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On the numerical simulation of the thermal regime of inland water bodies with field measurement data

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The problem of the numerical simulation of the thermal regime of inland water bodies is raised in the research, and the modified version of the program complex LAKE is proposed for its solving. Basic version of this complex was developed by V. M. Stepanenko from Moscow State University [1]. Also the results of validation of the modified version in accordance with the parameters of lake part of Gorky water reservoir (56°42′N 43°19′E) are provided. The modification caused changing the procedure of input data assignment, ensured the possibility of using the results from field measurements as starting profiles, led to the greater consideration of wind influence on mixing and allowed to reproduce general forms of distribution more accurately. Combined method was used for validation: the data from the experimental sites of Gorky water reservoir, the files of global reanalysis and the archives of hydrometeorological station were accounted. Measurements of the vertical temperature profiles were carried out with freely sinking TD-probe, which recorded the temperature values six times per second.
Values of temperature in control points, comparison of the forms of the profiles and the standard deviation for all performed realizations were taken into account for the assessment of the numerical results. The best agreement was obtained for the thermal regimes with strong mixing: the results reproduced the forms of distribution and the values of temperature extremely accurately. The results for the ones with strong stratification demonstrated less accuracy in the values of temperature in control points, particularly near the surface, but all specificities of the forms of vertical distribution were correctly reproduced. Thus, the numerical simulation with the modified model gives the results which are in good agreement with the real seasonal variations of thermal regime in lake part of Gorky water reservoir.

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