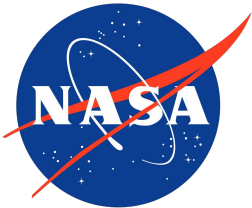


Phase Accuracy of Baroclinic Tides in the **Hybrid Coordinate Ocean Model**

Arin Nelson, Brian Arbic, Jay Shriver, Edward Zaron, Richard Ray, Maarten Buijsman



Introduction:

- HYCOM: Operational ocean model used by the US Navy for hind/now/forecasts
- HYCOM runs at a resolution that can resolve internal waves generated by tides (internal tides)
 - In sync with barotropic tides: “coherent” or “stationary”
 - When refracted by changes in stratification (eddies, etc.): “incoherent” or “nonstationary”
- For altimetry, want tides, including internal tides, separated from other signals
- Does HYCOM resolve internal tides well enough to aid in this endeavor?

Previous work:

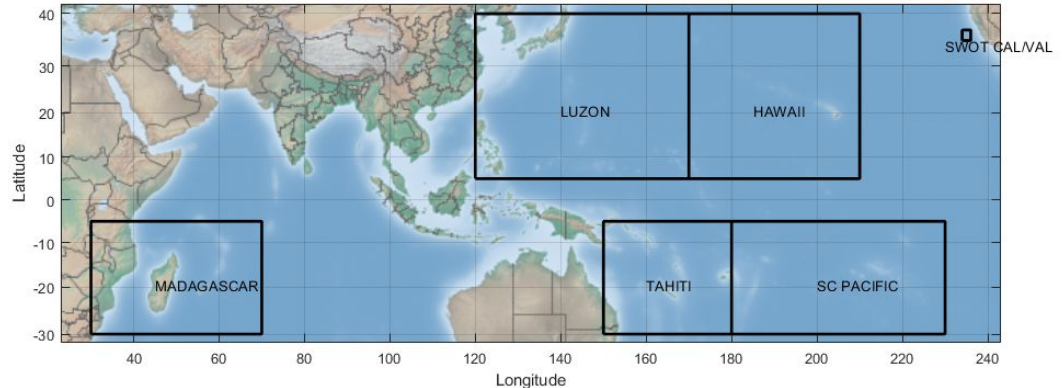
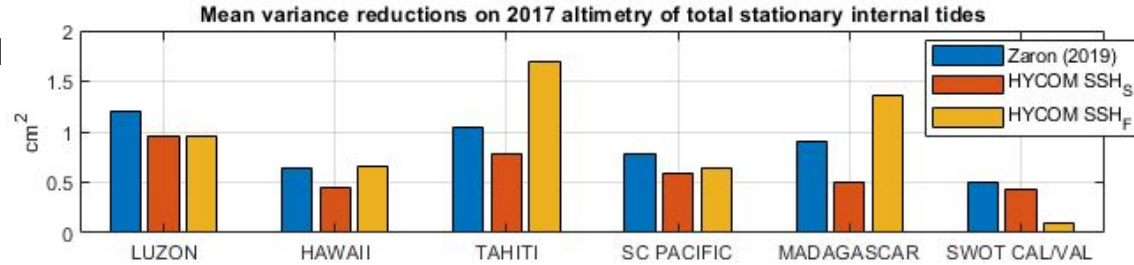
- Stationary & nonstationary internal tidal amplitudes in HYCOM approaching results from altimetry
 - e.g. Nelson et al. 2019
- Stationary internal tides in free-running HYCOM can reduce internal tidal variance in altimetry
 - e.g. Loren et al. 2020

Current questions:

- Can stationary internal tides in data-assimilating HYCOM reduce more tidal variance?
- Does data-assimilating HYCOM have any skill with nonstationary internal tides?
- Is HYCOM a viable tool for reducing internal tidal signals in SWOT, other altimetric missions?

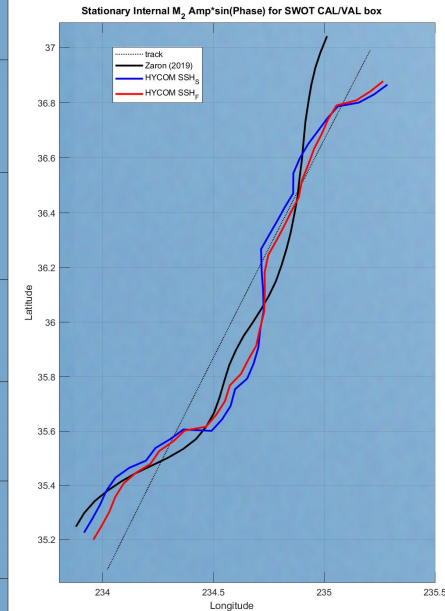
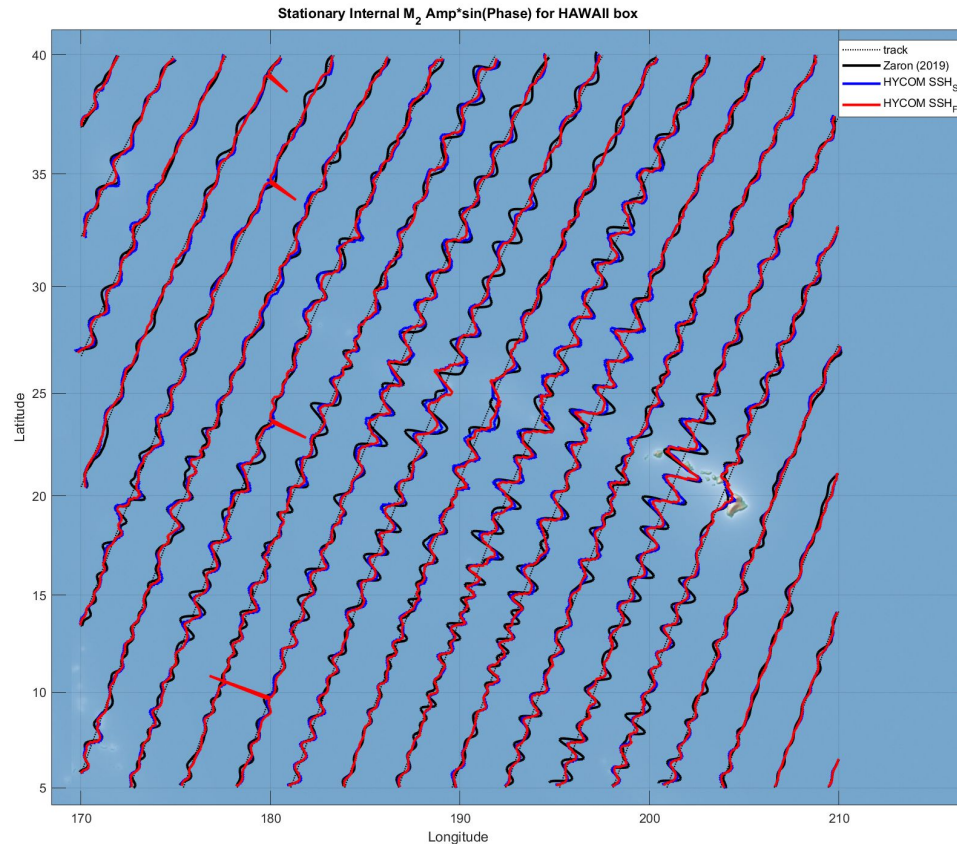
Preliminary Results for stationary tides:

- Subtracted tides from altimetry-based model (Zaron 2019), HYCOM steric ssh (SSH_S), and 2D-filtered total ssh (SSH_F).
- Using constituents M_2 , S_2 , K_1 , O_1
- SSH_S does fairly well in regions with strong internal tides
- SSH_F reduces more variance, but perhaps too much... (still contains some non-tidal signal?)



Preliminary results for stationary tides:

- Can compare tides along altimetry tracks using “wiggle plots”
- SWOT CAL/VAL region might be too small to get statistically significant results...



What's next:

- Include nonstationary tides using temporal bandpassing
 - See talk by Ritabrata Thakur using a more advanced method
- Analyze variance reduction in along-track wavenumber spectra
- Include more years of data and compute results for individual tidal constituents

Thank you for your time!