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COHESIVE SEDIMENT DUMPING IN THE RÍO DE LA PLATA: COMBINING IN-SITU MEASUREMENTS AND FINITE ELEMENT MODELLING

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Abstract. The development and maintenance of maritime waterways requires frequent dredging and dumping operations. In this work, we present the use of the TELEMAC-MASCARET system to model the dumping of cohesive sediments in the Río de la Plata. The system, which is based on the finite element method on unstructured meshes, was used to capture the estuary's hydrodynamics (both currents and waves), as well as the erosion, deposition, and transport processes of cohesive sediments associated with the dumping activities. To achieve this, field samples were collected and in-situ measurement campaigns were carried out to study the dynamics of suspended sediments. In parallel, several improvements were made to the numerical model. The in-situ measurements included drone imagery and current measurements using an ADCP, which were used to estimate the horizontal dispersion coefficient. Additionally, a LISST was used in the laboratory to quantify the range of settling velocities. The numerical model improvements included enabling nodal sources to allow direct bottom deposition, incorporating the possibility of concentration-dependent settling velocity, and implementing a consolidation model for the deposited sediment. This consolidation model had been previously calibrated and validated for the Río de la Plata. The model was applied to study the dumping of dredged sediments along Montevideo's coast under the influence of realistic forcing conditions (tide, waves, and wind), allowing for the analysis of both the suspended sediment dynamics and the evolution of the deposited sediment. The model improvements, together with the parameter specification based on field and laboratory measurements, resulted in a suitable tool for modelling the dynamics of dumped cohesive sediments in the estuary.

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