



Extreme internal waves in a weakly stratified shear flows

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We discuss the limitations imposed by the conservation of mass, momentum and energy for strongly nonlinear internal waves in a continuously stratified fluid. In several cases, the amplitude of permanent wave does not exceed its critical value which may be found a priori as the broadening limit for extreme table-top solitary wave. This limit corresponds to the amplitude of smooth internal bore which conjugates known upstream flow with unknown horizontal midsection flow. It is well known (Benjamin, 1966) that the problem on conjugate flows reduces to non-linear eigenvalue problem for the Dubreil-Jacotin-Long (DJL) equation. Recently, this problem has been studied analytically in the context of extreme internal waves having no shear in upstream flow (see Makarenko, Maltseva, Kazakov, NPG, 2009, 16, 169-178). Now we consider the conjugate flow problem under the assumption which admits small primary shear in the upstream flow. This assumption seems to be realistic by modeling intense internal waves in tidal flows. Asymptotic solutions of the DJL equation describing bifurcations of extreme internal waves are constructed. The role of the fine-scale stratification is considered in more details. This work was supported by RFBR (grant No 09-01-00427), Russian Government (grant No 11.G34.31.0035) and Program RAS (Project No 20.4).