ABSTRACTS

THURSDAY & FRIDAY

Session 50: Max '91 Workshop
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50.01
Active Region Evolution in the Chromosphere and Transition Region

R. A. Shine (LPARL) and C. Schrijver (JILA)

Images in the C IV 1548Å and the Si II 1526Å lines taken with the Ultra-violet Spectrometer Polarimeter (UVSP) instrument on board the Solar Maximum Mission (SMM) satellite have been combined into movies showing the evolution of active regions and the neighboring supergranulation over several days. The data sets generally consist of 240 by 240 arc second rasters with 3 arc second pixels taken every four hours (about every 90 minutes). The images are projected on a latitude/longitude grid to remove the forshortening as the region rotates across the solar disk and further processed to remove jitter and gain variations. Movies have been made with and without differential rotation. Although there are occasional missing orbits, these series do not suffer from the long nighttime gaps that occur in observations taken at a single ground-based observatory and are excellent for studying changes on time scales of several hours. The longest sequence processed to date runs from 20-Oct-1980 to 25-Oct-1980. This was taken during an SMM flare buildup study on AR 2744. Several shorter sequences taken in 1980 and 1984 will also be shown. The results will be presented on a video disk which can be interactively controlled to view the movies.

50.02
Full-Disk Magnetograms Obtained with a Na Magneto-Optical Filter at the Mount Wilson Observatory


We report here on the first full-disk magnetograms to be obtained with the Na Magneto-Optical Filter (MOP) which is located at the 60-foot solar tower of the Mount Wilson Observatory. This MOP is employed as a longitudinal magnetograph on June 18, 19, and July 1, 1987. On those three days the MOP was combined with a large format (1024 x 1024 pixel) virtual phase charge coupled device camera and a high-speed data acquisition system. The combined system was used to record both line-of-sight magnetograms and Dopplergrams which covered the entire visible solar hemisphere. The pixel size of these magnetograms and Dopplergrams was 2.3 arcseconds. On each of the three days a time series of nine pairs of magnetograms and Dopplergrams was obtained at the rate of one pair every two minutes. On the same three days longitudinal magnetograms having one arcsecond pixels were obtained with the vacuum telescope at Kitt Peak and provided to us by T. Duval. We have compared the MOP and vacuum tower magnetograms both at JPL's Multi-Mission Image Processing Laboratory at USC and have found the two sets of images to be well correlated both in the spatial distribution and strength of the measured magnetic field. We have also employed the simultaneously-obtained MOP Dopplergrams to remove the cross-talk which was present between the Doppler and Zeeman shifts of the Na D lines from the magnetograms. We will present magnetograms from all three days and will also describe recent improvements to the system which allow us to obtain full-disk magnetograms as rapidly as once every 35 seconds. This work was supported by NASA grant NASW-13 and by NSF grant INT 84-00213 to USC. A portion of the research was also performed by the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.

50.03
Observations of Photospheric Magnetic Fields and Shear Flows in Flaring Active Regions

T. Tarbell, S. Ferguson, Z. Frank, A. Title, R. Topty (LPARL)

Horizontal flows in the photosphere and sub-surface convection zone move the footpoints of coronal magnetic field lines. Magnetic energy to power flares can be stored in the corona if the flows drive the fields far from the potential configuration. We show videodisk movies with 0.5 - 1 arcsecond resolution of the following simultaneous observations: green continuum, longitudinal magnetogram, Fe I 5375 Å line center (mid-photosphere), Hα wings (+/- 600 mA), and Hα line center. The movies show a 90 x 90 arcsecond field-of-view of an active region at S29, W11 (15:05 - 16:25 UT, 8/6/87) and they include a small flare. When viewed at speeds of a few thousand times real-time, the photospheric movies clearly show the active region fields being distorted by a remarkable combination of large-scale shear flows and small eruptions of new flux. The Hα movies strongly suggest a simplifying reconnection process in the fibrils connecting opposite polarities, but other interpretations are possible. The horizontal flows are not discernable in Hα. We have mapped the horizontal flows in detail from the photospheric movies, and these can be used to suggest future evolution of the region. Longer sequences with more uniform seeing, as would be obtained from balloon or space flight, are sorely needed. These observations were obtained at the Vacuum Tower Telescope (NSO/Sunspot) using the SOUP tunable filter and the HRSO CCD camera.

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50.04
Flare Onset at Sites of Maximum Magnetic Shear

M.J. Hagyard (NASA/ Marshall Space Flight Center), J.B. Smith (NASA/Space Environment Laboratory)

In this poster display, we present results of an ongoing study to investigate the relation between sites of maximum magnetic shear in the photospheric magnetic field of active regions and the locations of the initial flare brightenings in large ribbon flares. The results presented are from studies of four different active regions for which we obtained measurements of the vector magnetic field in the photosphere using the Marshall Space Flight Center solar magnetograph system; these regions were all sites of major flares. By defining magnetic shear as the angular difference between the azimuth of the observed transverse component of the magnetic field at the photosphere and the azimuth of the potential transverse field defined by the observed line-of-sight field, we can obtain a quantitative measure of the degree to which the observed field deviates from a potential field. For each of the four active regions in this study, we evaluated this angular shear along all major magnetic inversion lines. We found that the flares in each region erupted right at the location where the local field was sheared the most. The observational data also indicate that the photospheric magnetic field must be greater than about 100 G for major flares to occur, and that the strong shear and intense fields must exist over an extended length of the inversion line. These results show that measurements of the vector magnetic field in active regions are essential if we are to understand how and where flare energy is stored and released. The implications of this on observational programs and new instrumentation for Max'91 will be outlined.

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