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Liner stability analysis of the two-dimensional Taylor-Green vortices in a stratified flow SHOTA SUZUKI, Graduate School of Information Science, Tohoku university, MAKOTO HIROTA, YUJI HATTORI, Institute of Fluid Science, Tohoku university — The linear stability of the two-dimensional Taylor-Green vortices in a stratified fluid is studied by modal stability analysis and short-wavelength stability analysis. By modal stability analysis it is found that the growth rate of the most unstable mode depends on the horizontal Froude number F_h and the stratification effects on the growth rate change as F_h becomes small or stratification becomes strong. There are three regions of F_h where the stratification effects are different: the stabilizing region where the elliptic instability is dominant at large F_h, the region where the growth rate has maximum, the slightly destabilizing region where the zigzag instability is dominant at small F_h. In order to reveal the mechanism of the behavior of the growth rate in the second region, we investigate the local stability of the flow near the vortex center and the flow near the boundaries between vortices by short-wavelength analysis. As a result, it is found that the competition between stabilizing elliptic instability near the vortex center and destabilizing hyperbolic instability near the boundaries occurs in the weakly stratified region. The relation between modal stability and the competition of short-wavelength stabilities will be discussed.

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