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Extreme Events and Sea Waves along Italian Coasts

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The Italian Wind Waves Measurement Network (RON) is composed by 15 directional buoys uniformly distributed all around the Italian coasts and provides data since 1989. Data, collected on these 15 locations represent one of the most accurate and complete oceanographic database in the Central Mediterranean Sea for many environmental issues such as studies on climate changes and variability and assessment of marine environments.
In this framework the study on wind waves extreme events and storm surges is here presented.
The first step in the extreme events analysis consists in extracting a set of independent wave events using different methodologies, such as Peak Over Threshold and annual maxima methods.
Attention has been focused on the determination of the historical storms in terms of the return times and the expected values of the wave heights over several decades. For this purpose an investigation on several statistical distribution has been carried out for each measurement station. As well known there are many distribution function candidates for extreme wave analysis. In this study, extreme events analysis has been made through the GPD (and GEV) that provides different kind of distributions such as Gumbel, Frechet and Weibull, depending on the values of the estimated parameters. These distributions have been used in order to evaluate the wave height return level and return times up to 50 years.
Even though the series are 25 years long, the analysis gives valuable information about the spatial distribution of the storms and their variability on a decadal time scale in the Central Mediterranean Sea.
For each time series, a set of statistical parameters has been evaluated, such as the average number of storms per year, the return period corresponding to the maximum value of observed Hs, the return level corresponding to a period of 20 to 50 years depending on the availability of data.
Finally, storm surge events have been considered highlighting the correlation among wind and wave setup and inverse barometric effect. Relevant examples have been reported.
The extreme events set have been analysed in order to provide useful information related to trend variation among the entire measurement period.