heating in the overall energy budget for these regions. The data suggest that short-term (few minute) fluctuations in the heating, as evidenced by short-term spatial and temporal variations in the EUV intensities, are responsible for a significant fraction of the total heating in small active regions. This suggests that the coronal heating in these regions is caused by a mechanism capable of generating a significant "AC" component as suggested by other investigations of short-term heating in active regions (cf. Porter, Toomre, and Gebbie 1984, Ap. J., 283, 570; Withbroe, Habbal, and Ronan 1985, Solar Phys., 95, 297). One possible mechanism is rapid magnetic reconnection which occurs stochastically.

9.07 Solar Activity and Flare Observations from the Swedish Solar Observatory on La Palma

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Movies of solar active regions with exceptional spatial resolution (0.3 - 0.5 arcseconds) were obtained at the Swedish Solar Observatory on La Palma, Canary Islands during International Solar Month (September, 1988). When possible, these overlapped with SMM and OS observations in time and target region. Simultaneous movies in red continuum, longitudinal magnetograms, Doppler velocity, and line center intensity were taken in Fe I 6302 and Ni I 6768 (GONG line), as well as Hα line center and wings. The SOUP tunable filter (75 mA bandpass) and the HRSO/OSL 1024 x 1024 CCD camera were used for the spectral images. Digital data were recorded with an 8 mm digital video tape system with 5-10 second cycle times. The SSO video frame selection system was also used for very high resolution continuum observations. About 50 Gbytes of data were obtained. Several small and medium sized flares were captured, at least some of which are associated with shearing motions in the photosphere.

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9.08 Acceleration of Coronal Loop Electrons by Magnetosonic Waves

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The impulsive phase of solar flares is characterized by a rapid rise in hard X-ray and microwave intensity. This emission indicates the presence of electrons accelerated to 10-100 keV. We are investigating a model for the acceleration of these electrons.

The mechanism we are considering is stochastic acceleration via resonant interaction with magnetosonic waves. Electrons can diffuse upwards in energy by migrating between wave effective potentials; electrons from a thermal distribution can be accelerated by this method. The wave turbulence is assumed to be generated by the flare primary energy release. The diffusion is a chaotic process, and certain ideas from nonlinear dynamics are relevant to this problem. We are conducting test particle calculations to determine the efficiency and timescale of this acceleration mechanism. Current results of the computations will be presented.

9.09 Ca XIX X-Ray Emission-Line Signatures of Impulsively Heated Solar Flares

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Numerical simulations show that hot plasma moves upward at velocities of several hundred kilometers per second in the early stages of an impulsively heated flare. Yet X-ray line observations show a strong stationary component and a relatively weak blueshifted component during the impulsive phase. For SMM, this is due to the tens of seconds of integration time required to produce a statistically meaningful observation, and complements comparisons with numerical simulations. Using the results of a series of time-dependent numerical simulations of an electron-beam-heated flare atmosphere, I have synthesized the Ca spectrum in the 3.17 to 3.22 Å wavelength region. Early in all of the simulations the Ca XIX resonance line is strongly blueshifted. In the 30 to 60 s that it takes to obtain a useful observation, however, the stationary component becomes the dominant element in the spectrum. Using different averaging intervals, I will show how this transition from a primarily blueshifted spectrum to a stationary spectrum with excess blue-wing emission develops. In a spectrum averaged over the first 40 s of the flare, the stationary component is already comparable with the blueshifted component. For a 60 s averaging interval, the stationary component dominates. Thus a full understanding of flare hydrodynamics will require more sensitive observations early in the flare. Some early flare data applicable to this problem may be available in the spectra obtained with the P78-1 spectrometer, which scanned in wavelength.

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9.10 Magnetic Fields in Solar Prominences

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Hanle effect measurements of vector fields inside quiescent prominences show that the field is nearly horizontal (Athay et al., Solar Phys. 89, 3, 1983), as expected for plasma which is magnetically supported. Using a statistical method, Leroy et al. (Astr. Ap. 131, 33, 1984) were able to remove the two-fold ambiguity inherent in these polarization measurements, and they concluded that the field component perpendicular to the long axis of the prominence points from the region of negative polarity in the photosphere to the region of positive polarity, opposite to the direction of the potential field but consistent with Kuperus-Raadu type models. This result applies in particular to Polar Crown filaments. However, there is an important problem regarding the origin of the less ambiguous and often stronger field component along the prominence axis: the polarity of this component is opposite to that produced by solar differential rotation acting on an initially potential magnetic field (also see Rust, Ap. J. 150, 313, 1967; Leroy, Astr. Ap. 64, 247, 1978; Leroy et al., Solar Phys. 83, 135, 1983). I consider several possible explanations: (1) the prominence is embedded in a current sheet (Kuperus and Raadu, Astr. Ap. 31, 189, 1974), and the differential rotation is transmitted from the neighboring open field to the prominence field via frictional coupling; (2) the prominence is embedded in a helical field, and relaxation processes within this field lead to the formation of a 'reversed-field pinch'; (3) the sign of the velocity shear near magnetic neutral lines is opposite from that of the global differential rotation. Various problems associated with these models are discussed. This research is supported by NASA.