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Hydrodynamic circulation and sediment transport along the Venice Lagoon littoral

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This contribution discuss the methodology and results of a research on sediment dynamics in the coastal areas close to the three inlets of the Venice Lagoon in normal (tide-governed) and storm conditions. The study, which is based on experimental investigations and mathematical models, attempts to improve the knowledge on suspended sediment transport along the littorals and its interactions with tidal exchanges at the inlets. The trend of littoral currents and the distribution of suspended particulate matter (SPM) along the coastline, which affect the solid fluxes through the inlets, have been investigated within specific field measurements by using Acoustic Doppler Current Profilers (ADCP). These instrument, mounted on a survey boat permit to acquire a bi-dimensional representation of the current field and backscatter. This last is related to the concentration of the scatterers (SPM) in the water column via calibration against concentration measured in water samples collected during the transect profiling. The modeling study apply an integrated 3-D model which permits to describe the dynamics of dispersion and transport of sediments. The considered numerical models, in increasing order of complexity are: a finite-elements hydrodynamical model (SHYFEM), a dispersion and diffusion module for contaminants, a finite-elements spectral wave model (WWMII) and a sediment transport model (SEDTRANS05). The integrated experimental-modelling study permitted to investigate the effects of the modified morphology of the inlets on the velocity field induced by the tide. It also allowed a detailed study of sediment transport in the areas adjacent to the inlets during two storm events.