On the shortwave instability of the stratified Kolmogorov flow

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In relation to internal gravity waves (IGW) propagating at a small angle to the vertical, the linear stability problem of the stratified Kolmogorov flow in a viscous and diffusive Boussinesq fluid, driven by a sinusoidal force in space is re-analyzed using Floquet theory, Galerkin approximations and the method of (generalized) continued fractions. Numerical and analytical arguments are provided in favor of the conjecture that an ideal Kolmogorov flow is prone to shortwave instability for Richardson numbers markedly greater than the critical Richardson number $Ri = \frac{1}{4}$ appearing in the Miles–Howard theorem, although the stratified Kolmogorov flow is in no way distinguished within the fairly general arguments of this theorem. The shortwave instability of the stratified Kolmogorov flow is conjectured to be due to resonant amplification of the Doppler-shifted IGW modes, but it is emphasized that complete resolution of the above paradox is the task of future research.

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