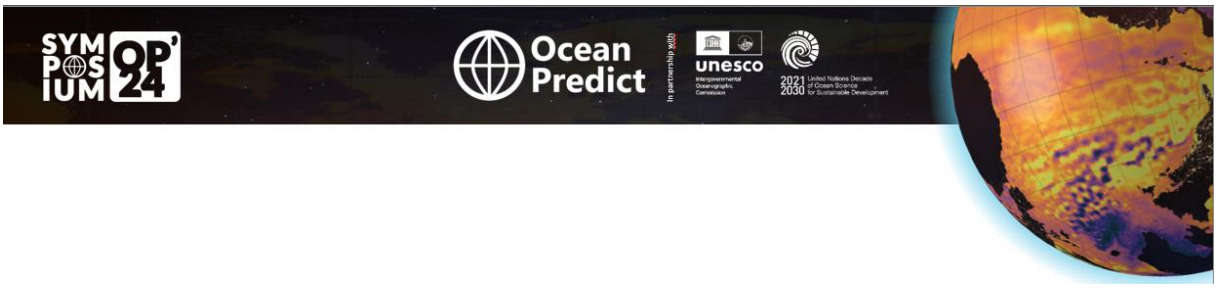
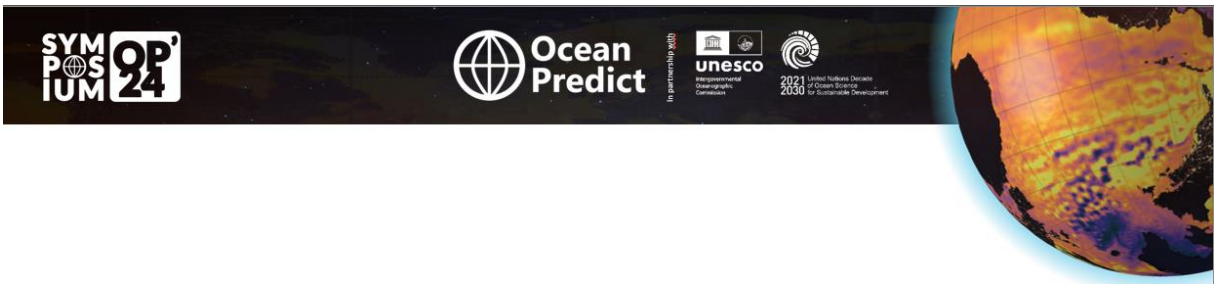


Enhancing Marine and Coastal Services: The Emilia-Romagna Operational Chain from Regional to Local Models

The Hydro-Meteo-Climate Services of the Regional Agency for Prevention, Environment, and Energy of Emilia-Romagna (Arpae-SIMC) operates as a Functional Centre within the Integrated Civil Protection Structure. One of its remits is to provide forecasting and monitoring services for several risk typologies. Among these, the sea state and coastal risks are addressed through a marine-coastal modelling chain that provides forecasts that extend up to 72 hours in advance. The modelling chain follows the implementation of weather prediction models (COSMO/ICON suites - https://www.cosmo-model.org/) which are used as forcing to wave and hydrodynamics models with varying resolutions. These models are ultimately used as inputs for an XBeach-based morphodynamics forecast for coastal risk. With regard to the hydrodynamics, the AdriaC model represents a basin-scale (Adriatic) configuration of the COAWST suite (ROMS plus SWAN) that employs the Copernicus Marine System products for the Mediterranean Sea at the boundaries. Since March 2023, Arpae has implemented an operational very high resolution finite element model based on Shyfem (https://github.com/SHYFEM-model/shyfem) referred to as shyfER. This model covers the coastline of the Emilia-Romagna region, the surrounding Adriatic Sea and the Po Delta, and is nested in AdriaC. The utilisation of a three-dimensional finite element model enables the resolution of highly complex morphological settings, such as those observed in the delta. Several river branches and the system's lagoons within the deltaic area are encompassed, thus allowing for the investigation of the intricate interplay between coastal, deltaic, and open-sea processes. The domain extends to the last measuring station of the Po River (Pontelagoscuro), situated approximately 75km upstream (on a straight line from the major river mouth) allowing the use of the latest temperature and discharge measured values as river boundary conditions for the Po River. Climatologies are employed for the other significant regional rivers. The present study evaluates the performance of the operational implementation, as well as the evaluation of the model in the context of the new atmospheric forcing (ICON) relative to the previous one (COSMO). Furthermore, the study examines the implications on shyfER of implementing the MFS total sea level at the boundaries of AdriaC. Finally, the future developments to be undertaken in the context of the ClimaxPo project are considered. In particular, the



potential for salt wedge forecasting and the southward extension of the modelling domain.

Luis Germano Biolchi (Arpae-SIMC), Silvia Unguendoli (Arpae-SIMC), Andrea Serra (Arpae-SIMC), Christian Ferrarin (CNR-ISMAR), Georg Umgiesser (CNR-ISMAR), Alejandro Paladio Hernandez (CNR-ISMAR), Andrea Valentini (Arpae-SIMC)