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Numerical simulation of a spanwise vortex in a tidal induced flow[1]

ERICK J. LOPEZ-SANCHEZ, GERARDO RUIZ-CHAVARRIA, Facultad de Ciencias, Universidad Nacional Autonoma de Mexico — The system formed by two counter-rotating vortices (known as a dipole) occurs often in geophysical flows and it has been the subject of some experimental and numerical investigations. In some previous works (e. g. Lacaze et. al. *Exp. Fluids* **48** (2010) 225-231) a spanwise vortex in front of the dipole has been observed. In this work we study the evolution of this transversal vortex in a system consisting of a channel flushing into a open domain and subject to a periodic forcing. To this end the Navier-Stokes and continuity equations are solved with a finite volume code (OpenFOAM). The numerical solution has been obtained for a Reynolds number $Re = 1000$ and two different values of the Strouhal number, namely $S = 0.01$ and $S = 0.02$, for which the dipole moves away from the channel. In addition two different aspect ratios (depth to channel width) are considered, these are 0.5 and 1. The horseshoe vortex forms near the bottom and it lifts as the dipole moves. We compare the evolution of the spanwise vortex with respect the case of a vortex produced by a impulsively jet and we highlight the effects of the periodic forcing. Finally we compare our results with some experimental data obtained in laboratory.

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