We contrast the relevance of line-tied boundary conditions on the resistive and ideal MHD stability of arcades. We discuss the energy storage in the arcade field, the fraction of energy released in the disruption, the timescale on which disruption occurs, and the relevance of these simulation results to solar observations.


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13.05 HEATING THE SOLAR CORONA BY THE RESONANT ABSORPTION OF MHD WAVES

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Recent observations of the solar corona have emphasized the inhomogeneous nature of the heating process. Hot magnetic loops near active regions have been routinely observed by UV and X-ray instruments. Several theoretical ideas have been advanced to account for the observed structure. One such idea states that wave energy driven by the turbulent convection zone can be resonantly absorbed in coronal loops. The process envisioned is similar to the one observed experimentally in tokamak plasmas. In this paper some recent work regarding the resonance absorption process and some of the implications for these results for solar coronal heating theory will be discussed.

13.06 High-Spatial-Resolution Microwave and Soft X-ray Observations as Diagnostics of Solar Magnetic Loops

G. D. Holman (NASA/GSFC), D. F. Webb and J. M. Davis (ASSE), and M. R. Kundu (U. of Maryland)

Simultaneous high-spatial-resolution microwave and soft X-ray observations of solar magnetic loops, together with theoretical models for the loop emission, can provide detailed information about the temperature, density, and magnetic field within the loop, as well as the environment around the loop. VLA maps at 5 and 1.5 GHz, and soft X-ray images obtained with a rocket payload, or active region loops are analyzed. Models for the microwave emission, which can be either thermal bremsstrahlung (cyclotron) or free-free emission, are developed and compared with the observational results. In addition to average physical parameters, information about the magnetic and plasma structure of the loops is obtained. The models for the 1.5 GHz observations require the presence of an external plasma around the three X-ray loops with a temperature ~10^6 K or less. These results emphasize the value of obtaining high-spatial-resolution microwave and simultaneous soft X-ray, and/or EUV, observations of magnetic loops on the sun.

13.07 Theoretical Models of the Microwave Emission from Solar Magnetic Loops

J. W. Brosius (NASA/GSFC and SASC Technologies) and G. D. Holman (NASA/GSFC)

The spatial and frequency structure of the microwave emission from solar coronal loops can reveal detailed information about the magnetic and plasma structure of these loops. The emission from these quiescent loops can be either thermal bremsstrahlung or gyroresonance (cyclotron) emission. Computations of the thermal bremsstrahlung microwave emission from a series of model magnetic loops is presented. The models demonstrate the effects of an external plasma, temperature and density gradients, and the refractive index of the plasma upon the observed emission.

13.08 The Effects of Magnetic Tapering on Thick Target Electron Heating in Solar Flares

S. Chandrasekhar and A. G. Enslin (U. Ala. Huntsville)

We investigate the behavior of non-thermal electrons injected into a tapered magnetic loop, under the influence of both Coulomb collisional and magnetic field gradient forces. An approximate analytic formula for the heating rate as a function of distance along the loop is developed, which we show to be consistent with exact numerical solutions of the relevant equations. Our results explain the effects of a converging magnetic field in a unified form, as compared to the purely numerical presentation of similar results by Leach and Petrosian (1981, Ap. J., 251, 761)

We have also studied the variation of reverse current ohmic heating with depth in situations of converging magnetic field. Preliminary results will be reported.

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13.09 A Search for Forerunners in the SOLWIND Coronagraph Images

J. T. Karpyn and R. A. Howard (Naval Research Lab.)

The possible existence of energetic disturbances in the corona significantly before the associated surface events has profound implications for the location and mechanism of preflare energy storage, as well as the evolution and magnitude of the energy release or failure of magnetic equilibrium characterizing the interval before and during the mass ejection. Jackson and Hildner (1978; JH) studied 18 coronal mass ejections (CMEs) observed with the SKYLAB white-light coronagraph. They found a low-density plateau riming each event, and denoted this phenomenon a "forerunner". In addition, they concluded that the forerunner material must be set in motion significantly before the onset of the associated CME and could not be explained by mere translation of the overlying coronal plasma. We have performed a systematic search for forerunners using the white-light coronagraph observations obtained with the SOLWIND instrument on board the P81-I satellite. We selected and analyzed 44 bright, well-observed events, employing selection criteria and analysis methods similar to those used by JH. In comparing the SOLWIND difference images to the excess mass contours, we find that the 2-sigma contour level used by JH to define the forerunner front is readily apparent in the image. In fact, this level generally outlines the leading edge of the visible event. If the contour plots of the SOLWIND events are made with the same (linear) contour spacing as used by JH, a forerunner plateau is visible in both the CME itself and nearby affected coronal features, e.g., a neighboring streamer that has been pushed aside. If contour levels with power-law spacing similar to the density distribution of the background corona are chosen, however, the forerunner plateau disappears. Therefore, we conclude that the forerunner phenomenon is an integral part of the CME itself and not a manifestation of precursor activity.

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