HEATING AND DYNAMICS OF THE QUIET SOLAR CHROMOSPHERE

W. Kalkofen

Harvard-Smithsonian Center for Astrophysics

The quiet solar chromosphere is bifurcated into the magnetic network on the boundary of supergranulation cells and the nonmagnetic cell interior. The cell interior was believed to be heated by acoustic waves. However, recent space observations with TRACE have found at most 10% of the necessary acoustic flux. To explain the low measurement it was speculated that the nonmagnetic chromosphere is heated mainly by waves related to the magnetic field. Yet the emergent radiation shows none of the signatures of magnetic waves; it shows only those of acoustic waves. Essentially all the heating of the nonmagnetic chromosphere must therefore be due to acoustic waves. In the magnetic network, on the other hand, since the filling factor of the magnetic field is very small in the photosphere, only a small fraction of the wave flux that travels upward to heat the chromosphere is channeled by the magnetic field. Hence, while some of the energy is in the form of magnetic waves, most of the energy that is dissipated in the magnetic network must be in the form of acoustic waves. I conclude that the quiet solar chromosphere, magnetic as well as nonmagnetic, is heated mainly by acoustic waves. The full wave flux heating the quiet chromosphere must therefore travel through the photosphere. The failure to observe the full acoustic flux heating the nonmagnetic chromosphere may be due to the limited spatial resolution of TRACE.