Efficiency evaluation of the long waves propagation models on the experimental results basis

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At present time there are three theoretical models describing the propagation and transformation of long waves over the bottom with variable depth: Green-Naghdi's (1976), Zheleznyak-Pelinovsky's (1985), and Aleshkov's (1985) models. The main difference consists in the ways how to specify the initial velocity.

The equations of Zheleznyak-Pelinovsky have been used extensively in numerical calculations for many years. The equation of the motion in Green-Naghdi's model in inconvenient for numerical calculations because it includes the second-order derivatives with respect to time. Fedotova and Khakimzyanov (2008) proved that the Green-Naghdi's and Zheleznyak-Pelinovsky's models are equivalent and have only different forms of the same system of equations of the second order shallow water theory.

The right side of the equation of the motion in Aleshkov's model is given by the gradient of the scalar function. This feature one may take efficiently into account by the elaboration of numerical algorithm. Moreover the curl of the initial velocity in Aleshkov's model equals zero, i.e. the flow has the potential function. Therefore one may use numerical techniques for potential flows in calculations using this model.

We carried out the calculations and compared the numerical results obtaining through these models with the results of the experiments fulfilled in our hydro flume. The coincidence was satisfactory in all cases.