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Computation of flow past a cylinder beneath of a free surface

This study focuses on free surface flow past a circular cylinder based on a two fluid model at a Reynolds number of $R = 200$. The cylinder is forced to perform harmonic streamwise oscillations in the presence of an oncoming uniform flow. The effects of the free surface presence at a submergence depth of $h = 0.75$ for a fixed Froude number, $\mathrm{Fr} = 0.2$ are investigated on the vortex shedding modes and fluid forces acting on the cylinder. Calculations are performed at a fixed displacement amplitude of $A = 0.13$ in forcing frequency-to-natural shedding frequency ratio range 1.5-3.5.