

# Suspended solid concentration in the Seine Estuary based on the SYNAPSES turbidity monitoring network: quantification and variability

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Estuaries are 'critical' interfaces between continental systems and coastal seas and concentrate environmental, economic, societal and scientific issues. A particularly challenging issue concerns the evaluation of fine sediment fluxes in estuaries, as they drive the morphological evolution of estuaries, habitat modification, siltation in waterways and estuarine water quality. Quantifying suspended solid fluxes requires to quantify suspended particulate matter (SPM) concentrations in key compartments within the estuary, fast enough to capture the tidal scale, and over long periods to evaluate the inter-annual variability. A main difficulty is related to the SPM behaviour in estuaries: SPM form aggregates, whose size, shape and density are strongly variable and controlled by flocculation processes. Meantime, SSC are usually measured indirectly from optical and acoustic sensors. These methods are based on the backscattering properties of the particles in suspension, and hence are strongly controlled by the floc features. This project aims to first examine and optimize methodologies applied to quantify SPM concentrations and next to investigate SPM concentration variability, from the tidal scale to inter-annual scale.

Since 2012, the Rouen Port Authorities and GIP Seine-Aval coordinate the SYNAPSES automated monitoring network measuring physico-chemical parameters at 6 key stations from the fluvial compartment to the estuary mouth, including the turbidity maximum zone (Fig. 1). In 2014, each station is equipped with an YSI multi-parameter probe, measuring pH, conductivity, salinity, temperature, dissolved oxygen, fluorescence and turbidity in sub surface and also close to the bed for the three downstream stations. In 2015, over the full year, monthly field campaigns will be conducted to calibrate the optical sensors in mass concentration, regarding associated SPM features measured from LISST and collected water samples (measuring total suspended solid concentration, organic matter content, chlorophyll a concentration, EPS/TEP concentrations, microfloc/primary particle size distribution). The preliminary results of this study will be examined, and especially the evolution of calibration relationships at various time scales: the tidal scale, the fortnightly cycle, and the seasonal scale. These results will be used to quantify and discuss measurement uncertainties based on different possible scenarios of optical sensor calibration usually applied in such environments.

The following phase of the project will be dedicated to the evaluation of sediment fluxes from these local measurements, and evaluate their fluctuations, associating ADCP measurements and model results. ation network SYNAPSES stations.



Fig. 1. Location network SYNAPSES stations.