

O07.4

Historic developments of the Ems Estuary – synergies between numerical modeling and observations

Julia Benndorf, Anna Wünsche, Jens Jürges, Marie Naulin

Federal Waterways and Research Institute, Germany

Abstract

The Ems Estuary represents a tidal river in north-west Germany which is strongly characterized by density differences and a pronounced occurrence of fluid mud. The natural river has changed constantly over time. Since the beginning of the 20th century, these changes are dominated by operations such as dredging, dumping and straightening. The amount of suspended sediments within the Ems Estuary has increased significantly due to anthropogenic influences, while at the same time the issue has moved into the focus of public and scientific communities.

Historic developments of the Ems Estuary are modeled in order to investigate reasons for the development and increased propagation of fluid mud in the estuary. The 3-dimensional numerical model UnTrim is used for scenarios from the 1950's, 1981 and 2015, investigating influences of the bathymetry, bottom roughness and sea-level rise. The modeling of hydrodynamics is well established while other parameters pose a challenge to the modeler. Therefore, the evaluation of hydrodynamic parameters and the connection to turbidity and salinity give valuable insight into the development of the estuary and lead to a better understanding of the processes behind the so-called regime-shift.

Additional investigations of long-term observations measured at gauge stations along the Ems Estuary allow for trend analyses of near-surface salinity. Due to positive linear trends, which accelerate up-estuary, we assume enhanced transport of saline water further up-estuary. This observation is in good agreement with the model results. To further examine the outcome of the numerical model this study investigates the correlation between the increase of salinity and the changes in tidal range along the estuary.

We will present the synergies between the observations and the numerical model results and discuss preliminary results of further numerical model analysis.

Acknowledgement: Partly funded by the German Federal Ministry of Education and Research (BMBF), project: MudEstuary (03KIS113).

Keywords

anthropogenic influence, salinity, numerical model, Ems Estuary