Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

DEP thermal convection in annular geometry under microgravity conditions[1] HARUNORI YOSHIKAWA, OLIVIER CRUMEYROLLE, INNOCENT MUTABAZI, Laboratoire Ondes et Milieux Complexes, UMR 6294 CNRS-Universite du Havre — Thermal convection driven by the dielectrophoretic force is investigated in annular geometry in microgravity environments. A radial heating and a radial alternating electric field are imposed on a dielectric fluid layer filling the gap of two concentric infinite-length cylinders. The resulting dielectric force field is regarded as spatially varying radial gravity that can develop thermal convection. The linear stability problem of a purely conductive basic state is solved by a spectral-collocation method for both axisymmetric and non-axisymmetric disturbances. A stationary non-axisymmetric mode becomes first unstable at a critical Rayleigh number to develop convection. The stability boundary shows asymmetry with respect to heating direction. For an outward heating the critical value approaches that of the Rayleigh-Bénard problem (1708) as the gap size decreases, while it converges to larger values in the narrow gap limit. For an inward heating the instability occurs only when the gap is narrower than a certain value. The critical number diverges with increasing the gap size. Instability mechanism is examined from energetic viewpoints. The feedback of electric field to temperature disturbances is found to stabilize the conductive state for narrow gaps.

[1]This work has been partly supported by the CNES, the CNRS and the FEDER.

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Date submitted: 25 Jul 2012

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