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A cross Criticality in the convection of Yield Stress fluids FRANCESCA PELUSI, MAURO SBRAGAGLIA, Department of Physics INFN, University of Rome Tor Vergata, ANDREA SCAGLIARINI, MASSIMO BERNASCHI, Istituto per le Applicazioni del Calcolo CNR — We study numerically the Rayleigh-B enard instability of a two-dimensional multi-component system confined between two horizontal walls heated from below and cooled from above. We first carefully validate the numerical model in the mixed regime, by studying the transition from conduction to convection in a homogeneous Newtonian system. As a further upgrade of complexity, the system is prepared in the de-mixed regime, with many liquid droplets closely packed together and separated by thin interfaces. In such conditions, the system is a yield stress fluid, i.e. it exhibits reference stress (the yield stress) below which it reacts to external perturbations as a solid, and above which it flows with non-Newtonian rheology. The transition to convection is characterized as a function of the packing and the intensity of the initial perturbation. When the system exhibits convection, a crucial additional feature with respect to the Newtonian homogeneous system is the presence of plasticity at the droplets scale, which is expected to alter the heat transfer from the hot to cold walls.

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