

Carbon Hot Spot

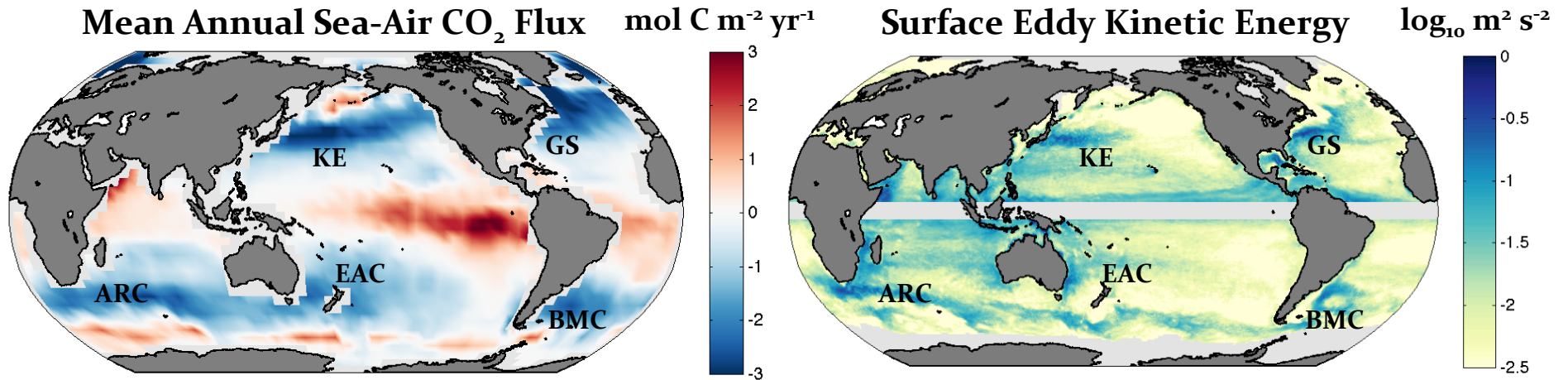


A Field Program to Understand Bio-Physical Drivers of Carbon Sequestration in Western Boundary Current Regions

Stuart P. Bishop, Andrea J. Fassbender,
Meghan F. Cronin, Dongxiao Zhang, Ryuichiro Inoue, Chris Osburn,
Eitarou Oka, Bo Qiu, Xiaopei Lin, Ivana Cerovecki

Tuesday July 26, 2016

Motivation

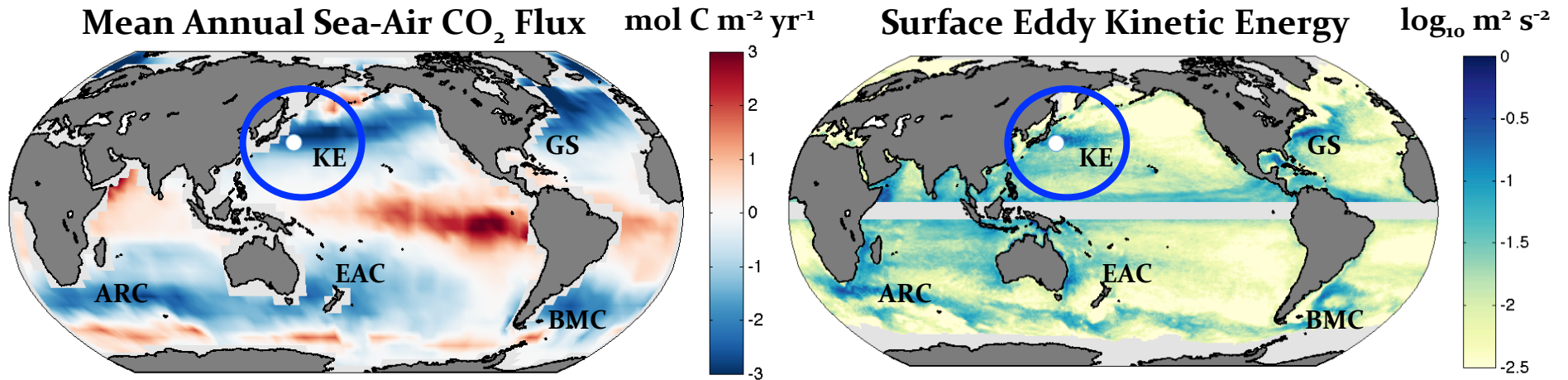


Goal: develop an interdisciplinary and international research community to facilitate better understanding of the role that WBCs play in climate and carbon sequestration.

Fundamental question:

How do bio-physical interactions, eddies, and mode water formation influence ocean carbon sequestration?

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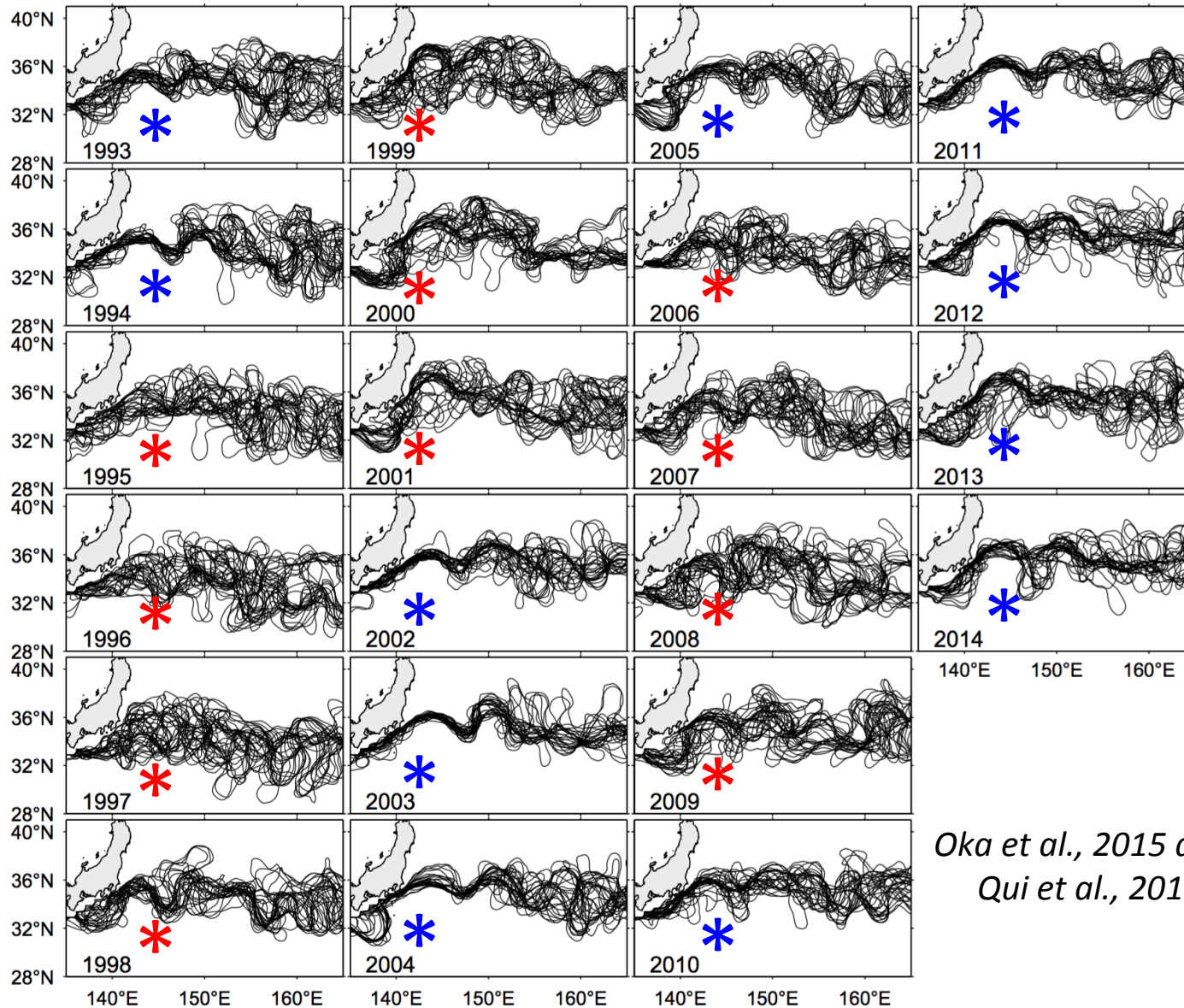
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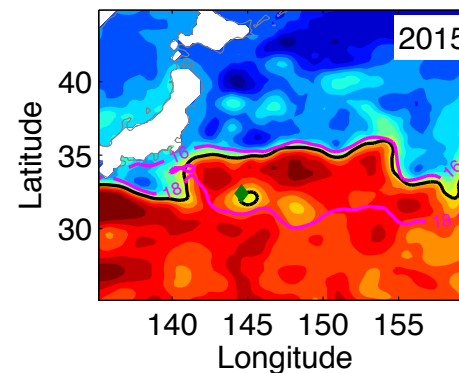
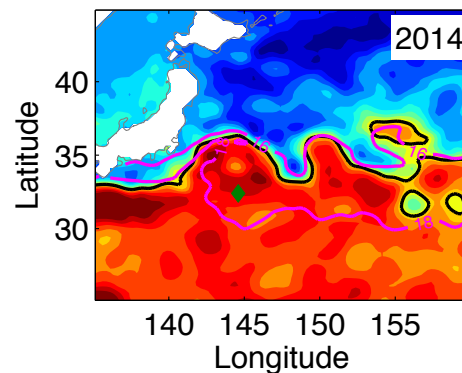
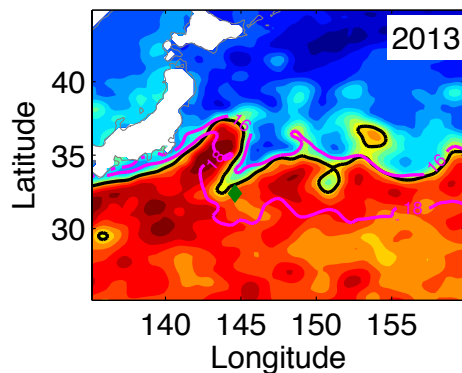
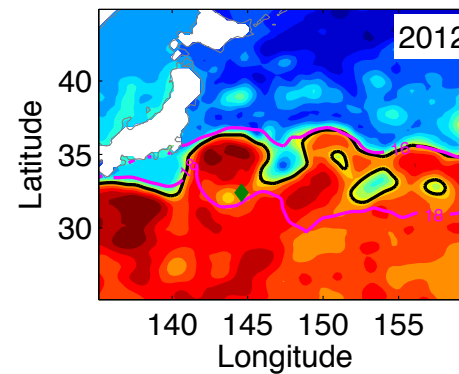
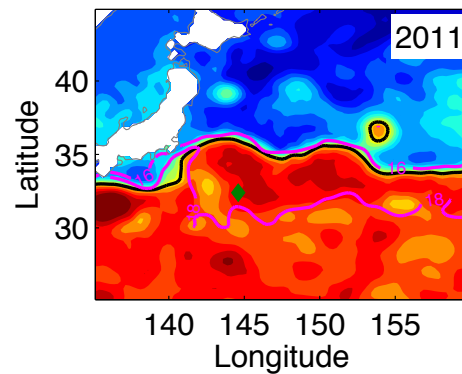
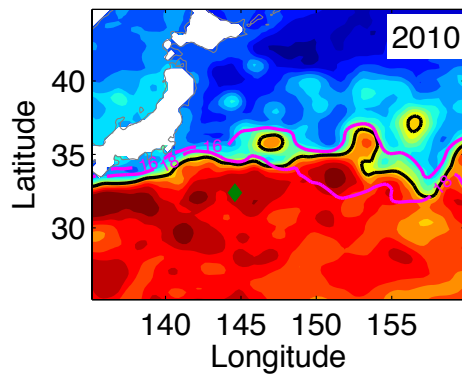
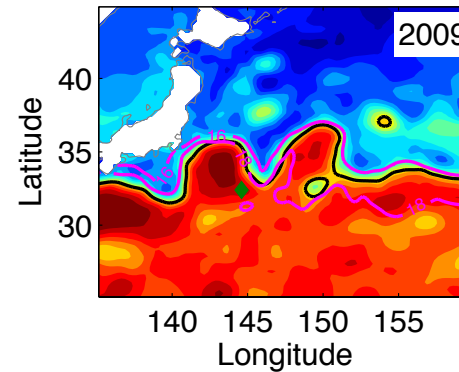
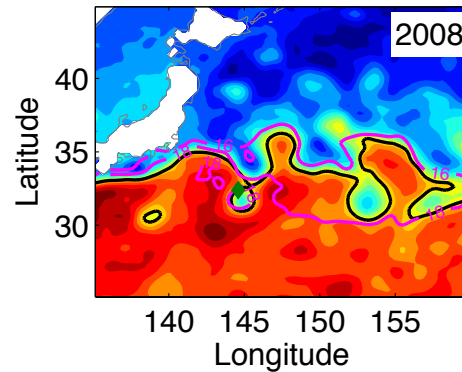
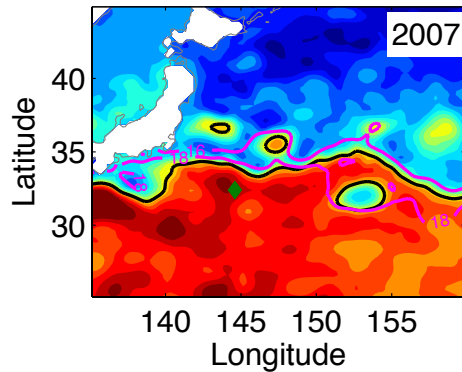
Kuroshio Extension Jet Variability

* Stable
* Unstable



*Oka et al., 2015 after
Qui et al., 2014*

Mode Water Impacts: March Outcropping

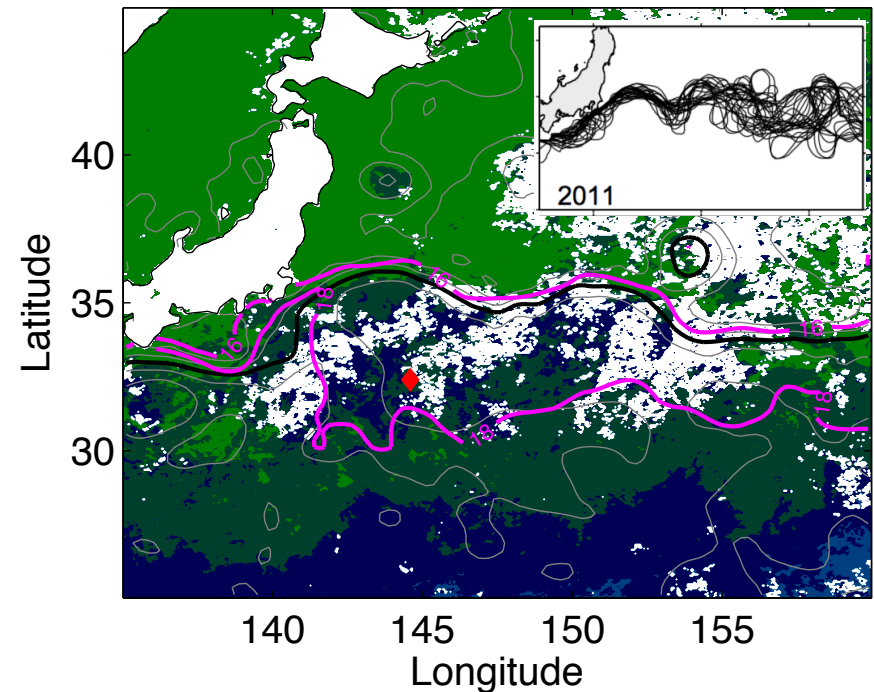
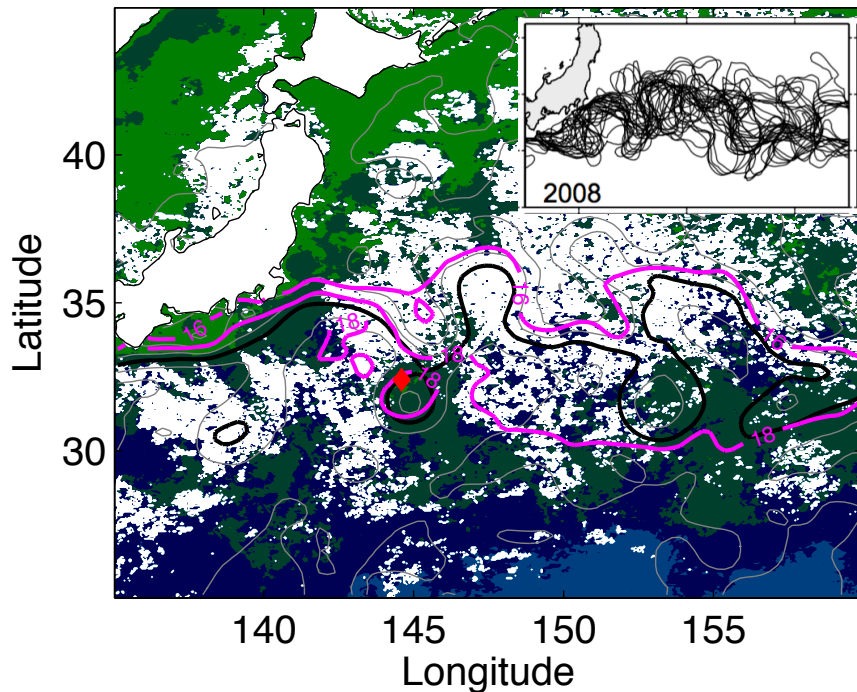


Color = SSH

Thick black contour = KE axis

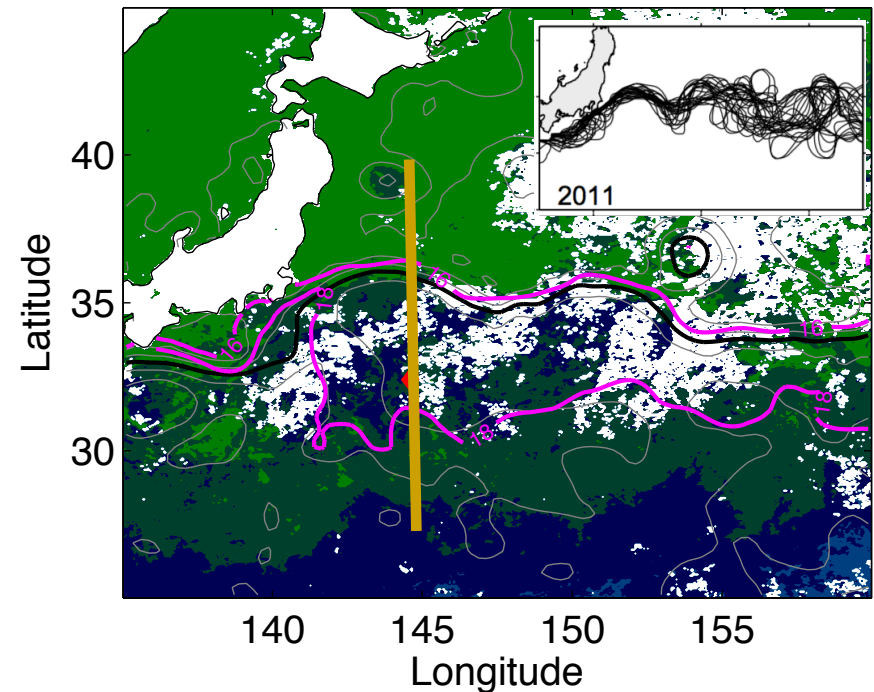
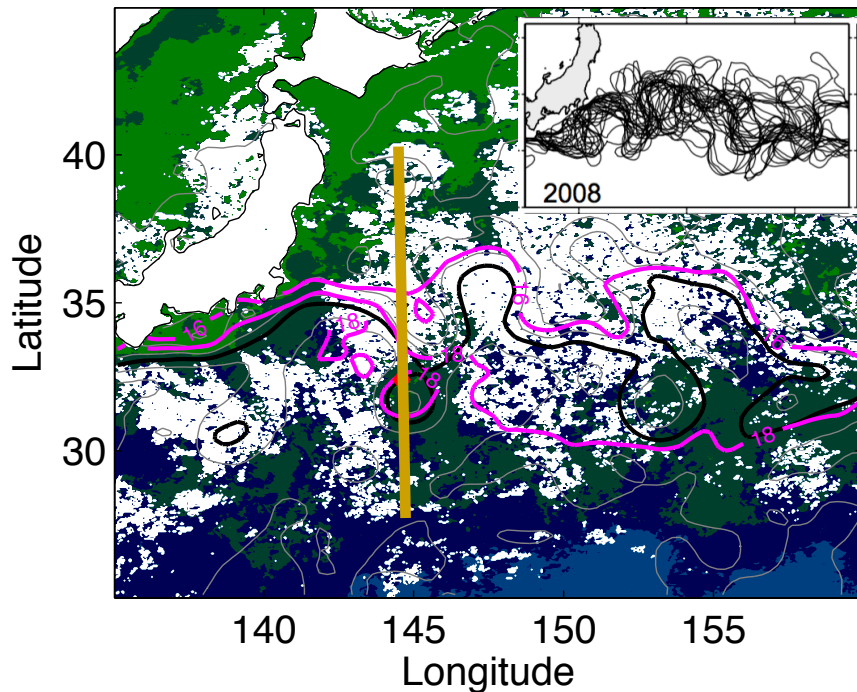
Magenta = 16-18°C

Bio-Physical Interactions: Eddies



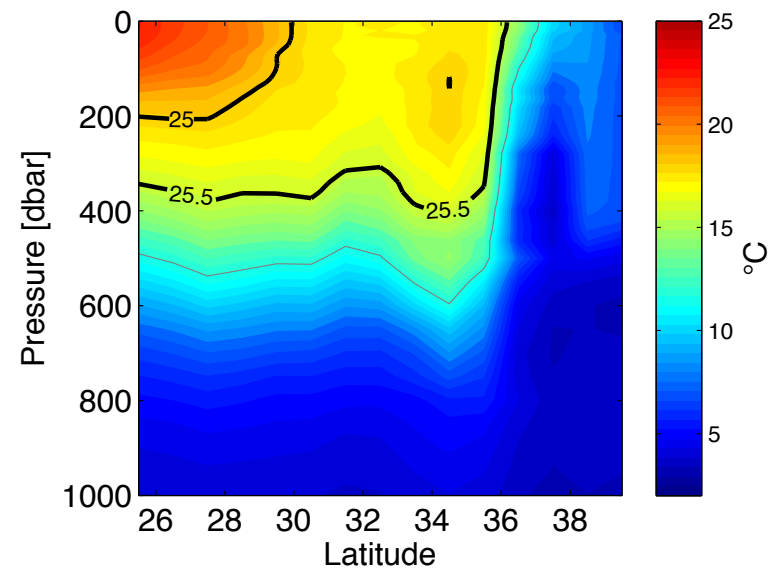
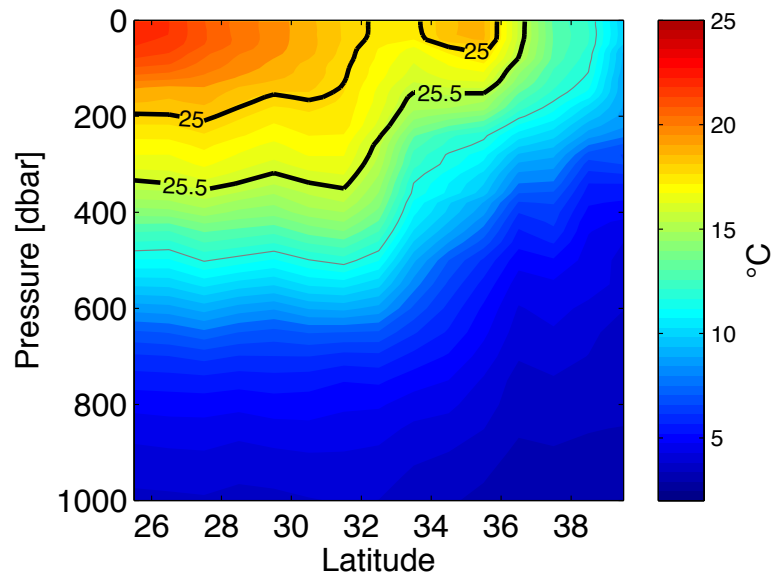
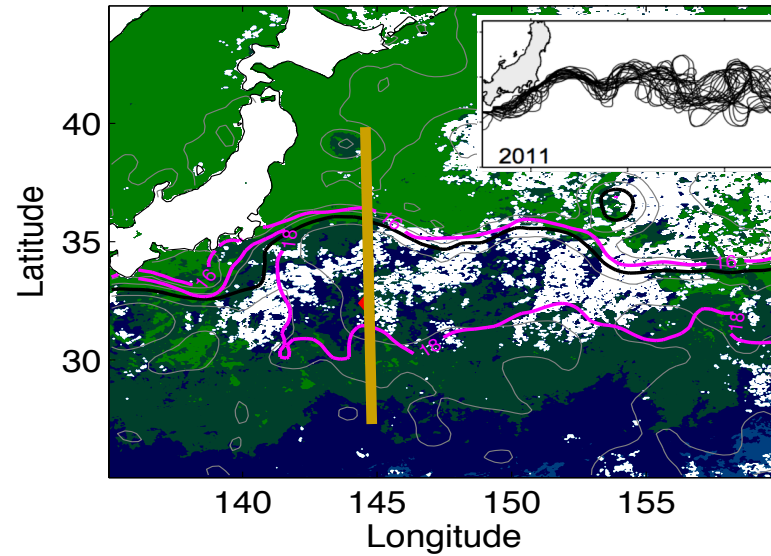
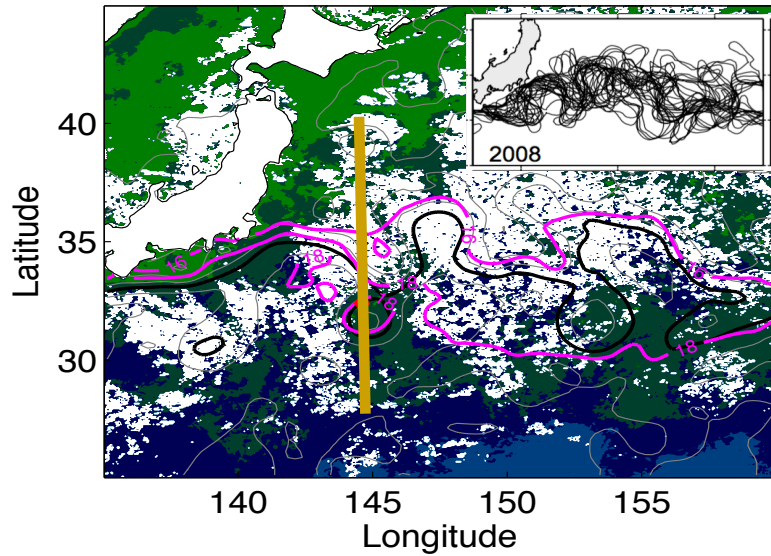
- Lin et al., 2014 found link between annual-average Chla and meandering state.
 - Unstable \rightarrow 12% higher Chla relative to multiyear mean.
 - Chla in the KE is likely modulated by vertical nutrient supply induced by divergences (convergences) associated with the westward propagation of wind-induced Rossby waves in the central and eastern North Pacific Ocean related to the PDO.
 - Submesoscales are particularly relevant to phytoplankton productivity due to time scales (Mahadevan, 2015).
- Oka et al., 2015 also found link between decadal variability in mode water and biogeochemistry at OK line (routine ship observations south of Japan)

Bio-Physical Interactions: Eddies

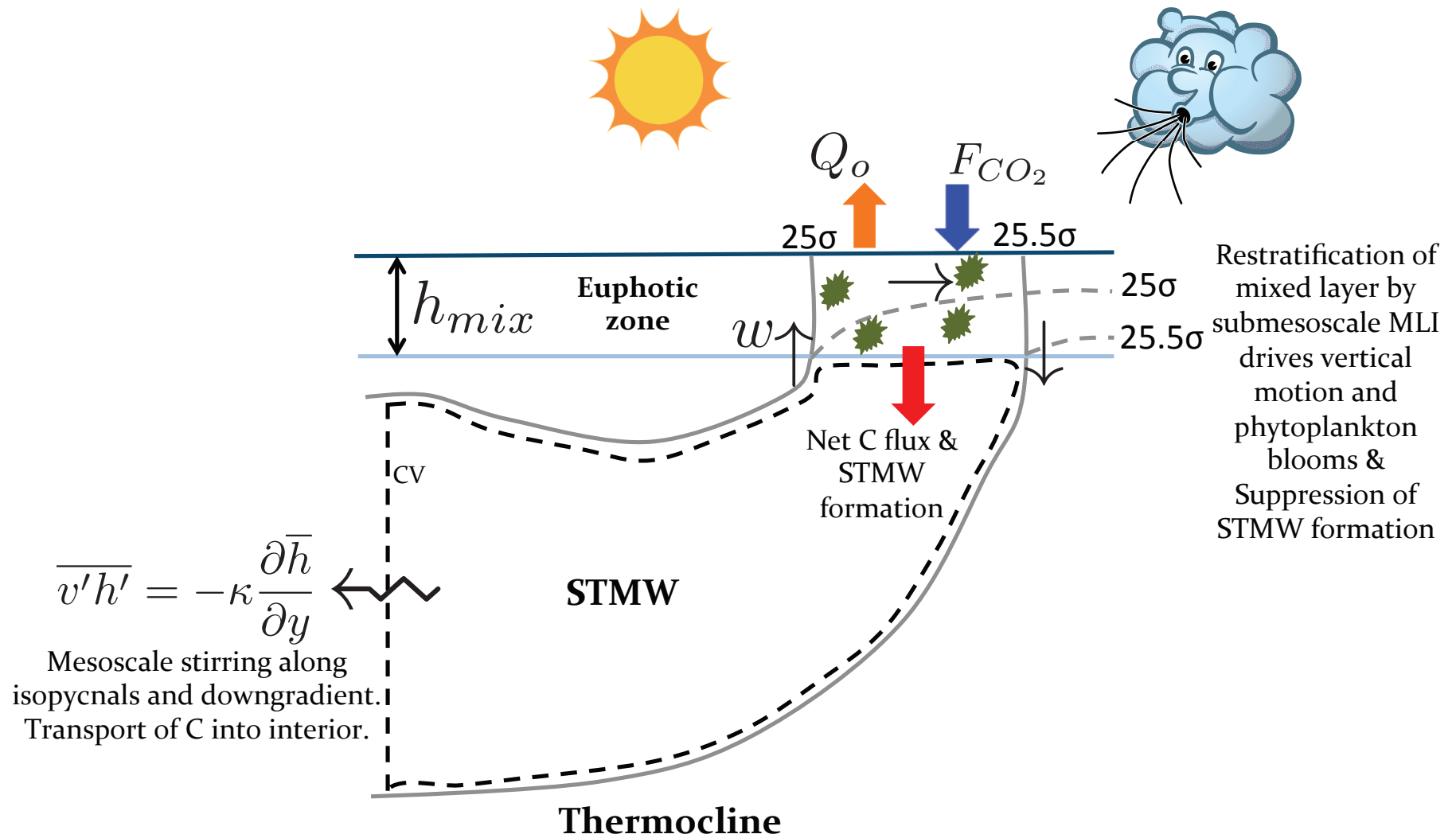


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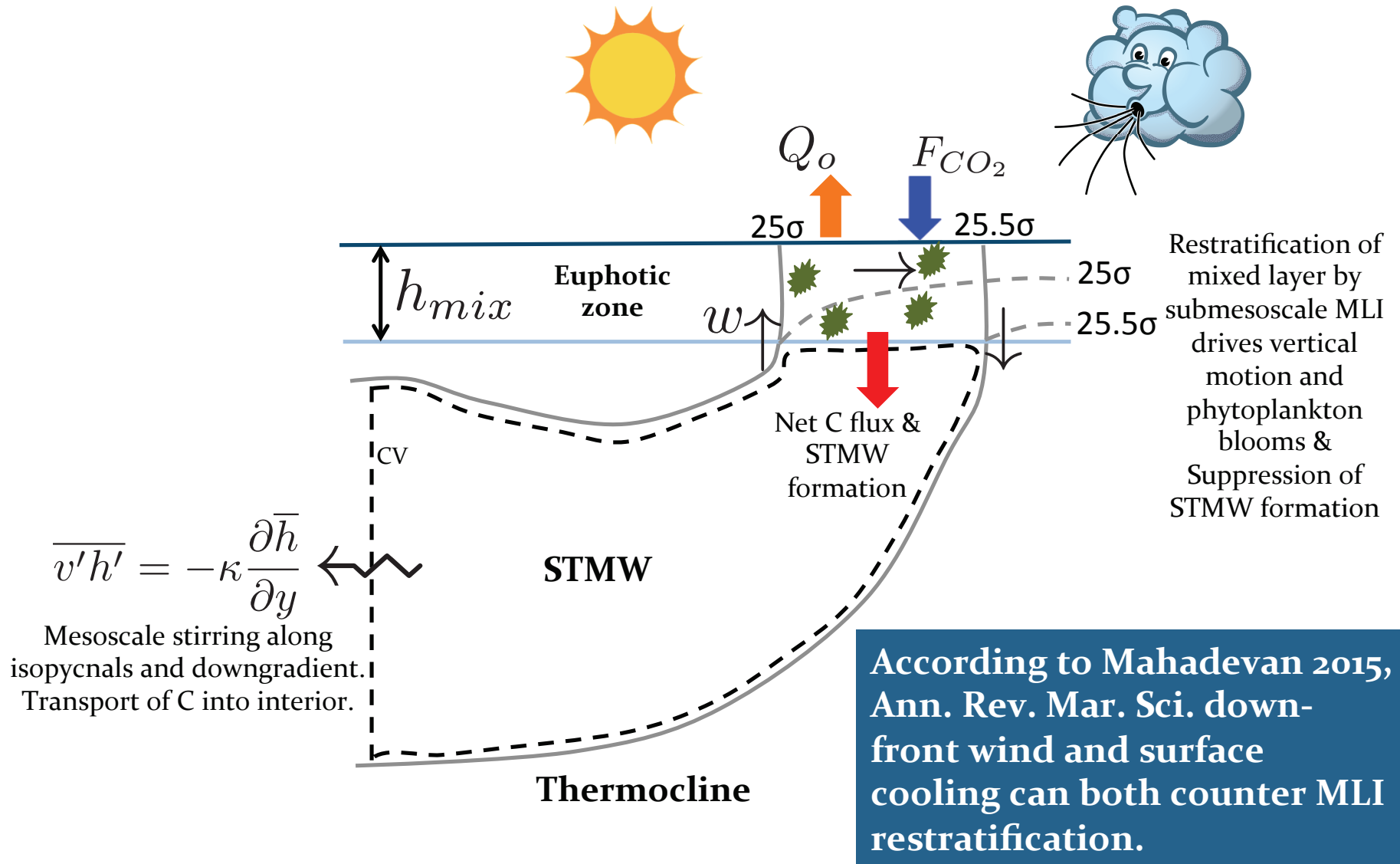
Bio-Physical Interactions: Eddies



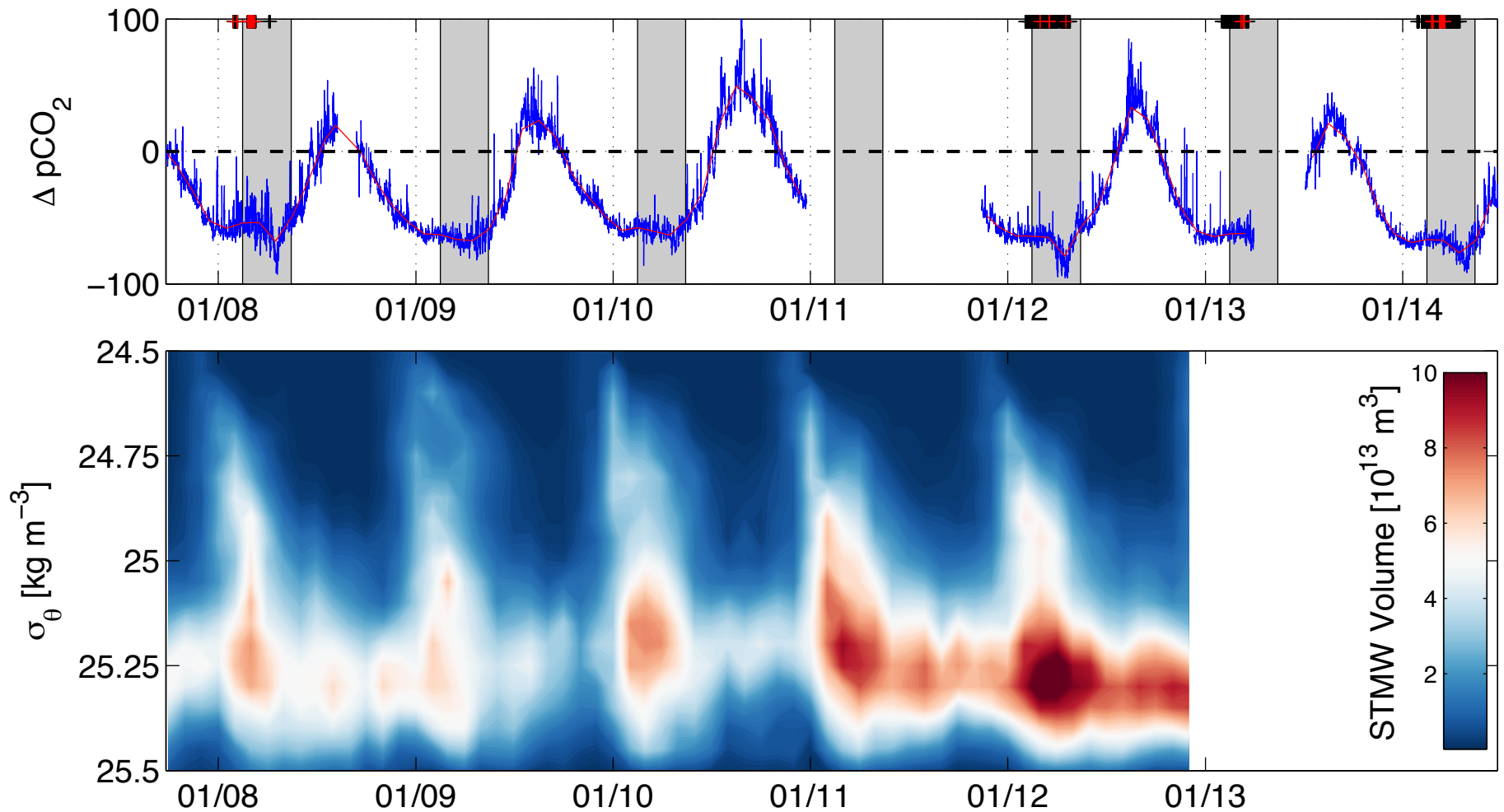
Bio-Physical Interactions: Mode Water



Bio-Physical Interactions: Mode Water



Bio-Physical Interactions: KEO-Mode Water



STMW volume data courtesy of Ivana Cerovecki from Cerovecki and Giglio (2016)

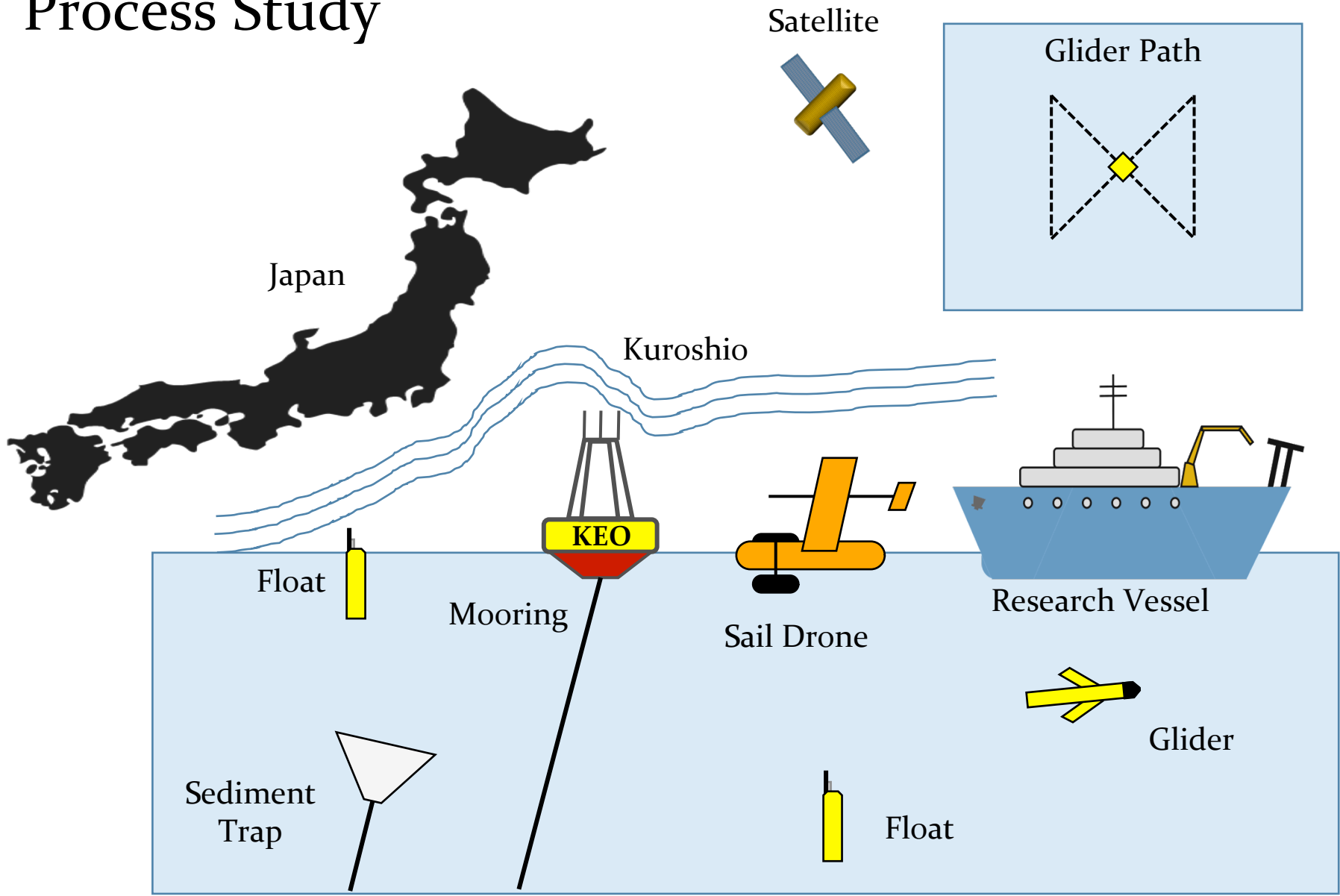
Community Feedback Wanted

1. Scientific Committee on Oceanic Research (SCOR) Working Group proposal under open review (<http://www.scor-int.org/>).
2. US CLIVAR Process Study and Model Improvement Panel endorsement to submit a proposal for a US CLIVAR Workgroup on biophysical interactions.

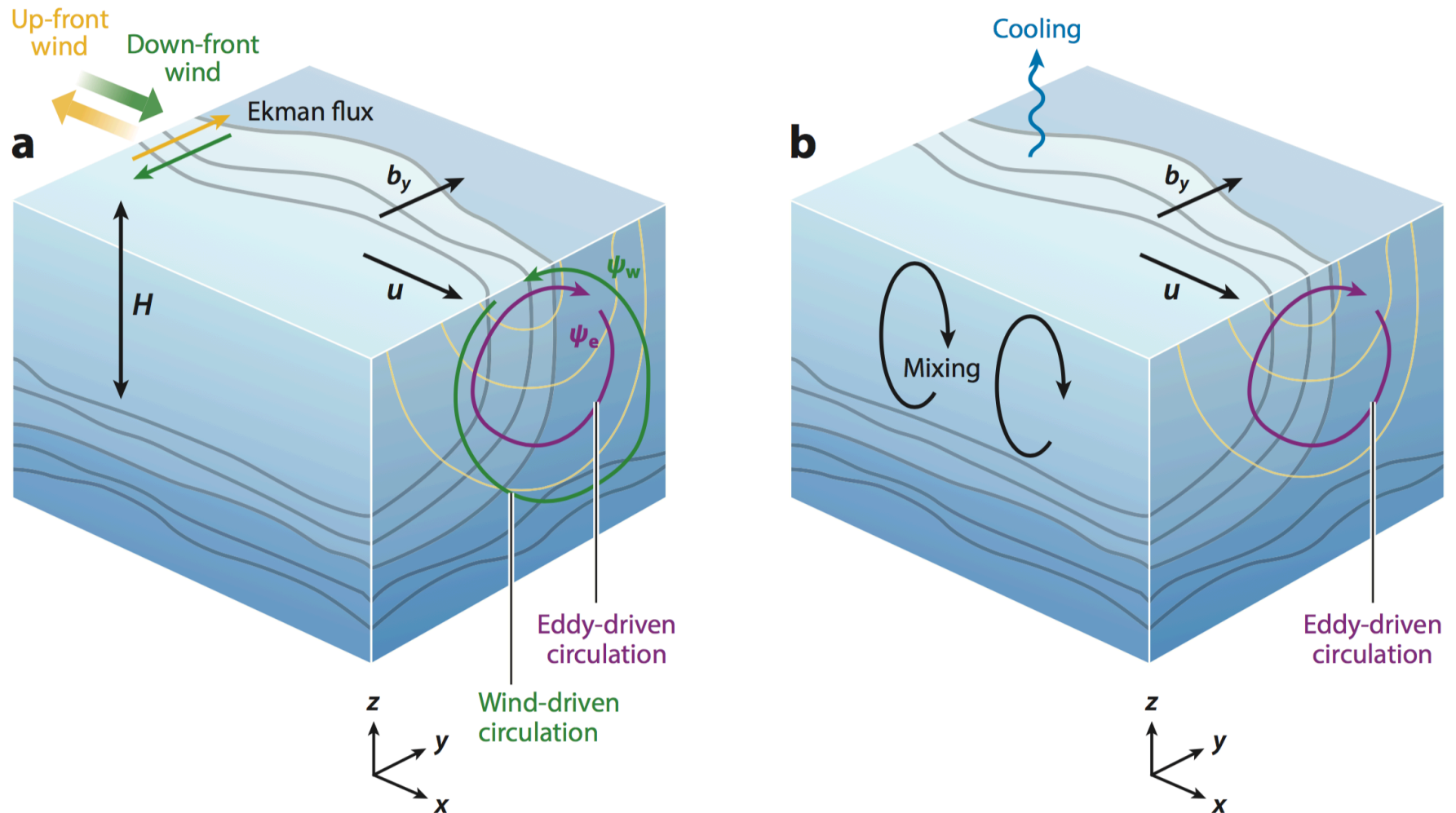


Carbon Hot Spot poster

Process Study



Wind & Cooling Counter MLI Restratification



KEO in Eddy-Rich Location

Eddy Kinetic Energy to Mean Kinetic Energy Ratio

