

EGU22-11312

<https://doi.org/10.5194/egusphere-egu22-11312>

EGU General Assembly 2022

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Numerical models to evaluate the potential effects of new port realization on coastal marine ecosystems

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The potential effects of anthropic pressures on the coastal marine environment are difficult to predict due to the high spatial and temporal variability of the physical and biological processes occurring in the coastal area. To overcome this issue, an innovative coastal observing and modelling system has been implemented along the Latium coast (Italy). The core of the modelling suite is composed of the unstructured-grid hydrodynamic SHYFEM and wave WW3 models to allow to compute the temperature, salinity, current velocity, water levels and wave parameters, seamlessly from the open sea to the coastal waters. The hydrodynamic and wave results were then used within process-oriented models (such as XBEACH, PTM, Leeway Lagrangian particles models) to analyse morphological changes, sediment dynamics and pollutant dispersion in the coastal, riverine and near-port areas.

In this work, the modelling suite was used to investigate the potential effects on the soft-bottom benthic communities due to the realization of the new port of Fiumicino, located in the coastal zone affected by the Tiber river dynamic. The coastal dynamic processes along the study area were simulated using different weather conditions, before and after the realization of the new harbour. Hydrodynamic and wave model performance was evaluated using in-situ and remote sensing observations carried out by high-resolution satellite imageries and traditional and innovative in-situ platforms. Finally, the model results were compared with the abundance and composition of the benthic community that was analysed in 25 stations, between 2 and 30 m depth.