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Coastal climatology of the North-Western Mediterranean area for long-term and short-term risk assessment.

Carlo Brandini, Stefano Taddei, Valentina Vannucchi, Michele Bendoni, Bartolomeo Doronzo, Maurizio Iannuccilli, Gianni Messeri, Francesco Pasi, and Valerio Capecchi
CNR IBE - LaMMA, Italy (brandini@lamma.rete.toscana.it) Via Madonna del Piano 10 Sesto Fiorentino (FI)

In this work we present the results obtained through a dynamic downscaling of the ERA5 reanalysis dataset (hindcast) of ECMWF, using high-resolution meteorological and wave models defined on unstructured computation grids along the Mediterranean coasts, with a particular focus on the North-Western Mediterranean area. Downscaling of the ERA5 meteorological data is obtained through the BOLAM and MOLOCH models (up to a resolution of 2.5 km) which force an unstructured WW3 model with a resolution of up to 500 m along the coast. Models were validated through available meteorological stations, wave buoy data and X-band wave radars, the latter for the purposes of wave spectra validation.

On the one hand, this allowed, by extracting the time series of some attack parameters of the waves along the coast, and according to the type of coast (rocky coasts, sandy coasts, coastal structures etc.), to compute the return periods and to characterize the impact of any individual storm. On the other hand, it is possible to highlight some trends observed in the last 30 years, during which recent research is showing an increasing evidence of some changes in global circulation at regional to local scales. These changes also include effects of wind rotation, wave regimes, storm surges, wave-induced coastal currents and coastal morphodynamics. For example, in the North-Western Mediterranean extreme events belonging to cyclonic weather-types circulation with stronger S-SE components (like the storm of October 28-30th 2018 and many others), rather than events associated with perturbations of Atlantic origin and zonal circulation, are becoming more frequent. These long-term wind/wave climate trends can have consequences not only in the assessment of long-term risk due to main morphodynamic variations (ie. coastal erosion), but also in the short-term risk assessment.

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