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Adjustment of the WW3 nonlinear source term DIA to the conditions of the middle-sized inland reservoir

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Nowadays meteorological services regularly model the hydrological and meteorological situation of the seas and oceans using numerical forecast models. However, when modeling winds and waves in the inland waters, a number of problems remain, as the conditions of the inland reservoir have a number of features that must be taken into account. Among them there are small fetches, stronger wind input, stronger non-linearity and the influence of the shore.

It was proposed to adjust the already existing global wave models, for example, WAVEWATCH III (WW3) [1], oriented primarily to ocean conditions, to inland water conditions. In previous works, we described the adjusting of the WW3 model to the conditions of a middle-sized inland reservoir based on the data of the full-scale experiment [2, 3], where the wind input source term was tuned, and a second stage of the adjustment was suggested concerning the nonlinear source term.

All the nonlinear source term parameterizations presented in the WW3 v.5.16 model were tested on the middle-sized inland reservoir. An example of such a reservoir is the Gorky reservoir, where our group had been carrying out field studies since 2011 [4]. Inefficiency of the nonlinear source term calculation was shown. It was proposed to adjust the DIA nonlinear source term by selecting the "optimal" parameters that define that parameterization. To search for a combination of optimal parameters λnl and C of the DIA nonlinearity scheme, the modeling was carried out with WAM3 and Babanin et al wind input parameterization with a modified drag coefficient CD [3], more than 15,000 WW3 model launches were performed. As a result, the distribution that describe the quality of the calculation with DIA of the wave parameters (significant wave height Hs and mean wave period Tm) on the basis of comparison with the experimental data was obtained. The point with the minimum values of the deviation of the simulation from the experiment both for Hs and Tm corresponded to the "optimal" set of DIA parameters. An improvement in the calculation of the WW3 model in an inland reservoir was shown.

The developing technique of the numerical prediction of the waves on the inland water bodies will allow creating high-resolution wave forecasts.

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