Geophysical Research Abstracts
Vol. 17, EGU2015-10469, 2015
EGU General Assembly 2015

Coupling of wave and circulation models in coastal-ocean predicting systems: A case study for the German Bight

Joanna Staneva (1) and Kathrin Wahle (2)

(1) HZG, Institute for Coastal Research, Geesthacht, Germany (Joanna.Staneva@hzg.de), (2) HZG, Institute for Coastal Research, Geesthacht, Germany (Kathrin.Wahle@hzg.de)

This study addresses the coupling between wind wave and circulation models on the example of the German Bight and its coastal area called the Wadden Sea (the area between the barrier islands and the coast). This topic reflects the increased interest in operational oceanography to reduce prediction errors of state estimates at coastal scales. The uncertainties in most of the presently used models result from the nonlinear feedback between strong tidal currents and wind-waves, which can no longer be ignored, in particular in the coastal zone where its role seems to be dominant. A nested modelling system is used in the Helmholtz-Zentrum Geesthacht to producing reliable now- and short-term forecasts of ocean state variables, including wind waves and hydrodynamics. In this study we present analysis of wave and hydrographic observations, as well as the results of numerical simulations. The data base includes ADCP observations and continuous measurements from data stations. The individual and collective role of wind, waves and tidal forcing are quantified. The performance of the forecasting system is illustrated for the cases of several extreme events. Effects of ocean waves on coastal circulation and SST simulations are investigated considering wave-dependent stress and wave breaking parameterization during extreme events, e.g. hurricane Xavier in December, 2013. Also the effect which the circulation exerts on the wind waves is tested for the coastal areas using different parameterizations. The improved skill resulting from the new developments in the forecasting system, in particular during extreme events, justifies further enhancements of the coastal pre-operational system for the North Sea and German Bight.