mean scan and compare our observations with those of White and Livingston (Astrophys. J., 249, 798) made at Kitt Peak. We find a good correlation between long-term (periods of several years) variations in the flare rate, calcium and Fe I plages index and sunspot number. However, the correlation for short-term variations (periods of a week or less) are usually poor. We have analyzed the data for rotational modulation and the results are compared to those of Stenflo and Londono (Solar Phys., 76, 167). We find a shorter apparent rotation rate for the Wilson-Bappu parameter than for the $K_2$ intensity or the emission index. Emerging and decaying active regions affect the apparent rotation rate differently during various phases of the activity cycle.

12.08 Facular Influences on the Apparent Solar Shape K. R. SCHATZEN, S. SOFTIA, NASA/Goddard Space Flight Center, Greenbelt, Maryland 20771

Utilizing the model of Schatten et al. (Geophys. Res. Lett., Vol. 9, No. 1, p. 49, 1982), we have calculated the influence of facular brightness on the apparent limb shape of the Sun. We concentrate our attention on 1966 when Dicke and Goldberg (Phys. Rev. Lett., Vol. 18, No. 9, p. 313, 1967) carried out their solar oblateness measurements. We find that the faculae can contribute a signal which has a similar time dependence to the Dicke and Goldberg oblateness signal. Chapman and Ingersoll (Astrophys. J., 175, 819, 1972) and Dicke (Astrophys. J., 175, 831, 1972) have examined the question of faculae in different ways. Our findings augment these earlier studies. We find with our best fit model to the total solar irradiance, little contribution to the oblateness signal from faculae-similar to Dicke's findings. The Chapman and Ingersoll model has, however, a larger limb contribution than our model. Dicke (private communication, 1982) is preparing further measurements with a view towards examining the higher numbered even harmonics of the limb shape. We have examined the facular contribution and the oblateness contribution to these higher harmonics. The faculae being fairly localized on the sun, provide a nearly flat harmonic spectrum diminishing only in accordance with the associated facular size. The contribution from a true oblateness source should decrease to near zero with harmonics higher than two in accordance with the fourier transform of the Macaulay ellipsoid shape. Since these behaviors are quite different, the new observations may allow a non-controversial separation between these two components.

12.09 Observations of Sunspot Bright Rings and Comparisons with a Convective Blocking Model, L.A. FOWLER, P. FOULK, AER, Inc.

We have used the KFPO vacuum telescope and 512 channel diode array to study the photospheric intensity distribution around sunspots, for comparison with isotherms predicted by convective blocking models of heat flow. Our two-dimensional raster scan observations of 10 spots on 18 days in 1980 and 1981 were made in 1/4 Å passbands of clean red and green continuum. 5-10 consecutive mosaics were summed to reduce granular intensity noise to an rms level below 1/4.

We find marginally significant (1-3 o) bright rings immediately surrounding most of the spots. We are not able to explain these rings as results of the telescope diffraction, residual facular signals, or diode response effects. With peak amplitude of only 0.1-0.3% above the photosphere, the bright rings do not account for an appreciable fraction of the sunspot flux deficit.

We compare the bright ring amplitude with the radial intensity profile calculated from models of heat flow blocking by spots of various depths and radii. These models indicate that a bright ring of 0.1% amplitude requires an effective thermal conductivity several orders of magnitude lower than the value conventionally used in mixing length models of the solar convective zone. This research was supported at AER, Inc. under NSF grants ATM8004346 and ATM8001498.

12.10 Speckle Image Reconstruction of Solar Features, R.V. STASCHILK, J.V. WISMON, R.W. ROYES, CFA.

Speckle image reconstruction using the Knox-Thompson algorithm has been applied to broadband solar data collected at the KPNO McMath 1.5 meter telescope using a C.E. CID detector. This detector has the wide dynamic range and linearity (after flat field correction) which is required for recording the extremely low contrast images characteristic of seeing-blurred solar features. Power spectra show structure approaching the telescope diffraction limit. Despite a limited number of frames available for processing, comparison of the smallest reliably observed features in reconstructions and in individual frames suggest at least a factor of five improvement over the seeing degrades images. Processed data include sunspots, pores and penumbral regions. No obvious artifacts are present in the reconstructions and consistency tests and laboratory experiments support the reality of the features we observe.


A series of high resolution observations of sunspots was made using photographic spectograms obtained with the SPO Vacuum Tower Telescope and Echelle Spectrograph. On the 18th of August, 1981, data was obtained every twenty seconds during a seventy minute period of good seeing. The data was taken at one slit position across the sunspot including the quiet photosphere. Magnetic field, velocity, and intensity information were obtained for the photosphere using Fe I 5303. Velocity and intensity data for the chromosphere came from calcium H. A magnetic feature of opposite polarity from the sunspot was observed to form and move radially outward from the sunspot. After moving approximately 2000 km, the feature disappeared. This appeared to be a typical moving magnetic feature (MMF) in terms of size and horizontal velocity and many MMF's have been observed to disappear during their transit of the moat. The maximum magnetic field strength (1000 G) is higher than previous observations, but this is probably due to spatial resolution since the total flux was typical of most MMF's. Our observations allowed us to measure a downdraft velocity in the feature of 400 m/s. The disappearance was probably due to spreading of the flux so that the field strength fell below our resolution limit. However, there was still evidence...