Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Nonlinear dynamics of destabilized array of vortices in stratified fluid[1] YUJI HATTORI, MAKOTO HIROTA, Institute of Fluid Science, Tohoku University — Periodic arrays of vortices are often observed in geophysical and astrophysical fluids, in which stratification and rotation effects are important. There exist hyperbolic stagnation points in the arrays of vortices. Recently, we have discovered *strato-hyperbolic instability* which is due to hyperbolic instability and phase shift by internal gravity waves (Suzuki et al., J. Fluid Mech. **854**, (2018) 293–323). The next step is to investigate nonlinear dynamics of a destabilized array of vortices in stratified fluid. We are particularly interested in evolution of strato-hyperbolic instability modes. Direct numerical simulation of the incompressible Navier-Stokes equations for stratified fluid under the Boussinesq approximation is performed. The results show that strato-hyperbolic instability modes of high wavenumber develop and become turbulent only in the neighborhood of the heteroclinic streamlines connecting the hyperbolic points, while the core region of the vortices survives. On the other hand, hyperbolic instability modes of low wavenumber make the whole region turbulent so that most of the energy is lost eventually.

[1]JSPS Kakenhi 17K05561

Yuji Hattori
Institute of Fluid Science, Tohoku University

Date submitted: 09 Sep 2019 Electronic form version 1.4