ABSTRACTS

04.08
High-Resolution Digital Movies of Emerging Flux and Horizontal Flows in Active Regions on the Sun

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We present high-resolution observations of active regions in many wavelength bands obtained at the Vacuum Tower Telescope of NSO/Sunspot (Sacramento Peak). The SOUP tunable filter (50–100 mA bandwidth), HRSO 1024 x 1024 CCD camera, and a sunspot tracker for image stabilization were used. Subarrays of 512 x 512 pixels have been processed digitally and recorded on videodisc in movie format. We show movies with 0.5–1 arcsecond resolution of the following simultaneous (i.e., interlaced) observations: green continuum, longitudinal magnetogram, Doppler velocity, Fe I 5576 Å line center (midphotosphere), Hα wings (± 600 mA), and Hα line center. The best set of 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 horizontal flows are not discernible in Hα, but they show excited plage and small flares at the sites of shear flows. Some of the flux emergence events have been studied in detail, with measurements of both horizontal and vertical flows. Proper motions of the magnetic flux tubes are compared with the flow of nearby granulation to estimate the effects of magnetic buoyancy and tension forces during the eruption process.

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04.09
The Solar Photospheric Structure Imaged with High Sensitivity

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We present images of the solar photosphere (integrated light) with an equivalent temperature resolution of 0.2 K and a dynamic range of 6 K. The images were recorded with a differential photometer detector and imaging system at the John W. Evans Facility of NSO/Sacramento Peak Observatory. Each digital image recorded in the first spatial derivative of the intensity was corrected for the limb darkening profile and numerically integrated to form the final image. Calibration of the image intensity or temperature variation was based on the limb profile variation across the image. Images recorded in regions over the entire solar disc show a structural complexity comparable to that of spectroheliograms in the strong Fraunhofer lines. Most notable in the structure is a bright network with a typical spatial scale of 40 arc sec. This network is probably related to faculae associated with the higher magnetic field and supergranule boundaries. Images of active regions with plages or faculae in integrated light are compared with Ca K-line spectroheliograms.

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04.10
Observations of NOAA 4835 Using the SFO RHUD

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We present results of observations of active region NOAA 4835 during its transit of the solar disk in July and August, 1987. The data are measurements of sunspot deficits and areas, and plage excesses and areas, for the entire period of visibility. They were obtained with the San Fernando Observatory Rotating Full Disk Photometer (SFO RHUD). We are currently obtaining results with a precision of a few parts per million with this instrument.

The variations in area, excess, deficit, and contrast with time will be presented and discussed.

04.11
Magnetic Flows Using Magnetic Tracer

Matthew J. Penn and Barry J. LaBonte (IFA, U. Hawaii)

Through spatial re-registering, time averaging, and image enhancement, movies of the longitudinal magnetic field of two sunspots have been produced from Kitt Peak Vacuum telescope magnetograms. The movies span 8 and 6 hour periods, and clearly show radial flows of magnetic features. Stellar photometry programs have been used to identify individual moving magnetic features (MMFs). The moves of these two sunspots are found to be smaller than average, and have characteristic velocities slightly less than expected. The acceleration of the MMFs is examined, and the magnetic flux budget of the spots and the moves are also investigated.

04.12
A COMPARISON OF VECTOR MAGNETOGRAMS FROM THE MARSHALL SPACE FLIGHT CENTER AND MEES SOLAR OBSERVATORY

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In this study we compare completely independent vector magnetic field measurements from two very different polarimetric instruments. The Marshall Space Flight Center (MSFC) vector magnetograph is based on a birefringent filter, routinely measuring all four Stokes parameters integrated over the filter bandpass (1/8 Angstrom), which is tuned sequentially to -90 (redward), 0, 60, 90, and 120 mA relative to the center of the Fe I 5250 Å line. The Haleakula Stokes polarimeter is based on a spectrograph, routinely measuring the profiles of the Fe I 6302 line in all four Stokes parameters simultaneously in 128 contiguous 25 mA spectral pixels, and scanning to build up a vector magnetogram. The Hawaii data are analyzed by two methods: (1) a broad-band analysis to emulate a filter magnetograph, and (2) a least squares fit to the full line profile. We obtained active region magnetic field data from both the MSFC and Hawaii systems on five days during June 1985. Time differences between the daily magnetograms range from less than one hour to more than five hours. For purposes of comparison, we have filtered the MSFC magnetograms (with 3 arcsec resolution) to the 5.6 arcsec sampling of the Hawaii data. We will present a comparison of the MSFC and Hawaii measurements of longitudinal field strength, transverse field strength, and transverse field direction.