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Wake reconfiguration downstream of an inclined flexible cylinder at the onset of vortex-induced vibrations REMI BOURGUET, IMFT / CNRS, MICHAEL TRIANTAFYLLOU, MIT — Slender flexible cylinders immersed in flow are common in nature (e.g. plants and trees in wind) and in engineering applications, for example in the domain of offshore engineering, where risers and mooring lines are exposed to ocean currents. Vortex-induced vibrations (VIV) naturally develop when the cylinder is placed at normal incidence but they also appear when the body is inclined in the current, including at large angles. In a previous work concerning a flexible cylinder inclined at 80 degrees, we found that the occurrence of VIV is associated with a profound alteration of the flow dynamics: the wake exhibits a slanted vortex shedding pattern in the absence of vibration, while the vortices are shed parallel to the body once the large-amplitude VIV regime is reached. The present study aims at bridging the gap between these two extreme configurations. On the basis of direct numerical simulations, we explore the intermediate states of the flow-structure system. We identify two dominant components of the flow: a high-frequency component that relates to the stationary body wake and a low-frequency component synchronized with body motion. We show that the scenario of flow reconfiguration is driven by the opposite trends of these two component contributions.

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