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Climate signal emergence and near-future climate projections of the hydrodynamics of the North West European Shelf Seas.

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Abstract:

The North-West European shelf seas (NWS), as with the wider climate, respond to both climate change and climate variability. On the days-to-weeks time-scale, the state of the climate variability is known, and so operational forecasts are possible. By the end of the century, the climate signal often dominates the climate variability, and so statistically significant changes between the present day and future can be identified by climate projections. Seasonal-to-decadal systems (relying on slowly-responding components of the climate system) can make projections about particular aspects of the climate system (e.g. NAO) although some important features still cannot be projected (e.g. North Sea stratification). Here we consider another methodology. Using an ensemble of transient climate projections for the NWS we are able to characterise the climate signal and variability of the region, and identify when the climate signal in the shelf sea hydrodynamics has emerged from this variability, after which, we are able to make near-future projections. We have downscaled an 11-member Perturbed-Physics-Ensemble (based on the global climate model HadCM3 under SRES A1B) with the shelf-seas hydrodynamic model POLCOMS. Each member was a 147-year transient simulation (1952-2098), with an accompanying 146-year pre-industrial climate simulation. We find that the SST climate signal rapidly emerges from the variability for certain regions within the NWS making projections between 1960-1989 and 2010-2039 possible. Conversely, in some regions, the SSS never emerges. We also note that often the regions with the strongest climate signal often have the strongest variability, and so often the climate signal emerges later.

Keywords:

Climate Signal Emergence; Near-Future Projections; Northwest European shelf seas; Climate projection; Regional modelling; Dynamic downscaling; Climate uncertainty; Perturbed Physics Ensemble.

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