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Improving the wave forecast in the Catalan Coast

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This study has been motivated by the limited accuracy of wave models under short-duration, fetch-limited conditions. This applies particularly to the wave period, and can be illustrated by the case of semi-enclosed domains with highly variable wind patterns such as the Catalan coast in the Spanish Mediterranean.

The wave model SWAN version 40.91A is used here in three nested grids covering all the North-western Mediterranean Sea with resolution from 9 to 1 km, forced with high resolution wind patterns from BSC (Barcelona Supercomputing Center) for two study periods, the winter 2010 and the spring 2011. The results are validated in eight locations with different types of instrumentation.

In order to improve the results, a modification of the whitecapping well-known formulation of Hasselmann (1974) has been considered. The delta coefficient is increased to adapt the dissipation to the growth rates actually observed in the region. This correction introduces a dependence on the squared wave number, improving the prediction of the energy spectra at lower frequencies. However, one may note that an over-prediction will occur for waves with longer fetch and/or duration.

The results obtained show a clear improvement of the mean and peak wave periods for the study area, decreasing considerably the negative bias observed previously, while almost no change is observed in wave height due to the proposed modifications. These results can be generalized to the Spanish Mediterranean coast and could be exported to similar environments, characterized by young/moderate sea wave conditions due to limited fetch and transient wind driving.

References:
- Hasselmann, K., 1974. On the spectral dissipation of ocean waves due to whitecapping. Boundary-layer Meteorology,6,107-127.