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Long-term wave measurements in a climate change perspective.

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Long-term wave measurements in a climate change perspective.
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Abstract
At present multi-decadal time series of wave data needed for climate studies are generally provided by long term model simulations (hindcasts) covering the area of interest. Examples, among many, at different scales are wave hindcasts adopting the wind fields of the ERA-Interim reanalysis of the European Centre for Medium-Range Weather Forecasts (ECMWF, Reading, U.K.) at the global level and by regional re-analysis as for the Mediterranean Sea (Lionello and Sanna, 2006). Valuable as they are, these estimates are necessarily affected by the approximations involved, the more so because of the problems encountered within modelling processes in small basins using coarse resolution wind fields (Cavaleri and Bertotti, 2004).
On the contrary, multi-decadal observed time series are rare. They have the evident advantage of somehow representing the real evolution of the waves, without the shortcomings associated with the limitation of models in reproducing the actual processes and the real variability within the wave fields. Obviously, observed wave time series are not exempt of problems. They represent a very local information, hence their use to describe the wave evolution at large scale is sometimes arguable and, in general, it needs the support of model simulations assessing to which extent the local value is representative of a large scale evolution. Local effects may prevent the identification of trends that are indeed present at large scale. Moreover, a regular maintenance, accurate monitoring and metadata information are crucial issues when considering the reliability of a time series for climate applications. Of course, where available, especially if for several decades, measured data are of great value for a number of reasons and can be valuable clues to delve further into the physics of the processes of interest, especially if considering that waves, as an integrated product of the local climate, if available in an area sensitive to even limited changes of the large scale pattern, can provide related compact and meaningful information.
In addition, the availability for the area of interest of a 20-year long dataset of directional spectra (in frequency and direction) offers an independent, but theoretically corresponding and significantly long dataset, allowing to penetrate the wave problem through different perspectives. In particular, we investigate the contribution of the individual wave systems that modulate the variability of waves in the Adriatic Sea. A characterization of wave conditions based on wave spectra in fact brings out a more detailed description of the different wave regimes, their associated meteorological conditions and their variation in time and geographical space.