

## **TIDAL BORE PROCESSES IN THE BAIE DU MONT SAINT MICHEL (FRANCE): FIELD OBSERVATIONS AND DISCUSSION**

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A tidal bore is a positive surge propagating upstream as the tidal flow turns to rising (CHANSON 2001). Its inception and development is commonly predicted using the method of characteristics and Saint-Venant equations (e.g. HENDERSON 1966, CHANSON 2004). After formation, the flow properties immediately upstream and downstream of the bore front must satisfy the continuity and momentum principles. A tidal bore process impacts significantly on estuarine systems. Mixing and dispersion of matters is drastically enhanced by the bore. Bed erosion and scour take place beneath the bore while suspended matters are then advected upstream with the tidal bore (DONNELLY and CHANSON 2002). However tidal processes remain poorly understood today because of a lack of field observations and comprehensive studies. In this paper, the occurrence of tidal bores in the Baie du Mont Saint Michel (48°40'N, 1°35'W) is documented based upon new field observations (Fig. 1, 2 & 3, Table 1), complemented by a laboratory study. A particular emphasis is placed on the bore impacts on the intertidal zones. In the Baie, tidal bores may spread over more than 1 km width before entering river mouths where the bores propagate more than 10 km inland. The tidal bore passage is associated with major sediment scour beneath the surge front and next to the banks, as well as with scour beneath bore front propagating over dry tidal flats. The Baie du Mont Saint Michel is a distinctive illustration of tidal bore impact on eco-systems. But the bore existence relies upon a fragile hydrodynamic balance which may be easily disturbed by changes in boundary conditions and freshwater inflows

*Keywords* : Tidal bores; Field observations; Baie du Mont Saint Michel; Scour; Mixing; Ecology

### **REFERENCES**

[http://www.uq.edu.au/~e2hchans/tid\\_bore.html](http://www.uq.edu.au/~e2hchans/tid_bore.html) Tidal bores. Myths, fables & reality  
[http://www.uq.edu.au/~e2hchans/tid\\_bore.html](http://www.uq.edu.au/~e2hchans/tid_bore.html) Tidal bore of the Seine river



(a) Sélune river tidal bore in front of Roche-Torin - Note the undular bore in the deep channel section, the breaking bores in shallower waters and the bore advancing over dry bed in background



(b) Sélune river tidal bore at Pontaubault, about 45 min. later - Advancing tidal bore (mascaret) downstream of Pont Aubaud with some kayakers - Note the banks undercut by the bore in background

Fig. 1 Photographs of a major tidal bore in Baie du Mont Saint Michel on 7 April 2004