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Wakes and vortex streets generated by a moving localized forcing: laboratory and numerical experiments.

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Abstract

Properties of wakes and vortex streets occurring frequently in geophysical flows are investigated numerically using high-resolution 2D finite volume simulations and experimentally using visualization and Particle Image Velocimetry techniques. Vortex structures are generated by moving localized forces in a viscous fluid at moderate values of the Reynolds number, $Re \sim 10^2$. In the experiment, the forcing is provided by an electromagnetic method and allows us to create a "virtual" body without introducing any solid objects into the fluid. Comparisons with theoretical solutions are made for the case of stable wakes. Characteristics of unstable wakes, in particular the shedding frequency, are investigated in the space of control parameters, namely the magnitude of the forcing and the speed of translational motion of the forcing. The problem considered here has an extra degree of freedom compared to the problem of the flow around a cylinder and exhibit a wider array of different regimes.