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Study and solution of some data assimilation problems of the tide theory

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Some identification problems of the theory of tides are considered: the problem of specifying the function of boundary condition on the liquid boundary and specifying the tide-generating forces. Both of these problems in present-day numerical calculations are solved approximately and, as a rule, with inadequate accuracy. Their solution can be approached by using the procedure of the variational assimilation of observation data. There is a lot of available information, in particular, on the free surface elevation in the considered basin, which is based on satellite or coastal measurements and frequently obtained in the on-line regime. To close the nonlinear system of equations of the tide theory and "additional unknowns" ("controls") we introduce the problem of minimization of a cost functional based on available observation data. These problems can be regarded as generalized statements of the corresponding identification problems in which, besides the usual solutions of the tide equations, it is also necessary to find the functions of the boundary values and the tide-generating forces. After the closed system of equations describing these problems is formulated, the solvability of the problems are investigated and the conditions under which the solution is unique are specified. We propose iterative algorithms for constructing the solutions and discuss the possible realizations of the algorithms. Numerical experiments are presented. On the whole all the investigations follow [1,2].

References:

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