A43a Nonlinear Dynamics of the Magnetic Rayleigh-Taylor Instability in Prominences

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Prominences are cool, dense structures found in the solar corona that are supported against gravity by magnetic tension. Recent observations of quiescent prominences by the Solar Optical Telescope on the Hinode satellite show low density plumes that rise through the high density prominence material. To investigate this phenomenon, we used 3D ideal MHD simulations to model the nonlinear evolution of the magnetic Rayleigh-Taylor instability in a quiescent prominence model. The instability drives the creation of low density filamentary structure aligned with the direction of the magnetic field. As the plumes rise through the prominence material, they interact with each other driving the creation of larger structures, draining mass from the prominence whilst resulting in a net upward transport of magnetic energy. The plume rise velocity ($\sim 7.5\,\mathrm{km/s}$) and width ($\sim 1\,\mathrm{Mm}$) are consistent with the observed values. This process of magnetic energy transport into the prominence system, may provide a mechanism for eruptions of coronal cavities. The nonlinear evolution Rayleigh-Taylor instability in prominences may be similar to that occurring in ionospheric plasma bubbles, fusion plasma, molecular loops in the galactic centre and supernova remnants allowing application of this study across many fields.