



Impact of wind and waves on partially mixed estuary

Emil Stanev (1) and Nico Lange (2)

(1) Helmholtz-Zentrum Geesthacht, Institute for Coastal Research, Geesthacht, Germany (emil.stanev@hzg.de), (2) Christian-Albrechts-Universität zu Kiel, Faculty of Mathematics and Natural Sciences, Department of Geosciences

The influence of a moderate onshore storm on estuarine hydro- and sediment dynamics in a partially mixed estuary is studied using the unstructured grid model SCHISM in conjunction with the spectral wave model WWM-II and the three-dimensional sediment model SED3D. For this purpose, results of six barotropic and baroclinic experiments were analyzed and the effect of baroclinicity, wind and wind-waves on the idealized convergent estuary quantified. The comparison of the experiment driven by tides and river run off with the one where on-shore winds were added revealed the opposing effect of onshore winds (10 m/s) on the classical estuarine circulation. This impact results from the additional surface mixing and the wind straining. Without wind forcing the suspended sediment showed two distinct maxima at the down-, upstream end of the salinity front. Stormy wind-conditions reduced bottom stress and hence the suspended sediment concentration throughout the estuary. Furthermore, the sand ETM was shifted downstream and the mud ETM weakened and largely homogenized. Analysis has been performed on the effects caused by wind-waves, along with the combined effect of swell and locally created wind-waves. Asymmetric behavior of the responses was explained by the interplay between the secondary circulation in the estuary and effects from wind waves. Some numerical problems in coupled wind-circulation modeling have also been elucidated.