U.S. NAVAL RESEARCH LABORATORY

Winter-mixing Intermittency and Restratification

AT A GLANCE

What is it?

The project aims to identify and isolate the relative role of submesoscale eddies on the generation of mixed layer intermittency during winter, and the extent to which atmospheric forcing modulates it.

How does it work?

The approach involves utilizing a combination of idealized and realistic high-resolution model simulations to specifically isolate the restratification effects resulting from submesoscale dynamics and atmospheric forcing. By supplementing high-resolution ocean observations with model simulations, this approach seeks to validate or refute the hypothesis.

What will it accomplish?

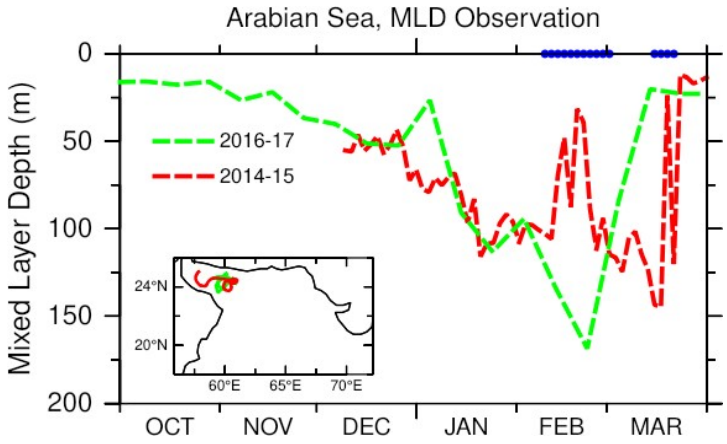
- A clear understanding of what submesoscale processes contribute to mixing intermittency and restratification.
- Understand the role of atmospheric forcing in modulating the intermittency and how do submesoscale processes interact with atmospheric forcing and contribute to intermittency.

R&D Sponsor(s)

ONR

Point(s) of Contact

Prasad Thoppil
228.688.5500
prasad.thoppil@nrlssc.navy.mil



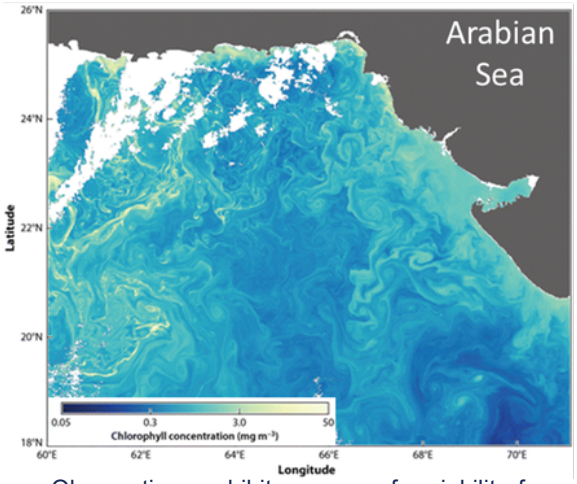
Observed winter-mixing intermittency in the Arabian Sea (Thoppil, 2023)

Winter-mixing Intermittency and Restratification

A common view is that mixed layer is continuously deeply mixed during winter, particularly in regions where convective mixing is prevalent. However, observational studies have revealed a different pattern, indicating that the winter mixed layer exhibits intermittent behavior and is marked by rapid shoaling. The mixed layer is not only influenced by the exchange of heat and momentum (fluxes) with the atmosphere at the ocean surface but also by the internal dynamics of the submesoscale eddies that are present within the mixed layer.

The instabilities growing from horizontal density gradients give rise to mixed layer eddies (MLEs) that generate vertical stratification on time scales of days to weeks. These eddies drive net horizontal transfer of lighter water above heavier water that can stratify the mixed layer.

By quantifying the effects of MLEs and atmospheric forcing on the winter-mixing intermittency, the study contributes to our improved understanding of the spatiotemporal variability in the mixed layer depth.



Observations exhibit a range of variability from mesoscales to submesoscale due to ocean's dynamics (Mahadevan 2016).

Post-Doc Opportunity

We are currently seeking post-doctoral applicants with expertise in areas of Physical Oceanography, Meteorology, and Ocean Modelling. Ability to conduct physics-based analyses on multi-faceted oceanographic datasets. For further information, contact us using the information to the left.