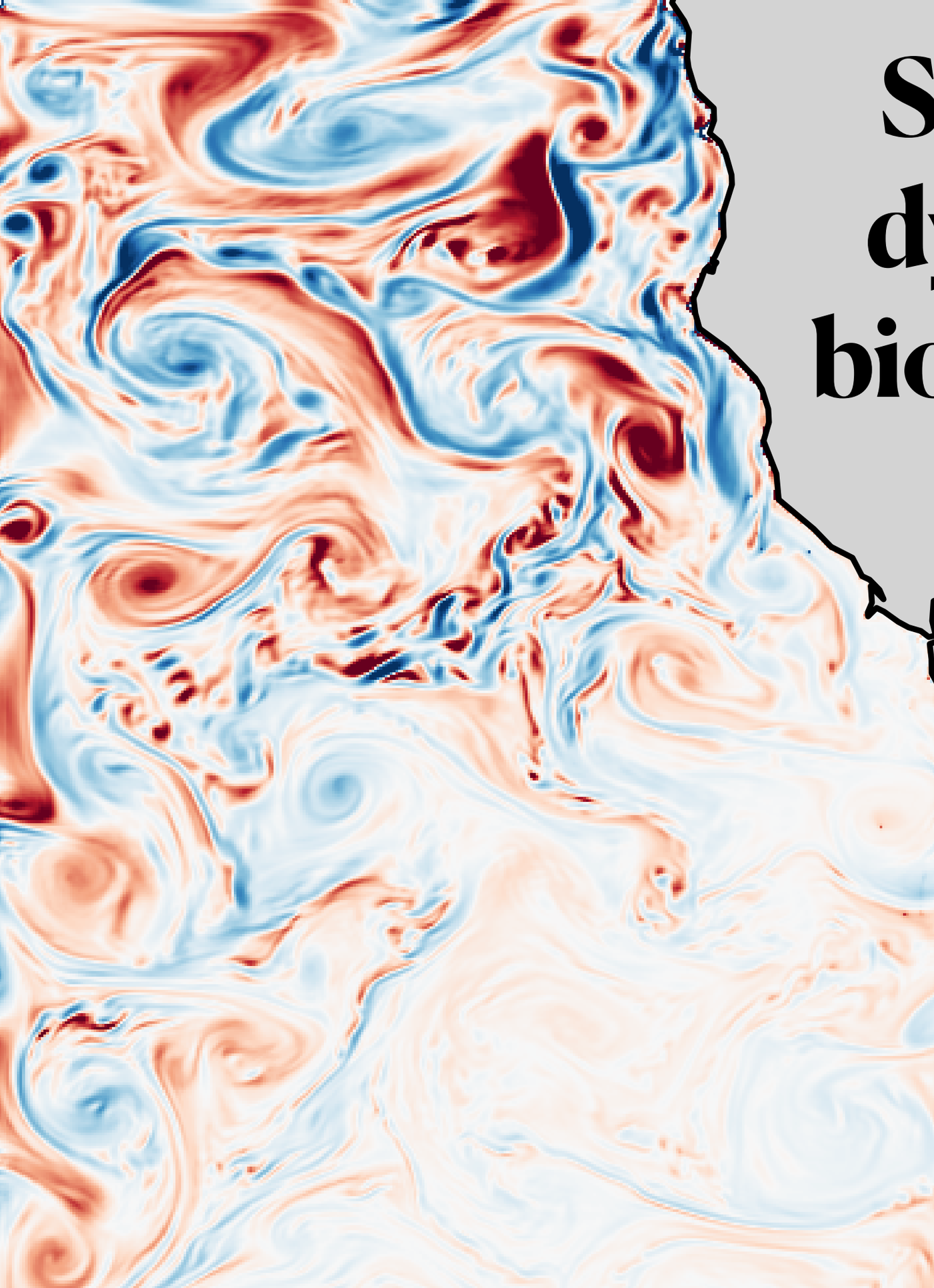


Submesoscale dynamics from biological tracers

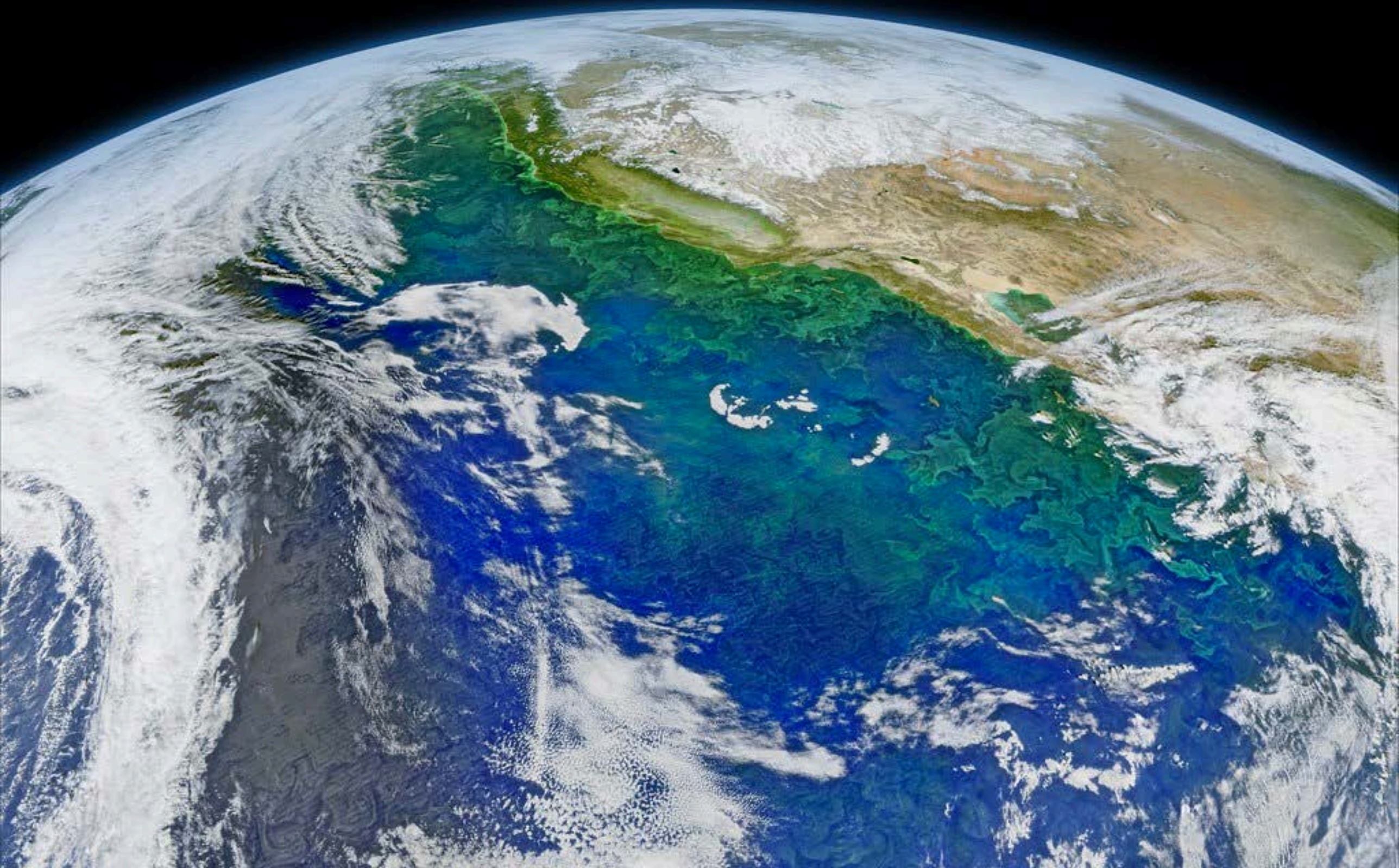
Mara Freilich
Luc Lenain,
Sarah Gille,
Matt Mazloff

Scripps Institution of Oceanography

8 February 2016

Suomi-NPP / VIIRS

Remote sensing of chlorophyll



8 February 2016

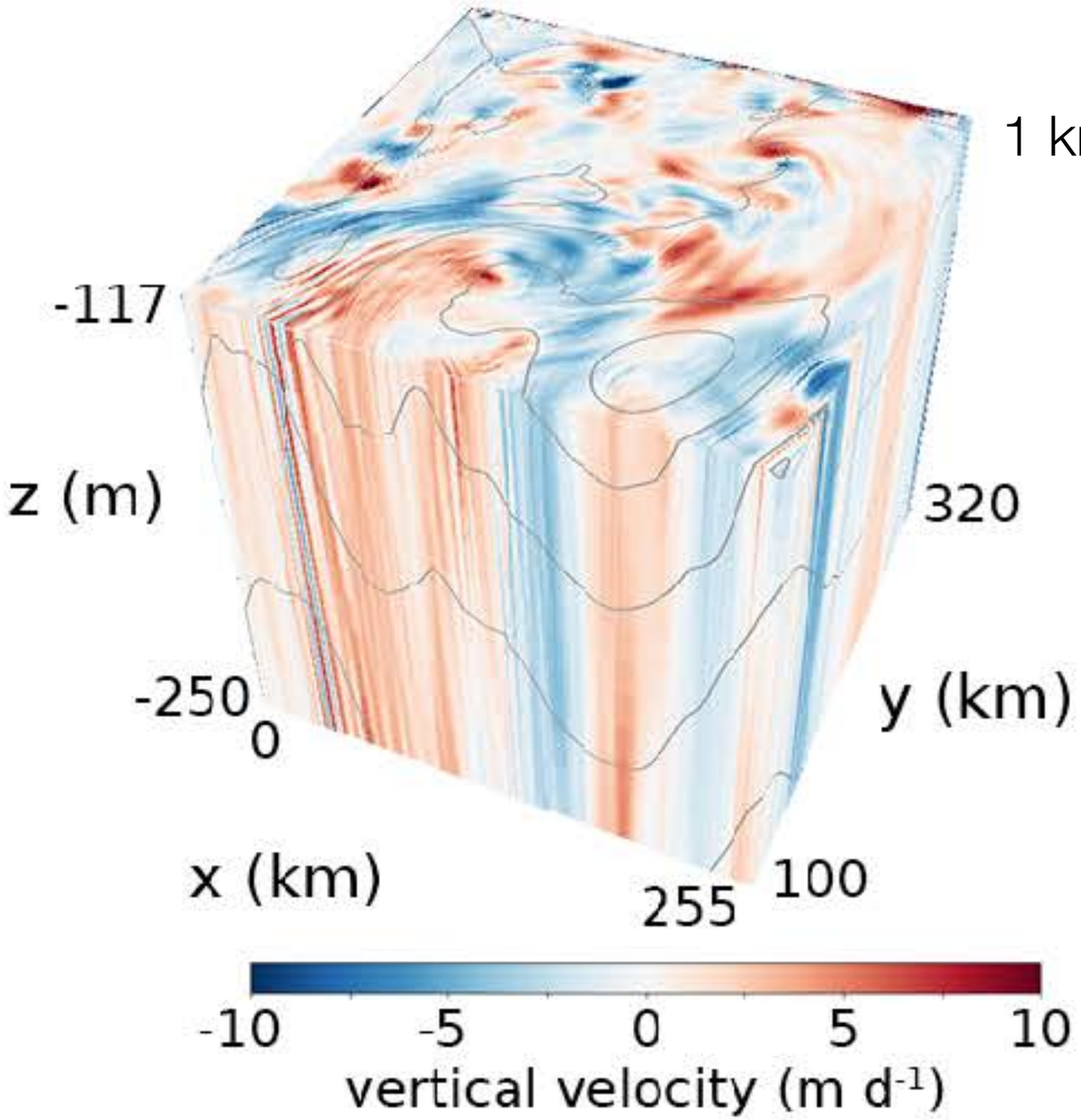
Suomi-NPP / VIIRS

Biological tracers

Can ocean color be used to supplement SWOT observations to infer physical dynamics?

Methods

Process study modeling and simple biological model



PSOM
1 km grid spacing

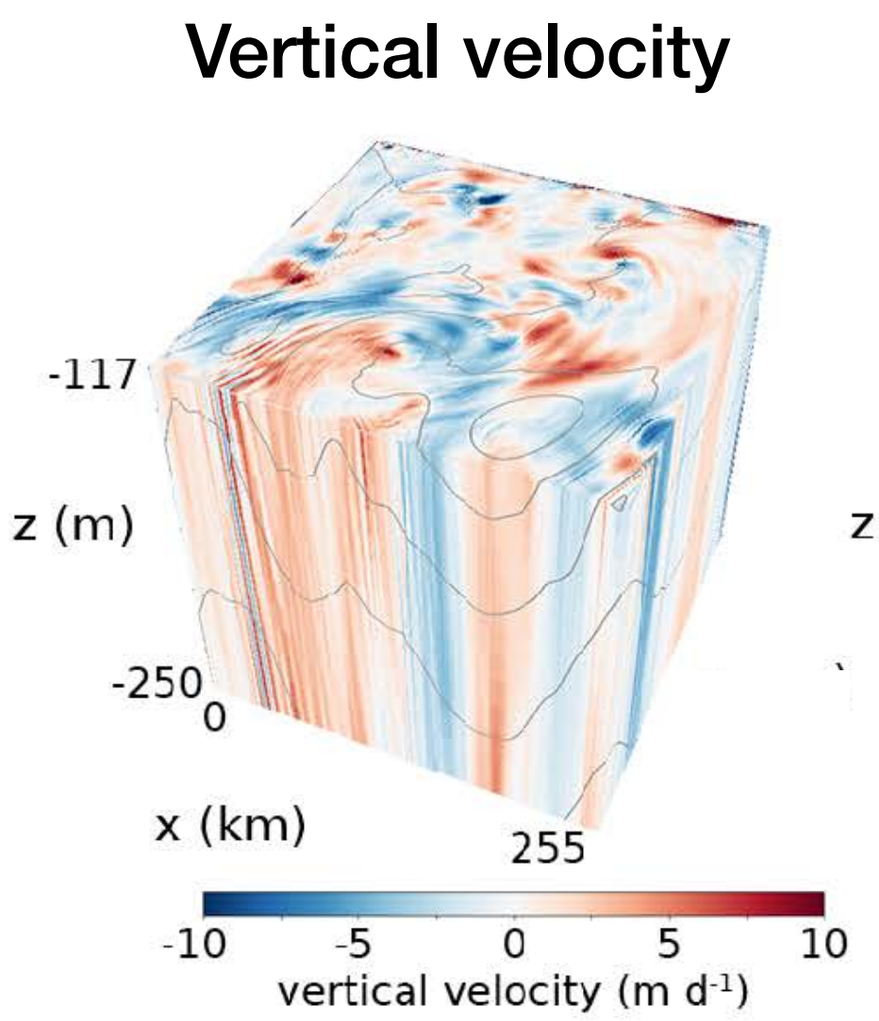
restoring biological model

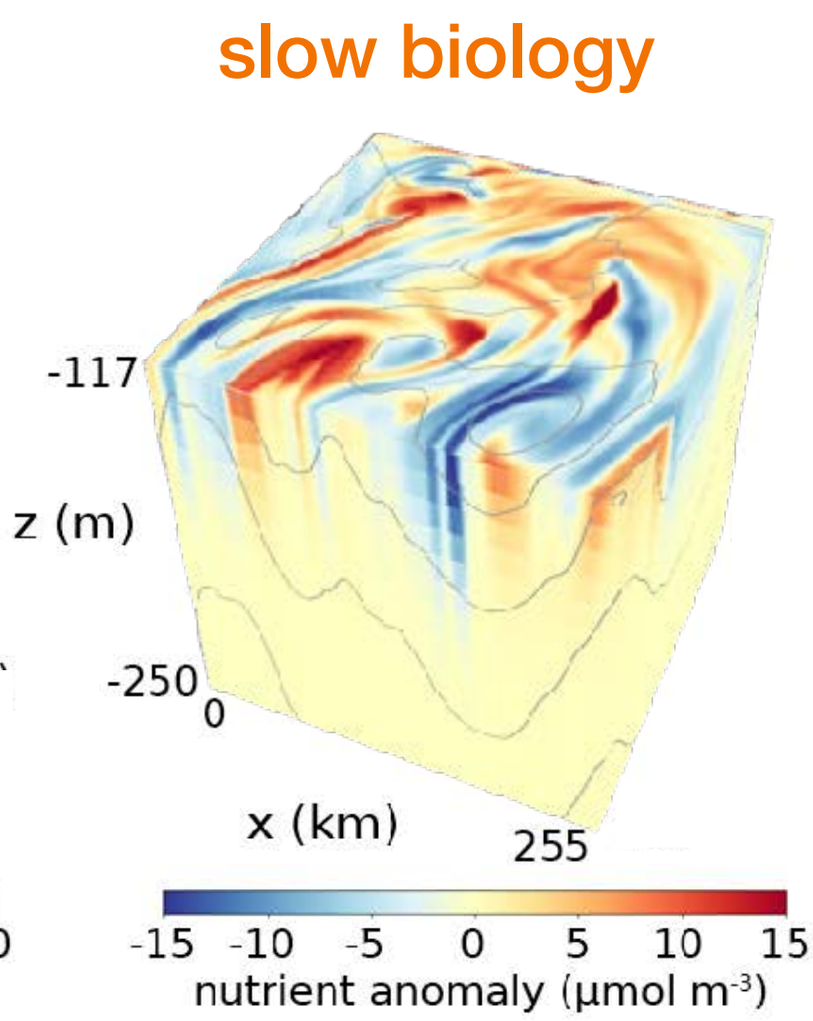
$$\frac{\partial N}{\partial t} + \vec{u} \cdot \nabla N = -\lambda(N - N_0)$$

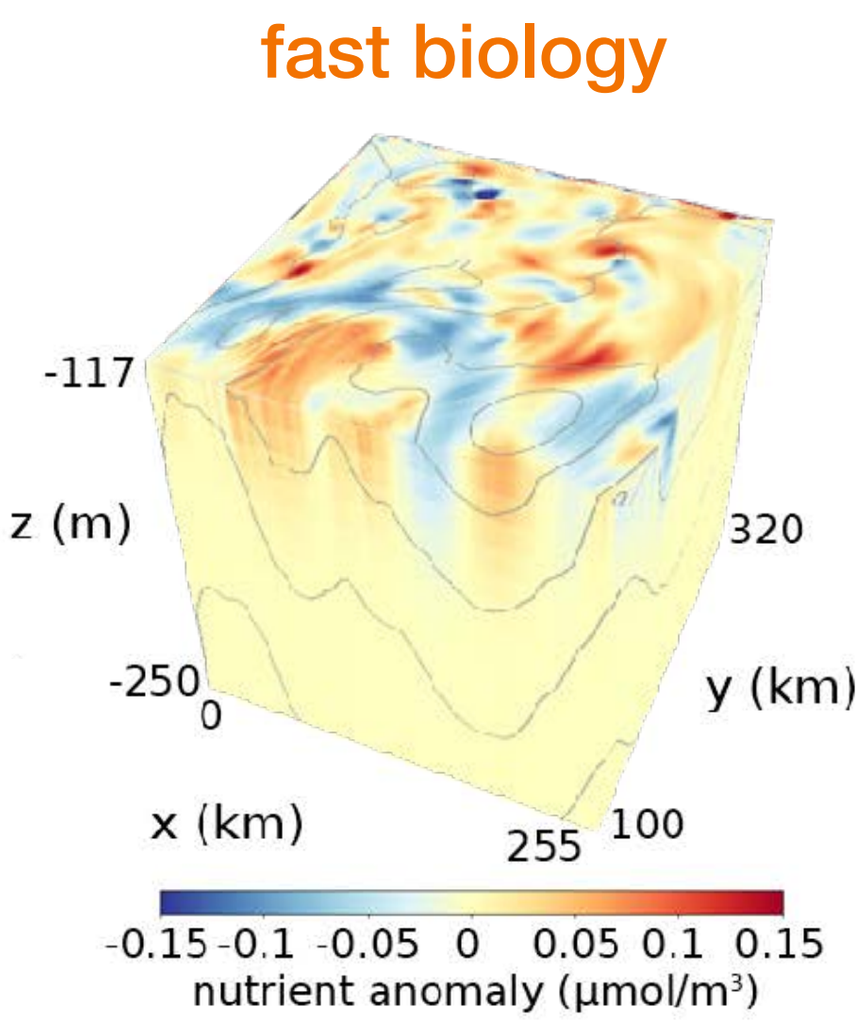
biological rate

Freilich, Flierl, & Mahadevan (2022), *Geophysical Research Letters*

Time scale dependence

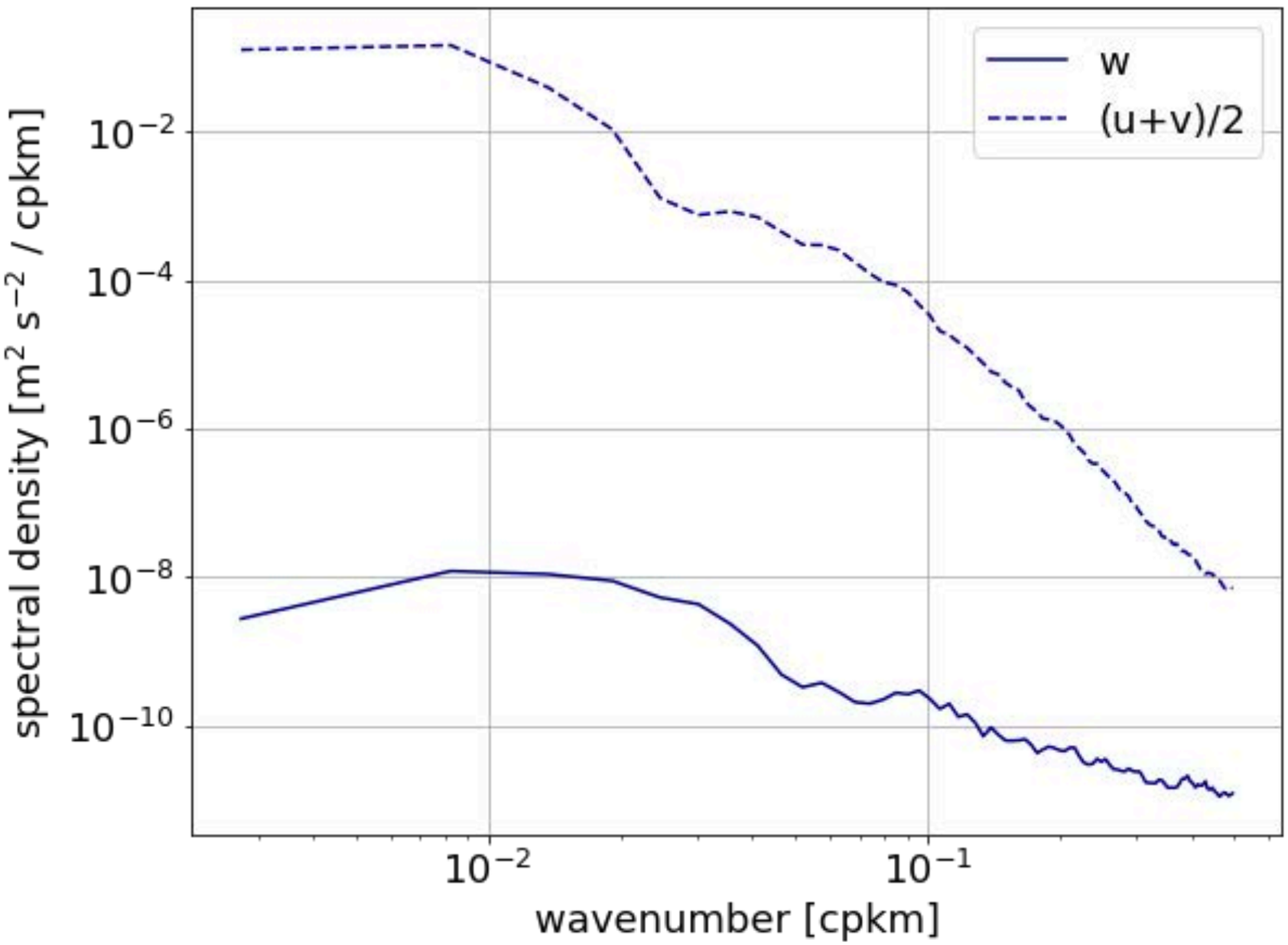




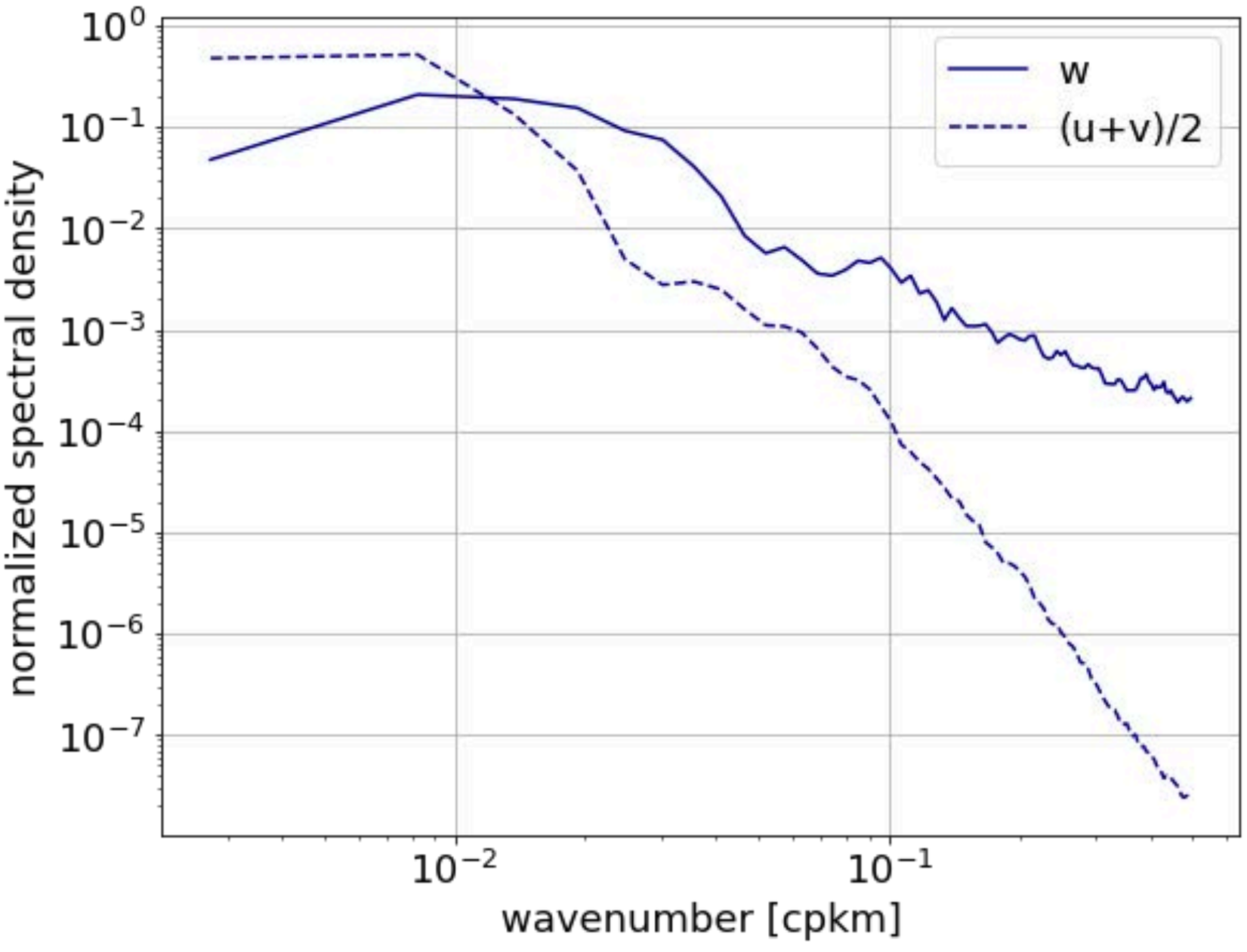


Freilich, M.A., Flierl, G., Mahadevan, A. (2022). Diversity of growth rates maximizes phytoplankton productivity in an eddying ocean, *Geophysical Research Letters*, e2021GL096180.

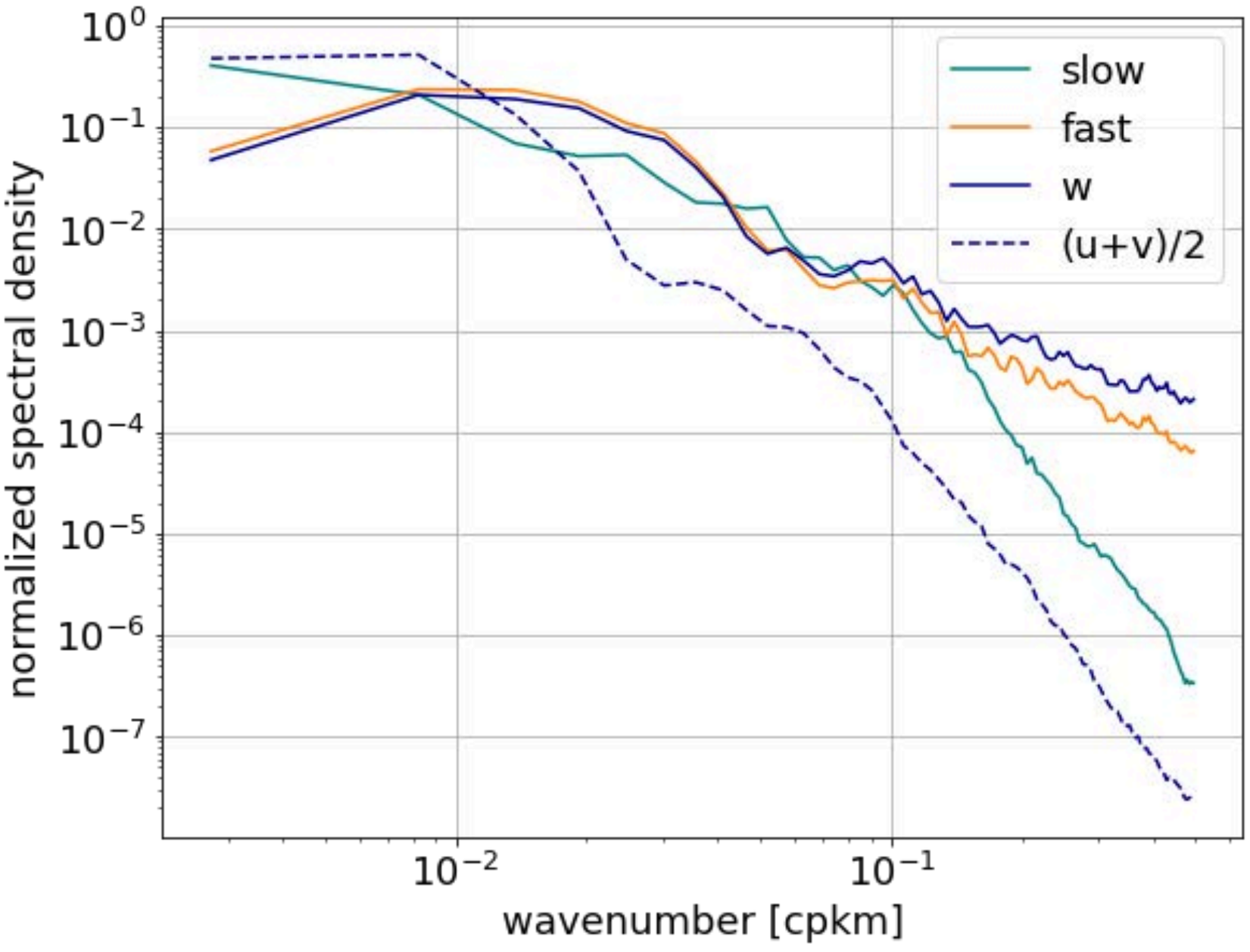
Kinetic energy spectrum



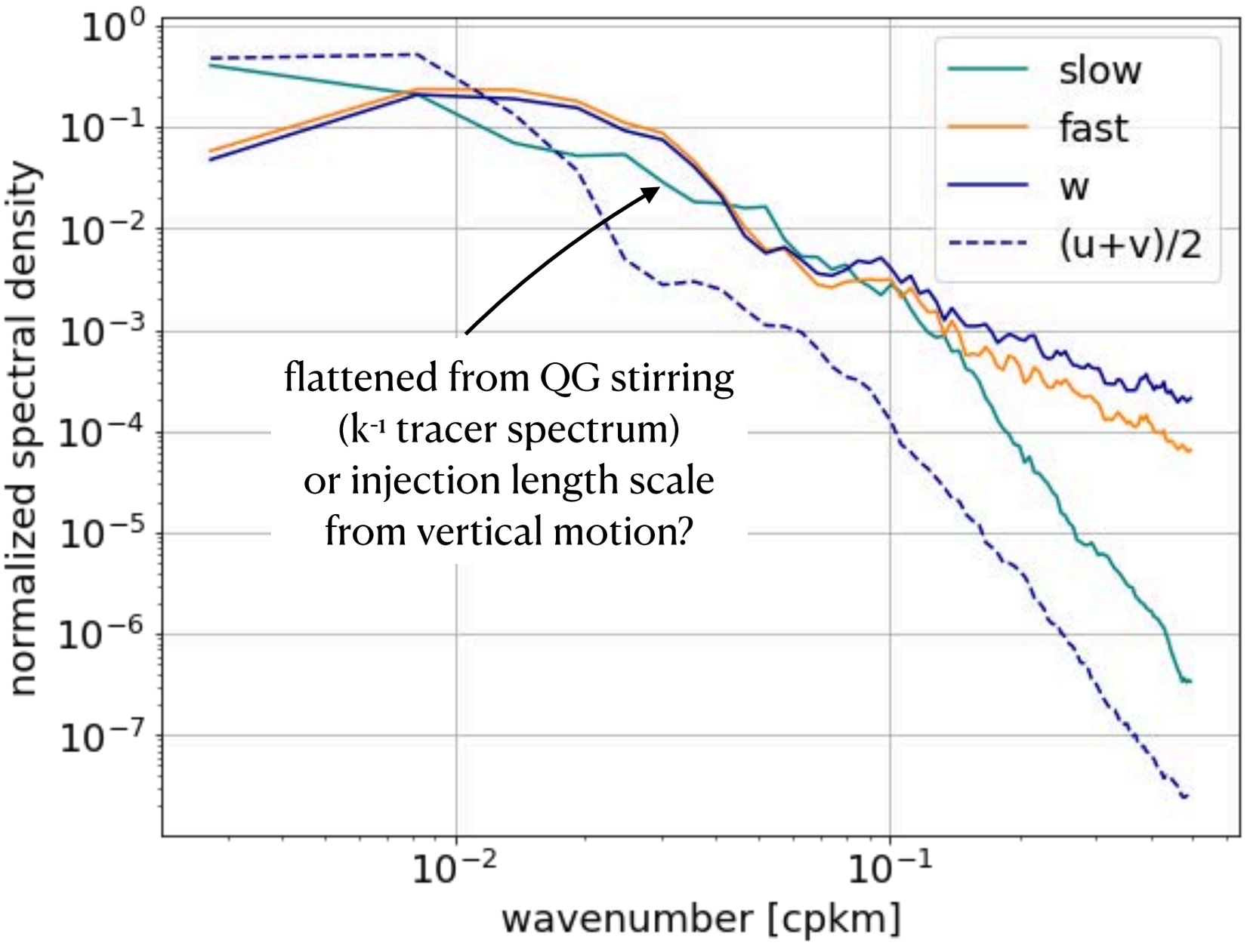
Tracer spectrum



Tracer spectrum

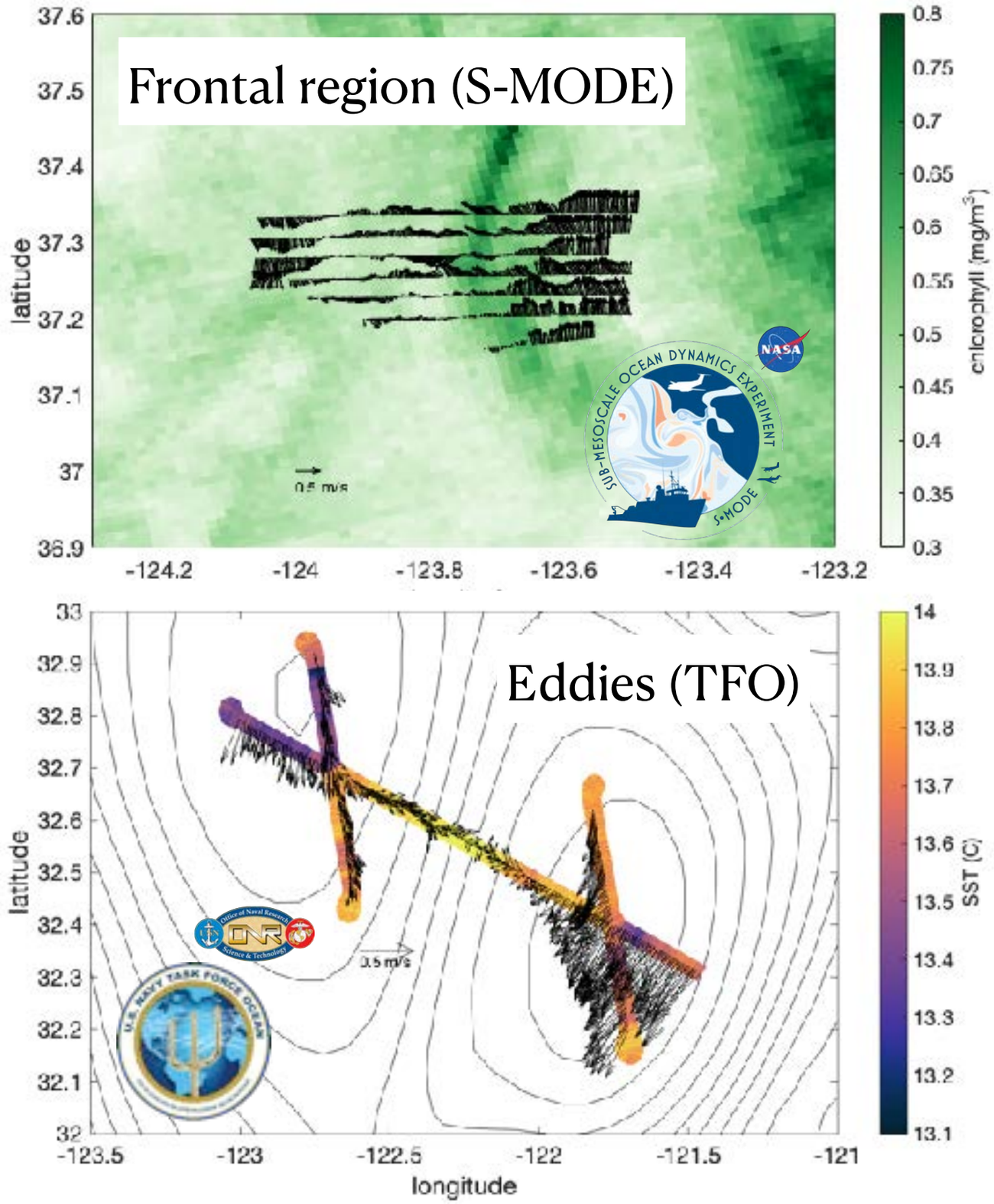


Tracer spectrum



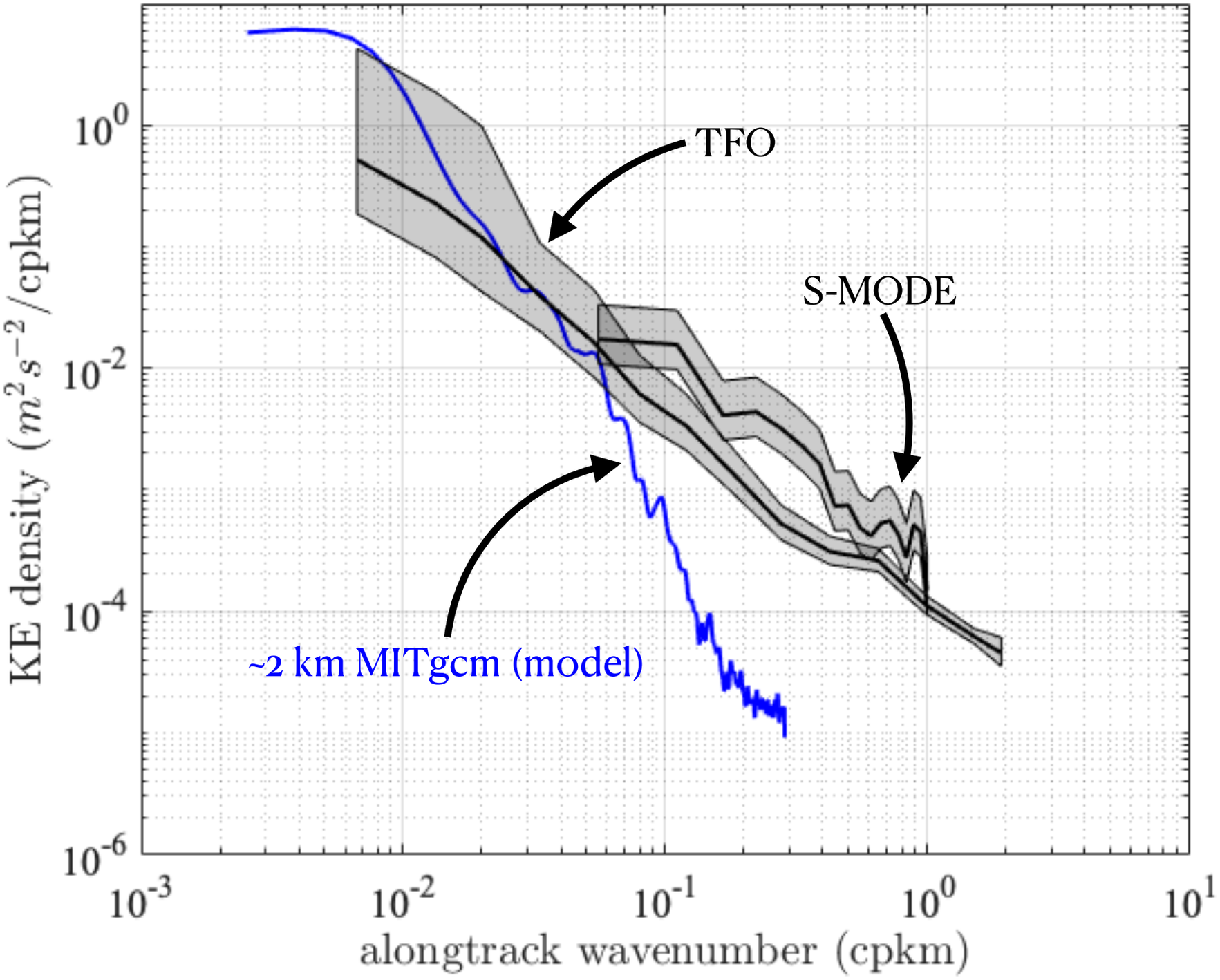
Submesoscale observations (SIO-MASS)

DoppVis	Surface currents, vertical shear, wave breaking statistics
Hyperspectral Camera Specim (EagleAISA)	Ocean surface and biogeochemical processes
GPS/IMU (Novatel SPAN-LN200)	Georeferencing, trajectory
Scanning Waveform (Lidar Riegl Q680i)	Surface wave, surface slope, directional wave spectra
Long-wave IR Camera (FLIR SC6000 (QWIP))	Ocean surface processes, wave kinematics and breaking, frontal processes
High-Resolution Video (JaiPulnix AB-800CL)	



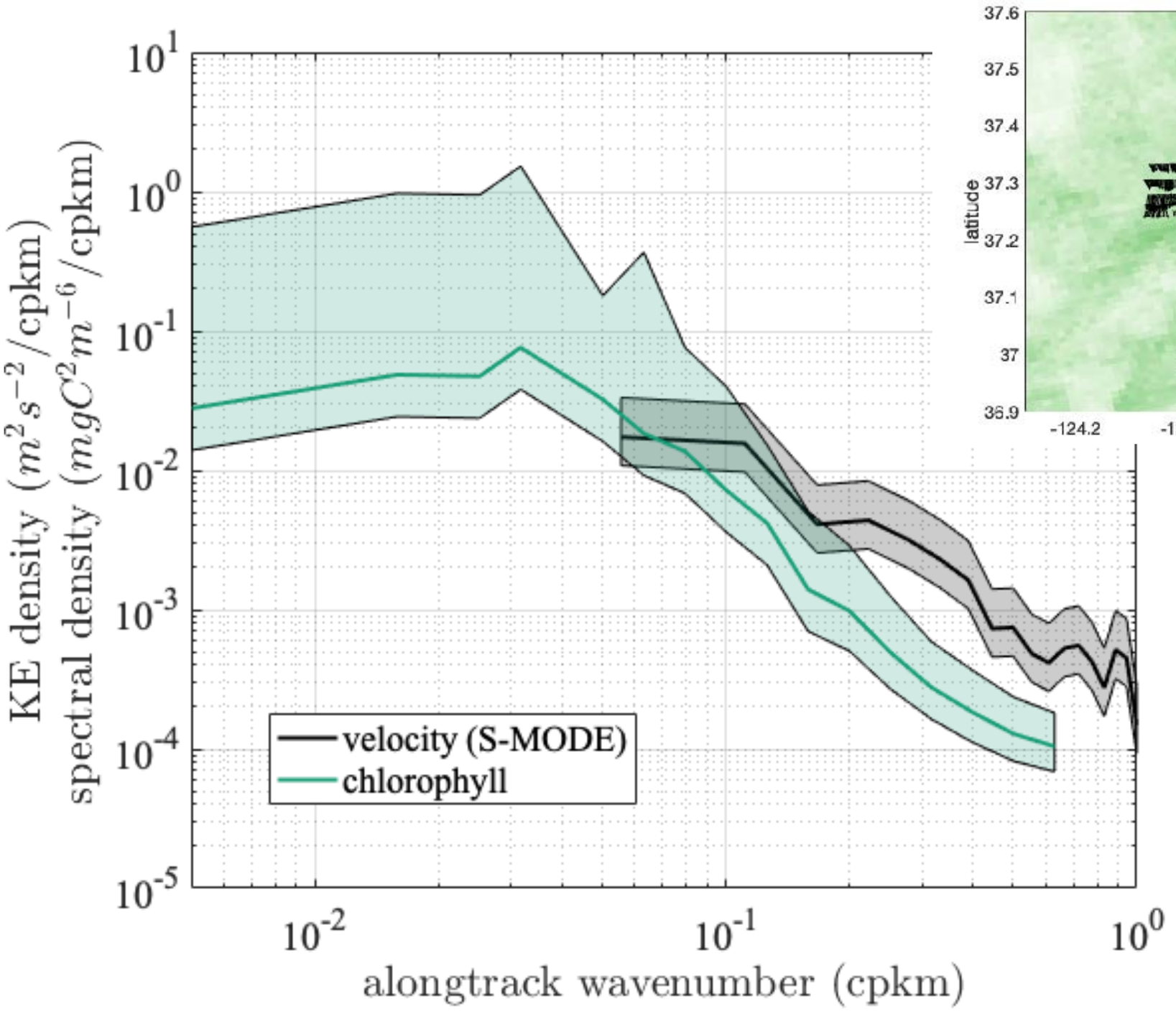
Kinetic energy spectrum

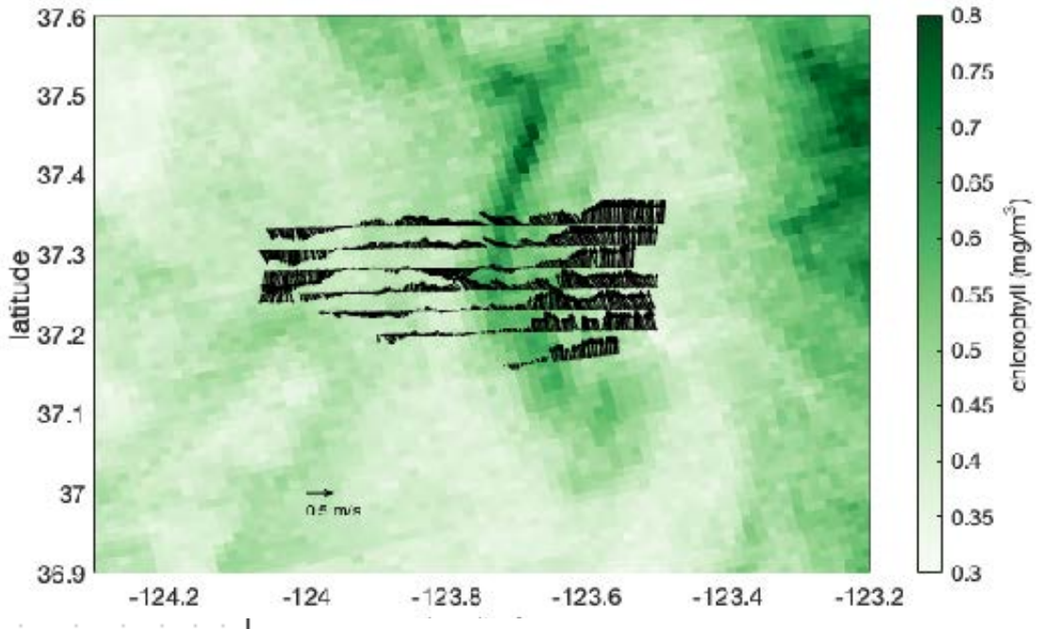
continuity of dynamics to small spatial scales



Tracer spectrum

influence of frontal dynamics





Conclusions

- Small scale processes structure velocity and biological communities.
    - Ocean color observations may aid interpretation of dynamics from SWOT.
- The dominant dynamics that influence biological tracers are mediated by the rates of biological processes.
- Kinetic energy spectrum is continuous to 500 meter spatial scales in the California Current system.