Southern Ocean tidally driven mixing: Tracking lateral energy transport via SWOT

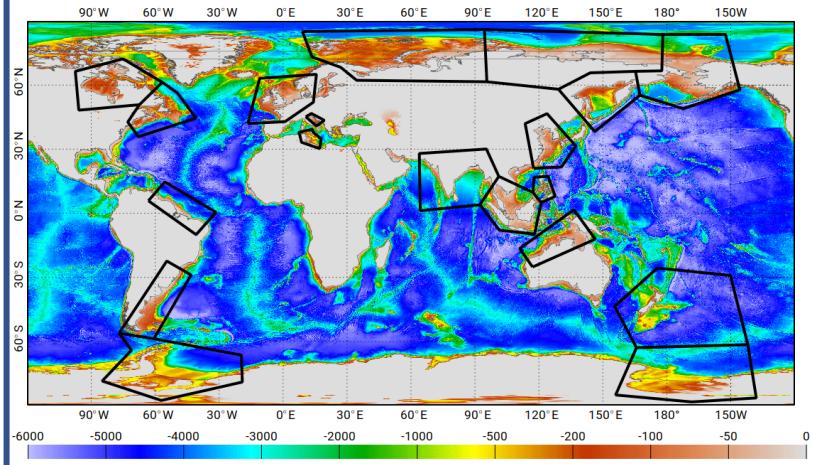
2022 SWOT Science Team Meeting

Youran Li, Matthew Mazloff, Sarah Gille

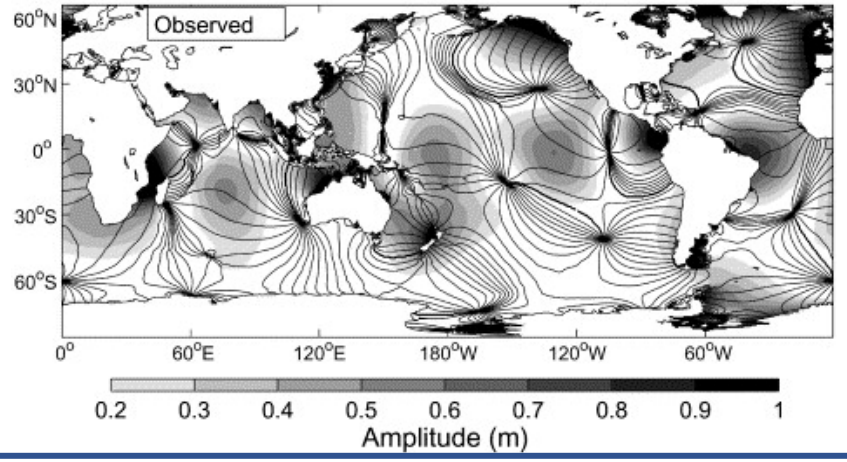
Scripps Institution of Oceanography, UCSD

- The Southern Ocean receives huge inputs of wind and tidal power

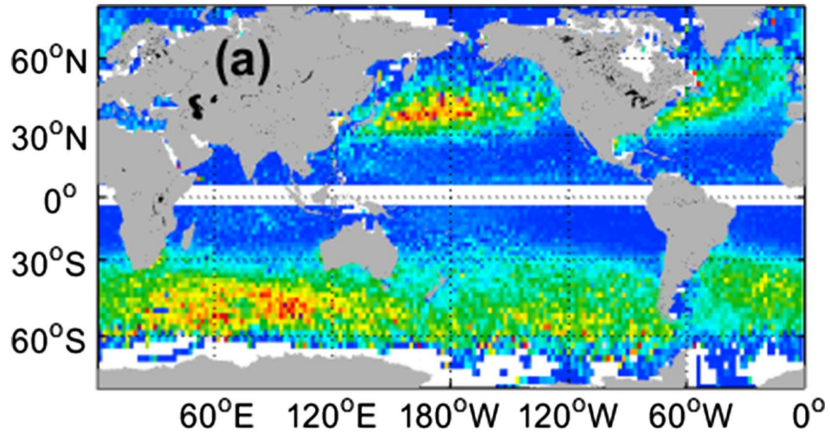
(a) Global bathymetry



(b) Observed global M2 barotropic tide

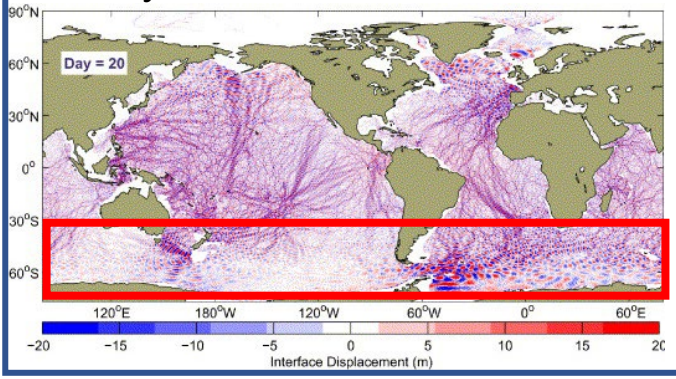


(c) Observed wind power into global oceanic near inertial oscillations



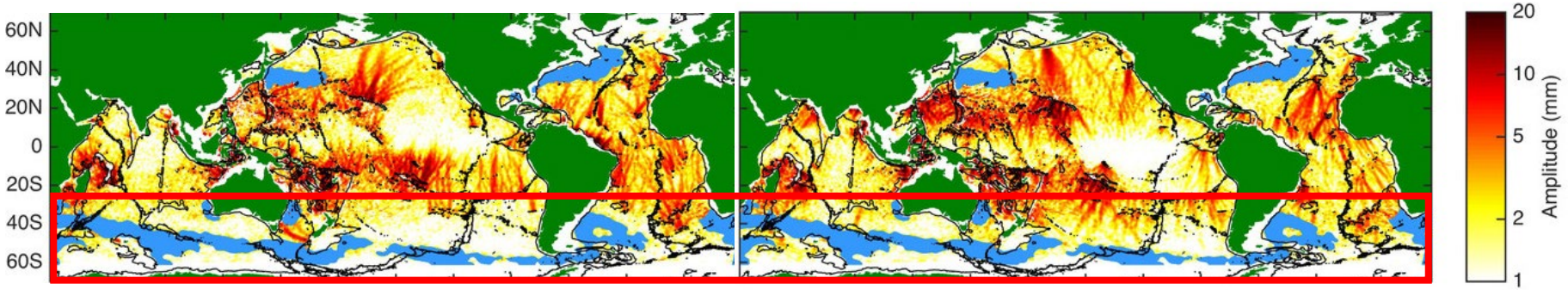
- Mapping internal waves(tides) in the energetic Southern Ocean has been problematic

(a) Interface displacement of a two-layer M2 internal tide model



(b1) Northbound component of satellite-inferred M2 internal tide

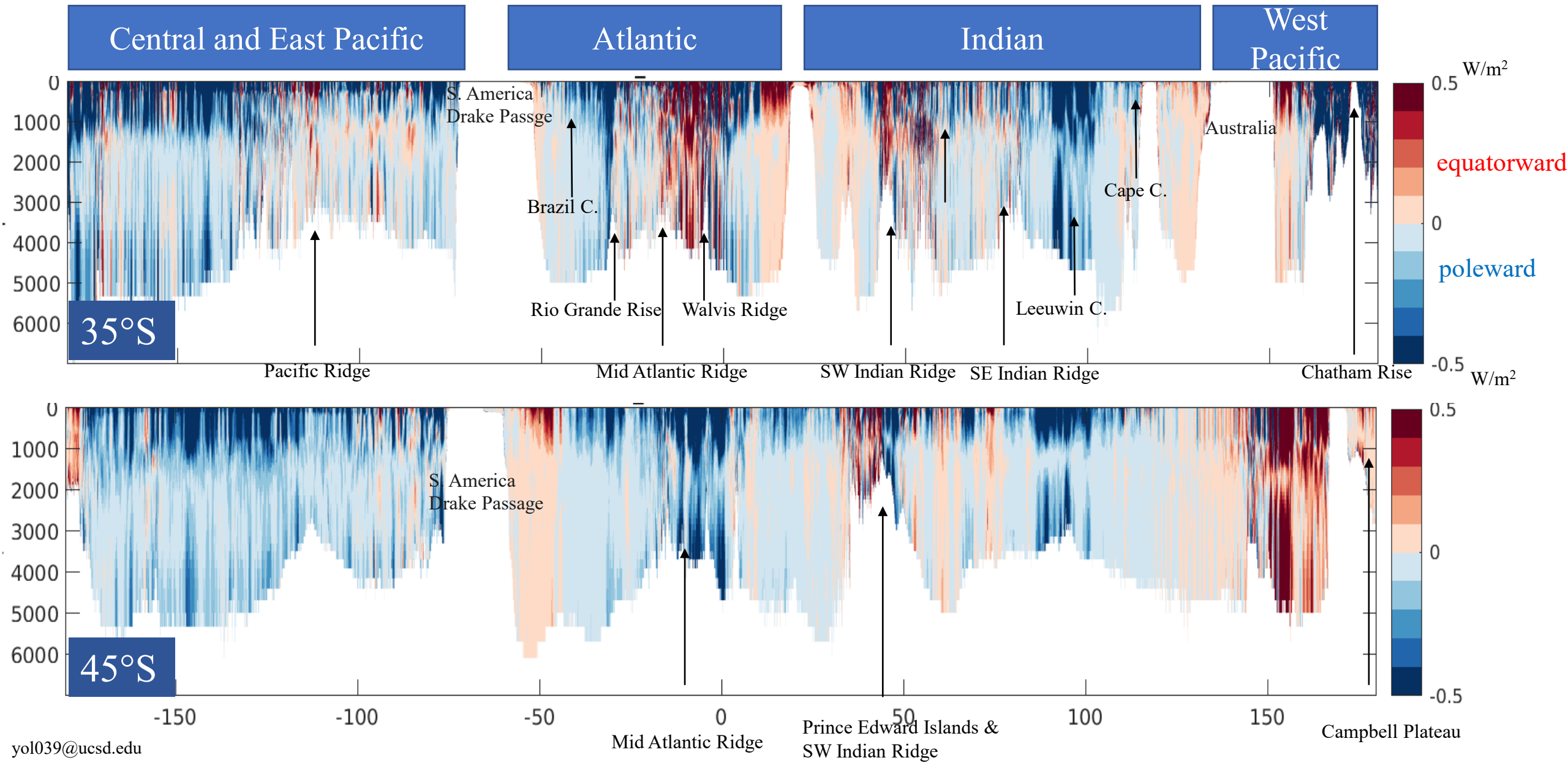
(b2) Southbound component of satellite-inferred M2 internal tide



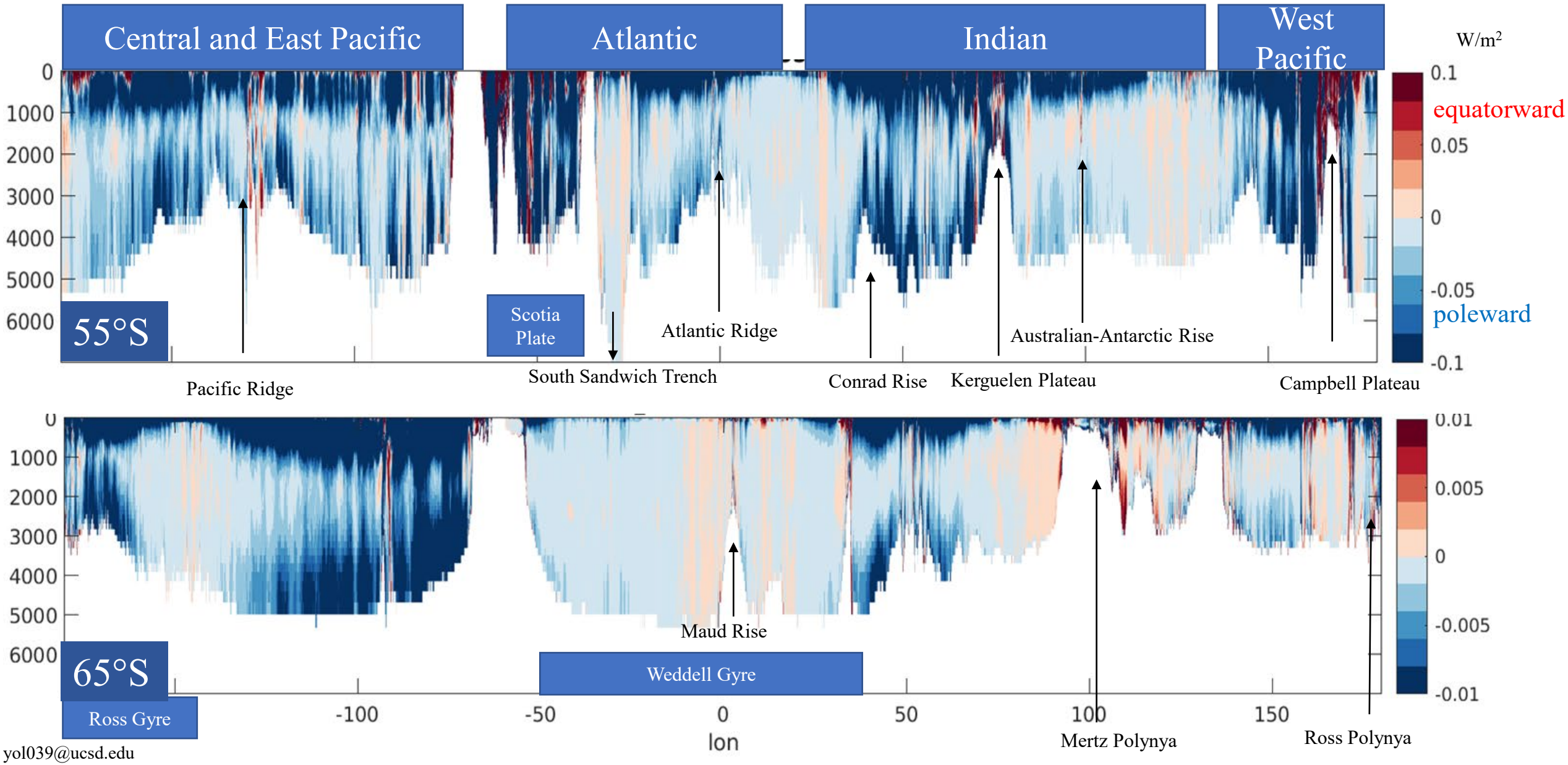
yol039@ucsd.edu

Fig 8, Lyard et al.,2021; fig 5 and fig 8, Simmons et al.,2004; fig 2, Liu et al., 2019; fig 5, Zhao et al., 2016

Background | **MITgcm Preliminary results** | SWOT Proposals

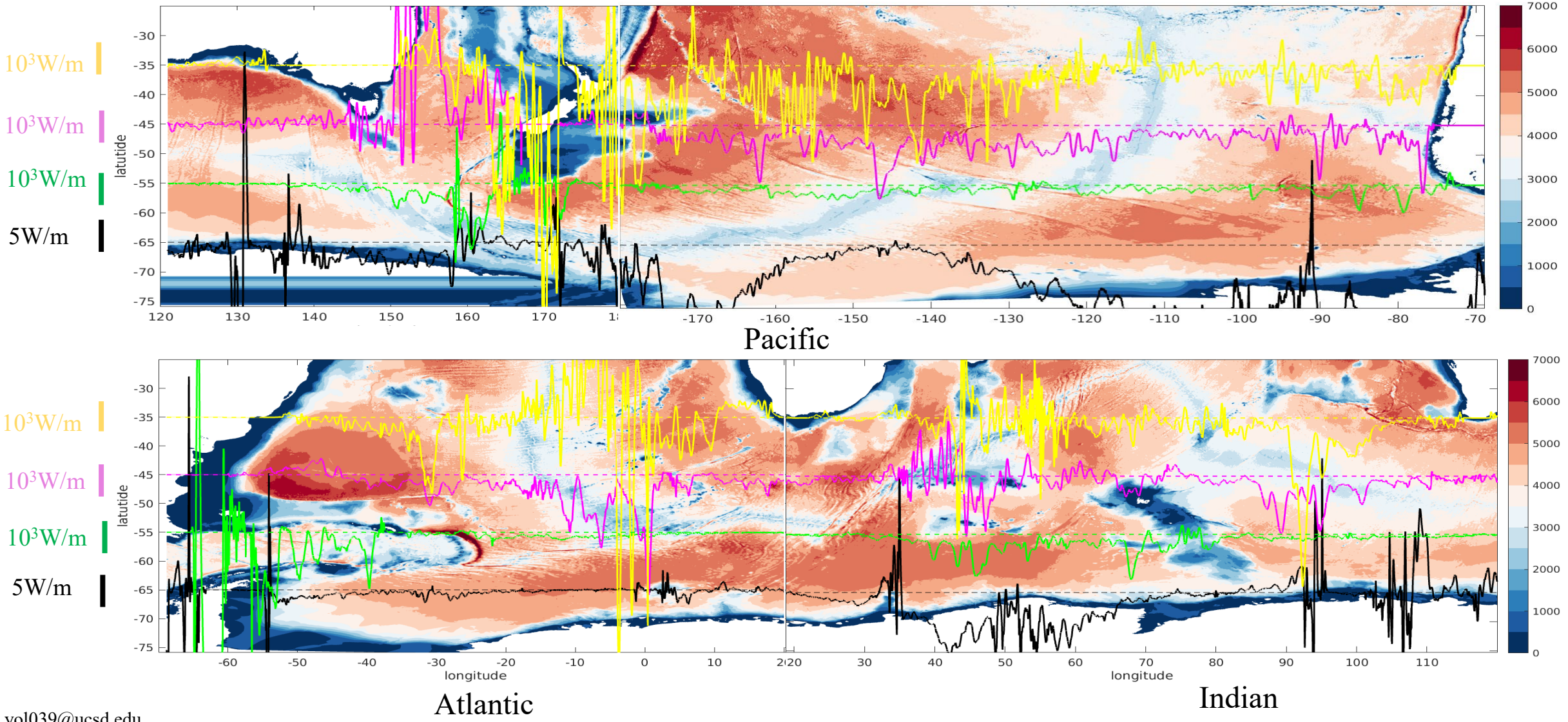


yol039@ucsd.edu



yol039@ucsd.edu

Time-mean depth-integrated internal wave energy flux(W/m)



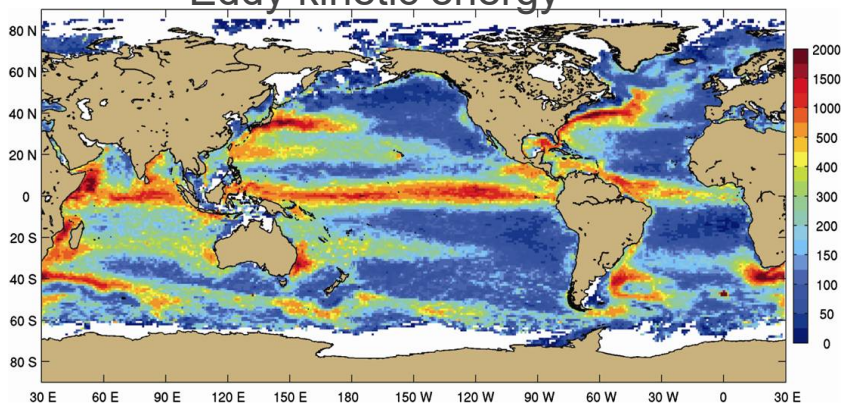
yol039@ucsd.edu

GOAL: Track low modes internal tides in the Southern Ocean via SWOT

Challenges

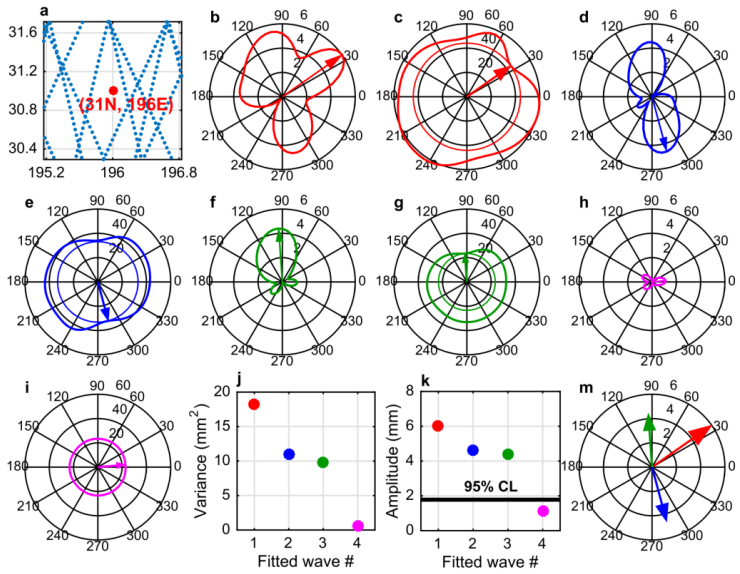
- Contamination of mesoscale and submesoscale motions
- infrequent temporal sampling and associated aliasing
- Narrow SWOT swath (~120km), in comparison with mode 1 IT λ ~160km, mode 2, λ ~80 km

Eddy kinetic energy



Recipes

- A plane-wave fitting method developed by Dr. Zhao to extract coherent low-mode internal tides and their propagation direction, phase, energy flux, interference patterns.
- modified with the help from Dr. Mazloff and Cornuelle to speed it up.



yol039@ucsd.edu

NOAA AOML PHOD (2009); Savage et al., 2017; Morrow et al., 2019; Zhao et al.,2016