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# Section B

# Appendices

## Appendix 1 – FLAC code

## Appendix 2 – UDEC code

# Appendix 1

FLAC numerical code

## HM Hamersley Models

### HM.1 Model 1 – Static mountain range

```
;
title
FLAC Modelling Input File
;
config extra 4 gw
grid  120   60
gen 0.00e0,-3.00e3 0.00e0,0.00e0 1.20e4,0.00e0 1.20e4,-3.00e3 i=1,121 j=1,61
gen 0.00e0,-3.00e3 0.00e0,0.00e0 1.50e3,0.00e0 1.50e3,-3.00e3 i=1,16 j=1,61
gen 1.50e3,-3.00e3 1.50e3,0.00e3 4.00e3,1.00e3 4.00e3,-3.00e3 i=16,41 j=1,61
gen 4.00e3,-3.00e3 4.00e3,1.00e3 8.00e3,1.00e3 8.00e3,-3.00e3 i=41,81 j=1,61
gen 8.00e3,-3.00e3 8.00e3,1.00e3 1.05e4,0.00e0 1.05e4,-3.00e3 i=81,106 j=1,61
gen 1.05e4,-3.00e3 1.05e4,0.00e0 1.20e4,0.00e0 1.20e4,-3.00e3 i=106,121 j=1,61

mark i=1
mark j=1
mark i = 121
mark j = 61
;
****************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3
set nmech 1 ngw 1 flow off
****************************************
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 77 , 16
pro coh=1.00e7 tens=1.00e6 reg= 77 , 16
pro fric=30 dil= 3  reg= 77 , 16
pro perm=1.00e-15 porosity=0.2 reg= 77 , 16

;
def hydro_pp
loop i (1,igp)
loop j (1,jgp)
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa + 1e5
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
hydro_pp
*
ini sat 1
fix sat
fix pp i=1,121 j=61
set gravity=9.8
set large

;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=60 j=30
hist 3 pp i=60 j=5
hist 4 pp i=60 j=15
hist 5 pp i=60 j=30
hist 6 pp i=60 j=40
fix x i=1
fix x i=121
```

```
fix y j=1

plot pp fill
sav finoext1_ini.sav

plot pp fill
movie on file finoext1.dcx step 500

;RUN TO GRAVITY SETTLING
STEP 1500
;SET FLUID FLOW ON AND RUN TO EQUILIBRIUM
set flow on
;apply discharge 1e-10 i=41,81 j=61

pl pp fi fl bl
sav finoext1_grav.sav
step 1500

sav finoext1_flow.sav
;
free x
free y
fix x i=1
fix x i=121
fix y j=1


step 2500
save finoext1_1.sav;
step 2500
save finoext1_2.sav;
step 2500
save finoext1_3.sav;
step 2500
save finoext1_4.sav;
```

## HM.2 Model 2 – Mountain range extension

```
;
title
FLAC Modelling Input File
;
config extra 4 gw
grid  120   60
gen 0.00e0,-3.00e3 0.00e0,0.00e0 1.20e4,0.00e0 1.20e4,-3.00e3 i=1,121 j=1,61
gen 0.00e0,-3.00e3 0.00e0,0.00e0 1.50e3,0.00e0 1.50e3,-3.00e3 i=1,16 j=1,61
gen 1.50e3,-3.00e3 1.50e3,0.00e3 4.00e3,1.00e3 4.00e3,-3.00e3 i=16,41 j=1,61
gen 4.00e3,-3.00e3 4.00e3,1.00e3 8.00e3,1.00e3 8.00e3,-3.00e3 i=41,81 j=1,61
gen 8.00e3,-3.00e3 8.00e3,1.00e3 1.05e4,0.00e0 1.05e4,-3.00e3 i=81,106 j=1,61
gen 1.05e4,-3.00e3 1.05e4,0.00e0 1.20e4,0.00e0 1.20e4,-3.00e3 i=106,121 j=1,61

mark i=1
mark j=1
mark i = 121
mark j = 61
;
***************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3
set nmech 1 ngw 1 flow off
***************************************
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 77 , 16
pro coh=1.00e7 tens=1.00e6 reg= 77 , 16
pro fric=30 dil= 3  reg= 77 , 16
pro perm=1.00e-15 porosity=0.2 reg= 77 , 16

;
def hydro_pp
loop i (1,igp)
loop j (1,jgp)
if j = jgp Then
```

```
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa + 1e5
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
hydro_pp
*
ini sat 1
fix sat
fix pp i=1,121 j=61
set gravity=9.8
set large

;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=60 j=30
hist 3 pp i=60 j=5
hist 4 pp i=60 j=15
hist 5 pp i=60 j=30
hist 6 pp i=60 j=40
fix x i=1
fix x i=121
fix y j=1

plot pp fill
sav finoext2_ini.sav

plot pp fill
movie on file finoext2.dcx step 500


;RUN TO GRAVITY SETTLING
STEP 1500
;SET FLUID FLOW ON AND RUN TO EQUILIBRIUM
set flow on
;apply discharge 1e-10 i=41,81 j=61

pl pp fi fl bl
sav finoext2_grav.sav
step 1500

sav finoext2_flow.sav
;
free x
free y
fix x i=1
fix x i=121
;fix y j=61
fix y j=1

ini xvel -0.024 var= 0.048 ,0 i=1, 121  j=1, 61

step 2500
save finext2_1.sav;   1 % deformation
step 2500
save finext2_2.sav;   2 % deformation
step 2500
save finext2_3.sav;   3 % deformation
step 2500
save finext2_4.sav;   4 % deformation
step 2500
save finext2_5.sav;   5 % deformation
step 2500
save finext2_6.sav;   6 % deformation
step 2500
save finext2_7.sav;   7 % deformation
step 2500
save finext2_8.sav;   8 % deformation
step 2500
save finext2_9.sav;   9 % deformation
step 2500
```

```
save finext2_10.sav;   10 % deformation
step 2500
save finext2_11.sav;   11 % deformation
step 2500
save finext2_12.sav;   12 % deformation
step 2500
save finext2_13.sav;   13 % deformation
step 2500
save finext2_14.sav;   14 % deformation
step 2500
save finext2_15.sav;   15 % deformation
step 2500
save finext2_16.sav;   16 % deformation
step 2500
save finext2_17.sav;   17 % deformation
step 2500
save finext2_18.sav;   18 % deformation
step 2500
save finext2_19.sav;   19 % deformation
step 2500
save finext2_20.sav;   20 % deformation
return
stop
```

## HM.3 Model 3 – Mountain range extension with shear zone

```
;
tit
FLAC Modelling Input File
;
config extra 4 gw
grid  120   60
gen 0.00e0,-3.00e3 0.00e0,0.00e0 1.20e4,0.00e0 1.20e4,-3.00e3 i=1,121 j=1,61
gen 0.00e0,-3.00e3 0.00e0,0.00e0 1.50e3,0.00e0 1.50e3,-3.00e3 i=1,16 j=1,61
gen 1.50e3,-3.00e3 1.50e3,0.00e3 4.00e3,1.00e3 4.00e3,-3.00e3 i=16,41 j=1,61
gen 4.00e3,-3.00e3 4.00e3,1.00e3 8.00e3,1.00e3 8.00e3,-3.00e3 i=41,81 j=1,61
gen 8.00e3,-3.00e3 8.00e3,1.00e3 1.05e4,0.00e0 1.05e4,-3.00e3 i=81,106 j=1,61
gen 1.05e4,-3.00e3 1.05e4,0.00e0 1.20e4,0.00e0 1.20e4,-3.00e3 i=106,121 j=1,61


mark i=1
mark j=1
mark i = 121
mark j = 61
;
****************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3
set nmech 1 ngw 1 flow off
****************************************
tab  1   0 ,-2506.14   12000 ,-2506.14
tab  2   1000 ,-3000   10300 , 1000   10900 , 1000
tab  2   1600 ,-3000
;
tab  3   0 ,-2006.43   3324.46 ,-2006.43
;
tab  4   3885.76 ,-2006.43   4197.59 ,-2068.89   4484.48 ,-2106.37
tab  4   5045.78 ,-2093.88   5619.56 ,-2031.41   6068.6 ,-1968.95
tab  4   6542.59 ,-1881.5   6979.16 ,-1756.57   7503.04 ,-1644.13
tab  4   7977.02 ,-1619.15   8488.43 ,-1669.12   8875.11 ,-1781.56
tab  4   9286.73 ,-1906.48   9673.4 ,-2043.9   10134.92 ,-2131.35
tab  4   10746.11 ,-2143.85   11245.05 ,-2081.38   11656.67 ,-1993.93
tab  4   12000 ,-1881.5
;
;
tab  5   4384.69 ,-1794.05   4609.21 ,-1831.53   4896.1 ,-1844.02
tab  5   5257.83 ,-1794.05   5669.45 ,-1756.57   6068.6 ,-1694.1
tab  5   6455.27 ,-1594.16   6929.26 ,-1481.73   7415.72 ,-1381.79
tab  5   7814.87 ,-1331.81   8201.55 ,-1356.8   8638.11 ,-1444.25
tab  5   9049.74 ,-1556.68   9448.88 ,-1694.1   9823.08 ,-1819.03
tab  5   10234.71 ,-1869   10733.64 ,-1906.48   11220.1 ,-1844.02
tab  5   11656.68 ,-1706.6   12000 ,-1569.18
```

```
;
;
tab  6   4883.63 ,-1569.18   5207.94 ,-1531.7   5482.35 ,-1494.22
tab  6   6031.18 ,-1394.28   6592.48 ,-1244.36   7041.52 ,-1131.93
tab  6   7552.93 ,-1044.48   8076.81 ,-994.51   8600.69 ,-1094.45
tab  6   9062.21 ,-1219.38   9548.67 ,-1381.79   10060.08 ,-1544.19
tab  6   10608.91 ,-1606.66   11070.42 ,-1556.68   11506.99 ,-1444.25
tab  6   12000 ,-1256.86
;
;
tab  7   5719.34 ,-1194.39   6118.49 ,-1119.44   6442.8 ,-1044.48
tab  7   6729.69 ,-982.02   7141.31 ,-869.58   7665.19 ,-757.15
tab  7   8201.55 ,-744.65   8737.9 ,-832.1   9286.73 ,-1031.99
tab  7   9723.3 ,-1169.41   10184.81 ,-1294.34   10571.49 ,-1331.81
tab  7   11020.53 ,-1306.83   11494.52 ,-1181.9   11793.88 ,-1069.46
tab  7   12000 ,-994.51
;
;
tab  8   4409.64 ,-1569.18   3835.86 ,-1331.81   3374.35 ,-1194.39
tab  8   2862.94 ,-1119.44   2301.64 ,-1119.44   1815.18 ,-1219.38
tab  8   1353.66 ,-1356.8   904.62 ,-1481.73   418.16 ,-1519.21
tab  8   0 ,-1481.73
;
;
tab  9   4758.89 ,-1394.28   4097.81 ,-1119.44   3673.71 ,-994.51
tab  9   3137.36 ,-882.07   2625.95 ,-869.58   2027.23 ,-919.55
tab  9   1490.87 ,-1044.48   966.99 ,-1194.39   555.37 ,-1269.35
tab  9   181.17 ,-1281.84   0 ,-1256.86
;
;
tab  10   5095.68 ,-1231.87   4472.01 ,-957.03   3823.39 ,-744.65
tab  10   3174.78 ,-644.71   2501.21 ,-607.23   1952.38 ,-657.2
tab  10   1416.03 ,-782.13   954.51 ,-907.06   443.11 ,-1007
tab  10   0 ,-994.51   0 ,-982.02
;
;
tab  11   5382.56 ,-1081.96   4634.16 ,-719.67   4147.7 ,-569.75
tab  11   3361.88 ,-419.84   2813.05 ,-382.36   2102.07 ,-407.35
tab  11   1353.66 ,-569.75   817.31 ,-694.68   293.43 ,-757.14
tab  11   0 ,-732.16
;
;gen tab  1
gen tab  2
;gen tab  3
;gen tab  4
;gen tab  5
;gen tab  6
;gen tab  7
;gen tab  8
;gen tab  9
;gen tab  10
;gen tab  11

; Properties for each sub-regions:
;
;  Fault
pro dens= 2400  bulk=2.33e8 shear=3.00e7 reg= 64 , 44
pro coh=2.00e2 tens=2.00e2 reg= 64 , 44
pro fric=30 dil= 4  reg= 64 , 44
pro perm=1.00e-13 porosity=0.3 reg= 64 , 44
;  Fault
pro dens= 2400  bulk=2.33e8 shear=3.00e7 reg= 24 , 10
pro coh=2.00e2 tens=2.00e2 reg= 24 , 10
pro fric=30 dil= 4  reg= 24 , 10
pro perm=1.00e-13 porosity=0.3 reg= 24 , 10
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 6 , 55
pro coh=1.00e7 tens=1.00e6 reg= 6 , 55
pro fric=30 dil= 4  reg= 6 , 55
pro perm=1.00e-15 porosity=0.2 reg= 6 , 55
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 64 , 30
pro coh=1.00e7 tens=1.00e6 reg= 64 , 30
pro fric=30 dil= 3  reg= 64 , 30
pro perm=1.00e-15 porosity=0.2 reg= 64 , 30
```

```
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 24 , 27
pro coh=1.00e7 tens=1.00e6 reg= 24 , 27
pro fric=30 dil= 3  reg= 24 , 27
pro perm=1.00e-15 porosity=0.2 reg= 24 , 27
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 106 , 50
pro coh=1.00e7 tens=1.00e6 reg= 106 , 50
pro fric=30 dil= 3  reg= 106 , 50
pro perm=1.00e-15 porosity=0.2 reg= 106 , 50
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 77 , 16
pro coh=1.00e7 tens=1.00e6 reg= 77 , 16
pro fric=30 dil= 3  reg= 77 , 16
pro perm=1.00e-15 porosity=0.2 reg= 77 , 16
;
*****
;
def hydro_pp
loop i (1,igp)
loop j (1,jgp)
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa + 1e5
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
hydro_pp
*
;
ini sat 1
fix sat
;fix pp i=1,121 j=61
set gravity=9.8
;
set large

;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=60 j=30
hist 3 pp i=60 j=5; basement
hist 4 pp i=60 j=15; footwall
hist 5 pp i=60 j=30; fault
hist 6 pp i=60 j=40; hangingwall

;FIX THE SIDES OF THE MODEL TO RUN TO GRAVITY SETTLING
fix x i=1
fix x i=121
fix y j=1
apply syy -7.5e7 j=1

plot pp fill
sav finext3_ini.sav

;Create Movie files every 500 steps
plot pp fill
movie on file finext3.dcx step 500
;

;RUN TO GRAVITY SETTLING
STEP 1500

;SET FLUID FLOW ON AND RUN TO EQUILIBRIUM
set flow on
apply discharge 1e-10 i=41,81 j=61

pl pp fi fl bl
sav finext3_grav.sav
step 1500

sav finext3_flow.sav
```

```
;

free x
free y
ini xvel -0.024 var= 0.048 ,0 i=1, 121  j=1, 61
fix x i=1
fix x i=121
;fix y j=61
fix y i=17,121 j=1 ; this fixes base on footwall side only, stress is applied to all to prevent drop on hangingwall
apply syy -7.5e7 j=1

step 2500
save finext3_1.sav;   1 % deformation
step 2500
save finext3_2.sav;   2 % deformation
step 2500
save finext3_3.sav;   3 % deformation
step 2500
save finext3_4.sav;   4 % deformation
step 2500
save finext3_5.sav;   5 % deformation
step 2500
save finext3_6.sav;   6 % deformation
step 2500
save finext3_7.sav;   7 % deformation
step 2500
save finext3_8.sav;   8 % deformation
step 2500
save finext3_9.sav;   9 % deformation
step 2500
save finext3_10.sav;   10 % deformation
step 2500
save finext3_11.sav;   11 % deformation
step 2500
save finext3_12.sav;   12 % deformation
step 2500
save finext3_13.sav;   13 % deformation
step 2500
save finext3_14.sav;   14 % deformation
step 2500
save finext3_15.sav;   15 % deformation
step 2500
save finext3_16.sav;   16 % deformation
step 2500
save finext3_17.sav;   17 % deformation
step 2500
save finext3_18.sav;   18 % deformation
step 2500
save finext3_19.sav;   19 % deformation
step 2500
save finext3_20.sav;   20 % deformation
return
stop
```

## HM.4 Model 4 – Low permeability basement

```
;
tit
FLAC Modelling Input File
;
config extra 4 gw
grid  120   60
gen 0.00e0,-3.00e3 0.00e0,0.00e0 1.20e4,0.00e0 1.20e4,-3.00e3 i=1,121 j=1,61
gen 0.00e0,-3.00e3 0.00e0,0.00e0 1.50e3,0.00e0 1.50e3,-3.00e3 i=1,16 j=1,61
gen 1.50e3,-3.00e3 1.50e3,0.00e3 4.00e3,1.00e3 4.00e3,-3.00e3 i=16,41 j=1,61
gen 4.00e3,-3.00e3 4.00e3,1.00e3 8.00e3,1.00e3 8.00e3,-3.00e3 i=41,81 j=1,61
gen 8.00e3,-3.00e3 8.00e3,1.00e3 1.05e4,0.00e0 1.05e4,-3.00e3 i=81,106 j=1,61
gen 1.05e4,-3.00e3 1.05e4,0.00e0 1.20e4,0.00e0 1.20e4,-3.00e3 i=106,121 j=1,61


mark i=1
mark j=1
```

```
mark i = 121
mark j = 61
;
****************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3
set nmech 1 ngw 1 flow off
****************************************
;
tab  1   0 ,-2506.14   12000 ,-2506.14

tab  2   2139.49 ,-2500.29   10300 , 1000   10900 , 1000
tab  2   2738.21 ,-2500.29
tab  3   0 ,-2006.43   3324.46 ,-2006.43
;
;
tab  4   3885.76 ,-2006.43   4197.59 ,-2068.89   4484.48 ,-2106.37
tab  4   5045.78 ,-2093.88   5619.56 ,-2031.41   6068.6 ,-1968.95
tab  4   6542.59 ,-1881.5   6979.16 ,-1756.57   7503.04 ,-1644.13
tab  4   7977.02 ,-1619.15   8488.43 ,-1669.12   8875.11 ,-1781.56
tab  4   9286.73 ,-1906.48   9673.4 ,-2043.9   10134.92 ,-2131.35
tab  4   10746.11 ,-2143.85   11245.05 ,-2081.38   11656.67 ,-1993.93
tab  4   12000 ,-1881.5
;
tab  5   4384.69 ,-1794.05   4609.21 ,-1831.53   4896.1 ,-1844.02
tab  5   5257.83 ,-1794.05   5669.45 ,-1756.57   6068.6 ,-1694.1
tab  5   6455.27 ,-1594.16   6929.26 ,-1481.73   7415.72 ,-1381.79
tab  5   7814.87 ,-1331.81   8201.55 ,-1356.8   8638.11 ,-1444.25
tab  5   9049.74 ,-1556.68   9448.88 ,-1694.1   9823.08 ,-1819.03
tab  5   10234.71 ,-1869   10733.64 ,-1906.48   11220.1 ,-1844.02
tab  5   11656.68 ,-1706.6   12000 ,-1569.18
;
tab  6   4883.63 ,-1569.18   5207.94 ,-1531.7   5482.35 ,-1494.22
tab  6   6031.18 ,-1394.28   6592.48 ,-1244.36   7041.52 ,-1131.93
tab  6   7552.93 ,-1044.48   8076.81 ,-994.51   8600.69 ,-1094.45
tab  6   9062.21 ,-1219.38   9548.67 ,-1381.79   10060.08 ,-1544.19
tab  6   10608.91 ,-1606.66   11070.42 ,-1556.68   11506.99 ,-1444.25
tab  6   12000 ,-1256.86
;
tab  7   5719.34 ,-1194.39   6118.49 ,-1119.44   6442.8 ,-1044.48
tab  7   6729.69 ,-982.02   7141.31 ,-869.58   7665.19 ,-757.15
tab  7   8201.55 ,-744.65   8737.9 ,-832.1   9286.73 ,-1031.99
tab  7   9723.3 ,-1169.41   10184.81 ,-1294.34   10571.49 ,-1331.81
tab  7   11020.53 ,-1306.83   11494.52 ,-1181.9   11793.88 ,-1069.46
tab  7   12000 ,-994.51
;
tab  8   4409.64 ,-1569.18   3835.86 ,-1331.81   3374.35 ,-1194.39
tab  8   2862.94 ,-1119.44   2301.64 ,-1119.44   1815.18 ,-1219.38
tab  8   1353.66 ,-1356.8   904.62 ,-1481.73   418.16 ,-1519.21
tab  8   0 ,-1481.73
;
tab  9   4758.89 ,-1394.28   4097.81 ,-1119.44   3673.71 ,-994.51
tab  9   3137.36 ,-882.07   2625.95 ,-869.58   2027.23 ,-919.55
tab  9   1490.87 ,-1044.48   966.99 ,-1194.39   555.37 ,-1269.35
tab  9   181.17 ,-1281.84   0 ,-1256.86
;
tab  10   5095.68 ,-1231.87   4472.01 ,-957.03   3823.39 ,-744.65
tab  10   3174.78 ,-644.71   2501.21 ,-607.23   1952.38 ,-657.2
tab  10   1416.03 ,-782.13   954.51 ,-907.06   443.11 ,-1007
tab  10   0 ,-994.51   0 ,-982.02
;
tab  11   5382.56 ,-1081.96   4634.16 ,-719.67   4147.7 ,-569.75
tab  11   3361.88 ,-419.84   2813.05 ,-382.36   2102.07 ,-407.35
tab  11   1353.66 ,-569.75   817.31 ,-694.68   293.43 ,-757.14
tab  11   0 ,-732.16
;
gen tab  1
gen tab  2
gen tab  3
;gen tab  4
;gen tab  5
;gen tab  6
;gen tab  7
;gen tab  8
```

```
;gen tab  9
;gen tab  10
;gen tab  11
;
;
; Properties for each sub-regions:
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 92 , 4
pro coh=4.00e6 tens=4.00e5 reg= 92 , 4
pro fric=30 dil= 3  reg= 92 , 4
pro perm=2.00e-16 porosity=0.3 reg= 92 , 4
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 9 , 14
pro coh=4.00e6 tens=4.00e5 reg= 9 , 14
pro fric=30 dil= 3  reg= 9 , 14
pro perm=2.00e-16 porosity=0.3 reg= 9 , 14
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 7 , 4
pro coh=4.00e6 tens=4.00e5 reg= 7 , 4
pro fric=30 dil= 3  reg= 7 , 4
pro perm=2.00e-16 porosity=0.3 reg= 7 , 4
;  Fault
pro dens= 2400  bulk=2.33e8 shear=3.00e7 reg= 64 , 44
pro coh=2.00e2 tens=2.00e2 reg= 64 , 44
pro fric=30 dil= 4  reg= 64 , 44
pro perm=1.00e-13 porosity=0.3 reg= 64 , 44
;  Fault
pro dens= 2400  bulk=2.33e8 shear=3.00e7 reg= 24 , 10
pro coh=2.00e2 tens=2.00e2 reg= 24 , 10
pro fric=30 dil= 4  reg= 24 , 10
pro perm=1.00e-13 porosity=0.3 reg= 24 , 10
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 6 , 55
pro coh=1.00e7 tens=1.00e6 reg= 6 , 55
pro fric=30 dil= 4  reg= 6 , 55
pro perm=1.00e-15 porosity=0.2 reg= 6 , 55
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 64 , 30
pro coh=1.00e7 tens=1.00e6 reg= 64 , 30
pro fric=30 dil= 3  reg= 64 , 30
pro perm=1.00e-15 porosity=0.2 reg= 64 , 30
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 24 , 27
pro coh=1.00e7 tens=1.00e6 reg= 24 , 27
pro fric=30 dil= 3  reg= 24 , 27
pro perm=1.00e-15 porosity=0.2 reg= 24 , 27
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 106 , 50
pro coh=1.00e7 tens=1.00e6 reg= 106 , 50
pro fric=30 dil= 3  reg= 106 , 50
pro perm=1.00e-15 porosity=0.2 reg= 106 , 50
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 77 , 16
pro coh=1.00e7 tens=1.00e6 reg= 77 , 16
pro fric=30 dil= 3  reg= 77 , 16
pro perm=1.00e-15 porosity=0.2 reg= 77 , 16
;
def hydro_pp
loop i (1,igp)
loop j (1,jgp)
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa + 1e5
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
hydro_pp
*
```

```
; Set PP at Lithostatic in basement
;
def litho_pp
loop i (1,igp)
loop j (1,21)
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 2650 * 9.8 * aaa + 1e5
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
litho_pp
*
;
ini sat 1
fix sat
;fix pp i=1,121 j=61

set gravity=9.8
set large

;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=60 j=30
hist 3 pp i=60 j=5; basement
hist 4 pp i=60 j=15; footwall
hist 5 pp i=60 j=30; fault
hist 6 pp i=60 j=40; hangingwall

;FIX THE SIDES OF THE MODEL TO RUN TO GRAVITY SETTLING
fix x i=1
fix x i=121
fix y j=1
apply syy -7.5e7 j=1

plot pp fill
sav finext4_ini.sav

;Create Movie files every 500 steps
plot pp fill
movie on file finext4.dcx step 500
;
;RUN TO GRAVITY SETTLING
STEP 1500
;SET FLUID FLOW ON AND RUN TO EQUILIBRIUM
set flow on
apply discharge 1e-10 i=41,81 j=61

pl pp fi fl bl
sav finext4_grav.sav
step 1500
sav finext4_flow.sav

free x
free y
ini xvel -0.024 var= 0.048 ,0 i=1, 121  j=1, 61
fix x i=1
fix x i=121
;fix y j=61
fix y i=26,121 j=1 ; this fixes base on footwall side only, stress is applied to all to prevent drop on hangingwall
apply syy -7.5e7 j=1


step 2500
save finext4_1.sav;   1 % deformation
step 2500
save finext4_2.sav;   2 % deformation
step 2500
save finext4_3.sav;   3 % deformation
step 2500
save finext4_4.sav;   4 % deformation
```

```
step 2500
save finext4_5.sav;   5 % deformation
step 2500
save finext4_6.sav;   6 % deformation
step 2500
save finext4_7.sav;   7 % deformation
step 2500
save finext4_8.sav;   8 % deformation
step 2500
save finext4_9.sav;   9 % deformation
step 2500
save finext4_10.sav;   10 % deformation
step 2500
save finext4_11.sav;   11 % deformation
step 2500
save finext4_12.sav;   12 % deformation
step 2500
save finext4_13.sav;   13 % deformation
step 2500
save finext4_14.sav;   14 % deformation
step 2500
save finext4_15.sav;   15 % deformation
step 2500
save finext4_16.sav;   16 % deformation
step 2500
save finext4_17.sav;   17 % deformation
step 2500
save finext4_18.sav;   18 % deformation
step 2500
save finext4_19.sav;   19 % deformation
step 2500
save finext4_20.sav;   20 % deformation
return
stop
```

## HM.5 Model 5 – Hamersley Model

```
;
tit
FLAC Modelling Input File
;
config extra 4 gw
grid  120   60
gen 0.00e0,-3.00e3 0.00e0,0.00e0 1.20e4,0.00e0 1.20e4,-3.00e3 i=1,121 j=1,61
gen 0.00e0,-3.00e3 0.00e0,0.00e0 1.50e3,0.00e0 1.50e3,-3.00e3 i=1,16 j=1,61
gen 1.50e3,-3.00e3 1.50e3,0.00e3 4.00e3,1.00e3 4.00e3,-3.00e3 i=16,41 j=1,61
gen 4.00e3,-3.00e3 4.00e3,1.00e3 8.00e3,1.00e3 8.00e3,-3.00e3 i=41,81 j=1,61
gen 8.00e3,-3.00e3 8.00e3,1.00e3 1.05e4,0.00e0 1.05e4,-3.00e3 i=81,106 j=1,61
gen 1.05e4,-3.00e3 1.05e4,0.00e0 1.20e4,0.00e0 1.20e4,-3.00e3 i=106,121 j=1,61

mark i=1
mark j=1
mark i = 121
mark j = 61
;
***************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3
set nmech 1 ngw 1 flow off
***************************************
tab  1   0 ,-2506.14   12000 ,-2506.14
tab  2   2139.49 ,-2500.29   10300 , 1000   10900 , 1000
tab  2   2738.21 ,-2500.29
tab  3   0 ,-2006.43   3324.46 ,-2006.43
tab  4   3885.76 ,-2006.43   4197.59 ,-2068.89   4484.48 ,-2106.37
tab  4   5045.78 ,-2093.88   5619.56 ,-2031.41   6068.6 ,-1968.95
tab  4   6542.59 ,-1881.5   6979.16 ,-1756.57   7503.04 ,-1644.13
tab  4   7977.02 ,-1619.15   8488.43 ,-1669.12   8875.11 ,-1781.56
tab  4   9286.73 ,-1906.48   9673.4 ,-2043.9   10134.92 ,-2131.35
tab  4   10746.11 ,-2143.85   11245.05 ,-2081.38   11656.67 ,-1993.93
```

```
tab  4   12000 ,-1881.5
;
tab  5   4384.69 ,-1794.05   4609.21 ,-1831.53   4896.1 ,-1844.02
tab  5   5257.83 ,-1794.05   5669.45 ,-1756.57   6068.6 ,-1694.1
tab  5   6455.27 ,-1594.16   6929.26 ,-1481.73   7415.72 ,-1381.79
tab  5   7814.87 ,-1331.81   8201.55 ,-1356.8   8638.11 ,-1444.25
tab  5   9049.74 ,-1556.68   9448.88 ,-1694.1   9823.08 ,-1819.03
tab  5   10234.71 ,-1869   10733.64 ,-1906.48   11220.1 ,-1844.02
tab  5   11656.68 ,-1706.6   12000 ,-1569.18
;
tab  6   4883.63 ,-1569.18   5207.94 ,-1531.7   5482.35 ,-1494.22
tab  6   6031.18 ,-1394.28   6592.48 ,-1244.36   7041.52 ,-1131.93
tab  6   7552.93 ,-1044.48   8076.81 ,-994.51   8600.69 ,-1094.45
tab  6   9062.21 ,-1219.38   9548.67 ,-1381.79   10060.08 ,-1544.19
tab  6   10608.91 ,-1606.66   11070.42 ,-1556.68   11506.99 ,-1444.25
tab  6   12000 ,-1256.86
;
tab  7   5719.34 ,-1194.39   6118.49 ,-1119.44   6442.8 ,-1044.48
tab  7   6729.69 ,-982.02   7141.31 ,-869.58   7665.19 ,-757.15
tab  7   8201.55 ,-744.65   8737.9 ,-832.1   9286.73 ,-1031.99
tab  7   9723.3 ,-1169.41   10184.81 ,-1294.34   10571.49 ,-1331.81
tab  7   11020.53 ,-1306.83   11494.52 ,-1181.9   11793.88 ,-1069.46
tab  7   12000 ,-994.51
;
tab  8   4409.64 ,-1569.18   3835.86 ,-1331.81   3374.35 ,-1194.39
tab  8   2862.94 ,-1119.44   2301.64 ,-1119.44   1815.18 ,-1219.38
tab  8   1353.66 ,-1356.8   904.62 ,-1481.73   418.16 ,-1519.21
tab  8   0 ,-1481.73
;
tab  9   4758.89 ,-1394.28   4097.81 ,-1119.44   3673.71 ,-994.51
tab  9   3137.36 ,-882.07   2625.95 ,-869.58   2027.23 ,-919.55
tab  9   1490.87 ,-1044.48   966.99 ,-1194.39   555.37 ,-1269.35
tab  9   181.17 ,-1281.84   0 ,-1256.86
;
tab  10   5095.68 ,-1231.87   4472.01 ,-957.03   3823.39 ,-744.65
tab  10   3174.78 ,-644.71   2501.21 ,-607.23   1952.38 ,-657.2
tab  10   1416.03 ,-782.13   954.51 ,-907.06   443.11 ,-1007
tab  10   0 ,-994.51   0 ,-982.02
;
tab  11   5382.56 ,-1081.96   4634.16 ,-719.67   4147.7 ,-569.75
tab  11   3361.88 ,-419.84   2813.05 ,-382.36   2102.07 ,-407.35
tab  11   1353.66 ,-569.75   817.31 ,-694.68   293.43 ,-757.14
tab  11   0 ,-732.16
;
gen tab  1
gen tab  2
gen tab  3
gen tab  4
gen tab  5
gen tab  6
gen tab  7
gen tab  8
gen tab  9
gen tab  10
gen tab  11
;
; Properties for each sub-regions:
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 92 , 4
pro coh=4.00e6 tens=4.00e5 reg= 92 , 4
pro fric=30 dil= 3  reg= 92 , 4
pro perm=2.00e-16 porosity=0.3 reg= 92 , 4
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 9 , 14
pro coh=4.00e6 tens=4.00e5 reg= 9 , 14
pro fric=30 dil= 3  reg= 9 , 14
pro perm=2.00e-16 porosity=0.3 reg= 9 , 14
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 7 , 4
pro coh=4.00e6 tens=4.00e5 reg= 7 , 4
pro fric=30 dil= 3  reg= 7 , 4
pro perm=2.00e-16 porosity=0.3 reg= 7 , 4
;  Fault
pro dens= 2400  bulk=2.33e8 shear=3.00e7 reg= 64 , 44
pro coh=2.00e2 tens=2.00e2 reg= 64 , 44
```

```
pro fric=30 dil= 4  reg= 64 , 44
pro perm=1.00e-13 porosity=0.3 reg= 64 , 44
;  Fault
pro dens= 2400  bulk=2.33e8 shear=3.00e7 reg= 24 , 10
pro coh=2.00e2 tens=2.00e2 reg= 24 , 10
pro fric=30 dil= 4  reg= 24 , 10
pro perm=1.00e-13 porosity=0.3 reg= 24 , 10
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 24 , 35
pro coh=3.01e6 tens=1.50e6 reg= 24 , 35
pro fric=30 dil= 4  reg= 24 , 35
pro perm=1.00e-14 porosity=0.3 reg= 24 , 35
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 24 , 44
pro coh=3.01e6 tens=1.50e6 reg= 24 , 44
pro fric=30 dil= 4  reg= 24 , 44
pro perm=1.00e-14 porosity=0.3 reg= 24 , 44
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 45 , 14
pro coh=3.01e6 tens=3.00e5 reg= 45 , 14
pro fric=30 dil= 4  reg= 45 , 14
pro perm=1.00e-14 porosity=0.3 reg= 45 , 14
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 42 , 23
pro coh=3.01e6 tens=3.00e5 reg= 42 , 23
pro fric=30 dil= 4  reg= 42 , 23
pro perm=1.00e-14 porosity=0.3 reg= 42 , 23
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 43 , 23
pro coh=3.01e6 tens=3.00e5 reg= 43 , 23
pro fric=30 dil= 4  reg= 43 , 23
pro perm=1.00e-14 porosity=0.3 reg= 43 , 23
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 53 , 23
pro coh=3.01e6 tens=3.00e5 reg= 53 , 23
pro fric=30 dil= 4  reg= 53 , 23
pro perm=1.00e-14 porosity=0.3 reg= 53 , 23
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 55 , 24
pro coh=3.01e6 tens=3.00e5 reg= 55 , 24
pro fric=30 dil= 4  reg= 55 , 24
pro perm=1.00e-14 porosity=0.3 reg= 55 , 24
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 22 , 50
pro coh=3.01e6 tens=3.00e5 reg= 22 , 50
pro fric=30 dil= 4  reg= 22 , 50
pro perm=1.00e-14 porosity=0.3 reg= 22 , 50
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 84 , 42
pro coh=3.01e6 tens=3.00e5 reg= 84 , 42
pro fric=30 dil= 4  reg= 84 , 42
pro perm=1.00e-14 porosity=0.3 reg= 84 , 42
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 82 , 28
pro coh=3.01e6 tens=3.00e5 reg= 82 , 28
pro fric=30 dil= 4  reg= 82 , 28
pro perm=1.00e-14 porosity=0.3 reg= 82 , 28
;  Shale
pro dens= 2500  bulk=2.81e10 shear=6.69e9 reg= 24 , 39
pro coh=3.00e6 tens=3.0e5 reg= 24 , 39
pro fric=30 dil= 4  reg= 24 , 39
pro perm=1.00e-19 porosity=0.3 reg= 24 , 39
;  Shale
pro dens= 2500  bulk=2.81e10 shear=6.69e9 reg= 80 , 28
pro coh=3.00e6 tens=3.0e5 reg= 80 , 28
pro fric=30 dil= 4  reg= 80 , 28
pro perm=1.00e-19 porosity=0.3 reg= 80 , 28
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 6 , 55
pro coh=1.00e7 tens=1.00e6 reg= 6 , 55
pro fric=30 dil= 4  reg= 6 , 55
pro perm=1.00e-15 porosity=0.2 reg= 6 , 55
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 64 , 30
pro coh=1.00e7 tens=1.00e6 reg= 64 , 30
```

```
pro fric=30 dil= 3  reg= 64 , 30
pro perm=1.00e-15 porosity=0.2 reg= 64 , 30
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 24 , 27
pro coh=1.00e7 tens=1.00e6 reg= 24 , 27
pro fric=30 dil= 3  reg= 24 , 27
pro perm=1.00e-15 porosity=0.2 reg= 24 , 27
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 106 , 50
pro coh=1.00e7 tens=1.00e6 reg= 106 , 50
pro fric=30 dil= 3  reg= 106 , 50
pro perm=1.00e-15 porosity=0.2 reg= 106 , 50
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 77 , 16
pro coh=1.00e7 tens=1.00e6 reg= 77 , 16
pro fric=30 dil= 3  reg= 77 , 16
pro perm=1.00e-15 porosity=0.2 reg= 77 , 16
;
*****
;
def hydro_pp
loop i (1,igp)
loop j (1,jgp)
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa + 1e5
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
hydro_pp
*

; Set PP at Lithostatic in basement
;
def litho_pp
loop i (1,igp)
loop j (1,21)
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 2650 * 9.8 * aaa + 1e5
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
litho_pp
*
ini sat 1
fix sat
fix pp j=61

set gravity=9.8
set large

;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=60 j=30
hist 3 pp i=60 j=5; basement
hist 4 pp i=60 j=15; footwall
hist 5 pp i=60 j=30; fault
hist 6 pp i=60 j=40; hangingwall


;FIX THE SIDES OF THE MODEL TO RUN TO GRAVITY SETTLING
fix x i=1
fix x i=121
fix y j=1
apply syy -7.5e7 j=1
```

```
plot pp fill
sav finext5_ini.sav

;Create Movie files every 500 steps
plot pp fill
movie on file finext5.dcx step 500
;

;RUN TO GRAVITY SETTLING
STEP 1500
;SET FLUID FLOW ON AND RUN TO EQUILIBRIUM
set flow on
apply discharge 1e-10 i=41,81 j=61

pl pp fi fl bl
sav finext5_grav.sav
step 1500
sav finext5_flow.sav
;
free x
free y
ini xvel -0.024 var= 0.048 ,0 i=1, 121  j=1, 61
fix x i=1
fix x i=121
;fix y j=61
fix y i=26,121 j=1 ; this fixes base on footwall side only, stress is applied to all to prevent drop on hangingwall
apply syy -7.5e7 j=1

step 2500
save finext5_1.sav;   1 % deformation
step 2500
save finext5_2.sav;   2 % deformation
step 2500
save finext5_3.sav;   3 % deformation
step 2500
save finext5_4.sav;   4 % deformation
step 2500
save finext5_5.sav;   5 % deformation
step 2500
save finext5_6.sav;   6 % deformation
step 2500
save finext5_7.sav;   7 % deformation
step 2500
save finext5_8.sav;   8 % deformation
step 2500
save finext5_9.sav;   9 % deformation
step 2500
save finext5_10.sav;   10 % deformation
step 2500
save finext5_11.sav;   11 % deformation
step 2500
save finext5_12.sav;   12 % deformation
step 2500
save finext5_13.sav;   13 % deformation
step 2500
save finext5_14.sav;   14 % deformation
step 2500
save finext5_15.sav;   15 % deformation
step 2500
save finext5_16.sav;   16 % deformation
step 2500
save finext5_17.sav;   17 % deformation
step 2500
save finext5_18.sav;   18 % deformation
step 2500
save finext5_19.sav;   19 % deformation
step 2500
save finext5_20.sav;   20 % deformation
return
stop
```

## HM.6 Model 5 – Hamersley Model with silica dissolution

```
;
tit
FLAC Modelling Input File
;
config extra 4 gw
grid  120   60
gen 0.00e0,-3.00e3 0.00e0,0.00e0 1.20e4,0.00e0 1.20e4,-3.00e3 i=1,121 j=1,61
gen 0.00e0,-3.00e3 0.00e0,0.00e0 1.50e3,0.00e0 1.50e3,-3.00e3 i=1,16 j=1,61
gen 1.50e3,-3.00e3 1.50e3,0.00e3 4.00e3,1.00e3 4.00e3,-3.00e3 i=16,41 j=1,61
gen 4.00e3,-3.00e3 4.00e3,1.00e3 8.00e3,1.00e3 8.00e3,-3.00e3 i=41,81 j=1,61
gen 8.00e3,-3.00e3 8.00e3,1.00e3 1.05e4,0.00e0 1.05e4,-3.00e3 i=81,106 j=1,61
gen 1.05e4,-3.00e3 1.05e4,0.00e0 1.20e4,0.00e0 1.20e4,-3.00e3 i=106,121 j=1,61


mark i=1
mark j=1
mark i = 121
mark j = 61
;
***************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3
set nmech 1 ngw 1 flow off
***************************************
tab  1   0 ,-2506.14   12000 ,-2506.14
;
tab  2   2139.49 ,-2500.29   10300 , 1000   10900 , 1000
tab  2   2738.21 ,-2500.29
;
tab  3   0 ,-2006.43   3324.46 ,-2006.43
;
tab  4   3885.76 ,-2006.43   4197.59 ,-2068.89   4484.48 ,-2106.37
tab  4   5045.78 ,-2093.88   5619.56 ,-2031.41   6068.6 ,-1968.95
tab  4   6542.59 ,-1881.5   6979.16 ,-1756.57   7503.04 ,-1644.13
tab  4   7977.02 ,-1619.15   8488.43 ,-1669.12   8875.11 ,-1781.56
tab  4   9286.73 ,-1906.48   9673.4 ,-2043.9   10134.92 ,-2131.35
tab  4   10746.11 ,-2143.85   11245.05 ,-2081.38   11656.67 ,-1993.93
tab  4   12000 ,-1881.5
;
tab  5   4384.69 ,-1794.05   4609.21 ,-1831.53   4896.1 ,-1844.02
tab  5   5257.83 ,-1794.05   5669.45 ,-1756.57   6068.6 ,-1694.1
tab  5   6455.27 ,-1594.16   6929.26 ,-1481.73   7415.72 ,-1381.79
tab  5   7814.87 ,-1331.81   8201.55 ,-1356.8   8638.11 ,-1444.25
tab  5   9049.74 ,-1556.68   9448.88 ,-1694.1   9823.08 ,-1819.03
tab  5   10234.71 ,-1869   10733.64 ,-1906.48   11220.1 ,-1844.02
tab  5   11656.68 ,-1706.6   12000 ,-1569.18
;
tab  6   4883.63 ,-1569.18   5207.94 ,-1531.7   5482.35 ,-1494.22
tab  6   6031.18 ,-1394.28   6592.48 ,-1244.36   7041.52 ,-1131.93
tab  6   7552.93 ,-1044.48   8076.81 ,-994.51   8600.69 ,-1094.45
tab  6   9062.21 ,-1219.38   9548.67 ,-1381.79   10060.08 ,-1544.19
tab  6   10608.91 ,-1606.66   11070.42 ,-1556.68   11506.99 ,-1444.25
tab  6   12000 ,-1256.86
;
tab  7   5719.34 ,-1194.39   6118.49 ,-1119.44   6442.8 ,-1044.48
tab  7   6729.69 ,-982.02   7141.31 ,-869.58   7665.19 ,-757.15
tab  7   8201.55 ,-744.65   8737.9 ,-832.1   9286.73 ,-1031.99
tab  7   9723.3 ,-1169.41   10184.81 ,-1294.34   10571.49 ,-1331.81
tab  7   11020.53 ,-1306.83   11494.52 ,-1181.9   11793.88 ,-1069.46
tab  7   12000 ,-994.51
;
tab  8   4409.64 ,-1569.18   3835.86 ,-1331.81   3374.35 ,-1194.39
tab  8   2862.94 ,-1119.44   2301.64 ,-1119.44   1815.18 ,-1219.38
tab  8   1353.66 ,-1356.8   904.62 ,-1481.73   418.16 ,-1519.21
tab  8   0 ,-1481.73
;
tab  9   4758.89 ,-1394.28   4097.81 ,-1119.44   3673.71 ,-994.51
tab  9   3137.36 ,-882.07   2625.95 ,-869.58   2027.23 ,-919.55
tab  9   1490.87 ,-1044.48   966.99 ,-1194.39   555.37 ,-1269.35
tab  9   181.17 ,-1281.84   0 ,-1256.86
;
```

```
;
tab  10   5095.68 ,-1231.87   4472.01 ,-957.03   3823.39 ,-744.65
tab  10   3174.78 ,-644.71   2501.21 ,-607.23   1952.38 ,-657.2
tab  10   1416.03 ,-782.13   954.51 ,-907.06   443.11 ,-1007
tab  10   0 ,-994.51   0 ,-982.02
;
tab  11   5382.56 ,-1081.96   4634.16 ,-719.67   4147.7 ,-569.75
tab  11   3361.88 ,-419.84   2813.05 ,-382.36   2102.07 ,-407.35
tab  11   1353.66 ,-569.75   817.31 ,-694.68   293.43 ,-757.14
tab  11   0 ,-732.16
;
gen tab  1
gen tab  2
gen tab  3
gen tab  4
gen tab  5
gen tab  6
gen tab  7
gen tab  8
gen tab  9
gen tab  10
gen tab  11
;
;
; Properties for each sub-regions:
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 92 , 4
pro coh=4.00e6 tens=4.00e5 reg= 92 , 4
pro fric=30 dil= 3  reg= 92 , 4
pro perm=2.00e-16 porosity=0.3 reg= 92 , 4
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 9 , 14
pro coh=4.00e6 tens=4.00e5 reg= 9 , 14
pro fric=30 dil= 3  reg= 9 , 14
pro perm=2.00e-16 porosity=0.3 reg= 9 , 14
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 7 , 4
pro coh=4.00e6 tens=4.00e5 reg= 7 , 4
pro fric=30 dil= 3  reg= 7 , 4
pro perm=2.00e-16 porosity=0.3 reg= 7 , 4
;  Fault
pro dens= 2400  bulk=2.33e8 shear=3.00e7 reg= 64 , 44
pro coh=2.00e2 tens=2.00e2 reg= 64 , 44
pro fric=30 dil= 4  reg= 64 , 44
pro perm=1.00e-13 porosity=0.3 reg= 64 , 44
;  Fault
pro dens= 2400  bulk=2.33e8 shear=3.00e7 reg= 24 , 10
pro coh=2.00e2 tens=2.00e2 reg= 24 , 10
pro fric=30 dil= 4  reg= 24 , 10
pro perm=1.00e-13 porosity=0.3 reg= 24 , 10
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 24 , 35
pro coh=3.01e6 tens=1.50e6 reg= 24 , 35
pro fric=30 dil= 4  reg= 24 , 35
pro perm=1.00e-14 porosity=0.3 reg= 24 , 35
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 24 , 44
pro coh=3.01e6 tens=1.50e6 reg= 24 , 44
pro fric=30 dil= 4  reg= 24 , 44
pro perm=1.00e-14 porosity=0.3 reg= 24 , 44
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 45 , 14
pro coh=3.01e6 tens=3.00e5 reg= 45 , 14
pro fric=30 dil= 4  reg= 45 , 14
pro perm=1.00e-14 porosity=0.3 reg= 45 , 14
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 42 , 23
pro coh=3.01e6 tens=3.00e5 reg= 42 , 23
pro fric=30 dil= 4  reg= 42 , 23
pro perm=1.00e-14 porosity=0.3 reg= 42 , 23
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 43 , 23
pro coh=3.01e6 tens=3.00e5 reg= 43 , 23
pro fric=30 dil= 4  reg= 43 , 23
pro perm=1.00e-14 porosity=0.3 reg= 43 , 23
```

```
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 53 , 23
pro coh=3.01e6 tens=3.00e5 reg= 53 , 23
pro fric=30 dil= 4  reg= 53 , 23
pro perm=1.00e-14 porosity=0.3 reg= 53 , 23
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 55 , 24
pro coh=3.01e6 tens=3.00e5 reg= 55 , 24
pro fric=30 dil= 4  reg= 55 , 24
pro perm=1.00e-14 porosity=0.3 reg= 55 , 24
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 22 , 50
pro coh=3.01e6 tens=3.00e5 reg= 22 , 50
pro fric=30 dil= 4  reg= 22 , 50
pro perm=1.00e-14 porosity=0.3 reg= 22 , 50
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 84 , 42
pro coh=3.01e6 tens=3.00e5 reg= 84 , 42
pro fric=30 dil= 4  reg= 84 , 42
pro perm=1.00e-14 porosity=0.3 reg= 84 , 42
;  Bif
pro dens= 2800  bulk=3.21e10 shear=4.0e9 reg= 82 , 28
pro coh=3.01e6 tens=3.00e5 reg= 82 , 28
pro fric=30 dil= 4  reg= 82 , 28
pro perm=1.00e-14 porosity=0.3 reg= 82 , 28
;  Shale
pro dens= 2500  bulk=2.81e10 shear=6.69e9 reg= 24 , 39
pro coh=3.00e6 tens=3.0e5 reg= 24 , 39
pro fric=30 dil= 4  reg= 24 , 39
pro perm=1.00e-19 porosity=0.3 reg= 24 , 39
;  Shale
pro dens= 2500  bulk=2.81e10 shear=6.69e9 reg= 80 , 28
pro coh=3.00e6 tens=3.0e5 reg= 80 , 28
pro fric=30 dil= 4  reg= 80 , 28
pro perm=1.00e-19 porosity=0.3 reg= 80 , 28
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 6 , 55
pro coh=1.00e7 tens=1.00e6 reg= 6 , 55
pro fric=30 dil= 4  reg= 6 , 55
pro perm=1.00e-15 porosity=0.2 reg= 6 , 55
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 64 , 30
pro coh=1.00e7 tens=1.00e6 reg= 64 , 30
pro fric=30 dil= 3  reg= 64 , 30
pro perm=1.00e-15 porosity=0.2 reg= 64 , 30
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 24 , 27
pro coh=1.00e7 tens=1.00e6 reg= 24 , 27
pro fric=30 dil= 3  reg= 24 , 27
pro perm=1.00e-15 porosity=0.2 reg= 24 , 27
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 106 , 50
pro coh=1.00e7 tens=1.00e6 reg= 106 , 50
pro fric=30 dil= 3  reg= 106 , 50
pro perm=1.00e-15 porosity=0.2 reg= 106 , 50
;  Upper Crust
pro dens= 2700  bulk=2.33e10 shear=6.40e9 reg= 77 , 16
pro coh=1.00e7 tens=1.00e6 reg= 77 , 16
pro fric=30 dil= 3  reg= 77 , 16
pro perm=1.00e-15 porosity=0.2 reg= 77 , 16
;

;
def hydro_pp
loop i (1,igp)
loop j (1,jgp)
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa + 1e5
end_if
gpp(i, j) = sss2
end_loop
end_loop
```

```
end
hydro_pp
*

; Set PP at Lithostatic in basement

def litho_pp
loop i (1,igp)
loop j (1,21)
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 2650 * 9.8 * aaa + 1e5
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
litho_pp
*
;
ini sat 1
fix sat
fix pp j=61

set gravity=9.8
set large

;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=60 j=30
hist 3 pp i=60 j=5; basement
hist 4 pp i=60 j=15; footwall
hist 5 pp i=60 j=30; fault
hist 6 pp i=60 j=40; hangingwall


;FIX THE SIDES OF THE MODEL TO RUN TO GRAVITY SETTLING
fix x i=1
fix x i=121
fix y j=1
apply syy -7.5e7 j=1

plot pp fill
sav finext5_rep_ini.sav

;Create Movie files every 500 steps
plot pp fill
movie on file finext5_rep.dcx step 500
;

;RUN TO GRAVITY SETTLING
STEP 1500
;SET FLUID FLOW ON AND RUN TO EQUILIBRIUM
set flow on
apply discharge 1e-10 i=41,81 j=61

pl pp fi fl bl
sav finext5_rep_grav.sav
step 1500

sav finext5_rep_flow.sav
;
;Reaction enhanced permeability function

table 5 0,1e-15 1e-20,1e-15 1e-15,1e-15 1e-14,1e-14
table 5 1e-13,1e-14 1e-12,1e-14 1e-11,9e-13
table 5 9e-10,9e-13 8e-10,8e-13
table 5 7e-10,7e-13 6e-10,6e-13 5e-10,5e-13 4e-10,4e-13
table 5 3e-10,3e-13 2e-10,2e-13 1e-10,1e-13 1e-8,1e-13; maxflow,perm (start with 0,original perm)


def incr_perm2
  while_stepping
```

```
    loop i (1, izones)
    loop j (1, jzones)
    ex_2(i,j)=sqrt((xflow(i,j)^2)+(yflow(i,j)^2)) ; puts flow rate into an extra variable
        if cohesion(i,j) = 3.01e6 then
        k11(i,j)=table(5,ex_2(i,j))
        k22(i,j)=k11(i,j)
        k12(i,j)=0
        ;end_if
        end_if
        end_loop
    end_loop
end
incr_perm2

free x
free y
ini xvel -0.024 var= 0.048 ,0 i=1, 121  j=1, 61
fix x i=1
fix x i=121
;fix y j=61
fix y i=26,121 j=1 ; this fixes base on footwall side only, stress is applied to all to prevent drop on hangingwall
apply syy -7.5e7 j=1

step 2500
save finext5_rep_1.sav;   1 % deformation
step 2500
save finext5_rep_2.sav;   2 % deformation
step 2500
save finext5_rep_3.sav;   3 % deformation
step 2500
save finext5_rep_4.sav;   4 % deformation
step 2500
save finext5_rep_5.sav;   5 % deformation
step 2500
save finext5_rep_6.sav;   6 % deformation
step 2500
save finext5_rep_7.sav;   7 % deformation
step 2500
save finext5_rep_8.sav;   8 % deformation
step 2500
save finext5_rep_9.sav;   9 % deformation
step 2500
save finext5_rep_10.sav;   10 % deformation
step 2500
save finext5_rep_11.sav;   11 % deformation
step 2500
save finext5_rep_12.sav;   12 % deformation
step 2500
save finext5_rep_13.sav;   13 % deformation
step 2500
save finext5_rep_14.sav;   14 % deformation
step 2500
save finext5_rep_15.sav;   15 % deformation
step 2500
save finext5_rep_16.sav;   16 % deformation
step 2500
save finext5_rep_17.sav;   17 % deformation
step 2500
save finext5_rep_18.sav;   18 % deformation
step 2500
save finext5_rep_19.sav;   19 % deformation
step 2500
save finext5_rep_20.sav;   20 % deformation
return
stop
```

# C Century Models

## C.1 Model 1a

```
;
tit
Century Model 1 - Extension
;
config extra 4 gw
grid  80   80
gen 0.00e0,-2.40e3 0.00e0,-2.00e3 4.00e2,-2.00e3 4.00e2,-2.40e3 i=1,81 j=1,81
mark i=1
mark j=1
mark i = 81
mark j = 81
;
***************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3 ; to be elaborated below
;; 1 mech step = 1 fluid step; modify if necessary!!!
set nmech 1 ngw 1 flow off
***************************************
tab  1   0 ,-2175.03   205.11 ,-2175.03
;
tab  2   221.48 ,-2155.5   400 ,-2155.5
;
tab  3   0 ,-2271.87   155.99 ,-2271.87
;
tab  4   173.92 ,-2250.78   400 ,-2250.78
;
tab  5   0 ,-2321.85   131.03 ,-2321.85
;
tab  6   148.97 ,-2301.54   400 ,-2301.54
;
tab  7   0 ,-2289.05   148.19 ,-2289.05
;
tab  8   164.56 ,-2268.74   400 ,-2268.74
;
tab  9   0 ,-2297.64   143.51 ,-2297.64
;
tab  10   159.88 ,-2278.12   400 ,-2278.12
;
tab  11   155.99 ,-2286.71   400 ,-2286.71
;
tab  12   137.27 ,-2308.57   0 ,-2307.79
;
tab  13   292.44 ,-2000   91.27 ,-2400
;
tab  14   100.62 ,-2400   300.24 ,-2000
;
gen tab  1
gen tab  2
gen tab  3
gen tab  4
gen tab  5
gen tab  6
gen tab  7
gen tab  8
gen tab  9
gen tab  10
gen tab  11
gen tab  12
gen tab  13
gen tab  14
;
; Moving the gridpoints i=20 j=1 at base
; Moving i=60 j=80 at top of fault to straighten it out
ini x add -3 i=20 j=1
ini x add -2 i=21 j=1
```

```
ini x add -3 i=22 j=1

ini x add 3 i=59 j=81
ini x add 2 i=60 j=81

ini y add 3 i=60 j=80


; Properties for each sub-regions:
;  Sand
pro dens= 1600  bulk=8.33e6 shear=1.88e7 reg= 22 , 61
pro coh= 3.0e3 tens= 1.0e3 reg= 22 , 61
pro fric=30 dil= 5  reg= 22 , 61
pro perm=1.00e-12 porosity=0.4 reg= 22 , 61
;  Sand
pro dens= 1600  bulk=8.33e6 shear=1.88e7 reg= 66 , 60
pro coh= 3.0e3 tens= 1.0e3 reg= 66 , 60
pro fric=30 dil= 5  reg= 66 , 60
pro perm=1.00e-12 porosity=0.4 reg= 66 , 60
;  Silt
pro dens= 1700  bulk=3.00e6 shear=7.5e6 reg= 17 , 34
pro coh= 3.0e3 tens= 1.0e3 reg= 17 , 34
pro fric=25 dil= 5  reg= 17 , 34
pro perm=1.00e-13 porosity=0.4 reg= 17 , 34
;  Silt
pro dens= 1700  bulk=3.00e6 shear=7.5e6 reg= 60 , 38
pro coh= 1.0e4 tens= 1.0e3 reg= 60 , 38
pro fric=25 dil= 5  reg= 60 , 38
pro perm=1.00e-13 porosity=0.4 reg= 60 , 38
;  Shale (clay layers)
pro dens= 1800  bulk=3.01e6 shear=5e6 reg= 11 , 8
pro coh= 1.0e3 tens= 1.0e2 reg= 11 , 8
pro fric=20 dil= 2  reg= 11 , 8
pro perm=1.00e-14 porosity=0.3 reg= 11 , 8
;  Shale
pro dens= 1800  bulk=3.01e6 shear=5.01e6 reg= 57 , 8
pro coh= 1.0e3 tens= 1.0e2 reg= 57 , 8
pro fric=20 dil= 2  reg= 57 , 8
pro perm=1.00e-14 porosity=0.3 reg= 57 , 8

; ORE ZONE
;  Silt / Shale
pro dens= 1750  bulk=8.0e5 shear=7.00e6 reg= 5 , 24
pro coh= 2.0e3 tens= 5.0e2 reg= 5 , 24
pro fric=22 dil= 3  reg= 5 , 24
pro perm=5.00e-13 porosity=0.35 reg= 5 , 24
;  Silt / Shale
pro dens= 1750  bulk=8.0e5 shear=7.00e6 reg= 55 , 28
pro coh= 2.0e3 tens= 5.0e2 reg= 55 , 28
pro fric=22 dil= 3  reg= 55 , 28
pro perm=5.00e-13 porosity=0.35 reg= 55 , 28
;  Shale
pro dens= 1800  bulk=3.01e6 shear=5.01e6 reg= 3 , 21
pro coh= 1.0e3 tens= 1.0e2 reg= 3 , 21
pro fric=20 dil= 2  reg= 3 , 21
pro perm=1.00e-14 porosity=0.3 reg= 3 , 21
;  Shale
pro dens= 1800  bulk=3.01e6 shear=5.01e6 reg= 75 , 25
pro coh= 1.0e3 tens= 1.0e2 reg= 75 , 25
pro fric=20 dil= 2  reg= 75 , 25
pro perm=1.00e-14 porosity=0.3 reg= 75 , 25
;  Silt / Shale
pro dens= 1750  bulk=8.0e5 shear=7.00e6 reg= 12 , 19
pro coh= 2.0e3 tens= 5.0e2 reg= 12 , 19
pro fric=22 dil= 3  reg= 12 , 19
pro perm=5.00e-13 porosity=0.35 reg= 12 , 19
;  Silt / Shale
pro dens= 1750  bulk=8.0e5 shear=7.00e6 reg= 32 , 23
pro coh= 2.0e3 tens= 5.0e2 reg= 32 , 23
pro fric=22 dil= 3  reg= 32 , 23
pro perm=5.00e-13 porosity=0.35 reg= 32 , 23
;  Silt / Shale
pro dens= 1750  bulk=8.0e5 shear=7.00e6 i= 34 j= 24
pro coh= 2.0e3 tens= 5.0e2 i= 34 j= 24
pro fric=22 dil= 3  i= 34 j= 24
```

```
pro perm=5.00e-13 porosity=0.35 i= 34 j= 24

;  Silt / Mud -as silt/shale prop (silt & clay)
pro dens= 1750 bulk=8.0e5 shear=9.5e5 reg= 5 , 17
pro coh= 2.0e3 tens= 5.0e2 reg= 5 , 17
pro fric=22 dil= 3  reg= 5 , 17
pro perm=2.00e-14 porosity=0.35 reg= 5 , 17
;  Silt / Mud
pro dens= 1750  bulk=8.0e5 shear=9.5e5 reg= 55 , 21
pro coh= 2.0e3 tens= 5.0e2 reg= 55 , 21
pro fric=22 dil= 3  reg= 55 , 21
pro perm=2.00e-14 porosity=0.35 reg= 55 , 21
;END ORE ZONE

pro dens= 1600  bulk=3.33e5 shear=7.00e4 reg= 58 , 78
pro coh= 1.0e3 tens= 1.0e2 reg= 58 , 78
pro fric=20 dil= 5  reg= 58 , 78
pro perm=1.00e-12 porosity=0.6 reg= 58 , 78
;  Fault
pro dens= 1600  bulk=3.33e5 shear=7.00e4 reg= 21 , 3
pro coh= 1.0e3 tens= 1.0e2 reg= 21 , 3
pro fric=20 dil= 5  reg= 21 , 3
pro perm=1.00e-12 porosity=0.6 reg= 21 , 3
;  Fault
pro dens= 1600  bulk=3.33e5 shear=7.00e4 reg= 21 , 1
pro coh= 1.0e3 tens= 1.0e2 reg= 21 , 1
pro fric=20 dil= 5  reg= 21 , 1
pro perm=1.00e-12 porosity=0.6 reg= 21 , 1
;  Fault
pro dens= 1600  bulk=3.33e5 shear=7.00e4 reg= 21 , 2
pro coh= 1.0e3 tens= 1.0e2 reg= 21 , 2
pro fric=20 dil= 5  reg= 21 , 2
pro perm=1.00e-12 porosity=0.6 reg= 21 , 2
;  Fault
pro dens= 1600  bulk=3.33e5 shear=7.00e4 reg= 20 , 1
pro coh= 1.0e3 tens= 1.0e2 reg= 20 , 1
pro fric=20 dil= 5  reg= 20 , 1
pro perm=1.00e-12 porosity=0.6 reg= 20 , 1
;  Fault
pro dens= 1600  bulk=3.33e5 shear=7.00e4 reg= 21 , 2
pro coh= 1.0e3 tens= 1.0e2 reg= 21 , 2
pro fric=20 dil= 5  reg= 21 , 2
pro perm=1.00e-12 porosity=0.6 reg= 21 , 2

;ORE ZONE
;  Silt / Shale
pro dens= 1750  bulk=8.0e5 shear=7.00e6 i= 33,80 j= 24
pro coh= 2.0e3 tens= 5.0e2 i= 33,80 j= 24
pro fric=22 dil= 3  i= 33,80 j= 24
pro perm=5.00e-13 porosity=0.35 i= 33,80 j= 24
;  Silt / Shale
pro dens= 1750  bulk=8.0e5 shear=7.00e6 i= 34 j= 27
pro coh= 2.0e3 tens= 5.0e2 i= 34 j= 27
pro fric=22 dil= 3  i= 34 j= 27
pro perm=5.00e-13 porosity=0.35 i= 34 j= 27
;END ORE ZONE

;  Silt
pro dens= 1700  bulk=3.00e6 shear=7.5e6 i= 36 j= 31
pro coh= 3.0e3 tens= 1.0e3 i=36 j= 31
pro fric=25 dil= 5  i= 36 j= 31
pro perm=1.00e-13 porosity=0.4 i=36 j= 31
;  Silt
pro dens= 1700  bulk=3.00e6 shear=7.5e6 i= 41 j= 45
pro coh= 3.0e3 tens= 1.0e4 i=41 j= 45
pro fric=25 dil= 5  i= 41 j= 45
pro perm=1.00e-13 porosity=0.4 i=41 j= 45

;ORE ZONE
;  Silt / Mud
pro dens= 1750  bulk=8.0e5 shear=9.5e5 i= 31 j= 21
pro coh= 2.0e3 tens= 5.0e2 i= 31 j= 21
pro fric=22 dil= 3  i= 31 j= 21
pro perm=2.00e-14 porosity=0.35 i= 31 j= 21
```

```
;  Shale
pro dens= 1800  bulk=3.01e6 shear=5.01e6 i=33 j=25
pro coh= 1.0e3 tens= 1.0e2 i=33 j=25
pro fric=20 dil= 2  i=33 j=25
pro perm=1.00e-14 porosity=0.3 i=33 j=25
;END ORE ZONE

;--------END OF PROPERTIES---------------------

def ini_stress
hh1 = 0.5*abs(y(1,2) - y(1,1))
surf_load = -2.0e3*9.8*2500
str_add = hh1*9.8*2700
bot_str = (-1.0)*(2.4e3*9.8*2500 - str_add)
top_str = (-1.0)*(2.0e3*9.8*2500 + str_add)

str_var = top_str - bot_str

command
ini sxx bot_str var=0,str_var i=1,80 j=1,80
ini syy bot_str var=0,str_var i=1,80 j=1,80
ini szz bot_str var=0,str_var i=1,80 j=1,80
ini sxy = 0.0
end_command

end
ini_stress

apply ns surf_load i=1,81 j=81

def hydro_pp

surf_pp = 2.5e3*9.8*1000 + 1e5 ;pp (2.0km) + pp (atmospheric loading)

loop i (1,igp)
loop j (1,jgp)
if j = jgp Then
;sss2 = 0
sss2 = surf_pp

else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa + surf_pp
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
hydro_pp
*
;
;
ini sat 1
fix sat
fix pp j=81
;
set gravity=9.8
;
set large
;
;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=40 j=40
hist 3 pp i=40 j=40

;Movie every 500 steps
plot pp fill
sav sm1a_ini.sav
movie on file sm1a.dcx step 500

;FIX THE SIDES OF THE MODEL TO RUN TO GRAVITY SETTLING
fix x i=1
fix x i=81
fix y j=1
```

```
; Gravity settling
STEP 1500

;Set fluid on run to equilibrium
set flow on
pl pp fi fl bl
STEP 1500

free x
free y

ini xvel -0.0008  var =  0.0016 ,0 i=1, 81  j=1, 81
fix x i=1
fix x i= 81
fix y j=1

sav sm1a_def.sav

step 5000
save sm1a_1.sav; 1%
step 5000
save sm1a_2.sav;
step 5000
save sm1a_3.sav;
step 5000
save sm1a_4.sav;
step 5000
save sm1a_5.sav;

step 5000
save sm1a_6.sav;
step 5000
save sm1a_7.sav;
step 5000
save sm1a_8.sav;
step 5000
save sm1a_9.sav;
step 5000
save sm1a_10.sav;

step 5000
save sm1a_11.sav;
step 5000
save sm1a_12.sav;
step 5000
save sm1a_13.sav;
step 5000
save sm1a_14.sav;
step 5000
save sm1a_15.sav;

step 5000
save sm1a_16.sav;
step 5000
save sm1a_17.sav;
step 5000
save sm1a_18.sav;
step 5000
save sm1a_19.sav;
step 5000
save sm1a_20.sav;

return
stop
```

## C.2 Model 1b

```
;
tit
Century Model 1 - Extension
;
config extra 4 gw
grid  80   80
gen 0.00e0,-2.40e3 0.00e0,-2.00e3 4.00e2,-2.00e3 4.00e2,-2.40e3 i=1,81 j=1,81
mark i=1
mark j=1
mark i = 81
mark j = 81
;
****************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3 ; to be elaborated below
;; 1 mech step = 10 fluid step; modify if necessary!!!
set nmech 1 ngw 1 flow off
****************************************
;
```

**GEOMETRY AS PREVIOUS MODEL**

```
; Properties for each sub-regions:
;  Sand
pro dens= 1600  bulk=8.33e6 shear=1.88e7 reg= 22 , 61
pro coh= 3.0e3 tens= 1.0e3 reg= 22 , 61
pro fric=30 dil= 5  reg= 22 , 61
pro perm=1.00e-12 porosity=0.4 reg= 22 , 61
;  Sand
pro dens= 1600  bulk=8.33e6 shear=1.88e7 reg= 66 , 60
pro coh= 3.0e3 tens= 1.0e3 reg= 66 , 60
pro fric=30 dil= 5  reg= 66 , 60
pro perm=1.00e-12 porosity=0.4 reg= 66 , 60

;  Silt
pro dens= 1700  bulk=3.00e6 shear=7.5e6 reg= 17 , 34
pro coh= 3.0e3 tens= 1.0e3 reg= 17 , 34
pro fric=25 dil= 5  reg= 17 , 34
pro perm=1.00e-13 porosity=0.4 reg= 17 , 34
;  Silt
pro dens= 1700  bulk=3.00e6 shear=7.5e6 reg= 60 , 38
pro coh= 1.0e4 tens= 1.0e3 reg= 60 , 38
pro fric=25 dil= 5  reg= 60 , 38
pro perm=1.00e-13 porosity=0.4 reg= 60 , 38

;  Shale (clay layers)
pro dens= 1800  bulk=3.01e6 shear=5e6 reg= 11 , 8
pro coh= 1.0e3 tens= 1.0e2 reg= 11 , 8
pro fric=20 dil= 2  reg= 11 , 8
pro perm=1.00e-14 porosity=0.3 reg= 11 , 8
;  Shale
pro dens= 1800  bulk=3.01e6 shear=5.01e6 reg= 57 , 8
pro coh= 1.0e3 tens= 1.0e2 reg= 57 , 8
pro fric=20 dil= 2  reg= 57 , 8
pro perm=1.00e-14 porosity=0.3 reg= 57 , 8

; ORE ZONE
;  Silt / Shale
pro dens= 1750  bulk=8.0e5 shear=7.00e6 reg= 5 , 24
pro coh= 2.0e3 tens= 5.0e2 reg= 5 , 24
pro fric=22 dil= 3  reg= 5 , 24
pro perm=5.00e-13 porosity=0.35 reg= 5 , 24
;  Silt / Shale
pro dens= 1750  bulk=8.0e5 shear=7.00e6 reg= 55 , 28
pro coh= 2.0e3 tens= 5.0e2 reg= 55 , 28
pro fric=22 dil= 3  reg= 55 , 28
pro perm=5.00e-13 porosity=0.35 reg= 55 , 28
;  Shale
pro dens= 1800  bulk=3.01e6 shear=5.01e6 reg= 3 , 21
pro coh= 1.0e3 tens= 1.0e2 reg= 3 , 21
pro fric=20 dil= 2  reg= 3 , 21
```

```
pro perm=1.00e-12 porosity=0.3 reg= 3 , 21
;  Shale
pro dens= 1800  bulk=3.01e6 shear=5.01e6 reg= 75 , 25
pro coh= 1.0e3 tens= 1.0e2 reg= 75 , 25
pro fric=20 dil= 2  reg= 75 , 25
pro perm=1.00e-12 porosity=0.3 reg= 75 , 25
;  Silt / Shale
pro dens= 1750  bulk=8.0e5 shear=7.00e6 reg= 12 , 19
pro coh= 2.0e3 tens= 5.0e2 reg= 12 , 19
pro fric=22 dil= 3  reg= 12 , 19
pro perm=5.00e-13 porosity=0.35 reg= 12 , 19
;  Silt / Shale
pro dens= 1750  bulk=8.0e5 shear=7.00e6 reg= 32 , 23
pro coh= 2.0e3 tens= 5.0e2 reg= 32 , 23
pro fric=22 dil= 3  reg= 32 , 23
pro perm=5.00e-13 porosity=0.35 reg= 32 , 23
;  Silt / Shale
pro dens= 1750  bulk=8.0e5 shear=7.00e6 i= 34 j= 24
pro coh= 2.0e3 tens= 5.0e2 i= 34 j= 24
pro fric=22 dil= 3  i= 34 j= 24
pro perm=5.00e-13 porosity=0.35 i= 34 j= 24
;  Silt / Mud -as silt/shale prop (silt & clay)
pro dens= 1750 bulk=8.0e5 shear=9.5e5 reg= 5 , 17
pro coh= 2.0e3 tens= 5.0e2 reg= 5 , 17
pro fric=22 dil= 3  reg= 5 , 17
pro perm=2.00e-14 porosity=0.35 reg= 5 , 17
;  Silt / Mud
pro dens= 1750  bulk=8.0e5 shear=9.5e5 reg= 55 , 21
pro coh= 2.0e3 tens= 5.0e2 reg= 55 , 21
pro fric=22 dil= 3  reg= 55 , 21
pro perm=2.00e-14 porosity=0.35 reg= 55 , 21
;END ORE ZONE


;  Fault
pro dens= 1600  bulk=3.33e5 shear=7.00e4 reg= 58 , 78
pro coh= 1.0e3 tens= 1.0e2 reg= 58 , 78
pro fric=20 dil= 5  reg= 58 , 78
pro perm=1.00e-12 porosity=0.6 reg= 58 , 78
;  Fault
pro dens= 1600  bulk=3.33e5 shear=7.00e4 reg= 21 , 3
pro coh= 1.0e3 tens= 1.0e2 reg= 21 , 3
pro fric=20 dil= 5  reg= 21 , 3
pro perm=1.00e-12 porosity=0.6 reg= 21 , 3
;  Fault
pro dens= 1600  bulk=3.33e5 shear=7.00e4 reg= 21 , 1
pro coh= 1.0e3 tens= 1.0e2 reg= 21 , 1
pro fric=20 dil= 5  reg= 21 , 1
pro perm=1.00e-12 porosity=0.6 reg= 21 , 1
;  Fault
pro dens= 1600  bulk=3.33e5 shear=7.00e4 reg= 21 , 2
pro coh= 1.0e3 tens= 1.0e2 reg= 21 , 2
pro fric=20 dil= 5  reg= 21 , 2
pro perm=1.00e-12 porosity=0.6 reg= 21 , 2
;  Fault
pro dens= 1600  bulk=3.33e5 shear=7.00e4 reg= 20 , 1
pro coh= 1.0e3 tens= 1.0e2 reg= 20 , 1
pro fric=20 dil= 5  reg= 20 , 1
pro perm=1.00e-12 porosity=0.6 reg= 20 , 1
;  Fault
pro dens= 1600  bulk=3.33e5 shear=7.00e4 reg= 21 , 2
pro coh= 1.0e3 tens= 1.0e2 reg= 21 , 2
pro fric=20 dil= 5  reg= 21 , 2
pro perm=1.00e-12 porosity=0.6 reg= 21 , 2

;ORE ZONE
;  Silt / Shale
pro dens= 1750  bulk=8.0e5 shear=7.00e6 i= 33,80 j= 24
pro coh= 2.0e3 tens= 5.0e2 i= 33,80 j= 24
pro fric=22 dil= 3  i= 33,80 j= 24
pro perm=5.00e-13 porosity=0.35 i= 33,80 j= 24
;  Silt / Shale
pro dens= 1750  bulk=8.0e5 shear=7.00e6 i= 34 j= 27
pro coh= 2.0e3 tens= 5.0e2 i= 34 j= 27
pro fric=22 dil= 3  i= 34 j= 27
```

```
pro perm=5.00e-13 porosity=0.35 i= 34 j= 27
;END ORE ZONE

;  Silt
pro dens= 1700  bulk=3.00e6 shear=7.5e6 i= 36 j= 31
pro coh= 3.0e3 tens= 1.0e3 i=36 j= 31
pro fric=25 dil= 5  i= 36 j= 31
pro perm=1.00e-13 porosity=0.4 i=36 j= 31
;  Silt
pro dens= 1700  bulk=3.00e6 shear=7.5e6 i= 41 j= 45
pro coh= 3.0e3 tens= 1.0e4 i=41 j= 45
pro fric=25 dil= 5  i= 41 j= 45
pro perm=1.00e-13 porosity=0.4 i=41 j= 45

;ORE ZONE
;  Silt / Mud
pro dens= 1750  bulk=8.0e5 shear=9.5e5 i= 31 j= 21
pro coh= 2.0e3 tens= 5.0e2 i= 31 j= 21
pro fric=22 dil= 3  i= 31 j= 21
pro perm=2.00e-14 porosity=0.35 i= 31 j= 21
;  Shale
pro dens= 1800  bulk=3.01e6 shear=5.01e6 i=33 j=25
pro coh= 1.0e3 tens= 1.0e2 i=33 j=25
pro fric=20 dil= 2  i=33 j=25
pro perm=1.00e-12 porosity=0.3 i=33 j=25
;END ORE ZONE

;--------END OF PROPERTIES---------------------

def ini_stress
hh1 = 0.5*abs(y(1,2) - y(1,1))
surf_load = -2.0e3*9.8*2500
str_add = hh1*9.8*2700
bot_str = (-1.0)*(2.4e3*9.8*2500 - str_add)
top_str = (-1.0)*(2.0e3*9.8*2500 + str_add)

str_var = top_str - bot_str

command
ini sxx bot_str var=0,str_var i=1,80 j=1,80
ini syy bot_str var=0,str_var i=1,80 j=1,80
ini szz bot_str var=0,str_var i=1,80 j=1,80
ini sxy = 0.0
end_command

end
ini_stress

apply ns surf_load i=1,81 j=81


def hydro_pp

surf_pp = 2.5e3*9.8*1000 + 1e5 ;pp (2.0km) + pp (atmospheric loading)

loop i (1,igp)
loop j (1,jgp)
if j = jgp Then
;sss2 = 0
sss2 = surf_pp

else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa + surf_pp
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
hydro_pp
*
;
;
ini sat 1
fix sat
```

```
fix pp j=81
;
set gravity=9.8
;
set large
;
;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=40 j=40
hist 3 pp i=40 j=40


;Movie every 500 steps
plot pp fill
sav sm1b_100_ini.sav
movie on file sm1b_100.dcx step 500

;FIX THE SIDES OF THE MODEL TO RUN TO GRAVITY SETTLING
fix x i=1
fix x i=81
fix y j=1

; Gravity settling
STEP 1500

;Set fluid on run to equilibrium
set flow on
pl pp fi fl bl
STEP 1500

free x
free y

ini xvel -0.0008  var =  0.0016 ,0 i=1, 81  j=1, 81
fix x i=1
fix x i= 81
fix y j=1

sav sm1b_100_def.sav

step 5000
save sm1b_100_1.sav; 1%
step 5000
save sm1b_100_2.sav;
step 5000
save sm1b_100_3.sav;
step 5000
save sm1b_100_4.sav;
step 5000
save sm1b_100_5.sav;   5% deformation

return
stop
```

## C.3 Model 2a

```
tit
Century Model 2 - Compression
;
config extra 9 gw
grid  80   80
gen 0.00e0,-2.90e3 0.00e0,-2.50e3 4.00e2,-2.50e3 4.00e2,-2.90e3 i=1,81 j=1,81
mark i=1
mark j=1
mark i = 81
mark j = 81
;
**************************************
model mohr
water bulk 2e9 dens 1000
```

```
prop poro=0.3 ; to be elaborated below
;; 1 mech step = 1 fluid step;
set nmech 1 ngw 1 flow off
****************************************
tab  1   0 ,-2675.03   205.11 ,-2675.03
;
tab  2   219.15 ,-2655.5   400 ,-2655.5
;
tab  3   0 ,-2771.87   155.99 ,-2771.87
;
tab  4   172.36 ,-2750.78   400 ,-2750.78
;
tab  5   0 ,-2821.85   131.03 ,-2821.85
;
tab  6   146.63 ,-2801.54   400 ,-2801.54
;
tab  7   0 ,-2789.05   148.19 ,-2789.05
;
tab  8   163 ,-2768.74   400 ,-2768.74
;
tab  9   0 ,-2797.64   143.51 ,-2797.64
;
tab  10   158.32 ,-2778.12   400 ,-2778.12
;
tab  11   154.43 ,-2786.71   400 ,-2786.71
;
tab  12   137.27 ,-2808.57   0 ,-2807.79
;
tab  13   291 ,-2500   91 ,-2900
;
tab  14   99 ,-2900   299 ,-2500
;
tab  15   60.85 ,-2500   117 ,-2852.31   123.24 ,-2839.03
tab  15   67.87 ,-2500
;
tab  16   139.61 ,-2500   180.16 ,-2727.35   186.4 ,-2714.86
tab  16   146.63 ,-2500
;
gen tab  1
gen tab  2
gen tab  3
gen tab  4
gen tab  5
gen tab  6
gen tab  7
gen tab  8
gen tab  9
gen tab  10
gen tab  11
gen tab  12
gen tab  13
gen tab  14
gen tab  15
gen tab  16
;
; Moving the gridpoints i=20 j=1 at base i=60 j=80 at top of fault to straighten it out
ini x add -4 i=20 j=1
ini x add 3 i=60 j=81


; Properties for each sub-regions:
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9  reg= 21 , 62
pro coh=2.7e7 tens=2.00e6 reg= 21 , 62
pro fric=27 dil= 4  reg= 21 , 62
pro perm=1.00e-15 porosity=0.3 reg= 21 , 62
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9  reg= 65 , 62
pro coh=2.7e7 tens=2.00e6 reg= 65 , 62
pro fric=27 dil= 4  reg= 65 , 62
pro perm=1.00e-15 porosity=0.3 reg= 65 , 62
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 reg= 8 , 36
pro coh=3.47e7 tens=2.00e6 reg= 8 , 36
pro fric=32 dil= 4  reg= 8 , 36
```

```
pro perm=1.00e-16 porosity=0.3 reg= 8 , 36
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 reg= 60 , 38
pro coh=3.47e7 tens=2.00e6 reg= 60 , 38
pro fric=32 dil= 4  reg= 60 , 38
pro perm=1.00e-16 porosity=0.3 reg= 60 , 38
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 11 , 8
pro coh=3.84e7 tens=8.00e5 reg= 11 , 8
pro fric=14 dil= 1  reg= 11 , 8
pro perm=1.00e-19 porosity=0.2 reg= 11 , 8
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 57 , 8
pro coh=3.84e7 tens=8.00e5 reg= 57 , 8
pro fric=14 dil= 1  reg= 57 , 8
pro perm=1.00e-19 porosity=0.2 reg= 57 , 8
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 5 , 24
pro coh=3.6e7 tens=8.00e5 reg= 5 , 24
pro fric=23 dil= 2  reg= 5 , 24
pro perm=5.00e-16 porosity=0.3 reg= 5 , 24
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 55 , 28
pro coh=3.6e7 tens=8.00e5 reg= 55 , 28
pro fric=23 dil= 2  reg= 55 , 28
pro perm=5.00e-16 porosity=0.3 reg= 55 , 28
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 3 , 21
pro coh=3.84e7 tens=8.00e5 reg= 3 , 21
pro fric=14 dil= 1  reg= 3 , 21
pro perm=1.00e-19 porosity=0.2 reg= 3 , 21
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 75 , 25
pro coh=3.84e7 tens=8.00e5 reg= 75 , 25
pro fric=14 dil= 1  reg= 75 , 25
pro perm=1.00e-19 porosity=0.2 reg= 75 , 25
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 12 , 19
pro coh=3.6e7 tens=8.00e5 reg= 12 , 19
pro fric=23 dil= 2  reg= 12 , 19
pro perm=5.00e-16 porosity=0.3 reg= 12 , 19
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 32 , 23
pro coh=3.6e7 tens=8.00e5 reg= 32 , 23
pro fric=23 dil= 2  reg= 32 , 23
pro perm=5.00e-16 porosity=0.3 reg= 32 , 23
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 reg= 5 , 17
pro coh=3.6e7 tens=8.00e5 reg= 5 , 17
pro fric=23 dil= 2  reg= 5 , 17
pro perm=1.00e-18 porosity=0.2 reg= 5 , 17
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 reg= 55 , 21
pro coh=3.6e7 tens=8.00e5 reg= 55 , 21
pro fric=23 dil= 2  reg= 55 , 21
pro perm=1.00e-18 porosity=0.2 reg= 55 , 21
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 reg= 27 , 36
pro coh=3.47e7 tens=2.00e6 reg= 27 , 36
pro fric=32 dil= 4  reg= 27 , 36
pro perm=1.00e-16 porosity=0.3 reg= 27 , 36
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 reg= 38 , 43
pro coh=3.47e7 tens=2.00e6 reg= 38 , 43
pro fric=32 dil= 4  reg= 38 , 43
pro perm=1.00e-16 porosity=0.3 reg= 38 , 43
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 24 , 24
pro coh=3.6e7 tens=8.00e5 reg= 24 , 24
pro fric=23 dil= 2  reg= 24 , 24
pro perm=5.00e-16 porosity=0.3 reg= 24 , 24
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 25 , 19
pro coh=3.6e7 tens=8.00e5 reg= 25 , 19
pro fric=23 dil= 2  reg= 25 , 19
```

```
pro perm=5.00e-16 porosity=0.3 reg= 25 , 19
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 25 , 21
pro coh=3.84e7 tens=8.00e5 reg= 25 , 21
pro fric=14 dil= 1  reg= 25 , 21
pro perm=1.00e-19 porosity=0.2 reg= 25 , 21
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 reg= 25 , 17
pro coh=3.6e7 tens=8.00e5 reg= 25 , 17
pro fric=23 dil= 2  reg= 25 , 17
pro perm=1.00e-18 porosity=0.2 reg= 25 , 17
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9 reg= 4 , 56
pro coh=2.7e7 tens=2.00e6 reg= 4 , 56
pro fric=27 dil= 4  reg= 4 , 56
pro perm=1.00e-15 porosity=0.3 reg= 4 , 56
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9 reg= 38 , 63
pro coh=2.7e7 tens=2.00e6 reg= 38 , 63
pro fric=27 dil= 4  reg= 38 , 63
pro perm=1.00e-15 porosity=0.3 reg= 38 , 63
;
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 14 , 79
pro coh=8.00e5 tens=8.00e5 reg= 14 , 79
pro fric=30 dil= 5  reg= 14 , 79
pro perm=1.00e-14 porosity=0.3 reg= 14 , 79
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 14 , 74
pro coh=8.00e5 tens=8.00e5 reg= 14 , 74
pro fric=30 dil= 5  reg= 14 , 74
pro perm=1.00e-14 porosity=0.3 reg= 14 , 74
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 15 , 68
pro coh=8.00e5 tens=8.00e5 reg= 15 , 68
pro fric=30 dil= 5  reg= 15 , 68
pro perm=1.00e-14 porosity=0.3 reg= 15 , 68

; LEFT Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 16 , 62
pro coh=8.00e5 tens=8.00e5 reg= 16 , 62
pro fric=30 dil= 5  reg= 16 , 62
pro perm=1.00e-14 porosity=0.3 reg= 16 , 62
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 17 , 56
pro coh=8.00e5 tens=8.00e5 reg= 17 , 56
pro fric=30 dil= 5  reg= 17 , 56
pro perm=1.00e-14 porosity=0.3 reg= 17 , 56
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 18 , 50
pro coh=8.00e5 tens=8.00e5 reg= 18 , 50
pro fric=30 dil= 5  reg= 18 , 50
pro perm=1.00e-14 porosity=0.3 reg= 18 , 50
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 19 , 44
pro coh=8.00e5 tens=8.00e5 reg= 19 , 44
pro fric=30 dil= 5  reg= 19 , 44
pro perm=1.00e-14 porosity=0.3 reg= 19 , 44
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 20 , 38
pro coh=8.00e5 tens=8.00e5 reg= 20 , 38
pro fric=30 dil= 5  reg= 20 , 38
pro perm=1.00e-14 porosity=0.3 reg= 20 , 38
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 21 , 32
pro coh=8.00e5 tens=8.00e5 reg= 21 , 32
pro fric=30 dil= 5  reg= 21 , 32
pro perm=1.00e-14 porosity=0.3 reg= 21 , 32
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 21 , 31
pro coh=8.00e5 tens=8.00e5 reg= 21 , 31
pro fric=30 dil= 5  reg= 21 , 31
pro perm=1.00e-14 porosity=0.3 reg= 21 , 31
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 22 , 25
```

```
pro coh=8.00e5 tens=8.00e5 reg= 22 , 25
pro fric=30 dil= 5  reg= 22 , 25
pro perm=1.00e-14 porosity=0.3 reg= 22 , 25
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 23 , 18
pro coh=8.00e5 tens=8.00e5 reg= 23 , 18
pro fric=30 dil= 5  reg= 23 , 18
pro perm=1.00e-14 porosity=0.3 reg= 23 , 18
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 23 , 16
pro coh=8.00e5 tens=8.00e5 reg= 23 , 16
pro fric=30 dil= 5  reg= 23 , 16
pro perm=1.00e-14 porosity=0.3 reg= 23 , 16

;MID Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 29 , 80
pro coh=8.00e5 tens=8.00e5 reg= 29 , 80
pro fric=30 dil= 5  reg= 29 , 80
pro perm=1.00e-14 porosity=0.3 reg= 29 , 80
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 30 , 74
pro coh=8.00e5 tens=8.00e5 reg= 30 , 74
pro fric=30 dil= 5  reg= 30 , 74
pro perm=1.00e-14 porosity=0.3 reg= 30 , 74
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 31 , 68
pro coh=8.00e5 tens=8.00e5 reg= 31 , 68
pro fric=30 dil= 5  reg= 31 , 68
pro perm=1.00e-14 porosity=0.3 reg= 31 , 68
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 33 , 61
pro coh=8.00e5 tens=8.00e5 reg= 33 , 61
pro fric=30 dil= 5  reg= 33 , 61
pro perm=1.00e-14 porosity=0.3 reg= 33 , 61
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 33 , 57
pro coh=8.00e5 tens=8.00e5 reg= 33 , 57
pro fric=30 dil= 5  reg= 33 , 57
pro perm=1.00e-14 porosity=0.3 reg= 33 , 57
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 34 , 53
pro coh=8.00e5 tens=8.00e5 reg= 34 , 53
pro fric=30 dil= 5  reg= 34 , 53
pro perm=1.00e-14 porosity=0.3 reg= 34 , 53
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 34 , 51
pro coh=8.00e5 tens=8.00e5 reg= 34 , 51
pro fric=30 dil= 5  reg= 34 , 51
pro perm=1.00e-14 porosity=0.3 reg= 34 , 51
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 35 , 47
pro coh=8.00e5 tens=8.00e5 reg= 35 , 47
pro fric=30 dil= 5  reg= 35 , 47
pro perm=1.00e-14 porosity=0.3 reg= 35 , 47
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 36 , 45
pro coh=8.00e5 tens=8.00e5 reg= 36 , 45
pro fric=30 dil= 5  reg= 36 , 45
pro perm=1.00e-14 porosity=0.3 reg= 36 , 45
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 36 , 43
pro coh=8.00e5 tens=8.00e5 reg= 36 , 43
pro fric=30 dil= 5  reg= 36 , 43
pro perm=1.00e-14 porosity=0.3 reg= 36 , 43
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 36 , 40
pro coh=8.00e5 tens=8.00e5 reg= 36 , 40
pro fric=30 dil= 5  reg= 36 , 40
pro perm=1.00e-14 porosity=0.3 reg= 36 , 40

;  RIGHT Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 59 , 80
pro coh=8.00e5 tens=8.00e5 reg= 59 , 80
pro fric=30 dil= 5  reg= 59 , 80
pro perm=1.00e-14 porosity=0.3 reg= 59 , 80
```

```
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 59 , 79
pro coh=8.00e5 tens=8.00e5 reg= 59 , 79
pro fric=30 dil= 5  reg= 59 , 79
pro perm=1.00e-14 porosity=0.3 reg= 59 , 79
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 58 , 77
pro coh=8.00e5 tens=8.00e5 reg= 58 , 77
pro fric=30 dil= 5  reg= 58 , 77
pro perm=1.00e-14 porosity=0.3 reg= 58 , 77
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 57 , 75
pro coh=8.00e5 tens=8.00e5 reg= 57 , 75
pro fric=30 dil= 5  reg= 57 , 75
pro perm=1.00e-14 porosity=0.3 reg= 57 , 75
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 55 , 71
pro coh=8.00e5 tens=8.00e5 reg= 55 , 71
pro fric=30 dil= 5  reg= 55 , 71
pro perm=1.00e-14 porosity=0.3 reg= 55 , 71
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 56 , 73
pro coh=8.00e5 tens=8.00e5 reg= 56 , 73
pro fric=30 dil= 5  reg= 56 , 73
pro perm=1.00e-14 porosity=0.3 reg= 56 , 73
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 53 , 68
pro coh=8.00e5 tens=8.00e5 reg= 53 , 68
pro fric=30 dil= 5  reg= 53 , 68
pro perm=1.00e-14 porosity=0.3 reg= 53 , 68
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 52 , 66
pro coh=8.00e5 tens=8.00e5 reg= 52 , 66
pro fric=30 dil= 5  reg= 52 , 66
pro perm=1.00e-14 porosity=0.3 reg= 52 , 66
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 52 , 65
pro coh=8.00e5 tens=8.00e5 reg= 52 , 65
pro fric=30 dil= 5  reg= 52 , 65
pro perm=1.00e-14 porosity=0.3 reg= 52 , 65
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 50 , 61
pro coh=8.00e5 tens=8.00e5 reg= 50 , 61
pro fric=30 dil= 5  reg= 50 , 61
pro perm=1.00e-14 porosity=0.3 reg= 50 , 61
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 47 , 56
pro coh=8.00e5 tens=8.00e5 reg= 47 , 56
pro fric=30 dil= 5  reg= 47 , 56
pro perm=1.00e-14 porosity=0.3 reg= 47 , 56
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=51 j=62,63
pro coh=8.00e5 tens=8.00e5 i=51 j=62,63
pro fric=30 dil= 5  i=51 j=62,63
pro perm=1.00e-14 porosity=0.3 i=51 j=62,63
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=49 j=58,59
pro coh=8.00e5 tens=8.00e5 i=49 j=58,59
pro fric=30 dil= 5  i=49 j=58,59
pro perm=1.00e-14 porosity=0.3 i=49 j=58,59
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=50 j=62,63
pro coh=8.00e5 tens=8.00e5 i=50 j=62,63
pro fric=30 dil= 5  i=50 j=62,63
pro perm=1.00e-14 porosity=0.3 i=50 j=62,63
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=48 j=58,59
pro coh=8.00e5 tens=8.00e5 i=48 j=58,59
pro fric=30 dil= 5  i=48 j=58,59
pro perm=1.00e-14 porosity=0.3 i=48 j=58,59
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=47 j=54,55
pro coh=8.00e5 tens=8.00e5 i=47 j=54,55
pro fric=30 dil= 5  i=47 j=54,55
pro perm=1.00e-14 porosity=0.3 i=47 j=54,55
```

```
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=46 j=52,53
pro coh=8.00e5 tens=8.00e5 i=46 j=52,53
pro fric=30 dil= 5  i=46 j=52,53
pro perm=1.00e-14 porosity=0.3 i=46 j=52,53
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 45 , 51
pro coh=8.00e5 tens=8.00e5 reg= 45 , 51
pro fric=30 dil= 5  reg= 45 , 51
pro perm=1.00e-14 porosity=0.3 reg= 45 , 51
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 44 , 50
pro coh=8.00e5 tens=8.00e5 reg= 44 , 50
pro fric=30 dil= 5  reg= 44 , 50
pro perm=1.00e-14 porosity=0.3 reg= 44 , 50
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 44 , 49
pro coh=8.00e5 tens=8.00e5 reg= 44 , 49
pro fric=30 dil= 5  reg= 44 , 49
pro perm=1.00e-14 porosity=0.3 reg= 44 , 49
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 43 , 48
pro coh=8.00e5 tens=8.00e5 reg= 43 , 48
pro fric=30 dil= 5  reg= 43 , 48
pro perm=1.00e-14 porosity=0.3 reg= 43 , 48
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=46 j=54,55
pro coh=8.00e5 tens=8.00e5 i=46 j=54,55
pro fric=30 dil= 5  i=46 j=54,55
pro perm=1.00e-14 porosity=0.3 i=46 j=54,55
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=45 j=52,53
pro coh=8.00e5 tens=8.00e5 i=45 j=52,53
pro fric=30 dil= 5  i=45 j=52,53
pro perm=1.00e-14 porosity=0.3 i=45 j=52,53
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=43 j=46,47
pro coh=8.00e5 tens=8.00e5 i=43 j=46,47
pro fric=30 dil= 5  i=43 j=46,47
pro perm=1.00e-14 porosity=0.3 i=43 j=46,47
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=42 j=44,45
pro coh=8.00e5 tens=8.00e5 i=42 j=44,45
pro fric=30 dil= 5  i=42 j=44,45
pro perm=1.00e-14 porosity=0.3 i=42 j=44,45
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=41 j=42,43
pro coh=8.00e5 tens=8.00e5 i=41 j=42,43
pro fric=30 dil= 5  i=41 j=42,43
pro perm=1.00e-14 porosity=0.3 i=41 j=42,43
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=40 j=40,41
pro coh=8.00e5 tens=8.00e5 i=40 j=40,41
pro fric=30 dil= 5  i=40 j=40,41
pro perm=1.00e-14 porosity=0.3 i=40 j=40,41
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=42 j=46,47
pro coh=8.00e5 tens=8.00e5 i=42 j=46,47
pro fric=30 dil= 5  i=42 j=46,47
pro perm=1.00e-14 porosity=0.3 i=42 j=46,47
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 41 , 44
pro coh=8.00e5 tens=8.00e5 reg= 41 , 44
pro fric=30 dil= 5  reg= 41 , 44
pro perm=1.00e-14 porosity=0.3 reg= 41 , 44
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=40 j=42,43
pro coh=8.00e5 tens=8.00e5 i=40 j=42,43
pro fric=30 dil= 5  i=40 j=42,43
pro perm=1.00e-14 porosity=0.3 i=40 j=42,43
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=39 j=38,41
pro coh=8.00e5 tens=8.00e5 i=39 j=38,41
pro fric=30 dil= 5  i=39 j=38,41
```

```
pro perm=1.00e-14 porosity=0.3 i=39 j=38,41
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=38 j=38,39
pro coh=8.00e5 tens=8.00e5 i=38 j=38,39
pro fric=30 dil= 5  i=38 j=38,39
pro perm=1.00e-14 porosity=0.3 i=38 j=38,39
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=36,37 j=35
pro coh=8.00e5 tens=8.00e5 i=36,37 j=35
pro fric=30 dil= 5  i=36,37 j=35
pro perm=1.00e-14 porosity=0.3 i=36,37 j=35
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 37 , 34
pro coh=8.00e5 tens=8.00e5 reg= 37 , 34
pro fric=30 dil= 5  reg= 37 , 34
pro perm=1.00e-14 porosity=0.3 reg= 37 , 34
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 35 , 32
pro coh=8.00e5 tens=8.00e5 reg= 35 , 32
pro fric=30 dil= 5  reg= 35 , 32
pro perm=1.00e-14 porosity=0.3 reg= 35 , 32
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=35 j=30,31
pro coh=8.00e5 tens=8.00e5 i=35 j=30,31
pro fric=30 dil= 5  i=35 j=30,31
pro perm=1.00e-14 porosity=0.3 i=35 j=30,31
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=34 j=28,31
pro coh=8.00e5 tens=8.00e5 i=34 j=28,31
pro fric=30 dil= 5  i=34 j=28,31
pro perm=1.00e-14 porosity=0.3 i=34 j=28,31
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=33 j=26,29
pro coh=8.00e5 tens=8.00e5 i=33 j=26,29
pro fric=30 dil= 5  i=33 j=26,29
pro perm=1.00e-14 porosity=0.3 i=33 j=26,29
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=32 j=25,27
pro coh=8.00e5 tens=8.00e5 i=32 j=25,27
pro fric=30 dil= 5  i=32 j=25,27
pro perm=1.00e-14 porosity=0.3 i=32 j=25,27
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=31 j=24,25
pro coh=8.00e5 tens=8.00e5 i=31 j=24,25
pro fric=30 dil= 5  i=31 j=24,25
pro perm=1.00e-14 porosity=0.3 i=31 j=24,25
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=31 j=22,25
pro coh=8.00e5 tens=8.00e5 i=31 j=22,25
pro fric=30 dil= 5  i=31 j=22,25
pro perm=1.00e-14 porosity=0.3 i=31 j=22,25
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 29 , 20
pro coh=8.00e5 tens=8.00e5 reg= 29 , 20
pro fric=30 dil= 5  reg= 29 , 20
pro perm=1.00e-14 porosity=0.3 reg= 29 , 20
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=30 j=20,23
pro coh=8.00e5 tens=8.00e5 i=30 j=20,23
pro fric=30 dil= 5  i=30 j=20,23
pro perm=1.00e-14 porosity=0.3 i=30 j=20,23
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 28 , 18
pro coh=8.00e5 tens=8.00e5 reg= 28 , 18
pro fric=30 dil= 5  reg= 28 , 18
pro perm=1.00e-14 porosity=0.3 reg= 28 , 18
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 28 , 17
pro coh=8.00e5 tens=8.00e5 reg= 28 , 17
pro fric=30 dil= 5  reg= 28 , 17
pro perm=1.00e-14 porosity=0.3 reg= 28 , 17
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 26 , 13
pro coh=8.00e5 tens=8.00e5 reg= 26 , 13
pro fric=30 dil= 5  reg= 26 , 13
```

```
pro perm=1.00e-14 porosity=0.3 reg= 26 , 13
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 25 , 12
pro coh=8.00e5 tens=8.00e5 reg= 25 , 12
pro fric=30 dil= 5  reg= 25 , 12
pro perm=1.00e-14 porosity=0.3 reg= 25 , 12
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 26 , 15
pro coh=8.00e5 tens=8.00e5 reg= 26 , 15
pro fric=30 dil= 5  reg= 26 , 15
pro perm=1.00e-14 porosity=0.3 reg= 26 , 15
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 25 , 11
pro coh=8.00e5 tens=8.00e5 reg= 25 , 11
pro fric=30 dil= 5  reg= 25 , 11
pro perm=1.00e-14 porosity=0.3 reg= 25 , 11
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 24 , 10
pro coh=8.00e5 tens=8.00e5 reg= 24 , 10
pro fric=30 dil= 5  reg= 24 , 10
pro perm=1.00e-14 porosity=0.3 reg= 24 , 10
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 24 , 9
pro coh=8.00e5 tens=8.00e5 reg= 24 , 9
pro fric=30 dil= 5  reg= 24 , 9
pro perm=1.00e-14 porosity=0.3 reg= 24 , 9
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 23 , 7
pro coh=8.00e5 tens=8.00e5 reg= 23 , 7
pro fric=30 dil= 5  reg= 23 , 7
pro perm=1.00e-14 porosity=0.3 reg= 23 , 7
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 22 , 5
pro coh=8.00e5 tens=8.00e5 reg= 22 , 5
pro fric=30 dil= 5  reg= 22 , 5
pro perm=1.00e-14 porosity=0.3 reg= 22 , 5
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 21 , 3
pro coh=8.00e5 tens=8.00e5 reg= 21 , 3
pro fric=30 dil= 5  reg= 21 , 3
pro perm=1.00e-14 porosity=0.3 reg= 21 , 3
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 20 , 1
pro coh=8.00e5 tens=8.00e5 reg= 20 , 1
pro fric=30 dil= 5  reg= 20 , 1
pro perm=1.00e-14 porosity=0.3 reg= 20 , 1

;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9 i=45 j=50
pro coh=2.7e7 tens=2.00e6 i=45 j=50
pro fric=27 dil= 4  i=45 j=50
pro perm=1.00e-15 porosity=0.3 i=45 j=50
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9 i=58 j=80
pro coh=2.7e7 tens=2.00e6 i=58 j=80
pro fric=27 dil= 4  i=58 j=80
pro perm=1.00e-15 porosity=0.3 i=58 j=80
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 i=38 j=40,41
pro coh=3.47e7 tens=2.00e6 i=38 j=40,41
pro fric=32 dil= 4  i=38 j=40,41
pro perm=1.00e-16 porosity=0.3 i=38 j=40,41
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 i=41 j=45
pro coh=3.47e7 tens=2.00e6 i=41 j=45
pro fric=32 dil= 4  i=41 j=45
pro perm=1.00e-16 porosity=0.3 i=41 j=45
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 i=36 j=31
pro coh=3.47e7 tens=2.00e6 i=36 j=31
pro fric=32 dil= 4  i=36 j=31
pro perm=1.00e-16 porosity=0.3 i=36 j=31
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 i=20 j=45
pro coh=3.47e7 tens=2.00e6 i=20 j=45
```

```
pro fric=32 dil= 4  i=20 j=45
pro perm=1.00e-16 porosity=0.3 i=20 j=45
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 25 , j=14,16
pro coh=3.84e7 tens=8.00e5 i= 25 , j=14,16
pro fric=14 dil= 1  i= 25 , j=14,16
pro perm=1.00e-19 porosity=0.2 i= 25 , j=14,16
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 26 , j=16
pro coh=3.84e7 tens=8.00e5 i= 26 , j=16
pro fric=14 dil= 1  i= 26 , j=16
pro perm=1.00e-19 porosity=0.2 i= 26 , j=16
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 22 , j=21
pro coh=3.84e7 tens=8.00e5 i= 22 , j=21
pro fric=14 dil= 1  i= 22 , j=21
pro perm=1.00e-19 porosity=0.2 i= 22 , j=21
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 33 , j=25
pro coh=3.84e7 tens=8.00e5 i= 33 , j=25
pro fric=14 dil= 1  i= 33 , j=25
pro perm=1.00e-19 porosity=0.2 i= 33 , j=25
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 29 , j=22
pro coh=3.84e7 tens=8.00e5 i= 29 , j=22
pro fric=14 dil= 1  i= 29 , j=22
pro perm=1.00e-19 porosity=0.2 i= 29 , j=22
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 21 , j=1
pro coh=3.84e7 tens=8.00e5 i= 21 , j=1
pro fric=14 dil= 1  i= 21 , j=1
pro perm=1.00e-19 porosity=0.2 i= 21 , j=1
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 i=24,28 j=20
pro coh=3.6e7 tens=8.00e5 i=24,28 j=20
pro fric=23 dil= 2  i=24,28 j=20
pro perm=5.00e-16 porosity=0.3 i=24,28 j=20
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 i=34 , j=27
pro coh=3.6e7 tens=8.00e5 i=34 , j=27
pro fric=23 dil= 2  reg= i=34 , j=27
pro perm=5.00e-16 porosity=0.3 i=34 , j=27
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 i=31 , j=21
pro coh=3.6e7 tens=8.00e5 i=31 , j=21
pro fric=23 dil= 2  i=31 , j=21
pro perm=1.00e-18 porosity=0.2 i=31 , j=21
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 i=27 , j=18
pro coh=3.6e7 tens=8.00e5 i=27 , j=18
pro fric=23 dil= 2  i=27 , j=18
pro perm=1.00e-18 porosity=0.2 i=27 , j=18

;--------END OF PROPERTIES---------------------

def ini_stress
hh1 = 0.5*abs(y(1,2) - y(1,1))
surf_load = -2.5e3*9.8*2500
str_add = hh1*9.8*2700
bot_str = (-1.0)*(2.9e3*9.8*2500 - str_add)
top_str = (-1.0)*(2.5e3*9.8*2500 + str_add)

str_var = top_str - bot_str

command
ini sxx bot_str var=0,str_var i=1,80 j=1,80
ini syy bot_str var=0,str_var i=1,80 j=1,80
ini szz bot_str var=0,str_var i=1,80 j=1,80
ini sxy = 0.0
end_command

end
ini_stress

apply ns surf_load i=1,81 j=81
```

```
def hydro_pp
surf_pp = 2.5e3*9.8*1000 + 1e5 ;pp (2.5km) + pp (atmospheric loading)
loop i (1,igp)
loop j (1,jgp)
if j = jgp Then
;sss2 = 0
sss2 = surf_pp
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa + surf_pp
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
hydro_pp
*
ini sat 1
fix sat

;fix pp j=81
set gravity=9.8
set large
;
;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=40 j=40
;hist 3 pp i=40 j=40

hist 3 pp i=10 j=18;sst/mud
hist 4 pp i=10 j=20;lower sst/sh
hist 5 pp i=10 j=22;shale
hist 6 pp i=10 j=26;higher sst/sh
hist 7 pp i=10 j=28;sst cap

;Movie every 500 steps
plot pp fill
sav m2a_ini.sav
movie on file m2a.dcx step 500

;FIX THE SIDES OF THE MODEL TO RUN TO GRAVITY SETTLING
fix x i=1
fix x i=81
fix y j=1

; Gravity settling
STEP 1500
;Set fluid on run to equilibrium
set flow on
pl pp fi fl bl
STEP 1500

free x
free y

;Compression
ini xvel  0.0008 var=-0.0016 ,0 i=1, 81  j=1, 81
fix x i=1
fix x i= 81
fix y j=1
;
step 2500
save m2a_1.sav ;   1 % compression
step 2500
save m2a_2.sav ;   2 % compression
step 2500
save m2a_3.sav ;   3 % compression
step 2500
save m2a_4.sav ;   4 % compression
step 2500
save m2a_5.sav ;   5 % compression
step 2500
save m2a_6.sav ;   6 % compression
step 2500
```

```
save m2a_7.sav ;   7 % compression
step 2500
save m2a_8.sav ;   8 % compression
step 2500
save m2a_9.sav ;   9 % compression
step 2500
save m2a_10.sav ;   10 % compression
step 2500
save m2a_11.sav ;   11 % compression
step 2500
save m2a_12.sav ;   12 % compression

return
stop
```

## C.4 Model 2b

```
;
tit
Century Model 2 - Compression
;
config extra 9 gw
grid  80   80
gen 0.00e0,-2.90e3 0.00e0,-2.50e3 4.00e2,-2.50e3 4.00e2,-2.90e3 i=1,81 j=1,81
mark i=1
mark j=1
mark i = 81
mark j = 81
;
****************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3 ; to be elaborated below
;; 1 mech step = 1 fluid step; modify if necessary!!!
set nmech 1 ngw 1 flow off
****************************************
```

**GEOMETRY AS PREVIOUS MODEL**

```
; Properties for each sub-regions:
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9  reg= 21 , 62
pro coh=2.7e7 tens=2.00e6 reg= 21 , 62
pro fric=27 dil= 4  reg= 21 , 62
pro perm=1.00e-19 porosity=0.3 reg= 21 , 62
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9  reg= 65 , 62
pro coh=2.7e7 tens=2.00e6 reg= 65 , 62
pro fric=27 dil= 4  reg= 65 , 62
pro perm=1.00e-19 porosity=0.3 reg= 65 , 62
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 reg= 8 , 36
pro coh=3.47e7 tens=2.00e6 reg= 8 , 36
pro fric=32 dil= 4  reg= 8 , 36
pro perm=1.00e-16 porosity=0.3 reg= 8 , 36
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 reg= 60 , 38
pro coh=3.47e7 tens=2.00e6 reg= 60 , 38
pro fric=32 dil= 4  reg= 60 , 38
pro perm=1.00e-16 porosity=0.3 reg= 60 , 38
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 11 , 8
pro coh=3.84e7 tens=8.00e5 reg= 11 , 8
pro fric=14 dil= 1  reg= 11 , 8
pro perm=1.00e-19 porosity=0.2 reg= 11 , 8
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 57 , 8
pro coh=3.84e7 tens=8.00e5 reg= 57 , 8
pro fric=14 dil= 1  reg= 57 , 8
pro perm=1.00e-19 porosity=0.2 reg= 57 , 8
;  Siltstone / Shale
```

```
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 5 , 24
pro coh=3.6e7 tens=8.00e5 reg= 5 , 24
pro fric=23 dil= 2  reg= 5 , 24
pro perm=5.00e-16 porosity=0.3 reg= 5 , 24
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 55 , 28
pro coh=3.6e7 tens=8.00e5 reg= 55 , 28
pro fric=23 dil= 2  reg= 55 , 28
pro perm=5.00e-16 porosity=0.3 reg= 55 , 28
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 3 , 21
pro coh=3.84e7 tens=8.00e5 reg= 3 , 21
pro fric=14 dil= 1  reg= 3 , 21
pro perm=1.00e-19 porosity=0.2 reg= 3 , 21
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 75 , 25
pro coh=3.84e7 tens=8.00e5 reg= 75 , 25
pro fric=14 dil= 1  reg= 75 , 25
pro perm=1.00e-19 porosity=0.2 reg= 75 , 25
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 12 , 19
pro coh=3.6e7 tens=8.00e5 reg= 12 , 19
pro fric=23 dil= 2  reg= 12 , 19
pro perm=5.00e-16 porosity=0.3 reg= 12 , 19
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 32 , 23
pro coh=3.6e7 tens=8.00e5 reg= 32 , 23
pro fric=23 dil= 2  reg= 32 , 23
pro perm=5.00e-16 porosity=0.3 reg= 32 , 23
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 reg= 5 , 17
pro coh=3.6e7 tens=8.00e5 reg= 5 , 17
pro fric=23 dil= 2  reg= 5 , 17
pro perm=1.00e-18 porosity=0.2 reg= 5 , 17
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 reg= 55 , 21
pro coh=3.6e7 tens=8.00e5 reg= 55 , 21
pro fric=23 dil= 2  reg= 55 , 21
pro perm=1.00e-18 porosity=0.2 reg= 55 , 21
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 reg= 27 , 36
pro coh=3.47e7 tens=2.00e6 reg= 27 , 36
pro fric=32 dil= 4  reg= 27 , 36
pro perm=1.00e-16 porosity=0.3 reg= 27 , 36
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 reg= 38 , 43
pro coh=3.47e7 tens=2.00e6 reg= 38 , 43
pro fric=32 dil= 4  reg= 38 , 43
pro perm=1.00e-16 porosity=0.3 reg= 38 , 43
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 24 , 24
pro coh=3.6e7 tens=8.00e5 reg= 24 , 24
pro fric=23 dil= 2  reg= 24 , 24
pro perm=5.00e-16 porosity=0.3 reg= 24 , 24
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 25 , 19
pro coh=3.6e7 tens=8.00e5 reg= 25 , 19
pro fric=23 dil= 2  reg= 25 , 19
pro perm=5.00e-16 porosity=0.3 reg= 25 , 19
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 25 , 21
pro coh=3.84e7 tens=8.00e5 reg= 25 , 21
pro fric=14 dil= 1  reg= 25 , 21
pro perm=1.00e-19 porosity=0.2 reg= 25 , 21
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 reg= 25 , 17
pro coh=3.6e7 tens=8.00e5 reg= 25 , 17
pro fric=23 dil= 2  reg= 25 , 17
pro perm=1.00e-18 porosity=0.2 reg= 25 , 17
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9 reg= 4 , 56
pro coh=2.7e7 tens=2.00e6 reg= 4 , 56
pro fric=27 dil= 4  reg= 4 , 56
pro perm=1.00e-19 porosity=0.3 reg= 4 , 56
;  Sandstone
```

```
pro dens= 2400  bulk=2.68e10 shear=7.0e9 reg= 38 , 63
pro coh=2.7e7 tens=2.00e6 reg= 38 , 63
pro fric=27 dil= 4  reg= 38 , 63
pro perm=1.00e-19 porosity=0.3 reg= 38 , 63
;
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 14 , 79
pro coh=8.00e5 tens=8.00e5 reg= 14 , 79
pro fric=30 dil= 5  reg= 14 , 79
pro perm=1.00e-14 porosity=0.3 reg= 14 , 79
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 14 , 74
pro coh=8.00e5 tens=8.00e5 reg= 14 , 74
pro fric=30 dil= 5  reg= 14 , 74
pro perm=1.00e-14 porosity=0.3 reg= 14 , 74
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 15 , 68
pro coh=8.00e5 tens=8.00e5 reg= 15 , 68
pro fric=30 dil= 5  reg= 15 , 68
pro perm=1.00e-14 porosity=0.3 reg= 15 , 68

; LEFT Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 16 , 62
pro coh=8.00e5 tens=8.00e5 reg= 16 , 62
pro fric=30 dil= 5  reg= 16 , 62
pro perm=1.00e-14 porosity=0.3 reg= 16 , 62
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 17 , 56
pro coh=8.00e5 tens=8.00e5 reg= 17 , 56
pro fric=30 dil= 5  reg= 17 , 56
pro perm=1.00e-14 porosity=0.3 reg= 17 , 56
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 18 , 50
pro coh=8.00e5 tens=8.00e5 reg= 18 , 50
pro fric=30 dil= 5  reg= 18 , 50
pro perm=1.00e-14 porosity=0.3 reg= 18 , 50
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 19 , 44
pro coh=8.00e5 tens=8.00e5 reg= 19 , 44
pro fric=30 dil= 5  reg= 19 , 44
pro perm=1.00e-14 porosity=0.3 reg= 19 , 44
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 20 , 38
pro coh=8.00e5 tens=8.00e5 reg= 20 , 38
pro fric=30 dil= 5  reg= 20 , 38
pro perm=1.00e-14 porosity=0.3 reg= 20 , 38
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 21 , 32
pro coh=8.00e5 tens=8.00e5 reg= 21 , 32
pro fric=30 dil= 5  reg= 21 , 32
pro perm=1.00e-14 porosity=0.3 reg= 21 , 32
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 21 , 31
pro coh=8.00e5 tens=8.00e5 reg= 21 , 31
pro fric=30 dil= 5  reg= 21 , 31
pro perm=1.00e-14 porosity=0.3 reg= 21 , 31
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 22 , 25
pro coh=8.00e5 tens=8.00e5 reg= 22 , 25
pro fric=30 dil= 5  reg= 22 , 25
pro perm=1.00e-14 porosity=0.3 reg= 22 , 25
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 23 , 18
pro coh=8.00e5 tens=8.00e5 reg= 23 , 18
pro fric=30 dil= 5  reg= 23 , 18
pro perm=1.00e-14 porosity=0.3 reg= 23 , 18
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 23 , 16
pro coh=8.00e5 tens=8.00e5 reg= 23 , 16
pro fric=30 dil= 5  reg= 23 , 16
pro perm=1.00e-14 porosity=0.3 reg= 23 , 16

;MID Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 29 , 80
pro coh=8.00e5 tens=8.00e5 reg= 29 , 80
```

```
pro fric=30 dil= 5  reg= 29 , 80
pro perm=1.00e-14 porosity=0.3 reg= 29 , 80
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 30 , 74
pro coh=8.00e5 tens=8.00e5 reg= 30 , 74
pro fric=30 dil= 5  reg= 30 , 74
pro perm=1.00e-14 porosity=0.3 reg= 30 , 74
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 31 , 68
pro coh=8.00e5 tens=8.00e5 reg= 31 , 68
pro fric=30 dil= 5  reg= 31 , 68
pro perm=1.00e-14 porosity=0.3 reg= 31 , 68
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 33 , 61
pro coh=8.00e5 tens=8.00e5 reg= 33 , 61
pro fric=30 dil= 5  reg= 33 , 61
pro perm=1.00e-14 porosity=0.3 reg= 33 , 61
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 33 , 57
pro coh=8.00e5 tens=8.00e5 reg= 33 , 57
pro fric=30 dil= 5  reg= 33 , 57
pro perm=1.00e-14 porosity=0.3 reg= 33 , 57
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 34 , 53
pro coh=8.00e5 tens=8.00e5 reg= 34 , 53
pro fric=30 dil= 5  reg= 34 , 53
pro perm=1.00e-14 porosity=0.3 reg= 34 , 53
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 34 , 51
pro coh=8.00e5 tens=8.00e5 reg= 34 , 51
pro fric=30 dil= 5  reg= 34 , 51
pro perm=1.00e-14 porosity=0.3 reg= 34 , 51
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 35 , 47
pro coh=8.00e5 tens=8.00e5 reg= 35 , 47
pro fric=30 dil= 5  reg= 35 , 47
pro perm=1.00e-14 porosity=0.3 reg= 35 , 47
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 36 , 45
pro coh=8.00e5 tens=8.00e5 reg= 36 , 45
pro fric=30 dil= 5  reg= 36 , 45
pro perm=1.00e-14 porosity=0.3 reg= 36 , 45
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 36 , 43
pro coh=8.00e5 tens=8.00e5 reg= 36 , 43
pro fric=30 dil= 5  reg= 36 , 43
pro perm=1.00e-14 porosity=0.3 reg= 36 , 43
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 36 , 40
pro coh=8.00e5 tens=8.00e5 reg= 36 , 40
pro fric=30 dil= 5  reg= 36 , 40
pro perm=1.00e-14 porosity=0.3 reg= 36 , 40

;  RIGHT Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 59 , 80
pro coh=8.00e5 tens=8.00e5 reg= 59 , 80
pro fric=30 dil= 5  reg= 59 , 80
pro perm=1.00e-14 porosity=0.3 reg= 59 , 80
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 59 , 79
pro coh=8.00e5 tens=8.00e5 reg= 59 , 79
pro fric=30 dil= 5  reg= 59 , 79
pro perm=1.00e-14 porosity=0.3 reg= 59 , 79
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 58 , 77
pro coh=8.00e5 tens=8.00e5 reg= 58 , 77
pro fric=30 dil= 5  reg= 58 , 77
pro perm=1.00e-14 porosity=0.3 reg= 58 , 77
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 57 , 75
pro coh=8.00e5 tens=8.00e5 reg= 57 , 75
pro fric=30 dil= 5  reg= 57 , 75
pro perm=1.00e-14 porosity=0.3 reg= 57 , 75
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 55 , 71
```

```
pro coh=8.00e5 tens=8.00e5 reg= 55 , 71
pro fric=30 dil= 5  reg= 55 , 71
pro perm=1.00e-14 porosity=0.3 reg= 55 , 71
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 56 , 73
pro coh=8.00e5 tens=8.00e5 reg= 56 , 73
pro fric=30 dil= 5  reg= 56 , 73
pro perm=1.00e-14 porosity=0.3 reg= 56 , 73
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 53 , 68
pro coh=8.00e5 tens=8.00e5 reg= 53 , 68
pro fric=30 dil= 5  reg= 53 , 68
pro perm=1.00e-14 porosity=0.3 reg= 53 , 68
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 52 , 66
pro coh=8.00e5 tens=8.00e5 reg= 52 , 66
pro fric=30 dil= 5  reg= 52 , 66
pro perm=1.00e-14 porosity=0.3 reg= 52 , 66
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 52 , 65
pro coh=8.00e5 tens=8.00e5 reg= 52 , 65
pro fric=30 dil= 5  reg= 52 , 65
pro perm=1.00e-14 porosity=0.3 reg= 52 , 65
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 50 , 61
pro coh=8.00e5 tens=8.00e5 reg= 50 , 61
pro fric=30 dil= 5  reg= 50 , 61
pro perm=1.00e-14 porosity=0.3 reg= 50 , 61
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 47 , 56
pro coh=8.00e5 tens=8.00e5 reg= 47 , 56
pro fric=30 dil= 5  reg= 47 , 56
pro perm=1.00e-14 porosity=0.3 reg= 47 , 56
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=51 j=62,63
pro coh=8.00e5 tens=8.00e5 i=51 j=62,63
pro fric=30 dil= 5  i=51 j=62,63
pro perm=1.00e-14 porosity=0.3 i=51 j=62,63
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=49 j=58,59
pro coh=8.00e5 tens=8.00e5 i=49 j=58,59
pro fric=30 dil= 5  i=49 j=58,59
pro perm=1.00e-14 porosity=0.3 i=49 j=58,59
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=50 j=62,63
pro coh=8.00e5 tens=8.00e5 i=50 j=62,63
pro fric=30 dil= 5  i=50 j=62,63
pro perm=1.00e-14 porosity=0.3 i=50 j=62,63
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=48 j=58,59
pro coh=8.00e5 tens=8.00e5 i=48 j=58,59
pro fric=30 dil= 5  i=48 j=58,59
pro perm=1.00e-14 porosity=0.3 i=48 j=58,59
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=47 j=54,55
pro coh=8.00e5 tens=8.00e5 i=47 j=54,55
pro fric=30 dil= 5  i=47 j=54,55
pro perm=1.00e-14 porosity=0.3 i=47 j=54,55
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=46 j=52,53
pro coh=8.00e5 tens=8.00e5 i=46 j=52,53
pro fric=30 dil= 5  i=46 j=52,53
pro perm=1.00e-14 porosity=0.3 i=46 j=52,53
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 45 , 51
pro coh=8.00e5 tens=8.00e5 reg= 45 , 51
pro fric=30 dil= 5  reg= 45 , 51
pro perm=1.00e-14 porosity=0.3 reg= 45 , 51
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 44 , 50
pro coh=8.00e5 tens=8.00e5 reg= 44 , 50
pro fric=30 dil= 5  reg= 44 , 50
pro perm=1.00e-14 porosity=0.3 reg= 44 , 50
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 44 , 49
```

```
pro coh=8.00e5 tens=8.00e5 reg= 44 , 49
pro fric=30 dil= 5  reg= 44 , 49
pro perm=1.00e-14 porosity=0.3 reg= 44 , 49
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 43 , 48
pro coh=8.00e5 tens=8.00e5 reg= 43 , 48
pro fric=30 dil= 5  reg= 43 , 48
pro perm=1.00e-14 porosity=0.3 reg= 43 , 48
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=46 j=54,55
pro coh=8.00e5 tens=8.00e5 i=46 j=54,55
pro fric=30 dil= 5  i=46 j=54,55
pro perm=1.00e-14 porosity=0.3 i=46 j=54,55
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=45 j=52,53
pro coh=8.00e5 tens=8.00e5 i=45 j=52,53
pro fric=30 dil= 5  i=45 j=52,53
pro perm=1.00e-14 porosity=0.3 i=45 j=52,53
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=43 j=46,47
pro coh=8.00e5 tens=8.00e5 i=43 j=46,47
pro fric=30 dil= 5  i=43 j=46,47
pro perm=1.00e-14 porosity=0.3 i=43 j=46,47
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=42 j=44,45
pro coh=8.00e5 tens=8.00e5 i=42 j=44,45
pro fric=30 dil= 5  i=42 j=44,45
pro perm=1.00e-14 porosity=0.3 i=42 j=44,45
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=41 j=42,43
pro coh=8.00e5 tens=8.00e5 i=41 j=42,43
pro fric=30 dil= 5  i=41 j=42,43
pro perm=1.00e-14 porosity=0.3 i=41 j=42,43
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=40 j=40,41
pro coh=8.00e5 tens=8.00e5 i=40 j=40,41
pro fric=30 dil= 5  i=40 j=40,41
pro perm=1.00e-14 porosity=0.3 i=40 j=40,41
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=42 j=46,47
pro coh=8.00e5 tens=8.00e5 i=42 j=46,47
pro fric=30 dil= 5  i=42 j=46,47
pro perm=1.00e-14 porosity=0.3 i=42 j=46,47
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 41 , 44
pro coh=8.00e5 tens=8.00e5 reg= 41 , 44
pro fric=30 dil= 5  reg= 41 , 44
pro perm=1.00e-14 porosity=0.3 reg= 41 , 44
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=40 j=42,43
pro coh=8.00e5 tens=8.00e5 i=40 j=42,43
pro fric=30 dil= 5  i=40 j=42,43
pro perm=1.00e-14 porosity=0.3 i=40 j=42,43
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=39 j=38,41
pro coh=8.00e5 tens=8.00e5 i=39 j=38,41
pro fric=30 dil= 5  i=39 j=38,41
pro perm=1.00e-14 porosity=0.3 i=39 j=38,41
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=38 j=38,39
pro coh=8.00e5 tens=8.00e5 i=38 j=38,39
pro fric=30 dil= 5  i=38 j=38,39
pro perm=1.00e-14 porosity=0.3 i=38 j=38,39
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=36,37 j=35
pro coh=8.00e5 tens=8.00e5 i=36,37 j=35
pro fric=30 dil= 5  i=36,37 j=35
pro perm=1.00e-14 porosity=0.3 i=36,37 j=35
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 37 , 34
pro coh=8.00e5 tens=8.00e5 reg= 37 , 34
pro fric=30 dil= 5  reg= 37 , 34
pro perm=1.00e-14 porosity=0.3 reg= 37 , 34
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 35 , 32
```

```
pro coh=8.00e5 tens=8.00e5 reg= 35 , 32
pro fric=30 dil= 5  reg= 35 , 32
pro perm=1.00e-14 porosity=0.3 reg= 35 , 32
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=35 j=30,31
pro coh=8.00e5 tens=8.00e5 i=35 j=30,31
pro fric=30 dil= 5  i=35 j=30,31
pro perm=1.00e-14 porosity=0.3 i=35 j=30,31
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=34 j=28,31
pro coh=8.00e5 tens=8.00e5 i=34 j=28,31
pro fric=30 dil= 5  i=34 j=28,31
pro perm=1.00e-14 porosity=0.3 i=34 j=28,31
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=33 j=26,29
pro coh=8.00e5 tens=8.00e5 i=33 j=26,29
pro fric=30 dil= 5  i=33 j=26,29
pro perm=1.00e-14 porosity=0.3 i=33 j=26,29
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=32 j=25,27
pro coh=8.00e5 tens=8.00e5 i=32 j=25,27
pro fric=30 dil= 5  i=32 j=25,27
pro perm=1.00e-14 porosity=0.3 i=32 j=25,27
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=31 j=24,25
pro coh=8.00e5 tens=8.00e5 i=31 j=24,25
pro fric=30 dil= 5  i=31 j=24,25
pro perm=1.00e-14 porosity=0.3 i=31 j=24,25
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=31 j=22,25
pro coh=8.00e5 tens=8.00e5 i=31 j=22,25
pro fric=30 dil= 5  i=31 j=22,25
pro perm=1.00e-14 porosity=0.3 i=31 j=22,25
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 29 , 20
pro coh=8.00e5 tens=8.00e5 reg= 29 , 20
pro fric=30 dil= 5  reg= 29 , 20
pro perm=1.00e-14 porosity=0.3 reg= 29 , 20
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=30 j=20,23
pro coh=8.00e5 tens=8.00e5 i=30 j=20,23
pro fric=30 dil= 5  i=30 j=20,23
pro perm=1.00e-14 porosity=0.3 i=30 j=20,23
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 28 , 18
pro coh=8.00e5 tens=8.00e5 reg= 28 , 18
pro fric=30 dil= 5  reg= 28 , 18
pro perm=1.00e-14 porosity=0.3 reg= 28 , 18
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 28 , 17
pro coh=8.00e5 tens=8.00e5 reg= 28 , 17
pro fric=30 dil= 5  reg= 28 , 17
pro perm=1.00e-14 porosity=0.3 reg= 28 , 17
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 26 , 13
pro coh=8.00e5 tens=8.00e5 reg= 26 , 13
pro fric=30 dil= 5  reg= 26 , 13
pro perm=1.00e-14 porosity=0.3 reg= 26 , 13
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 25 , 12
pro coh=8.00e5 tens=8.00e5 reg= 25 , 12
pro fric=30 dil= 5  reg= 25 , 12
pro perm=1.00e-14 porosity=0.3 reg= 25 , 12
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 26 , 15
pro coh=8.00e5 tens=8.00e5 reg= 26 , 15
pro fric=30 dil= 5  reg= 26 , 15
pro perm=1.00e-14 porosity=0.3 reg= 26 , 15
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 25 , 11
pro coh=8.00e5 tens=8.00e5 reg= 25 , 11
pro fric=30 dil= 5  reg= 25 , 11
pro perm=1.00e-14 porosity=0.3 reg= 25 , 11
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 24 , 10
```

```
pro coh=8.00e5 tens=8.00e5 reg= 24 , 10
pro fric=30 dil= 5  reg= 24 , 10
pro perm=1.00e-14 porosity=0.3 reg= 24 , 10
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 24 , 9
pro coh=8.00e5 tens=8.00e5 reg= 24 , 9
pro fric=30 dil= 5  reg= 24 , 9
pro perm=1.00e-14 porosity=0.3 reg= 24 , 9
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 23 , 7
pro coh=8.00e5 tens=8.00e5 reg= 23 , 7
pro fric=30 dil= 5  reg= 23 , 7
pro perm=1.00e-14 porosity=0.3 reg= 23 , 7
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 22 , 5
pro coh=8.00e5 tens=8.00e5 reg= 22 , 5
pro fric=30 dil= 5  reg= 22 , 5
pro perm=1.00e-14 porosity=0.3 reg= 22 , 5
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 21 , 3
pro coh=8.00e5 tens=8.00e5 reg= 21 , 3
pro fric=30 dil= 5  reg= 21 , 3
pro perm=1.00e-14 porosity=0.3 reg= 21 , 3
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 20 , 1
pro coh=8.00e5 tens=8.00e5 reg= 20 , 1
pro fric=30 dil= 5  reg= 20 , 1
pro perm=1.00e-14 porosity=0.3 reg= 20 , 1

;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9 i=45 j=50
pro coh=2.7e7 tens=2.00e6 i=45 j=50
pro fric=27 dil= 4  i=45 j=50
pro perm=1.00e-19 porosity=0.3 i=45 j=50
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9 i=58 j=80
pro coh=2.7e7 tens=2.00e6 i=58 j=80
pro fric=27 dil= 4  i=58 j=80
pro perm=1.00e-19 porosity=0.3 i=58 j=80
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 i=38 j=40,41
pro coh=3.47e7 tens=2.00e6 i=38 j=40,41
pro fric=32 dil= 4  i=38 j=40,41
pro perm=1.00e-16 porosity=0.3 i=38 j=40,41
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 i=41 j=45
pro coh=3.47e7 tens=2.00e6 i=41 j=45
pro fric=32 dil= 4  i=41 j=45
pro perm=1.00e-16 porosity=0.3 i=41 j=45
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 i=36 j=31
pro coh=3.47e7 tens=2.00e6 i=36 j=31
pro fric=32 dil= 4  i=36 j=31
pro perm=1.00e-16 porosity=0.3 i=36 j=31
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 i=20 j=45
pro coh=3.47e7 tens=2.00e6 i=20 j=45
pro fric=32 dil= 4  i=20 j=45
pro perm=1.00e-16 porosity=0.3 i=20 j=45
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 25 , j=14,16
pro coh=3.84e7 tens=8.00e5 i= 25 , j=14,16
pro fric=14 dil= 1  i= 25 , j=14,16
pro perm=1.00e-19 porosity=0.2 i= 25 , j=14,16
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 26 , j=16
pro coh=3.84e7 tens=8.00e5 i= 26 , j=16
pro fric=14 dil= 1  i= 26 , j=16
pro perm=1.00e-19 porosity=0.2 i= 26 , j=16
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 22 , j=21
pro coh=3.84e7 tens=8.00e5 i= 22 , j=21
pro fric=14 dil= 1  i= 22 , j=21
pro perm=1.00e-19 porosity=0.2 i= 22 , j=21
;  Shale
```

```
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 33 , j=25
pro coh=3.84e7 tens=8.00e5 i= 33 , j=25
pro fric=14 dil= 1  i= 33 , j=25
pro perm=1.00e-19 porosity=0.2 i= 33 , j=25
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 29 , j=22
pro coh=3.84e7 tens=8.00e5 i= 29 , j=22
pro fric=14 dil= 1  i= 29 , j=22
pro perm=1.00e-19 porosity=0.2 i= 29 , j=22
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 21 , j=1
pro coh=3.84e7 tens=8.00e5 i= 21 , j=1
pro fric=14 dil= 1  i= 21 , j=1
pro perm=1.00e-19 porosity=0.2 i= 21 , j=1
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 i=24,28 j=20
pro coh=3.6e7 tens=8.00e5 i=24,28 j=20
pro fric=23 dil= 2  i=24,28 j=20
pro perm=5.00e-16 porosity=0.3 i=24,28 j=20
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 i=34 , j=27
pro coh=3.6e7 tens=8.00e5 i=34 , j=27
pro fric=23 dil= 2  reg= i=34 , j=27
pro perm=5.00e-16 porosity=0.3 i=34 , j=27
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 i=31 , j=21
pro coh=3.6e7 tens=8.00e5 i=31 , j=21
pro fric=23 dil= 2  i=31 , j=21
pro perm=1.00e-18 porosity=0.2 i=31 , j=21
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 i=27 , j=18
pro coh=3.6e7 tens=8.00e5 i=27 , j=18
pro fric=23 dil= 2  i=27 , j=18
pro perm=1.00e-18 porosity=0.2 i=27 , j=18
;--------END OF PROPERTIES---------------------


def ini_stress
hh1 = 0.5*abs(y(1,2) - y(1,1))
surf_load = -2.5e3*9.8*2500
str_add = hh1*9.8*2700
bot_str = (-1.0)*(2.9e3*9.8*2500 - str_add)
top_str = (-1.0)*(2.5e3*9.8*2500 + str_add)

str_var = top_str - bot_str

command
ini sxx bot_str var=0,str_var i=1,80 j=1,80
ini syy bot_str var=0,str_var i=1,80 j=1,80
ini szz bot_str var=0,str_var i=1,80 j=1,80
ini sxy = 0.0
end_command

end
ini_stress

apply ns surf_load i=1,81 j=81
def hydro_pp
surf_pp = 2.5e3*9.8*1000 + 1e5 ;pp (2.5km) + pp (atmospheric loading)
loop i (1,igp)
loop j (1,jgp)
if j = jgp Then
;sss2 = 0
sss2 = surf_pp
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa + surf_pp
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
hydro_pp
*
;
```

```
;
ini sat 1
fix sat

;fix pp j=81
;
set gravity=9.8
;
set large
;
;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=40 j=40
;hist 3 pp i=40 j=40

hist 3 pp i=10 j=18;sst/mud
hist 4 pp i=10 j=20;lower sst/sh
hist 5 pp i=10 j=22;shale
hist 6 pp i=10 j=26;higher sst/sh
hist 7 pp i=10 j=28;sst cap


;Movie every 500 steps
plot pp fill
sav m2b_ini.sav
movie on file m2b.dcx step 500

;FIX THE SIDES OF THE MODEL TO RUN TO GRAVITY SETTLING
fix x i=1
fix x i=81
fix y j=1

; Gravity settling
STEP 1500

;Set fluid on run to equilibrium
set flow on
pl pp fi fl bl
STEP 1500

;***Fish function to set overpressure from j=45 to j=1****
def overpress_pp
surf_pp = 3.0e3*9.8*2700 + 1e5 ;pp (3km) + pp (atmospheric loading)
loop i (1,igp)
loop j (1,45)
if j < 45 Then
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 2700 * 9.8 * aaa + surf_pp
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
overpress_pp
*
;
sav m2b_overpress.sav

free x
free y

;Compression
ini xvel  0.0008 var=-0.0016 ,0 i=1, 81  j=1, 81
fix x i=1
fix x i= 81
fix y j=1
;

step 2500
save m2b_1.sav ;   1 % compression
step 2500
save m2b_2.sav ;   2 % compression
step 2500
save m2b_3.sav ;   3 % compression
step 2500
```

```
save m2b_4.sav ;   4 % compression
step 2500
save m2b_5.sav ;   5 % compression
step 2500
save m2b_6.sav ;   6 % compression
step 2500
save m2b_7.sav ;   7 % compression
step 2500
save m2b_8.sav ;   8 % compression
step 2500
save m2b_9.sav ;   9 % compression
step 2500
save m2b_10.sav ;   10 % compression

return
stop
```

## C.5 Model 2c

```
;
tit
Century Model 2 - Compression
;
config extra 9 gw
grid  80   80
gen 0.00e0,-2.90e3 0.00e0,-2.50e3 4.00e2,-2.50e3 4.00e2,-2.90e3 i=1,81 j=1,81
mark i=1
mark j=1
mark i = 81
mark j = 81
;
****************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3 ; to be elaborated below
;; 1 mech step = 1 fluid step; modify if necessary!!!
set nmech 1 ngw 1 flow off
****************************************
```

**GEOMETRY AS PREVIOUS MODEL**

```
; Properties for each sub-regions:
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9  reg= 21 , 62
pro coh=2.7e7 tens=2.00e6 reg= 21 , 62
pro fric=27 dil= 4  reg= 21 , 62
pro perm=1.00e-19 porosity=0.3 reg= 21 , 62
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9  reg= 65 , 62
pro coh=2.7e7 tens=2.00e6 reg= 65 , 62
pro fric=27 dil= 4  reg= 65 , 62
pro perm=1.00e-19 porosity=0.3 reg= 65 , 62
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 reg= 8 , 36
pro coh=3.47e7 tens=2.00e6 reg= 8 , 36
pro fric=32 dil= 4  reg= 8 , 36
pro perm=1.00e-16 porosity=0.3 reg= 8 , 36
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 reg= 60 , 38
pro coh=3.47e7 tens=2.00e6 reg= 60 , 38
pro fric=32 dil= 4  reg= 60 , 38
pro perm=1.00e-16 porosity=0.3 reg= 60 , 38
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 11 , 8
pro coh=3.84e7 tens=8.00e5 reg= 11 , 8
pro fric=14 dil= 1  reg= 11 , 8
pro perm=1.00e-19 porosity=0.2 reg= 11 , 8
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 57 , 8
pro coh=3.84e7 tens=8.00e5 reg= 57 , 8
pro fric=14 dil= 1  reg= 57 , 8
```

```
pro perm=1.00e-19 porosity=0.2 reg= 57 , 8
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 5 , 24
pro coh=3.6e7 tens=8.00e5 reg= 5 , 24
pro fric=23 dil= 2  reg= 5 , 24
pro perm=5.00e-16 porosity=0.3 reg= 5 , 24
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 55 , 28
pro coh=3.6e7 tens=8.00e5 reg= 55 , 28
pro fric=23 dil= 2  reg= 55 , 28
pro perm=5.00e-16 porosity=0.3 reg= 55 , 28
;  Shale (ore zone)
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 3 , 21
pro coh=3.84e7 tens=8.00e5 reg= 3 , 21
pro fric=14 dil= 5  reg= 3 , 21
pro perm=5.00e-15 porosity=0.2 reg= 3 , 21
;  Shale (ore zone)
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 75 , 25
pro coh=3.84e7 tens=8.00e5 reg= 75 , 25
pro fric=14 dil= 5  reg= 75 , 25
pro perm=5.00e-15 porosity=0.2 reg= 75 , 25
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 12 , 19
pro coh=3.6e7 tens=8.00e5 reg= 12 , 19
pro fric=23 dil= 2  reg= 12 , 19
pro perm=5.00e-16 porosity=0.3 reg= 12 , 19
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 32 , 23
pro coh=3.6e7 tens=8.00e5 reg= 32 , 23
pro fric=23 dil= 2  reg= 32 , 23
pro perm=5.00e-16 porosity=0.3 reg= 32 , 23
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 reg= 5 , 17
pro coh=3.6e7 tens=8.00e5 reg= 5 , 17
pro fric=23 dil= 2  reg= 5 , 17
pro perm=1.00e-18 porosity=0.2 reg= 5 , 17
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 reg= 55 , 21
pro coh=3.6e7 tens=8.00e5 reg= 55 , 21
pro fric=23 dil= 2  reg= 55 , 21
pro perm=1.00e-18 porosity=0.2 reg= 55 , 21

;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 reg= 27 , 36
pro coh=3.47e7 tens=2.00e6 reg= 27 , 36
pro fric=32 dil= 4  reg= 27 , 36
pro perm=1.00e-16 porosity=0.3 reg= 27 , 36
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 reg= 38 , 43
pro coh=3.47e7 tens=2.00e6 reg= 38 , 43
pro fric=32 dil= 4  reg= 38 , 43
pro perm=1.00e-16 porosity=0.3 reg= 38 , 43
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 24 , 24
pro coh=3.6e7 tens=8.00e5 reg= 24 , 24
pro fric=23 dil= 2  reg= 24 , 24
pro perm=5.00e-16 porosity=0.3 reg= 24 , 24
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 25 , 19
pro coh=3.6e7 tens=8.00e5 reg= 25 , 19
pro fric=23 dil= 2  reg= 25 , 19
pro perm=5.00e-16 porosity=0.3 reg= 25 , 19
;  Shale (ore zone)
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 25 , 21
pro coh=3.84e7 tens=8.00e5 reg= 25 , 21
pro fric=14 dil= 5  reg= 25 , 21
pro perm=5.00e-15 porosity=0.2 reg= 25 , 21
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 reg= 25 , 17
pro coh=3.6e7 tens=8.00e5 reg= 25 , 17
pro fric=23 dil= 2  reg= 25 , 17
pro perm=1.00e-18 porosity=0.2 reg= 25 , 17
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9 reg= 4 , 56
pro coh=2.7e7 tens=2.00e6 reg= 4 , 56
```

```
pro fric=27 dil= 4  reg= 4 , 56
pro perm=1.00e-19 porosity=0.3 reg= 4 , 56
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9 reg= 38 , 63
pro coh=2.7e7 tens=2.00e6 reg= 38 , 63
pro fric=27 dil= 4  reg= 38 , 63
pro perm=1.00e-19 porosity=0.3 reg= 38 , 63
;
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 14 , 79
pro coh=8.00e5 tens=8.00e5 reg= 14 , 79
pro fric=30 dil= 5  reg= 14 , 79
pro perm=1.00e-14 porosity=0.3 reg= 14 , 79
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 14 , 74
pro coh=8.00e5 tens=8.00e5 reg= 14 , 74
pro fric=30 dil= 5  reg= 14 , 74
pro perm=1.00e-14 porosity=0.3 reg= 14 , 74
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 15 , 68
pro coh=8.00e5 tens=8.00e5 reg= 15 , 68
pro fric=30 dil= 5  reg= 15 , 68
pro perm=1.00e-14 porosity=0.3 reg= 15 , 68

; LEFT Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 16 , 62
pro coh=8.00e5 tens=8.00e5 reg= 16 , 62
pro fric=30 dil= 5  reg= 16 , 62
pro perm=1.00e-14 porosity=0.3 reg= 16 , 62
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 17 , 56
pro coh=8.00e5 tens=8.00e5 reg= 17 , 56
pro fric=30 dil= 5  reg= 17 , 56
pro perm=1.00e-14 porosity=0.3 reg= 17 , 56
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 18 , 50
pro coh=8.00e5 tens=8.00e5 reg= 18 , 50
pro fric=30 dil= 5  reg= 18 , 50
pro perm=1.00e-14 porosity=0.3 reg= 18 , 50
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 19 , 44
pro coh=8.00e5 tens=8.00e5 reg= 19 , 44
pro fric=30 dil= 5  reg= 19 , 44
pro perm=1.00e-14 porosity=0.3 reg= 19 , 44
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 20 , 38
pro coh=8.00e5 tens=8.00e5 reg= 20 , 38
pro fric=30 dil= 5  reg= 20 , 38
pro perm=1.00e-14 porosity=0.3 reg= 20 , 38
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 21 , 32
pro coh=8.00e5 tens=8.00e5 reg= 21 , 32
pro fric=30 dil= 5  reg= 21 , 32
pro perm=1.00e-14 porosity=0.3 reg= 21 , 32
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 21 , 31
pro coh=8.00e5 tens=8.00e5 reg= 21 , 31
pro fric=30 dil= 5  reg= 21 , 31
pro perm=1.00e-14 porosity=0.3 reg= 21 , 31
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 22 , 25
pro coh=8.00e5 tens=8.00e5 reg= 22 , 25
pro fric=30 dil= 5  reg= 22 , 25
pro perm=1.00e-14 porosity=0.3 reg= 22 , 25
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 23 , 18
pro coh=8.00e5 tens=8.00e5 reg= 23 , 18
pro fric=30 dil= 5  reg= 23 , 18
pro perm=1.00e-14 porosity=0.3 reg= 23 , 18
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 23 , 16
pro coh=8.00e5 tens=8.00e5 reg= 23 , 16
pro fric=30 dil= 5  reg= 23 , 16
pro perm=1.00e-14 porosity=0.3 reg= 23 , 16
```

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;MID Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 29 , 80
pro coh=8.00e5 tens=8.00e5 reg= 29 , 80
pro fric=30 dil= 5  reg= 29 , 80
pro perm=1.00e-14 porosity=0.3 reg= 29 , 80
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 30 , 74
pro coh=8.00e5 tens=8.00e5 reg= 30 , 74
pro fric=30 dil= 5  reg= 30 , 74
pro perm=1.00e-14 porosity=0.3 reg= 30 , 74
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 31 , 68
pro coh=8.00e5 tens=8.00e5 reg= 31 , 68
pro fric=30 dil= 5  reg= 31 , 68
pro perm=1.00e-14 porosity=0.3 reg= 31 , 68
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 33 , 61
pro coh=8.00e5 tens=8.00e5 reg= 33 , 61
pro fric=30 dil= 5  reg= 33 , 61
pro perm=1.00e-14 porosity=0.3 reg= 33 , 61
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 33 , 57
pro coh=8.00e5 tens=8.00e5 reg= 33 , 57
pro fric=30 dil= 5  reg= 33 , 57
pro perm=1.00e-14 porosity=0.3 reg= 33 , 57
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 34 , 53
pro coh=8.00e5 tens=8.00e5 reg= 34 , 53
pro fric=30 dil= 5  reg= 34 , 53
pro perm=1.00e-14 porosity=0.3 reg= 34 , 53
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 34 , 51
pro coh=8.00e5 tens=8.00e5 reg= 34 , 51
pro fric=30 dil= 5  reg= 34 , 51
pro perm=1.00e-14 porosity=0.3 reg= 34 , 51
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 35 , 47
pro coh=8.00e5 tens=8.00e5 reg= 35 , 47
pro fric=30 dil= 5  reg= 35 , 47
pro perm=1.00e-14 porosity=0.3 reg= 35 , 47
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 36 , 45
pro coh=8.00e5 tens=8.00e5 reg= 36 , 45
pro fric=30 dil= 5  reg= 36 , 45
pro perm=1.00e-14 porosity=0.3 reg= 36 , 45
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 36 , 43
pro coh=8.00e5 tens=8.00e5 reg= 36 , 43
pro fric=30 dil= 5  reg= 36 , 43
pro perm=1.00e-14 porosity=0.3 reg= 36 , 43
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 36 , 40
pro coh=8.00e5 tens=8.00e5 reg= 36 , 40
pro fric=30 dil= 5  reg= 36 , 40
pro perm=1.00e-14 porosity=0.3 reg= 36 , 40

;  RIGHT Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 59 , 80
pro coh=8.00e5 tens=8.00e5 reg= 59 , 80
pro fric=30 dil= 5  reg= 59 , 80
pro perm=1.00e-14 porosity=0.3 reg= 59 , 80
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 59 , 79
pro coh=8.00e5 tens=8.00e5 reg= 59 , 79
pro fric=30 dil= 5  reg= 59 , 79
pro perm=1.00e-14 porosity=0.3 reg= 59 , 79
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 58 , 77
pro coh=8.00e5 tens=8.00e5 reg= 58 , 77
pro fric=30 dil= 5  reg= 58 , 77
pro perm=1.00e-14 porosity=0.3 reg= 58 , 77
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 57 , 75
pro coh=8.00e5 tens=8.00e5 reg= 57 , 75
```

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pro fric=30 dil= 5  reg= 57 , 75
pro perm=1.00e-14 porosity=0.3 reg= 57 , 75
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 55 , 71
pro coh=8.00e5 tens=8.00e5 reg= 55 , 71
pro fric=30 dil= 5  reg= 55 , 71
pro perm=1.00e-14 porosity=0.3 reg= 55 , 71
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 56 , 73
pro coh=8.00e5 tens=8.00e5 reg= 56 , 73
pro fric=30 dil= 5  reg= 56 , 73
pro perm=1.00e-14 porosity=0.3 reg= 56 , 73
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 53 , 68
pro coh=8.00e5 tens=8.00e5 reg= 53 , 68
pro fric=30 dil= 5  reg= 53 , 68
pro perm=1.00e-14 porosity=0.3 reg= 53 , 68
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 52 , 66
pro coh=8.00e5 tens=8.00e5 reg= 52 , 66
pro fric=30 dil= 5  reg= 52 , 66
pro perm=1.00e-14 porosity=0.3 reg= 52 , 66
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 52 , 65
pro coh=8.00e5 tens=8.00e5 reg= 52 , 65
pro fric=30 dil= 5  reg= 52 , 65
pro perm=1.00e-14 porosity=0.3 reg= 52 , 65
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 50 , 61
pro coh=8.00e5 tens=8.00e5 reg= 50 , 61
pro fric=30 dil= 5  reg= 50 , 61
pro perm=1.00e-14 porosity=0.3 reg= 50 , 61
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 47 , 56
pro coh=8.00e5 tens=8.00e5 reg= 47 , 56
pro fric=30 dil= 5  reg= 47 , 56
pro perm=1.00e-14 porosity=0.3 reg= 47 , 56
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=51 j=62,63
pro coh=8.00e5 tens=8.00e5 i=51 j=62,63
pro fric=30 dil= 5  i=51 j=62,63
pro perm=1.00e-14 porosity=0.3 i=51 j=62,63
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=49 j=58,59
pro coh=8.00e5 tens=8.00e5 i=49 j=58,59
pro fric=30 dil= 5  i=49 j=58,59
pro perm=1.00e-14 porosity=0.3 i=49 j=58,59
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=50 j=62,63
pro coh=8.00e5 tens=8.00e5 i=50 j=62,63
pro fric=30 dil= 5  i=50 j=62,63
pro perm=1.00e-14 porosity=0.3 i=50 j=62,63
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=48 j=58,59
pro coh=8.00e5 tens=8.00e5 i=48 j=58,59
pro fric=30 dil= 5  i=48 j=58,59
pro perm=1.00e-14 porosity=0.3 i=48 j=58,59
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=47 j=54,55
pro coh=8.00e5 tens=8.00e5 i=47 j=54,55
pro fric=30 dil= 5  i=47 j=54,55
pro perm=1.00e-14 porosity=0.3 i=47 j=54,55
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=46 j=52,53
pro coh=8.00e5 tens=8.00e5 i=46 j=52,53
pro fric=30 dil= 5  i=46 j=52,53
pro perm=1.00e-14 porosity=0.3 i=46 j=52,53
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 45 , 51
pro coh=8.00e5 tens=8.00e5 reg= 45 , 51
pro fric=30 dil= 5  reg= 45 , 51
pro perm=1.00e-14 porosity=0.3 reg= 45 , 51
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 44 , 50
pro coh=8.00e5 tens=8.00e5 reg= 44 , 50
```

```
pro fric=30 dil= 5  reg= 44 , 50
pro perm=1.00e-14 porosity=0.3 reg= 44 , 50
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 44 , 49
pro coh=8.00e5 tens=8.00e5 reg= 44 , 49
pro fric=30 dil= 5  reg= 44 , 49
pro perm=1.00e-14 porosity=0.3 reg= 44 , 49
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 43 , 48
pro coh=8.00e5 tens=8.00e5 reg= 43 , 48
pro fric=30 dil= 5  reg= 43 , 48
pro perm=1.00e-14 porosity=0.3 reg= 43 , 48
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=46 j=54,55
pro coh=8.00e5 tens=8.00e5 i=46 j=54,55
pro fric=30 dil= 5  i=46 j=54,55
pro perm=1.00e-14 porosity=0.3 i=46 j=54,55
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=45 j=52,53
pro coh=8.00e5 tens=8.00e5 i=45 j=52,53
pro fric=30 dil= 5  i=45 j=52,53
pro perm=1.00e-14 porosity=0.3 i=45 j=52,53
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=43 j=46,47
pro coh=8.00e5 tens=8.00e5 i=43 j=46,47
pro fric=30 dil= 5  i=43 j=46,47
pro perm=1.00e-14 porosity=0.3 i=43 j=46,47
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=42 j=44,45
pro coh=8.00e5 tens=8.00e5 i=42 j=44,45
pro fric=30 dil= 5  i=42 j=44,45
pro perm=1.00e-14 porosity=0.3 i=42 j=44,45
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=41 j=42,43
pro coh=8.00e5 tens=8.00e5 i=41 j=42,43
pro fric=30 dil= 5  i=41 j=42,43
pro perm=1.00e-14 porosity=0.3 i=41 j=42,43
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=40 j=40,41
pro coh=8.00e5 tens=8.00e5 i=40 j=40,41
pro fric=30 dil= 5  i=40 j=40,41
pro perm=1.00e-14 porosity=0.3 i=40 j=40,41
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=42 j=46,47
pro coh=8.00e5 tens=8.00e5 i=42 j=46,47
pro fric=30 dil= 5  i=42 j=46,47
pro perm=1.00e-14 porosity=0.3 i=42 j=46,47
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 41 , 44
pro coh=8.00e5 tens=8.00e5 reg= 41 , 44
pro fric=30 dil= 5  reg= 41 , 44
pro perm=1.00e-14 porosity=0.3 reg= 41 , 44
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=40 j=42,43
pro coh=8.00e5 tens=8.00e5 i=40 j=42,43
pro fric=30 dil= 5  i=40 j=42,43
pro perm=1.00e-14 porosity=0.3 i=40 j=42,43
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=39 j=38,41
pro coh=8.00e5 tens=8.00e5 i=39 j=38,41
pro fric=30 dil= 5  i=39 j=38,41
pro perm=1.00e-14 porosity=0.3 i=39 j=38,41
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=38 j=38,39
pro coh=8.00e5 tens=8.00e5 i=38 j=38,39
pro fric=30 dil= 5  i=38 j=38,39
pro perm=1.00e-14 porosity=0.3 i=38 j=38,39
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=36,37 j=35
pro coh=8.00e5 tens=8.00e5 i=36,37 j=35
pro fric=30 dil= 5  i=36,37 j=35
pro perm=1.00e-14 porosity=0.3 i=36,37 j=35
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 37 , 34
pro coh=8.00e5 tens=8.00e5 reg= 37 , 34
```

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pro fric=30 dil= 5  reg= 37 , 34
pro perm=1.00e-14 porosity=0.3 reg= 37 , 34
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 35 , 32
pro coh=8.00e5 tens=8.00e5 reg= 35 , 32
pro fric=30 dil= 5  reg= 35 , 32
pro perm=1.00e-14 porosity=0.3 reg= 35 , 32
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=35 j=30,31
pro coh=8.00e5 tens=8.00e5 i=35 j=30,31
pro fric=30 dil= 5  i=35 j=30,31
pro perm=1.00e-14 porosity=0.3 i=35 j=30,31
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=34 j=28,31
pro coh=8.00e5 tens=8.00e5 i=34 j=28,31
pro fric=30 dil= 5  i=34 j=28,31
pro perm=1.00e-14 porosity=0.3 i=34 j=28,31
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=33 j=26,29
pro coh=8.00e5 tens=8.00e5 i=33 j=26,29
pro fric=30 dil= 5  i=33 j=26,29
pro perm=1.00e-14 porosity=0.3 i=33 j=26,29
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=32 j=25,27
pro coh=8.00e5 tens=8.00e5 i=32 j=25,27
pro fric=30 dil= 5  i=32 j=25,27
pro perm=1.00e-14 porosity=0.3 i=32 j=25,27
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=31 j=24,25
pro coh=8.00e5 tens=8.00e5 i=31 j=24,25
pro fric=30 dil= 5  i=31 j=24,25
pro perm=1.00e-14 porosity=0.3 i=31 j=24,25
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=31 j=22,25
pro coh=8.00e5 tens=8.00e5 i=31 j=22,25
pro fric=30 dil= 5  i=31 j=22,25
pro perm=1.00e-14 porosity=0.3 i=31 j=22,25
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 29 , 20
pro coh=8.00e5 tens=8.00e5 reg= 29 , 20
pro fric=30 dil= 5  reg= 29 , 20
pro perm=1.00e-14 porosity=0.3 reg= 29 , 20
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=30 j=20,23
pro coh=8.00e5 tens=8.00e5 i=30 j=20,23
pro fric=30 dil= 5  i=30 j=20,23
pro perm=1.00e-14 porosity=0.3 i=30 j=20,23
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 28 , 18
pro coh=8.00e5 tens=8.00e5 reg= 28 , 18
pro fric=30 dil= 5  reg= 28 , 18
pro perm=1.00e-14 porosity=0.3 reg= 28 , 18
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 28 , 17
pro coh=8.00e5 tens=8.00e5 reg= 28 , 17
pro fric=30 dil= 5  reg= 28 , 17
pro perm=1.00e-14 porosity=0.3 reg= 28 , 17
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 26 , 13
pro coh=8.00e5 tens=8.00e5 reg= 26 , 13
pro fric=30 dil= 5  reg= 26 , 13
pro perm=1.00e-14 porosity=0.3 reg= 26 , 13
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 25 , 12
pro coh=8.00e5 tens=8.00e5 reg= 25 , 12
pro fric=30 dil= 5  reg= 25 , 12
pro perm=1.00e-14 porosity=0.3 reg= 25 , 12
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 26 , 15
pro coh=8.00e5 tens=8.00e5 reg= 26 , 15
pro fric=30 dil= 5  reg= 26 , 15
pro perm=1.00e-14 porosity=0.3 reg= 26 , 15
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 25 , 11
pro coh=8.00e5 tens=8.00e5 reg= 25 , 11
```

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pro fric=30 dil= 5  reg= 25 , 11
pro perm=1.00e-14 porosity=0.3 reg= 25 , 11
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 24 , 10
pro coh=8.00e5 tens=8.00e5 reg= 24 , 10
pro fric=30 dil= 5  reg= 24 , 10
pro perm=1.00e-14 porosity=0.3 reg= 24 , 10
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 24 , 9
pro coh=8.00e5 tens=8.00e5 reg= 24 , 9
pro fric=30 dil= 5  reg= 24 , 9
pro perm=1.00e-14 porosity=0.3 reg= 24 , 9
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 23 , 7
pro coh=8.00e5 tens=8.00e5 reg= 23 , 7
pro fric=30 dil= 5  reg= 23 , 7
pro perm=1.00e-14 porosity=0.3 reg= 23 , 7
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 22 , 5
pro coh=8.00e5 tens=8.00e5 reg= 22 , 5
pro fric=30 dil= 5  reg= 22 , 5
pro perm=1.00e-14 porosity=0.3 reg= 22 , 5
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 21 , 3
pro coh=8.00e5 tens=8.00e5 reg= 21 , 3
pro fric=30 dil= 5  reg= 21 , 3
pro perm=1.00e-14 porosity=0.3 reg= 21 , 3
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 20 , 1
pro coh=8.00e5 tens=8.00e5 reg= 20 , 1
pro fric=30 dil= 5  reg= 20 , 1
pro perm=1.00e-14 porosity=0.3 reg= 20 , 1
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9 i=45 j=50
pro coh=2.7e7 tens=2.00e6 i=45 j=50
pro fric=27 dil= 4  i=45 j=50
pro perm=1.00e-19 porosity=0.3 i=45 j=50
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9 i=58 j=80
pro coh=2.7e7 tens=2.00e6 i=58 j=80
pro fric=27 dil= 4  i=58 j=80
pro perm=1.00e-19 porosity=0.3 i=58 j=80

;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 i=38 j=40,41
pro coh=3.47e7 tens=2.00e6 i=38 j=40,41
pro fric=32 dil= 4  i=38 j=40,41
pro perm=1.00e-16 porosity=0.3 i=38 j=40,41
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 i=41 j=45
pro coh=3.47e7 tens=2.00e6 i=41 j=45
pro fric=32 dil= 4  i=41 j=45
pro perm=1.00e-16 porosity=0.3 i=41 j=45
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 i=36 j=31
pro coh=3.47e7 tens=2.00e6 i=36 j=31
pro fric=32 dil= 4  i=36 j=31
pro perm=1.00e-16 porosity=0.3 i=36 j=31
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 i=20 j=45
pro coh=3.47e7 tens=2.00e6 i=20 j=45
pro fric=32 dil= 4  i=20 j=45
pro perm=1.00e-16 porosity=0.3 i=20 j=45
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 25 , j=14,16
pro coh=3.84e7 tens=8.00e5 i= 25 , j=14,16
pro fric=14 dil= 1  i= 25 , j=14,16
pro perm=1.00e-19 porosity=0.2 i= 25 , j=14,16
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 26 , j=16
pro coh=3.84e7 tens=8.00e5 i= 26 , j=16
pro fric=14 dil= 1  i= 26 , j=16
pro perm=1.00e-19 porosity=0.2 i= 26 , j=16
;  Shale (ore zone)
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 22 , j=21
```

```
pro coh=3.84e7 tens=8.00e5 i= 22 , j=21
pro fric=14 dil= 5  i= 22 , j=21
pro perm=5.00e-15 porosity=0.2 i= 22 , j=21
;  Shale (ore zone)
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 33 , j=25
pro coh=3.84e7 tens=8.00e5 i= 33 , j=25
pro fric=14 dil= 5  i= 33 , j=25
pro perm=5.00e-15 porosity=0.2 i= 33 , j=25
;  Shale (ore zone)
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 29 , j=22
pro coh=3.84e7 tens=8.00e5 i= 29 , j=22
pro fric=14 dil= 5  i= 29 , j=22
pro perm=5.00e-15 porosity=0.2 i= 29 , j=22
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 21 , j=1
pro coh=3.84e7 tens=8.00e5 i= 21 , j=1
pro fric=14 dil= 1  i= 21 , j=1
pro perm=1.00e-19 porosity=0.2 i= 21 , j=1
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 i=24,28 j=20
pro coh=3.6e7 tens=8.00e5 i=24,28 j=20
pro fric=23 dil= 2  i=24,28 j=20
pro perm=5.00e-16 porosity=0.3 i=24,28 j=20
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 i=34 , j=27
pro coh=3.6e7 tens=8.00e5 i=34 , j=27
pro fric=23 dil= 2  reg= i=34 , j=27
pro perm=5.00e-16 porosity=0.3 i=34 , j=27
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 i=31 , j=21
pro coh=3.6e7 tens=8.00e5 i=31 , j=21
pro fric=23 dil= 2  i=31 , j=21
pro perm=1.00e-18 porosity=0.2 i=31 , j=21
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 i=27 , j=18
pro coh=3.6e7 tens=8.00e5 i=27 , j=18
pro fric=23 dil= 2  i=27 , j=18
pro perm=1.00e-18 porosity=0.2 i=27 , j=18
;--------END OF PROPERTIES---------------------

def ini_stress
hh1 = 0.5*abs(y(1,2) - y(1,1))
surf_load = -2.5e3*9.8*2500
str_add = hh1*9.8*2700
bot_str = (-1.0)*(2.9e3*9.8*2500 - str_add)
top_str = (-1.0)*(2.5e3*9.8*2500 + str_add)

str_var = top_str - bot_str

command
ini sxx bot_str var=0,str_var i=1,80 j=1,80
ini syy bot_str var=0,str_var i=1,80 j=1,80
ini szz bot_str var=0,str_var i=1,80 j=1,80
ini sxy = 0.0
end_command

end
ini_stress

apply ns surf_load i=1,81 j=81


def hydro_pp
surf_pp = 2.5e3*9.8*1000 + 1e5 ;pp (2.5km) + pp (atmospheric loading)
loop i (1,igp)
loop j (1,jgp)
if j = jgp Then
;sss2 = 0
sss2 = surf_pp
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa + surf_pp
end_if
gpp(i, j) = sss2
end_loop
```

```
end_loop
end
hydro_pp
*
;
;
ini sat 1
fix sat

;fix pp j=81
;
set gravity=9.8
;
set large
;
;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=40 j=40
;hist 3 pp i=40 j=40

hist 3 pp i=10 j=18;sst/mud
hist 4 pp i=10 j=20;lower sst/sh
hist 5 pp i=10 j=22;shale
hist 6 pp i=10 j=26;higher sst/sh
hist 7 pp i=10 j=28;sst cap

;Movie every 500 steps
plot pp fill
sav m2c_ini.sav
movie on file m2c.dcx step 500

;FIX THE SIDES OF THE MODEL TO RUN TO GRAVITY SETTLING
fix x i=1
fix x i=81
fix y j=1

; Gravity settling
STEP 1500

;Set fluid on run to equilibrium
set flow on
pl pp fi fl bl
STEP 1500

;***Fish function to set overpressure from j=45 to j=1****
def overpress_pp
surf_pp = 3.0e3*9.8*2700 + 1e5 ;pp (3km) + pp (atmospheric loading)
loop i (1,igp)
loop j (1,45)
if j < 45 Then
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 2700 * 9.8 * aaa + surf_pp
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
overpress_pp
*
;
sav m2c_overpress.sav

free x
free y

;Compression 5% shortening
ini xvel  0.0008 var=-0.0016 ,0 i=1, 81  j=1, 81
fix x i=1
fix x i= 81
fix y j=1


step 2500
save m2c_1.sav ;   1 % compression
step 2500
```

```
save m2c_2.sav ;   2 % compression
step 2500
save m2c_3.sav ;   3 % compression
step 2500
save m2c_4.sav ;   4 % compression
step 2500
save m2c_5.sav ;   5 % compression
step 2500
save m2c_6.sav ;   6 % extension
step 2500
save m2c_7.sav ;   7 % extension
step 2500
save m2c_9.sav ;   8 % compression
step 2500
save m2c_10.sav ;   9 % compression
step 2500
save m2c_11.sav ;   10 % compression
step 2500
save m2c_12.sav ;   11 % compression
step 2500
save m2c_13.sav ;   12 % compression

return
stop
```

## C.6 Model 2d

```
;
tit
Century Model 2 - Compression
;
config extra 9 gw
grid  80   80
gen 0.00e0,-2.90e3 0.00e0,-2.50e3 4.00e2,-2.50e3 4.00e2,-2.90e3 i=1,81 j=1,81
mark i=1
mark j=1
mark i = 81
mark j = 81
;
***************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3 ; to be elaborated below
;; 1 mech step = 1 fluid step;
set nmech 1 ngw 1 flow off
***************************************
```

**GEOMETRY AS PREVIOUS MODEL**

```
; Properties for each sub-regions:
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9  reg= 21 , 62
pro coh=2.7e7 tens=2.00e6 reg= 21 , 62
pro fric=27 dil= 4  reg= 21 , 62
pro perm=1.00e-19 porosity=0.3 reg= 21 , 62
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9  reg= 65 , 62
pro coh=2.7e7 tens=2.00e6 reg= 65 , 62
pro fric=27 dil= 4  reg= 65 , 62
pro perm=1.00e-19 porosity=0.3 reg= 65 , 62
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 reg= 8 , 36
pro coh=3.47e7 tens=2.00e6 reg= 8 , 36
pro fric=32 dil= 4  reg= 8 , 36
pro perm=1.00e-16 porosity=0.3 reg= 8 , 36
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 reg= 60 , 38
pro coh=3.47e7 tens=2.00e6 reg= 60 , 38
pro fric=32 dil= 4  reg= 60 , 38
pro perm=1.00e-16 porosity=0.3 reg= 60 , 38
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 11 , 8
```

```
pro coh=3.84e7 tens=8.00e5 reg= 11 , 8
pro fric=14 dil= 1  reg= 11 , 8
pro perm=1.00e-19 porosity=0.2 reg= 11 , 8
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 reg= 57 , 8
pro coh=3.84e7 tens=8.00e5 reg= 57 , 8
pro fric=14 dil= 1  reg= 57 , 8
pro perm=1.00e-19 porosity=0.2 reg= 57 , 8
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 5 , 24
pro coh=3.6e7 tens=8.00e5 reg= 5 , 24
pro fric=23 dil= 2  reg= 5 , 24
pro perm=5.00e-16 porosity=0.3 reg= 5 , 24
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 55 , 28
pro coh=3.6e7 tens=8.00e5 reg= 55 , 28
pro fric=23 dil= 2  reg= 55 , 28
pro perm=5.00e-16 porosity=0.3 reg= 55 , 28
;  Shale (ore zone)
pro dens= 2500  bulk=2.2e11 shear=1.66e11 reg= 3 , 21
pro coh=3.84e8 tens=2.00e5 reg= 3 , 21
pro fric=14 dil= 5  reg= 3 , 21
pro perm=1.00e-15 porosity=0.2 reg= 3 , 21
;  Shale (ore zone)
pro dens= 2500  bulk=2.2e11 shear=1.66e11 reg= 75 , 25
pro coh=3.84e8 tens=2.00e5 reg= 75 , 25
pro fric=14 dil= 5  reg= 75 , 25
pro perm=1.00e-15 porosity=0.2 reg= 75 , 25
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 12 , 19
pro coh=3.6e7 tens=8.00e5 reg= 12 , 19
pro fric=23 dil= 2  reg= 12 , 19
pro perm=5.00e-16 porosity=0.3 reg= 12 , 19
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 32 , 23
pro coh=3.6e7 tens=8.00e5 reg= 32 , 23
pro fric=23 dil= 2  reg= 32 , 23
pro perm=5.00e-16 porosity=0.3 reg= 32 , 23
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 reg= 5 , 17
pro coh=3.6e7 tens=8.00e5 reg= 5 , 17
pro fric=23 dil= 2  reg= 5 , 17
pro perm=1.00e-18 porosity=0.2 reg= 5 , 17
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 reg= 55 , 21
pro coh=3.6e7 tens=8.00e5 reg= 55 , 21
pro fric=23 dil= 2  reg= 55 , 21
pro perm=1.00e-18 porosity=0.2 reg= 55 , 21
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 reg= 27 , 36
pro coh=3.47e7 tens=2.00e6 reg= 27 , 36
pro fric=32 dil= 4  reg= 27 , 36
pro perm=1.00e-16 porosity=0.3 reg= 27 , 36
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 reg= 38 , 43
pro coh=3.47e7 tens=2.00e6 reg= 38 , 43
pro fric=32 dil= 4  reg= 38 , 43
pro perm=1.00e-16 porosity=0.3 reg= 38 , 43
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 24 , 24
pro coh=3.6e7 tens=8.00e5 reg= 24 , 24
pro fric=23 dil= 2  reg= 24 , 24
pro perm=5.00e-16 porosity=0.3 reg= 24 , 24
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 reg= 25 , 19
pro coh=3.6e7 tens=8.00e5 reg= 25 , 19
pro fric=23 dil= 2  reg= 25 , 19
pro perm=5.00e-16 porosity=0.3 reg= 25 , 19
;  Shale (ore zone)
pro dens= 2500  bulk=2.2e11 shear=1.66e11 reg= 25 , 21
pro coh=3.84e8 tens=2.00e5 reg= 25 , 21
pro fric=14 dil= 5  reg= 25 , 21
pro perm=1.00e-15 porosity=0.2 reg= 25 , 21
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 reg= 25 , 17
```

```
pro coh=3.6e7 tens=8.00e5 reg= 25 , 17
pro fric=23 dil= 2  reg= 25 , 17
pro perm=1.00e-18 porosity=0.2 reg= 25 , 17
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9 reg= 4 , 56
pro coh=2.7e7 tens=2.00e6 reg= 4 , 56
pro fric=27 dil= 4  reg= 4 , 56
pro perm=1.00e-19 porosity=0.3 reg= 4 , 56
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9 reg= 38 , 63
pro coh=2.7e7 tens=2.00e6 reg= 38 , 63
pro fric=27 dil= 4  reg= 38 , 63
pro perm=1.00e-19 porosity=0.3 reg= 38 , 63
;
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 14 , 79
pro coh=8.00e5 tens=8.00e5 reg= 14 , 79
pro fric=30 dil= 5  reg= 14 , 79
pro perm=1.00e-14 porosity=0.3 reg= 14 , 79
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 14 , 74
pro coh=8.00e5 tens=8.00e5 reg= 14 , 74
pro fric=30 dil= 5  reg= 14 , 74
pro perm=1.00e-14 porosity=0.3 reg= 14 , 74
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 15 , 68
pro coh=8.00e5 tens=8.00e5 reg= 15 , 68
pro fric=30 dil= 5  reg= 15 , 68
pro perm=1.00e-14 porosity=0.3 reg= 15 , 68

; LEFT Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 16 , 62
pro coh=8.00e5 tens=8.00e5 reg= 16 , 62
pro fric=30 dil= 5  reg= 16 , 62
pro perm=1.00e-14 porosity=0.3 reg= 16 , 62
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 17 , 56
pro coh=8.00e5 tens=8.00e5 reg= 17 , 56
pro fric=30 dil= 5  reg= 17 , 56
pro perm=1.00e-14 porosity=0.3 reg= 17 , 56
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 18 , 50
pro coh=8.00e5 tens=8.00e5 reg= 18 , 50
pro fric=30 dil= 5  reg= 18 , 50
pro perm=1.00e-14 porosity=0.3 reg= 18 , 50
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 19 , 44
pro coh=8.00e5 tens=8.00e5 reg= 19 , 44
pro fric=30 dil= 5  reg= 19 , 44
pro perm=1.00e-14 porosity=0.3 reg= 19 , 44
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 20 , 38
pro coh=8.00e5 tens=8.00e5 reg= 20 , 38
pro fric=30 dil= 5  reg= 20 , 38
pro perm=1.00e-14 porosity=0.3 reg= 20 , 38
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 21 , 32
pro coh=8.00e5 tens=8.00e5 reg= 21 , 32
pro fric=30 dil= 5  reg= 21 , 32
pro perm=1.00e-14 porosity=0.3 reg= 21 , 32
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 21 , 31
pro coh=8.00e5 tens=8.00e5 reg= 21 , 31
pro fric=30 dil= 5  reg= 21 , 31
pro perm=1.00e-14 porosity=0.3 reg= 21 , 31
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 22 , 25
pro coh=8.00e5 tens=8.00e5 reg= 22 , 25
pro fric=30 dil= 5  reg= 22 , 25
pro perm=1.00e-14 porosity=0.3 reg= 22 , 25
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 23 , 18
pro coh=8.00e5 tens=8.00e5 reg= 23 , 18
pro fric=30 dil= 5  reg= 23 , 18
pro perm=1.00e-14 porosity=0.3 reg= 23 , 18
```

```
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 23 , 16
pro coh=8.00e5 tens=8.00e5 reg= 23 , 16
pro fric=30 dil= 5  reg= 23 , 16
pro perm=1.00e-14 porosity=0.3 reg= 23 , 16


;MID Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 29 , 80
pro coh=8.00e5 tens=8.00e5 reg= 29 , 80
pro fric=30 dil= 5  reg= 29 , 80
pro perm=1.00e-14 porosity=0.3 reg= 29 , 80
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 30 , 74
pro coh=8.00e5 tens=8.00e5 reg= 30 , 74
pro fric=30 dil= 5  reg= 30 , 74
pro perm=1.00e-14 porosity=0.3 reg= 30 , 74
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 31 , 68
pro coh=8.00e5 tens=8.00e5 reg= 31 , 68
pro fric=30 dil= 5  reg= 31 , 68
pro perm=1.00e-14 porosity=0.3 reg= 31 , 68
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 33 , 61
pro coh=8.00e5 tens=8.00e5 reg= 33 , 61
pro fric=30 dil= 5  reg= 33 , 61
pro perm=1.00e-14 porosity=0.3 reg= 33 , 61
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 33 , 57
pro coh=8.00e5 tens=8.00e5 reg= 33 , 57
pro fric=30 dil= 5  reg= 33 , 57
pro perm=1.00e-14 porosity=0.3 reg= 33 , 57
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 34 , 53
pro coh=8.00e5 tens=8.00e5 reg= 34 , 53
pro fric=30 dil= 5  reg= 34 , 53
pro perm=1.00e-14 porosity=0.3 reg= 34 , 53
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 34 , 51
pro coh=8.00e5 tens=8.00e5 reg= 34 , 51
pro fric=30 dil= 5  reg= 34 , 51
pro perm=1.00e-14 porosity=0.3 reg= 34 , 51
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 35 , 47
pro coh=8.00e5 tens=8.00e5 reg= 35 , 47
pro fric=30 dil= 5  reg= 35 , 47
pro perm=1.00e-14 porosity=0.3 reg= 35 , 47
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 36 , 45
pro coh=8.00e5 tens=8.00e5 reg= 36 , 45
pro fric=30 dil= 5  reg= 36 , 45
pro perm=1.00e-14 porosity=0.3 reg= 36 , 45
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 36 , 43
pro coh=8.00e5 tens=8.00e5 reg= 36 , 43
pro fric=30 dil= 5  reg= 36 , 43
pro perm=1.00e-14 porosity=0.3 reg= 36 , 43
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 36 , 40
pro coh=8.00e5 tens=8.00e5 reg= 36 , 40
pro fric=30 dil= 5  reg= 36 , 40
pro perm=1.00e-14 porosity=0.3 reg= 36 , 40

;  RIGHT Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 59 , 80
pro coh=8.00e5 tens=8.00e5 reg= 59 , 80
pro fric=30 dil= 5  reg= 59 , 80
pro perm=1.00e-14 porosity=0.3 reg= 59 , 80
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 59 , 79
pro coh=8.00e5 tens=8.00e5 reg= 59 , 79
pro fric=30 dil= 5  reg= 59 , 79
pro perm=1.00e-14 porosity=0.3 reg= 59 , 79
;  Fault
```

```
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 58 , 77
pro coh=8.00e5 tens=8.00e5 reg= 58 , 77
pro fric=30 dil= 5  reg= 58 , 77
pro perm=1.00e-14 porosity=0.3 reg= 58 , 77
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 57 , 75
pro coh=8.00e5 tens=8.00e5 reg= 57 , 75
pro fric=30 dil= 5  reg= 57 , 75
pro perm=1.00e-14 porosity=0.3 reg= 57 , 75
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 55 , 71
pro coh=8.00e5 tens=8.00e5 reg= 55 , 71
pro fric=30 dil= 5  reg= 55 , 71
pro perm=1.00e-14 porosity=0.3 reg= 55 , 71
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 56 , 73
pro coh=8.00e5 tens=8.00e5 reg= 56 , 73
pro fric=30 dil= 5  reg= 56 , 73
pro perm=1.00e-14 porosity=0.3 reg= 56 , 73
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 53 , 68
pro coh=8.00e5 tens=8.00e5 reg= 53 , 68
pro fric=30 dil= 5  reg= 53 , 68
pro perm=1.00e-14 porosity=0.3 reg= 53 , 68
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 52 , 66
pro coh=8.00e5 tens=8.00e5 reg= 52 , 66
pro fric=30 dil= 5  reg= 52 , 66
pro perm=1.00e-14 porosity=0.3 reg= 52 , 66
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 52 , 65
pro coh=8.00e5 tens=8.00e5 reg= 52 , 65
pro fric=30 dil= 5  reg= 52 , 65
pro perm=1.00e-14 porosity=0.3 reg= 52 , 65
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 50 , 61
pro coh=8.00e5 tens=8.00e5 reg= 50 , 61
pro fric=30 dil= 5  reg= 50 , 61
pro perm=1.00e-14 porosity=0.3 reg= 50 , 61
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 47 , 56
pro coh=8.00e5 tens=8.00e5 reg= 47 , 56
pro fric=30 dil= 5  reg= 47 , 56
pro perm=1.00e-14 porosity=0.3 reg= 47 , 56
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=51 j=62,63
pro coh=8.00e5 tens=8.00e5 i=51 j=62,63
pro fric=30 dil= 5  i=51 j=62,63
pro perm=1.00e-14 porosity=0.3 i=51 j=62,63
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=49 j=58,59
pro coh=8.00e5 tens=8.00e5 i=49 j=58,59
pro fric=30 dil= 5  i=49 j=58,59
pro perm=1.00e-14 porosity=0.3 i=49 j=58,59
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=50 j=62,63
pro coh=8.00e5 tens=8.00e5 i=50 j=62,63
pro fric=30 dil= 5  i=50 j=62,63
pro perm=1.00e-14 porosity=0.3 i=50 j=62,63
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=48 j=58,59
pro coh=8.00e5 tens=8.00e5 i=48 j=58,59
pro fric=30 dil= 5  i=48 j=58,59
pro perm=1.00e-14 porosity=0.3 i=48 j=58,59
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=47 j=54,55
pro coh=8.00e5 tens=8.00e5 i=47 j=54,55
pro fric=30 dil= 5  i=47 j=54,55
pro perm=1.00e-14 porosity=0.3 i=47 j=54,55
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=46 j=52,53
pro coh=8.00e5 tens=8.00e5 i=46 j=52,53
pro fric=30 dil= 5  i=46 j=52,53
pro perm=1.00e-14 porosity=0.3 i=46 j=52,53
;  Fault
```

```
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 45 , 51
pro coh=8.00e5 tens=8.00e5 reg= 45 , 51
pro fric=30 dil= 5  reg= 45 , 51
pro perm=1.00e-14 porosity=0.3 reg= 45 , 51
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 44 , 50
pro coh=8.00e5 tens=8.00e5 reg= 44 , 50
pro fric=30 dil= 5  reg= 44 , 50
pro perm=1.00e-14 porosity=0.3 reg= 44 , 50
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 44 , 49
pro coh=8.00e5 tens=8.00e5 reg= 44 , 49
pro fric=30 dil= 5  reg= 44 , 49
pro perm=1.00e-14 porosity=0.3 reg= 44 , 49
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 43 , 48
pro coh=8.00e5 tens=8.00e5 reg= 43 , 48
pro fric=30 dil= 5  reg= 43 , 48
pro perm=1.00e-14 porosity=0.3 reg= 43 , 48
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=46 j=54,55
pro coh=8.00e5 tens=8.00e5 i=46 j=54,55
pro fric=30 dil= 5  i=46 j=54,55
pro perm=1.00e-14 porosity=0.3 i=46 j=54,55
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=45 j=52,53
pro coh=8.00e5 tens=8.00e5 i=45 j=52,53
pro fric=30 dil= 5  i=45 j=52,53
pro perm=1.00e-14 porosity=0.3 i=45 j=52,53
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=43 j=46,47
pro coh=8.00e5 tens=8.00e5 i=43 j=46,47
pro fric=30 dil= 5  i=43 j=46,47
pro perm=1.00e-14 porosity=0.3 i=43 j=46,47
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=42 j=44,45
pro coh=8.00e5 tens=8.00e5 i=42 j=44,45
pro fric=30 dil= 5  i=42 j=44,45
pro perm=1.00e-14 porosity=0.3 i=42 j=44,45
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=41 j=42,43
pro coh=8.00e5 tens=8.00e5 i=41 j=42,43
pro fric=30 dil= 5  i=41 j=42,43
pro perm=1.00e-14 porosity=0.3 i=41 j=42,43
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=40 j=40,41
pro coh=8.00e5 tens=8.00e5 i=40 j=40,41
pro fric=30 dil= 5  i=40 j=40,41
pro perm=1.00e-14 porosity=0.3 i=40 j=40,41
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=42 j=46,47
pro coh=8.00e5 tens=8.00e5 i=42 j=46,47
pro fric=30 dil= 5  i=42 j=46,47
pro perm=1.00e-14 porosity=0.3 i=42 j=46,47
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 41 , 44
pro coh=8.00e5 tens=8.00e5 reg= 41 , 44
pro fric=30 dil= 5  reg= 41 , 44
pro perm=1.00e-14 porosity=0.3 reg= 41 , 44
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=40 j=42,43
pro coh=8.00e5 tens=8.00e5 i=40 j=42,43
pro fric=30 dil= 5  i=40 j=42,43
pro perm=1.00e-14 porosity=0.3 i=40 j=42,43
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=39 j=38,41
pro coh=8.00e5 tens=8.00e5 i=39 j=38,41
pro fric=30 dil= 5  i=39 j=38,41
pro perm=1.00e-14 porosity=0.3 i=39 j=38,41
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=38 j=38,39
pro coh=8.00e5 tens=8.00e5 i=38 j=38,39
pro fric=30 dil= 5  i=38 j=38,39
pro perm=1.00e-14 porosity=0.3 i=38 j=38,39
;  Fault
```

```
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=36,37 j=35
pro coh=8.00e5 tens=8.00e5 i=36,37 j=35
pro fric=30 dil= 5  i=36,37 j=35
pro perm=1.00e-14 porosity=0.3 i=36,37 j=35
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 37 , 34
pro coh=8.00e5 tens=8.00e5 reg= 37 , 34
pro fric=30 dil= 5  reg= 37 , 34
pro perm=1.00e-14 porosity=0.3 reg= 37 , 34
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 35 , 32
pro coh=8.00e5 tens=8.00e5 reg= 35 , 32
pro fric=30 dil= 5  reg= 35 , 32
pro perm=1.00e-14 porosity=0.3 reg= 35 , 32
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=35 j=30,31
pro coh=8.00e5 tens=8.00e5 i=35 j=30,31
pro fric=30 dil= 5  i=35 j=30,31
pro perm=1.00e-14 porosity=0.3 i=35 j=30,31
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=34 j=28,31
pro coh=8.00e5 tens=8.00e5 i=34 j=28,31
pro fric=30 dil= 5  i=34 j=28,31
pro perm=1.00e-14 porosity=0.3 i=34 j=28,31
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=33 j=26,29
pro coh=8.00e5 tens=8.00e5 i=33 j=26,29
pro fric=30 dil= 5  i=33 j=26,29
pro perm=1.00e-14 porosity=0.3 i=33 j=26,29
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=32 j=25,27
pro coh=8.00e5 tens=8.00e5 i=32 j=25,27
pro fric=30 dil= 5  i=32 j=25,27
pro perm=1.00e-14 porosity=0.3 i=32 j=25,27
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=31 j=24,25
pro coh=8.00e5 tens=8.00e5 i=31 j=24,25
pro fric=30 dil= 5  i=31 j=24,25
pro perm=1.00e-14 porosity=0.3 i=31 j=24,25
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=31 j=22,25
pro coh=8.00e5 tens=8.00e5 i=31 j=22,25
pro fric=30 dil= 5  i=31 j=22,25
pro perm=1.00e-14 porosity=0.3 i=31 j=22,25
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 29 , 20
pro coh=8.00e5 tens=8.00e5 reg= 29 , 20
pro fric=30 dil= 5  reg= 29 , 20
pro perm=1.00e-14 porosity=0.3 reg= 29 , 20
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 i=30 j=20,23
pro coh=8.00e5 tens=8.00e5 i=30 j=20,23
pro fric=30 dil= 5  i=30 j=20,23
pro perm=1.00e-14 porosity=0.3 i=30 j=20,23
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 28 , 18
pro coh=8.00e5 tens=8.00e5 reg= 28 , 18
pro fric=30 dil= 5  reg= 28 , 18
pro perm=1.00e-14 porosity=0.3 reg= 28 , 18
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 28 , 17
pro coh=8.00e5 tens=8.00e5 reg= 28 , 17
pro fric=30 dil= 5  reg= 28 , 17
pro perm=1.00e-14 porosity=0.3 reg= 28 , 17
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 26 , 13
pro coh=8.00e5 tens=8.00e5 reg= 26 , 13
pro fric=30 dil= 5  reg= 26 , 13
pro perm=1.00e-14 porosity=0.3 reg= 26 , 13
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 25 , 12
pro coh=8.00e5 tens=8.00e5 reg= 25 , 12
pro fric=30 dil= 5  reg= 25 , 12
pro perm=1.00e-14 porosity=0.3 reg= 25 , 12
;  Fault
```

```
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 26 , 15
pro coh=8.00e5 tens=8.00e5 reg= 26 , 15
pro fric=30 dil= 5  reg= 26 , 15
pro perm=1.00e-14 porosity=0.3 reg= 26 , 15
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 25 , 11
pro coh=8.00e5 tens=8.00e5 reg= 25 , 11
pro fric=30 dil= 5  reg= 25 , 11
pro perm=1.00e-14 porosity=0.3 reg= 25 , 11
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 24 , 10
pro coh=8.00e5 tens=8.00e5 reg= 24 , 10
pro fric=30 dil= 5  reg= 24 , 10
pro perm=1.00e-14 porosity=0.3 reg= 24 , 10
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 24 , 9
pro coh=8.00e5 tens=8.00e5 reg= 24 , 9
pro fric=30 dil= 5  reg= 24 , 9
pro perm=1.00e-14 porosity=0.3 reg= 24 , 9
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 23 , 7
pro coh=8.00e5 tens=8.00e5 reg= 23 , 7
pro fric=30 dil= 5  reg= 23 , 7
pro perm=1.00e-14 porosity=0.3 reg= 23 , 7
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 22 , 5
pro coh=8.00e5 tens=8.00e5 reg= 22 , 5
pro fric=30 dil= 5  reg= 22 , 5
pro perm=1.00e-14 porosity=0.3 reg= 22 , 5
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 21 , 3
pro coh=8.00e5 tens=8.00e5 reg= 21 , 3
pro fric=30 dil= 5  reg= 21 , 3
pro perm=1.00e-14 porosity=0.3 reg= 21 , 3
;  Fault
pro dens= 2300  bulk=4.70e9 shear=4.30e9 reg= 20 , 1
pro coh=8.00e5 tens=8.00e5 reg= 20 , 1
pro fric=30 dil= 5  reg= 20 , 1
pro perm=1.00e-14 porosity=0.3 reg= 20 , 1

;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9 i=45 j=50
pro coh=2.7e7 tens=2.00e6 i=45 j=50
pro fric=27 dil= 4  i=45 j=50
pro perm=1.00e-19 porosity=0.3 i=45 j=50
;  Sandstone
pro dens= 2400  bulk=2.68e10 shear=7.0e9 i=58 j=80
pro coh=2.7e7 tens=2.00e6 i=58 j=80
pro fric=27 dil= 4  i=58 j=80
pro perm=1.00e-19 porosity=0.3 i=58 j=80
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 i=38 j=40,41
pro coh=3.47e7 tens=2.00e6 i=38 j=40,41
pro fric=32 dil= 4  i=38 j=40,41
pro perm=1.00e-16 porosity=0.3 i=38 j=40,41
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 i=41 j=45
pro coh=3.47e7 tens=2.00e6 i=41 j=45
pro fric=32 dil= 4  i=41 j=45
pro perm=1.00e-16 porosity=0.3 i=41 j=45
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 i=36 j=31
pro coh=3.47e7 tens=2.00e6 i=36 j=31
pro fric=32 dil= 4  i=36 j=31
pro perm=1.00e-16 porosity=0.3 i=36 j=31
;  Siltstone
pro dens= 2450  bulk=1.56e10 shear=1.08e10 i=20 j=45
pro coh=3.47e7 tens=2.00e6 i=20 j=45
pro fric=32 dil= 4  i=20 j=45
pro perm=1.00e-16 porosity=0.3 i=20 j=45
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 25 , j=14,16
pro coh=3.84e7 tens=8.00e5 i= 25 , j=14,16
pro fric=14 dil= 1  i= 25 , j=14,16
pro perm=1.00e-19 porosity=0.2 i= 25 , j=14,16
```

```
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 26 , j=16
pro coh=3.84e7 tens=8.00e5 i= 26 , j=16
pro fric=14 dil= 1  i= 26 , j=16
pro perm=1.00e-19 porosity=0.2 i= 26 , j=16
;  Shale (ore zone)
pro dens= 2500  bulk=2.2e11 shear=1.66e11 i= 22 , j=21
pro coh=3.84e8 tens=2.00e5 i= 22 , j=21
pro fric=14 dil= 5  i= 22 , j=21
pro perm=1.00e-15 porosity=0.2 i= 22 , j=21
;  Shale (ore zone)
pro dens= 2500  bulk=2.2e11 shear=1.66e11 i= 33 , j=25
pro coh=3.84e8 tens=2.00e5 i= 33 , j=25
pro fric=14 dil= 5  i= 33 , j=25
pro perm=1.00e-15 porosity=0.2 i= 33 , j=25
;  Shale (ore zone)
pro dens= 2500  bulk=2.2e11 shear=1.66e11 i= 29 , j=22
pro coh=3.84e8 tens=2.00e5 i= 29 , j=22
pro fric=14 dil= 5  i= 29 , j=22
pro perm=1.00e-15 porosity=0.2 i= 29 , j=22
;  Shale
pro dens= 2500  bulk=8.8e9 shear=4.3e9 i= 21 , j=1
pro coh=3.84e7 tens=8.00e5 i= 21 , j=1
pro fric=14 dil= 1  i= 21 , j=1
pro perm=1.00e-19 porosity=0.2 i= 21 , j=1
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 i=24,28 j=20
pro coh=3.6e7 tens=8.00e5 i=24,28 j=20
pro fric=23 dil= 2  i=24,28 j=20
pro perm=5.00e-16 porosity=0.3 i=24,28 j=20
;  Siltstone / Shale
pro dens= 2500  bulk=1.0e10 shear=7.5e9 i=34 , j=27
pro coh=3.6e7 tens=8.00e5 i=34 , j=27
pro fric=23 dil= 2  reg= i=34 , j=27
pro perm=5.00e-16 porosity=0.3 i=34 , j=27
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 i=31 , j=21
pro coh=3.6e7 tens=8.00e5 i=31 , j=21
pro fric=23 dil= 2  i=31 , j=21
pro perm=1.00e-18 porosity=0.2 i=31 , j=21
;  Siltstone / Mudstone
pro dens= 2600  bulk=1.0e10 shear=7.5e9 i=27 , j=18
pro coh=3.6e7 tens=8.00e5 i=27 , j=18
pro fric=23 dil= 2  i=27 , j=18
pro perm=1.00e-18 porosity=0.2 i=27 , j=18
;--------END OF PROPERTIES---------------------

def ini_stress
hh1 = 0.5*abs(y(1,2) - y(1,1))
surf_load = -2.5e3*9.8*2500
str_add = hh1*9.8*2700
bot_str = (-1.0)*(2.9e3*9.8*2500 - str_add)
top_str = (-1.0)*(2.5e3*9.8*2500 + str_add)

str_var = top_str - bot_str

command
ini sxx bot_str var=0,str_var i=1,80 j=1,80
ini syy bot_str var=0,str_var i=1,80 j=1,80
ini szz bot_str var=0,str_var i=1,80 j=1,80
ini sxy = 0.0
end_command

end
ini_stress

apply ns surf_load i=1,81 j=81


def hydro_pp

surf_pp = 2.5e3*9.8*1000 + 1e5 ;pp (2.5km) + pp (atmospheric loading)
loop i (1,igp)
loop j (1,jgp)
```

```
if j = jgp Then
;sss2 = 0
sss2 = surf_pp
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa + surf_pp
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
hydro_pp
*
;
;
ini sat 1
fix sat

;fix pp j=81
;
set gravity=9.8
;
set large
;
;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=40 j=40
;hist 3 pp i=40 j=40

hist 3 pp i=10 j=18;sst/mud
hist 4 pp i=10 j=20;lower sst/sh
hist 5 pp i=10 j=22;shale
hist 6 pp i=10 j=26;higher sst/sh
hist 7 pp i=10 j=28;sst cap

;Movie every 500 steps
plot pp fill
sav m2d_ini.sav
movie on file m2d.dcx step 500

;FIX THE SIDES OF THE MODEL TO RUN TO GRAVITY SETTLING
fix x i=1
fix x i=81
fix y j=1

; Gravity settling
STEP 1500

;Set fluid on run to equilibrium
set flow on
pl pp fi fl bl
STEP 1500

;***Fish function to set overpressure from j=45 to j=1****
def overpress_pp
surf_pp = 3.0e3*9.8*2700 + 1e5 ;pp (3km) + pp (atmospheric loading)
loop i (1,igp)
loop j (1,45)
if j < 45 Then
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 2700 * 9.8 * aaa + surf_pp
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
overpress_pp
*
;
sav m2d_overpress.sav
```

```
;FISH FUNCTION TO STORE THE ORIGINAL PERMEABILITIES
;IN THE EXTRA VARIABLE ex_9

def store_perm_isotropic
  loop i1 (1,izones)
           loop j1 (1,jzones)
           ex_9(i1,j1) = k11(i1,j1)
           end_loop
   end_loop
end
store_perm_isotropic
;



;FISH function to test each zone and set it's
;permeability to an order of magnitude higher than it's original
;value if it is at yield (according to the FLAC state variables).

def yld_pincr1ordermag_isotropic

   WHILE_STEPPING
   incrval = 10.0  ; value to increment the permability by, 0.1 = 10%

   loop i1 (1,izones)

      loop j1 (1,jzones)

          case_of state(i1,j1)

           case 1  ; at yield in shear

             k11(i1,j1) = ex_9(i1,j1) * incrval

             k12(i1,j1) = 0.0

             k22(i1,j1) = ex_9(i1,j1) * incrval

           case 2  ; was at yield, but not now

             k11(i1,j1) = ex_9(i1,j1)

             k12(i1,j1) = 0.0

             k22(i1,j1) = ex_9(i1,j1)
           case 3  ; at yield in tension

             k11(i1,j1) = ex_9(i1,j1) * incrval

             k12(i1,j1) = 0.0

             k22(i1,j1) = ex_9(i1,j1) * incrval

          end_case

      end_loop
   end_loop
 end
;

free x
free y

;Compression
ini xvel  0.0008 var=-0.0016 ,0 i=1, 81  j=1, 81
fix x i=1
fix x i= 81
fix y j=1
;


step 2500
save m2d_1.sav ;   1 % compression
step 2500
```

```
save m2d_2.sav ;   2 % compression
step 2500
save m2d_3.sav ;   3 % compression
step 2500
save m2d_4.sav ;   4 % compression
step 2500
save m2d_5.sav ;   5 % compression
step 2500
save m2d_6.sav ;   6 % compression
step 2500
save m2d_7.sav ;   7 % compression
step 2500
save m2d_8.sav ;   8 % compression
step 2500
save m2d_9.sav ;   9 % compression
step 2500
save m2d_10.sav ;   10 % compression
step 2500
save m2d_11.sav ;   11 % compression
step 2500
save m2d_12.sav ;   12 % compression

return
stop
```

# E Extension Models

## E.1 Model 1a

FLAC Modelling Input File

```
;
config extra 4 gw
grid  120   80
gen 0.00e0,-8.00e3 0.00e0,0.00e0 1.20e4,0.00e0 1.20e4,-8.00e3 i=1,121 j=1,81
mark i=1
mark j=1
mark i = 121
mark j = 81
;
****************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3 ; to be elaborated below
;; 1 mech step = 1 fluid step;
set nmech 1 ngw 1 flow on
****************************************

tab  1   0 ,-4000   12000 ,-4000
;
;tab  2   0 ,-2000   12000 ,-2000
;
;tab  3   3000 ,-7000   8500 ,-1000  8800 ,-1000   3300 ,-7000

gen tab  1
;gen line 3000 -7000  8500 ,-1000
;;gen line 8500 ,-1000  8800 ,-1000
;gen line 8800 ,-1000  3300 ,-7000
;gen line 3300 ,-7000  3000 -7000
;gen tab  2
;gen tab  3
;

;  Sandstone
pro dens= 2400  bulk=3.20e10 shear=1.92e10 reg= 20 , 64
pro coh=4.00e6 tens=2.00e6 reg= 20 , 64
pro fric=30 dil= 4  reg= 20 , 64
pro perm=1.00e-10 porosity=0.3 reg= 20 , 64
;  Granite
```

```
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 18 , 34
pro coh=4.00e6 tens=2.00e6 reg= 18 , 34
pro fric=30 dil= 4  reg= 18 , 34
pro perm=2.00e-13 porosity=0.3 reg= 18 , 34
;
def hydro_pp
loop i (1,igp)
loop j (1,jgp)
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
hydro_pp
*
;
ini sat 1
fix sat
fix pp j=81
;
set gravity=9.8
set large
;
;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=60 j=40
hist 3 pp i=60 j=5; basement
hist 4 pp i=60 j=40; middle
hist 5 pp i=60 j=80; top

;FIX THE SIDES OF THE MODEL TO RUN TO GRAVITY SETTLING
fix x i=1
fix x i=121
fix y j=1 ;

plot pp fill
sav block1_ini.sav

;Create Movie files every 10000 steps
plot pp fill
movie on file block1.dcx step 10000
;

;RUN TO GRAVITY SETTLING
STEP 5000
;SET FLUID FLOW ON AND RUN TO EQUILIBRIUM
set flow on

pl pp fi fl bl
sav block1_grav.sav
step 5000
sav block1_flow.sav
;
free x
free y
ini xvel -0.0024 var= 0.0048 ,0 i=1, 121  j=1, 81 :

fix x i=1
fix x i=121
fix y j=1

his reset

; fish function for determining the sum of the stresses at each end of the model, for plotting as a history.

def stress_sum
while_stepping
sum_left = 0.0
sum_right = 0.0
sum_ave = 0.0
```

```
loop j (1,jzones)
depth_corr = 2700.0*10.0
sum_left = -(sum_left + sxx(1,j)-depth_corr*(y(1,j)-y(1,1)))
sum_right = -(sum_right + sxx(120,j)-depth_corr*(y(120,j)-y(120,1)))
sum_ave = (sum_left+sum_right)/2.0
end_loop
end

hist 1 unbalanced
hist 2 ydispl i=60 j=30
his 3 sum_left
his 4 sum_right
his 5 sum_ave
his 6 xdispl i 1 j 30
his 7 xdispl i 121 j 30
hist 8 pp i=60 j=5; basement
hist 9 pp i=60 j=40; middle
hist 10 pp i=60 j=80; top

step 50000
save block1_1.sav;   2 % deformation
step 50000
save block1_2.sav;   4 % deformation
step 50000
save block1_3.sav;   6 % deformation
step 50000
save block1_4.sav;   8 % deformation
step 50000
save block1_5.sav;   10 % deformation
pause
return
stop
```

## E.2 Model 1b

FLAC Modelling Input File

```
;
config extra 4 gw
grid  120   80
gen 0.00e0,-8.00e3 0.00e0,0.00e0 1.20e4,0.00e0 1.20e4,-8.00e3 i=1,121 j=1,81
mark i=1
mark j=1
mark i = 121
mark j = 81
;
****************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3 ; to be elaborated below
;; 1 mech step = 1 fluid step;
set nmech 1 ngw 10 flow on
****************************************
tab  1   0 ,-4000   12000 ,-4000
;
;tab  2   0 ,-2000   12000 ,-2000
;
;tab  3   3000 ,-7000   8500 ,-1000  8800 ,-1000   3300 ,-7000


gen tab  1
;gen line 3000 -7000  8500 ,-1000
;;gen line 8500 ,-1000  8800 ,-1000
;gen line 8800 ,-1000  3300 ,-7000
;gen line 3300 ,-7000  3000 -7000
;gen tab  2
;gen tab  3
;
;  Sandstone
pro dens= 2400  bulk=3.20e10 shear=1.92e10 reg= 20 , 64
pro coh=4.00e6 tens=2.00e6 reg= 20 , 64
pro fric=30 dil= 4  reg= 20 , 64
pro perm=1.00e-10 porosity=0.3 reg= 20 , 64
;  Granite
```

```
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 18 , 34
pro coh=4.00e6 tens=2.00e6 reg= 18 , 34
pro fric=30 dil= 4  reg= 18 , 34
pro perm=2.00e-13 porosity=0.3 reg= 18 , 34
;
def hydro_pp
loop i (1,igp)
loop j (1,jgp)
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
hydro_pp
*
;
def litho_pp
loop i (1,igp)
loop j (1,41)
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 2650 * 9.8 * aaa + 1e5
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
litho_pp
*

ini sat 1
fix sat
fix pp j=81
;
set gravity=9.8
set large
;
;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=60 j=40
hist 3 pp i=60 j=5; basement
hist 4 pp i=60 j=40; middle
hist 5 pp i=60 j=80; top

;FIX THE SIDES OF THE MODEL TO RUN TO GRAVITY SETTLING
fix x i=1
fix x i=121
fix y j=1 ;

plot pp fill
sav block2_10_ini.sav

;Create Movie files every 10000 steps
plot pp fill
movie on file block2_10.dcx step 10000
;

;RUN TO GRAVITY SETTLING
STEP 5000
;SET FLUID FLOW ON AND RUN TO EQUILIBRIUM
set flow on

pl pp fi fl bl
sav block2_10_grav.sav
step 5000

sav block2_10_flow.sav
free x
```

```
free y
ini xvel -0.0024 var= 0.0048 ,0 i=1, 121  j=1, 81 :

fix x i=1
fix x i=121
fix y j=1

his reset

; fish function for determining the sum of the stresses at each end of the model, for plotting as a history.
def stress_sum
while_stepping
sum_left = 0.0
sum_right = 0.0
sum_ave = 0.0
loop j (1,jzones)
depth_corr = 2700.0*10.0
sum_left = -(sum_left + sxx(1,j)-depth_corr*(y(1,j)-y(1,1)))
sum_right = -(sum_right + sxx(120,j)-depth_corr*(y(120,j)-y(120,1)))
sum_ave = (sum_left+sum_right)/2.0
end_loop
end

hist 1 unbalanced
hist 2 ydispl i=60 j=30
his 3 sum_left
his 4 sum_right
his 5 sum_ave
his 6 xdispl i 1 j 30
his 7 xdispl i 121 j 30
hist 8 pp i=60 j=5; basement
hist 9 pp i=60 j=40; middle
hist 10 pp i=60 j=80; top

step 50000
save block2_10_10_1.sav;   2 % deformation
step 50000
save block2_10_10_2.sav;   4 % deformation
step 10000
sav block2_10_10_2,1.sav
step 10000
sav block2_10_10_2,2.sav
step 10000
sav block2_10_10_2,3.sav
step 10000
sav block2_10_10_2,4.sav
step 10000
save block2_10_10_3.sav;   6 % deformation
step 10000
sav block2_10_10_3,1.sav
step 10000
sav block2_10_10_3,2.sav
step 10000
sav block2_10_10_3,3.sav
step 10000
sav block2_10_10_3,4.sav
step 10000
save block2_10_10_4.sav;   8 % deformation
step 50000
save block2_10_5.sav;   10 % deformation
step 50000
save block2_10_6.sav;   12 % deformation
step 50000
save block2_10_7.sav;   14 % deformation
step 50000
save block2_10_8.sav;   16 % deformation
step 50000
save block2_10_9.sav;   18 % deformation
step 50000
save block2_10_10.sav;   20 % deformation

return
stop
```

## E.3 Model 2a

FLAC Modelling Input File

```
;
config extra 4 gw
grid  120   80
gen 0.00e0,-8.00e3 0.00e0,0.00e0 1.20e4,0.00e0 1.20e4,-8.00e3 i=1,121 j=1,81
mark i=1
mark j=1
mark i = 121
mark j = 81
;
***************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3 ; to be elaborated below
;; 1 mech step = 1 fluid step;
set nmech 1 ngw 1 flow on
***************************************
tab  1   0 ,-4000   12000 ,-4000
;
;tab  2   0 ,-2000   12000 ,-2000
;
tab  3   3000 ,-8000   8500 , 0   8800 , 0
tab  3   3300 ,-8000
;
gen tab  1
;gen tab  2
gen tab  3
;
; Moving the gridpoints i=63 j=41 at base i=60 j=80 at top of fault to straighten it out
ini x add 75 i=88 j=81
ini x add 25 i=58 j=41
ini x add -25 i=62 j=41


; Properties for each sub-regions
;  Sandstone
pro dens= 2400  bulk=3.20e10 shear=1.92e10 reg= 20 , 64
pro coh=4.00e6 tens=2.00e6 reg= 20 , 64
pro fric=30 dil= 4  reg= 20 , 64
pro perm=1.00e-10 porosity=0.3 reg= 20 , 64
;  Sandstone
pro dens= 2400  bulk=3.20e10 shear=1.92e10 reg= 90 , 64
pro coh=4.00e6 tens=2.00e6 reg= 90 , 64
pro fric=30 dil= 4  reg= 90 , 64
pro perm=1.00e-10 porosity=0.3 reg= 90 , 64
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 18 , 34
pro coh=4.00e6 tens=2.00e6 reg= 18 , 34
pro fric=30 dil= 4  reg= 18 , 34
pro perm=2.00e-13 porosity=0.3 reg= 18 , 34
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 60 , 34
pro coh=4.00e6 tens=2.00e6 reg= 60 , 34
pro fric=30 dil= 4  reg= 60 , 34
pro perm=2.00e-13 porosity=0.3 reg= 60 , 34
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 i= 34 j= 1
pro coh=4.00e6 tens=2.00e6 i= 34 j= 1
pro fric=30 dil= 4  i= 34 j= 1
pro perm=2.00e-13 porosity=0.3 i= 34 j= 1
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 i= 60 j= 40
pro coh=4.00e6 tens=2.00e6 i= 60 j= 40
pro fric=30 dil= 4  i= 60 j= 40
pro perm=2.00e-13 porosity=0.3 i= 60 j= 40
;  Fault
pro dens= 2500  bulk=2.81e10 shear=1.69e9 reg= 52 , 30
pro coh=3.00e3 tens=1.50e6 reg= 52 , 30
pro fric=30 dil= 4  reg= 52 , 30
pro perm=1.00e-11 porosity=0.3 reg= 52 , 30
;Additional commands to sort out loose zones
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 i= 57 j= 40
```

```
pro coh=4.00e6 tens=2.00e6 i= 57 j= 40
pro fric=30 dil= 4  i= 57 j= 40
pro perm=2.00e-13 porosity=0.3 i= 57 j= 40
;  Fault
pro dens= 2500  bulk=2.81e10 shear=1.69e9 reg= 61 , 42
pro coh=3.00e3 tens=1.50e6 reg= 61 , 42
pro fric=30 dil= 4  reg= 61 , 42
pro perm=1.00e-11 porosity=0.3 reg= 61 , 42
;  Sandstone
pro dens= 2400  bulk=3.20e10 shear=1.92e10 i= 62 j= 41
pro coh=4.00e6 tens=2.00e6 i= 62 j= 41
pro fric=30 dil= 4  i= 62 j= 41
pro perm=1.00e-10 porosity=0.3 i= 62 j= 41

;
def hydro_pp
loop i (1,igp)
loop j (1,jgp)
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
hydro_pp
*
;
ini sat 1
fix sat
fix pp j=81
;
set gravity=9.8
set large
;
;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=60 j=40
hist 3 pp i=60 j=5; basement
hist 4 pp i=60 j=40; middle
hist 5 pp i=60 j=80; top

;FIX THE SIDES OF THE MODEL TO RUN TO GRAVITY SETTLING
fix x i=1
fix x i=121
fix y j=1 ;

plot pp fill
sav faultnb2_ini.sav

;Create Movie files every 10000 steps
plot pp fill
movie on file faultnb2.dcx step 10000
;

;RUN TO GRAVITY SETTLING
STEP 5000
;SET FLUID FLOW ON AND RUN TO EQUILIBRIUM
set flow on

pl pp fi fl bl
sav faultnb2_grav.sav
step 5000

sav faultnb2_flow.sav
;
free x
free y

ini xvel -0.0024 var= 0.0048 ,0 i=1, 121  j=1, 81 :
fix x i=1
fix x i=121
```

```
fix y j=1

his reset

; fish function for determining the sum of the stresses at each end of the model, for plotting as a history.
def stress_sum
while_stepping
sum_left = 0.0
sum_right = 0.0
sum_ave = 0.0
loop j (1,jzones)
depth_corr = 2700.0*10.0
sum_left = -(sum_left + sxx(1,j)-depth_corr*(y(1,j)-y(1,1)))
sum_right = -(sum_right + sxx(120,j)-depth_corr*(y(120,j)-y(120,1)))
sum_ave = (sum_left+sum_right)/2.0
end_loop
end

hist 1 unbalanced
hist 2 ydispl i=60 j=30
his 3 sum_left
his 4 sum_right
his 5 sum_ave
his 6 xdispl i 1 j 30
his 7 xdispl i 121 j 30
hist 8 pp i=60 j=5; basement
hist 9 pp i=60 j=40; middle
hist 10 pp i=60 j=80; top

step 50000
save faultnb2_1.sav;   2 % deformation
step 50000
save faultnb2_2.sav;   4 % deformation
step 50000
save faultnb2_3.sav;   6 % deformation
step 50000
save faultnb2_4.sav;   8 % deformation
step 50000
save faultnb2_5.sav;   10 % deformation
step 50000
save faultnb2_6.sav;   12 % deformation
step 50000
save faultnb2_7.sav;   14 % deformation

return
stop
```

## E.4 Model 2b

FLAC Modelling Input File

```
;
config extra 4 gw
grid  120   80
gen 0.00e0,-8.00e3 0.00e0,0.00e0 1.20e4,0.00e0 1.20e4,-8.00e3 i=1,121 j=1,81
mark i=1
mark j=1
mark i = 121
mark j = 81
;
****************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3 ; to be elaborated below
;; 1 mech step = 1 fluid step;
set nmech 1 ngw 1 flow on
****************************************
tab  1   0 ,-4000   12000 ,-4000
;
;tab  2   0 ,-2000   12000 ,-2000
;
;tab  3   3000 ,-7000   8500 ,-1000  8800 ,-1000   3300 ,-7000
gen tab  1
gen line 3000 -7000  8500 ,-1000
```

```
gen line 8500 ,-1000  8800 ,-1000
gen line 8800 ,-1000  3300 ,-7000
gen line 3300 ,-7000  3000 -7000

;gen tab  2
;gen tab  3
;
; Moving the gridpoints i=63 j=41 at base i=60 j=80 at top of fault to straighten it out
;ini x add 75 i=88 j=81
;ini x add 25 i=58 j=41
;ini x add -25 i=62 j=41

; Properties for each sub-regions:
;  Sandstone
pro dens= 2400  bulk=3.20e10 shear=1.92e10 reg= 20 , 64
pro coh=4.00e6 tens=2.00e6 reg= 20 , 64
pro fric=30 dil= 4  reg= 20 , 64
pro perm=1.00e-10 porosity=0.3 reg= 20 , 64
;  Sandstone
pro dens= 2400  bulk=3.20e10 shear=1.92e10 reg= 90 , 64
pro coh=4.00e6 tens=2.00e6 reg= 90 , 64
pro fric=30 dil= 4  reg= 90 , 64
pro perm=1.00e-10 porosity=0.3 reg= 90 , 64
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 18 , 34
pro coh=4.00e6 tens=2.00e6 reg= 18 , 34
pro fric=30 dil= 4  reg= 18 , 34
pro perm=2.00e-13 porosity=0.3 reg= 18 , 34
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 60 , 34
pro coh=4.00e6 tens=2.00e6 reg= 60 , 34
pro fric=30 dil= 4  reg= 60 , 34
pro perm=2.00e-13 porosity=0.3 reg= 60 , 34

;Additional commands to sort out loose zones

;  Fault
pro dens= 2500  bulk=2.81e10 shear=1.69e9 reg= 72 , 54
pro coh=3.00e3 tens=1.50e6 reg= 72 , 54
pro fric=30 dil= 4  reg= 72 , 54
pro perm=1.00e-11 porosity=0.3 reg= 72 , 54
;  Fault
pro dens= 2500  bulk=2.81e10 shear=1.69e9 reg= 41 , 20
pro coh=3.00e3 tens=1.50e6 reg= 41 , 20
pro fric=30 dil= 4  reg= 41 , 20
pro perm=1.00e-11 porosity=0.3 reg= 41 , 20
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 18 , 34
pro coh=4.00e6 tens=2.00e6 reg= 18 , 34
pro fric=30 dil= 4  reg= 18 , 34
pro perm=2.00e-13 porosity=0.3 reg= 18 , 34
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 60 , 34
pro coh=4.00e6 tens=2.00e6 reg= 60 , 34
pro fric=30 dil= 4  reg= 60 , 34
pro perm=2.00e-13 porosity=0.3 reg= 60 , 34
;  Sandstone
pro dens= 2400  bulk=3.20e10 shear=1.92e10 i= 62 j= 41
pro coh=4.00e6 tens=2.00e6 i= 62 j= 41
pro fric=30 dil= 4  i= 62 j= 41
pro perm=1.00e-10 porosity=0.3 i= 62 j= 41
;  Fault
pro dens= 2500  bulk=2.81e10 shear=1.69e9 reg= 41 , 20
pro coh=3.00e3 tens=1.50e6 reg= 41 , 20
pro fric=30 dil= 4  reg= 41 , 20
pro perm=1.00e-11 porosity=0.3 reg= 41 , 20
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 i=57,58 j=40
pro coh=4.00e6 tens=2.00e6 i=57,58 j=40
pro fric=30 dil= 4  i=57,58 j=40
pro perm=2.00e-13 porosity=0.3 i=57,58 j=40
;  Sandstone
pro dens= 2400  bulk=3.20e10 shear=1.92e10 i=61,62 j= 41
pro coh=4.00e6 tens=2.00e6 i=61,62 j= 41
pro fric=30 dil= 4  i=61,62 j= 41
```

```
pro perm=1.00e-10 porosity=0.3 i=61,62 j= 41

;
def hydro_pp
loop i (1,igp)
loop j (1,jgp)
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
hydro_pp
*
;

ini sat 1
fix sat
fix pp j=81
;
set gravity=9.8
set large
;
;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=60 j=40
hist 3 pp i=60 j=5; basement
hist 4 pp i=60 j=40; middle
hist 5 pp i=60 j=80; top

;FIX THE SIDES OF THE MODEL TO RUN TO GRAVITY SETTLING
fix x i=1
fix x i=121
fix y j=1 ;

plot pp fill
sav faultnb4_ini.sav

;Create Movie files every 10000 steps
plot pp fill
movie on file faultnb4.dcx step 10000
;

;RUN TO GRAVITY SETTLING
STEP 5000
;SET FLUID FLOW ON AND RUN TO EQUILIBRIUM
set flow on


pl pp fi fl bl
sav faultnb4_grav.sav
step 5000

sav faultnb4_flow.sav

free x
free y
ini xvel -0.0024 var= 0.0048 ,0 i=1, 121  j=1, 81 :
fix x i=1
fix x i=121
fix y j=1

his reset

; fish function for determining the sum of the stresses at each end of the model, for plotting as a history.
def stress_sum
while_stepping

sum_left = 0.0
sum_right = 0.0
sum_ave = 0.0
```

```
loop j (1,jzones)
depth_corr = 2700.0*10.0
sum_left = -(sum_left + sxx(1,j)-depth_corr*(y(1,j)-y(1,1)))
sum_right = -(sum_right + sxx(120,j)-depth_corr*(y(120,j)-y(120,1)))
sum_ave = (sum_left+sum_right)/2.0
end_loop
end

hist 1 unbalanced
hist 2 ydispl i=60 j=30
his 3 sum_left
his 4 sum_right
his 5 sum_ave
his 6 xdispl i 1 j 30
his 7 xdispl i 121 j 30
hist 8 pp i=60 j=5; basement
hist 9 pp i=60 j=40; middle
hist 10 pp i=60 j=80; top

step 50000
save faultnb4_1.sav;   2 % deformation
step 50000
save faultnb4_2.sav;   4 % deformation
step 50000
save faultnb4_3.sav;   6 % deformation
step 50000
save faultnb4_4.sav;   8 % deformation
step 50000
save faultnb4_5.sav;   10 % deformation
step 50000
save faultnb4_6.sav;   12 % deformation
step 50000
save faultnb4_7.sav;   14 % deformation
step 50000
save faultnb4_8.sav;   16 % deformation
step 50000
save faultnb4_9.sav;   18 % deformation
step 50000
save faultnb4_10.sav;   20 % deformation

return
stop
```

## E.5 Model 2c

FLAC Modelling Input File

```
;
config extra 4 gw
grid  120   80
gen 0.00e0,-8.00e3 0.00e0,0.00e0 1.20e4,0.00e0 1.20e4,-8.00e3 i=1,121 j=1,81
mark i=1
mark j=1
mark i = 121
mark j = 81
;
****************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3 ; to be elaborated below
;; 1 mech step = 1 fluid step;
set nmech 1 ngw 1 flow on
****************************************
tab  1   0 ,-4000   12000 ,-4000
;
;tab  2   0 ,-2000   12000 ,-2000
;
;tab  3   3000 ,-7000   8500 ,-1000  8800 ,-1000   3300 ,-7000

gen tab  1
gen line 3000 -7000  8500 ,-1000
gen line 8500 ,-1000  8800 ,-1000
gen line 8800 ,-1000  3300 ,-7000
gen line 3300 ,-7000  3000 -7000
```

```
;gen tab  2
;gen tab  3
;
; Moving the gridpoints i=63 j=41 at base i=60 j=80 at top of fault to straighten it out
;ini x add 75 i=88 j=81
;ini x add 25 i=58 j=41
;ini x add -25 i=62 j=41

; Properties for each sub-regions:
;  Sandstone
pro dens= 2400  bulk=3.20e10 shear=1.92e10 reg= 20 , 64
pro coh=4.00e6 tens=2.00e6 reg= 20 , 64
pro fric=30 dil= 4  reg= 20 , 64
pro perm=1.00e-10 porosity=0.3 reg= 20 , 64
;  Sandstone
pro dens= 2400  bulk=3.20e10 shear=1.92e10 reg= 90 , 64
pro coh=4.00e6 tens=2.00e6 reg= 90 , 64
pro fric=30 dil= 4  reg= 90 , 64
pro perm=1.00e-10 porosity=0.3 reg= 90 , 64
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 18 , 34
pro coh=4.00e6 tens=2.00e6 reg= 18 , 34
pro fric=30 dil= 4  reg= 18 , 34
pro perm=2.00e-13 porosity=0.3 reg= 18 , 34
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 60 , 34
pro coh=4.00e6 tens=2.00e6 reg= 60 , 34
pro fric=30 dil= 4  reg= 60 , 34
pro perm=2.00e-13 porosity=0.3 reg= 60 , 34

;Additional commands to sort out loose zones
;  Fault
pro dens= 2500  bulk=2.81e10 shear=1.69e9 reg= 72 , 54
pro coh=3.00e3 tens=1.50e6 reg= 72 , 54
pro fric=30 dil= 4  reg= 72 , 54
pro perm=1.00e-11 porosity=0.3 reg= 72 , 54
;  Fault
pro dens= 2500  bulk=2.81e10 shear=1.69e9 reg= 41 , 20
pro coh=3.00e3 tens=1.50e6 reg= 41 , 20
pro fric=30 dil= 4  reg= 41 , 20
pro perm=1.00e-11 porosity=0.3 reg= 41 , 20
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 18 , 34
pro coh=4.00e6 tens=2.00e6 reg= 18 , 34
pro fric=30 dil= 4  reg= 18 , 34
pro perm=2.00e-13 porosity=0.3 reg= 18 , 34
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 60 , 34
pro coh=4.00e6 tens=2.00e6 reg= 60 , 34
pro fric=30 dil= 4  reg= 60 , 34
pro perm=2.00e-13 porosity=0.3 reg= 60 , 34
;  Sandstone
pro dens= 2400  bulk=3.20e10 shear=1.92e10 i= 62 j= 41
pro coh=4.00e6 tens=2.00e6 i= 62 j= 41
pro fric=30 dil= 4  i= 62 j= 41
pro perm=1.00e-10 porosity=0.3 i= 62 j= 41
;  Fault
pro dens= 2500  bulk=2.81e10 shear=1.69e9 reg= 41 , 20
pro coh=3.00e3 tens=1.50e6 reg= 41 , 20
pro fric=30 dil= 4  reg= 41 , 20
pro perm=1.00e-11 porosity=0.3 reg= 41 , 20
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 i=57,58 j=40
pro coh=4.00e6 tens=2.00e6 i=57,58 j=40
pro fric=30 dil= 4  i=57,58 j=40
pro perm=2.00e-13 porosity=0.3 i=57,58 j=40
;  Sandstone
pro dens= 2400  bulk=3.20e10 shear=1.92e10 i=61,62 j= 41
pro coh=4.00e6 tens=2.00e6 i=61,62 j= 41
pro fric=30 dil= 4  i=61,62 j= 41
pro perm=1.00e-10 porosity=0.3 i=61,62 j= 41
;
def hydro_pp
loop i (1,igp)
loop j (1,jgp)
```

```
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
hydro_pp
*
;

def litho_pp
loop i (1,igp)
loop j (1,41)
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 2650 * 9.8 * aaa + 1e5
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
litho_pp
*
;

ini sat 1
fix sat
fix pp j=81
;
set gravity=9.8
set large
;
;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=60 j=40
hist 3 pp i=60 j=5; basement
hist 4 pp i=60 j=40; middle
hist 5 pp i=60 j=80; top

;FIX THE SIDES OF THE MODEL TO RUN TO GRAVITY SETTLING
fix x i=1
fix x i=121
fix y j=1 ;
plot pp fill
sav faultnb3_ini.sav

;Create Movie files every 10000 steps
plot pp fill
movie on file faultnb3.dcx step 10000
;

;RUN TO GRAVITY SETTLING
STEP 5000
;SET FLUID FLOW ON AND RUN TO EQUILIBRIUM
set flow on
pl pp fi fl bl
sav faultnb3_grav.sav
step 5000
sav faultnb3_flow.sav
;

free x
free y
ini xvel -0.0024 var= 0.0048 ,0 i=1, 121  j=1, 81 :
fix x i=1
fix x i=121
fix y j=1
```

```
his reset

; fish function for determining the sum of the stresses at each end of the model, for plotting as a history.
def stress_sum
while_stepping
sum_left = 0.0
sum_right = 0.0
sum_ave = 0.0
loop j (1,jzones)
depth_corr = 2700.0*10.0
sum_left = -(sum_left + sxx(1,j)-depth_corr*(y(1,j)-y(1,1)))
sum_right = -(sum_right + sxx(120,j)-depth_corr*(y(120,j)-y(120,1)))
sum_ave = (sum_left+sum_right)/2.0
end_loop
end

hist 1 unbalanced
hist 2 ydispl i=60 j=30
his 3 sum_left
his 4 sum_right
his 5 sum_ave
his 6 xdispl i 1 j 30
his 7 xdispl i 121 j 30
hist 8 pp i=60 j=5; basement
hist 9 pp i=60 j=40; middle
hist 10 pp i=60 j=80; top

step 50000
save faultnb3_1.sav;   2 % deformation
step 50000
save faultnb3_2.sav;   4 % deformation
step 50000
save faultnb3_3.sav;   6 % deformation
step 50000
save faultnb3_4.sav;   8 % deformation
step 50000
save faultnb3_5.sav;   10 % deformation
step 50000
save faultnb3_6.sav;   12 % deformation
step 50000
save faultnb3_7.sav;   14 % deformation
step 50000
save faultnb3_8.sav;   16 % deformation
step 50000
save faultnb3_9.sav;   18 % deformation
step 50000
save faultnb3_10.sav;   20 % deformation

return
stop
```

## E.6 Model 2d

FLAC Modelling Input File

```
;
config extra 4 gw
grid  120   80
gen 0.00e0,-8.00e3 0.00e0,0.00e0 1.20e4,0.00e0 1.20e4,-8.00e3 i=1,121 j=1,81
mark i=1
mark j=1
mark i = 121
mark j = 81
;
****************************************
model mohr
water bulk 2e9 dens 1000
prop poro=0.3 ; to be elaborated below
;; 1 mech step = 1 fluid step;
set nmech 1 ngw 1 flow on
****************************************
tab  1   0 ,-4000   12000 ,-4000
;
```

```
;tab  2   0 ,-2000   12000 ,-2000
tab  3   3000 ,-8000   6000 ,-4000   6300 ,-4000
tab  3   3300 ,-8000
;
gen tab  1
;gen tab  2
gen tab  3
;
; Moving the gridpoints i=63 j=41 at base i=60 j=80 at top of fault to straighten it out
;ini x add 75 i=63 j=41

; Properties for each sub-regions: NEW PERM PROPS !!!!!
;  Sandstone
pro dens= 2400  bulk=3.20e10 shear=1.92e10 reg= 20 , 64
pro coh=4.00e6 tens=2.00e6 reg= 20 , 64
pro fric=30 dil= 4  reg= 20 , 64
pro perm=1.00e-10 porosity=0.3 reg= 20 , 64
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 18 , 34
pro coh=4.00e6 tens=2.00e6 reg= 18 , 34
pro fric=30 dil= 4  reg= 18 , 34
pro perm=2.00e-13 porosity=0.3 reg= 18 , 34
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 reg= 60 , 34
pro coh=4.00e6 tens=2.00e6 reg= 60 , 34
pro fric=30 dil= 4  reg= 60 , 34
pro perm=2.00e-13 porosity=0.3 reg= 60 , 34
;  Fault
pro dens= 2500  bulk=2.81e10 shear=1.69e9 reg= 54 , 30
pro coh=3.00e3 tens=1.50e6 reg= 54 , 30
pro fric=30 dil= 4  reg= 54 , 30
pro perm=1.00e-11 porosity=0.3 reg= 54 , 30
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 i= 34 j= 1
pro coh=4.00e6 tens=2.00e6 i= 34 j= 1
pro fric=30 dil= 4  i= 34 j= 1
pro perm=2.00e-13 porosity=0.3 i= 34 j= 1
;  Granite
pro dens= 2650  bulk=4.95e10 shear=2.97e10 i= 60 j= 40
pro coh=4.00e6 tens=2.00e6 i= 60 j= 40
pro fric=30 dil= 4  i= 60 j= 40
pro perm=2.00e-13 porosity=0.3 i= 60 j= 40
;
def hydro_pp
loop i (1,igp)
loop j (1,jgp)
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 1000 * 9.8 * aaa
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
hydro_pp
*
;
def litho_pp
loop i (1,igp)
loop j (1,41)
if j = jgp Then
sss2 = 0
else
aaa = abs(y(i, j) - y(i, jgp))
sss2 = 2650 * 9.8 * aaa + 1e5
end_if
gpp(i, j) = sss2
end_loop
end_loop
end
litho_pp
*
;
```

```
ini sat 1
fix sat
fix pp j=81
;
set gravity=9.8
;
set large
;
;SET UP A COUPLE OF HISTORIES
hist 1 unbalanced
hist 2 ydispl i=60 j=40
hist 3 pp i=60 j=5; basement
hist 4 pp i=60 j=40; middle
hist 5 pp i=60 j=42; base of cover
hist 4 pp i=60 j=80; top

;FIX THE SIDES OF THE MODEL TO RUN TO GRAVITY SETTLING
fix x i=1
fix x i=121
fix y j=1 ;

plot pp fill
sav faultnb1_ini.sav

;Create Movie files every 10000 steps
plot pp fill
movie on file faultnb1.dcx step 10000
;

;RUN TO GRAVITY SETTLING
STEP 5000
;SET FLUID FLOW ON AND RUN TO EQUILIBRIUM
set flow on

pl pp fi fl bl
sav faultnb1_grav.sav
step 5000

sav faultnb1_flow.sav
;
free x
free y
ini xvel -0.0024 var= 0.0048 ,0 i=1, 121  j=1, 81 :

fix x i=1
fix x i=121
fix y j=1

step 50000
save faultnb1_1.sav;   2 % deformation
step 50000
save faultnb1_2.sav;   4 % deformation
step 50000
save faultnb1_3.sav;   6 % deformation
step 50000
save faultnb1_4.sav;   8 % deformation
step 50000
save faultnb1_5.sav;   10 % deformation
step 50000
save faultnb1_6.sav;   12 % deformation
step 50000
save faultnb1_7.sav;   14 % deformation
step 50000
save faultnb1_8.sav;   16 % deformation
step 50000
save faultnb1_9.sav;   18 % deformation
step 50000
save faultnb1_10.sav;   20 % deformation

return
stop
```

# Appendix 2

## UDEC numerical code

(note: Geometry was constructed by digital tracing in Corel Draw, then using a grid, co-ordinates at each point were recorded and code was entered by user. Geometry files are only included in Models1a and 2a due to the extensive code.)

## U UDEC Models

### U.1 Model 1a – dry model $\sigma_1 = 90°$

```
;>1530Ma (Map Interp)MODEL 1 Old Granites- DRY MODEL


prop mat=1 dens 2850 bulk 25e9 shear 25e9 cohesion 10e6 tens 5e6 fric 31 dil 4

prop mat=2 dens 2650 bulk 49e9 shear 27e9 cohesion 20e6 tens 10e6 fric 37 dil 5

;contact properties
prop jmat=1 jkn 5e6 jks 1e3 jcoh 4e2 jtens 2e6 jfri 30 jdil 5
;prop jmat=1 jper 300 azero 0.05 ares 0.03

prop jmat=2 jkn 5e9 jks 1e5 jcoh 10e2 jtens 3e6 jfri 35 jdil 5
;prop jmat=2 jper 238 azero 0.03 ares 0.01

;Pseudo joints
prop jmat=5 jkn 100e9 jks 40e9 jcoh 190e10 jtens 190e10 jdil 0
;prop jmat=5 jper 0 azero 0 ares 0

round 100

block 0,0 0,200000 124000,200000 124000,0

;*****(Geometry File Start)*****
crack   1000    200000  1500    192000;1-2
crack   1500    192000  1000    191000;2-3
crack   1000    191000  0       189000;3-4
crack   6500    200000  5500    199000;7-6
crack   5500    199000  4000    198000;6-5
crack   4000    198000  1500    192000;5-2
crack   5500    199000  6000    193000;6-8
crack   6000    193000  4000    186000;8-9
crack   4000    186000  4000    180000;9-10
crack   4000    180000  4500    176000;10-11
crack   4500    176000  2000    171000;11-12
crack   4000    198000  3500    188000;5-17
crack   3500    188000  2500    184000;17-18
crack   2500    184000  2500    175000;18-19
crack   2500    175000  2000    171000;19-12
crack   2000    171000  1500    170000;12-13
crack   1500    170000  1500    160000;13-14
crack   1500    160000  5000    155000;14-15
crack   5000    155000  2000    150000;15-16
crack   2000    150000  0       148000;16-20
crack   21500   200000  21500   189000;21-22
crack   21500   189000  20000   182000;22-23
crack   27500   200000  23000   185000;25-26
crack   23000   185000  20000   182000;26-23
crack   20000   182000  19500   179000;23-24
crack   19500   179000  13500   168000;24-27
crack   13500   168000  10500   165000;27-28
crack   10500   165000  9500    162000;28-29
crack   9500    162000  5000    155000;29-15
crack   9500    162000  10000   160000;29-30
crack   10000   160000  6500    154000;30-31
crack   6500    154000  4000    149000;31-32
crack   4000    149000  0       147000;32-33
crack   4000    149000  0       141000;32-34
```

| | | | | |
|---|---|---|---|---|
| crack | 69000 | 200000 | 64000 | 181000;35-36 |
| crack | 64000 | 181000 | 62000 | 181000;36-37 gr1 bound centr:57000,60000,175000,180000 |
| crack | 62000 | 181000 | 61000 | 180000;37-38 gr1 bound |
| crack | 61000 | 180000 | 54500 | 180000;38-39 gr1 bound |
| crack | 54500 | 180000 | 53000 | 179500;39-40 gr1 bound |
| crack | 53000 | 179500 | 53000 | 176000;40-41 gr1 bound |
| crack | 53000 | 176000 | 54000 | 175000;41-42 gr1 bound |
| crack | 54000 | 175000 | 56000 | 173000;42-43 gr1 bound |
| crack | 56000 | 173000 | 57000 | 171000;43-44 gr1 bound |
| crack | 57000 | 171000 | 58000 | 172000;44-45 gr1 bound |
| crack | 58000 | 172000 | 60000 | 172500;45-46 gr1 bound |
| crack | 60000 | 172500 | 59500 | 173500;46-47 gr1 bound |
| crack | 59500 | 173500 | 58000 | 173000;47-48 gr1 bound |
| crack | 58000 | 173000 | 57000 | 173500;48-49 gr1 bound |
| crack | 57000 | 173500 | 57500 | 175000;49-50 gr1 bound |
| crack | 57500 | 175000 | 61000 | 175000;50-51 gr1 bound |
| crack | 61000 | 175000 | 63000 | 177000;51-52 gr1 bound |
| crack | 63000 | 177000 | 64000 | 181000;52-36 gr1 bound |
| crack | 54000 | 175000 | 52000 | 176000;42-53 |
| crack | 52000 | 176000 | 47000 | 179000;53-54 |
| crack | 47000 | 179000 | 45000 | 179000;54-55 |
| crack | 45000 | 179000 | 41000 | 181000;55-56 |
| crack | 41000 | 181000 | 38000 | 179000;56-57 |
| crack | 38000 | 179000 | 38500 | 173000;57-58 |
| crack | 38500 | 173000 | 37000 | 169000;58-59 |
| crack | 37000 | 169000 | 25000 | 164000;59-60 |
| crack | 25000 | 164000 | 21000 | 163000;60-61 |
| crack | 21000 | 163000 | 11000 | 158000;61-62 |
| crack | 11000 | 158000 | 8000 | 145000;62-63 |
| crack | 8000 | 145000 | 0 | 130000;63-64 |
| crack | 38500 | 173000 | 42000 | 170000;58-65 |
| crack | 42000 | 170000 | 42000 | 163000;65-66 |
| crack | 42000 | 163000 | 38000 | 153000;66-67 |
| crack | 38000 | 153000 | 40000 | 152000;67-68 |
| crack | 40000 | 152000 | 43000 | 150000;68-69 |
| crack | 43000 | 150000 | 38000 | 144000;69-70 |
| crack | 38000 | 144000 | 32000 | 141000;70-71 |
| crack | 32000 | 141000 | 23000 | 130000;71-72 |
| crack | 23000 | 130000 | 16000 | 127000;72-73 |
| crack | 16000 | 127000 | 14000 | 123000;73-74 |
| crack | 14000 | 123000 | 11000 | 119000;74-75 |
| crack | 11000 | 119000 | 6000 | 114000;75-76 |
| crack | 6000 | 114000 | 2000 | 111000;76-77 |
| crack | 2000 | 111000 | 0 | 107000;77-78 |
| crack | 38000 | 144000 | 36000 | 141000;70-79 |
| crack | 36000 | 141000 | 35000 | 135000;79-80 |
| crack | 35000 | 135000 | 37000 | 134500;80-81 |
| crack | 37000 | 134500 | 39000 | 131000;81-82 |
| crack | 39000 | 131000 | 35000 | 123000;82-83 |
| crack | 35000 | 123000 | 31000 | 120000;83-84 |
| crack | 31000 | 120000 | 25000 | 118000;84-85 |
| crack | 25000 | 118000 | 23000 | 114000;85-86 |
| crack | 23000 | 114000 | 16000 | 109000;86-87 |
| crack | 16000 | 109000 | 6000 | 105000;87-88 |
| crack | 6000 | 105000 | 3000 | 107000;88-89 |
| crack | 3000 | 107000 | 0 | 107000;89-78 |
| crack | 43000 | 150000 | 43000 | 147000;69-90 |
| crack | 43000 | 147000 | 43000 | 141000;90-91 |
| crack | 43000 | 141000 | 44000 | 138000;91-92 |
| crack | 44000 | 138000 | 50000 | 133000;92-93 |
| crack | 50000 | 133000 | 53000 | 129000;93-94 |
| crack | 53000 | 129000 | 57000 | 124000;94-95 |
| crack | 43000 | 147000 | 44000 | 142000;90-96 |
| crack | 44000 | 142000 | 53000 | 131000;96-97 |
| crack | 53000 | 131000 | 57000 | 124000;97-95 |
| crack | 57000 | 124000 | 55000 | 120000;95-98 |
| crack | 55000 | 120000 | 55000 | 112000;98-99 |
| crack | 55000 | 112000 | 52000 | 89000;99-100 |
| crack | 52000 | 89000 | 45000 | 84000;100-101 |
| crack | 45000 | 84000 | 44000 | 81000;101-102 |
| crack | 44000 | 81000 | 43000 | 75000;102-103 |
| crack | 43000 | 75000 | 39000 | 66000;103-104 |
| crack | 39000 | 66000 | 39000 | 60000;104-105 |
| crack | 39000 | 60000 | 38000 | 58000;105-106 |
| crack | 38000 | 58000 | 38000 | 54000;106-107 |

| | | | | |
|---|---|---|---|---|
| crack | 38000 | 54000 | 38000 | 48000;107-108 |
| crack | 38000 | 48000 | 38000 | 46000;108-191 |
| crack | 52000 | 89000 | 46000 | 62000;100-109 |
| crack | 46000 | 62000 | 43000 | 56000;109-110 |
| crack | 43000 | 56000 | 47000 | 59000;110-111 |
| crack | 47000 | 59000 | 48000 | 58000;111-112 |
| crack | 48000 | 58000 | 47000 | 53000;112-113 |
| crack | 47000 | 53000 | 48000 | 50000;113-114 |
| crack | 48000 | 50000 | 47000 | 38000;114-118 |
| crack | 47000 | 38000 | 48000 | 36000;118-119 |
| crack | 48000 | 36000 | 47000 | 31000;119-120 |
| crack | 43000 | 56000 | 42000 | 54000;110-115 |
| crack | 42000 | 54000 | 45000 | 43000;115-116 |
| crack | 45000 | 43000 | 45000 | 36000;116-117 |
| crack | 45000 | 36000 | 47000 | 31000;117-120 |
| crack | 48000 | 50000 | 49000 | 47000;114-121 |
| crack | 49000 | 47000 | 51000 | 47000;121-122 |
| crack | 51000 | 47000 | 53000 | 54000;122-123 |
| crack | 53000 | 54000 | 54000 | 57000;123-124 |
| crack | 54000 | 57000 | 57000 | 55000;124-125 |
| crack | 57000 | 55000 | 57500 | 54000;125-126 |
| crack | 57500 | 54000 | 59000 | 48000;126-127 |
| crack | 59000 | 48000 | 59000 | 41000;127-128 |
| crack | 59000 | 41000 | 58000 | 35000;128-129 |
| crack | 58000 | 35000 | 55000 | 31000;129-130 |
| crack | 55000 | 31000 | 54000 | 27000;130-131 |
| crack | 54000 | 27000 | 51000 | 24000;131-132 |
| crack | 51000 | 24000 | 48000 | 14000;132-133 |
| crack | 49000 | 47000 | 50000 | 42000;121-134 |
| crack | 50000 | 42000 | 49000 | 40000;134-135;gr11 bound centr:53000,55000,45000,47000 |
| crack | 49000 | 40000 | 51000 | 38000;135-136;gr11 bound |
| crack | 51000 | 38000 | 55000 | 38000;136-137;gr11 bound |
| crack | 55000 | 38000 | 58000 | 46000;137-138;gr11 bound |
| crack | 58000 | 46000 | 58000 | 48000;138-139;gr11 bound |
| crack | 58000 | 48000 | 57000 | 48500;139-140;gr11 bound |
| crack | 57000 | 48500 | 57500 | 49000;140-141;gr11 bound |
| crack | 57500 | 49000 | 57000 | 53000;141-142;gr11 bound |
| crack | 57000 | 53000 | 56000 | 54000;142-143;gr11 bound |
| crack | 56000 | 54000 | 54000 | 54000;143-144;gr11 bound |
| crack | 54000 | 54000 | 54000 | 51000;144-145;gr11 bound |
| crack | 54000 | 51000 | 53000 | 50000;145-146;gr11 bound |
| crack | 53000 | 50000 | 51000 | 43000;146-147;gr11 bound |
| crack | 51000 | 43000 | 50000 | 42000;147-134;gr11 bound |
| crack | 56000 | 54000 | 57000 | 54000;143-126 |
| crack | 47000 | 31000 | 45000 | 18000;120-148 |
| crack | 45000 | 18000 | 43000 | 14000;148-149 |
| crack | 43000 | 14000 | 43000 | 7000;149-150 |
| crack | 43000 | 7000 | 43500 | 4500;150-151 |
| crack | 43500 | 4500 | 43500 | 0;151-152 |
| crack | 48000 | 14000 | 47000 | 14500;133-153 |
| crack | 47000 | 14500 | 45000 | 9000;153-154 |
| crack | 45000 | 9000 | 45000 | 0;154-155 |
| crack | 48000 | 14000 | 49000 | 13000;133-160 |
| crack | 49000 | 13000 | 50000 | 15000;160-161 |
| crack | 49000 | 13000 | 51000 | 11000;160-159 |
| crack | 51000 | 11000 | 47000 | 7000;159-158 |
| crack | 47000 | 7000 | 46500 | 5000;158-157 |
| crack | 46500 | 5000 | 46000 | 0;157-156 |
| crack | 50000 | 15000 | 53000 | 18000;161-162 |
| crack | 53000 | 18000 | 53000 | 13000;162-163 |
| crack | 53000 | 13000 | 55000 | 10000;163-164 |
| crack | 55000 | 10000 | 56000 | 4000;164-165 |
| crack | 56000 | 4000 | 56000 | 0;165-166 |
| crack | 56000 | 4000 | 60000 | 14000;165-167 |
| crack | 60000 | 14000 | 62000 | 17000;167-168 |
| crack | 62000 | 17000 | 69000 | 23000;168-169 |
| crack | 69000 | 23000 | 67000 | 19000;169-170 |
| crack | 67000 | 19000 | 63000 | 14000;170-171 |
| crack | 63000 | 14000 | 61000 | 11000;171-172 |
| crack | 61000 | 11000 | 59000 | 6000;172-173 |
| crack | 59000 | 6000 | 59000 | 0;173-174 |
| crack | 71500 | 0 | 72000 | 4000;175-176 |
| crack | 72000 | 4000 | 78000 | 12000;176-177 |
| crack | 78000 | 12000 | 79000 | 15000;177-178 |
| crack | 79000 | 15000 | 84000 | 21000;178-179 |

| | | | | |
|---|---|---|---|---|
| crack | 84000 | 21000 | 86000 | 21000;179-180 |
| crack | 86000 | 21000 | 84000 | 18000;180-181 |
| crack | 84000 | 18000 | 79000 | 11000;181-182 |
| crack | 79000 | 11000 | 77000 | 6000;182-183 |
| crack | 77000 | 6000 | 76000 | 0;183-184 |
| crack | 38000 | 48000 | 40000 | 45000;108-185 |
| crack | 40000 | 45000 | 41000 | 39000;185-186 |
| crack | 41000 | 39000 | 42000 | 30500;186-187 |
| crack | 42000 | 30500 | 40000 | 31000;187-188 |
| crack | 40000 | 31000 | 39500 | 34000;188-189 |
| crack | 39500 | 34000 | 38000 | 42000;189-190 |
| crack | 38000 | 42000 | 38000 | 46000;190-191 |
| crack | 38000 | 46000 | 36000 | 54000;191-192 |
| crack | 36000 | 54000 | 35500 | 55500;192-193 |
| crack | 35500 | 55500 | 36000 | 59000;193-194 |
| crack | 36000 | 59000 | 34000 | 56000;194-195 |
| crack | 34000 | 56000 | 34000 | 53000;195-196 |
| crack | 34000 | 53000 | 34000 | 52000;196-197 |
| crack | 34000 | 52000 | 34000 | 50000;197-198 |
| crack | 34000 | 50000 | 35000 | 48000;198-199 |
| crack | 35000 | 48000 | 36000 | 36000;199-200 |
| crack | 36000 | 36000 | 37500 | 34000;200-201 |
| crack | 36000 | 36000 | 39500 | 34000;200-201 |
| crack | 37500 | 34000 | 37000 | 33000;201-202 |
| crack | 37000 | 33000 | 34000 | 36000;202-203 |
| crack | 34000 | 36000 | 34000 | 41000;203-204 |
| crack | 34000 | 41000 | 32000 | 44000;204-205 |
| crack | 32000 | 44000 | 32000 | 46000;205-206 |
| crack | 32000 | 46000 | 31000 | 49000;206-207 |
| crack | 31000 | 49000 | 31000 | 54000;207-208 |
| crack | 31000 | 54000 | 31000 | 55000;208-209 |
| crack | 31000 | 55000 | 34000 | 53000;209-196 |
| crack | 31000 | 54000 | 34000 | 52000;208-197 |
| crack | 40000 | 31000 | 39000 | 31000;188-210 |
| crack | 39000 | 31000 | 36000 | 31000;210-211 |
| crack | 37000 | 33000 | 36000 | 31000;202-211 |
| crack | 36000 | 31000 | 32000 | 35000;211-212 |
| crack | 32000 | 35000 | 32000 | 33000;212-213 |
| crack | 32000 | 33000 | 35000 | 31000;213-214 |
| crack | 35000 | 31000 | 38000 | 30000;214-219 |
| crack | 39000 | 31000 | 38000 | 30000;210-219 |
| crack | 35000 | 31000 | 35000 | 28000;214-215 |
| crack | 38000 | 30000 | 37000 | 26000;219-218 |
| crack | 37000 | 26000 | 39000 | 23000;218-217 |
| crack | 39000 | 23000 | 36500 | 24000;217-216 |
| crack | 36500 | 24000 | 35000 | 28000;216-215 |
| crack | 36500 | 24000 | 36500 | 18000;216-220 |
| crack | 36500 | 18000 | 39000 | 14000;220-221 |
| crack | 39000 | 14000 | 40000 | 9000;221-222 |
| crack | 40000 | 9000 | 40000 | 0;222-223 |
| crack | 63000 | 177000 | 65000 | 170000;52-224 |
| crack | 65000 | 170000 | 72000 | 175000;224-225 |
| crack | 72000 | 175000 | 74000 | 175000;225-226 |
| crack | 74000 | 175000 | 76000 | 172000;226-227 |
| crack | 76000 | 172000 | 79000 | 165000;227-228 |
| crack | 76000 | 172000 | 78000 | 173000;227-235 |
| crack | 79000 | 165000 | 83000 | 164000;228-229 |
| crack | 83000 | 164000 | 84000 | 166000;229-230 |
| crack | 84000 | 166000 | 82000 | 170000;230-231 |
| crack | 82000 | 170000 | 85000 | 170000;231-232 |
| crack | 85000 | 170000 | 83000 | 172000;232-233 |
| crack | 83000 | 172000 | 80000 | 171000;233-234 |
| crack | 80000 | 171000 | 78000 | 173000;234-235 |
| crack | 78000 | 173000 | 80000 | 174000;235-236 |
| crack | 80000 | 174000 | 78000 | 176000;236-237 |
| crack | 78000 | 176000 | 80000 | 179000;237-238 |
| crack | 80000 | 179000 | 85000 | 185000;238-239 |
| crack | 85000 | 185000 | 90000 | 188000;239-240 |
| crack | 90000 | 188000 | 99000 | 190000;240-241 |
| crack | 99000 | 190000 | 96000 | 190000;241-242 |
| crack | 96000 | 190000 | 86000 | 194000;242-243 |
| crack | 86000 | 194000 | 85500 | 197000;243-244 |
| crack | 85500 | 197000 | 84000 | 200000;244-245 |
| crack | 86000 | 194000 | 75000 | 196000;243-246 |
| crack | 75000 | 196000 | 71000 | 200000;246-247 |

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|---|---|---|---|---|
| crack | 99000 | 190000 | 102000 | 194000;241-248 |
| crack | 102000 | 194000 | 104000 | 195000;248-249 |
| crack | 104000 | 195000 | 105000 | 196000;249-250 |
| crack | 105000 | 196000 | 105000 | 198000;250-251 |
| crack | 105000 | 198000 | 106000 | 200000;251-252 |
| crack | 104000 | 195000 | 99000 | 182000;249-253 |
| crack | 99000 | 182000 | 97000 | 180000;253-254 |
| crack | 97000 | 180000 | 91000 | 179000;254-255 |
| crack | 91000 | 179000 | 87000 | 175000;255-256 |
| crack | 87000 | 175000 | 84000 | 174000;256-257 |
| crack | 84000 | 174000 | 82000 | 174000;257-258 |
| crack | 82000 | 174000 | 80000 | 176000;258-259 |
| crack | 80000 | 176000 | 80000 | 179000;259-238 |
| crack | 82000 | 174000 | 80000 | 174000;258-236 |
| crack | 65000 | 170000 | 68000 | 158000;224-260 |
| crack | 68000 | 158000 | 82000 | 133000;260-261 |
| crack | 82000 | 133000 | 82000 | 131000;261-262 gr2 bound centr: 83000,85000,126000,129000 |
| crack | 82000 | 131000 | 83000 | 130000;262-263 gr2 bound |
| crack | 83000 | 130000 | 81000 | 130000;263-264 gr2 bound |
| crack | 81000 | 130000 | 79000 | 129000;264-265 gr2 bound |
| crack | 79000 | 129000 | 78000 | 127500;265-266 gr2 bound |
| crack | 78000 | 127500 | 79000 | 126000;266-267 gr2 bound |
| crack | 79000 | 126000 | 80000 | 125000;267-268 gr2 bound |
| crack | 80000 | 125000 | 82000 | 123000;268-269 gr2 bound |
| crack | 82000 | 123000 | 83000 | 122500;269-270 gr2 bound |
| crack | 83000 | 122500 | 84000 | 123000;270-271 gr2 bound |
| crack | 84000 | 123000 | 83000 | 124000;271-272 gr2 bound |
| crack | 83000 | 124000 | 83000 | 125000;272-273 gr2 bound |
| crack | 83000 | 125000 | 84000 | 125000;273-274 gr2 bound |
| crack | 84000 | 125000 | 84000 | 127000;274-275 gr2 bound |
| crack | 84000 | 127000 | 85000 | 127000;275-276 gr2 bound |
| crack | 85000 | 127000 | 87500 | 126500;276-277 gr2 bound |
| crack | 87500 | 126500 | 88000 | 129000;277-278 gr2 bound |
| crack | 88000 | 129000 | 89000 | 129500;278-279 gr2 bound |
| crack | 89000 | 129500 | 89500 | 131000;279-280 gr2 bound |
| crack | 89500 | 131000 | 89000 | 132000;280-281 gr2 bound |
| crack | 89000 | 132000 | 88000 | 132500;281-282 gr2 bound |
| crack | 88000 | 132500 | 85000 | 132500;282-283 gr2 bound |
| crack | 85000 | 132500 | 84000 | 133000;283-284 gr2 bound |
| crack | 84000 | 133000 | 82000 | 133000;284-261 gr2 bound |
| crack | 84000 | 125000 | 86500 | 115000;274-285 |
| crack | 86500 | 115000 | 85000 | 118000;285-286 gr7 bound centr: 85500,87500,100500,102500 |
| crack | 85000 | 118000 | 84000 | 119000;286-287 gr7 bound |
| crack | 84000 | 119000 | 82500 | 119000;287-288 gr7 bound |
| crack | 82500 | 119000 | 81000 | 118500;288-289 gr7 bound |
| crack | 81000 | 118500 | 80000 | 118500;289-290 gr7 bound |
| crack | 80000 | 118500 | 79000 | 116000;290-291 gr7 bound |
| crack | 79000 | 116000 | 81000 | 116000;291-292 gr7 bound |
| crack | 81000 | 116000 | 79000 | 114000;292-293 gr7 bound |
| crack | 79000 | 114000 | 79500 | 113000;293-294 gr7 bound |
| crack | 79500 | 113000 | 81000 | 113500;294-295 gr7 bound |
| crack | 81000 | 113500 | 81000 | 113000;295-296 gr7 bound |
| crack | 81000 | 113000 | 78000 | 110000;296-297 gr7 bound |
| crack | 78000 | 110000 | 77500 | 108000;297-298 gr7 bound |
| crack | 77500 | 108000 | 77500 | 107000;298-299 gr7 bound |
| crack | 77500 | 107000 | 81500 | 100000;299-300 gr7 bound |
| crack | 81500 | 100000 | 84000 | 100000;300-301 gr7 bound |
| crack | 84000 | 100000 | 86000 | 99000;301-302 gr7 bound |
| crack | 86000 | 99000 | 87000 | 96500;302-303 gr7 bound |
| crack | 87000 | 96500 | 86000 | 96000;303-304 gr7 bound |
| crack | 86000 | 96000 | 85000 | 94000;304-305 gr7 bound |
| crack | 85000 | 94000 | 85000 | 92000;305-306 gr7 bound |
| crack | 85000 | 92000 | 85500 | 91000;306-307 gr7 bound |
| crack | 85500 | 91000 | 85000 | 89000;307-308 gr7 bound |
| crack | 85000 | 89000 | 88000 | 86000;308-309 gr7 bound |
| crack | 88000 | 86000 | 90000 | 85000;309-310 gr7 bound |
| crack | 90000 | 85000 | 92000 | 85500;310-311 gr7 bound |
| crack | 92000 | 85500 | 93000 | 87000;311-312 gr7 bound |
| crack | 93000 | 87000 | 94000 | 87000;312-313 gr7 bound |
| crack | 94000 | 87000 | 95500 | 86500;313-314 gr7 bound |
| crack | 95500 | 86500 | 97000 | 87000;314-315 gr7 bound |
| crack | 97000 | 87000 | 96000 | 89500;315-316 gr7 bound |
| crack | 96000 | 89500 | 93000 | 91000;316-317 gr7 bound |
| crack | 93000 | 91000 | 93000 | 93000;317-318 gr7 bound |
| crack | 93000 | 93000 | 92500 | 93000;318-319 gr7 bound |

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|---|---|---|---|---|
| crack | 92500 | 93000 | 91500 | 97000;319-320 gr7 bound |
| crack | 91500 | 97000 | 89000 | 97000;320-321 gr7 bound |
| crack | 89000 | 97000 | 89000 | 98000;321-322 gr7 bound |
| crack | 89000 | 98000 | 88000 | 102000;322-323 gr7 bound |
| crack | 88000 | 102000 | 86000 | 104000;323-324 gr7 bound |
| crack | 86000 | 104000 | 87000 | 104000;324-325 gr7 bound |
| crack | 87000 | 104000 | 87000 | 105000;325-326 gr7 bound |
| crack | 87000 | 105000 | 86000 | 106000;326-327 gr7 bound |
| crack | 86000 | 106000 | 85000 | 106000;327-328 gr7 bound |
| crack | 85000 | 106000 | 87000 | 108000;328-329 gr7 bound |
| crack | 87000 | 108000 | 87000 | 109500;329-330 gr7 bound |
| crack | 87000 | 109500 | 86000 | 110000;330-331 gr7 bound |
| crack | 86000 | 110000 | 86500 | 115000;331-285 gr7 bound |
| crack | 87500 | 126500 | 86000 | 125000;277-341 |
| crack | 86000 | 125000 | 86000 | 123000;341-342 gr3 bound centr: 89000,91000,117000,119000 |
| crack | 86000 | 123000 | 87000 | 121000;342-343 gr3 bound |
| crack | 87000 | 121000 | 87500 | 122000;343-344 gr3 bound |
| crack | 87500 | 122000 | 87000 | 122000;344-345 gr3 bound |
| crack | 87000 | 122000 | 87000 | 125000;345-346 gr3 bound |
| crack | 87000 | 125000 | 88000 | 125000;346-347 gr3 bound |
| crack | 88000 | 125000 | 88000 | 123000;347-348 gr3 bound |
| crack | 88000 | 123000 | 89000 | 121500;348-349 gr3 bound |
| crack | 89000 | 121500 | 89000 | 115000;349-350 gr3 bound |
| crack | 89000 | 115000 | 90000 | 112000;350-351 gr3 bound |
| crack | 90000 | 112000 | 89000 | 109000;351-352 gr3 bound |
| crack | 89000 | 109000 | 90000 | 108000;352-353 gr3 bound |
| crack | 90000 | 108000 | 91000 | 109000;353-354 gr3 bound |
| crack | 91000 | 109000 | 91500 | 109000;354-355 gr3 bound |
| crack | 91500 | 109000 | 92000 | 108000;355-356 gr3 bound |
| crack | 92000 | 108000 | 92500 | 107500;356-357 gr3 bound |
| crack | 92500 | 107500 | 94000 | 108000;357-358 gr3 bound |
| crack | 94000 | 108000 | 92000 | 109000;358-359 gr3 bound |
| crack | 92000 | 109000 | 92000 | 110000;359-360 gr3 bound |
| crack | 92000 | 110000 | 92000 | 110500;360-361 gr3 bound |
| crack | 92000 | 110500 | 94000 | 110500;361-362 gr3 bound |
| crack | 94000 | 110500 | 94500 | 111000;362-363 gr3 bound |
| crack | 94500 | 111000 | 94000 | 114000;363-364 gr3 bound |
| crack | 94000 | 114000 | 93000 | 116000;364-365 gr3 bound |
| crack | 93000 | 116000 | 92000 | 116500;365-366 gr3 bound |
| crack | 92000 | 116500 | 92000 | 118000;366-367 gr3 bound |
| crack | 92000 | 118000 | 93000 | 118500;367-368 gr3 bound |
| crack | 93000 | 118500 | 93000 | 120000;368-369 gr3 bound |
| crack | 93000 | 120000 | 92000 | 124000;369-370 gr3 bound |
| crack | 92000 | 124000 | 93000 | 124000;370-371 gr3 bound |
| crack | 93000 | 124000 | 93500 | 125000;371-372 gr3 bound |
| crack | 93500 | 125000 | 90500 | 128500;372-373 gr3 bound |
| crack | 90500 | 128500 | 88000 | 126000;373-374 gr3 bound |
| crack | 88000 | 126000 | 86000 | 125000;374-341 gr3 bound |
| crack | 93500 | 125000 | 94000 | 124500;372-375 |
| crack | 94000 | 124500 | 94000 | 129000;375-376 gr4 bound centr: 97000,99000,124000,126000 |
| crack | 94000 | 129000 | 96000 | 130000;376-377 gr4 bound |
| crack | 96000 | 130000 | 97000 | 130000;377-378 gr4 bound |
| crack | 97000 | 130000 | 97000 | 131000;378-379 gr4 bound |
| crack | 97000 | 131000 | 98000 | 131500;379-380 gr4 bound |
| crack | 98000 | 131500 | 101500 | 131500;380-381 gr4 bound |
| crack | 101500 | 131500 | 103000 | 129000;381-382 gr4 bound |
| crack | 103000 | 129000 | 103000 | 127000;382-383 gr4 bound |
| crack | 103000 | 127000 | 102000 | 126000;383-384 gr4 bound |
| crack | 102000 | 126000 | 102000 | 124500;384-385 gr4 bound |
| crack | 102000 | 124500 | 101000 | 124000;385-386 gr4 bound |
| crack | 101000 | 124000 | 101000 | 123000;386-387 gr4 bound |
| crack | 101000 | 123000 | 102000 | 123000;387-388 gr4 bound |
| crack | 102000 | 123000 | 102000 | 121500;388-389 gr4 bound |
| crack | 102000 | 121500 | 101000 | 120000;389-390 gr4 bound |
| crack | 101000 | 120000 | 98000 | 119000;390-391 gr4 bound |
| crack | 98000 | 119000 | 94000 | 121000;391-392 gr4 bound |
| crack | 94000 | 121000 | 94000 | 124500;392-375 gr4 bound |
| crack | 94000 | 121000 | 94000 | 120000;392-393 |
| crack | 94000 | 120000 | 93500 | 118000;393-394 gr5 bound centr:94000,96000,117000,119000 |
| crack | 93500 | 118000 | 94000 | 116500;394-395 gr5 bound |
| crack | 94000 | 116500 | 95000 | 115000;395-396 gr5 bound |
| crack | 95000 | 115000 | 96500 | 116500;396-397 gr5 bound |
| crack | 96500 | 116500 | 97000 | 116500;397-398 gr5 bound |
| crack | 97000 | 116500 | 97000 | 118000;398-399 gr5 bound |
| crack | 97000 | 118000 | 94000 | 120000;399-393 gr5 bound |

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|---|---|---|---|---|
| crack | 94500 | 111000 | 95500 | 111000;363-400 |
| crack | 95500 | 111000 | 96000 | 112500;400-401 gr6 bound centr:96000,98000,108000,110000 |
| crack | 96000 | 112500 | 97000 | 113000;401-402 gr6 bound |
| crack | 97000 | 113000 | 98500 | 112000;402-403 gr6 bound |
| crack | 98500 | 112000 | 99500 | 110000;403-404 gr6 bound |
| crack | 99500 | 110000 | 99500 | 107500;404-405 gr6 bound |
| crack | 99500 | 107500 | 99000 | 106000;405-406 gr6 bound |
| crack | 99000 | 106000 | 98000 | 106000;406-407 gr6 bound |
| crack | 98000 | 106000 | 97000 | 105500;407-408 gr6 bound |
| crack | 97000 | 105500 | 95000 | 108000;408-409 gr6 bound |
| crack | 95000 | 108000 | 95000 | 110000;409-410 gr6 bound |
| crack | 95000 | 110000 | 95500 | 111000;410-400 gr6 bound |
| crack | 86500 | 115000 | 91000 | 101000;285-332 |
| crack | 91000 | 101000 | 90500 | 99000;332-333 |
| crack | 90500 | 99000 | 91500 | 97000;333-320 |
| crack | 91000 | 101000 | 92500 | 98000;332-334 |
| crack | 92500 | 98000 | 97000 | 98000;334-335 |
| crack | 97000 | 98000 | 97000 | 97000;335-336 gr8 bound centr:98000,100000,97000,99000 |
| crack | 97000 | 97000 | 98000 | 96000;336-337 gr8 bound |
| crack | 98000 | 96000 | 99500 | 96000;337-338 gr8 bound |
| crack | 99500 | 96000 | 101000 | 98000;338-339 gr8 bound |
| crack | 101000 | 98000 | 99500 | 99500;339-340 gr8 bound |
| crack | 99500 | 99500 | 97000 | 98000;340-335 gr8 bound |
| crack | 92500 | 98000 | 96000 | 91500;334-411 |
| crack | 96000 | 91500 | 98500 | 86000;411-412 |
| crack | 98500 | 86000 | 100000 | 76000;412-415 |
| crack | 88000 | 86000 | 92000 | 82500;309-413 |
| crack | 92000 | 85500 | 92000 | 82500;311-413 |
| crack | 92000 | 82500 | 98000 | 76500;413-414 |
| crack | 98000 | 76500 | 100000 | 76000;414-415 |
| crack | 92000 | 82500 | 94500 | 76000;413-427 |
| crack | 94500 | 76000 | 95500 | 64000;427-428 |
| crack | 95500 | 64000 | 96000 | 57000;428-429 |
| crack | 96000 | 57000 | 97000 | 48000;429-430 |
| crack | 97000 | 48000 | 98000 | 41000;430-431 |
| crack | 98000 | 41000 | 100500 | 33000;431-432 |
| crack | 100500 | 33000 | 103000 | 29500;432-433 |
| crack | 103000 | 29500 | 109500 | 22000;433-422 |
| crack | 100000 | 76000 | 101500 | 73000;415-416 |
| crack | 101500 | 73000 | 103000 | 69500;416-417 |
| crack | 103000 | 69500 | 107000 | 52000;417-418 |
| crack | 107000 | 52000 | 108500 | 46000;418-419 |
| crack | 108500 | 46000 | 110000 | 35000;419-420 |
| crack | 110000 | 35000 | 109500 | 29000;420-421 |
| crack | 109500 | 29000 | 109500 | 22000;421-422 |
| crack | 109500 | 22000 | 109000 | 21000;422-423 |
| crack | 109000 | 21000 | 108500 | 15000;423-424 |
| crack | 108500 | 15000 | 110500 | 8500;424-425 |
| crack | 110500 | 8500 | 112500 | 0;425-426 |
| crack | 109500 | 22000 | 114000 | 17000;422-445 |
| crack | 114000 | 17000 | 117000 | 14500;445-446 |
| crack | 117000 | 14500 | 122500 | 6000;446-447 |
| crack | 122500 | 6000 | 122500 | 4500;447-448 |
| crack | 122500 | 4500 | 124000 | 3000;448-449 |
| crack | 101500 | 73000 | 107000 | 68000;416-434 |
| crack | 107000 | 68000 | 111500 | 59000;434-435 |
| crack | 111500 | 59000 | 112000 | 49000;435-436 |
| crack | 112000 | 49000 | 113000 | 41000;436-437 |
| crack | 113000 | 41000 | 117000 | 29000;437-438 |
| crack | 117000 | 29000 | 115000 | 28500;438-439 |
| crack | 115000 | 28500 | 115000 | 27000;439-440 |
| crack | 115000 | 27000 | 114000 | 26000;440-441 |
| crack | 109500 | 29000 | 114000 | 26000;421-441 |
| crack | 114000 | 26000 | 118500 | 23000;441-442 |
| crack | 118500 | 23000 | 120000 | 21000;442-443 |
| crack | 120000 | 21000 | 124000 | 19000;443-444 |
| crack | 117000 | 29000 | 123000 | 32000;438-450 |
| crack | 123000 | 32000 | 124000 | 31000;450-451 |
| crack | 124000 | 165000 | 123000 | 163000;452-453 |
| crack | 123000 | 163000 | 117000 | 160000;453-454 |
| crack | 117000 | 160000 | 117000 | 153000;454-455 |
| crack | 117000 | 153000 | 117500 | 145000;455-456 |
| crack | 117500 | 145000 | 115500 | 138000;456-457 |
| crack | 115500 | 138000 | 113000 | 135000;457-458 |
| crack | 113000 | 135000 | 113500 | 130000;458-459 |

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|---|---|---|---|---|
| crack | 113500 | 130000 | 112500 | 125000;459-460 |
| crack | 112500 | 125000 | 112000 | 120000;460-461 |
| crack | 112000 | 120000 | 110000 | 114500;461-462 |
| crack | 110000 | 114500 | 106500 | 110000;462-463 |
| crack | 106500 | 110000 | 104000 | 105000;463-464 |
| crack | 104000 | 105000 | 104500 | 102000;464-465 |
| crack | 104500 | 102000 | 105500 | 100000;465-466 |
| crack | 105500 | 100000 | 106000 | 95000;466-467 |
| crack | 106000 | 95000 | 109500 | 84000;467-468 |
| crack | 109500 | 84000 | 111500 | 82000;468-469 |
| crack | 111500 | 82000 | 112000 | 80000;469-470 gr9 bound centr:112000,114000,80000,82000 |
| crack | 112000 | 80000 | 113000 | 78000;470-471 gr9 bound |
| crack | 113000 | 78000 | 114500 | 76500;471-472 gr9 bound |
| crack | 114500 | 76500 | 115000 | 77000;472-473 gr9 bound |
| crack | 115000 | 77000 | 115000 | 82000;473-474 gr9 bound |
| crack | 115000 | 82000 | 114000 | 84000;474-475 gr9 bound |
| crack | 114000 | 84000 | 113000 | 85000;475-476 gr9 bound |
| crack | 113000 | 85000 | 112000 | 85000;476-477 gr9 bound |
| crack | 112000 | 85000 | 111000 | 84000;477-478 gr9 bound |
| crack | 111000 | 84000 | 111500 | 82000;478-469 gr9 bound |
| crack | 114500 | 76500 | 115500 | 75000;472-479 |
| crack | 115500 | 75000 | 117000 | 70000;479-480 |
| crack | 117000 | 70000 | 120500 | 61000;480-481 |
| crack | 120500 | 61000 | 121000 | 59000;481-482 |
| crack | 121000 | 59000 | 120000 | 54500;482-483 |
| crack | 120000 | 54500 | 123000 | 45000;483-484 |
| crack | 123000 | 45000 | 122500 | 41000;484-485 |
| crack | 122500 | 41000 | 124000 | 39000;485-486 |
| crack | 123000 | 163000 | 122000 | 159000;453-487 |
| crack | 122000 | 159000 | 120000 | 147000;487-488 |
| crack | 120000 | 147000 | 119500 | 142000;488-489 |
| crack | 119500 | 142000 | 121000 | 137000;489-490 |
| crack | 121000 | 137000 | 121500 | 129000;490-491 |
| crack | 121500 | 129000 | 122000 | 122000;491-492 |
| crack | 122000 | 122000 | 121000 | 117000;492-493 |
| crack | 121000 | 117000 | 119500 | 115000;493-494 |
| crack | 119500 | 115000 | 115000 | 107000;494-495 |
| crack | 115000 | 107000 | 118500 | 105500;495-496 |
| crack | 118500 | 105500 | 117000 | 104000;496-497 |
| crack | 117000 | 104000 | 115000 | 100500;497-498 |
| crack | 115000 | 100500 | 115000 | 96000;498-499 |
| crack | 115000 | 96000 | 116000 | 92500;499-500 |
| crack | 116000 | 92500 | 119000 | 89000;500-501 |
| crack | 119000 | 89000 | 121500 | 87500;501-515 |
| crack | 118500 | 105500 | 117000 | 102000;496-509 |
| crack | 117000 | 102000 | 117000 | 99000;509-510 |
| crack | 117000 | 99000 | 119000 | 94500;510-511 |
| crack | 119000 | 94500 | 121500 | 94500;511-512 |
| crack | 121500 | 94500 | 123000 | 92500;512-513 |
| crack | 123000 | 92500 | 122000 | 91000;513-514 |
| crack | 122000 | 91000 | 121500 | 87500;514-515 |
| crack | 121500 | 87500 | 121000 | 84500;515-516 |
| crack | 118500 | 105500 | 119500 | 104000;496-502 |
| crack | 119500 | 104000 | 119500 | 101000;502-503 |
| crack | 119500 | 101000 | 122000 | 98000;503-504 |
| crack | 122000 | 98000 | 124000 | 98000;504-505 |
| crack | 119500 | 101000 | 120000 | 97500;503-506 |
| crack | 120000 | 97500 | 123000 | 94500;506-507 |
| crack | 123000 | 94500 | 124000 | 94500;507-508 |
| crack | 113500 | 130000 | 114000 | 125000;459-520 |
| crack | 114000 | 125000 | 113000 | 114000;520-521 |
| crack | 113000 | 114000 | 112500 | 111000;521-522 |
| crack | 112500 | 111000 | 113500 | 108000;522-523 |
| crack | 113500 | 108000 | 113000 | 89500;523-524 |
| crack | 105500 | 100000 | 113000 | 89500;466-524 |
| crack | 113000 | 89500 | 120500 | 80000;524-525 |
| crack | 120500 | 80000 | 120500 | 77000;525-526 |
| crack | 120500 | 77000 | 118500 | 74000;526-527 |
| crack | 118500 | 74000 | 118000 | 71000;527-528 |
| crack | 118000 | 71000 | 120500 | 65000;528-532 |
| crack | 120500 | 65000 | 120500 | 61000;532-481 |
| crack | 121000 | 84500 | 120500 | 80000;516-525 |
| crack | 121000 | 84500 | 123000 | 82000;516-517 |
| crack | 123000 | 82000 | 124000 | 81000;517-518 |
| crack | 123000 | 82000 | 124000 | 86500;517-519 |

```
crack     124000    86500     122500     80000;517-529
crack     122500    80000     122500     76000;529-530
crack     122500    76000     120000     72000;530-531
crack     120000    72000     120500     65000;531-532
crack     124000    70000     123500     68500;533-534 gr10 bound centr: 122000,124000,66000,67000
crack     123500    68500     122500     67500;534-535 gr10 bound
crack     122500    67500     122500     65500;535-536 gr10 bound
crack     122500    65500     123000     64000;536-537 gr10 bound
crack     123000    64000     124000     63000;537-538 gr10 bound
crack     52000     176000    57000     169500;53-539
crack     57000     169500    56000     168000;539-540
crack     56000     168000    53000     168500;540-541
crack     53000     168500    49000     171000;541-542
crack     49000     171000    43500     171500;542-543
crack     43500     171500    44000     170000;543-544
crack     44000     170000    52000     168000;544-545
crack     52000     168000    49000     162000;545-546
crack     49000     162000    48000     161000;546-547
crack     48000     161000    47000     157000;547-548
crack     47000     157000    43000     150000;548-69
;*****(Geometry File End)*****


;Psuedo contacts to reduce block size and allow zoning
crack     0         66000     39000      66000;Pj1(left block)
crack     47000     71000     96000      71000;Pj2(mid block)
crack     80000     135000    114000    135000;Pj3(rmid block)
;crack    90000     102000    106000    102000;Pj4(rmid block)
crack     104000    70000     108000     70000;Pj5(rmid block)
;crack    90000     102000    106000    102000;Pj6(rmid block)
crack     88000     110000    90000     110000;Pj7(rmid block)
crack     103000    127000    113000    127000;Pj8(rmid block)
crack     99000     107000    106000    107000;Pj9(rmid block)
crack     101000    98000     106000    98000;Pj10(rmid block)
crack     55000     38000     59000     38000;Pj11(rmid block)
crack     93000     115000    95000     115000;Pj12(rmid block)


hist unbal ; hist1
hist sxx 62000 100000;hist2 (red 2)
hist syy 62000 100000;hist3 (red 2)

hist sst 60000 41000;hist4 (yel 4)Shear Stress selwyn high strain zone
hist sst 43000 40000;hist5 (yel 5)Shear Stress left of gin ck gr
hist sst 61000 172000;hist7 (yel 6)Shear Stress cloncurry

sav m1a_block.sav

gen 0 124000 0 200000 auto 1000

insitu stress -210e6 0 -140e6 szz -175e6
bound stress -210e6 0 -140e6

damp auto

;changing whole model to mat=1 (schist)
change 0 200000 0 124000 mat=1 cons=3

;changing all joints to jmat=1
change 0 200000 0 124000 jmat=1 jcon=2

;changing granite blocks to mat=2 (granite) constit model 3
change 57000,60000,175000,180000 mat=2 con=3 change 83000,85000,126000,129000 mat=2 con=3 ;gr2
change 89000,91000,117000,119000 mat=2 con=3 ;gr3
change 97000,99000,124000,126000 mat=2 con=3 ;gr4
change 94000,96000,117000,119000 mat=2 con=3 ;gr5
change 96000,98000,108000,110000 mat=2 con=3 ;gr6
change 85500,87500,100500,102500 mat=2 con=3 ;gr7
change 98000,100000,97000,99000 mat=2 con=3 ;gr8
change 112000,114000,80000,82000 mat=2 con=3 ;gr9
change 122000,124000,66000,67000 mat=2 con=3 ;gr10
change 53000,55000,45000,47000 mat=2 con=3 ;gr11

change jmat=2 range minterface 1 2
```

```
;changing pseudo joint properties to jmat=5
change jmat=5 range xr 0,39000 yr 65900 66100 ang -5,5;Pj1 properties
;pl hold mat jo
change jmat=5 range xr 47000,96000 yr 70900 71100 ang -5,5;Pj2 properties
;pl hold mat jo
change jmat=5 range xr 80000,114000 yr 134900 135100 ang -5,5; Pj3 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj4 properties
change jmat=5 range xr 104000,108000 yr 69900 70100 ang -5,5; Pj5 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj6 properties
change jmat=5 range xr 88000,90000 yr 109900 110100 ang -5,5; Pj7 properties
;pl hold mat jo
change jmat=5 range xr 103000,113000 yr 126900 127100 ang -5,5; Pj8 properties
;pl hold mat jo
change jmat=5 range xr 99000,106000 yr 106900 107100 ang -5,5; Pj9 properties
;pl hold mat jo
change jmat=5 range xr 101000,106000 yr 97900 98100 ang -5,5; Pj10 properties
;pl hold mat jo
change jmat=5 range xr 55000,59000 yr 37900 38100 ang -5,5; Pj11 properties
change jmat=5 range xr 93000,95000 yr 114900 115100 ang -5,5; Pj12 properties

;Create Movie files every 100 steps
plot ccfail blo bla
movie on file m1a.dcx step 500

sav m1a_prop.sav
step 10
sav m1a_stress.sav

step 500
sav m1a_1.sav
step 500
sav m1a_2.sav
step 500
sav m1a_3.sav
step 500
sav m1a_4.sav

step 500
sav m1a_5.sav
step 500
sav m1a_6.sav
step 500
sav m1a_7.sav
step 500
sav m1a_8.sav

return
```

## U.2 Model 1b – dry model $\sigma_1$ = 112.5°

```
;>1530Ma (Map Interp)MODEL 1 Old Granites- DRY MODEL


prop mat=1 dens 2850 bulk 25e9 shear 25e9 cohesion 10e6 tens 5e6 fric 31 dil 4

prop mat=2 dens 2650 bulk 49e9 shear 27e9 cohesion 20e6 tens 10e6 fric 37 dil 5

;contact properties
prop jmat=1 jkn 5e6 jks 1e3 jcoh 4e2 jtens 2e6 jfri 30 jdil 5
;prop jmat=1 jper 300 azero 0.05 ares 0.03

prop jmat=2 jkn 5e9 jks 1e5 jcoh 10e2 jtens 3e6 jfri 35 jdil 5
;prop jmat=2 jper 238 azero 0.03 ares 0.01

;Pseudo joints
prop jmat=5 jkn 100e9 jks 40e9 jcoh 190e10 jtens 190e10 jdil 0
;prop jmat=5 jper 0 azero 0 ares 0

round 100

block 0,0 0,200000 124000,200000 124000,0
```

*****(Geometry files as per Model 1a)******

```
;Psuedo contacts to reduce block size and allow zoning
crack    0       66000   39000    66000;Pj1(left block)
crack    47000   71000   96000    71000;Pj2(mid block)
crack    80000   135000  114000   135000;Pj3(rmid block)
;crack   90000   102000  106000   102000;Pj4(rmid block)
crack    104000  70000   108000    70000;Pj5(rmid block)
;crack   90000   102000  106000   102000;Pj6(rmid block)
crack    88000   110000  90000    110000;Pj7(rmid block)
crack    103000  127000  113000   127000;Pj8(rmid block)
crack    99000   107000  106000   107000;Pj9(rmid block)
crack    101000  98000   106000   98000;Pj10(rmid block)
crack    55000   38000   59000    38000;Pj11(rmid block)
crack    93000   115000  95000    115000;Pj12(rmid block)

hist unbal ; hist1
hist sxx 62000 100000;hist2 (red 2)
hist syy 62000 100000;hist3 (red 2)

hist sst 60000 41000;hist4 (yel 4)selwyn high strain zone
hist sst 43000 40000;hist5 (yel 5)left of gin ck gr
hist sst 61000 172000;hist7 (yel 6)cloncurry

sav m1b_block.sav

gen 0 124000 0 200000 auto 1000

insitu stress -210e6 52.5e6 -140e6 szz -175e6
bound stress -210e6 52.5e6 -140e6

damp auto

;changing whole model to mat=1 (schist)
change 0 200000 0 124000 mat=1 cons=3

;changing all joints to jmat=1
change 0 200000 0 124000 jmat=1 jcon=2

;changing granite blocks to mat=2 (granite) constit model 3
change 57000,60000,175000,180000 mat=2 con=3 ;gr1
change 83000,85000,126000,129000 mat=2 con=3 ;gr2
change 89000,91000,117000,119000 mat=2 con=3 ;gr3
change 97000,99000,124000,126000 mat=2 con=3 ;gr4
change 94000,96000,117000,119000 mat=2 con=3 ;gr5
change 96000,98000,108000,110000 mat=2 con=3 ;gr6
change 85500,87500,100500,102500 mat=2 con=3 ;gr7
change 98000,100000,97000,99000 mat=2 con=3 ;gr8
change 112000,114000,80000,82000 mat=2 con=3 ;gr9
change 122000,124000,66000,67000 mat=2 con=3 ;gr10
change 53000,55000,45000,47000 mat=2 con=3 ;gr11

;changing granite edges to jmat=2
change jmat=2 range minterface 1 2

;changing pseudo joint properties to jmat=5
change jmat=5 range xr 0,39000 yr 65900 66100 ang -5,5;Pj1 properties
;pl hold mat jo
change jmat=5 range xr 47000,96000 yr 70900 71100 ang -5,5;Pj2 properties
;pl hold mat jo
change jmat=5 range xr 80000,114000 yr 134900 135100 ang -5,5; Pj3 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj4 properties
change jmat=5 range xr 104000,108000 yr 69900 70100 ang -5,5; Pj5 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj6 properties
change jmat=5 range xr 88000,90000 yr 109900 110100 ang -5,5; Pj7 properties
;pl hold mat jo
change jmat=5 range xr 103000,113000 yr 126900 127100 ang -5,5; Pj8 properties
;pl hold mat jo
change jmat=5 range xr 99000,106000 yr 106900 107100 ang -5,5; Pj9 properties
;pl hold mat jo
change jmat=5 range xr 101000,106000 yr 97900 98100 ang -5,5; Pj10 properties
;pl hold mat jo
```

```
change jmat=5 range xr 55000,59000 yr 37900 38100 ang -5,5; Pj11 properties
;pl hold mat jo
change jmat=5 range xr 93000,95000 yr 114900 115100 ang -5,5; Pj12 properties
;pl hold mat jo

;Create Movie files every 100 steps
plot ccfail blo bla
movie on file m1b.dcx step 500

sav m1b_prop.sav
step 10
sav m1b_stress.sav

step 500
sav m1b_1.sav
step 500
sav m1b_2.sav
step 500
sav m1b_3.sav
step 500
sav m1b_4.sav

step 500
sav m1b_5.sav
step 500
sav m1b_6.sav
step 500
sav m1b_7.sav
step 500
sav m1b_8.sav


return
```

## U.3 Model 1c – wet model $\sigma_1$ = 90°

```
;>1530Ma (Map Interp)MODEL 1 Old Granites- DRY MODEL


prop mat=1 dens 2850 bulk 25e9 shear 25e9 cohesion 10e6 tens 5e6 fric 31 dil 4

prop mat=2 dens 2650 bulk 49e9 shear 27e9 cohesion 20e6 tens 10e6 fric 37 dil 5

;contact properties
prop jmat=1 jkn 5e6 jks 1e3 jcoh 4e2 jtens 2e6 jfri 30 jdil 5
;prop jmat=1 jper 300 azero 0.05 ares 0.03

prop jmat=2 jkn 5e9 jks 1e5 jcoh 10e2 jtens 3e6 jfri 35 jdil 5
;prop jmat=2 jper 238 azero 0.03 ares 0.01

;Pseudo joints
prop jmat=5 jkn 100e9 jks 40e9 jcoh 190e10 jtens 190e10 jdil 0
;prop jmat=5 jper 0 azero 0 ares 0

round 100

block 0,0 0,200000 124000,200000 124000,0
```

*****(Geometry files as per Model 1a)******

```
;Psuedo contacts to reduce block size and allow zoning
crack    0        66000    39000     66000;Pj1(left block)
crack    47000    71000    96000     71000;Pj2(mid block)
crack    80000    135000   114000   135000;Pj3(rmid block)
;crack   90000    102000   106000   102000;Pj4(rmid block)
crack    104000   70000    108000    70000;Pj5(rmid block)
;crack   90000    102000   106000   102000;Pj6(rmid block)
crack    88000    110000   90000    110000;Pj7(rmid block)
crack    103000   127000   113000   127000;Pj8(rmid block)
crack    99000    107000   106000   107000;Pj9(rmid block)
crack    101000   98000    106000    98000;Pj10(rmid block)
```

```
crack   55000   38000   59000   38000;Pj11(rmid block)
crack   93000   115000  95000   115000;Pj12(rmid block)


hist unbal ; hist1
hist sxx 62000 100000;hist2 (red 2)
hist syy 62000 100000;hist3 (red 2)

hist sst 60000 41000;hist4 (yel 4)selwyn high strain zone
hist sst 43000 40000;hist5 (yel 5)left of gin ck gr
hist sst 61000 172000;hist7 (yel 6)cloncurry

sav m1c_block.sav

gen 0 124000 0 200000 auto 1000

insitu stress -210e6 0 -140e6 szz -175e6
bound stress -210e6 0 -140e6
damp auto

;changing whole model to mat=1 (schist)
change 0 200000 0 124000 mat=1 cons=3

;changing all joints to jmat=1
change 0 200000 0 124000 jmat=1 jcon=2

;changing granite blocks to mat=2 (granite) constit model 3
change 57000,60000,175000,180000 mat=2 con=3 ;gr1
change 83000,85000,126000,129000 mat=2 con=3 ;gr2
change 89000,91000,117000,119000 mat=2 con=3 ;gr3
change 97000,99000,124000,126000 mat=2 con=3 ;gr4
change 94000,96000,117000,119000 mat=2 con=3 ;gr5
change 96000,98000,108000,110000 mat=2 con=3 ;gr6
change 85500,87500,100500,102500 mat=2 con=3 ;gr7
change 98000,100000,97000,99000 mat=2 con=3 ;gr8
change 112000,114000,80000,82000 mat=2 con=3 ;gr9
change 122000,124000,66000,67000 mat=2 con=3 ;gr10
change 53000,55000,45000,47000 mat=2 con=3 ;gr11

;changing granite edges to jmat=2 - must follow commands setting jmat=2 blocks
change jmat=2 range minterface 1 2

;changing pseudo joint properties to jmat=5
change jmat=5 range xr 0,39000 yr 65900 66100 ang -5,5;Pj1 properties
;pl hold mat jo
change jmat=5 range xr 47000,96000 yr 70900 71100 ang -5,5;Pj2 properties
;pl hold mat jo
change jmat=5 range xr 80000,114000 yr 134900 135100 ang -5,5; Pj3 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj4 properties
change jmat=5 range xr 104000,108000 yr 69900 70100 ang -5,5; Pj5 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj6 properties
change jmat=5 range xr 88000,90000 yr 109900 110100 ang -5,5; Pj7 properties
;pl hold mat jo
change jmat=5 range xr 103000,113000 yr 126900 127100 ang -5,5; Pj8 properties
;pl hold mat jo
change jmat=5 range xr 99000,106000 yr 106900 107100 ang -5,5; Pj9 properties
;pl hold mat jo
change jmat=5 range xr 101000,106000 yr 97900 98100 ang -5,5; Pj10 properties
;pl hold mat jo
change jmat=5 range xr 55000,59000 yr 37900 38100 ang -5,5; Pj11 properties
;pl hold mat jo
change jmat=5 range xr 93000,95000 yr 114900 115100 ang -5,5; Pj12 properties
;pl hold mat jo

;Create Movie files every 100 steps
plot ccfail blo bla
movie on file m1c.dcx step 500

sav m1c_prop.sav
step 10
sav m1c_stress.sav

step 500
```

```
sav m1c_1.sav
step 500
sav m1c_2.sav
step 500
sav m1c_3.sav
step 500
sav m1c_4.sav

;Establishing fluid pressure
fluid dens=1000;fluid density of 1000kgm'3
set flow steady;set steady state flow
bo pp=125e6;
pfix pressure=125e6

step 500
sav m1c_5.sav
step 500
sav m1c_6.sav
step 500
sav m1c_7.sav
step 500
sav m1c_8.sav

step 500
sav m1c_9.sav
step 500
sav m1c_10.sav
step 500
sav m1c_11.sav
step 500
sav m1c_12.sav

step 500
sav m1c_13.sav
step 500
sav m1c_14.sav

return
```

## U.4 Model 1d – wet model $\sigma_1$ = 112.5°

```
;>1530Ma (Map Interp)MODEL 1 Old Granites- DRY MODEL


prop mat=1 dens 2850 bulk 25e9 shear 25e9 cohesion 10e6 tens 5e6 fric 31 dil 4

prop mat=2 dens 2650 bulk 49e9 shear 27e9 cohesion 20e6 tens 10e6 fric 37 dil 5

;contact properties
prop jmat=1 jkn 5e6 jks 1e3 jcoh 4e2 jtens 2e6 jfri 30 jdil 5
;prop jmat=1 jper 300 azero 0.05 ares 0.03

prop jmat=2 jkn 5e9 jks 1e5 jcoh 10e2 jtens 3e6 jfri 35 jdil 5
;prop jmat=2 jper 238 azero 0.03 ares 0.01

;Pseudo joints
prop jmat=5 jkn 100e9 jks 40e9 jcoh 190e10 jtens 190e10 jdil 0
;prop jmat=5 jper 0 azero 0 ares 0

round 100

block 0,0 0,200000 124000,200000 124000,0
```

*****(Geometry files as per Model 1a)******

```
;Psuedo contacts to reduce block size and allow zoning
crack    0        66000    39000     66000;Pj1(left block)
crack    47000    71000    96000     71000;Pj2(mid block)
crack    80000    135000   114000   135000;Pj3(rmid block)
;crack   90000    102000   106000   102000;Pj4(rmid block)
crack    104000   70000    108000    70000;Pj5(rmid block)
;crack   90000    102000   106000   102000;Pj6(rmid block)
```

```
crack    88000    110000   90000    110000;Pj7(rmid block)
crack    103000   127000   113000   127000;Pj8(rmid block)
crack    99000    107000   106000   107000;Pj9(rmid block)
crack    101000   98000    106000   98000;Pj10(rmid block)
crack    55000    38000    59000    38000;Pj11(rmid block)
crack    93000    115000   95000    115000;Pj12(rmid block)

hist unbal ; hist1
hist sxx 62000 100000;hist2 (red 2)
hist syy 62000 100000;hist3 (red 2)

hist sst 60000 41000;hist4 (yel 4)selwyn high strain zone
hist sst 43000 40000;hist5 (yel 5)left of gin ck gr
hist sst 61000 172000;hist7 (yel 6)cloncurry

sav m1d_block.sav

gen 0 124000 0 200000 auto 1000

insitu stress -210e6 52.5e6 -140e6 szz -175e6
bound stress -210e6 0 -140e6
damp auto

;changing whole model to mat=1 (schist)
change 0 200000 0 124000 mat=1 cons=3

;changing all joints to jmat=1
change 0 200000 0 124000 jmat=1 jcon=2

;changing granite blocks to mat=2 (granite) constit model 3
change 57000,60000,175000,180000 mat=2 con=3 ;gr1
change 83000,85000,126000,129000 mat=2 con=3 ;gr2
change 89000,91000,117000,119000 mat=2 con=3 ;gr3
change 97000,99000,124000,126000 mat=2 con=3 ;gr4
change 94000,96000,117000,119000 mat=2 con=3 ;gr5
change 96000,98000,108000,110000 mat=2 con=3 ;gr6
change 85500,87500,100500,102500 mat=2 con=3 ;gr7
change 98000,100000,97000,99000 mat=2 con=3 ;gr8
change 112000,114000,80000,82000 mat=2 con=3 ;gr9
change 122000,124000,66000,67000 mat=2 con=3 ;gr10
change 53000,55000,45000,47000 mat=2 con=3 ;gr11

;changing granite edges to jmat=2 - must follow commands setting jmat=2 blocks
change jmat=2 range minterface 1 2

;changing pseudo joint properties to jmat=5
change jmat=5 range xr 0,39000 yr 65900 66100 ang -5,5;Pj1 properties
;pl hold mat jo
change jmat=5 range xr 47000,96000 yr 70900 71100 ang -5,5;Pj2 properties
;pl hold mat jo
change jmat=5 range xr 80000,114000 yr 134900 135100 ang -5,5; Pj3 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj4 properties
change jmat=5 range xr 104000,108000 yr 69900 70100 ang -5,5; Pj5 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj6 properties
change jmat=5 range xr 88000,90000 yr 109900 110100 ang -5,5; Pj7 properties
;pl hold mat jo
change jmat=5 range xr 103000,113000 yr 126900 127100 ang -5,5; Pj8 properties
;pl hold mat jo
change jmat=5 range xr 99000,106000 yr 106900 107100 ang -5,5; Pj9 properties
;pl hold mat jo
change jmat=5 range xr 101000,106000 yr 97900 98100 ang -5,5; Pj10 properties
;pl hold mat jo
change jmat=5 range xr 55000,59000 yr 37900 38100 ang -5,5; Pj11 properties
;pl hold mat jo
change jmat=5 range xr 93000,95000 yr 114900 115100 ang -5,5; Pj12 properties
;pl hold mat jo

;Create Movie files every 100 steps
plot ccfail blo bla
movie on file m1d.dcx step 500

sav m1d_prop.sav
step 10
```

```
sav m1d_stress.sav

step 500
sav m1d_1.sav
step 500
sav m1d_2.sav
step 500
sav m1d_3.sav
step 500
sav m1d_4.sav

;Establishing fluid pressure
fluid dens=1000;fluid density of 1000kgm'3
set flow steady;set steady state flow
bo pp=125e6;
pfix pressure=125e6

step 500
sav m1d_5.sav
step 500
sav m1d_6.sav
step 500
sav m1d_7.sav
step 500
sav m1d_8.sav

step 500
sav m1d_9.sav
step 500
sav m1d_10.sav
step 500
sav m1d_11.sav
step 500
sav m1d_12.sav

step 500
sav m1d_13.sav
step 500
sav m1d_14.sav

return
```

## U.5 Model 2a – dry model $\sigma_1$ = 90°

```
;>1490Ma (Map Interp)MODEL 2 Young Granites- DRY MODEL

;metasediment properties
prop mat=1 dens 2850 bulk 25e9 shear 25e9 cohesion 10e6 tens 5e6 fric 31 dil 4

;granite properties
prop mat=2 dens 2650 bulk 49e9 shear 27e9 cohesion 20e6 tens 10e6 fric 37 dil 5

;contact properties
prop jmat=1 jkn 5e6 jks 1e3 jcoh 4e2 jtens 2e6 jfri 30 jdil 5
;prop jmat=1 jper 300 azero 0.05 ares 0.03

prop jmat=2 jkn 5e9 jks 1e5 jcoh 10e2 jtens 3e6 jfri 35 jdil 5
;prop jmat=2 jper 238 azero 0.03 ares 0.01

;Pseudo joints
prop jmat=5 jkn 100e9 jks 40e9 jcoh 190e10 jtens 190e10 jdil 0
;prop jmat=5 jper 0 azero 0 ares 0

round 100

block 0,0 0,200000 124000,200000 124000,0

;*****(Geometry File Start)*****
crack    1000    200000    1500    192000;1-2
crack    1500    192000    1000    191000;2-3
crack    1000    191000    0       189000;3-4
```

| | | | | |
|---|---|---|---|---|
| crack | 6500 | 200000 | 5500 | 199000;7-6 |
| crack | 5500 | 199000 | 4000 | 198000;6-5 |
| crack | 4000 | 198000 | 1500 | 192000;5-2 |
| crack | 5500 | 199000 | 6000 | 193000;6-8 |
| crack | 6000 | 193000 | 4000 | 186000;8-9 |
| crack | 4000 | 186000 | 4000 | 180000;9-10 |
| crack | 4000 | 180000 | 4500 | 176000;10-11 |
| crack | 4500 | 176000 | 2000 | 171000;11-12 |
| crack | 4000 | 198000 | 3500 | 188000;5-17 |
| crack | 3500 | 188000 | 2500 | 184000;17-18 |
| crack | 2500 | 184000 | 2500 | 175000;18-19 |
| crack | 2500 | 175000 | 2000 | 171000;19-12 |
| crack | 2000 | 171000 | 1500 | 170000;12-13 |
| crack | 1500 | 170000 | 1500 | 160000;13-14 |
| crack | 1500 | 160000 | 5000 | 155000;14-15 |
| crack | 5000 | 155000 | 2000 | 150000;15-16 |
| crack | 2000 | 150000 | 0 | 148000;16-20 |
| crack | 21500 | 200000 | 21500 | 189000;21-22 |
| crack | 21500 | 189000 | 20000 | 182000;22-23 |
| crack | 27500 | 200000 | 23000 | 185000;25-26 |
| crack | 23000 | 185000 | 20000 | 182000;26-23 |
| crack | 20000 | 182000 | 19500 | 179000;23-24 |
| crack | 19500 | 179000 | 13500 | 168000;24-27 |
| crack | 13500 | 168000 | 10500 | 165000;27-28 |
| crack | 10500 | 165000 | 9500 | 162000;28-29 |
| crack | 9500 | 162000 | 5000 | 155000;29-15 |
| crack | 9500 | 162000 | 10000 | 160000;29-30 |
| crack | 10000 | 160000 | 6500 | 154000;30-31 |
| crack | 6500 | 154000 | 4000 | 149000;31-32 |
| crack | 4000 | 149000 | 0 | 147000;32-33 |
| crack | 4000 | 149000 | 0 | 141000;32-34 |
| ;crack | 69000 | 200000 | 64000 | 181000;35-36 |
| crack | 64000 | 181000 | 62000 | 181000;36-37 gr1 bound centr:57000,60000,175000,180000 |
| crack | 62000 | 181000 | 61000 | 180000;37-38 gr1 bound |
| crack | 61000 | 180000 | 54500 | 180000;38-39 gr1 bound |
| crack | 54500 | 180000 | 53000 | 179500;39-40 gr1 bound |
| crack | 53000 | 179500 | 53000 | 176000;40-41 gr1 bound |
| crack | 53000 | 176000 | 54000 | 175000;41-42 gr1 bound |
| crack | 54000 | 175000 | 56000 | 173000;42-43 gr1 bound |
| crack | 56000 | 173000 | 57000 | 171000;43-44 gr1 bound |
| crack | 57000 | 171000 | 58000 | 172000;44-45 gr1 bound |
| crack | 58000 | 172000 | 60000 | 172500;45-46 gr1 bound |
| crack | 60000 | 172500 | 59500 | 173500;46-47 gr1 bound |
| crack | 59500 | 173500 | 58000 | 173000;47-48 gr1 bound |
| crack | 58000 | 173000 | 57000 | 173500;48-49 gr1 bound |
| crack | 57000 | 173500 | 57500 | 175000;49-50 gr1 bound |
| crack | 57500 | 175000 | 61000 | 175000;50-51 gr1 bound |
| crack | 61000 | 175000 | 63000 | 177000;51-52 gr1 bound |
| ;crack | 63000 | 177000 | 64000 | 181000;52-36 gr1 bound |
| crack | 54000 | 175000 | 52000 | 176000;42-53 |
| crack | 52000 | 176000 | 47000 | 179000;53-54 |
| crack | 47000 | 179000 | 45000 | 179000;54-55 |
| crack | 45000 | 179000 | 41000 | 181000;55-56 |
| crack | 41000 | 181000 | 38000 | 179000;56-57 |
| crack | 38000 | 179000 | 38500 | 173000;57-58 |
| crack | 38500 | 173000 | 37000 | 169000;58-59 |
| crack | 37000 | 169000 | 25000 | 164000;59-60 |
| crack | 25000 | 164000 | 21000 | 163000;60-61 |
| crack | 21000 | 163000 | 11000 | 158000;61-62 |
| crack | 11000 | 158000 | 8000 | 145000;62-63 |
| crack | 8000 | 145000 | 0 | 130000;63-64 |
| crack | 38500 | 173000 | 42000 | 170000;58-65 |
| crack | 42000 | 170000 | 42000 | 163000;65-66 |
| crack | 42000 | 163000 | 38000 | 153000;66-67 |
| crack | 38000 | 153000 | 40000 | 152000;67-68 |
| crack | 40000 | 152000 | 43000 | 150000;68-69 |
| crack | 43000 | 150000 | 38000 | 144000;69-70 |
| crack | 38000 | 144000 | 32000 | 141000;70-71 |
| crack | 32000 | 141000 | 23000 | 130000;71-72 |
| crack | 23000 | 130000 | 16000 | 127000;72-73 |
| crack | 16000 | 127000 | 14000 | 123000;73-74 |
| crack | 14000 | 123000 | 11000 | 119000;74-75 |
| crack | 11000 | 119000 | 6000 | 114000;75-76 |
| crack | 6000 | 114000 | 2000 | 111000;76-77 |
| crack | 2000 | 111000 | 0 | 107000;77-78 |

| | | | | |
|---|---|---|---|---|
| crack | 38000 | 144000 | 36000 | 141000;70-79 |
| crack | 36000 | 141000 | 35000 | 135000;79-80 |
| crack | 35000 | 135000 | 37000 | 134500;80-81 |
| crack | 37000 | 134500 | 39000 | 131000;81-82 |
| crack | 39000 | 131000 | 35000 | 123000;82-83 |
| crack | 35000 | 123000 | 31000 | 120000;83-84 |
| crack | 31000 | 120000 | 25000 | 118000;84-85 |
| crack | 25000 | 118000 | 23000 | 114000;85-86 |
| crack | 23000 | 114000 | 16000 | 109000;86-87 |
| crack | 16000 | 109000 | 6000 | 105000;87-88 |
| crack | 6000 | 105000 | 3000 | 107000;88-89 |
| crack | 3000 | 107000 | 0 | 107000;89-78 |
| crack | 43000 | 150000 | 43000 | 147000;69-90 |
| crack | 43000 | 147000 | 43000 | 141000;90-91 |
| crack | 43000 | 141000 | 44000 | 138000;91-92 |
| crack | 44000 | 138000 | 50000 | 133000;92-93 |
| crack | 50000 | 133000 | 53000 | 129000;93-94 |
| crack | 53000 | 129000 | 57000 | 124000;94-95 |
| crack | 43000 | 147000 | 44000 | 142000;90-96 |
| crack | 44000 | 142000 | 53000 | 131000;96-97 |
| crack | 53000 | 131000 | 57000 | 124000;97-95 |
| crack | 57000 | 124000 | 55000 | 120000;95-98 |
| crack | 55000 | 120000 | 55000 | 112000;98-99 |
| ;crack | 55000 | 112000 | 52000 | 89000;99-100 |
| crack | 52000 | 89000 | 45000 | 84000;100-101 |
| crack | 45000 | 84000 | 44000 | 81000;101-102 |
| crack | 44000 | 81000 | 43000 | 75000;102-103 |
| crack | 43000 | 75000 | 39000 | 66000;103-104 |
| crack | 39000 | 66000 | 39000 | 60000;104-105 |
| crack | 39000 | 60000 | 38000 | 58000;105-106 |
| crack | 38000 | 58000 | 38000 | 54000;106-107 |
| crack | 38000 | 54000 | 38000 | 48000;107-108 |
| crack | 38000 | 48000 | 38000 | 46000;108-191 |
| crack | 52000 | 89000 | 46000 | 62000;100-109 |
| crack | 46000 | 62000 | 43000 | 56000;109-110 |
| crack | 43000 | 56000 | 47000 | 59000;110-111 |
| crack | 47000 | 59000 | 48000 | 58000;111-112 |
| crack | 48000 | 58000 | 47000 | 53000;112-113 |
| crack | 47000 | 53000 | 48000 | 50000;113-114 |
| crack | 48000 | 50000 | 47000 | 38000;114-118 |
| crack | 47000 | 38000 | 48000 | 36000;118-119 |
| crack | 48000 | 36000 | 47000 | 31000;119-120 |
| crack | 43000 | 56000 | 42000 | 54000;110-115 |
| crack | 42000 | 54000 | 45000 | 43000;115-116 |
| crack | 45000 | 43000 | 45000 | 36000;116-117 |
| crack | 45000 | 36000 | 47000 | 31000;117-120 |
| crack | 48000 | 50000 | 49000 | 47000;114-121 |
| crack | 49000 | 47000 | 51000 | 47000;121-122 |
| crack | 51000 | 47000 | 53000 | 54000;122-123 |
| crack | 53000 | 54000 | 54000 | 57000;123-124 |
| crack | 54000 | 57000 | 57000 | 55000;124-125 |
| crack | 57000 | 55000 | 57500 | 54000;125-126 |
| crack | 57500 | 54000 | 59000 | 48000;126-127 |
| crack | 59000 | 48000 | 59000 | 41000;127-128 |
| crack | 59000 | 41000 | 58000 | 35000;128-129 |
| crack | 58000 | 35000 | 55000 | 31000;129-130 |
| crack | 55000 | 31000 | 54000 | 27000;130-131 |
| crack | 54000 | 27000 | 51000 | 24000;131-132 |
| crack | 51000 | 24000 | 48000 | 14000;132-133 |
| crack | 49000 | 47000 | 50000 | 42000;121-134 |
| crack | 50000 | 42000 | 49000 | 40000;134-135;gr11 bound centr:53000,55000,45000,47000 |
| crack | 49000 | 40000 | 51000 | 38000;135-136;gr11 bound |
| crack | 51000 | 38000 | 55000 | 38000;136-137;gr11 bound |
| crack | 55000 | 38000 | 58000 | 46000;137-138;gr11 bound |
| crack | 58000 | 46000 | 58000 | 48000;138-139;gr11 bound |
| crack | 58000 | 48000 | 57000 | 48500;139-140;gr11 bound |
| crack | 57000 | 48500 | 57500 | 49000;140-141;gr11 bound |
| crack | 57500 | 49000 | 57000 | 53000;141-142;gr11 bound |
| crack | 57000 | 53000 | 56000 | 54000;142-143;gr11 bound |
| crack | 56000 | 54000 | 54000 | 54000;143-144;gr11 bound |
| crack | 54000 | 54000 | 54000 | 51000;144-145;gr11 bound |
| crack | 54000 | 51000 | 53000 | 50000;145-146;gr11 bound |
| crack | 53000 | 50000 | 51000 | 43000;146-147;gr11 bound |
| crack | 51000 | 43000 | 50000 | 42000;147-134;gr11 bound |
| crack | 56000 | 54000 | 57500 | 54000;143-126 |

| | | | | |
|---|---|---|---|---|
| crack | 47000 | 31000 | 45000 | 18000;120-148 |
| crack | 45000 | 18000 | 43000 | 14000;148-149 |
| crack | 43000 | 14000 | 43000 | 7000;149-150 |
| crack | 43000 | 7000 | 43500 | 4500;150-151 |
| crack | 43500 | 4500 | 43500 | 0;151-152 |
| crack | 48000 | 14000 | 47000 | 14500;133-153 |
| crack | 47000 | 14500 | 45000 | 9000;153-154 |
| crack | 45000 | 9000 | 45000 | 0;154-155 |
| crack | 48000 | 14000 | 49000 | 13000;133-160 |
| crack | 49000 | 13000 | 50000 | 15000;160-161 |
| crack | 49000 | 13000 | 51000 | 11000;160-159 |
| crack | 51000 | 11000 | 47000 | 7000;159-158 |
| crack | 47000 | 7000 | 46500 | 5000;158-157 |
| crack | 46500 | 5000 | 46000 | 0;157-156 |
| crack | 50000 | 15000 | 53000 | 18000;161-162 |
| crack | 53000 | 18000 | 53000 | 13000;162-163 |
| crack | 53000 | 13000 | 55000 | 10000;163-164 |
| crack | 55000 | 10000 | 56000 | 4000;164-165 |
| crack | 56000 | 4000 | 56000 | 0;165-166 |
| crack | 56000 | 4000 | 60000 | 14000;165-167 |
| crack | 60000 | 14000 | 62000 | 17000;167-168 |
| crack | 62000 | 17000 | 69000 | 23000;168-169 |
| crack | 69000 | 23000 | 67000 | 19000;169-170 |
| crack | 67000 | 19000 | 63000 | 14000;170-171 |
| crack | 63000 | 14000 | 61000 | 11000;171-172 |
| crack | 61000 | 11000 | 59000 | 6000;172-173 |
| crack | 59000 | 6000 | 59000 | 0;173-174 |
| crack | 71500 | 0 | 72000 | 4000;175-176 |
| crack | 72000 | 4000 | 78000 | 12000;176-177 |
| crack | 78000 | 12000 | 79000 | 15000;177-178 |
| crack | 79000 | 15000 | 83000 | 20000;178-179 |
| crack | 83000 | 20000 | 85000 | 20000;179-180 |
| crack | 86000 | 21000 | 84000 | 18000;180-181 |
| crack | 84000 | 18000 | 79000 | 11000;181-182 |
| crack | 79000 | 11000 | 77000 | 6000;182-183 |
| crack | 77000 | 6000 | 76000 | 0;183-184 |
| crack | 38000 | 48000 | 40000 | 45000;108-185 |
| crack | 40000 | 45000 | 41000 | 39000;185-186 |
| crack | 41000 | 39000 | 42000 | 30500;186-187 |
| crack | 42000 | 30500 | 40000 | 31000;187-188 |
| crack | 40000 | 31000 | 39500 | 34000;188-189 |
| crack | 39500 | 34000 | 38000 | 42000;189-190 |
| crack | 38000 | 42000 | 38000 | 46000;190-191 |
| crack | 38000 | 46000 | 36000 | 54000;191-192 |
| crack | 36000 | 54000 | 35500 | 55500;192-193 |
| crack | 35500 | 55500 | 36000 | 59000;193-194 |
| crack | 36000 | 59000 | 34000 | 56000;194-195 |
| crack | 34000 | 56000 | 34000 | 53000;195-196 |
| crack | 34000 | 53000 | 34000 | 52000;196-197 |
| crack | 34000 | 52000 | 34000 | 50000;197-198 |
| crack | 34000 | 50000 | 35000 | 48000;198-199 |
| crack | 35000 | 48000 | 36000 | 36000;199-200 |
| crack | 36000 | 36000 | 37500 | 34000;200-201 |
| crack | 36000 | 36000 | 39500 | 34000;200-201 |
| crack | 37500 | 34000 | 37000 | 33000;201-202 |
| crack | 37000 | 33000 | 34000 | 36000;202-203 |
| crack | 34000 | 36000 | 34000 | 41000;203-204 |
| crack | 34000 | 41000 | 32000 | 44000;204-205 |
| crack | 32000 | 44000 | 32000 | 46000;205-206 |
| crack | 32000 | 46000 | 31000 | 49000;206-207 |
| crack | 31000 | 49000 | 31000 | 54000;207-208 |
| crack | 31000 | 54000 | 31000 | 55000;208-209 |
| crack | 31000 | 55000 | 34000 | 53000;209-196 |
| crack | 31000 | 54000 | 34000 | 52000;208-197 |
| crack | 40000 | 31000 | 39000 | 31000;188-210 |
| crack | 39000 | 31000 | 36000 | 31000;210-211 |
| crack | 37000 | 33000 | 36000 | 31000;202-211 |
| crack | 36000 | 31000 | 32000 | 35000;211-212 |
| crack | 32000 | 35000 | 32000 | 33000;212-213 |
| crack | 32000 | 33000 | 35000 | 31000;213-214 |
| crack | 35000 | 31000 | 38000 | 30000;214-219 |
| crack | 39000 | 31000 | 38000 | 30000;210-219 |
| crack | 35000 | 31000 | 35000 | 28000;214-215 |
| crack | 38000 | 30000 | 37000 | 26000;219-218 |
| crack | 37000 | 26000 | 39000 | 23000;218-217 |

| | | | | |
|---|---|---|---|---|
| crack | 39000 | 23000 | 36500 | 24000;217-216 |
| crack | 36500 | 24000 | 35000 | 28000;216-215 |
| crack | 36500 | 24000 | 36500 | 18000;216-220 |
| crack | 36500 | 18000 | 39000 | 14000;220-221 |
| crack | 39000 | 14000 | 40000 | 9000;221-222 |
| crack | 40000 | 9000 | 40000 | 0;222-223 |
| crack | 63000 | 177000 | 65000 | 170000;52-224 |
| crack | 65000 | 170000 | 72000 | 175000;224-225 |
| crack | 72000 | 175000 | 74000 | 175000;225-226 |
| crack | 74000 | 175000 | 76000 | 172000;226-227 |
| crack | 76000 | 172000 | 79000 | 165000;227-228 |
| crack | 76000 | 172000 | 78000 | 173000;227-235 |
| crack | 79000 | 165000 | 83000 | 164000;228-229 |
| crack | 83000 | 164000 | 84000 | 166000;229-230 |
| crack | 84000 | 166000 | 82000 | 170000;230-231 |
| crack | 82000 | 170000 | 85000 | 170000;231-232 |
| crack | 85000 | 170000 | 83000 | 172000;232-233 |
| crack | 83000 | 172000 | 80000 | 171000;233-234 |
| crack | 80000 | 171000 | 78000 | 173000;234-235 |
| crack | 78000 | 173000 | 80000 | 174000;235-236 |
| crack | 80000 | 174000 | 78000 | 176000;236-237 |
| crack | 78000 | 176000 | 80000 | 179000;237-238 |
| crack | 80000 | 179000 | 85000 | 185000;238-239 |
| crack | 85000 | 185000 | 90000 | 188000;239-240 |
| crack | 90000 | 188000 | 99000 | 190000;240-241 |
| crack | 99000 | 190000 | 96000 | 190000;241-242 |
| crack | 96000 | 190000 | 86000 | 194000;242-243 |
| crack | 86000 | 194000 | 85500 | 197000;243-244 |
| crack | 85500 | 197000 | 84000 | 200000;244-245 |
| ;crack | 86000 | 194000 | 75000 | 196000;243-246 |
| ;crack | 75000 | 196000 | 71000 | 200000;246-247 |
| crack | 99000 | 190000 | 102000 | 194000;241-248 |
| crack | 102000 | 194000 | 104000 | 195000;248-249 |
| crack | 104000 | 195000 | 105000 | 196000;249-250 |
| crack | 105000 | 196000 | 105000 | 198000;250-251 |
| crack | 105000 | 198000 | 106000 | 200000;251-252 |
| crack | 104000 | 195000 | 99000 | 182000;249-253 |
| crack | 99000 | 182000 | 97000 | 180000;253-254 |
| crack | 97000 | 180000 | 91000 | 179000;254-255 |
| crack | 91000 | 179000 | 87000 | 175000;255-256 |
| crack | 87000 | 175000 | 84000 | 174000;256-257 |
| crack | 84000 | 174000 | 82000 | 174000;257-258 |
| crack | 82000 | 174000 | 80000 | 176000;258-259 |
| crack | 80000 | 176000 | 80000 | 179000;259-238 |
| crack | 82000 | 174000 | 80000 | 174000;258-236 |
| crack | 65000 | 170000 | 68000 | 158000;224-260 |
| ;crack | 68000 | 158000 | 82000 | 133000;260-261 |
| crack | 82000 | 133000 | 82000 | 131000;261-262 gr2 bound centr: 83000,85000,126000,129000 |
| crack | 82000 | 131000 | 83000 | 130000;262-263 gr2 bound |
| crack | 83000 | 130000 | 81000 | 130000;263-264 gr2 bound |
| crack | 81000 | 130000 | 79000 | 129000;264-265 gr2 bound |
| crack | 79000 | 129000 | 78000 | 127500;265-266 gr2 bound |
| crack | 78000 | 127500 | 79000 | 126000;266-267 gr2 bound |
| crack | 79000 | 126000 | 80000 | 125000;267-268 gr2 bound |
| crack | 80000 | 125000 | 82000 | 123000;268-269 gr2 bound |
| crack | 82000 | 123000 | 83000 | 122500;269-270 gr2 bound |
| crack | 83000 | 122500 | 84000 | 123000;270-271 gr2 bound |
| crack | 84000 | 123000 | 83000 | 124000;271-272 gr2 bound |
| crack | 83000 | 124000 | 83000 | 125000;272-273 gr2 bound |
| crack | 83000 | 125000 | 84000 | 125000;273-274 gr2 bound |
| crack | 84000 | 125000 | 84000 | 127000;274-275 gr2 bound |
| crack | 84000 | 127000 | 85000 | 127000;275-276 gr2 bound |
| crack | 85000 | 127000 | 87500 | 126500;276-277 gr2 bound |
| crack | 87500 | 126500 | 88000 | 129000;277-278 gr2 bound |
| crack | 88000 | 129000 | 89000 | 129500;278-279 gr2 bound |
| crack | 89000 | 129500 | 89500 | 131000;279-280 gr2 bound |
| crack | 89500 | 131000 | 89000 | 132000;280-281 gr2 bound |
| crack | 89000 | 132000 | 88000 | 132500;281-282 gr2 bound |
| crack | 88000 | 132500 | 85000 | 132500;282-283 gr2 bound |
| crack | 85000 | 132500 | 84000 | 133000;283-284 gr2 bound |
| crack | 84000 | 133000 | 82000 | 133000;284-261 gr2 bound |
| crack | 84000 | 125000 | 86500 | 115000;274-285 |
| crack | 86500 | 115000 | 85000 | 118000;285-286 gr7 bound centr: 85500,87500,100500,102500 |
| crack | 85000 | 118000 | 84000 | 119000;286-287 gr7 bound |
| crack | 84000 | 119000 | 82500 | 119000;287-288 gr7 bound |

| | | | | |
|---|---|---|---|---|
| crack | 82500 | 119000 | 81000 | 118500;288-289 gr7 bound |
| crack | 81000 | 118500 | 80000 | 118500;289-290 gr7 bound |
| crack | 80000 | 118500 | 79000 | 116000;290-291 gr7 bound |
| crack | 79000 | 116000 | 81000 | 116000;291-292 gr7 bound |
| crack | 81000 | 116000 | 79000 | 114000;292-293 gr7 bound |
| crack | 79000 | 114000 | 79500 | 113000;293-294 gr7 bound |
| crack | 79500 | 113000 | 81000 | 113500;294-295 gr7 bound |
| crack | 81000 | 113500 | 81000 | 113000;295-296 gr7 bound |
| crack | 81000 | 113000 | 78000 | 110000;296-297 gr7 bound |
| crack | 78000 | 110000 | 77500 | 108000;297-298 gr7 bound |
| crack | 77500 | 108000 | 77500 | 107000;298-299 gr7 bound |
| crack | 77500 | 107000 | 81500 | 100000;299-300 gr7 bound |
| crack | 81500 | 100000 | 84000 | 100000;300-301 gr7 bound |
| crack | 84000 | 100000 | 86000 | 99000;301-302 gr7 bound |
| crack | 86000 | 99000 | 87000 | 96500;302-303 gr7 bound |
| crack | 87000 | 96500 | 86000 | 96000;303-304 gr7 bound |
| crack | 86000 | 96000 | 85000 | 94000;304-305 gr7 bound |
| crack | 85000 | 94000 | 85000 | 92000;305-306 gr7 bound |
| crack | 85000 | 92000 | 85500 | 91000;306-307 gr7 bound |
| crack | 85500 | 91000 | 85000 | 89000;307-308 gr7 bound |
| crack | 85000 | 89000 | 88000 | 86000;308-309 gr7 bound |
| crack | 88000 | 86000 | 90000 | 85000;309-310 gr7 bound |
| crack | 90000 | 85000 | 92000 | 85500;310-311 gr7 bound |
| crack | 92000 | 85500 | 93000 | 87000;311-312 gr7 bound |
| crack | 93000 | 87000 | 94000 | 87000;312-313 gr7 bound |
| crack | 94000 | 87000 | 95500 | 86500;313-314 gr7 bound |
| crack | 95500 | 86500 | 97000 | 87000;314-315 gr7 bound |
| crack | 97000 | 87000 | 96000 | 89500;315-316 gr7 bound |
| crack | 96000 | 89500 | 93000 | 91000;316-317 gr7 bound |
| crack | 93000 | 91000 | 93000 | 93000;317-318 gr7 bound |
| crack | 93000 | 93000 | 92500 | 93000;318-319 gr7 bound |
| crack | 92500 | 93000 | 91500 | 97000;319-320 gr7 bound |
| crack | 91500 | 97000 | 89000 | 97000;320-321 gr7 bound |
| crack | 89000 | 97000 | 89000 | 98000;321-322 gr7 bound |
| crack | 89000 | 98000 | 88000 | 102000;322-323 gr7 bound |
| crack | 88000 | 102000 | 86000 | 104000;323-324 gr7 bound |
| crack | 86000 | 104000 | 87000 | 104000;324-325 gr7 bound |
| crack | 87000 | 104000 | 87000 | 105000;325-326 gr7 bound |
| crack | 87000 | 105000 | 86000 | 106000;326-327 gr7 bound |
| crack | 86000 | 106000 | 85000 | 106000;327-328 gr7 bound |
| crack | 85000 | 106000 | 87000 | 108000;328-329 gr7 bound |
| crack | 87000 | 108000 | 87000 | 109500;329-330 gr7 bound |
| crack | 87000 | 109500 | 86000 | 110000;330-331 gr7 bound |
| crack | 86000 | 110000 | 86500 | 115000;331-285 gr7 bound |
| crack | 87500 | 126500 | 86000 | 125000;277-341 |
| crack | 86000 | 125000 | 86000 | 123000;341-342 gr3 bound centr: 89000,91000,117000,119000 |
| crack | 86000 | 123000 | 87000 | 121000;342-343 gr3 bound |
| crack | 87000 | 121000 | 87500 | 122000;343-344 gr3 bound |
| crack | 87500 | 122000 | 87000 | 122000;344-345 gr3 bound |
| crack | 87000 | 122000 | 87000 | 125000;345-346 gr3 bound |
| crack | 87000 | 125000 | 88000 | 125000;346-347 gr3 bound |
| crack | 88000 | 125000 | 88000 | 123000;347-348 gr3 bound |
| crack | 88000 | 123000 | 89000 | 121500;348-349 gr3 bound |
| crack | 89000 | 121500 | 89000 | 115000;349-350 gr3 bound |
| crack | 89000 | 115000 | 90000 | 112000;350-351 gr3 bound |
| crack | 90000 | 112000 | 89000 | 109000;351-352 gr3 bound |
| crack | 89000 | 109000 | 90000 | 108000;352-353 gr3 bound |
| crack | 90000 | 108000 | 91000 | 109000;353-354 gr3 bound |
| crack | 91000 | 109000 | 91500 | 109000;354-355 gr3 bound |
| crack | 91500 | 109000 | 92000 | 108000;355-356 gr3 bound |
| crack | 92000 | 108000 | 92500 | 107500;356-357 gr3 bound |
| crack | 92500 | 107500 | 94000 | 108000;357-358 gr3 bound |
| crack | 94000 | 108000 | 92000 | 109000;358-359 gr3 bound |
| crack | 92000 | 109000 | 92000 | 110000;359-360 gr3 bound |
| crack | 92000 | 110000 | 92000 | 110500;360-361 gr3 bound |
| crack | 92000 | 110500 | 94000 | 110500;361-362 gr3 bound |
| crack | 94000 | 110500 | 94500 | 111000;362-363 gr3 bound |
| crack | 94500 | 111000 | 94000 | 114000;363-364 gr3 bound |
| crack | 94000 | 114000 | 93000 | 116000;364-365 gr3 bound |
| crack | 93000 | 116000 | 92000 | 116500;365-366 gr3 bound |
| crack | 92000 | 116500 | 92000 | 118000;366-367 gr3 bound |
| crack | 92000 | 118000 | 93000 | 118500;367-368 gr3 bound |
| crack | 93000 | 118500 | 93000 | 120000;368-369 gr3 bound |
| crack | 93000 | 120000 | 92000 | 124000;369-370 gr3 bound |
| crack | 92000 | 124000 | 93000 | 124000;370-371 gr3 bound |

| | | | | |
|---|---|---|---|---|
| crack | 93000 | 124000 | 93500 | 125000;371-372 gr3 bound |
| crack | 93500 | 125000 | 90500 | 128500;372-373 gr3 bound |
| crack | 90500 | 128500 | 88000 | 126000;373-374 gr3 bound |
| crack | 88000 | 126000 | 86000 | 125000;374-341 gr3 bound |
| crack | 93500 | 125000 | 94000 | 124500;372-375 |
| crack | 94000 | 124500 | 94000 | 129000;375-376 gr4 bound centr: 97000,99000,124000,126000 |
| crack | 94000 | 129000 | 96000 | 130000;376-377 gr4 bound |
| crack | 96000 | 130000 | 97000 | 130000;377-378 gr4 bound |
| crack | 97000 | 130000 | 97000 | 131000;378-379 gr4 bound |
| crack | 97000 | 131000 | 98000 | 131500;379-380 gr4 bound |
| crack | 98000 | 131500 | 101500 | 131500;380-381 gr4 bound |
| crack | 101500 | 131500 | 103000 | 129000;381-382 gr4 bound |
| crack | 103000 | 129000 | 103000 | 127000;382-383 gr4 bound |
| crack | 103000 | 127000 | 102000 | 126000;383-384 gr4 bound |
| crack | 102000 | 126000 | 102000 | 124500;384-385 gr4 bound |
| crack | 102000 | 124500 | 101000 | 124000;385-386 gr4 bound |
| crack | 101000 | 124000 | 101000 | 123000;386-387 gr4 bound |
| crack | 101000 | 123000 | 102000 | 123000;387-388 gr4 bound |
| crack | 102000 | 123000 | 102000 | 121500;388-389 gr4 bound |
| crack | 102000 | 121500 | 101000 | 120000;389-390 gr4 bound |
| crack | 101000 | 120000 | 98000 | 119000;390-391 gr4 bound |
| crack | 98000 | 119000 | 94000 | 121000;391-392 gr4 bound |
| crack | 94000 | 121000 | 94000 | 124500;392-375 gr4 bound |
| crack | 94000 | 121000 | 94000 | 120000;392-393 |
| crack | 94000 | 120000 | 93500 | 118000;393-394 gr5 bound centr:94000,96000,117000,119000 |
| crack | 93500 | 118000 | 94000 | 116500;394-395 gr5 bound |
| crack | 94000 | 116500 | 95000 | 115000;395-396 gr5 bound |
| crack | 95000 | 115000 | 96500 | 116500;396-397 gr5 bound |
| crack | 96500 | 116500 | 97000 | 116500;397-398 gr5 bound |
| crack | 97000 | 116500 | 97000 | 118000;398-399 gr5 bound |
| crack | 97000 | 118000 | 94000 | 120000;399-393 gr5 bound |
| crack | 94500 | 111000 | 95500 | 111000;363-400 |
| crack | 95500 | 111000 | 96000 | 112500;400-401 gr6 bound centr:96000,98000,108000,110000 |
| crack | 96000 | 112500 | 97000 | 113000;401-402 gr6 bound |
| crack | 97000 | 113000 | 98500 | 112000;402-403 gr6 bound |
| crack | 98500 | 112000 | 99500 | 110000;403-404 gr6 bound |
| crack | 99500 | 110000 | 99500 | 107500;404-405 gr6 bound |
| crack | 99500 | 107500 | 99000 | 106000;405-406 gr6 bound |
| crack | 99000 | 106000 | 98000 | 106000;406-407 gr6 bound |
| crack | 98000 | 106000 | 97000 | 105500;407-408 gr6 bound |
| crack | 97000 | 105500 | 95000 | 108000;408-409 gr6 bound |
| crack | 95000 | 108000 | 95000 | 110000;409-410 gr6 bound |
| crack | 95000 | 110000 | 95500 | 111000;410-400 gr6 bound |
| crack | 86500 | 115000 | 91000 | 101000;285-332 |
| crack | 91000 | 101000 | 90500 | 99000;332-333 |
| crack | 90500 | 99000 | 91500 | 97000;333-320 |
| crack | 91000 | 101000 | 92500 | 98000;332-334 |
| crack | 92500 | 98000 | 97000 | 98000;334-335 |
| crack | 97000 | 98000 | 97000 | 97000;335-336 gr8 bound centr:98000,100000,97000,99000 |
| crack | 97000 | 97000 | 98000 | 96000;336-337 gr8 bound |
| crack | 98000 | 96000 | 99500 | 96000;337-338 gr8 bound |
| crack | 99500 | 96000 | 101000 | 98000;338-339 gr8 bound |
| crack | 101000 | 98000 | 99500 | 99500;339-340 gr8 bound |
| crack | 99500 | 99500 | 97000 | 98000;340-335 gr8 bound |
| crack | 92500 | 98000 | 96000 | 91500;334-411 |
| crack | 96000 | 91500 | 98500 | 86000;411-412 |
| crack | 98500 | 86000 | 100000 | 76000;412-415 |
| crack | 88000 | 86000 | 92000 | 82500;309-413 |
| crack | 92000 | 85500 | 92000 | 82500;311-413 |
| crack | 92000 | 82500 | 92000 | 82500;413-b393 |
| crack | 98000 | 76500 | 100000 | 76000;414-415 |
| ;crack | 92000 | 82500 | 94500 | 76000;413-427 |
| ;crack | 94500 | 76000 | 95500 | 64000;427-428 |
| ;crack | 95500 | 64000 | 96000 | 57000;428-429 |
| ;crack | 96000 | 57000 | 97000 | 48000;429-430 |
| ;crack | 97000 | 48000 | 98000 | 41000;430-431 |
| ;crack | 98000 | 41000 | 100500 | 33000;431-432 |
| ;crack | 100500 | 33000 | 103000 | 29500;432-433 |
| crack | 103000 | 29500 | 109500 | 22000;433-422 |
| crack | 100000 | 76000 | 101500 | 73000;415-416 |
| crack | 101500 | 73000 | 103000 | 69500;416-417 |
| crack | 103000 | 69500 | 107000 | 52000;417-418 |
| crack | 107000 | 52000 | 108500 | 46000;418-419 |
| crack | 108500 | 46000 | 110000 | 35000;419-420 |

| | | | | |
|---|---|---|---|---|
| crack | 110000 | 35000 | 109500 | 29000;420-421 |
| crack | 109500 | 29000 | 109500 | 22000;421-422 |
| crack | 109500 | 22000 | 109000 | 21000;422-423 |
| crack | 109000 | 21000 | 108500 | 15000;423-424 |
| crack | 108500 | 15000 | 110500 | 8500;424-425 |
| crack | 110500 | 8500 | 112500 | 0;425-426 |
| crack | 109500 | 22000 | 114000 | 17000;422-445 |
| crack | 114000 | 17000 | 117000 | 14500;445-446 |
| crack | 117000 | 14500 | 122500 | 6000;446-447 |
| crack | 122500 | 6000 | 122500 | 4500;447-448 |
| crack | 122500 | 4500 | 124000 | 3000;448-449 |
| crack | 101500 | 73000 | 107000 | 68000;416-434 |
| crack | 107000 | 68000 | 111500 | 59000;434-435 |
| crack | 111500 | 59000 | 112000 | 49000;435-436 |
| crack | 112000 | 49000 | 113000 | 41000;436-437 |
| crack | 113000 | 41000 | 117000 | 29000;437-438 |
| crack | 117000 | 29000 | 115000 | 28500;438-439 |
| crack | 115000 | 28500 | 115000 | 27000;439-440 |
| crack | 115000 | 27000 | 114000 | 26000;440-441 |
| crack | 109500 | 29000 | 114000 | 26000;421-441 |
| crack | 114000 | 26000 | 118500 | 23000;441-442 |
| crack | 118500 | 23000 | 120000 | 21000;442-443 |
| crack | 120000 | 21000 | 121500 | 20500;443-444 |
| crack | 117000 | 29000 | 123000 | 32000;438-450 |
| crack | 123000 | 32000 | 124000 | 31000;450-451 |
| crack | 124000 | 165000 | 123000 | 163000;452-453 |
| crack | 123000 | 163000 | 117000 | 160000;453-454 |
| crack | 117000 | 160000 | 117000 | 153000;454-455 |
| crack | 117000 | 153000 | 117500 | 145000;455-456 |
| crack | 117500 | 145000 | 115500 | 138000;456-457 |
| crack | 115500 | 138000 | 113000 | 135000;457-458 |
| crack | 113000 | 135000 | 113500 | 130000;458-459 |
| crack | 113500 | 130000 | 112500 | 125000;459-460 |
| crack | 112500 | 125000 | 112000 | 120000;460-461 |
| crack | 112000 | 120000 | 110000 | 114500;461-462 |
| crack | 110000 | 114500 | 106500 | 110000;462-463 |
| crack | 106500 | 110000 | 104000 | 105000;463-464 |
| crack | 104000 | 105000 | 104500 | 102000;464-465 |
| crack | 104500 | 102000 | 105500 | 100000;465-466 |
| crack | 105500 | 100000 | 106000 | 95000;466-467 |
| crack | 106000 | 95000 | 109500 | 84000;467-468 |
| crack | 109500 | 84000 | 111500 | 82000;468-469 |
| crack | 111500 | 82000 | 112000 | 80000;469-470 gr9 bound centr:112000,114000,80000,82000 |
| crack | 112000 | 80000 | 113000 | 78000;470-471 gr9 bound |
| crack | 113000 | 78000 | 114500 | 76500;471-472 gr9 bound |
| crack | 114500 | 76500 | 115000 | 77000;472-473 gr9 bound |
| crack | 115000 | 77000 | 115000 | 82000;473-474 gr9 bound |
| crack | 115000 | 82000 | 114000 | 84000;474-475 gr9 bound |
| crack | 114000 | 84000 | 113000 | 85000;475-476 gr9 bound |
| crack | 113000 | 85000 | 112000 | 85000;476-477 gr9 bound |
| crack | 112000 | 85000 | 111000 | 84000;477-478 gr9 bound |
| crack | 111000 | 84000 | 111500 | 82000;478-469 gr9 bound |
| crack | 114500 | 76500 | 115500 | 75000;472-479 |
| crack | 115500 | 75000 | 117000 | 70000;479-480 |
| crack | 117000 | 70000 | 120500 | 61000;480-481 |
| crack | 120500 | 61000 | 121000 | 59000;481-482 |
| crack | 121000 | 59000 | 120000 | 54500;482-483 |
| crack | 120000 | 54500 | 123000 | 45000;483-484 |
| crack | 123000 | 45000 | 122500 | 41000;484-485 |
| crack | 122500 | 41000 | 124000 | 39000;485-486 |
| crack | 123000 | 163000 | 122000 | 159000;453-487 |
| crack | 122000 | 159000 | 120000 | 147000;487-488 |
| crack | 120000 | 147000 | 119500 | 142000;488-489 |
| crack | 119500 | 142000 | 121000 | 137000;489-490 |
| crack | 121000 | 137000 | 121500 | 129000;490-491 |
| crack | 121500 | 129000 | 122000 | 122000;491-492 |
| crack | 122000 | 122000 | 121000 | 117000;492-493 |
| crack | 121000 | 117000 | 119500 | 115000;493-494 |
| crack | 119500 | 115000 | 115000 | 107000;494-495 |
| crack | 115000 | 107000 | 118500 | 105500;495-496 |
| crack | 118500 | 105500 | 117000 | 104000;496-497 |
| crack | 117000 | 104000 | 115000 | 100500;497-498 |
| crack | 115000 | 100500 | 115000 | 96000;498-499 |
| crack | 115000 | 96000 | 116000 | 92500;499-500 |
| crack | 116000 | 92500 | 119000 | 89000;500-501 |

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crack   119000  89000   121500   87500;501-515
crack   118500  105500  117000  102000;496-509
crack   117000  102000  117000   99000;509-510
crack   117000  99000   119000   94500;510-511
crack   119000  94500   121500   94500;511-512
crack   121500  94500   123000   92500;512-513
crack   123000  92500   122000   91000;513-514
crack   122000  91000   121500   87500;514-515
crack   121500  87500   121000   84500;515-516
crack   118500  105500  119500  104000;496-502
crack   119500  104000  119500  101000;502-503
crack   119500  101000  122000   98000;503-504
crack   122000  98000   124000   98000;504-505
crack   119500  101000  120000   97500;503-506
crack   120000  97500   123000   94500;506-507
crack   123000  94500   124000   94500;507-508
crack   113500  130000  114000  125000;459-520
crack   114000  125000  113000  114000;520-521
crack   113000  114000  112500  111000;521-522
crack   112500  111000  113500  108000;522-523
crack   113500  108000  113000   89500;523-524
crack   105500  100000  113000   89500;466-524
crack   113000  89500   120500   80000;524-525
crack   120500  80000   120500   77000;525-526
crack   120500  77000   118500   74000;526-527
crack   118500  74000   118000   71000;527-528
crack   118000  71000   120500   65000;528-532
crack   120500  65000   120500   61000;532-481
crack   121000  84500   120500   80000;516-525
crack   121000  84500   123000   82000;516-517
crack   123000  82000   124000   81000;517-518
crack   123000  82000   124000   86500;517-519
crack   124000  86500   122500   80000;517-529
crack   122500  80000   122500   76000;529-530
crack   122500  76000   120000   72000;530-531
crack   120000  72000   120500   65000;531-532
crack   124000  70000   123500   68500;533-534 gr10 bound centr: 122000,124000,66000,67000
crack   123500  68500   122500   67500;534-535 gr10 bound
crack   122500  67500   122500   65500;535-536 gr10 bound
crack   122500  65500   123000   64000;536-537 gr10 bound
crack   123000  64000   124000   63000;537-538 gr10 bound
crack   52000   176000  57000   169500;53-539
crack   57000   169500  56000   168000;539-540
crack   56000   168000  53000   168500;540-541
crack   53000   168500  49000   171000;541-542
crack   49000   171000  43500   171500;542-543
crack   43500   171500  44000   170000;543-544
crack   44000   170000  52000   168000;544-545
crack   52000   168000  49000   162000;545-546
crack   49000   162000  48000   161000;546-547
crack   48000   161000  47000   157000;547-548
crack   47000   157000  43000   150000;548-69

;Psuedo contacts to reduce block size and allow zoning
;crack  0       66000   39000    66000;Pj1(left block)
;crack  47000   71000   96000    71000;Pj2(mid block)
;crack  80000   135000  114000  135000;Pj3(rmid block)
;crack  90000   102000  106000  102000;Pj4(rmid block)
;crack  104000  70000   108000   70000;Pj5(rmid block)
;crack  90000   102000  106000  102000;Pj6(rmid block)
crack   88000   110000  90000   110000;Pj7(rmid block)
;crack  103000  127000  113000  127000;Pj8(rmid block)
crack   99000   107000  106000  107000;Pj9(rmid block)
crack   101000  98000   106000  98000;Pj10(rmid block)
;crack  55000   38000   59000   38000;Pj11(rmid block)
crack   93000   115000  95000   115000;Pj12(rmid block)

;-----------------------------------------------

;New 1490 granites geometry and faults (above data may be out-commented)
;denoted by b
crack   18500   200000  19000   197000;b1-b2
crack   19000   197000  21500   195000;b2-b3
crack   21500   200000  21500   195000;21-b3
crack   21500   195000  21500   189000;b3-22
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| | | | | |
|---|---|---|---|---|
| crack | 19000 | 197000 | 18000 | 195000;b2-b4 |
| crack | 18000 | 195000 | 21000 | 186000;b4-b6 |
| crack | 21500 | 189000 | 21000 | 186000;22-b6 |
| crack | 21000 | 186000 | 20000 | 182000;b6-23 |
| crack | 18000 | 195000 | 14000 | 191000;b4-b5 |
| crack | 14000 | 191000 | 11500 | 183000;b5-b7 |
| crack | 11500 | 183000 | 7500 | 178000;b7-b8 |
| crack | 7500 | 178000 | 9000 | 171000;b8-b9 |
| crack | 7500 | 178000 | 6000 | 176000;b8-b11 |
| crack | 9000 | 171000 | 6000 | 174000;b9-b10 |
| crack | 6000 | 174000 | 6000 | 176000;b10-b11 |
| crack | 6000 | 174000 | 6500 | 170000;b10-b17 |
| crack | 6000 | 176000 | 1500 | 170000;b11-13 |
| crack | 1500 | 170000 | 0 | 169000;13-b12 |
| crack | 0 | 169000 | 1000 | 157000;b12-b13 |
| crack | 1000 | 157000 | 3000 | 154000;b13-b14 |
| crack | 3000 | 154000 | 2000 | 152000;b14-b15 |
| crack | 2000 | 152000 | 0 | 151000;b15-b16 |
| crack | 6500 | 170000 | 8500 | 160000;b17-b18 |
| crack | 9500 | 162000 | 8500 | 160000;29-b18 |
| crack | 8500 | 160000 | 5000 | 155000;b18-15 |
| crack | 26000 | 200000 | 24000 | 194000;b19-b20 |
| crack | 24000 | 194000 | 23500 | 187000;b20-b21 |
| crack | 23500 | 187000 | 24000 | 184000;b21-b22 |
| crack | 24000 | 184000 | 23000 | 181000;b22-blank |
| crack | 23000 | 181000 | 19500 | 179000;blank-24 |
| crack | 24000 | 184000 | 23000 | 178000;b22-b23 |
| crack | 23000 | 178000 | 20000 | 171000;b23-b24 |
| crack | 20000 | 171000 | 20000 | 162500;b24-b25 |
| crack | 21000 | 163000 | 20000 | 162500;61-b25 |
| crack | 20000 | 162500 | 11000 | 158000;b25-62 |
| crack | 30000 | 200000 | 28000 | 197000;b26-b27 |
| crack | 28000 | 197000 | 27500 | 194000;b27-b28 |
| crack | 27500 | 194000 | 25500 | 193000;b28-b29 |
| crack | 27500 | 200000 | 25500 | 193000;25-b29 |
| crack | 25500 | 193000 | 24500 | 190000;b29-b30 |
| crack | 24500 | 190000 | 23000 | 185000;b30-26 |
| crack | 24500 | 190000 | 28000 | 186000;b30-b33 |
| crack | 32000 | 200000 | 27000 | 190000;b31-b32 |
| crack | 27000 | 190000 | 28000 | 186000;b32-b33 |
| crack | 28000 | 186000 | 30000 | 184000;b33-b34 |
| crack | 27000 | 190000 | 30000 | 187000;b32-b38 |
| crack | 30000 | 187000 | 30000 | 184000;b38-b34 |
| crack | 30000 | 184000 | 32500 | 176000;b34-b35 |
| crack | 32500 | 176000 | 34500 | 176000;b35-b36 |
| crack | 34500 | 176000 | 37500 | 171000;b36-b37 |
| crack | 38500 | 179000 | 37500 | 171000;58-b37 |
| crack | 37500 | 171000 | 37000 | 169000;b37-59 |
| crack | 30000 | 187000 | 31000 | 186000;b38-b39 |
| crack | 31000 | 186000 | 31500 | 183000;b39-b40 |
| crack | 31500 | 183000 | 34000 | 180000;b40-b41 |
| crack | 34000 | 180000 | 36500 | 175000;b41-b42 |
| crack | 36500 | 175000 | 38500 | 173000;b42-58 |
| crack | 31000 | 186000 | 38000 | 177000;b39-b43 |
| crack | 38000 | 179000 | 38000 | 177000;57-b43 |
| crack | 38000 | 177000 | 38500 | 173000;b43-58 |
| crack | 37500 | 200000 | 37500 | 197000;b44-b45 |
| crack | 37500 | 197000 | 39500 | 196000;b45-b46 |
| crack | 39500 | 196000 | 43000 | 192000;b46-b47 |
| crack | 38500 | 200000 | 39500 | 196000;b48-b46 |
| crack | 39500 | 200000 | 42500 | 195000;b49-b51 |
| crack | 41000 | 200000 | 42500 | 195000;b50-b51; gr12 bound centr:55000,68000,184000,193000 |
| crack | 42500 | 195000 | 43000 | 192000;b51-b47 |
| crack | 43000 | 192000 | 43000 | 188000;b47-b52 |
| crack | 43000 | 188000 | 48000 | 182500;b52-b53 |
| crack | 48000 | 182500 | 49500 | 178000;b53-b54 |
| crack | 49500 | 178000 | 51000 | 177000;b54-b55 |
| crack | 51000 | 177000 | 52000 | 178500;b55-b56 |
| crack | 52000 | 178500 | 53000 | 179500;b56-40 |
| crack | 64000 | 181000 | 62000 | 181000;36-37 gr1/12 bound |
| crack | 62000 | 181000 | 61000 | 180000;37-38 gr1/12 bound |
| crack | 61000 | 180000 | 54500 | 180000;38-39 gr1/12 bound |
| crack | 54500 | 180000 | 53000 | 179500;39-40 gr1/12 bound |
| crack | 64000 | 181000 | 64500 | 182500;36-b57 |
| crack | 64500 | 182500 | 65500 | 182500;b57-b58 |

| | | | | |
|---|---|---|---|---|
| crack | 65500 | 182500 | 67000 | 180000;b58-b59 |
| crack | 67000 | 180000 | 67000 | 178000;b59-b60 |
| crack | 67000 | 178000 | 70500 | 178000;b60-b61 |
| crack | 70500 | 178000 | 70000 | 179500;b61-b62 |
| crack | 70000 | 179500 | 68000 | 180500;b62-b63 |
| crack | 68000 | 180500 | 68000 | 183000;b63-b64 |
| crack | 68000 | 183000 | 70000 | 182500;b64-b65 |
| crack | 70000 | 182500 | 73000 | 180000;b65-b66 |
| crack | 73000 | 180000 | 75500 | 181000;b66-b67 |
| crack | 75500 | 181000 | 75500 | 182500;b67-b68 |
| crack | 75500 | 182500 | 79000 | 184500;b68-b69 |
| crack | 79000 | 184500 | 81000 | 187000;b69-b70 |
| crack | 81000 | 187000 | 84000 | 193000;b70-b80 |
| crack | 84000 | 193000 | 85000 | 195000;b80-b81 |
| crack | 85000 | 195000 | 83000 | 195500;b81-b82 |
| crack | 83000 | 195500 | 81000 | 197500;b82-b83 |
| crack | 81000 | 197500 | 80000 | 196000;b83-b84 |
| crack | 80000 | 196000 | 79000 | 197000;b84-b85 |
| crack | 79000 | 197000 | 78000 | 198000;b85-b86 |
| crack | 78000 | 198000 | 77000 | 200000;b86-b87 |
| crack | 84000 | 193000 | 85500 | 192500;b80-b89 |
| crack | 87500 | 200000 | 85500 | 192500;b88-b89 |
| crack | 85500 | 192500 | 96000 | 189000;b89-b90 |
| crack | 96000 | 189000 | 99000 | 200000;b90-b91 |
| crack | 99000 | 190000 | 105000 | 194500;241-b92 |
| crack | 105000 | 194500 | 105000 | 196000;b92-250 |
| crack | 108000 | 200000 | 108500 | 193000;b93-b94 |
| crack | 108500 | 193000 | 112000 | 200000;b94-b95 |
| crack | 99000 | 182000 | 99000 | 179000;253-b96 |
| crack | 99000 | 179000 | 96500 | 176000;b96-b97 |
| crack | 96500 | 176000 | 94000 | 175000;b97-b98 |
| crack | 94000 | 175000 | 92000 | 176000;b98-b101 |
| crack | 94000 | 175000 | 92000 | 173000;b98-b99 |
| crack | 92000 | 173000 | 91500 | 176500;b99-b100 |
| crack | 92000 | 176000 | 91500 | 176500;b101-b100 |
| crack | 91500 | 176500 | 91000 | 179000;b100-255 |
| crack | 91000 | 179000 | 88000 | 180000;255-b102 |
| crack | 91000 | 179000 | 90000 | 178000;255-b104 |
| crack | 88000 | 180000 | 87500 | 179500;b102-b103 |
| crack | 87500 | 179500 | 90000 | 178000;b103-b104 |
| crack | 87500 | 179500 | 85000 | 177000;b103-b105 |
| crack | 85000 | 177000 | 82000 | 174000;b105-258 |
| crack | 85000 | 177000 | 84000 | 182000;b105-b106 |
| crack | 84000 | 182000 | 85000 | 185000;b106-239 |
| crack | 85000 | 177000 | 88000 | 176000;b105-b107 |
| crack | 90000 | 178000 | 88000 | 176000;b104-b107 |
| crack | 88000 | 176000 | 87000 | 175000;b107-256 |
| crack | 81000 | 187000 | 79000 | 181000;b70-b108 |
| crack | 79000 | 181000 | 72000 | 175000;b108-225 |
| crack | 72000 | 175000 | 69000 | 173000;225-b109 |
| crack | 69000 | 173000 | 65000 | 170000;b109-224 |
| crack | 69000 | 173000 | 63000 | 178000;b109-b110 |
| crack | 63000 | 178000 | 64000 | 181000;b110-36 |
| crack | 63000 | 178000 | 63000 | 177000;b110-52 |
| crack | 65500 | 182500 | 64000 | 173000;b58-b111 |
| crack | 64000 | 173000 | 65000 | 170000;b111-224 |
| crack | 64000 | 173000 | 57000 | 171000;b111-44 |
| crack | 65000 | 170000 | 72000 | 165000;224-b112 |
| crack | 72000 | 165000 | 73000 | 163000;b112-b113 |
| crack | 73000 | 163000 | 72000 | 151500;b113-b114 |
| crack | 68000 | 158000 | 72000 | 151500;260-b114 |
| crack | 72000 | 151500 | 82000 | 133000;b114-261 |
| crack | 72000 | 165000 | 80000 | 159000;b112-b115 |
| crack | 80000 | 159000 | 79000 | 165000;b115-228 |
| crack | 80000 | 159000 | 80000 | 158000;b115-b116 |
| crack | 80000 | 158000 | 88000 | 155000;b116-b117 |
| crack | 88000 | 155000 | 95000 | 153000;b117-b118 |
| crack | 95000 | 153000 | 97000 | 152000;b118-b119 |
| crack | 97000 | 152000 | 96500 | 150000;b119-b120 |
| crack | 96500 | 150000 | 96500 | 145000;b120-b121 |
| crack | 96500 | 145000 | 96500 | 141000;b121-b122 |
| crack | 96500 | 141000 | 95000 | 135000;b122-b123 |
| crack | 96500 | 145000 | 95000 | 141000;b121-b124 |
| crack | 95000 | 135000 | 95000 | 141000;b123-b124 |
| crack | 95000 | 135000 | 94000 | 129000;b123-376 |

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|---|---|---|---|---|
| crack | 97000 | 152000 | 117000 | 144000;b119-b125 |
| crack | 117500 | 145000 | 117000 | 144000;456-b125 |
| crack | 117000 | 184500 | 115500 | 138000;b125-457 |
| crack | 103000 | 127000 | 108000 | 123000;383-b126 |
| crack | 108000 | 123000 | 112500 | 124000;b126-b127 |
| crack | 112500 | 124000 | 114000 | 123000;b127-b128 |
| crack | 114000 | 123000 | 114000 | 124000;b128-b129 |
| crack | 114000 | 124000 | 122000 | 122000;b129-492 |
| crack | 47000 | 179000 | 48000 | 177000;54-b130 |
| crack | 48000 | 177000 | 51000 | 175000;b130-b131 |
| crack | 51000 | 175000 | 53250 | 175000;b131-b132 |
| crack | 45000 | 179000 | 56500 | 169000;55-b133 |
| crack | 57000 | 169500 | 56500 | 169000;539-b133 |
| crack | 56500 | 169000 | 56000 | 168000;b133-540 |
| crack | 56000 | 168000 | 57000 | 165000;540-b134 |
| crack | 57000 | 165000 | 54000 | 165500;b134-b135 |
| crack | 54000 | 165500 | 53000 | 165000;b135-b136 |
| crack | 53000 | 165000 | 52000 | 163500;b136-b137 |
| crack | 52000 | 163500 | 58000 | 156000;b137-b138 |
| crack | 58000 | 156000 | 62000 | 150000;b138-b139 |
| crack | 62000 | 150000 | 69000 | 143500;b139-b140 |
| crack | 69000 | 143500 | 73000 | 137500;b140-b141 |
| crack | 73000 | 137500 | 74000 | 134000;b141-b142 |
| crack | 74000 | 134000 | 73000 | 129000;b142-b143 |
| ;----------------------- | | | | |
| crack | 73000 | 129000 | 71000 | 126000;b143-b144 |
| crack | 71000 | 126000 | 74000 | 124000;b144-b145 |
| crack | 74000 | 124000 | 77500 | 124000;b145-b146 |
| crack | 77500 | 124000 | 83000 | 121000;b146-b147 |
| crack | 83000 | 121000 | 85500 | 119000;b147-b148 |
| crack | 84000 | 125000 | 85500 | 119000;274-b148 |
| crack | 85500 | 119000 | 86500 | 115000;b148-285 |
| crack | 62000 | 150000 | 64000 | 139000;b139-b153 |
| crack | 64000 | 139000 | 64000 | 133000;b153-b152 |
| crack | 64000 | 133000 | 68000 | 124000;b152-b151 |
| crack | 71000 | 126000 | 68000 | 124000;b144-b151 |
| crack | 71000 | 126000 | 69500 | 122000;b144-b149 |
| crack | 69500 | 122000 | 68500 | 120000;b149-b150 |
| crack | 68500 | 120000 | 68000 | 124000;b150-b151 |
| crack | 68000 | 124000 | 60500 | 114000;b151-b180 |
| crack | 69500 | 122000 | 70000 | 120000;b149-b154 |
| crack | 70000 | 120000 | 72000 | 118000;b154-b155 |
| crack | 72000 | 118000 | 74000 | 117500;b155-b156 |
| crack | 74000 | 117500 | 77000 | 115000;b156-b157 |
| crack | 77000 | 115000 | 79500 | 111500;b157-b158 |
| crack | 79500 | 111500 | 81000 | 113000;b158-296 |
| crack | 79500 | 111500 | 78000 | 110000;b158-297 |
| crack | 70000 | 120000 | 72000 | 112000;b154-b159 |
| crack | 72000 | 112000 | 74000 | 107500;b159-b160 |
| crack | 74000 | 107500 | 76500 | 105000;b160-b170 |
| crack | 76500 | 105000 | 78500 | 104000;b170-b171 |
| crack | 78500 | 104000 | 77500 | 107000;b171-299 |
| crack | 78500 | 104000 | 81500 | 100000;b171-300 |
| crack | 76500 | 105000 | 76500 | 103000;b170-b172 |
| crack | 76500 | 103000 | 81500 | 100000;b172-300 |
| crack | 72000 | 112000 | 72000 | 110000;b159-b173 |
| crack | 72000 | 110000 | 73500 | 105000;b173-b174 |
| crack | 73500 | 105000 | 76500 | 103000;b174-b172 |
| crack | 73500 | 105000 | 77000 | 94000;b174-b175 |
| crack | 77000 | 94000 | 80000 | 89500;b175-b385 |
| crack | 81500 | 100000 | 82000 | 98000;300-b176 |
| crack | 82000 | 98000 | 82000 | 97000;b176-b177 |
| crack | 82000 | 97000 | 85500 | 95000;b177-b178 |
| crack | 85500 | 95000 | 86000 | 96000;b178-304 |
| crack | 85500 | 95000 | 85000 | 94000;b178-305 |
| crack | 82000 | 97000 | 83000 | 91000;b177-b179 |
| crack | 83000 | 91000 | 85000 | 89000;b179-308 |
| crack | 52000 | 163500 | 51000 | 161000;b137-b181 |
| crack | 51000 | 161000 | 51500 | 154000;b181-b182 |
| crack | 51500 | 154000 | 51500 | 147000;b182-b183 |
| crack | 51500 | 147000 | 52000 | 144000;b183-b184 |
| crack | 52000 | 144000 | 54000 | 141000;b184-b185 |
| crack | 54000 | 141000 | 55000 | 137000;b185-b186 |
| crack | 55000 | 137000 | 57000 | 128000;b186-b187 |
| crack | 57000 | 128000 | 59000 | 124000;b187-b188 |

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|---|---|---|---|---|
| crack | 59000 | 124000 | 60500 | 121000;b188-b189 |
| crack | 60500 | 121000 | 60500 | 114000;b189-b180 |
| crack | 60500 | 114000 | 59000 | 112000;b180-b197 |
| crack | 51000 | 161000 | 49000 | 157000;b181-b190 |
| crack | 49000 | 157000 | 49500 | 152000;b190-b191 |
| crack | 49500 | 152000 | 51500 | 154000;b191-b182 |
| crack | 49500 | 152000 | 49500 | 150000;b191-b192 |
| crack | 49500 | 150000 | 51500 | 147000;b192-b183 |
| crack | 49500 | 150000 | 50000 | 140000;b192-b193 |
| crack | 50000 | 140000 | 55000 | 131000;b193-b194 |
| crack | 55000 | 131000 | 57500 | 125000;b194-b195 |
| crack | 57500 | 125000 | 58500 | 121000;b195-b196 |
| crack | 58500 | 121000 | 59000 | 112000;b196-b197 |
| crack | 49500 | 152000 | 49000 | 150000;b191-b198 |
| crack | 49000 | 150000 | 49000 | 140000;b198-b199 |
| crack | 49000 | 140000 | 51000 | 135000;b199-b200 |
| crack | 51000 | 135000 | 51500 | 133000;b200-b201 |
| crack | 51500 | 133000 | 44000 | 142000;b201-96 |
| crack | 51500 | 133000 | 53000 | 131000;b201-97 |
| crack | 59000 | 112000 | 62000 | 109000;b197-b202 |
| crack | 62000 | 109000 | 63500 | 106000;b202-b203 |
| crack | 63500 | 106000 | 67500 | 98000;b203-b204 |
| crack | 67500 | 98000 | 68000 | 95000;b204-b205 |
| crack | 68000 | 95000 | 73500 | 86000;b205-b456 |
| crack | 68000 | 95000 | 64000 | 102000;b205-b206 |
| crack | 64000 | 102000 | 63500 | 106000;b206-b203 |
| crack | 62000 | 109000 | 62000 | 101000;b202-b207 |
| crack | 62000 | 101000 | 63500 | 98000;b207-b208 |
| crack | 63500 | 98000 | 62500 | 93000;b208-b209 |
| crack | 62500 | 93000 | 62500 | 86000;b209-b210 |
| crack | 62500 | 86000 | 63000 | 83000;b210-b211 |
| crack | 63000 | 83000 | 64500 | 81000;b211-b450 |
| crack | 59000 | 112000 | 57000 | 109000;b197-b212 |
| crack | 57000 | 109000 | 54000 | 105000;b212-b213 |
| crack | 54000 | 105000 | 51500 | 104000;b213-b243 |
| crack | 54000 | 105000 | 55500 | 103000;b213-b214 |
| crack | 55500 | 103000 | 55000 | 102000;b214-b244 |
| crack | 55000 | 112000 | 54000 | 105000;99-b213 |
| crack | 57000 | 109000 | 58000 | 102000;b212-blank |
| crack | 58000 | 102000 | 58000 | 96500;blank-b215 |
| crack | 58000 | 96500 | 56000 | 94000;b215-b247 |
| crack | 56000 | 94000 | 55000 | 91000;b247-b216 |
| crack | 55000 | 91000 | 54000 | 89000;b216-b217 |
| crack | 54000 | 89000 | 51500 | 86000;b217-b218 |
| crack | 51500 | 86000 | 51000 | 84000;b218-b219 |
| crack | 51000 | 84000 | 53000 | 81500;b219-b220 |
| crack | 53000 | 81500 | 54500 | 79500;b220-b221 |
| crack | 54500 | 79500 | 60000 | 69000;b221-b445 |
| crack | 54500 | 79500 | 55000 | 74000;b221-b222 |
| crack | 55000 | 74000 | 57000 | 68000;b222-b223 |
| crack | 57000 | 68000 | 59000 | 63000;b223-b224 |
| crack | 59000 | 63000 | 61000 | 53000;b224-b375 |
| crack | 53000 | 81500 | 52500 | 79000;b220-b225 |
| crack | 52500 | 79000 | 51500 | 75000;b225-b226 |
| crack | 51500 | 75000 | 53000 | 71000;b226-b227 |
| crack | 53000 | 71000 | 56500 | 64000;b227-b228 |
| crack | 56500 | 64000 | 59000 | 57000;b228-b229 |
| crack | 59000 | 57000 | 60000 | 51000;b229-b376 |
| crack | 25000 | 118000 | 30000 | 117500;85-b230 gr13 co-ord cntr:20000,37000,93000,102000 |
| crack | 30000 | 117500 | 33000 | 117000;b230-b231 |
| crack | 33000 | 117000 | 36000 | 116000;b231-b232 |
| crack | 36000 | 116000 | 38000 | 114500;b232-b233 |
| crack | 38000 | 114500 | 41000 | 114500;b233-b234 |
| crack | 41000 | 114500 | 43000 | 113000;b234-b235 |
| crack | 43000 | 113000 | 46000 | 111000;b235-b236 |
| crack | 46000 | 111000 | 46500 | 109000;b236-b237 |
| crack | 46000 | 111000 | 52000 | 114000;b236-b201d |
| crack | 52000 | 114000 | 53000 | 116000;b201d-b201c |
| crack | 53000 | 116000 | 55000 | 117000;b201c-b201b |
| crack | 55000 | 117000 | 55000 | 120000;b201b-98 |
| crack | 55000 | 117000 | 55000 | 112000;b201b-99 |
| crack | 46500 | 109000 | 47000 | 106000;b237-b238 |
| crack | 47000 | 106000 | 46000 | 105000;b238-b239 |
| crack | 46000 | 105000 | 45000 | 101000;b239-b240 |
| crack | 45000 | 101000 | 47000 | 104500;b240-b241 |

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|---|---|---|---|---|
| crack | 47000 | 104500 | 49000 | 105000;b241-b242 |
| crack | 49000 | 105000 | 51500 | 104000;b242-b243 |
| crack | 51500 | 104000 | 55000 | 102000;b243-b244 |
| crack | 55000 | 102000 | 56000 | 100000;b244-b245 |
| crack | 56000 | 100000 | 56500 | 97000;b245-b246 |
| crack | 56500 | 97000 | 56000 | 94000;b246-b247 |
| crack | 56000 | 94000 | 52500 | 91000;b247-b248 |
| crack | 52500 | 91000 | 52000 | 89000;b248-100 |
| crack | 52000 | 89000 | 47000 | 85500;100-b249 |
| crack | 47000 | 85500 | 44000 | 81000;b249-102 |
| crack | 47000 | 85500 | 45000 | 84000;b249-101 |
| crack | 45000 | 84000 | 39500 | 82000;101-b250 |
| crack | 39500 | 82000 | 39000 | 80000;b250-b251 |
| crack | 39000 | 80000 | 35000 | 78000;b251-b252 |
| crack | 35000 | 78000 | 36000 | 79000;b252-b253 |
| crack | 36000 | 79000 | 35500 | 80000;b253-b254 |
| crack | 35500 | 80000 | 36000 | 82000;b254-b255 |
| crack | 36000 | 82000 | 34000 | 81500;b255-b256 |
| crack | 34000 | 81500 | 32000 | 80000;b256-b257 |
| crack | 32000 | 80000 | 31000 | 82000;b257-b258 |
| crack | 31000 | 82000 | 32000 | 83000;b258-b259 |
| crack | 32000 | 83000 | 28000 | 84000;b259-b260 |
| crack | 28000 | 84000 | 26000 | 83500;b260-b261 |
| crack | 26000 | 83500 | 17000 | 83500;b261-b262 |
| crack | 17000 | 83500 | 12000 | 87000;b262-b263 |
| crack | 12000 | 87000 | 8000 | 92000;b263-b264 |
| crack | 8000 | 92000 | 4500 | 97000;b264-b265 |
| crack | 4500 | 97000 | 3000 | 101000;b265-b266 |
| crack | 3000 | 101000 | 1000 | 103000;b266-b267 |
| crack | 1000 | 103000 | 0 | 104500;b267-b268 gr13 co-ords |
| crack | 1000 | 103000 | 2000 | 100000;b267-b269 |
| crack | 2000 | 100000 | 3500 | 88000;b269-b270 |
| crack | 3500 | 88000 | 8000 | 92000;b270-b264 |
| crack | 3500 | 88000 | 4000 | 83500;b270-b274 |
| crack | 0 | 85000 | 1000 | 85000;b271-b272 gr14 co-ords cntr:6000,24000,45000,66000 |
| crack | 1000 | 85000 | 3000 | 83500;b272-b273 |
| crack | 3000 | 83500 | 4000 | 83500;b273-b274 |
| crack | 4000 | 83500 | 10000 | 82000;b274-b275 |
| crack | 10000 | 82000 | 14000 | 80500;b275-b276 |
| crack | 14000 | 80500 | 18000 | 78000;b276-b277 |
| crack | 18000 | 78000 | 23000 | 71000;b277-b278 |
| crack | 23000 | 71000 | 23500 | 68000;b278-b279 |
| crack | 23500 | 68000 | 24500 | 66000;b279-b280 |
| crack | 24500 | 66000 | 26000 | 60500;b280-b281 |
| crack | 26000 | 60500 | 28000 | 58000;b281-b282 |
| crack | 28000 | 58000 | 28000 | 52000;b282-b283 |
| crack | 28000 | 52000 | 29000 | 51000;b283-b284 |
| crack | 29000 | 51000 | 29000 | 43000;b284-b285 |
| crack | 29000 | 43000 | 31000 | 39000;b285-b286 |
| crack | 31000 | 39000 | 31000 | 38000;b286-b287 |
| crack | 31000 | 38000 | 30500 | 35000;b287-b288 |
| crack | 31000 | 38000 | 34000 | 36000;b287-203 |
| crack | 30500 | 35000 | 30000 | 33000;b288-b289 |
| crack | 30500 | 35000 | 36000 | 31000;b288-211 |
| crack | 30000 | 33000 | 29000 | 28000;b289-b290 |
| crack | 30000 | 33000 | 35000 | 31000;b289-b214 |
| crack | 29000 | 28000 | 32000 | 30000;b290-blank |
| crack | 32000 | 30000 | 36000 | 25000;blank-b306 |
| crack | 36000 | 25000 | 35000 | 28000;b306-215 |
| crack | 36000 | 25000 | 36500 | 24000;b306-216 |
| crack | 29000 | 28000 | 22000 | 31000;b290-b291 |
| crack | 22000 | 31000 | 16000 | 34000;b291-b292 |
| crack | 16000 | 34000 | 12000 | 37000;b292-b293 |
| crack | 12000 | 37000 | 9000 | 39000;b293-b294 |
| crack | 9000 | 39000 | 4000 | 41500;b294-b295 |
| crack | 4000 | 41500 | 2000 | 45000;b295-b296 |
| crack | 2000 | 45000 | 0 | 47500;b296-b297 |
| crack | 31000 | 82000 | 29000 | 79000;b258-b298 |
| crack | 29000 | 79000 | 28500 | 71000;b298-b299 |
| crack | 28500 | 71000 | 30500 | 63000;b299-b300 |
| crack | 30500 | 63000 | 31000 | 55000;b300-209 |
| crack | 31000 | 55000 | 33000 | 53500;209-b305 |
| crack | 33000 | 53500 | 34000 | 53000;b305-196 |
| crack | 35000 | 78000 | 32000 | 74000;b252-b301 |
| crack | 32000 | 74000 | 31500 | 70000;b301-b302 |

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|---|---|---|---|---|
| crack | 31500 | 70000 | 32000 | 65000;b302-b303 |
| crack | 32000 | 65000 | 33000 | 62000;b303-b304 |
| crack | 33000 | 62000 | 33000 | 53500;b304-b305 |
| crack | 51000 | 11000 | 53000 | 10000;159-b307 gr15 bound centr:49000,53000,3000,7000 |
| crack | 53000 | 10000 | 54500 | 7000;b307-b308 |
| crack | 54500 | 7000 | 55500 | 2000;b308-b309 |
| crack | 55500 | 2000 | 55000 | 0;b309-b310 |
| crack | 55500 | 39000 | 56500 | 33000;b311-b312 gr 16 bound centr:50500,54000,30000,33000 |
| crack | 56500 | 33000 | 58000 | 35000;b312-129 |
| crack | 56500 | 33000 | 55000 | 31000;b312-b130 |
| crack | 55000 | 31000 | 53500 | 30000;130-b313 |
| crack | 53500 | 30000 | 53000 | 28500;b313-b314 |
| crack | 53000 | 28500 | 51000 | 25000;b314-b315 |
| crack | 51000 | 25000 | 49500 | 25000;b315-b316 |
| crack | 49500 | 25000 | 49000 | 26000;b316-b317 |
| crack | 49000 | 26000 | 47500 | 26000;b317-b318 |
| crack | 47500 | 26000 | 48000 | 32000;b318-b319 |
| crack | 48000 | 32000 | 53000 | 35000;b319-b320 |
| crack | 53000 | 35000 | 53500 | 36500;b320-b321 |
| crack | 53500 | 36500 | 55000 | 38000;b321-137 |
| crack | 55000 | 38000 | 55500 | 39000;137-b311 |
| crack | 57000 | 27000 | 59000 | 28000;b322-b323 gr 17 bound centr:64000,73000,26250,27750 |
| crack | 59000 | 28000 | 61500 | 28000;b323-b324 |
| crack | 61500 | 28000 | 63000 | 28500;b324-b325 |
| crack | 63000 | 28500 | 68500 | 28000;b325-b326 |
| crack | 68500 | 28000 | 70000 | 29000;b326-b327 |
| crack | 70000 | 29000 | 71500 | 29000;b327-b328 |
| crack | 71500 | 29000 | 73000 | 29000;b328-b329 |
| crack | 73000 | 29000 | 74000 | 28500;b329-b330 |
| crack | 74000 | 28500 | 75000 | 28000;b330-b331 |
| crack | 75000 | 28000 | 78000 | 28000;b331-b332 |
| crack | 78000 | 28000 | 80000 | 27000;b332-b333 |
| crack | 80000 | 27000 | 80500 | 25500;b333-b334 |
| crack | 80500 | 25500 | 79000 | 26000;b334-b335 |
| crack | 79000 | 26000 | 77000 | 25000;b335-b336 |
| crack | 77000 | 25000 | 75000 | 24000;b336-b337 |
| crack | 75000 | 24000 | 71500 | 26000;b337-b338 |
| crack | 71500 | 26000 | 70000 | 26000;b338-b339 |
| crack | 70000 | 26000 | 69000 | 23000;b339-169 |
| crack | 70000 | 26000 | 69000 | 26000;b339-b340 |
| crack | 69000 | 26000 | 68000 | 25500;b340-b341 |
| crack | 68000 | 25500 | 66000 | 25500;b341-b342 |
| crack | 66000 | 25500 | 64000 | 25000;b342-b343 |
| crack | 64000 | 25000 | 61500 | 25000;b343-b344 |
| crack | 61500 | 25000 | 59000 | 22000;b344-b345 |
| crack | 59000 | 22000 | 57000 | 25000;b345-b346 |
| crack | 57000 | 25000 | 57000 | 27000;b346-b322 |
| crack | 57000 | 25000 | 53000 | 18000;b346-162 |
| crack | 59000 | 22000 | 59500 | 18000;b345-b347 |
| crack | 59500 | 18000 | 57500 | 12000;b347-b348 |
| crack | 57500 | 12000 | 57000 | 6000;b348-b349 |
| crack | 57000 | 6000 | 56000 | 4000;b349-165 |
| crack | 57000 | 6000 | 60000 | 14000;b349-167 |
| crack | 77000 | 25000 | 76000 | 23000;b336-b350 |
| crack | 76000 | 23000 | 73000 | 19000;b350-b351 |
| crack | 73000 | 19000 | 68000 | 15000;b351-b352 |
| crack | 68000 | 15000 | 66000 | 12000;b352-b353 |
| crack | 66000 | 12000 | 63000 | 0;b353-b354 |
| crack | 74000 | 28500 | 78000 | 33500;b330-b355 |
| crack | 78000 | 33500 | 79000 | 36000;b355-355b |
| crack | 79000 | 36000 | 79500 | 39000;355b-355c |
| crack | 78000 | 33500 | 72000 | 36000;b355-b356 |
| crack | 78000 | 33500 | 80500 | 32000;b355-b426 |
| crack | 72000 | 36000 | 71500 | 29000;b356-b328 |
| crack | 72000 | 36000 | 71500 | 43000;b356-b357 |
| crack | 71500 | 43000 | 73500 | 51000;b357-b358 |
| crack | 73500 | 51000 | 73000 | 55000;b358-b439 |
| crack | 59000 | 28000 | 61000 | 34000;b323-b359 |
| crack | 61000 | 34000 | 63000 | 39000;b359-b360 |
| crack | 63000 | 39000 | 63500 | 44000;b360-b364 |
| crack | 57000 | 27000 | 60000 | 34000;b322-b361 |
| crack | 60000 | 34000 | 61000 | 43000;b361-b362 |
| crack | 61000 | 43000 | 63000 | 43500;b362-b363 gr 18 bound cntr:63000,68000,48000,52000 |
| crack | 63000 | 43500 | 63500 | 44000;b363-b364 |
| crack | 63500 | 44000 | 64500 | 44500;b364-b365 |

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|---|---|---|---|---|
| crack | 64500 | 44500 | 69000 | 48000;b365-b366 |
| crack | 69000 | 48000 | 71000 | 51000;b366-b367 |
| crack | 71000 | 51000 | 71500 | 53000;b367-b368 |
| crack | 71500 | 53000 | 70000 | 56000;b368-b369 |
| crack | 70000 | 56000 | 68000 | 55500;b369-b370 |
| crack | 68000 | 55500 | 67000 | 56000;b370-b371 |
| crack | 67000 | 56000 | 65000 | 60000;b371-b442 |
| crack | 67000 | 56000 | 66000 | 56000;b371-b372 |
| crack | 66000 | 56000 | 63500 | 55500;b372-b373 |
| crack | 63500 | 55500 | 63000 | 53500;b373-b374 |
| crack | 63000 | 53500 | 61000 | 53000;b374-b375 |
| crack | 61000 | 53000 | 60000 | 51000;b375-b376 |
| crack | 60000 | 51000 | 60000 | 50000;b376-b377 |
| crack | 60000 | 50000 | 61000 | 48000;b377-b378 |
| crack | 61000 | 48000 | 61000 | 46000;b378-b379 |
| crack | 61000 | 46000 | 60000 | 45500;b379-b380 |
| crack | 60000 | 45500 | 61000 | 43000;b380-b362 |
| crack | 69000 | 98000 | 71000 | 97500;b381-b382 gr 19 bound centr:82500,96000,44000,70000 |
| crack | 71000 | 97500 | 73000 | 96000;b382-b383 |
| crack | 73000 | 96000 | 79000 | 89000;b383-b384 |
| crack | 79000 | 89000 | 80000 | 89500;b384-b385 |
| crack | 80000 | 89500 | 82000 | 89500;b385-b386 |
| crack | 82000 | 89500 | 82000 | 87000;b386-b387 |
| crack | 82000 | 87000 | 84000 | 86500;b387-b388 |
| crack | 84000 | 86500 | 85000 | 85000;b388-b389 |
| crack | 85000 | 85000 | 87500 | 84000;b389-b390 |
| crack | 87500 | 84000 | 90000 | 83500;b390-b391 |
| crack | 90000 | 83500 | 91000 | 80500;b391-b392 |
| crack | 91000 | 80500 | 92000 | 82500;b392-413 |
| crack | 92000 | 82500 | 94000 | 82500;413-b393 |
| crack | 92000 | 82500 | 96000 | 77500;b393-b394 |
| crack | 96000 | 77500 | 98500 | 74000;b394-b395 |
| crack | 98500 | 74000 | 97000 | 72000;b395-b396 |
| crack | 97000 | 72000 | 97000 | 69000;b396-b397 |
| crack | 97000 | 69000 | 99500 | 67000;b397-b398 |
| crack | 99500 | 67000 | 99500 | 64000;b398-b399 |
| crack | 99500 | 64000 | 102000 | 61500;b399-b400 |
| crack | 102000 | 61500 | 103000 | 57000;b400-b401 |
| crack | 103000 | 57000 | 107000 | 52000;b401-418 |
| crack | 107000 | 52000 | 107000 | 48000;418-b402 |
| crack | 107000 | 48000 | 107000 | 46000;b402-b403 |
| crack | 107000 | 46000 | 106500 | 44000;b403-b404 |
| crack | 106500 | 44000 | 108000 | 42000;b404-b405 |
| crack | 108000 | 42000 | 109000 | 41000;b405-b406 |
| crack | 109000 | 41000 | 108500 | 46000;b406-419 |
| crack | 109000 | 41000 | 110000 | 35000;b406-420 |
| crack | 108000 | 42000 | 109000 | 36000;b405-b407 |
| crack | 109000 | 36000 | 107500 | 33000;b407-b408 |
| crack | 107500 | 33000 | 109500 | 31000;b408-b409 |
| crack | 109500 | 31000 | 110000 | 35000;b409-420 |
| crack | 109500 | 31000 | 109500 | 29000;b409-421 |
| crack | 107500 | 33000 | 106000 | 30000;b408-b410 |
| crack | 106000 | 30000 | 103000 | 29500;b410-433 |
| crack | 103000 | 29500 | 102500 | 26000;433-b411 |
| crack | 102500 | 26000 | 102000 | 24000;b411-412 |
| crack | 102000 | 24000 | 97000 | 20000;412-b413 |
| crack | 97000 | 20000 | 99000 | 17000;b413-b414 |
| crack | 99000 | 17000 | 99000 | 12000;b414-b415 |
| crack | 99000 | 12000 | 97500 | 9000;b415-b416 |
| crack | 97500 | 9000 | 96000 | 7000;b416-b417 |
| crack | 96000 | 7000 | 93000 | 7000;b417-b418 |
| crack | 93000 | 7000 | 91000 | 13000;b418-b419 |
| crack | 91000 | 13000 | 91500 | 16000;b419-b420 |
| crack | 91500 | 16000 | 93000 | 19000;b420-b421 |
| crack | 93000 | 19000 | 91000 | 20500;b421-b422 |
| crack | 91000 | 20500 | 88000 | 21000;b422-b423 |
| crack | 88000 | 21000 | 86000 | 20000;b423-b424 |
| crack | 86000 | 20000 | 85000 | 20000;b424-180 |
| crack | 85000 | 20000 | 83000 | 20000;180-179 |
| crack | 83000 | 20000 | 80000 | 29000;179-b425 |
| crack | 80000 | 29000 | 80500 | 32000;b425-b426 |
| crack | 80500 | 32000 | 79500 | 35000;b426-b427 |
| crack | 79500 | 35000 | 80500 | 38000;b427-b428 |
| crack | 80500 | 38000 | 79500 | 39000;b428-355c |
| crack | 79500 | 39000 | 78000 | 40000;355c-b429 |

```
crack	78000	40000	79000	42000;b429-b430
crack	79000	42000	80500	43000;b430-b431
crack	79000	42000	81000	45500;b430-b432
crack	80500	43000	81000	45500;b431-b432
crack	81000	45500	82000	46000;b432-b433
crack	82000	46000	82500	47000;b433-b434
crack	82000	46000	80000	51000;b433-b436
crack	82500	47000	82000	50000;b434-b435
crack	82000	50000	80000	51000;b435-b436
crack	80000	51000	76000	53000;b436-b437
crack	76000	53000	75000	54000;b437-b438
crack	75000	54000	73000	55000;b438-b439
crack	73000	55000	69000	58500;b439-b440
crack	69000	58500	66000	59000;b440-b441
crack	66000	59000	65000	60000;b441-b442
crack	65000	60000	62500	62000;b442-b443
crack	62500	62000	60000	68000;b443-b444
crack	60000	68000	60000	69000;b444-b445
crack	60000	69000	60000	74000;b445-b446
crack	60000	74000	62000	76000;b446-b447
crack	62000	76000	63000	76000;b447-b448
crack	63000	76000	65000	78000;b448-b449
crack	65000	78000	64500	81000;b449-b450
crack	64500	81000	63500	86000;b450-b451
crack	63500	86000	66000	88500;b451-b452
crack	66000	88500	69000	88500;b452-b453
crack	69000	88500	71000	88000;b453-b454
crack	71000	88000	72000	85500;b454-b455
crack	72000	85500	73500	86000;b455-b456
crack	73500	86000	73000	91000;b456-b457
crack	73000	91000	70000	95000;b457-b458
crack	70000	95000	69000	98000;b458-b381
crack	98500	86000	99000	83000;412-b459
crack	100000	76000	99000	83000;415-b459
crack	99000	83000	101500	82000;b459-b460
crack	101500	82000	107000	77000;b460-b461
crack	107000	77000	111000	72000;b461-b462
crack	111000	72000	118000	67000;b462-b463
crack	118000	67000	117000	70000;b463-480
crack	118000	67000	120500	61000;b463-481
crack	124000	22500	123000	23000;b464-b465 gr 20 bound centr:122250,123500,19000,22000
crack	123000	23000	121500	26000;b465-b466
crack	121500	26000	117000	29000;b466-438
crack	123000	23000	121000	22000;b465-b467
crack	121000	22000	121500	20500;b467-444
crack	121500	20500	122000	19000;444-b468
crack	122000	19000	124000	17500;b468-b469
crack	108500	15000	110000	11000;424-b470
crack	110000	11000	110500	 8500;b470-425
crack	110000	11000	112500	 8000;b470-b471
crack	112500	8000	116000	 6000;b471-b472
crack	116000	6000	117000	14000;b472-446
crack	116000	6000	120000	 3000;b472-b473
crack	120000	3000	124000	 2000;b473-b474
crack	109500	22000	107000	22500;422-b475
crack	107000	22500	102500	26000;b475-b411
crack	123000	32000	121000	34000;450-b476
crack	121000	34000	120000	37000;b476-b477
crack	120000	37000	119500	43000;b477-b478
crack	119500	43000	121000	43000;b478-b479
crack	121000	43000	122500	41000;b479-485
;*****(Geometry File End)*****


;Psuedo contacts to reduce block size and allow zoning
;crack	0	66000	39000	 66000;Pj1(left block)
;crack	47000	71000	96000	 71000;Pj2(mid block)
;crack	80000	135000	114000	135000;Pj3(rmid block)
;crack	90000	102000	106000	102000;Pj4(rmid block)
;crack	104000	70000	108000	 70000;Pj5(rmid block)
;crack	90000	102000	106000	102000;Pj6(rmid block)
crack	88000	110000	90000	110000;Pj7(rmid block)
;crack	103000	127000	113000	127000;Pj8(rmid block)
crack	99000	107000	106000	107000;Pj9(rmid block)
crack	101000	98000	106000	98000;Pj10(rmid block)
```

```
;crack	55000	38000	59000	38000;Pj11(rmid block)
crack	93000	115000	95000	115000;Pj12(rmid block)

hist unbal ; hist1
hist sxx 62000 100000;hist2 (red 2)
hist syy 62000 100000;hist3 (red 3)

hist sst 60000 41000;hist4 (yel 4)selwyn high strain zone
hist sst 43000 40000;hist5 (yel 5)left of gin ck gr
hist sst 69000 98000;hist6 (yel 6)tip of sq. hills gr
hist sst 61000 172000;hist7 (yel 7)cloncurry

sav m2a_block.sav

gen 0 124000 0 200000 auto 1000

insitu stress -210e6 0 -140e6 szz -175e6
bound stress -210e6 0 -140e6
damp auto

;changing whole model to mat=1 (schist)
change 0 200000 0 124000 mat=1 cons=3

;changing all joints to jmat=1
change 0 200000 0 124000 jmat=1 jcon=2

;changing granite blocks to mat=2 (granite) constit model 3
change 57000,60000,175000,180000 mat=2 con=3 ;gr1
change 83000,85000,126000,129000 mat=2 con=3 ;gr2
change 89000,91000,117000,119000 mat=2 con=3 ;gr3
change 97000,99000,124000,126000 mat=2 con=3 ;gr4
change 94000,96000,117000,119000 mat=2 con=3 ;gr5
change 96000,98000,108000,110000 mat=2 con=3 ;gr6
change 85500,87500,100500,102500 mat=2 con=3 ;gr7
change 98000,100000,97000,99000 mat=2 con=3 ;gr8
change 112000,114000,80000,82000 mat=2 con=3 ;gr9
change 122000,124000,66000,67000 mat=2 con=3 ;gr10
change 53000,55000,45000,47000 mat=2 con=3 ;gr11
change 55000,68000,184000,193000 mat=2 con=3 ;gr12
change 20000,37000,93000,102000 mat=2 con=3 ;gr13
change 6000,24000,45000,66000 mat=2 con=3 ;gr14
change 49000,53000,3000,7000 mat=2 con=3 ;gr15
change 50500,54000,30000,33000 mat=2 con=3 ;gr16
change 64000,73000,26250,27750 mat=2 con=3 ;gr17
change 63000,68000,48000,52000 mat=2 con=3 ;gr18
change 82500,96000,44000,70000 mat=2 con=3 ;gr19
change 122250,123500,19000,22000 mat=2 con=3 ;gr20

;changing granite edges to jmat=2 - must follow commands setting jmat=2 blocks
change jmat=2 range minterface 1 2

;changing pseudo joint properties to jmat=5
change jmat=5 range xr 0,39000 yr 65900 66100 ang -5,5;Pj1 properties
;pl hold mat jo
change jmat=5 range xr 47000,96000 yr 70900 71100 ang -5,5;Pj2 properties
;pl hold mat jo
change jmat=5 range xr 80000,114000 yr 134900 135100 ang -5,5; Pj3 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj4 properties
change jmat=5 range xr 104000,108000 yr 69900 70100 ang -5,5; Pj5 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj6 properties
change jmat=5 range xr 88000,90000 yr 109900 110100 ang -5,5; Pj7 properties
;pl hold mat jo
change jmat=5 range xr 103000,113000 yr 126900 127100 ang -5,5; Pj8 properties
;pl hold mat jo
change jmat=5 range xr 99000,106000 yr 106900 107100 ang -5,5; Pj9 properties
;pl hold mat jo
change jmat=5 range xr 101000,106000 yr 97900 98100 ang -5,5; Pj10 properties
;pl hold mat jo
change jmat=5 range xr 55000,59000 yr 37900 38100 ang -5,5; Pj11 properties
;pl hold mat jo
change jmat=5 range xr 93000,95000 yr 114900 115100 ang -5,5; Pj12 properties

;Create Movie files every 100 steps
```

```
;plot ccfail blo bla
;movie on file m2a.dcx step 500

sav m2a_prop.sav
step 10
sav m2a_stress.sav

step 500
sav m2a_1.sav
step 500
sav m2a_2.sav
step 500
sav m2a_3.sav
step 500
sav m2a_4.sav

step 500
sav m2a_5.sav
step 500
sav m2a_6.sav
step 500
sav m2a_7.sav
step 500
sav m2a_8.sav


return
```

## U.6 Model 2b – dry model $\sigma_1$ = 112.5°

```
;>1490Ma (Map Interp)MODEL 2 Young Granites- DRY MODEL

;metasediment properties
prop mat=1 dens 2850 bulk 25e9 shear 25e9 cohesion 10e6 tens 5e6 fric 31 dil 4

;granite properties
prop mat=2 dens 2650 bulk 49e9 shear 27e9 cohesion 20e6 tens 10e6 fric 37 dil 5

;contact properties
prop jmat=1 jkn 5e6 jks 1e3 jcoh 4e2 jtens 2e6 jfri 30 jdil 5
;prop jmat=1 jper 300 azero 0.05 ares 0.03

prop jmat=2 jkn 5e9 jks 1e5 jcoh 10e2 jtens 3e6 jfri 35 jdil 5
;prop jmat=2 jper 238 azero 0.03 ares 0.01

;Pseudo joints
prop jmat=5 jkn 100e9 jks 40e9 jcoh 190e10 jtens 190e10 jdil 0
;prop jmat=5 jper 0 azero 0 ares 0

round 100

block 0,0 0,200000 124000,200000 124000,0
```

**;*****(Geometry File as Model 2a)*****

```
;Psuedo contacts to reduce block size and allow zoning
;crack   0        66000    39000    66000;Pj1(left block)
;crack   47000    71000    96000    71000;Pj2(mid block)
;crack   80000    135000   114000   135000;Pj3(rmid block)
;crack   90000    102000   106000   102000;Pj4(rmid block)
;crack   104000   70000    108000   70000;Pj5(rmid block)
;crack   90000    102000   106000   102000;Pj6(rmid block)
crack    88000    110000   90000    110000;Pj7(rmid block)
;crack   103000   127000   113000   127000;Pj8(rmid block)
crack    99000    107000   106000   107000;Pj9(rmid block)
crack    101000   98000    106000   98000;Pj10(rmid block)
;crack   55000    38000    59000    38000;Pj11(rmid block)
crack    93000    115000   95000    115000;Pj12(rmid block)

hist unbal ; hist1
hist sxx 62000 100000;hist2 (red 2)
hist syy 62000 100000;hist3 (red 3)
```

```
hist sst 60000 41000;hist4 (yel 4)selwyn high strain zone
hist sst 43000 40000;hist5 (yel 5)left of gin ck gr
hist sst 69000 98000;hist6 (yel 6)tip of sq. hills gr
hist sst 61000 172000;hist7 (yel 7)cloncurry

sav m2a_block.sav

gen 0 124000 0 200000 auto 1000

insitu stress -210e6 52.5e6 -140e6 szz -175e6
bound stress -210e6 0 -140e6
damp auto

;changing whole model to mat=1 (schist)
change 0 200000 0 124000 mat=1 cons=3

;changing all joints to jmat=1
change 0 200000 0 124000 jmat=1 jcon=2

;changing granite blocks to mat=2 (granite) constit model 3
change 57000,60000,175000,180000 mat=2 con=3 ;gr1
change 83000,85000,126000,129000 mat=2 con=3 ;gr2
change 89000,91000,117000,119000 mat=2 con=3 ;gr3
change 97000,99000,124000,126000 mat=2 con=3 ;gr4
change 94000,96000,117000,119000 mat=2 con=3 ;gr5
change 96000,98000,108000,110000 mat=2 con=3 ;gr6
change 85500,87500,100500,102500 mat=2 con=3 ;gr7
change 98000,100000,97000,99000 mat=2 con=3 ;gr8
change 112000,114000,80000,82000 mat=2 con=3 ;gr9
change 122000,124000,66000,67000 mat=2 con=3 ;gr10
change 53000,55000,45000,47000 mat=2 con=3 ;gr11
change 55000,68000,184000,193000 mat=2 con=3 ;gr12
change 20000,37000,93000,102000 mat=2 con=3 ;gr13
change 6000,24000,45000,66000 mat=2 con=3 ;gr14
change 49000,53000,3000,7000 mat=2 con=3 ;gr15
change 50500,54000,30000,33000 mat=2 con=3 ;gr16
change 64000,73000,26250,27750 mat=2 con=3 ;gr17
change 63000,68000,48000,52000 mat=2 con=3 ;gr18
change 82500,96000,44000,70000 mat=2 con=3 ;gr19
change 122250,123500,19000,22000 mat=2 con=3 ;gr20

;changing granite edges to jmat=2 - must follow commands setting jmat=2 blocks
change jmat=2 range minterface 1 2

;changing pseudo joint properties to jmat=5
change jmat=5 range xr 0,39000 yr 65900 66100 ang -5,5;Pj1 properties
;pl hold mat jo
change jmat=5 range xr 47000,96000 yr 70900 71100 ang -5,5;Pj2 properties
;pl hold mat jo
change jmat=5 range xr 80000,114000 yr 134900 135100 ang -5,5; Pj3 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj4 properties
change jmat=5 range xr 104000,108000 yr 69900 70100 ang -5,5; Pj5 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj6 properties
change jmat=5 range xr 88000,90000 yr 109900 110100 ang -5,5; Pj7 properties
;pl hold mat jo
change jmat=5 range xr 103000,113000 yr 126900 127100 ang -5,5; Pj8 properties
;pl hold mat jo
change jmat=5 range xr 99000,106000 yr 106900 107100 ang -5,5; Pj9 properties
;pl hold mat jo
change jmat=5 range xr 101000,106000 yr 97900 98100 ang -5,5; Pj10 properties
;pl hold mat jo
change jmat=5 range xr 55000,59000 yr 37900 38100 ang -5,5; Pj11 properties
;pl hold mat jo
change jmat=5 range xr 93000,95000 yr 114900 115100 ang -5,5; Pj12 properties

;Create Movie files every 100 steps
;plot ccfail blo bla
;movie on file m2b.dcx step 500

sav m2b_prop.sav
step 10
sav m2b_stress.sav
```

```
step 500
sav m2b_1.sav
step 500
sav m2b_2.sav
step 500
sav m2b_3.sav
step 500
sav m2b_4.sav

step 500
sav m2b_5.sav
step 500
sav m2b_6.sav
step 500
sav m2b_7.sav
step 500
sav m2b_8.sav


return
```

## U.7 Model 2c – wet model $\sigma_1$ = 90°

```
 ;>1490Ma (Map Interp)MODEL 2 Young Granites- DRY MODEL

;metasediment properties
prop mat=1 dens 2850 bulk 25e9 shear 25e9 cohesion 10e6 tens 5e6 fric 31 dil 4

;granite properties
prop mat=2 dens 2650 bulk 49e9 shear 27e9 cohesion 20e6 tens 10e6 fric 37 dil 5

;contact properties
prop jmat=1 jkn 5e6 jks 1e3 jcoh 4e2 jtens 2e6 jfri 30 jdil 5
;prop jmat=1 jper 300 azero 0.05 ares 0.03

prop jmat=2 jkn 5e9 jks 1e5 jcoh 10e2 jtens 3e6 jfri 35 jdil 5
;prop jmat=2 jper 238 azero 0.03 ares 0.01

;Pseudo joints
prop jmat=5 jkn 100e9 jks 40e9 jcoh 190e10 jtens 190e10 jdil 0
;prop jmat=5 jper 0 azero 0 ares 0

round 100

block 0,0 0,200000 124000,200000 124000,0
```

**;*****(Geometry File as per Model 2a)*****

```
;Psuedo contacts to reduce block size and allow zoning
;crack    0        66000    39000     66000;Pj1(left block)
;crack    47000    71000    96000     71000;Pj2(mid block)
;crack    80000    135000   114000   135000;Pj3(rmid block)
;crack    90000    102000   106000   102000;Pj4(rmid block)
;crack    104000   70000    108000    70000;Pj5(rmid block)
;crack    90000    102000   106000   102000;Pj6(rmid block)
crack     88000    110000   90000    110000;Pj7(rmid block)
;crack    103000   127000   113000   127000;Pj8(rmid block)
crack     99000    107000   106000   107000;Pj9(rmid block)
crack     101000   98000    106000    98000;Pj10(rmid block)
;crack    55000    38000    59000     38000;Pj11(rmid block)
crack     93000    115000   95000    115000;Pj12(rmid block)

hist unbal ; hist1
hist sxx 62000 100000;hist2
hist syy 62000 100000;hist3

hist sst 60000 41000;hist4 selwyn high strain zone
hist sst 43000 40000;hist5 left of gin ck gr
hist sst 69000 98000;hist6 tip of sq. hills gr
hist sst 61000 172000;hist7 cloncurry
```

```
sav m2c_block.sav

gen 0 124000 0 200000 auto 1000

insitu stress -210e6 0 -140e6 szz -175e6
bound stress -210e6 0 -140e6
damp auto

;changing whole model to mat=1 (schist)
change 0 200000 0 124000 mat=1 cons=3

;changing all joints to jmat=1
change 0 200000 0 124000 jmat=1 jcon=2

;changing granite blocks to mat=2 (granite) constit model 3
change 57000,60000,175000,180000 mat=2 con=3 ;gr1
change 83000,85000,126000,129000 mat=2 con=3 ;gr2
change 89000,91000,117000,119000 mat=2 con=3 ;gr3
change 97000,99000,124000,126000 mat=2 con=3 ;gr4
change 94000,96000,117000,119000 mat=2 con=3 ;gr5
change 96000,98000,108000,110000 mat=2 con=3 ;gr6
change 85500,87500,100500,102500 mat=2 con=3 ;gr7
change 98000,100000,97000,99000 mat=2 con=3 ;gr8
change 112000,114000,80000,82000 mat=2 con=3 ;gr9
change 122000,124000,66000,67000 mat=2 con=3 ;gr10
change 53000,55000,45000,47000 mat=2 con=3 ;gr11
change 55000,68000,184000,193000 mat=2 con=3 ;gr12
change 20000,37000,93000,102000 mat=2 con=3 ;gr13
change 6000,24000,45000,66000 mat=2 con=3 ;gr14
change 49000,53000,3000,7000 mat=2 con=3 ;gr15
change 50500,54000,30000,33000 mat=2 con=3 ;gr16
change 64000,73000,26250,27750 mat=2 con=3 ;gr17
change 63000,68000,48000,52000 mat=2 con=3 ;gr18
change 82500,96000,44000,70000 mat=2 con=3 ;gr19
change 122250,123500,19000,22000 mat=2 con=3 ;gr20

;changing granite edges to jmat=2 - must follow commands setting jmat=2 blocks
change jmat=2 range minterface 1 2

;changing pseudo joint properties to jmat=5
change jmat=5 range xr 0,39000 yr 65900 66100 ang -5,5;Pj1 properties
;pl hold mat jo
change jmat=5 range xr 47000,96000 yr 70900 71100 ang -5,5;Pj2 properties
;pl hold mat jo
change jmat=5 range xr 80000,114000 yr 134900 135100 ang -5,5; Pj3 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj4 properties
change jmat=5 range xr 104000,108000 yr 69900 70100 ang -5,5; Pj5 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj6 properties
change jmat=5 range xr 88000,90000 yr 109900 110100 ang -5,5; Pj7 properties
;pl hold mat jo
change jmat=5 range xr 103000,113000 yr 126900 127100 ang -5,5; Pj8 properties
;pl hold mat jo
change jmat=5 range xr 99000,106000 yr 106900 107100 ang -5,5; Pj9 properties
;pl hold mat jo
change jmat=5 range xr 101000,106000 yr 97900 98100 ang -5,5; Pj10 properties
;pl hold mat jo
change jmat=5 range xr 55000,59000 yr 37900 38100 ang -5,5; Pj11 properties
;pl hold mat jo
change jmat=5 range xr 93000,95000 yr 114900 115100 ang -5,5; Pj12 properties

sav m2c_prop.sav
step 10
sav m2c_stress.sav

step 500
sav m2c_1.sav
step 500
sav m2c_2.sav
step 500
sav m2c_3.sav
step 500
sav m2c_4.sav
```

```
;Establishing fluid pressure
fluid dens=1000;fluid density of 1000kgm'3
set flow steady;set steady state flow
bo pp=125e6
pfix pressure=125e6

step 500
sav m2c_5.sav
step 500
sav m2c_6.sav
step 500
sav m2c_7.sav
step 500
sav m2c_8.sav

step 500
sav m2c_9.sav
step 500
sav m2c_10.sav

step 500
sav m2c_11.sav
step 500
sav m2c_12.sav

step 500
sav m2c_13.sav
step 500
sav m2c_14.sav

return
```

## U.8 Model 2d – wet model $\sigma_1$ = 112.5°

```
;>1490Ma (Map Interp)MODEL 2 Young Granites- DRY MODEL

;metasediment properties
prop mat=1 dens 2850 bulk 25e9 shear 25e9 cohesion 10e6 tens 5e6 fric 31 dil 4

;granite properties
prop mat=2 dens 2650 bulk 49e9 shear 27e9 cohesion 20e6 tens 10e6 fric 37 dil 5

;contact properties
prop jmat=1 jkn 5e6 jks 1e3 jcoh 4e2 jtens 2e6 jfri 30 jdil 5
;prop jmat=1 jper 300 azero 0.05 ares 0.03

prop jmat=2 jkn 5e9 jks 1e5 jcoh 10e2 jtens 3e6 jfri 35 jdil 5
;prop jmat=2 jper 238 azero 0.03 ares 0.01

;Pseudo joints
prop jmat=5 jkn 100e9 jks 40e9 jcoh 190e10 jtens 190e10 jdil 0
;prop jmat=5 jper 0 azero 0 ares 0

round 100

block 0,0 0,200000 124000,200000 124000,0
```

**;*****(Geometry File as per Model 2a)*****

```
;Psuedo contacts to reduce block size and allow zoning
;crack    0        66000    39000     66000;Pj1(left block)
;crack    47000    71000    96000     71000;Pj2(mid block)
;crack    80000    135000   114000    135000;Pj3(rmid block)
;crack    90000    102000   106000    102000;Pj4(rmid block)
;crack    104000   70000    108000    70000;Pj5(rmid block)
;crack    90000    102000   106000    102000;Pj6(rmid block)
crack     88000    110000   90000     110000;Pj7(rmid block)
;crack    103000   127000   113000    127000;Pj8(rmid block)
crack     99000    107000   106000    107000;Pj9(rmid block)
crack     101000   98000    106000    98000;Pj10(rmid block)
;crack    55000    38000    59000     38000;Pj11(rmid block)
```

```
crack     93000     115000    95000     115000;Pj12(rmid block)

hist unbal ; hist1
hist sxx 62000 100000;hist2
hist syy 62000 100000;hist3

hist sst 60000 41000;hist4 selwyn high strain zone
hist sst 43000 40000;hist5 left of gin ck gr
hist sst 69000 98000;hist6 tip of sq. hills gr
hist sst 61000 172000;hist7 cloncurry


sav m2d_block.sav

gen 0 124000 0 200000 auto 1000

insitu stress -210e6 52.5e6 -140e6 szz -175e6
bound stress -210e6 0 -140e6
damp auto

;changing whole model to mat=1 (schist)
change 0 200000 0 124000 mat=1 cons=3

;changing all joints to jmat=1
change 0 200000 0 124000 jmat=1 jcon=2

;changing granite blocks to mat=2 (granite) constit model 3
change 57000,60000,175000,180000 mat=2 con=3 ;gr1
change 83000,85000,126000,129000 mat=2 con=3 ;gr2
change 89000,91000,117000,119000 mat=2 con=3 ;gr3
change 97000,99000,124000,126000 mat=2 con=3 ;gr4
change 94000,96000,117000,119000 mat=2 con=3 ;gr5
change 96000,98000,108000,110000 mat=2 con=3 ;gr6
change 85500,87500,100500,102500 mat=2 con=3 ;gr7
change 98000,100000,97000,99000 mat=2 con=3 ;gr8
change 112000,114000,80000,82000 mat=2 con=3 ;gr9
change 122000,124000,66000,67000 mat=2 con=3 ;gr10
change 53000,55000,45000,47000 mat=2 con=3 ;gr11
change 55000,68000,184000,193000 mat=2 con=3 ;gr12
change 20000,37000,93000,102000 mat=2 con=3 ;gr13
change 6000,24000,45000,66000 mat=2 con=3 ;gr14
change 49000,53000,3000,7000 mat=2 con=3 ;gr15
change 50500,54000,30000,33000 mat=2 con=3 ;gr16
change 64000,73000,26250,27750 mat=2 con=3 ;gr17
change 63000,68000,48000,52000 mat=2 con=3 ;gr18
change 82500,96000,44000,70000 mat=2 con=3 ;gr19
change 122250,123500,19000,22000 mat=2 con=3 ;gr20

;changing granite edges to jmat=2 - must follow commands setting jmat=2 blocks
change jmat=2 range minterface 1 2

;changing pseudo joint properties to jmat=5
change jmat=5 range xr 0,39000 yr 65900 66100 ang -5,5;Pj1 properties
;pl hold mat jo
change jmat=5 range xr 47000,96000 yr 70900 71100 ang -5,5;Pj2 properties
;pl hold mat jo
change jmat=5 range xr 80000,114000 yr 134900 135100 ang -5,5; Pj3 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj4 properties
change jmat=5 range xr 104000,108000 yr 69900 70100 ang -5,5; Pj5 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj6 properties
change jmat=5 range xr 88000,90000 yr 109900 110100 ang -5,5; Pj7 properties
;pl hold mat jo
change jmat=5 range xr 103000,113000 yr 126900 127100 ang -5,5; Pj8 properties
;pl hold mat jo
change jmat=5 range xr 99000,106000 yr 106900 107100 ang -5,5; Pj9 properties
;pl hold mat jo
change jmat=5 range xr 101000,106000 yr 97900 98100 ang -5,5; Pj10 properties
;pl hold mat jo
change jmat=5 range xr 55000,59000 yr 37900 38100 ang -5,5; Pj11 properties
;pl hold mat jo
change jmat=5 range xr 93000,95000 yr 114900 115100 ang -5,5; Pj12 properties

sav m2d_prop.sav
```

```
step 10
sav m2d_stress.sav

step 500
sav m2d_1.sav
step 500
sav m2d_2.sav
step 500
sav m2d_3.sav
step 500
sav m2d_4.sav



;Establishing fluid pressure
fluid dens=1000;fluid density of 1000kgm'3
set flow steady;set steady state flow
bo pp=125e6
pfix pressure=125e6

step 500
sav m2d_5.sav
step 500
sav m2d_6.sav
step 500
sav m2d_7.sav
step 500
sav m2d_8.sav

step 500
sav m2d_9.sav
step 500
sav m2d_10.sav

step 500
sav m2d_11.sav
step 500
sav m2d_12.sav

step 500
sav m2d_13.sav
step 500
sav m2d_14.sav

return
```

## U.9 Fluid Discharge Model -xgrad

```
;>1490Ma (Map Interp)MODEL 2 Young Granites- DRY MODEL

;metasediment properties
prop mat=1 dens 2850 bulk 25e9 shear 25e9 cohesion 10e6 tens 5e6 fric 31 dil 4

;granite properties
prop mat=2 dens 2650 bulk 49e9 shear 27e9 cohesion 20e6 tens 10e6 fric 37 dil 5

;contact properties
prop jmat=1 jkn 5e6 jks 1e3 jcoh 4e2 jtens 2e6 jfri 30 jdil 5
;prop jmat=1 jper 300 azero 0.05 ares 0.03

prop jmat=2 jkn 5e9 jks 1e5 jcoh 10e2 jtens 3e6 jfri 35 jdil 5
;prop jmat=2 jper 238 azero 0.03 ares 0.01

;Pseudo joints
prop jmat=5 jkn 100e9 jks 40e9 jcoh 190e10 jtens 190e10 jdil 0
;prop jmat=5 jper 0 azero 0 ares 0

round 100

block 0,0 0,200000 124000,200000 124000,0
```

**;*****(Geometry File as per Model 2a)*****

```
;Psuedo contacts to reduce block size and allow zoning
;crack    0         66000     39000      66000;Pj1(left block)
;crack    47000     71000     96000      71000;Pj2(mid block)
;crack    80000     135000    114000    135000;Pj3(rmid block)
;crack    90000     102000    106000    102000;Pj4(rmid block)
;crack    104000    70000     108000     70000;Pj5(rmid block)
;crack    90000     102000    106000    102000;Pj6(rmid block)
crack     88000     110000    90000     110000;Pj7(rmid block)
;crack    103000    127000    113000    127000;Pj8(rmid block)
crack     99000     107000    106000    107000;Pj9(rmid block)
crack     101000    98000     106000    98000;Pj10(rmid block)
;crack    55000     38000     59000     38000;Pj11(rmid block)
crack     93000     115000    95000     115000;Pj12(rmid block)

hist unbal ; hist1
hist sxx 62000 100000;hist2
hist syy 62000 100000;hist3

hist sst 60000 41000;hist4 selwyn high strain zone
hist sst 43000 40000;hist5 left of gin ck gr
hist sst 69000 98000;hist6 tip of sq. hills gr
hist sst 61000 172000;hist7 cloncurry


sav m2fgx_block.sav

gen 0 124000 0 200000 auto 1000

insitu stress -210e6 52.5e6 -140e6 szz -175e6
bound stress -210e6 0 -140e6
damp auto

;changing whole model to mat=1 (schist)
change 0 200000 0 124000 mat=1 cons=3

;changing all joints to jmat=1
change 0 200000 0 124000 jmat=1 jcon=2

;changing granite blocks to mat=2 (granite) constit model 3
change 57000,60000,175000,180000 mat=2 con=3 ;gr1
change 83000,85000,126000,129000 mat=2 con=3 ;gr2
change 89000,91000,117000,119000 mat=2 con=3 ;gr3
change 97000,99000,124000,126000 mat=2 con=3 ;gr4
change 94000,96000,117000,119000 mat=2 con=3 ;gr5
change 96000,98000,108000,110000 mat=2 con=3 ;gr6
change 85500,87500,100500,102500 mat=2 con=3 ;gr7
change 98000,100000,97000,99000 mat=2 con=3 ;gr8
change 112000,114000,80000,82000 mat=2 con=3 ;gr9
change 122000,124000,66000,67000 mat=2 con=3 ;gr10
change 53000,55000,45000,47000 mat=2 con=3 ;gr11
change 55000,68000,184000,193000 mat=2 con=3 ;gr12
change 20000,37000,93000,102000 mat=2 con=3 ;gr13
change 6000,24000,45000,66000 mat=2 con=3 ;gr14
change 49000,53000,3000,7000 mat=2 con=3 ;gr15
change 50500,54000,30000,33000 mat=2 con=3 ;gr16
change 64000,73000,26250,27750 mat=2 con=3 ;gr17
change 63000,68000,48000,52000 mat=2 con=3 ;gr18
change 82500,96000,44000,70000 mat=2 con=3 ;gr19
change 122250,123500,19000,22000 mat=2 con=3 ;gr20

;changing granite edges to jmat=2 - must follow commands setting jmat=2 blocks
change jmat=2 range minterface 1 2

;changing pseudo joint properties to jmat=5
change jmat=5 range xr 0,39000 yr 65900 66100 ang -5,5;Pj1 properties
;pl hold mat jo
change jmat=5 range xr 47000,96000 yr 70900 71100 ang -5,5;Pj2 properties
;pl hold mat jo
change jmat=5 range xr 80000,114000 yr 134900 135100 ang -5,5; Pj3 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj4 properties
change jmat=5 range xr 104000,108000 yr 69900 70100 ang -5,5; Pj5 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj6 properties
change jmat=5 range xr 88000,90000 yr 109900 110100 ang -5,5; Pj7 properties
```

```
;pl hold mat jo
change jmat=5 range xr 103000,113000 yr 126900 127100 ang -5,5; Pj8 properties
;pl hold mat jo
change jmat=5 range xr 99000,106000 yr 106900 107100 ang -5,5; Pj9 properties
;pl hold mat jo
change jmat=5 range xr 101000,106000 yr 97900 98100 ang -5,5; Pj10 properties
;pl hold mat jo
change jmat=5 range xr 55000,59000 yr 37900 38100 ang -5,5; Pj11 properties
;pl hold mat jo
change jmat=5 range xr 93000,95000 yr 114900 115100 ang -5,5; Pj12 properties

sav m2fgx_prop.sav
step 10
sav m2 fgx _stress.sav

step 500
sav m2 fgx _1.sav
step 500
sav m2 fgx _2.sav
step 500
sav m2 fgx _3.sav
step 500
sav m2 fgx _4.sav

;Establishing fluid pressure
fluid dens=1000;fluid density of 1000kgm'3
set flow steady;set steady state flow
bo pp=125e6
pfix pressure=125e6

step 500
sav m2 fgx _5.sav
step 500
sav m2 fgx _6.sav
step 500
sav m2 fgx _7.sav
step 500
sav m2 fgx _8.sav


;Flow Modelling no Mechanical deformation
set mech off;suppressing mechnical deformation
pfix pressure=0
bo pp=0
step 10;allow settling
pfree
step 10; allow settling

; Apppling fluid pressure gradient of 1Mpa in x direction
bo pp 1e6 pxgrad -1e6 range  0 200000 -1 1
bo pp 1e6 pxgrad -1e6 range  0 200000 123999 124001
bo pp 0 range  123999 124001 0 200000
bo pp 1e6 range  -1 1 0 200000

; flow calculation
step 500
sav m2_fgx_9.sav
step 500
sav m2_fgx_10.sav

step 500
sav m2_fgx_11.sav
step 500
sav m2_fgx_12.sav

step 500
sav m2_fgx_13.sav
step 500
sav m2_fgx_14.sav

return
```

## U.10 Fluid Discharge Model – granite fluid source

```
;>1490Ma (Map Interp)MODEL 2 Young Granites- DRY MODEL

;metasediment properties
prop mat=1 dens 2850 bulk 25e9 shear 25e9 cohesion 10e6 tens 5e6 fric 31 dil 4

;granite properties
prop mat=2 dens 2650 bulk 49e9 shear 27e9 cohesion 20e6 tens 10e6 fric 37 dil 5

;contact properties
prop jmat=1 jkn 5e6 jks 1e3 jcoh 4e2 jtens 2e6 jfri 30 jdil 5
;prop jmat=1 jper 300 azero 0.05 ares 0.03

prop jmat=2 jkn 5e9 jks 1e5 jcoh 10e2 jtens 3e6 jfri 35 jdil 5
;prop jmat=2 jper 238 azero 0.03 ares 0.01

;Pseudo joints
prop jmat=5 jkn 100e9 jks 40e9 jcoh 190e10 jtens 190e10 jdil 0
;prop jmat=5 jper 0 azero 0 ares 0

round 100
block 0,0 0,200000 124000,200000 124000,0

;*****(Geometry File as per Model 2a)*****
;Psuedo contacts to reduce block size and allow zoning
;crack    0        66000    39000     66000;Pj1(left block)
;crack    47000    71000    96000     71000;Pj2(mid block)
;crack    80000    135000   114000    135000;Pj3(rmid block)
;crack    90000    102000   106000    102000;Pj4(rmid block)
;crack    104000   70000    108000     70000;Pj5(rmid block)
;crack    90000    102000   106000    102000;Pj6(rmid block)
crack     88000    110000   90000     110000;Pj7(rmid block)
;crack    103000   127000   113000    127000;Pj8(rmid block)
crack     99000    107000   106000    107000;Pj9(rmid block)
crack     101000   98000    106000    98000;Pj10(rmid block)
;crack    55000    38000    59000     38000;Pj11(rmid block)
crack     93000    115000   95000     115000;Pj12(rmid block)

hist unbal ; hist1
hist sxx 62000 100000;hist2
hist syy 62000 100000;hist3

hist sst 60000 41000;hist4 selwyn high strain zone
hist sst 43000 40000;hist5 left of gin ck gr
hist sst 69000 98000;hist6 tip of sq. hills gr
hist sst 61000 172000;hist7 cloncurry

sav m2fs_block.sav

gen 0 124000 0 200000 auto 1000

insitu stress -210e6 52.5e6 -140e6 szz -175e6
bound stress -210e6 0 -140e6
damp auto

;changing whole model to mat=1 (schist)
change 0 200000 0 124000 mat=1 cons=3

;changing all joints to jmat=1
change 0 200000 0 124000 jmat=1 jcon=2

;changing granite blocks to mat=2 (granite) constit model 3
change 57000,60000,175000,180000 mat=2 con=3 ;gr1
change 83000,85000,126000,129000 mat=2 con=3 ;gr2
change 89000,91000,117000,119000 mat=2 con=3 ;gr3
change 97000,99000,124000,126000 mat=2 con=3 ;gr4
change 94000,96000,117000,119000 mat=2 con=3 ;gr5
change 96000,98000,108000,110000 mat=2 con=3 ;gr6
change 85500,87500,100500,102500 mat=2 con=3 ;gr7
change 98000,100000,97000,99000 mat=2 con=3 ;gr8
change 112000,114000,80000,82000 mat=2 con=3 ;gr9
change 122000,124000,66000,67000 mat=2 con=3 ;gr10
```

```
change 53000,55000,45000,47000 mat=2 con=3 ;gr11
change 55000,68000,184000,193000 mat=2 con=3 ;gr12
change 20000,37000,93000,102000 mat=2 con=3 ;gr13
change 6000,24000,45000,66000 mat=2 con=3 ;gr14
change 49000,53000,3000,7000 mat=2 con=3 ;gr15
change 50500,54000,30000,33000 mat=2 con=3 ;gr16
change 64000,73000,26250,27750 mat=2 con=3 ;gr17
change 63000,68000,48000,52000 mat=2 con=3 ;gr18
change 82500,96000,44000,70000 mat=2 con=3 ;gr19
change 122250,123500,19000,22000 mat=2 con=3 ;gr20

;changing granite edges to jmat=2 - must follow commands setting jmat=2 blocks
change jmat=2 range minterface 1 2

;changing pseudo joint properties to jmat=5
change jmat=5 range xr 0,39000 yr 65900 66100 ang -5,5;Pj1 properties
;pl hold mat jo
change jmat=5 range xr 47000,96000 yr 70900 71100 ang -5,5;Pj2 properties
;pl hold mat jo
change jmat=5 range xr 80000,114000 yr 134900 135100 ang -5,5; Pj3 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj4 properties
change jmat=5 range xr 104000,108000 yr 69900 70100 ang -5,5; Pj5 properties
;pl hold mat jo
;change jmat=5 range xr 90000,106000 yr 101900 102100 ang -5,5; Pj6 properties
change jmat=5 range xr 88000,90000 yr 109900 110100 ang -5,5; Pj7 properties
;pl hold mat jo
change jmat=5 range xr 103000,113000 yr 126900 127100 ang -5,5; Pj8 properties
;pl hold mat jo
change jmat=5 range xr 99000,106000 yr 106900 107100 ang -5,5; Pj9 properties
;pl hold mat jo
change jmat=5 range xr 101000,106000 yr 97900 98100 ang -5,5; Pj10 properties
;pl hold mat jo
change jmat=5 range xr 55000,59000 yr 37900 38100 ang -5,5; Pj11 properties
;pl hold mat jo
change jmat=5 range xr 93000,95000 yr 114900 115100 ang -5,5; Pj12 properties

sav m2fslong_prop.sav
step 10
sav m2 fslong _stress.sav
step 500
sav m2 fslong _1.sav
step 500
sav m2 fslong _2.sav
step 500
sav m2 fslong _3.sav
step 500
sav m2 fslong _4.sav

;Establishing fluid pressure
fluid dens=1000
set flow steady
bo pp=10e6
pfix pressure=10e6

step 500
sav m2fslong_5.sav
step 500
sav m2fslong_6.sav
step 500
sav m2fslong_7.sav
step 500
sav m2fslong_8.sav

;suppressing mech and applying fluid gradient
set mech off
pfix pressure=0
bo pp=0
step 10
pfree
step 10

;Applying fluid source to granites low fluid rate
well dom 89024 flow 1e-6;gr12
well dom 89792 flow 1e-6;
```

```
well dom 90560 flow 1e-6;
well dom 9950 flow 1e-6;gr13
well dom 118222 flow 1e-6;
well dom 119292 flow 1e-6;
well dom 120306 flow 1e-6;
well dom 116152 flow 1e-6;
well dom 116200 flow 1e-6;
well dom 130662 flow 1e-6;
well dom 129996 flow 1e-6;
well dom 123130 flow 1e-6;
well dom 124850 flow 1e-6;gr14
well dom 126328 flow 1e-6;
well dom 128356 flow 1e-6;
well dom 128404 flow 1e-6;
well dom 19610 flow 1e-6;gr1
well dom 131862 flow 1e-6;gr16
well dom 134896 flow 1e-6;gr17
well dom 136288 flow 1e-6;
well dom 134560 flow 1e-6;
well dom 134752 flow 1e-6;
well dom 142218 flow 1e-6;gr18
well dom 141492 flow 1e-6;
well dom 154190 flow 1e-6;
well dom 154612 flow 1e-6;gr19
well dom 155402 flow 1e-6;
well dom 156904 flow 1e-6;
well dom 157184 flow 1e-6;
well dom 143934 flow 1e-6;
well dom 144126 flow 1e-6;
well dom 146116 flow 1e-6;
well dom 149784 flow 1e-6;
well dom 149832 flow 1e-6;
well dom 150024 flow 1e-6;
well dom 150674 flow 1e-6;
well dom 159134 flow 1e-6;gr20
well dom 159468 flow 1e-6;

step 500
sav m2fslong_9.sav
step 500
sav m2fslong_10.sav
step 500
sav m2fslong_11.sav
step 500
sav m2fslong_12.sav
step 5000
sav m2fslong_13.sav
step 5000
sav m2fslong_14.sav
step 5000
sav m2fslong_15.sav
step 5000
sav m2fslong_16.sav
step 5000
sav m2fslong_17.sav
step 5000
sav m2fslong_18.sav
step 5000
sav m2fslong_19.sav
step 5000
sav m2fslong_20.sav
step 50000
sav m2fslong_21.sav
step 50000
sav m2fslong_22.sav
step 50000
sav m2fslong_21.sav
step 50000
sav m2fslong_23.sav
step 50000
sav m2fslong_24.sav
step 50000
sav m2fslong_25.sav

return
```