Precandidacy Exam: Report

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1. Introduction

In the recent history of fluid dynamics, few studies have completely acclimated the dynamics of both stratification and rotation in a fully comprehensive manner. By contrast, many achievements have been made in studying isolated dynamics, whereby the effects of other physical mechanisms are ignored in order to better understand the instabilities, flow structures, and other properties which arise under specific conditions. This has led to many discoveries about stratified flows (CITE PAPERS HERE) and rotating flows (CITE PAPERS HERE). Solving problems in fluid dynamics becomes mouch more difficult when multiple dynamics are included in the governing equations. This is often due to the nonlinearity implicit to the Navier-Stokes equation which prevents the superposition of solutions. For this reason, there are fewer studies which involve both rotation and stratification, and among those, few that are able to make general statements about rotating stratified flows.

Despite the limitations to analytical solutions of the Navier-Stokes equation (coupled with the equations for mass conservation, an equation of state, and other quantities),

2. Numerical methods for high resolution fluid dynamics

3. Multiscale theory for rotating and/or stratified flows

4. Instabilities and turbulence in rotating and/or stratified flows

5. Research Proposal

keep this in here until I have a lot of citations going Chini *et al.* (2022)

REFERENCES

Chini, Gregory P., Michel, Guillaume, Julien, Keith, Rocha, Cesar B. & Caulfield, Colm-cille P. 2022 Exploiting self-organized criticality in strongly stratified turbulence. *Journal of Fluid Mechanics* **933**, A22, arXiv: 2111.08806.

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