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Stability, cyclone-anticyclone asymmetry and frequency selection in rotating shallow-water wakes THOMAS DUBOS, IPSL/LMD, GAELE PERRET, LMPG, ALEXANDRE STEGNER, IPSL/LMD, JEAN-MARC CHOMAZ, LadHyX, MARIE FARGE, IPSL/LMD — Atmospheric and oceanic wakes past islands or mountains present, or not, similarities with the von-Karman vortex street. Observations amd rotating-tank experiments show that cyclone-anticyclone asymmetry may occur, and that shedding frequencies (Strouhal numbers) may differ. Using direct numerical simulation and linear stability analysis, we explain and interpret these observations and characterize the dynamics of a single shallow layer of rotating fluid downstream a cylindrical obstacle. Especially, we show that while the wake is symmetric in the quasi-geostrophic (QG) regime, the frontal-geostrophic (FG) regime favors the emergence of anticyclones. This selection takes place at the linear stage and is exacerbated in subsequent, nonlinear stages. Furthermore we find that the wake emerges from a genuine, global instability only in a certain region of the parameter space, including the QG regime. Outside of this region, and especially in the FG regime, the wake emerges only as a response to upstream noise. However very low levels of upstream noise are sufficient to trigger a fully nonlinear wake with a well-defined shedding frequency.

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