# Rayleigh-Taylor Instability in Prominence Partially Ionized Plasma

Antonio Diaz*†[1], Elena Khomenko[1], Manuel Collados[1], Roberto Soler[2], and José Luis Ballester[2]

[1]Instituto de Astrofisica de Canarias (IAC) – C Via Lactea SN La Laguna Tenerife, Islas Canarias, Spain

[2]Universitat de les Illes Balears (UIB) – Crta Valldemossa, km 7,5 Palma de Mallorca Illes Balears, Spain

**Abstract**

We study the modification of the classical criterion for the linear onset and growing rate of the Rayleigh-Taylor instability (RTI) in a partially ionized (PI) plasma both in the one-fluid and two-fluid descriptions, considering a generalized induction equation and linealizing the resulting set. The configuration with heavier plasma on the top of lighter one becomes always unstable because of the presence of a neutral species, who do not feel directly the stabilising effect of the magnetic field. In the classical stability regime the growing rate for PI plasma is very small, since the collisions prevent the neutral fluid to fully develop the RTI. In the classical instability regime the growing rate for PI plasma is lowered, but for the considered theoretical values of the collision frequencies and diffusion coefficients for solar prominences the differences with the MHD case are small. Hence, PI modify some aspects of the RTI instability, since it takes into account that neutrals do not feel the stabilizing effect of the magnetic field. For solar prominence plasma, our model gives the resulting timescale comparable with the observed lifetimes of the threads, and this is a hint that the PI effects should be included regarding the equilibrium and instabilities of the prominence fine structures. Among the PI effects considered, ambipolar diffusion turns out to be the leading one, while the remaning terms are much less significant.

**Keywords:** Prominences, Partial Ionization, MHD, Instabilities

*Speaker

†Corresponding author: tdiaz@iac.es