indicates that strong screening occurs if the
typical width W of the giant cells in the
east-west direction is less than twice the
depth D of the convective zone. Assuming D =
200 Mm, agreement between theoretical and
observed velocity amplitudes can be obtained if
W < 140 Mm. Deviation at larger scales is suppressed by the effects of
solar rotation. This is suggested by a linear
analysis of convective instability in a
stratified layer, which shows that, in the
presence of rotation, modes with wavelengths
above a critical value are stable. We suggest that the strongly
screamed giant cells may be reflected in
the typical separation of the two magnetic
polarieties within large active regions.

8.6
On the Generalization of the Mixing Length Theory to
Rotating Convection Zones

B.R. Durney NOAA/NSO/Sacramento Peak

The main ideas behind this approach to theories of
differential rotation will be explained and some results
will be presented.

8.7
Activity Cycle Variations of Photospheric Lines in the
Sun’s Irradiance Spectrum

W. Livingston (NOAO/NSO) and
L. Wallace (NOAO/KPNO)

New correction methods for water vapor and for
spectrograph seeing have clarified our archives on
photospheric line strength in the sun-as-a-star.
From 1976-84, for 9 selected lines, we find (1)
the equivalent widths of the ground state lines
\( \lambda \lambda 5394.8 \) and \( \lambda \lambda 5290.2 \) varied synchronously with the
intensity of \( Ca \, K \, 3963 \), (2) any solar variability
signature in the remaining 7 lines (\( Ca \, H \), \( Fe \, 5258 \), etc.) is not detectable, except
(3) during the onset of activity in 1977 the central
intensity of \( Ca \, H \) underwent minor fluctuations.

8.8
Investigation of Photospheric Limb-Darkening Variation
Between 1980 and 1985

L. D. Petro, P. V. Foukal, AER, Inc., W. A. Rosen, Vassar
College, A. K. Pierce, NOAO, and R. L. Kurucz, CFA

We have carried out precision measurements of pho-
tospheric limb darkening at the KPNO McMath Main Spectrograph
on 46 days between September 1980 and February 1985. Summa-
tion of typically 50 diametral scans per day enables us to
reduce noise to a level of 5 x 10^{-7} r.m.s.-

Session 9: Flares, Mass Ejections
(Poster Session)

9.1
A 157-Day Periodicity of Flare Occurrence Observed In
Microwave Data

R.S. Bogart and T. Bai (Stanford U.)

Nierer et al. (1985), to be published in Nature) have reported evidence for a 156-day periodicity in the occurrence of flares producing hard X-rays and gamma-rays above 270 keV, based on observations made with the Gamma-Ray Spectrometer aboard SMM from
February 1980 to June 1983. By analyzing the hard X-ray flare observations of the Hard X-Ray Burst Spectrometer, Kiplinger et al. (1984) also found evidence for periodicity at a similar period of 156 days. We have analyzed the microwave flare occurrence rate, inferred from solar radio noise data compiled by
World Data Center A in Boulder, Colorado. We find a
157-day periodicity in the data from January 1980 through June 1983, consistent with other findings. We also find evidence for a 27-day periodicity, attributable to the solar rotation. The GCS data and HXRBS data did not show the 27-day periodicity.

Having found that microwave flares show the same periodicity as hard X-ray and gamma-ray flares, we can now investigate whether this periodicity is transient or persists from earlier times of the present solar cycle or the previous solar cycle. Such a study cannot be performed directly with hard X-ray flares or gamma-ray flares because SMM was launched in February 1980.


9.2
No Microflares at the Limit of Hard X-ray Detectability

T.R. Metcalf, R.C. Canfield (UCSD)

Sensitive balloon-borne hard X-ray spectrometer
instrumentation has revealed energetically significant
numbers of very small hard X-ray bursts, termed microflares
(Lin et al., Ap. J., 283, 421, 1984). During the time of the
balloon flight that discovered these microflares, we were
carrying out our CCD-based polychromatic spectrobolliogram
observations at Sacramento Peak Observatory. As we reported previously (Canfield and Metcalf, BAA, 16, 891, 1984),
the larger of the hard X-ray microflares show many Hα features
(most notably - 50 km/s Hα redshifts) expected of chromospheric condensations resulting from explosive
chromospheric evaporation driven by intense nonthermal
electron beams (Fisher, Canfield and McCormant, Ap. J., 289,
434, 1985) of small cross-section.

In this paper we have searched for Hα counterparts of the
smallest hard X-ray events detected during the balloon
flight, examining the most appropriate segment of our data,
only a few minutes long, which contains two very small hard
X-ray microflares. We find that both these hard X-ray
microflares have apparent Hα counterparts, which differ from
the stronger events discussed by us previously in that they
are much weaker in total Hα, as well as X-rays, and they
show little or no Hα redshift. From the point of view of the
thermal/nonthermal issue, it is interesting that these tiny
events, as well other regions at the periphery of larger
events, show weak Hα wing enhancements that are temporally
correlated with hard X-rays. Such by detection biases
enhancements in larger microflares, suggests the presence of
nonthermal electron-injection events below the current
detection threshold of hard X-rays. This calls further
attention to the possible energetic significance of such
evidently nonthermal events.