M31a Nonlinear stability analysis of the Kippenhahn-Shülter model for the solar prominence with ambipolar diffusion

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The launch of Hinode satellite allowed previously unprecedented high resolution images of Solar Prominences to be taken continuously over a long period of time. These new images led to the discovery of dark upflows that propagated from the base of the prominence through a height of approximately 10Mm before ballooning into the familiar mushroom shape of the Rayleigh-Taylor instability (Berger et al. 2008). As yet the origin of these dark upflows is unknown.

At temperatures approximately 10,000K, the solar prominence is an example of a partially ionised plasma where amibipolar diffusion dominates resistive diffusion and the Hall effect. Under the influence of ambipolar diffusion, it is possible for the plasma at the base of the prominence to drain away, leaving the prominence susceptible to the interchange instability and tearing instability, which could result in the dark upflows that have been observed. In this study, using 3-D MHD simulations, we investigate the nonlinear stability of the Kippenhahn-Shülter model for the solar prominence under the influence of amibipolar diffusion.