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Self-similar evolution, structure and stability of optically thin plasmas: analytical and numerical study EMERIC FALIZE, CEA-LUTH, BERENICE LOUPIAS, LULI, SERGE BOUQUET, CEA-LUTH, CLAIRE MICHAUT, LUTH, MICHEL KOENIG, LULI — In this work we will consider, analytically and numerically, the multi-dimensional dynamics (expansion and collapse) of optically thin plasmas. We will present self-similar solutions when the cooling function can be written in power law forms. These solutions are obtained using the Burgan-Feix transformation which consists in a generalized self-similar transformation. We will establish the plasma configurations compatible with cooling flows. It turns out that from a multi-dimensional analysis these solutions apply to jets as well as supernovae remnant dynamics. We compare these results with numerical simulations. Moreover, virial theorem predicts the existence of instability that we will physically identify. Thus, we will present the study of the linear stability of the radial and non-radial evolution and the study of the non-linear regime with numerical simulations. We will discuss the astrophysical implications of these results and their reproduction in laboratory.

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