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Using on-demand prediction services to build user-tailored coastal Digital Twins

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The concept of open forecast data has been gaining importance throughout the world, whether they address global, regional or local dynamics. Most forecast systems in operation, however, just publish images, without providing quantified predictions that could be used to produce new services and have a greater societal impact. The initiatives under the UN Ocean Decade such as CoastPredict (<https://www.coastpredict.org/>) and DITTO (<https://ditto-oceandecade.org/>) programs aim at opening forecast information to all and address dynamics from the global to the coastal dimension.

Setting up model or forecast systems are complex tasks that require considerable expertise of coastal dynamics, numerical modeling and computer science. In the last few years, several initiatives have emerged to provide simplified ways to address this challenge and provide user-friendly tools to set up models and their forecast systems, with automatic linkage to global or regional forcings and access to data comparison in near real time. These on-demand forecast platforms aim at expanding the application of forecast systems worldwide, allowing for a broad implementation of decision support and emergency tools thus being an integral part of Digital Twins creation for coastal areas. Examples include SURF (Trotta et al., 2021), Delft-FEWS (Delft-Flood Early Warning System, Werner et al., 2013) and OPENCoastS (Oliveira et al., 2019, 2021).

Herein the OPENCoastS service and web platform are used to illustrate the creation of a core coastal Digital Twin for a data-poor region, using model outputs to compute relevant indicators for fisheries. The application site is the coast of Nigeria in Africa and CMEMs global data is used both to force the predictions and to evaluate its results through comparison with remote sensing products. Indicators suitable for fisheries sustainable operation are presented, developed in close collaboration with local players. This demonstration showcases the importance of on-demand forecast platforms and their role in the construction of Digital twins, facilitating the implementation of the UN Decade goals. The proposed methodology can be expanded in the future to other coastal regions in the scope of the UN Decade WOLLF project, supported by the human and computational resources provided by the ATTRACT European Digital Innovation Hub project.

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