WAVE MODEL PERFORMANCE UNDER TRANSIENT CONDITIONS. THE WHITECAPPING TERM AND RATE OF WAVE GROWTH FOR THE NORTH WESTERN MEDITERRANEAN

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It is well known that the performance of wave models for semi enclosed domains and under short duration storm events is significantly lower than for open sea conditions. Moreover, for the case of winds blowing from land, so common in the North Western Mediterranean (and in particular for the Catalan coast which will be our main case study), the problem is compounded by the short generation length and the slanting fetch effect.

Because of that in this paper we analyse in detail the energy balance (input versus dissipation) of the wave action equation for a selected number of storms in the North Western Mediterranean Sea. More specifically we look at the whitecapping dissipation term and the rate of wave energy growth. The whitecapping dissipation term in the SWAN model, our modelling tool for this paper, 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) that incudes it in the calculation.

The aim of our analysis will be to show how by adjusting the dependence for the wave number and selecting the best ratio of spatial and temporal time steps we achieve a better balance in the action equation (both physical and although of lesser importance also numerical) that reduces the under prediction particularly for storm peaks. With the proposed adjustments the predicted wave height under storm events gets closer (less under prediction) than the values normally reported in the state of the art and the prediction of the wave period is significantly modified. The estimates of wave period using the by default parameters in SWAN show a systematic under prediction bias of order two seconds plus some residual error, which amounts to nearly 50% error in period prediction. With the proposed formulations, in addition to the wave height improvement, there is a very clear reduction in the bias for the period. However the proposed improvements are not universally valid, nor suitable for all stages of wave growth, as will be discussed during the presentation.