Geophysical Research Abstracts, Vol. 7, 00828, 2005
SRef-ID: 1607-7962/gra/EGU05-A-00828

Surface wave generation and variability in a field of non-stationary inhomogeneous current

V.V. Bakhanov, V.I. Kazakov, O.N. Kemarskaya

Institute of Applied Physics RAS, Nizhny Novgorod, Russia (bakh@hydro.appl.sci-nnov.ru / Fax: 7-8312-365976)

Generation and spatial-temporal variability of surface wave in the field around a submerged non-stationary moving sphere was experimentally studied in laboratory tank. Unlike the earlier conducted experiments [1] the frequency range of sphere oscillations was expanded. Besides, the parameters of experiment were selected so that to examine independently the cases, when the resonance condition is fulfilled ($\Omega U/g$ = 0.25, U is the average velocity of the sphere motion, Ω is the variation frequency of the sphere motion parameters) and when the reduced Froude number $F_1 = Fr + \Omega\sqrt{h/g}$, where $Fr = U/\sqrt{gh}$, h is the average depth of the sphere submersion, is close to unity.

Experimental investigations of the sphere motion non-stationarity influence on transformation of background surface waves generated by the wave maker are carried out for their four frequencies: the group velocity of surface waves is less than the sphere motion velocity, close to it and for two values of the surface wave frequency - more than the sphere motion velocity.

An optical system for recording surface wave slopes [2] and a contact device - a string wave recorder were used to record surface wave parameters. Comparison of obtained results is performed.

Both the previously theoretically predicted generation of surface waves in the resonance case and excitation of surface waves in the case when the reduced Froude number is close to unity are confirmed in the experiments. In the first case as time grew, the surface wave amplitude was approximately constant, while the wave perturbation region extended, in the second case, vice versa, the surface wave amplitude increased with conservation of spatial sizes of the wave perturbation region.

In the regimes of the sphere motion, when surface wave generation was not observed, variability in the sphere motion velocity and depth slightly affected the transformation character of background surface waves generated by the wave maker in the field of its non-uniform streamlining. In the rest of the experiments we, evidently, have a superposition of surface waves generated as a result of the sphere motion non-stationarity with background surface waves; thus the picture of surface anomalies changed.

This work was supported by the grant RFBR 02-05-65099, 05-05-64942, Research school program (03 Hsh 16372003.2) and NOAA, ETL, Boulder, CO.

References:

1. Bakhanov V. V., V. I. Kazakov, and O. N. Kemarskaya. Laboratory investigations of surface wave variability in a field of non-stationary inhomogeneous current. Geophysical Research Abstract, Vol. 6, 01040, 2004. SRef-ID: 1607-7962/gra/EGU04-A-01040.

2. Bakhanov V. V., V. I. Kazakov, D. P. Korotkov, B. V. Serin, V. I. Talanov, L. A. Ostrovsky, S. N. Vlasov, E. V. Koposova, and O. N. Kemarskaya, 2002. Laboratory Modeling and Theoretical Studies of Surface Wave Modulation by a Moving Sphere. Ed., L. A. Ostrovsky. Environmental Technology Laboratory, Boulder, CO, OAR, NOAA, 72 pp.