IMPROVEMENT OF THE WAVE HEIGHT REAL-TIME FORECAST IN THE AEGEAN SEA USING STOCHASTIC METHODS

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Wave forecasting for the Aegean Sea in Eastern Mediterranean is accomplished today via the numerical model WAM, run by the Hellenic Centre for Marine Research in the framework of the Poseidon Operational System. Measurements from four pilot-study monitoring stations of the Aegean Sea showed a systematic underestimation of the significant wave height. The measurement stations are located in the open sea near the Athos peninsula and offshore of Lesvos, Mykonos and Santorini islands. To improve wave forecasting in this area, where peculiarities such as the complex shore-line and the numerous islets as well as the changeable nature of the wind field influence adversely WAM model predictive power, a set of stochastic models were examined. Specifically, linear and non-linear regression models, which take into account the time series of the significant wave height (measured and forecasted) were developed and tested.

A preliminary exploratory research was performed using a simple one-parameter linear regression model with only one explanatory variable. This model did not bring any improvement in the coefficient of determination between WAM forecasts and measurements of the significant wave height. However, the forecast of the larger wave heights was improved for all stations and for all periods of the year. In addition, the negative bias of WAM forecasts was significantly reduced. The other multiregression models used include: a bivariate linear model whose explanatory variables are the WAM prediction of the current step and the measured height at a previous step; a trivariate linear model whose explanatory variables are the WAM prediction of the current step and the measured height of two previous steps; and a bivariate nonlinear model with explanatory variables same as in the corresponding linear model. All these

models resulted in significant improvement of the coefficient of determination, which increased from approximately 0.7 to over 0.9 for all periods of application. Another important result is the fact that the forecast error was no longer systematic as in the case of the WAM model (underestimation). In addition, the application showed that the model parameters are almost invariable for all stations and periods of the year. Conclusively, it is shown that use of real time measurements in combination with stochastic methods, can improve significantly the WAM model forecasting capability in the Aegean Sea.