Geophysical Research Abstracts,
Vol. 10, EGU2008-A-12255, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-12255
EGU General Assembly 2008

Torsional Alfven waves in small scale density threads of the solar corona

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The density structuring of the solar corona is observed at large scales (loops and funnels), but also at small scales (sub-structures of loops and funnels). Coronal loops consist of thin density threads with sizes down to (and most probably below) the resolution limit. We study the properties of torsional Alfven waves in inhomogeneous cylindrical density threads using the two-fluid MHD equations. The eigenmode solutions supported by such a structure are obtained and analyzed. It is shown that the dispersive and dissipative effects become important for the waves localized in thin threads. This mathematical model is applied to waves propagating in coronal structures. In particular, we consider ~ 1 Hz Alfven waves propagating along density threads with a relatively smooth radial profile, where a density contrast of about 1.1 is attained at radial distances of about 0.1 km. We found that the dissipation distance of these waves is less than the typical length of hot coronal loops, 50 Mm. Therefore, the torsional Alfven waves localized in thin density threads can be responsible for coronal heating and for maintenance of the small-scale coronal structuring.