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Rayleigh-Taylor instability-induced interactions between turbulence and magnetic reconnection in the Solar Prominences.

The internal dynamics of solar prominences have been observed to be highly complex for many decades, many of which also indicate the possibility of turbulence. Prominences represent large-scale, dense condensations suspended against gravity at great heights within the solar atmosphere. Therefore, it is no surprise that the fundamental process of the Rayleigh-Taylor (RT) instability has been suggested as the potential mechanism for driving the dynamics and turbulence remarked upon within observations. Observations have also revealed the presence of bi-directional jets due to current sheets in the prominence body, thus highlighting the shift of topology of the magnetic fields induced due to the gravity-driven flows.

We begin with the 2.5D fully-resistive magnetohydrodynamic (MHD) high-resolution simulations with the open-source **MPI-AMRVAC** code and follow the far nonlinear evolution of an RT instability that starts at the prominence-corona interface. We use statistical analysis to investigate the evolution of turbulent regimes, which corresponds to the observational counterpart. Furthermore, the strength of the mean magnetic field directed into the 2D plane, and its alignment with the plane itself, creates a system with varying turbulent behavior. The intermittent heating and energy dissipation events are caused by magnetic reconnection, which we investigate in detail by the 2.5D fully-resistive MHD model. Based on the evolution of plasma beta (β) along the prominence's height, the stratified numerical model generates different dynamics of turbulent magnetic reconnection. As a result, we observe that the turbulent dynamics and prominence reconnection events are unique from those occurring elsewhere in the solar corona.

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