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Contribution of intra-estuarine tributaries to estuarine sediment budget

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This study aims to quantify the sedimentary fluxes between the Seine estuary and an intra-estuarine tributary: the Risle river, located close to the Seine turbidity maximum (TM). Four key areas are monitored from the upstream river to the confluence. Water level, current speed, Suspended Solid Concentration (SSC) and salinity are continuously monitored at high-frequency during one hydrological cycle. This dataset allows to (i) identify the hydrodynamics and sedimentary forcing parameters including their spatial and temporal variability (from event to seasonal scale) and (ii) establish the sedimentary fluxes.

It appears that the Risle river behaviour is similar to a macrotidal estuary. The hydrodynamics in the upstream part is mainly controlled by the river discharge that reflects the watershed inputs. The sedimentary fluxes are thus also controlled by the discharge in the order of 25,000 tons.years-1. In the downstream part, the tide is the main hydrodynamics forcing parameter (maximum current speed $\sim$ 2.5m.s-1). The intertidal mudflats (44,000m2), only localised in this part, are subjected to erosion (10,000 tons.years-1). Erosion process is generally sudden and intense, with destabilization and removal of pluri-metric muddy blocks. This area is also characterized by the presence of a TM whom resuspended volume ranges between 5,000 tons (neap tide) and 25,000 tons (spring tide) which represents between 2 and 10 % of the Seine TM volume. During ebb, the Risle river plume contributes to locally increase the SSC in the Seine estuary, while during flood, particules from the Seine estuary are trapped in the river. Thus, exchanges between the Seine TM and a tributary located near this sedimentary stock are significant.

This study was conducted during a period of low discharge with low intensity flood. In the Seine estuary, the TM average position is partially controlled by pluri-annual cycles. Besides this phenomenon is poorly examined in literature, the estuarine sediment dynamics is significantly affected by pluri-annual variability. This timescale has to be taken into account in order to study hydro-sedimentary behaviour in estuarine environments in particular considering the development of long-term estuarine observatories.