the application of a fully threedimensional, non-periodic, resistive MHD code to a model force-free sunspot field (Barnes and Sturrock 1972; Yang, Sturrock, and Antiochos 1986). While this field is topologically similar to an isolated linear arcade, it has important geometric differences; it requires a three-dimensional description. We study the fully three-dimensional stability of this field for various degrees of photospheric shearing. The magnetic properties of this field have been studied previously and can be used to validate our simulations.


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08.08
Alfvénically-Driven Slow Shocks in the Solar Chromosphere and Corona
J.V. Hollweg (University of New Hampshire)

If an impulsive torsional Alfvén wave is launched from the solar photosphere, it can steepen in the chromosphere into a fast shock followed by a slow shock. The fast shock has been shown previously to cause substantial motions of the transition region (TR) and underlying chromosphere. Here we investigate the effects of the slow shock. Surprisingly, the slow shock has a tendency to "stall" in the chromosphere and eventually decay there, without interacting strongly with the TR. However, the slow shock can indirectly affect the transition region by reflecting downgoing Alfvén waves back upwards, where they can dynamically affect the TR. Moreover, the slow shock can heat part of the chromosphere; this, combined with the tendency of the fast shock to set the TR in motion, can lead to structures resembling spicules.

08.09
SOLAR CHROMOSPHERIC HEATING
Stuart D. Jordan (NASA/GSFC)

Recent work by Anderson and Athay (Astrophys J., 1989, 346, 1010) has raised again the possibility that much of the quiet solar chromosphere is heated by acoustic shock waves. Their detailed treatment of net radiative losses yields an approximately constant loss rate per gram in the region of the chromosphere dominated by losses due to the many lines of Fe II, a result one would expect from the passage of weak acoustic shocks through this region. Here, a spectrum of weak acoustic shocks is introduced into the latest VAL model for the quiet chromosphere, with initial conditions determined by using scaling laws developed by Ullsmlnder and Kalkofen (Astron and Astro, 1977, 57, 199) to account for the effects of radiative dissipation in the photosphere. Local net radiative losses are obtained from Anderson and Athay (above reference) and from Avrett (CHROMOSPHERIC DIAGNOSTICS AND MODELLING, 1985, ed. Lites, Sunspot, NSO, 67). The waves are introduced sequentially, corresponding to the tenacity of the dominant wave to "sweep up" the weaker ones at any given point; then a time average is taken over all waves in the initial spectrum for comparison with the time-averaged model. The effects of magnetic fields are ignored. Initial conditions are varied over the range of possibilities constrained by the effects of radiative damping on the waves, and by the long-period cutoff resulting from OSO-8 observations (Athey and White, Astrophys J., 1978, 226, 1135). The results show that it is difficult to reproduce the recent models with acoustic shock heating throughout the middle chromosphere, and a critique of the approximations used and a discussion of other possibilities follows.

08.10
On the Generation of Magnetic Tube Waves in the Solar Convection Zone
Z. E. Musielak (UAH), R. Rosner (U. Chicago), P. Ulmschneider and P. Gail (U. Heidelberg)

We discuss the correct status of computing longitudinal and transverse tube wave energy fluxes for the Sun. Recent work has focussed on incorporation of a physically meaningful description of the temporal spectrum (so-called "frequency factor") of the convective turbulence which drives magnetic tube waves. We shall present results showing the dependence of wave fluxes on the nature of this frequency factor and discuss possible role of these waves in the heating of the solar atmosphere.

08.11
A Novel Way to Convert Alfvén Waves to Heat in Coronal Holes: Reflective Damping
R. L. Moore (NASA/ Marshall Space Flight Center/SSL)

This paper builds on the recent paper, “Alfvén Wave Trapping, Network Microfaring, and Heating in Solar Coronal Holes,” by R. L. Moore, Z. E. Musielak, S. T. Suesc, and C.-H. An (submitted to Ap. J., November 1990). That paper found that for Alfvén waves with periods of about 5 min, and for realistic density and magnetic field for coronal holes, upward waves are reflected back down if the coronal temperature is only slightly less than $1.0\times10^{6}$ K, but are passed on to the solar wind if the temperature is only slightly greater than $1.0\times10^{6}$ K. Because the spectrum of Alfvén waves emitted into coronal holes from the underlying magnetic network is expected (1) to carry enough energy ($10^{14}$ erg/cm$^2$/s) to sustain the corona and solar wind and (2) to peak around 5 min, and because the coronal temperature in holes is close to $1.0\times10^{6}$ K, the sensitive temperature dependence of the reflection suggests that the temperature in coronal holes is regulated by heating by the reflected Alfvén waves. The purpose of the present paper is (1) to stress that for this thermostat process to work the mechanism that dissipates the Alfvén waves into heat must act much more strongly on the reflected waves than on the passed waves, and (2) to propose that the dissipation is caused by the reflection itself together with the intermittency of the Alfvén waves, i.e., that the resulting lifting and dropping of coronal plasma converts the energy of the reflected waves first into gravitational potential energy and then into heat by infall impact.

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Session 9:Instrumentation
10:30 am–12:30 pm, Salon A

09.01
The OSL/HRTS UV CCD Development Program
D.G. Socker (Naval Research Laboratory), M. Marchyvka (Interferometrics Inc.), C. Korendyke (Naval Research Laboratory)

The High Resolution Telescope and Spectrograph (HRTS) experiment planned for the Orbiting Solar Laboratory requires a spectrograph camera with vacuum ultraviolet sensitivity (1175 Å - 1700 Å) and large format. The camera system should also provide a moderately fast (2400,000 pixels/second), low noise and flexible readout capable of windowing various spectral lines of interest.