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Bottom pressure induced by the long nonlinear internal waves

Tatiana Talipova^{1,2} and Efim Pelinovsky^{1,2,3}

¹Institute of Applied Physics RAS, Nizhny Novgorod, Russian Federation (tgtalipova@mail.ru)

²Nizhny Novgorod State Technical University na. R.E. Alekseev, Nizhny Novgorod, Russia

³National Research University - Higher School of Economics, Nizhny Novgorod, Russia

The bottom pressure sensors are widely used for the purpose of registration of the sea surface movement. They are particularly efficient to measure long surface waves like tsunami and storm surges. The bottom pressure gauges can be also used to record internal waves in coastal waters. For instance, the perspective system of the internal wave warning in the Andaman Sea is based on the bottom pressure variation data. Here we investigate theoretically the relation between long internal waves and induced bottom pressure fluctuations. Firstly, the linear relations are derived for the multi-modal internal wave field. Then, the weakly nonlinear theory is developed. Structurally, the obtained formula for the bottom pressure induced by the long internal waves is similar to those known for the surface waves within the Green-Naghdi system framework, but the coefficients are determined through the integrals for the water density stratification and vertical mode wave functions. In particular, the bottom pressure variations are calculated for solitary waves in two- and three-layer flows described by the Gardner equation.

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