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Plate-like convection in fluids with temperature-dependent viscosity[1] ANA M. MANCHO, ICMAT, CSIC, JEZABEL CURBELO, ICMAT, UAM — The study of instabilities in fluids in which viscosity experiences a transition at a certain temperature range is of great interest for the understanding of planetary interiors, since this phenomena models the melting and solidification of a magma ocean and thus is suitable for representing a lithosphere over a convecting mantle. To this end, we study a 2D convection problem in which viscosity depends on temperature by abruptly changing its value by a factor 400 within a narrow temperature gap at which magma melts. We perform a study which combines bifurcation analysis and time dependent simulations. Solutions such as limit cycles are found that are fundamentally related to the presence of the O(2) symmetry. Sporadically during these cycles, through abrupt bursts, spontaneous plate-like behaviors that rapidly evolve towards a stagnant lid regime emerge. The plate-like evolution alternates motions towards either right or left, introducing temporary asymmetries on the convecting styles. Further time dependent regimes are described for different transition laws which are greatly influenced by the presence of the symmetry.

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