Non-linear internal waves over rough topography

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The problem on steady internal waves in non-homogeneous flow over an uneven bottom is considered. Stratified flows over the barrier are of interest, because tidal flows over the bottom ridges and atmospheric air currents over the mountains demonstrate such an example of the flow. It is well known that hazardous large-amplitude lee waves may occur downstream the obstacle for appropriate upstream conditions. Mathematical model of this phenomenon deals with asymptotic solutions of Euler equations of stratified fluid. Limitations on validity of known lee-wave solutions appear due to hydraulic effects, and also due to resonant non-stationary behavior, as well as considerable correction due to non-linearity may occur. In this paper, the impact of non-linearity is analyzed by the perturbation method with small parameter which characterizes typical height of obstacle. Attention is focused on the amplification effect and fragmentation properties for near-field wave patterns forced by rough topography of finite extension.