



## **Impact of boat generated waves over an estuarine intertidal zone of the Seine estuary (France)**

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Water movements in macrotidal estuaries are controlled by the tidal regime modulated seasonally by the fluvial discharge. Wind effect on hydrodynamics and sediment transport is also reported at the mouth. Besides estuaries are frequently man altered our knowledge on the human impact on hydrodynamics and sediment transport is less extended. As an example on the Seine estuary (France) port authorities have put emphasis on facilitating economic exchanges by means of embankment building and increased dredging activity over the last century. These developments led to secure sea vessel traffic in the Seine estuary but they also resulted in a change of estuarine hydrodynamics and sediment transport features. Consequences of boat generated waves are varied: increased water turbidity and sediment transfer, release of nutrient and contaminants in the water column, harmful to users, ecosystems and infrastructures generating important maintenance spending. The aim of this study is to analyse the impact of boat generated waves on sediment transport over an intertidal area.

The studied site is located on the left bank in the fluvial part of the Seine estuary. On this site the maximum tidal range ranges between 1.25 and 3.5m respectively during neap and spring tide. The sampling strategy is based on continuous ADV acquisition at 4Hz coupled with turbidimeter and altimeter measurements (1 measurement every minute) in order to decipher sediment dynamics during one year. Our results indicate that sediment dynamics are controlled by river flow while medium term scale evolution is dependent on tidal range and short term dynamics on sea-vessels waves. 64% of boat passages generated significant sediment reworking (from few mm.min<sup>-1</sup> to 3cm.min<sup>-1</sup>). This reworking rate is mainly controlled by two parameters: (i) water height on the site and (ii) vessels characteristics; in particular the distance between seabed and keel that generate a Bernoulli wave (with maximum amplitude of 0.6m). Simultaneous hydrodynamics and bed elevation measurements permit to quantify the impact of the boat generated wave. Measurements demonstrate that the sediment transport occurs during the Bernoulli wave (few mm up to 8cm). This mechanism induces mainly a long-shore transfer of particles over the intertidal area. This study proves that the sediment transport generated by boat waves cannot be neglected in the Seine estuary case.