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New results of the spherical convection experiment Geoflow IIc

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Thermal driven convection in spherical geometry is of main interest in geo- and astrophysical research. To capture certain aspects of convective processes we investigate the micro-gravity experiment GeoFlow-IIc, located on the ISS. This unique experimental setup consists of a bottom heated and top cooled spherical gap, filled with the silicon oil 1-Nonanol. However, rotation and varying temperature gradients can be applied, to spread the experimental parameter space. The main focus of the currently performed mission is the investigation of flow structures at the convective onset and the transition from laminar to turbulent flows. Since the ISS requirements makes it impossible to use tracer particles, the flow structures are captured by interferometry, whose outcome is analysed by an ground based adapted image processing technique. We present advanced post-processing techniques to capture and trace convective plumes to investigate their relative speed and the temporal behavior. Additionally, we are presenting latest results concerning non-unique convective patterns at the same Rayleigh number. The results are cautiously compared with theoretical assumptions of structural changes, which depend on initial perturbations and non-linear influences like the dielectrophoretic force field.
Besides, numerical simulations in the same parameter regime are performed, which give the opportunity to deduce the internal structure of the experimental flow flied. The main focus of the presented results are the temporal evolution of convective plumes in the spherical gap, image capturing- and processing techniques and the non-unique pattern formation.