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Transition to turbulence in homogeneous and stratified Ekman boundary layers - an experimental study[1] MANIKANDAN MATHUR, THOMAS DUBOS, Laboratoire de Meteorologie Dynamique, Ecole Polytechnique, 91128 Palaiseau, France, SAMUEL VIBOUD, HENRI DIDELLE, JOEL SOMMERIA, Laboratoire des Ecoulements Geophysiques et Industriels, UMR 5519 CNRS-UJF-INPG, 21 rue des Martyrs, 38000 Grenoble, France — A dynamical interplay between the pressure gradient, the Coriolis force and the viscous forces describes the laminar regime of the (Ekman) boundary layers in the ocean and the atmosphere. Early experiments on the homogeneous Ekman layer identified two branches of instabilities that result in roll patterns with distinct wavelengths and orientation. In this talk, we present results based on quantitative velocity field measurements in experiments performed on the 13m diameter Coriolis rotating platform at Grenoble, France. Geostrophic flow outside the boundary layer is set up in a well-controlled manner by changing the tank rotation appropriately. In the homogeneous case, each of the two branches of instabilities is captured in isolation by abruptly increasing the Reynolds number from 0 to a finite value ranging from 50 to 360. The corresponding wavelengths and growth rates as a function of the Reynolds number are deduced from our measurements. Emission of inertial waves is detected for certain parameters. Finally, the influence of a background stratification on the roll patterns of instability is investigated in some exploratory experiments.

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