EGU24-19023, updated on 15 Mar 2024
https://doi.org/10.5194/egusphere-egu24-19023
EGU General Assembly 2024

Projecting future sea-level change along the coast of the Netherlands with a regional ocean model

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Global mean sea level is rising due to anthropogenic climate change, via the thermal expansion of seawater and the mass loss of land ice. Regional sea-level change is also affected by changes in ocean currents due to the changing climate or internal climate variability. We use the Regional Ocean Modeling System (ROMS) to simulate future sterodynamic sea-level change – the combined contribution of thermal expansion and ocean dynamics – on the Northwestern European Shelf. Regional ocean models such as ROMS are suitable to simulate the exchange of deep ocean currents in the Atlantic with the Northwestern European shelf, and can improve the horizontal resolution from the order of 100 by 100 km (typical for global climate models) to the order of 10 by 10 km. The ROMS model is driven by CMIP6 (Coupled Model Intercomparison Project Phase 6) global climate model output at the domain boundaries, and uses dynamical downscaling to produce projections of sterodynamic sea-level change at a 12 by 12 km horizontal resolution with 30 terrain-following depth layers.

We present projections until 2100 based on 2 CMIP6 models and 5 emission scenarios, for Western Europe at this high resolution. Our results show the advantage of dynamical downscaling on projecting annual average sea level and how this differs between the chosen CMIP6 models and the different emission scenarios. In addition, we assess the linkage between regional sea level and freshwater input of European rivers, comparing simulations without river input, with realistic river input (based on observations) and with enhanced river input. This tests whether a potential future increase in river discharge is relevant to consider in projections of regional sea-level change.