

Strapping field profiles to reproduce instability in coronal mass ejections.

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In solar coronal loop experiments at Caltech, the hoop force causes plasma loops to expand unless additional forces are applied. By applying a strapping magnetic field of proper polarity, Hansen and Bellan [1] slowed and even inhibited this expansion. They did not try to reproduce the slow expansion to fast eruption exhibited by plasma loops on the sun. Kliem and Torok predicted that a transition from a slow expansion to a fast eruption occurs if the magnetic field's rate of decay with increasing altitude meets an instability criterion. If the restoring force due to the strapping field decays faster than the hoop force, then the plasma will move from a region where its expansion is decelerated to one where its expansion is accelerated. We have calculated the magnetic profiles which attains the instability criterion to within the length scale of the Caltech experiment and are constructing an auxiliary coil with independent power supply designed to match the calculated profiles.

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References

- [1] J. F. Hansen and P. M. Bellan, *Astrophys. J. Lett.* 563, L183 (2001)
- [2] B. Kleim and T. Torok, *Phys. Rev. Lett.* 96, 255002 (2006)