

Abstract Submitted
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Instabilities in Non-Boussinesq Density Stratified Long and Narrow Lakes¹ ANIRBAN GUHA, MIHIR SHETE, Indian Inst of Tech-Kanpur — We have discovered a new type of instability that can potentially occur in density stratified long and narrow lakes. The non-Boussinesq air-water interface plays a major role in this instability mechanism. A two layered lake driven by wind is considered; in such wind driven scenarios circulation sets up in each layer of the lake. The flow is assumed to be two dimensional, inviscid and incompressible. A surface gravity wave exists on the interface between air and water while an interfacial gravity wave exists on the interface between the two water layers (interface between warm and cold water). The resonant interactions between these two waves under a suitable doppler shift gives rise to normal mode growth rates leading to instability. We verify these claims analytically by piecewise linear velocity and density profiles. Furthermore we also use a realistic velocity and density profiles that are smooth and perform a linear stability analysis using a non-Boussinesq Taylor-Goldstein equation solver. We find that the normal mode instabilities are instigated by realistic wind velocities.

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