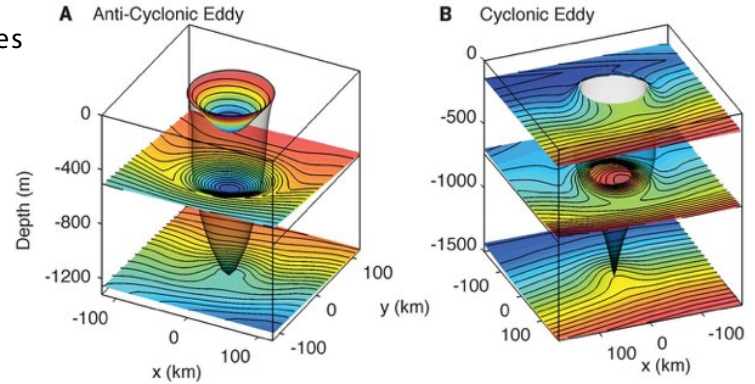# Submesoscale Eddies in the North Indian Ocean:

Tracking Techniques With SWOT

PhD Student: Paul Ernst
University of South Carolina, Columbia
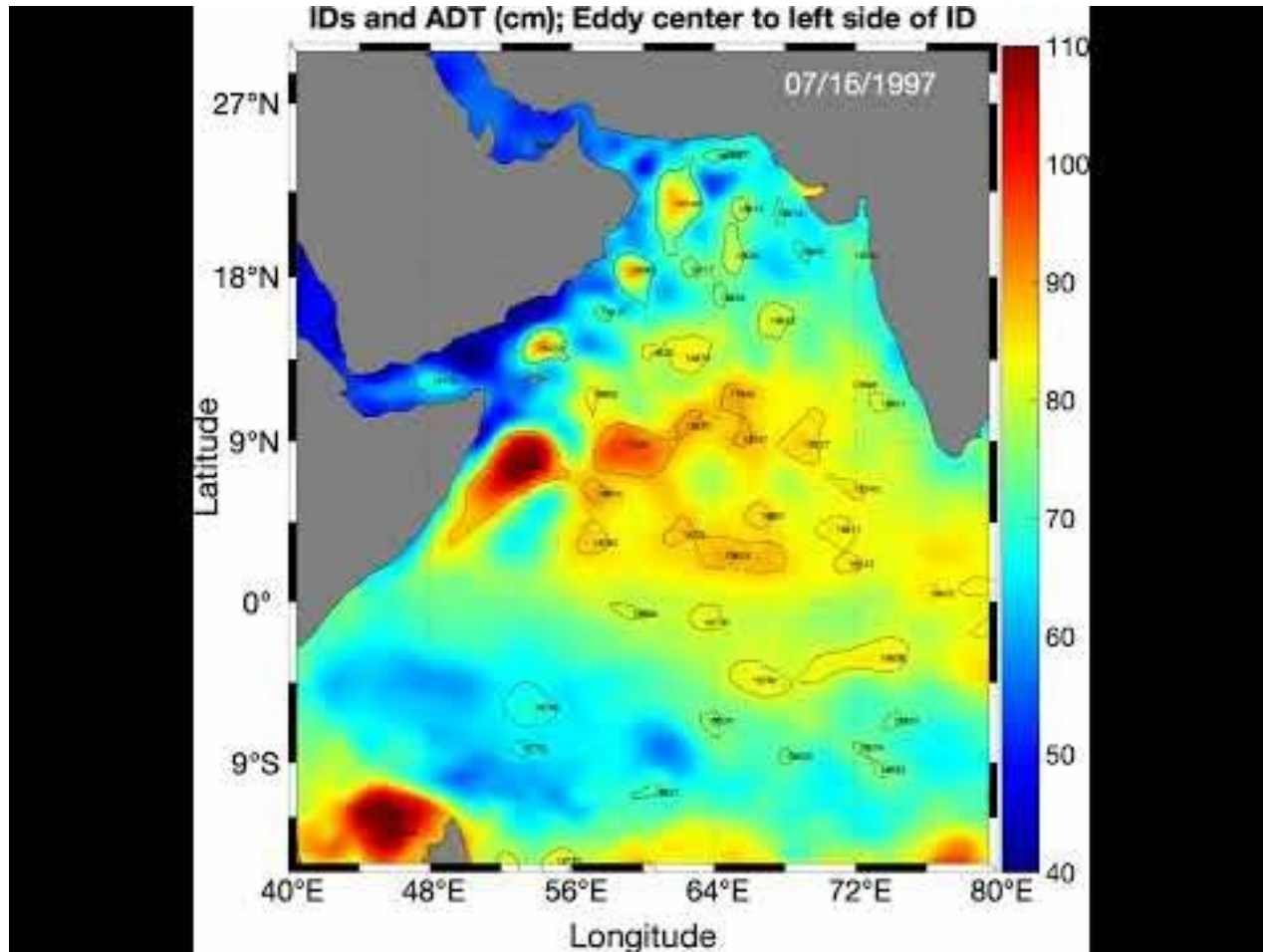School of the Earth, Ocean, and Environment

PhD Advisor: Bulusu Subrahmanyam

Basic structure of eddies
(Zhang et al., 2014)

Mesoscale Eddies

❖ Coherent ocean vortices (30+ km radius)

❖ Ubiquitous throughout the world's oceans

❖ Contributes as much to mass transport as the mean flow (Zhang et al., 2014)

Zhang, Z., W. Wang, and B. Qiu, 2014: Oceanic mass transport by mesoscale eddies. *Science*, **345**, 322–324, https://doi.org/10.1126/science.1252418.

Arabian Sea Eddy Tracking Examples
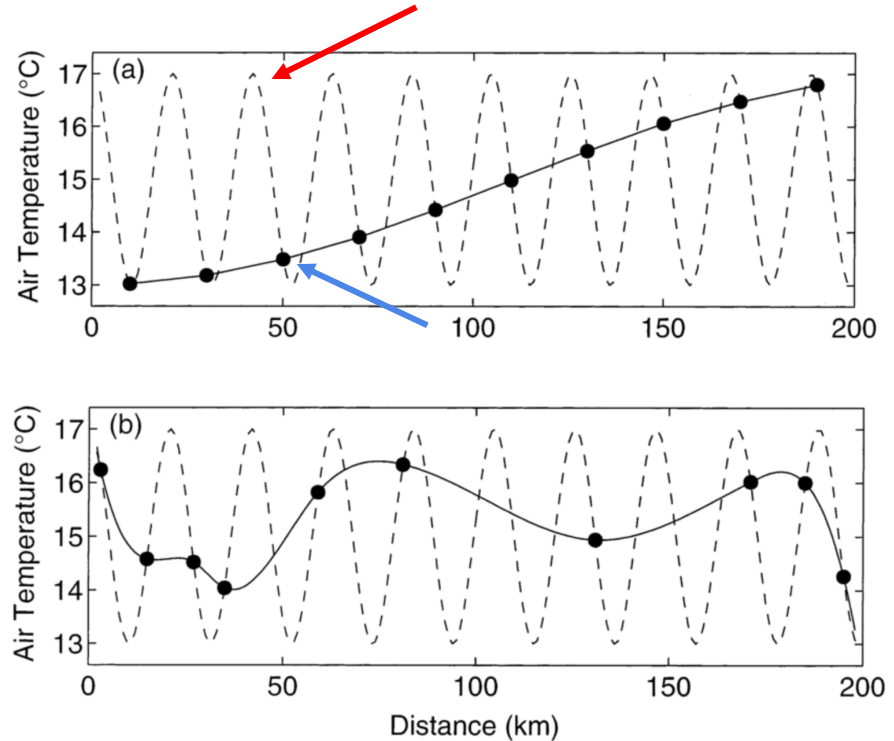

IDs and ADT (cm); Eddy center to left side of ID

Aliasing Problems with Submesoscale Eddies/Interpolation

❖ Global, constant observational data limited to **surface** measurements

❖ **Aliasing** and spatial interpolation are both problems for mesoscale data, and not easily fixed without submesoscale data
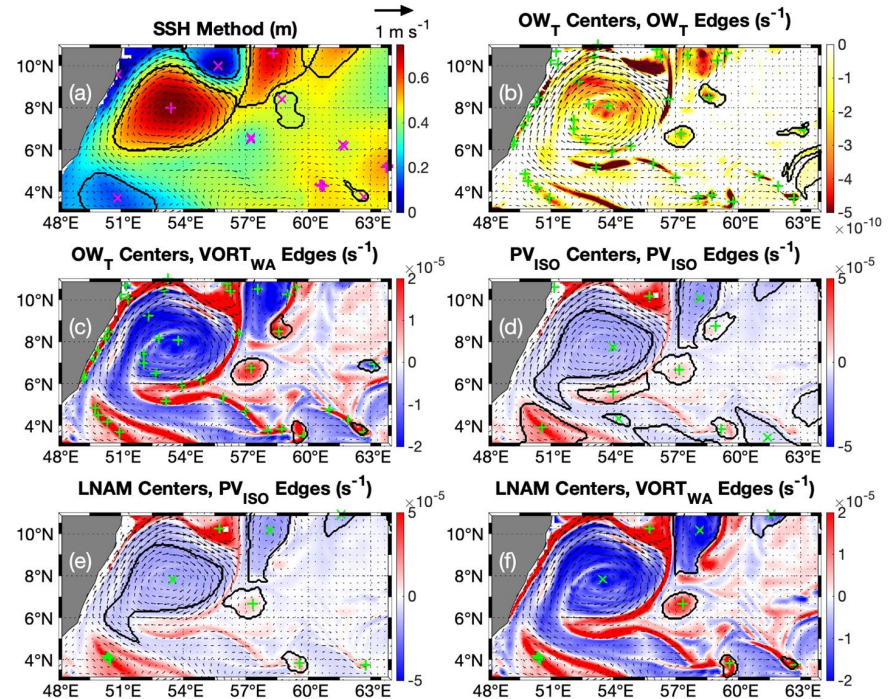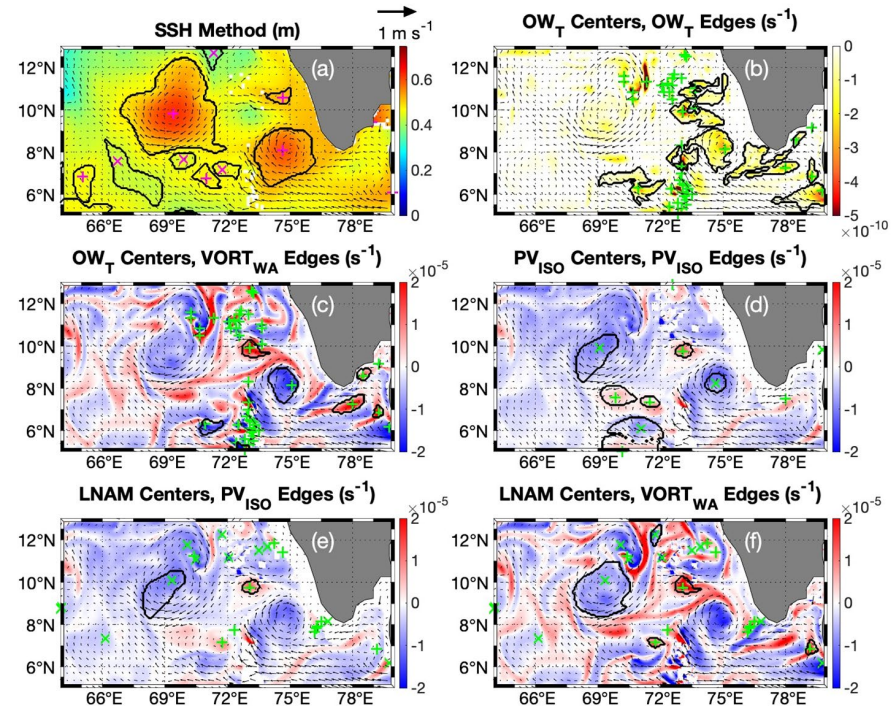

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Submesoscale Structures in Mesoscale Eddies

❖ Easy to ID eddies with Sea Level Anomaly contours, closed streamlines, etc.

❖ Does the submesoscale structure of mesoscale eddies impact ability to track?

❖ Almost certainly to some degree, depends on algorithm used

Comparison of eddy tracking methods, Great Whirl Regions (Ernst et al., in preparation)

Submesoscale Eddies & Energy Transfer Between Scales

❖ Evolution and splitting/merging between eddies almost certainly involves major processes at the submesoscale

❖ Could help clarify how certain mesoscale eddies form/dissipate + what structures spin off them

Comparison of eddy tracking methods, Lakshadweep High region (Ernst et al., in preparation)

Summary

❖ SWOT data will provide the first widespread observational insights into how widespread submesoscale eddies are in relation to mesoscale eddies

❖ Also provide new ideas of how these spatial scales interact and how energy flows between them, critical for better eddy tracking algorithms