have been formulated. A "magnetic complexity index" is used to describe the overall magnetic complexity of the region or group of regions, and a "flaringness index", based upon the number and importance of X-ray events, to provide an estimate of rates of energy storage and dissipation.

The radio source intensity correlates very well with the magnetic complexity index and moderately well with the flaringness, indicating a strong connection between the sources and dynamic, rather than static circumstances in the host regions or complexes.

1.10
The Onset of Solar Cycle 22 in Coronal Emission Lines

R. C. Altrock (AFLG/PHS, NSO/SP, Sunspot, NM 88349)

Solar Cycle 22 is expected to be one of the most active in history. This is reflected in the rapid rise in coronal emission-line intensities over the last two years. Current data obtained in Fe X, Fe Xiv and Ca Xv with the Emission-Line Coronal Photometer at the National Solar Observatory Evans Solar Facility at Sacramento Peak will be compared with the data from Solar Cycle 21. Latitudinally-averaged intensities as well as the temporally-averaged latitudinal variation will be displayed for the two cycles. The approaching dipole-field reversal is mapped by the "Rush to the Poles" of the polar-crown streamers, which are now in the vicinity of 80° latitude in each hemisphere. The current status of the "Extended Solar Cycle" will also be reviewed.

1.11
Spectrum, Lifetime, and Rotation Rate of Supergranules

D. H. Hathaway (NASA/MSFC), E. J. Rhodes, Jr. (USC/JPL), A. Cacciani (U Rome), and S. Korzennik (USC/UCLA)

Doppler velocity observations obtained at the 60-ft Solar Tower of the Mount Wilson Observatory with a Na version of Cacciani's Magneto-Optical Filter have been analysed to determine the nature of the steady photospheric flows. Doppler velocity images were constructed every 60 s from filtered images obtained about 125 mA to the red and blue of the Na D lines with a 1024 by 1024 CCD camera. Steady flow velocity images were produced by running a 20 minute long temporal filter over the individual velocity images to remove the p-mode oscillations. The observer's motion was removed from these steady flow images and the resulting images are analysed to determine the convective limb shift and the rotation profile. These large-scale velocity fields were then removed from the images leaving a velocity signal largely due to supergranulation.

This supergranulation velocity field was projected onto spherical harmonics. The resulting spectrum has a maximum at spherical harmonic degree \( l \sim 100 \) and then decreases monotonically to \( l > 500 \). There are no spectral features to indicate the presence of mesogranulation as a distinctly different mode of convection. A series of these images produced over the course of several days was analysed using cross-correlation techniques. From the longitude shift for maximum correlation we find that the supergranulation pattern exhibits a differential rotation profile similar in form and magnitude to recent Doppler measurements of the photospheric rotation rate. From the decrease in the amplitude of the maximum correlation with time, and after accounting for changes in the line-of-sight velocity projection, we find that typical supergranules live for about two days.

1.12
Modeling the Flow in Solar Vortices

G.W. Simon (GL/NSO/SPO), N.O. Weiss (U. Cambridge), G.B. Scharmer (Roy. Swed. Acad. Sciences)

We modify a model (Simon and Weiss 1989) developed earlier to describe the radial outflow associated with an isolated convection plume at the solar surface, to include azimuthal velocities. The model is used to describe the motions in a strong vortex observed at the Swedish Solar Observatory on La Palma on 1987 June 16 (Brandt et al. 1988). We have also applied the model to vortices measured by other observers. In almost every case the fit between observations and model is excellent.

References


Session 2: Waves and Oscillations

Oral Session
9:30 am, Classroom

2.01
Resonant Wave Heating of Coronal Loops

J. M. Davila (NASA/GSFC)

Resonance absorption was proposed as a mechanism for the heating of fusion plasmas nearly twenty years ago. McPherson and Pridmore-Brown (1968) presented one of the early papers reporting experimental results which confirmed the basic concepts of the theory of low frequency wave propagation and damping in an inhomogeneous plasma. Chen and Hasegawa (1974) showed that the heating rate in an inhomogeneous tokamak plasma can be calculated, under rather general assumptions, from the ideal MHD solution. This calculation demonstrated that the heating rate could in some regimes be independent of the detailed dissipation physics. In a series of papers, Tataronis and co-authors (Tataronis and Grossmann 1973, Tataronis 1975, Tataronis and Grossmann 1976, and Kapraff and Tataronis 1977) consider wave propagation in inhomogeneous tokamak plasmas using a two-scale Fourier transform technique.

Resonance absorption was introduced into the solar literature by Jonsson (1978, 1982, 1983) who pointed out, using a heuristic "LRC equivalent circuit" approach, the potentially important role of density and magnetic field gradients for the dissipation of energy in the solar corona. The qualitative features of Jonsson's calculation were essentially confirmed by Hollweg (1984) using a similarly heuristic "dissipation length" formalism. Jonsson and Hollweg both concluded that resonance absorption could explain the observed heating in the solar corona.

Recently, Davila (1986, 1987) has calculated the heating rate for a coronal magnetic loop using the more rigorous two scale, Fourier transform technique reported in the fusion literature. This calculation demonstrates that resonance absorption is consistent with the observed heating rate necessary to explain the soft X-ray emission from active region loops, and therefore must be considered a viable mechanism for the heating at least portions of the corona of the Sun and other late-type stars.

2.02
An Episodic Model of Coronal Heating

P.A. Sturrock (Stanford U.) and S.K. Antiochos (NRL)

We abandon the concept that there exists a mechanism for the steady heating of the solar corona, and consider instead the possibility that heating is episodic. As far as heating is concerned, we consider that the corona may be modeled as an assembly of discrete units, each unit being associated with a magnetic flux tube. We further consider that magnetic energy is converted into heat in short bursts, each burst being followed by a comparatively long period when no further energy is added to the system.