Geophysical Research Abstracts
Vol. 21, EGU2019-7487, 2019
EGU General Assembly 2019

Software package for modeling the dynamics of internal waves in a stratified ocean with cloud computing and storage integration

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This project is aimed to create a modern adapted and verified software tool for solving the applied geophysical problem related to the study of internal gravity waves in the shelf zone of the seas and oceans. The tool implements a computational module for performing the numeric simulation of the initial boundary value problem for a system of equations of hydrodynamics of a nonuniform horizontal and vertical liquid (weakly non-linear theory).
High integration of the software package with cloud computing and cloud storage allows users to exchange their results and collaborate very effectively. A wide range of tools implemented in the package includes direct access to data sources required for numerical experiment initialization, remote computing on cluster infrastructure, data analysis and visualization tools, project-based computational process organization, data exchange via cloud storage, modern graphical user interface with smart algorithms for user assistance in experiment initialization.
The computational core of the package consists of a high-performance parallelized block for computing the kinematic and nonlinear characteristics of internal waves, including phase speed data, the coefficients of cubic and quadratic nonlinearity in terms of weakly nonlinear models, effective computational finite-difference, spectral and pseudospectral algorithms for solving initial boundary value problem (Gardner and Grander-Ostrovsky equations).
Acknowledgment: The research was conducted with the support of the Russian Science Foundation Grant No. 17-71-10101.