AAS 204th Meeting, June 2004
Session 37 Solar Magnetic Fields and the Photosphere
SPD Poster, Tuesday, June 1, 2004, 10:00am-7:00pm, Ballroom

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[37.20] Evershed Flow of CO at Different Depths in a Sunspot Penumbra.

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CO lines of different strengths near 4.7 microns have been used to observe Evershed flow of molecular gas in the penumbra of a large sunspot near to the solar limb. An adaptive optics system and IR camera on the main spectrograph of the McMath-Pierce Solar Telescope produced a sequence of diffraction-limited spectral-spatial images to 0.8 arc-second resolution as the telescope was scanned across this sunspot. Dopplergrams constructed from this sequence for several of these CO lines have been used to outline the characteristics of this molecular flow as a function of depth within the penumbra.

Particularly noteworthy in these Dopplergrams is the change in pattern of high-speed outflow, from a radial direction deep in the penumbra from weak-line images, matching the structure in the continuum penumbral image, to a spiral pattern more closely resembling the appearance of penumbral structure at chromospheric heights. Typical weak-line flow speeds were a few km/s, significantly lower than those measured recently by Penn et al.,(2003) for weak CH lines at shorter wavelengths, which are postulated to originate in dark fibrils deeper in the penumbra. Strong CO-line images show lower flow speeds. Small regions of narrow inverse Evershed flow channels appear in these latter images near to the outer penumbral boundary. For all lines, the speed of the Evershed flow reaches a maximum just before this boundary and all flow appears to cease at or just beyond it.

Future Evershed flow investigations will include observations of other potentially useful spectral features within this spectral range such as weak OH lines, in addition to several atomic FeI and SiI lines whose high Zeeman sensitivity make them suitable for simultaneous penumbral magnetic field mapping.

Penn, M.J, et al., Ap.J. 590, L119, 2003.

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