



Instability of spiral convective vortex

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Formation of large-scale vortices in atmosphere is one of the interesting problems of geophysical fluid dynamics. Tropical cyclones are examples of atmospheric spiral vortices for which convection plays an important role in their formation and evolution. Our study is focused on intensive cyclonic vortex produced by heating in the central part of the rotating layer. The previous studies made by Bogatyrev et al, showed that structure of such vortex is very similar to the structure of tropical cyclones. Qualitative observations described in (Bogatyrev, 2009) showed that the evolution of large-scale vortex in extreme regimes can be very complicated. Our main goal is the study of evolution of convective cyclonic vortex at high values of Grasshof number by PIV system. Experimental setup is a rotating cylindrical tank of fluid (radius 150 mm, depth 30 mm, free upper surface). Velocity fields for different values of heat flux were obtained and temporal and spatial structure of intensive convective vortex were studied in details. With the use of PIV data vorticity fields were reconstructed in different horizontal cross-sections. Physical interpretation of mechanisms that lead to the crucial change in the vortex structure with the growth of heat rate is described.

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