On the inertial instability of the Kolmogorov flow in a rotating stratified fluid

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The linear and non-linear inertial stability of the Kolmogorov flow in a rotating viscous fluid of uniform density is investigated. A necessary condition for instability is the violation of the criterion of non-viscous inertial stability, and the sufficient condition of instability is formulated in terms of the Reynolds criterion. The existence of stable secondary stationary regimes in the problem is shown, developing in a context of loss of stability of the main flow and having the shape of rolls (cloud streets in the atmosphere) oriented along it. Stable density stratification is taken into account when the direction of gravity coincides with the direction of rotation of the fluid. In this case, the necessary condition for the inertial instability of the main flow remains the same, but the critical Reynolds number for the instability depends on two additional dimensionless parameters that appear in the problem: the stratification parameter and the Prandtl number. The case of Prandtl numbers less than or equal to unity has been studied in greater detail, when there is a secondary stationary regime, which can be unstable - in contrast to the case of a fluid that is uniform in density - and density stratification is a destabilizing factor.