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Simulating Rayleigh-Taylor induced magnetohydrodynamic turbulence in Solar Prominences

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The purpose of our study is to deepen our understanding of the turbulence that arises from the Rayleigh Taylor Instability and leads to the formation and evolution of prominence. Quiescent prominence formed in the solar corona are cool and dense condensates comprising of varied dynamics of physical processes and scales. It is dominated by the vertical motion of flows in the upper atmosphere where the mean magnetic field is predominantly in the horizontal direction, and the magnetic pressure holds the dense suspended prominence material. Previous studies with Hinode Solar Optical Telescope's observations revealed turbulent behavior in these prominence structures having evolving rising plumes and descending pillars. We perform numerical simulations from **MPI-AMRVAC** to study the 2.5D Rayleigh Taylor Instability at the prominence-corona transition region, using the ideal-magnetohydrodynamic approach. High-resolution simulations achieved spatial grid resolution of ~ 23 km having a cadence of ~ 0.85 sec for ~ 25 min transitioning from a multi-mode perturbation instability to the non-linear regime and finally a fully turbulent region. We use statistical methods to relate that the dynamics due to the instability in quiescent prominence indicate turbulence behavior that occurs distinctly on different prominence scales for the turbulent magnetic and velocity field fluctuations.

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