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A possible mechanism of interleaving at weak baroclinic fronts under stable-stable stratification in the Arctic Basin

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Some analytical solutions are found for the problem of three-dimensional instability of a weak geostrophic flow with linear velocity shear taking into account vertical diffusion of buoyancy. The analysis is based on the potential vorticity equation in a long-wave approximation when the horizontal scale of disturbances is taken much larger than the local baroclinic radius Rossby. It is hypothesized that the solutions found can be applied to describe stable and unstable disturbances of planetary scale with respect, especially, to the Arctic basin where weak baroclinic fronts with typical temporal variability period of the order of several years or more are observed and the beta-effect is negligible. Stable (decreasing with time) solutions describe disturbances that, in contrast to the Rossby waves, can propagate both to the west and east depending on the sign of linear shear of geostrophic velocity. The unstable (growing with time) solutions are applied to describe large-scale intrusions at baroclinic fronts under stable-stable thermohaline stratification observed in the upper layer of the Polar Deep Water in the Eurasian basin. The proposed description of intrusive layering can be considered as a possible alternative to the mechanism of interleaving due to the differential mixing (Merryfield, 2002; Kuzmina et al., 2011).

References

Kuzmina N., Rudels B., Zhurbas V., Stipa T. On the structure and dynamical features of intrusive layering in the Eurasian Basin in the Arctic Ocean. J. Geophys. Res., 2011, 116, C00D11, doi:10.1029/2010JC006920.
Merryfield W. J. Intrusions in double-diffusively stable Arctic Waters: Evidence for differential mixing? J. Phys. Oceanogr., 2002, 32, 1452–1439.