initial field strength, shear motion and plasma properties are deduced or estimated from observation (AR 4711). But, the field configuration is a hypothetical one which is based on an analytical solution and is self consistent with the MHD model. Numerical results which will be presented for the AR 4711 are:

(i) Total energy as well as each mode of the energy (i.e., magnetic, thermal, kinetic and gravitation mode) and their growth rate.

(ii) Currents and field distribution in the region.

(iii) Plasma properties including EM (Emission Measures) in the region.

Session 9: Open

9.01
A Current System Asymmetry Relative to the Poles of an Expanding Bipolar Active Region

B. V. Jackson (UCSD)

An expanding bipolar active region presents a current system asymmetry outward from the solar surface that is related to a vertical plane which bisects both poles of the region. This asymmetry is tested with positional information from metric type III radio bursts which emanate from the region. Specifically, the data include May, 1984 – February, 1985, 327, 160 and 80 MHz type III burst positions from the Culgoora Radiotelescopograph. I find that the type III burst positions generally trace this current system surrounding an active region; they also indicate that type II burst electrons are directed along open field lines in a sense that tends to reduce the crossed component of magnetic field or eliminate the pre-existing current.

9.02
Correlation Study on the Weak Magnetic Fields

H. Wang and H. Zirin (Caltech)

We applied the auto and cross correlation techniques to the Big Bear Videomagnetogram data. The average size of the Quiet Sun magnetic elements derived from the auto-correlation curve is about 5700 km. The distance between the primary and secondary peak in auto-correlation curve is about 17000 km, which is smaller than the size of supergranulation as determined for the velocity map. The correlation time is about 10 to 20 hours. The diffusion constant derived from the cross-correlation curve is 150 km²/sec. There is no obvious 5 min. oscillation pattern on the cross-correlation curve of the weak magnetic fields. We also found, in quiet region, that the total magnetic flux in a window 3'X 4' changes very little in nearly 10 hours. That means the emergence and the disappearance of magnetic flux are in balanced.

9.03
Sunspot Areas from a Small Photometric Telescope

C.A. Chapman, L. Johnson, A.D. Herzog (San Fernando Obs./CSU)

A one-inch aperture telescope and 512-diode array have been used to obtain full-disk images of the sun at \( \lambda = 0.67 \mu m \) with a bandpass of less than 10nm. We have examined sunspot areas for two active regions, NOAA nos. 4662 and 4663 seen during June 1985. We find that our areas are systematically larger than those published. Our average time step would be 248 and 141 millionths of the solar hemisphere, respectively. The mean of the published areas are 185 and 126, respectively. The photometrically derived areas differ by over 8 and 1 standard deviations, respectively, from the published areas. We have tested the photometric areas by comparison with computer generated sunspots of known area. We have also compared successive photometric images obtained on the same day. We conclude that our photometric areas are accurate to within plus or minus one pixel, which has a typical area of 5 millionths of a hemisphere. We acknowledge help from our student observing team in obtaining some of these observations. In particular, J. Britt, M. Puskas, H. Siekmund, S. Templer, and L. C. Trupp. This research has been supported by NSF under grant AST-84-01145 and by NASA under grant NAGW-888. We are grateful to the CSUN computer center for their continuing patience with our large data file storage requirements.

9.04
On the Feasibility of Correlation Tracking at Moderate Resolution

R.S. Bogart & P.H. Scherrer (Stanford Univ.), S.H. Ferguson, T.D. Tarbell & A.M. Title (Lockheed Corp.)

The SOUP experiment demonstrated that large-scale photospheric flows can be measured by correlation tracking of white-light intensity features at high resolution (November et al. 1987). In order to assess the feasibility of applying this technique to observations made at lower resolution, we have applied it to the same SOUP data artificially degraded, but still free of seeing distortion. Comparisons with the velocity structures inferred from the original data will be presented, and a practical resolution limit for correlation tracking on granular features established.

Reference:


9.05
An Alternating Direction Implicit Scheme for Time-dependent Two-dimensional Magnetohydrodynamic Flows

Y.Q. Hu (NCAR/HAO)

It is well known that many solar phenomena take place in or near active regions where the magnetic fields are so strong as to play a predominant role in supporting, heating and accelerating the plasma. The time step would be severely restricted by the CFL condition and a long time computation would be subjected to numerical instability if an explicit method is adopted. In addition, improper treatment of the artificial boundaries one has to introduce in order to limit the size of the computational domain often leads to unphysical reflections. An algorithm for solving time-dependent, two-dimensional magnetohydrodynamic equations is presented which consists of a modified ADI scheme for discretizing the governing equations and the projected characteristic method for stipulating artificial boundary conditions. The algorithm is illustrated by a physical problem concerning the dynamical response of the static atmosphere to a magnetic flux emergence of opposite polarity from below the photosphere. The stability criteria are given for both the ADI scheme and the projected characteristic method.