Abstracts

Diamagnetic Acceleration of the Solar Wind

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We develop a new model to account for proton acceleration in the solar wind. Acceleration is a direct result of the diamagnetic effect on the charged particles, and hence on their velocity distribution. Our basic assumptions are: a collisionless plasma, energy conservation and magnetic moment conservation.

Through numerical simulations we explore the changes in bulk speed between 0.3 AU and 1 AU. We find that the diamagnetic effect accounts for the observed velocity increase in bulk speed.

Since any form of wave-particle interactions is excluded from our simulations, but they fit well the observations, we suggest that the diamagnetic effect also accounts for wind expansion in early type stars, i.e. for stars without convective energy available at their surface.

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Energy Transport to the Solar Corona by Magnetic Kink Waves

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We show that the magnetic kink waves generated by the motions of photospheric footpoints of the coronal flux tubes can supply adequate energy for heating the quiet corona, provided there are occasional rapid motions of these footpoints as found in recent observations (Vigneau et al. 1992, preprint). Choudhuri, Auffret & Priest (1992, Solar Phys., 143, 49; hereafter Paper I) modelled the solar corona as an isothermal atmosphere and showed that these rapid footpoint motions are much more efficient for transporting energy compared to the slow footpoint motions taking place most of the time. We extend these calculations for a two-layer atmosphere, with the lower layer having chromospheric thickness and temperature and the upper layer having coronal temperature. Even in the presence of such a temperature jump, we find that the rapid footpoint motions are still much more efficient for transporting energy to the corona and the estimated energy flux is sufficient for quiet coronal heating, i.e. we reinforce the conclusions of Paper I.

In addition to presenting results for the solar corona, we discuss the general problem of the propagation of kink pulses in a two-layer atmosphere for different possible values of the basic parameters. We find a fairly complicated behavior which could not be anticipated from the analysis of a pure Fourier mode. For pulses generated by rapid footpoint motions, the energy flux decreases due to reflection at the transition layer. For pulses generated by slow footpoint motions, however, the behavior of the system is