Evolution of Ocean Predictions on the Catalan Coast

The Catalan Coast, a dynamic and ecologically significant region of the NW Mediterranean Sea, has been the focus of extensive research in oceanic/coastal predictions because of the high density of human pressures it supports. This density leads to increasing levels of risk under climate change, which requires advances in knowledge, observations and modelling to improve predicting capabilities. The resulting early warnings are benefiting a wide range of sectors such as marine safety, environmental sustainability, coastal productivity and infrastructure risk reduction. This contribution presents and discusses some key requirements for reliable coastal predictions that consider the interactions with coastal ecosystems and infrastructures, analysing the implications for scientific research but also for added value products. Among these are the simulation of ecosystem service delivery (e.g. for reduction of erosion risks) and the performance of coastal infrastructure (ports but also coastal). The paper will present the challenges to combine process-based models with artificial intelligence predictions, as well as the support offered by observation systems (conventional and low-cost) and intensive field campaigns to achieve reliable localized predictions. From here the road for advancing the coupling of high-resolution numerical models and associating error bars to the prediction of key variables will be discussed. The long-standing cooperation with users and stakeholders has served to delineate the requirements for hydro-morpho-eco predictions under present and future conditions, which will be illustrated by tailor-made products for climate vulnerability hot-spots, such as Ebro delta or Barcelona urban beaches. The paper will conclude describing how the Catalan Coast has become a hub for innovative ocean prediction systems, driven by advances in process-based models, statistical tools and observational systems.

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