**Linear transient dynamics of IGWs in stratified flows with horizontal shear**

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The turning point in the investigation of shear flows dynamics has been reached in 1990s. At this time, the hydrodynamic community well understood the non-normal nature of such flows and its consequences. This fact initiated rethinking of shear flows phenomena, moreover, that nonuniform kinematics is ubiquitous both in natural (geophysical and astrophysical) and engineering flows. These circumstances led to the breakthrough in the understanding and precise description of shear flow dynamics. Novel ways of describing flow stability emerged, which allow the quantitative study of short-term disturbance behavior.

We investigate linear transient dynamics of internal gravity waves in stably stratified shear flows aiming to go inside of the wave overreflection phenomenon. We consider flows with horizontal shear, $U_0(Ay,0,0)$, at different values of the Richardson number $Ri = N^2/A^2$, where A is the flow shear parameter and N is the Brunt-Vaisala frequency. In such a flows, when the Boussinesq approximation is valid, there exist three modes of perturbations. Two of them are counter propagating internal gravity waves (IGWs) and the third is vortex mode. IGWs have zero potential vorticity (PV), whereas vortex mode perturbations have nonzero PV and are nonoscillatory, corresponding to balanced motions/modes in quasigeostrophic models.

We use the nonmodal approach and introduce a so-called eigen-variables for each counter propagating wave and write the first-order ordinary differential equations for them. By this way we separate from each other different physical processes (primarily, the wave-wave and vortex-wave couplings), grasp their interplay and described the basic physics of the overreflection phenomenon. \

We show that at the Richardson number of the order of unity, the transient growth of IGWs is activated substantially. We have revelaed the importance of the generation of IGWs by vortex mode perturbations that provides a channel of energy transfer from balanced motions to unbalanced nongeostrophic IGWs.