

Experiments on tidal bores in a circular channel

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Tidal bores are natural phenomena observed in at least 450 river estuaries all around the world from Europe (Baie du Mont Saint Michel - France) to America (Colorado River - Mexico) and, Asia (Qiantang River - China). Tidal bores manifest as series of waves propagating upstream in the estuarine zone of a river and they are formed during the flood tide. Tidal bores are usually smaller and less dangerous than Tsunamis, but they can have unpredictable development near the river bank. Moreover, they occur twice a day and have a strong impact on sediment transfer and fishery in the river estuary.

Here we present data on tidal bore formation and propagation from an experimental device previously developed for studying rotating baroclinic flows. Up to our knowledge this is the first experimental study of tidal bores in a circular channel. For a setup without barriers, this geometry accomplishes in a natural way the periodic lateral boundary conditions, very often used in the numerical simulations. An excellent agreement between the experiment and simulation has been achieved. The spatio-temporal structure of a bore is well reproduced not only for the periodic case but also after several reflections from a lateral wall.