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Mid-Twenty-First-Century Changes in Global Wave Energy Flux: Single-Model, Single-Forcing and Single-Scenario Ensemble Projections

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The knowledge of ocean surface wave energy fluxes (or wave power) is of outmost relevance since wave power has a direct impact in coastal erosion, but also in sediment transport and beach nourishment, and ship, as well as in coastal and offshore infrastructures design. Changes in the global wave energy flux pattern can alter significantly the impact of waves in continental shelf and coastal areas.
Up until recently the impact of climate change in future global wave climate had received very little attention. Some single model single scenario global wave climate projections, based on CMIP3 scenarios, were pursuit under the auspices of the COWCLIP (coordinated ocean wave climate projections) project, and received some attention in the IPCC (Intergovernmental Panel for Climate Change) AR5 (fifth assessment report).
In the present study the impact of a warmer climate in the near future global wave energy flux climate is investigated through a 4-member “coherent” ensemble of wave climate projections: single-model, single-forcing, and single-scenario. In this methodology model variability is reduced, leaving only room for the climate change signal. The four ensemble members were produced with the wave model WAM, forced with wind speed and ice coverage from EC-Earth projections, following the representative concentration pathway with a high emissions scenario 8.5 (RCP8.5). The ensemble present climate reference period (the control run) has been set for 1976 to 2005. The projected changes in the global wave energy flux climate are analyzed for the 2031-2060 period.