GeoFlow: First Results of Thermal Convection Experiment on ISS

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The ISS experiment GeoFlow is a thermal convection experiment in spherical shells under central force field influence. It is integrated in the Fluid Science Laboratory of European COLUMBUS module.
We present numerical studies of this spherical Rayleigh-Bénard problem under a central dielectrophoretic force in microgravity environment. Numerical simulation is done with a pseudospectral method and is accomplished for a wide range of parameter values for Rayleigh and Taylor number. In the non-rotating case various stable flow states can coexist. Their symmetry patterns are axisymmetric, cubic or show a mode number of 5. For rotating case dynamics show a change of drift velocity from prograde to retrograde, i.e. from co- to counter-rotating of patterns with the rotation of the sphere. The higher the parameter range is, the higher the modes of first instability occur.
After start of the experiment at the beginning of August 2008 now first results for rotating and non-rotating cases are presented. Aspects of first scientific evaluation of images are discussed.

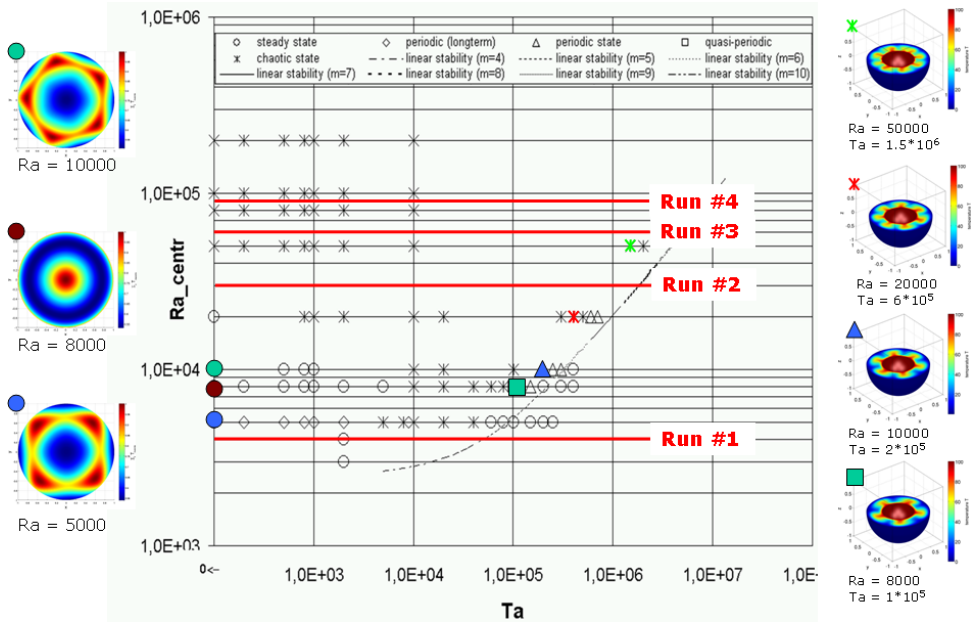
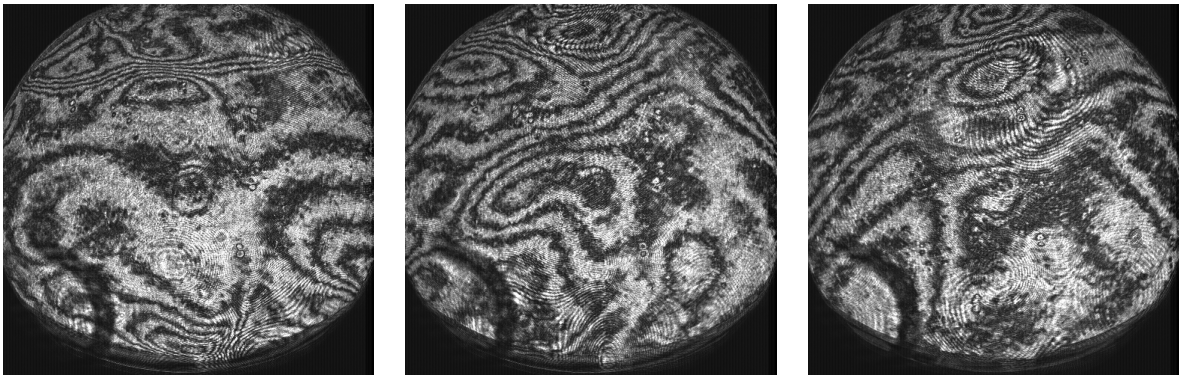


Figure 1: Convective flow states of GeoFlow and first experimental runs



$Ta = 1.34 \cdot 10^5$ $Ta = 3.36 \cdot 10^6$ $Ta = 8.59 \cdot 10^6$

Figure 2: First experimental images from run#4 at $Ra = 8.87 \cdot 10^4$