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Instabilities of a cylinder wake in a stratified fluid PATRICE MEUNIER, IRPHE, Aix-Marseille Univ,, CNRS — The goal of this study is to analyse experimentally, numerically and theoretically how a linear density stratification modifies a cylinder wake, which is well known to exhibit a rich dynamics in a homogeneous fluid. In a first part, we focus on the 2D dynamics of the wake. We show that the von Karman vortex street is stabilised by a moderate stratification for tilted and horizontal cylinders, in agreement with the stabilisation of shear flows at large Richardson numbers. However, it is curious to see that the von Karman vortices reappear for a strong stratification in the case of a tilted cylinder. This new unstable mode can be explained by the presence of tilted vortices with no vertical velocity, i.e. with horizontal streamlines. In a second part, we focus on the 3D instabilities of the cylinder wake. For a vertical cylinder, the well known mode A can be nicely visualised by shadowgraph and seems to be enhanced by a moderate stratification. For a tilted cylinder, the structure of the instability is strongly modified, with the presence of thin undulated dark lines in the shadowgraph images. These structures are similar to the Kelvin-Helmholtz billows which have been observed recently in the critical layer of a tilted stratified vortex.

Patrice Meunier
IRPHE, Aix-Marseille Univ,, CNRS

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