9.3 Detailed Morphology of Flare-Associated Coronal Loops

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Four sets of high-resolution observations of coronal loops associated with flares have been recorded with the NSO 20-cm aperture, emission-line coronagraph. The images are recorded in the lines of Fe XIV (5303Å), Fe X (6374Å) and Hα. Geometrical parameters of loops as recorded in different lines are presented, as also expansion velocities, which appear to be continuous. Bright knots are observed to move down the loops, at a quasi-periodic rate. Systematic changes in the form of these knots as a function of height are observed. These observational data are interpreted and physical parameters of the loop systems tentatively deduced.

9.7 The Structure of High Temperature Flare Plasma in Electron-Heated Flare Models

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There are two mechanisms by which a stable electron beam may heat a plasma into which it is injected. The first is direct collisions of the beam electrons with ambient electrons; the second is the ohmic heating produced by the beam-neutralizing return current. The parametric dependences of these two mechanisms are substantially different - collisional heating scales as \( n_j \), where \( n \) is the ambient plasma density and \( j \) is the beam current, while ohmic heating scales as \( jT^{-3/2} \), where \( T \) is the plasma temperature. The steady-state structure of flare coronae heated by an electron beam and cooled by conduction \( [\nabla \cdot (j T^{3/2}/4\nabla T)] \) will therefore be different for each mechanism. In this paper we present analytic expressions for the temperature structure of solar flare coronae in regimes where one or other of the above two mechanisms is dominant, and we discuss the features of the solutions. A simple result arising from the analysis is that the peak temperature of the loop, \( T_{\text{peak}} \), scales as \( j^{3/2} \) for collisionally-heated models, but as \( j^{5/2} \) for ohmically-heated models. Such "scaling laws" can be tested observationally. We also comment on the relative role of each of the above two mechanisms at various times and atmospheric levels.

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9.8 The Height Distribution of Solar Hard X-Rays in Non-Thermal Models

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Using a thick-target bremsstrahlung model, we have calculated the evolution of the hard X-ray height distribution in the hydrodynamic model atmospheres of Negai and Emelie (1984, Ap. J., 279, 896). We evaluate the upward motion of the source as a result of ablation of chromospheric material ("evaporation") and also self-consistently include the contribution from the hot thermal plasma created by collisional heating of the background plasma by the non-thermal electrons. Our results can be compared with recent observations of the hard X-ray spatial structure in actual events.

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