

## Problems # 7

*Due Tuesday, November 22, 2016*

1. **Aliasing.** The Surface Water and Ocean Topography (SWOT) satellite is due to launch in 2021. It has two planned orbits. The initial calibration and validation will be carried out with a fast-sampling orbit, with an exact repeat of about a day, and the subsequent science mission will have about a 21-day repeat. Specific time periods are listed in the table below:

Orbit	period (days)
Fast-sampling	0.99349
Science	20.86455

What is the alias period for each of these orbits for the lunar semi-diurnal (M2) and solar diurnal (S1) tidal cycles? How long should the satellite operate in each orbit to provide multiple realizations of the tidal amplitude?

Symbol	Name	period (hours)
S1	Solar diurnal	24.00
M2	Principal lunar	12.42

2. **Frequency-wavenumber spectra.** Download the monthly NOAA Optimum Interpolation monthly mean sea surface temperature data (available from TritonED). Compute frequency/wavenumber spectra for two slabs of data in the Pacific.

a Along the equator:  $-0.5^{\circ}\text{S}$ , from  $219.5$  to  $269.5^{\circ}\text{E}$ .

b In the subtropics:  $-29.5^{\circ}\text{S}$ , from  $189.5$  to  $249.5^{\circ}\text{E}$ .

For both slabs, plot a time/longitude plot (known as a Hovmoller diagram) and compute frequency/wavenumber spectra using at least some amount of averaging/segmenting. Is there a difference in energy propagation between the tropics and subtropics? What evidence do your figures provide?