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Modelling wave propagation and wave-current interaction in the East-Frisian Wadden Sea with the unstructured-mesh modelling system FVCOM-SWAVE

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Within the research project „Climate Impacts - Scenarios for Adaptation (KLIFF)" funded by the ministry for science and culture of the federal State of Lower Saxony in Germany, consequences of the potential future climate change on hydro- and sediment dynamics in the area of the East-Frisian Wadden Sea are to be estimated with the use of spatial high-resolution numerical models.

The most important physical factors influencing the sediment dynamics in coastal areas are wind- and tidally-driven currents, surface gravity waves and currents driven by current-wave interaction. In preliminary studies, the performance of the three-dimensional, unstructured grid modelling system FVCOM-SWAVE (see Chen et al. 2003 or Qi et al. 2009), which is a 'combination' of the hydrodynamical model FVCOM and the wave model SWAN, is tested.

This modelling system is applied to the Barrier Islands of the East Frisian Wadden Sea with a fine resolution down to 50 m in regions of high interest and with a coarser resolution towards the open North Sea. The processes of wave propagation and wave-current interaction are tested for artificial atmospheric and boundary conditions as well as for a real storm surge which happened in November 2006.

The obtained results are compared to measured hydrodynamic and wave data of a permanent time series station close to the Island of Spiekeroog and to ADCP data obtained during ship cruises within the study area.