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Regional scale evaluation of marine properties as simulated by CMIP6 Earth System models for contemporary climate conditions

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Environmental changes resulting from anthropogenic forcings have significant implications at regional and coastal scales impacting considerably on a variety of key ecosystem services.

While the capacity to understand, quantify and predict these impacts is essential for a consolidated implementation of adaptation and mitigation strategies, the information available on the environmental changes is often insufficient. Extensive datasets from global projections exist from the CMIP initiatives that provide a wealth of information including crucial estimates of uncertainty and likelihood but are mostly assessed at global or basin level delivering broad-scale information that is often less relevant or prone to large uncertainties at the regional service level. While some regional information exists deriving from individual dynamically downscaled simulations, these are mostly driven by the effort of individual institutions and hence lack robust estimates of uncertainty and are prone to significant biases deriving from the applied boundary forcings, which are often chosen in an opportunistic manner.

Here we present an attempt to overcome some of these short-comings pursued in the CE2COAST project (<https://www.ce2coast.com>) providing a systematic assessment of a suite of indicators of multiple ocean pressures from CMIP6 simulations validated at regional level for selected European Seas and the Humbolt Current. The outcome presents valuable information in itself on the spread of model performances in CMIP6 at regional level and is highly relevant as baseline and benchmark for regional downscaling efforts. It highlights that there is no single global model that will fit-for-purpose for downscaling in all regions or for addressing all ocean pressures.