Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Nonlinear resonance in the persistence of layers in stably-stratified fluids[1] PAUL BURNS, JEMMA SHIPTON, BETH WINGATE[2], University of Exeter — In this work we look at the long-lived nature of layers in non-rotating stably-stratified flows and discuss whether our results support the idea that internal gravity waves (IGWs) are the cause of this longevity. We seek to describe the (low frequency) layer structure in space (or meanflow) using the non-linear resonance of IGWs. Our work is motivated by the phenomena of layer formation in the upper Arctic Ocean, which prevents the ice packs from melting by limiting vertical heat transfers. The research includes numerical simulations of an idealised laboratory experiment simplified to enable analytical methods. Our key analysis tool is a novel coordinate rotation, rotating our Boussinesq equations into the space of the waves and so revealing the non-linear resonance within our system. Future work will consider the effects of an external force and incorporate observations from the Beaufort Gyre Exploration program.

[1]Engineering and Physical Sciences Research Council (EPSRC), University of Exeter High Performance Computing (HPC) facility
[2]Beth is the PI for this project.

Paul Burns
University of Exeter

Date submitted: 31 Jul 2019 Electronic form version 1.4