

Pre-candidacy notes:

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1 Billant & Chomaz Papers

1.1 Self-similarity of strongly stratified inviscid flows (2001)

- Posits the scaling of an intrinsic vertical length scale of strongly stratified flows, $l_z \propto U/N$.
- Third paper which describes the “Zig-Zag” instability. Two previous papers conducted linear stability analysis of the instability.
- Zig-zag instability is self-similar with respect to $k_z U/N$ which implies that the dominant vertical wavenumber of the flow is proportional to Fr .

2 Hattori & Hirota Papers

2.1 Stability of two-dimensional Taylor-Green vortices in rotating stratified fluids (2023)

- Conducted a local stability analysis as well as DNS and analyzed the data using modal stability analysis.
- Linear Stability analysis is conducted on a linearized and inviscid version of the governing equations.
- Both the DNS and LSA begin with a base flow composed of Taylor-Green vortices, which are arranged in a grid lattice.
- 5 instabilities are identified from the LSA, each with a different mechanism and different instability/resonance conditions.
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2.2 Modal stability analysis of arrays of stably stratified vortices (2021)

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3 GFD Group (Garaud, Chini, Shah, Caulfield ...)

3.1 Exploiting self-organized criticality in strongly stratified turbulence (2021)

- Developed a multiscale model for strongly stratified flows wherein an aspect ratio α is used to describe scale separation of horizontal and vertical motions recovering that $l_z \propto Fr$ as posited by

3.2 Cope et al. 2020

3.3 Shah et al. 2023

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