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Hydrodynamic and sediment dynamic in the Venice Lagoon

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An armoured inlet in a tidal lagoon generates a sediment loss due to a non symmetric configuration of the flow in the ebb and in the flood phase. In the flood phase, the flow at the inlet looks irrotational while in the ebb phase it exhibits a jet configuration. The different hydrodynamic flow field reflects to an analogous behaviour in the suspended sediment exchange. This process has been recently investigated on the Venice Lagoon with a 2D numerical model ([1],[2],[3]) pointing out the differences with the configuration of 1800 and 1900 and leading to consideration about the order of magnitude of the sediment loss due the tidal currents (the resuspension effect of the wind waves was not taken into account).

The sediment loss obtained (6'000÷8'000m^3a day for a tide with 1m excursion) is very important and seems to justify the quantities usually reported, i.e. 700'000÷1'000'000m^3/year of sediment lost by the inlets. Numerical results on the resuspention effects of a wave field generated by a 10m/s (from north-east) wind has shown that the solid discharges at the inlets increase 2÷3 times respect to the situation where wind is absent [2]. As the sediment loss derives from the degradation of the morphology (disappearance of the shoals and deepening of the shallows) the annual quantity of the sediment loss at the inlets give reason of new special attention to prevent further losses or, at least, to limit them.

On this basis, the paper treats the following main topics of the Venice Lagoon:

a) the inner morphology has been conserved until the tidal prism has remained pretty stable, as it was in the 1800 and 1900; b) the most important changes in the morphology happened in last century after the excavation of the industrial channels in the central lagoon (mainly, Malamocco-Marghera in the 60's); c) changes in the inner morphology strictly correspond to changes at the inlets both in the sediment and water

dynamics and in the bathymetry: results of simulation (from 1901, 1930, 1970, 1990 and 2000 bathymetries) are presented and discussed.

References

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