lar maximum. The primary objectives of the SOUP experiment are to study the physical processes that store magnetic energy in active regions and the conditions that trigger its release; and to understand how magnetic flux emerges, evolves, combines, and disappears on spatial scales of 400 to 100,000 km. The instrument includes: a 30 cm Cassegrain telescope; an active mirror for image stabilization; broadband film and TV cameras; a birefringent filter, tunable over 5100-6600 Å with 0.05 Å bandpass; a 35 mm film camera and a digital CCD camera behind the filter; digital image processor; and 8 mm digital tape recorders. An analyser allows precise measurement of circular and linear polarisation for making longitudinal and transverse magnetograms. In addition, images spaced at intervals across the fili line show the paths of chromospheric fibrils, allowing the connectivity of magnetic field lines to be inferred. The broadband frames are used to measure transverse velocities; thus the flow patterns which shear the magnetic fields of an active region can be measured independently of the fields themselves.

7.07 Problems in the Analysis of Off-Disk Center Vector Magnetograms

G. A. Gary, M. J. Hagyard (NASA/ Marshall Space Flight Center)

Measurements obtained with solar vector magnetographs provide the maximum information possible on all three components of the photospheric magnetic field in active regions. These measurements thus provide the most accurate interpretation of magnetic field configurations for regions far from disk center and the most consistent calculation of a potential field independent of viewing angle. Methods of transforming the magnetic field vector and its coordinates from the observed coordinate system in the image plane into heliographic coordinates have been developed recently and described in the literature. In this paper we outline the full procedure required for such a transformation in the case of an off-disk center vector magnetogram in order to highlight two problems that are encountered in the process and that can affect the results significantly: the curvature of the photosphere and the 180 degree ambiguity in the direction of the transverse field. Specific results are presented using magnetograms obtained with the Marshall Space Flight Center Solar Vector Magnetograph.

7.08 Evaluation of Magnetic Shear in Off-Disk Center Active Regions

M. J. Hagyard, D. H. Hathaway (NASA/ Marshall Space Flight Center), P. Venkatakrishnan (Indian Institute of Astrophysics)

We analyze the changes that projection effects produce in the evaluation of magnetic shear in off-disk center active regions by comparing angular shear calculated in image plane and heliographic coordinates. We describe the procedure for properly evaluating magnetic shear by transforming the observed vector magnetic field into the heliographic system and then apply this procedure to evaluate magnetic shear along the magnetic neutral line in an active region that was observed on 1984 April 24 at a longitude offset of ~45 degrees. In particular, we show that the number of "critically sheared" pixels along an east-west directed segment of the neutral line in the

leader sunspot group changes from 16 in the image plane magnetogram to 14 in the heliographic magnetogram. We also show that the critical shear as calculated in the image plane served as a good predictor for the location of flaring activity since the flare ribbons of the great flare of April 24 bracketed the inversion line where the critical shear was located. These results indicate that for this particular region, projection effects did not significantly affect the evaluation of critical shear.

This work was supported by the Solar Maximum Mission Guest Investigator Program, the NASA Office of Solar and Heliospheric Physics, and the Air Force Geophysical Laboratory through its Solar Research Branch of the Space Physics Division.

7.09 Interpretation of Multiwavelength Observations of Solar Active Regions Obtained During CoMSTOC


Simultaneous microwave and soft X-ray observations of two solar active regions were obtained with the Very Large Array (VLA), the Solar Maximum Mission X-Ray Polychromator (SMM/XRP), and numerous other instruments on 28 November 1987, during the Coronal Magnetic Structures Observing Campaign (CoMSTOC). These two active regions, observed at the limb, were joined by a magnetic loop structure ~124,000 km in length and ~50,000 km in height. The 20 cm microwave observations of the loop structure joining the two active regions are interpreted in terms of magnetic loop models coupled with XRP emission measure and temperature data. Relative amounts of "hot" (temperatures to which XRP is sensitive) and "cool" (temperatures to which XRP is insensitive) material are determined. Similar observations of sunspot and plage associated coronal emission were obtained on 18 December 1987. Microwave emission from sunspot, plage, and loops are interpreted in terms of thermal bremsstrahlung and thermal gyromission. Estimates of the variation of the magnetic field strength with height are consistent with potential field extrapolations of photospheric magnetic fields.

7.10 Evidence for Solar-Cycle Evolution of North-South Flare Asymmetry During Cycles 20 and 21

H.A. Garcia (Space Environment Laboratory, NOAA)

The record of flare incidence from January 1969 to October 1988 indicates that the north-south (N-S) distribution of large flares is periodic and approximately in phase with the 11-year sunspot cycle. These data are based on observations of the whole-disk Sun in continuum soft X-rays which commenced in early 1969 and have proceeded without interruption to the present time. The pattern of occurrence, observed for slightly less than two sunspot cycles, is that large flares concentrate in north heliographic latitudes soon after solar minimum and then migrate gradually southward as the cycle progresses. By the