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The relevance of the whitecapping term in wave forecasting. An analysis for the wave period of the Catalan coast.

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The Catalan Coast is located in the North Western Mediterranean Sea. It is a region with highly heterogeneous wind and wave conditions, characterized by a microtidal environment, and economically very dependent from the sea and the coastal zone activities. Because some of the main coastal conflicts and management problems occur within a few kilometers of the land-ocean boundary, the level of resolution and accuracy from meteo-oceanographic predictions required is not currently available. The current work is focused on improving high resolution wave forecasting very near the coast.

The SWAN wave model is used to simulate the waves in the area, and various buoy data and field campaigns are used to validate the results. The simulations are structured in four different domains covering all the North Western Mediterranean Sea, with a grid resolution from 9 km to 250 meters in coastal areas.

Previous results show that the significant wave height is almost always underpredicted in this area, and the underprediction is higher during storm events. However, the error in the peak period and the mean period is almost always constantly under predicted with a bias between one and two seconds, plus some residual error. This systematic error represents 40% of the total error.

To improve the initial results, the whiteccaping dissipation term is studied and modified. In the SWAN model, the whitecapping is mainly controlled by the steepness of the waves. Although the by default parameter is not depending on the wave number, there is a new formulation in the last SWAN version (40.81) to include it in the calculations. Previous investigations show that adjusting the dependence for the wave number improved the predictions for the wave energy at lower frequencies, solving the underprediction of the period mentioned before.

In the present work different simulations are developed to calibrate the new formulation, obtaining important improvements in the results. For the significant wave height, the results are only modified during the storm events, when the wave height is higher. The main improvement is shown in the period, with a reduction of the bias mentioned before from -1.45 to 0.19 seconds on average for the more coastal locations.