pled model simulates vegetation composition and dynamics as a function of climate and soil conditions. The fire component (SPITFIRE) of the model simulates ignition sources, fire spread and the effects of fire on vegetation dynamics. Climate scenarios for the Last Glacial Maximum (ca 21,000 yr BP), the mid-Holocene (ca 6000 yr BP) and pre-industrial conditions (ca 1850 A.D.) are derived from coupled ocean-atmosphere simulations made in the Palaeoclimate Modelling Intercomparison Project (PMIP2). The simulated changes in fire regimes at a sub-regional scale show considerable heterogeneity, as might be expected given the complexity of the controls on fire initiation and spread, but more coherent patterns of change emerge at a supra-regional scale. At the Last Glacial Maximum, fire regimes were similar to present in the tropics but the impact of fire was reduced in the subtropics. Changes in fire in the extratropics are strongly dependent of the nature of the vegetation: there was less fire in forested areas and increased fire in areas of non-forest vegetation. The most pronounced changes during the Mid-Holocene occur in high northern latitudes and in regions of monsoonal climate. The complex but consistent patterns of change in monsoon regions show that a specific change in climate, such as an increase in precipitation, may produce either an increase or a decrease in fire depending how the climate signal impacts on vegetation and on fuel availability. These simulations are important for several reasons. First, LPJ-SPITFIRE is a tool that can be used to explore the interactions between climate, vegetation and fire and thus help provide a better understanding of the mechanisms driving palaeoenvironmental changes. Second, these kinds of simulations will improve the ongoing evaluation of the ability of models to predict potential future climates by creating an opportunity to use charcoal records as a target for data-model comparison. Finally, biomass burning is a major source of climatically-important trace gases and aerosols, including CO_2, CO, CH_4, volatile organic carbon: VOC and NOx and black-carbon aerosols, and changes in fire intensity and area burnt could therefore have a significant effect on radiative forcing and atmospheric chemistry, and through this biogeochemical feedback loop on climate.

0192

Climates, fire regimes and vegetation patterns of Australia during the past 70,000 years: observations and model results

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The colonization of Australia (ca 55,000-45,000 years ago) and subsequent human dispersal across the continent is set against a background of large-scale changes in regional climates and environmental conditions. Specifically, changes in the Australian monsoon resulted in a significant expansion of the extent of monsoon-fed inland lakes and moisture-demanding vegetation in the mid-continent between ca 65,000 and 45,000 years ago, with the subsequent aridification of the continent. Known changes in the external factors affecting regional climates, in particular changes in insolation, atmospheric composition and changes in the extent of polar ice sheets, during the past 70,000 years would have had a significant impact on the Australian monsoon. These changes in climate would in turn have led to changes in the vegetation cover, changes that in turn influence water- and energy-exchange between the land and the atmosphere, and thus produce feedbacks on the climate system. Changes in climate and vegetation influence the fire regime, which in turn influences climate via biophysical and bigeochemical feedbacks. Changes in climate, hydrological conditions, vegetation cover and fire can have profound impacts on both the speed and pathway of human colonization. However, the deliberate or accidental setting of fire by human colonists also affects the vegetation cover and such activities may be implicated in the Late Quaternary aridification of Australia and the development of fire-adapted vegetation there. Earth system models provide the only way of disentangling the different strands of such a complex system in order to determine the relative importance of different factors in explaining observed palaeoenvironmental changes. Here, as part of a major new project (ACACIA) to investigate the interactions between climate, vegetation changes, natural wildfires and human activities, over the past 70,000 years in Australia, we investigate the implications of known changes in external forcing (insolation, ice sheet extent and height, greenhouse gas concentrations) for changes in Australian climate using two relatively fast coupled ocean-atmosphere-vegetation models (FAMOUS, FOAM). The use of two climate models allows us to determine whether the simulated climate changes are robust. Output from both sets of climate simulations are then used to drive a coupled vegetation-fire model (LPJ-SPITFIRE) to examine the impact of the simulated climate changes on vegetation patterns and natural fire regimes.

0646

The interrelationship between basal sliding and subglacial deformation revealed by using a wireless subglacial probe

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An understanding of the subglacial environment is vital to our understanding of the relationship between glacier dynamics and climate change. It has been argued that the Antarctic ice streams are controlled by the behaviour of a saturated deforming bed although the nature of this deformation has been contested. In recent years, great advances have been made in out understanding of the subglacial environment, by direct in situ experiments. In this talk we highlight the results from a new wireless subglacial probe (installed beneath Briksdalsbreen, Norway) that behaves like a clast within the subglacial environment. The results include: (a) an annual pattern of basal sliding and subglacial deformation, indicating early summer lodgement and late summer deformation; (b) The amount and nature of clast rotation within the deforming layer, with implications for till sedimentation and till fabric production; (c) Evidence for subglacial deformation a wide range of basal shear stresses, which indicates the style of subglacial behaviour.

1122

The Keiva ice marginal zone on the Kola Peninsula, NW Russia – a complex marginal deposit of the Fennoscandian ice sheet

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One of the key elements in reconstructing the palaeoglaciology of the northeastern sector of the Fennoscandian Ice Sheet is the Keiva ice marginal zone (KIZ) along the southern and eastern coasts of Kola Peninsula, including the Keiva I and II moraines. From detailed geomorphological mapping of the KIZ, primarily using aerial photographs and satellite images, combined with field work, we observe the following: (a) The moraines display ice contact features on both the Kola