on the spectroheliograph. This instrument consists of two 512 element reticon diode arrays; one operated in the continuum near 8663 Å and the other in the wing of the Calcium line at 8663 Å. Software has been developed to use the line channel to identify the location of faculae in an active region while their contrast is established from the continuum channel. Alignment between channels is better than one element (0.9 arc seconds). Data is usually square averaged to give a system resolution of 1.8 arc seconds.

03.17

**Variability in Active Region Corona Loops**

B. M. Haisch (Lockheed Palo Alto Res. Lab.)

Rapid variability has been found in two active region coronal loops imaged in the X-ray resonance lines of 0 VIII (18.97 Å), Ne IX (13.45 Å) and Mg X (9.17 Å) by the Flat Crystal Spectrometer (PCS) and in the soft X-ray continuum by the Hard X-ray Imaging Spectrometer (HXIS) onboard the Solar Maximum Mission (SMM). We have identified what appear to be two typical coronal loops, each about 2' in diameter at a temperature of about 3 to 4 million degrees, as determined from the Mg X/Ne IX line ratio. The loops are bright features in the lowest HXIS band (3.5 - 5.5 keV), but appear as well in the bands 2/3 (5.5 - 11.5 keV). Twenty-five PCS spectroheliograms over four orbits show considerable variability in the loop brightnesses, but the topology of the loops is rather stable. Light curves of both loops were made from the PCS spectroheliograms and from the HXIS images. Order of magnitude changes are evident in the HXIS intensities on time scales of an hour; factor of two changes occur in the X-ray line fluxes. There appear to be surprisingly few published observations of the short-time scale behaviour of hot loops. The evidence presented herein lends support to the hypothesis that coronal heating may be impulsive and driven by flaring and microflaring.

03.18

**Simultaneous Observations of Coronal Bright Point Emission at 20 cm Radio and He 10830 A Wavelengths**

K. L. Harvey (SPRC), S. R. Habbal (CfA)

We report on the results of observations of solar coronal bright points made simultaneously at 20 cm radio and He 10830 A wavelengths, with good temporal (3 min) and spatial (2-15”) resolution, on September 6 and 9, 1985. The spatial correspondence of the emission at both wavelengths shows that some bright points observed at 20 cm overlay He 10830 'dark points', while others connect between the He 10830 dark points. We also show how spatial changes that occur at transition region-low corona heights (as observed from the 20 cm emission) correlate with the temporal changes in emission at 20 cm and absorption in He 10830. The implications of such a correlation on the dynamic nature of coronal heating will be discussed.

03.19

**The Differential Emission Measure of Transiently Heated Corona Loops**

S.K. Antiochos (Naval Research Laboratory)

P.A. Sturrock (Stanford University)

We consider the effect of a time-dependent heating rate on the structure of the plasma in a solar coronal loop and on the radiation from this plasma. In particular, we assume that the heating has a cyclical behavior and then calculate the time-averaged form of the differential emission measure for such a heating. Several cases are considered. For a sufficiently slow variation in the energy input rate the loop can adjust through a series of quasi-static equilibria. The main effect on the emission measure in this case is to alter the profile at high temperatures. We also consider the effect of a more rapid variation in which the plasma dynamics plays an important role. For these cases the differential emission measure may be very different than that predicted by static models. The implications of these results for solar and stellar observations are discussed.

03.20

**Solar Transition Region and Coronal Response to Heating Rate Perturbations**

J.T. Mariska (Naval Research Laboratory)

The solar transition region is in a dynamic state characterized by impulsively upflowing plasma and continually downflowing plasma. Using numerical simulations, I examine the conjecture that the areas of downflowing plasma are simply the base regions of coronal loops in which the heating is gradually decreasing and the areas of upflowing plasma are the base regions of coronal loops in which the heating rate is gradually increasing. Only when the heating is reduced to 1% of the initial value do appreciable downflow velocities develop at 10^5 K. The time scale over which the heating is reduced is not of great importance. Moreover, maximum downflow velocities are present only after the emission measure has declined significantly, making them difficult to observe. Appreciable upflow velocities are only present in the case in which the loop which has been cooled to 1.1 energy deposition rates is reheated. These upflow velocities at 10^5 K are much smaller than those observed at high spatial resolution in impulsive events. Larger velocities are present in higher temperature plasma early in the heating. At this stage, however, the emission measure at high temperatures is small, making it unlikely that the plasma could be observed. The calculations suggest that gradually reducing or increasing the heating in a magnetic flux tube will not result in plasma motions that are similar to those observed at high spatial resolution.

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03.21

**Numerical Simulation of Turbulent Corona Self-Organization**

R. B. Dahlburg, J. P. Dahlburg, and J. T. Mariska (Naval Research Laboratory)

Heyvaerts and Priest [1] have used Taylor's method to investigate the heating of the solar corona by local current production. Using this hypothesis, they predict the minimum energy state to which twisted flux tubes will relax - the excess magnetic energy being converted into heat. According to Taylor's scheme, the minimum energy state will be a force-free state, i.e., \( \nabla \times B = 0 \), with \( \alpha \) equal to a constant.

Taylor's method only depends on the stability of the final state - it provides no information on the processes by which the final state is achieved, viz., the self-organization of the helically turbulent magnetofluid. Of particular importance for the occurrence of a force-free state is the selective decay of the energy with respect to the magnetic helicity [2].

We use the recently developed 3-D MHD simulation code MDDBOX [3] to simulate the self-organization of a helically turbulent magnetofluid. MDDBOX solves the 3-D, viscoresistive, incompressible MHD equations in a periodic, Cartesian geometry. The Fourier pseudospectral method is used to discretize space, and time is discretized by a second order Runge-Kutta scheme. We present preliminary results of 3-D magnetofluid self-organization both with and without the presence of a mean magnetic field. We show that in both cases relaxation of the magnetofluid to a force-free, lower energy state occurs. Some variation of \( \alpha \) in the force-free regions has been observed.


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