Seasonality of the mesoscale sea surface variability from the multi-year satellite altimetry

Yao Yu[1*], David T. Sandwell[1], Sarah T. Gille[1]

1. Scripps Institution of Oceanography, University of California San Diego, La Jolla, 92037
* yayu@ucsd.edu

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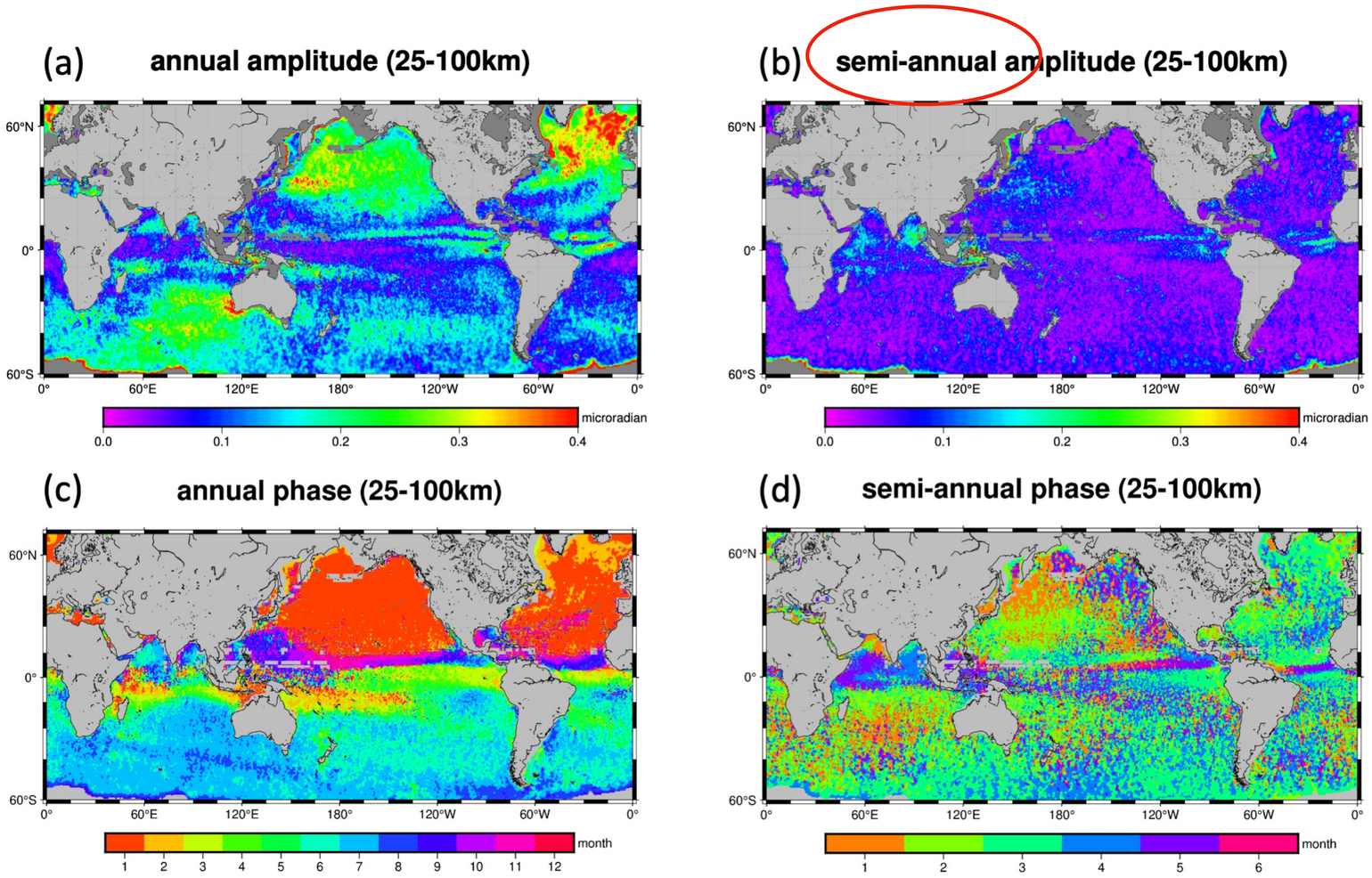
Seasonality of sea surface slope in the 25-100 km wavelength band

Altimeters: Geosat, Jason1/2, Envisat, Cryosat2, SARAL/Altika, Sentinel-3

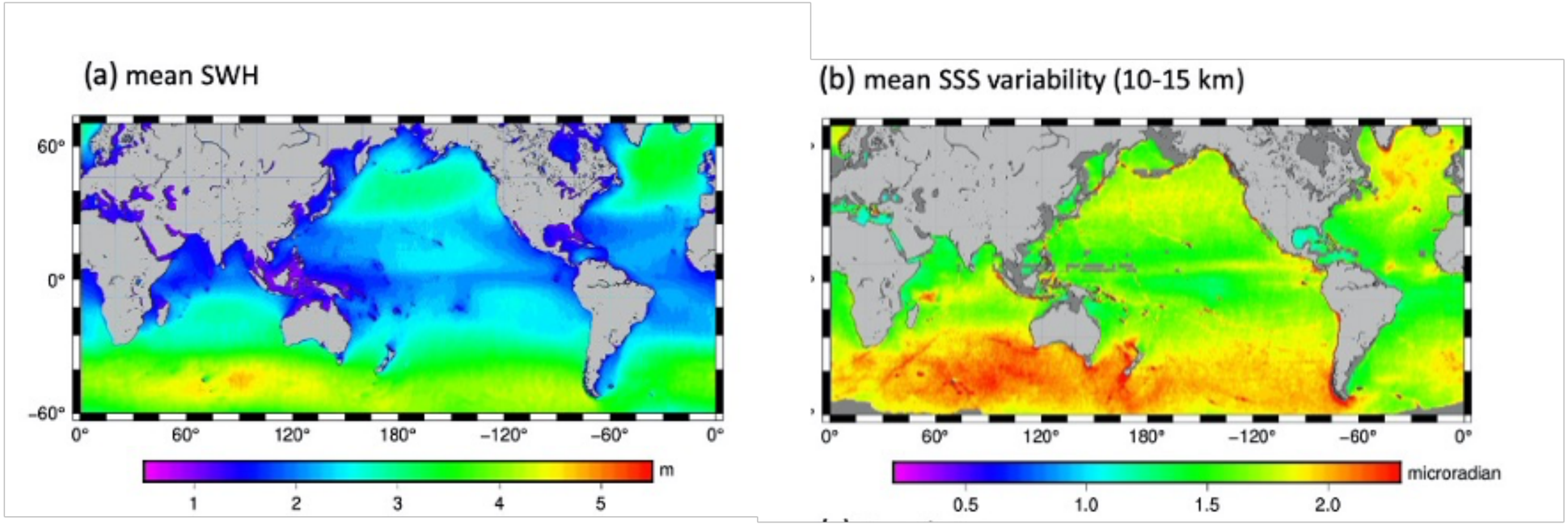


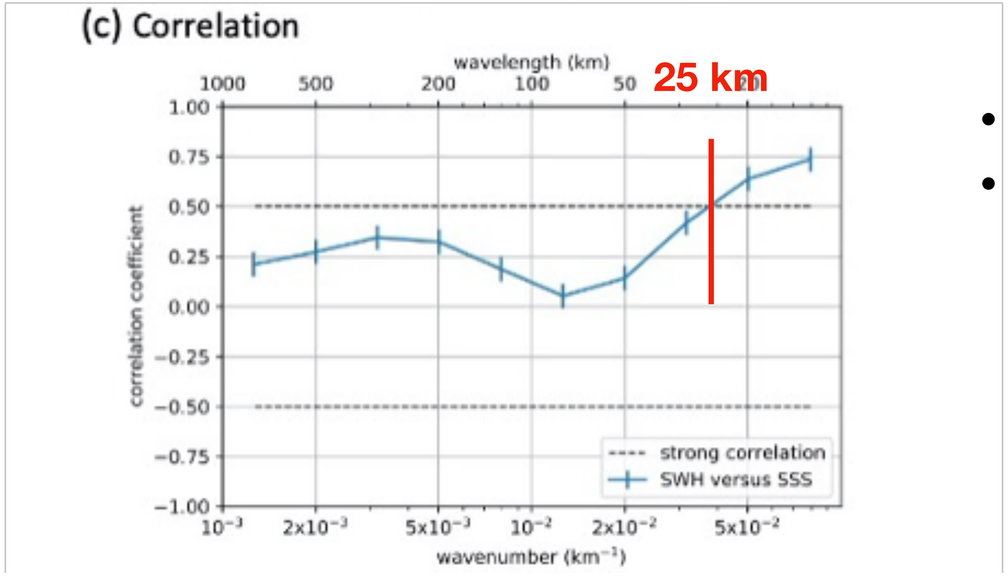
Amplitude and phase for annual and semi-annual SSS variability in the 25-100 km wavelength band.

- **The 25-100 km band can only be observed with geodetic mission data because the ERM track spacing is too large. SWOT will see this band.**

- Annual cycle amplitude is large in the high-latitude Northern Hemisphere and the south Indian Ocean. Is it wind driven?
- Annual maxima occur in local winter months; a few regions deviate from this pattern.
- New results: Semi-annual variations are confined to ±15° latitude. Are these solar heating variations?

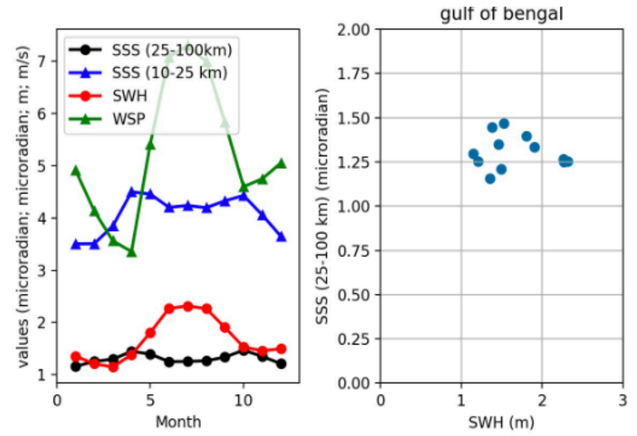
SWH vs SSS

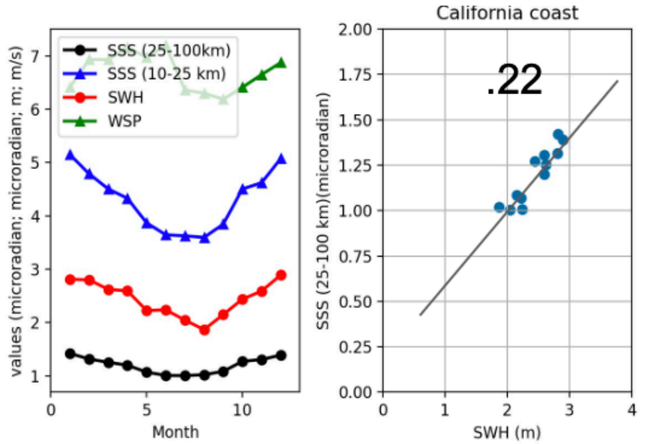


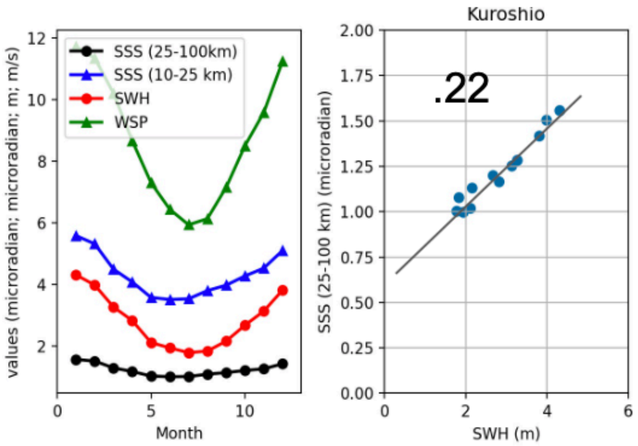


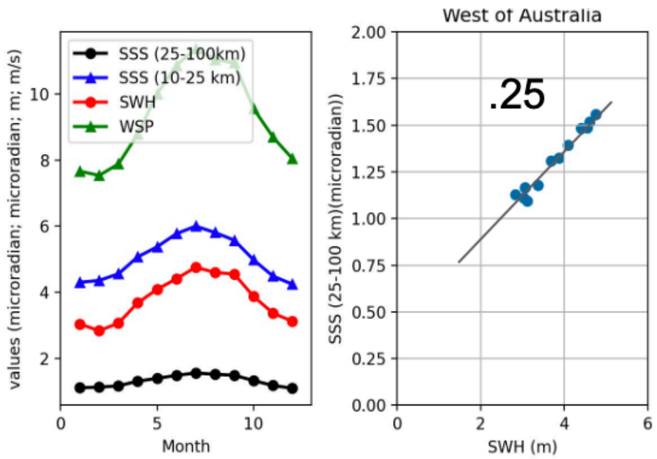
- Weak correlation (<0.5) in the 25-100km band
- Strong correlation (>0.5) for SSS wavelength < 25 km
  - SWH noise leaks into the SSS variability?
  - Or SSS variability is wind-generated?

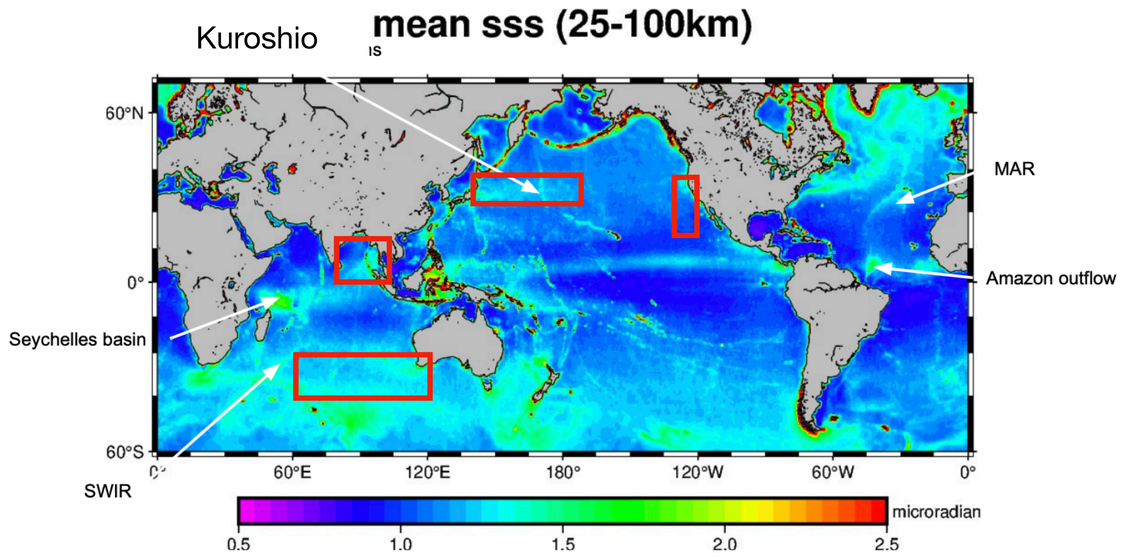
Sea surface slope/SWH/wind speed







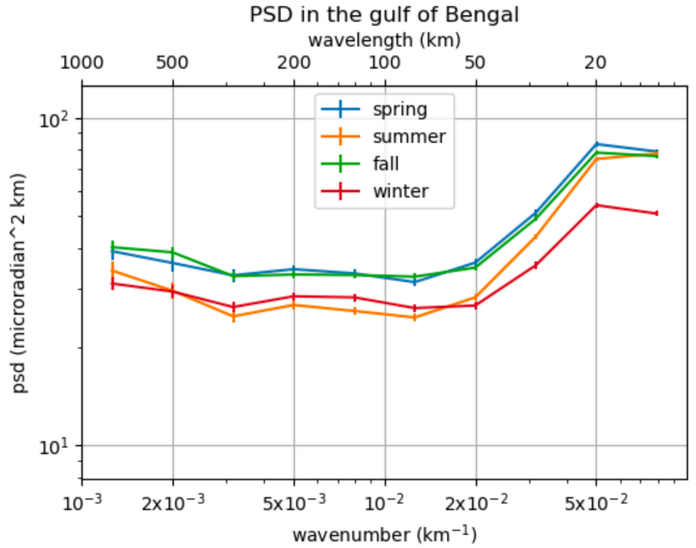


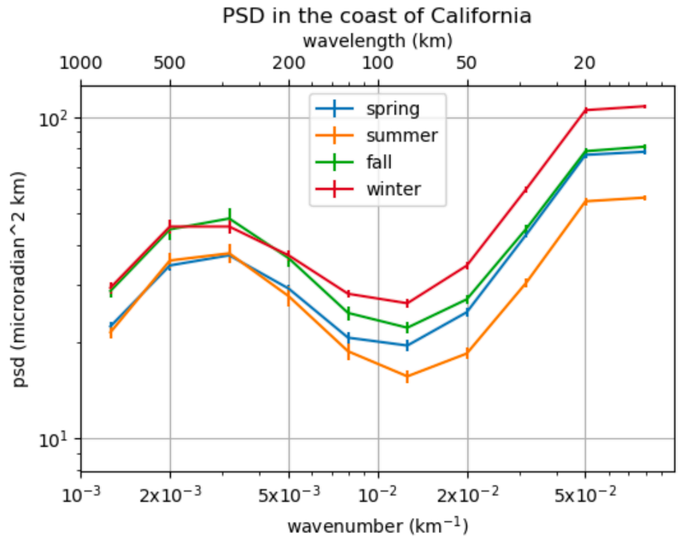


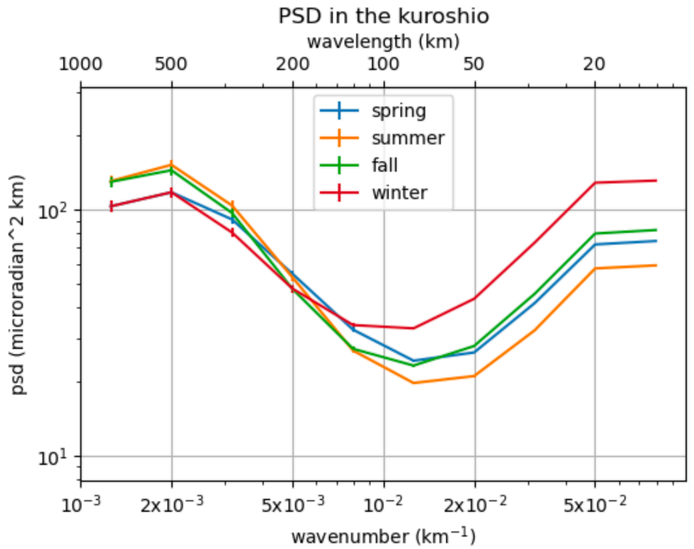
- Strong annual cycle
- SSS and SWH are highly correlated
- **Gulf of Bengal is very different suggesting SSS is not all wave bias.**
- Sea state bias (SSB): error from waves
  - Electromagnetic bias
  - Skewness bias
- We are working to reduce the SSB for wavelengths < 30 km with better modeling.

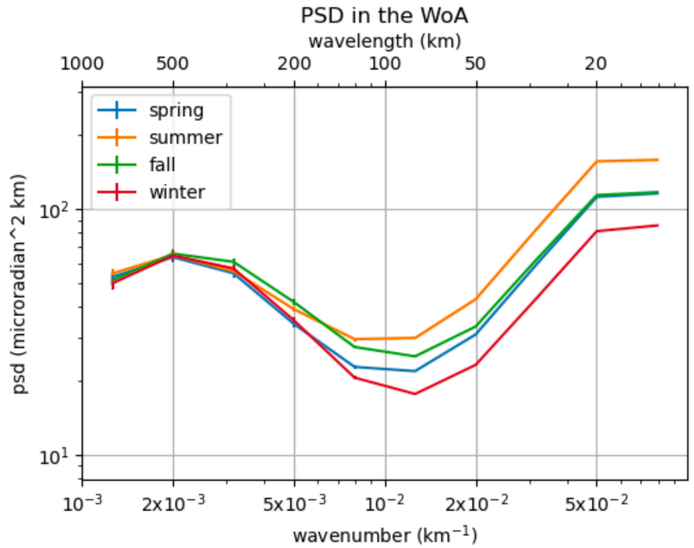
Power spectral density of SSS

Winter: December-February









- Wavelength < 100km:
  - large seasonal variations
- Wavelength > 100km:
  - Lower seasonal variations
- Gulf of Bengal:
  - Energy is higher in the spring and fall
  - For wavelengths<100km, energy is higher in summer under the influence of stronger winds/SWH
- **SWOT will be important for understanding the 25-100 km band but waves may dominate at wavelengths < 25 km.**