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Coupled wave-atmosphere-ocean modeling under RCP8.5 emissions during the 21st century

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Most climate models have no explicit treatment of surface ocean waves. As a result, wave climatologies are usually obtained off-line, using atmospheric forcing as input. In recent years attempts have been made to incorporate surface ocean wave models into GCMs, giving the possibility of interactions between components. In the presence of waves the atmospheric winds are modified due to different drag-coefficient and breaking waves will have also influence vertical ocean mixing. As such the waves may play a role in solving long-standing ocean and atmospheric biases.

Recently we have coupled the global wave model WAM into EC-Earth GCM (v3.0.1). EC-Earth is based on the IFS atmospheric model and the NEMO/LIM ocean/sea ice model. First results are presented from a 140-year (1961-2100) continuous transient, coupled simulation under RCP8.5 emission scenario. As the modelled climate warms during the transient period, (arctic) sea-ice gradually diminishes, allowing surface waves to penetrate to higher and higher latitudes. Eventually Arctic sea-ice completely disappears in the simulation in late summer. We will discuss swell and wind-wave climatologies, Stokes drift patterns as well as other relevant wave parameters.