M33a Tearing instability in the Kippenhahn-Schlueter Prominence model

○ Andrew Hillier、Hiroaki Isobe、Kazunari Shibata (京都大学)

The launch of SOT on the Hinode satellite, with it's previously unprecedented high resolution, high cadence images of Solar Prominences, led to the discovery of bright and fast ejections from inside prominences. As these ejections are faster than the local sound speed, they can be viewed as Alfvenic. This could be seen as evidence of bursty reconnection, driven by the tearing instability, occurring in prominences. Whether such phenomena can be driven by the tearing instability and, if so, how the instability evolves is yet to be fully investigated.

In this study, we use the Kippenhahn-Schlueter prominence model (Kippenhahn and Schlueter, 1957) as the base for 2-D resistive MHD simulations. The Kippenhahn-Schlueter model is linearly stable for ideal MHD instabilities, but can be made unstable through the inclusion of diffusive terms. Our simulations follow the linear and nonlinear evolution of the tearing instability (2-D) in the Kippenhahn-Schlueter prominence model. We also include Cowling resistivity to replicate the effect of neutral flow in our 1 fluid model, to understand how this effects the tearing instability in a prominence geometry. Using the results from these simulations, we discuss how the instabilities are affected by the geometry of the Kippenhahn-Schlueter model and how these results can be applied toward understanding prominence dynamics. We found that the linear growth rate of the instability was reduced due to the non-uniform density distribution and, in the nonlinear phase, fast plasmoid ejection occurred.