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The baroclinic instability of an initially stratified fluid layer[1]
PATRICE LE GAL, IRPHE - Aix Marseille University - CNRS, MIKLOS VINCZE, UWE HARLANDER, Department of Aerodynamics and Fluid Mechanics Brandenburg University of Technology, Cottbus — Our project aims to describe the baroclinic instability that destabilizes an initially stratified layer of fluid. Classically, this instability is studied using pure fluid. Here, the originality of the project comes from the use of a layer of water initially stratified with salt. Before rotation is started, double convection sets in within the stratified layer with a strongly non-homogeneous pattern consisting of a double diffusive staircase at the bottom of the container in the very dense water layers and a shallow convective cell in the top surface layer. As radial motions take place due to the presence of these convective cells, the action of the Coriolis force generates strong zonal flows as soon as rotation is started. Thus, above a rotation rate threshold, the baroclinic instability destabilizes the flow in a shallow layer, generating a ring of pancake vortices. Infrared camera images measure the temperature distributions at the water surface and PIV velocity maps describe the wavy flow pattern and the pancake vortices. Note finally that if we prepare a stratification profile with an inner shallow non-stratified zone, it is possible to confine the baroclinic instability within this confined zone immersed inside the stratified fluid.

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