

Water waves generated by impulsively moving obstacle

Nikolay Makarenko (1,2) and Vasily Kostikov (1,2)

(1) Lavrentyev Institute of Hydrodynamics, Novosibirsk, Russia (makarenko@hydro.nsc.ru), (2) Novosibirsk State University

There are several mechanisms of tsunami-type wave formation such as piston displacement of the ocean floor due to a submarine earthquake, landslides, etc. We consider simplified mathematical formulation which involves non-stationary Euler equations of infinitely deep ideal fluid with submerged compact wave-maker. We apply semi-analytical method [1] based on the reduction of fully nonlinear water wave problem to the integral-differential system for the wave elevation together with normal and tangential fluid velocities at the free surface. Recently, small-time asymptotic solutions were constructed by this method for submerged piston modeled by thin elliptic cylinder which starts with constant acceleration from rest [2,3]. By that, the leading-order solution terms describe several regimes of non-stationary free surface flow such as formation of inertial fluid layer, splash jets and diverging waves over the obstacle. Now we construct asymptotic solution taking into account higher-order nonlinear terms in the case of submerged circular cylinder. The role of non-linearity in the formation mechanism of surface waves is clarified in comparison with linear approximations.

This work was supported by RFBR (grant No 15-01-03942).

References

- [1] Makarenko N.I. Nonlinear interaction of submerged cylinder with free surface, *JOMAE Trans. ASME*, 2003, 125(1), 75-78.
- [2] Makarenko N.I., Kostikov V.K. Unsteady motion of an elliptic cylinder under a free surface, *J. Appl. Mech. Techn. Phys.*, 2013, 54(3), 367-376.
- [3] Makarenko N.I., Kostikov V.K. Non-linear water waves generated by impulsive motion of submerged obstacle, *NHESS*, 2014, 14(4), 751-756.