Geophysical Research Abstracts
Vol. 21, EGU2019-16713, 2019
EGU General Assembly 2019

GCOAST Model System: coupling of ocean and atmosphere through a dynamic wave interface

Joanna Staneva, Sebastian Grayek, Anne Wiese, Arno Behrens, Marcel Ricker, and Corinna Schrum
HZG, Institute for Coastal Research, Geesthacht, Germany (joanna.staneva@hzg.de)

The coupling of models is a commonly used approach when addressing the complex interactions between different components of earth system. Here we present the development of a new, high -resolution, coupled ocean , wave and atmosphere model system for the North Sea and the Baltic Sea, which is part of the Geestacht COAstal model SysTem GCOAST. We focus on 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. In NEMO stand-alone model, the momentum flux from the atmosphere, which is related to the wind speed, is passed directly to the ocean and this is controlled by the drag coefficient. However, in the real ocean, the waves also play the role of a reservoir for momentum and energy because different amounts of the momentum flux from the atmosphere is taken up by the waves. In the coupled model system the momentum transferred into the ocean model is estimated as the fraction of the total flux that goes directly to the currents plus the momentum lost from wave dissipation. Additionally, we demonstrate that the wave -induced Stokes Coriolis force leads to a deflection of the current. During extreme events the Stokes velocity is comparable in magnitude to the current velocity. The resulting wave -induced drift is crucial for the transport of particles in the upper ocean. The performance of the coupled modelling system is also illustrated for the cases of several extreme events. In the frame of H2020 CEASELESS project, assessment of coupled model data versus newly available satellite data (e.g. Sentinel) is performed. The comparisons with in-situ and satellite data showed that the implementation of wave model component into the coupled systems reduces the errors, especially under severe storm conditions.