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Operational sediment transport modelling in the Western Mediterranean. System implementation and quality assessment

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The knowledge of coastal sediment transport processes in coastal areas is proving to be critical due to the economic importance of the activities that take place in these areas. Moreover, the prediction of sediment fluxes would also be a desirable product in most cases, mainly close to big urban areas (pollution issues), shellfish and fish productions areas (mortality and production issues), estuaries (morphodynamic issues) and other special scenarios such as flooding or legacy contaminant sites issues. Operational systems providing forecasts of different variables and at different scales are widely used in meteorology and, to a lesser extent, in oceanography. Furthermore, few sediment transport operational models, are implemented worldwide. In particular, none of them has been developed for Mediterranean continental shelves. Being a relatively new issue, the implementation of these systems requires a careful approach and set-up process. Calibration and validation of the sediment transport module is a basic step. Also, the assessment of different sources to provide wind, large scale currents and river run-off is required in order to identify the optimal system configuration.

A pre-operational sediment transport modelling system has been implemented in the Ebro Delta Continental Shelf (NW Mediterranean). SYMPHONIE ocean model has been chosen to model water circulation and sediment transport. Hydrodynamic results have been compared to observed data from two different buoys located in the model domain, and sediment transport model results have been compared to MERIS satellite derived data. Different data sources to force the system have been tested regarding boundary conditions (MFS, MERCATOR and ESEOMED), wind and waves (Catalan Meteorological Service and Spanish Port Authority operational model suites) and continental solid inputs. The quality of the system has been assessed at different scenarios (from mild to storm conditions) in order to identify the best system configuration.

The system has proven to be able to produce good quality forecasts of near-surface suspended sediment concentrations. However, result quality depends highly on the quality of the different forcing fields. In particular, the agreement of the hydrodynamic results with observed data is compromised due to the quality of the open boundary conditions from large scale models. Nevertheless, this do not seem to be the most influencing factor for sediment transport results, because riverine input and wave forcing seem to dominate suspended sediment dynamics. Hence, after analysing the obtained results, a monitoring strategy to overcome the system limitations will also be proposed.