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Coupled WAM/COSMO – Application to the Southern North Sea

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A nested-grid model system is used to predict wave model parameters for the Southern North Sea. Validations of the wave model with observations show that the wave heights are often over-predicted, especially during extreme events, due to errors in the driving wind fields. To resolve this problem, wave-induced drag and transfer of energy and momentum due to waves have been introduced in the regional atmospheric model leading to wave-induced changes in the atmospheric boundary layer. As a consequence, the surface drag is enhanced thus reducing the surface wind speed. We use a high resolution two-way fully coupled ocean wave- atmosphere model. The atmospheric model COSMO that has a spatial resolution of about 10km and 40 vertical coordinates is coupled to the wave model WAM (with horizontal resolution of 5 km) via the coupler OASIS. In the coupled model 10m wind field is transferred from COSMO to WAM and the wave dependent Charnock parameter is transferred from WAM to COSMO for surface flux calculations. The impact of the sea state depending surface roughness length onto the atmospheric forcing (wind speed) and wave model results is investigated under different conditions including severe storm events. Observations from satellite data and in-situ platforms are used to validate the coupled model. The improved skill of the coupled model compared to the stand alone wave and atmospheric models, justifies the further enhancements of coastal model systems by including wave effects into atmospheric models, in particular during extreme events.