Diurnal forcing of mixed-layer biogeochemistry at the K1 tidal period at Stn. Aloha
David Nicholson, 10/28/2014
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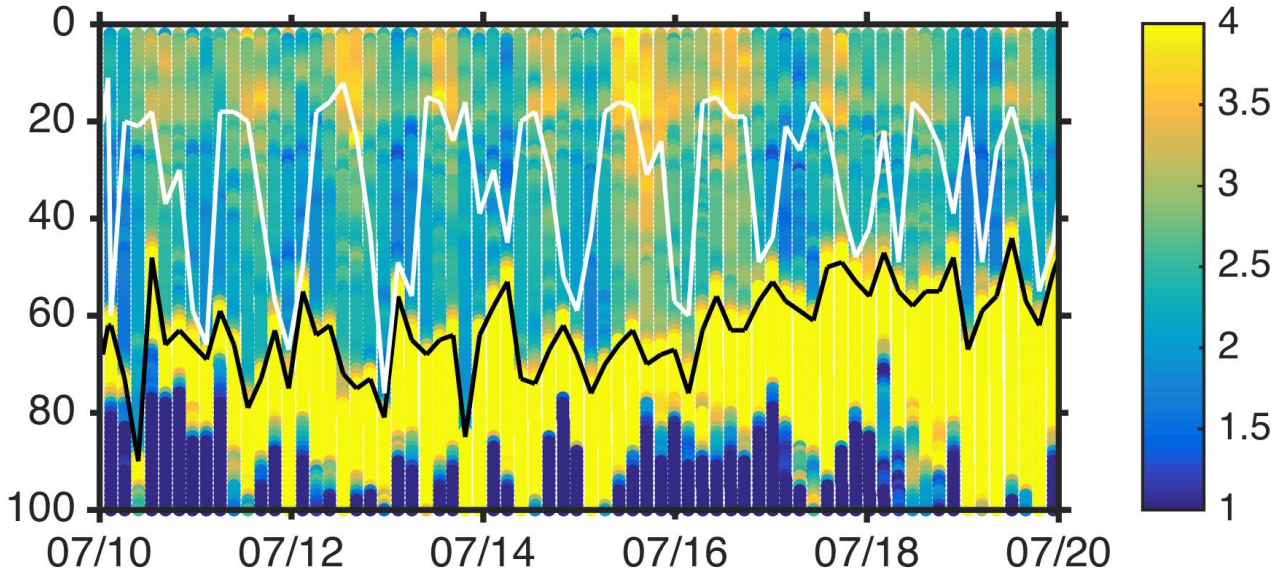
Figure X: An example of diurnal-scale cycles in $\Delta[O_2]$ ($\mu mol\ kg^{-1}$) shown for a 10-day period in July. Permanent mixed layer ($\Delta\sigma_\theta$ = 0.125 kg m^{-3}) is shown in black, while the diurnal mixed layer ($\Delta\sigma_\theta$ = 0.03 kg m^{-3}) is white.



note: (O_2 saturation anomaly ($\Delta[O_2]$) is defined as O_2-O_2sat)

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Figure X: Normalized power spectral density for WHOTS mooring and seaglider data. Horizontal velocity has dominant peak at the semi-diurnal (M2) phase and a lesser diurnal peak. Temperature and oxygen have a dominant diurnal period. This spectral analysis alone is insufficient to differentiate between an insolation driven solar period (24.000 hrs) and the K_1 diurnal tide (23.93 hrs)

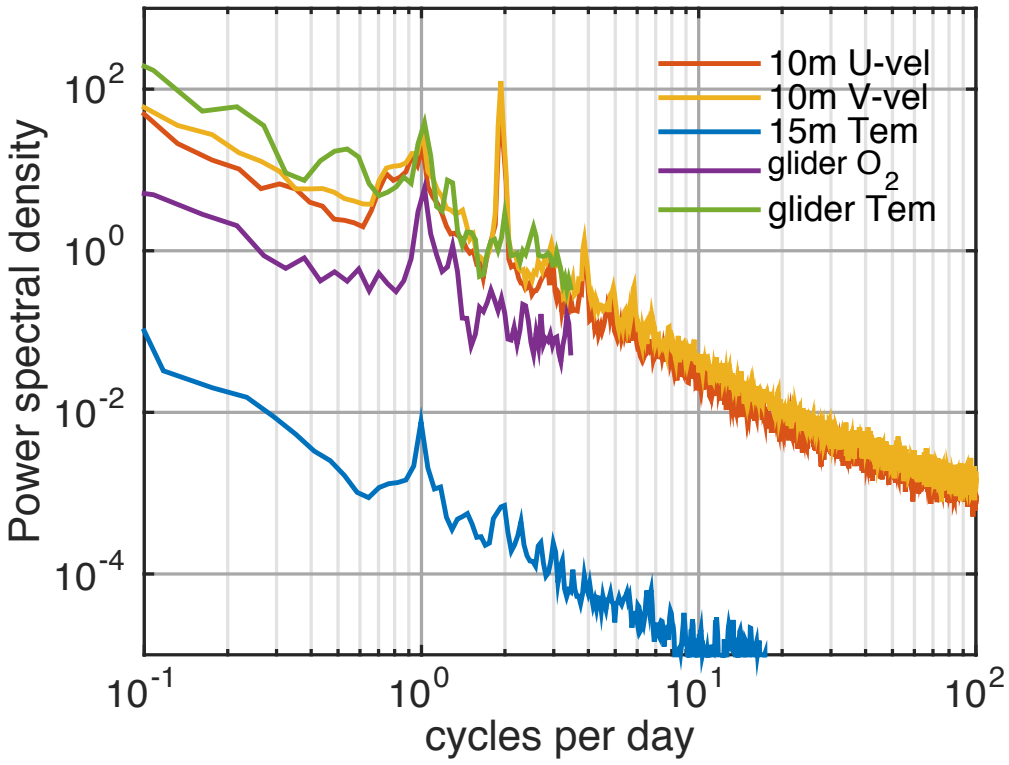

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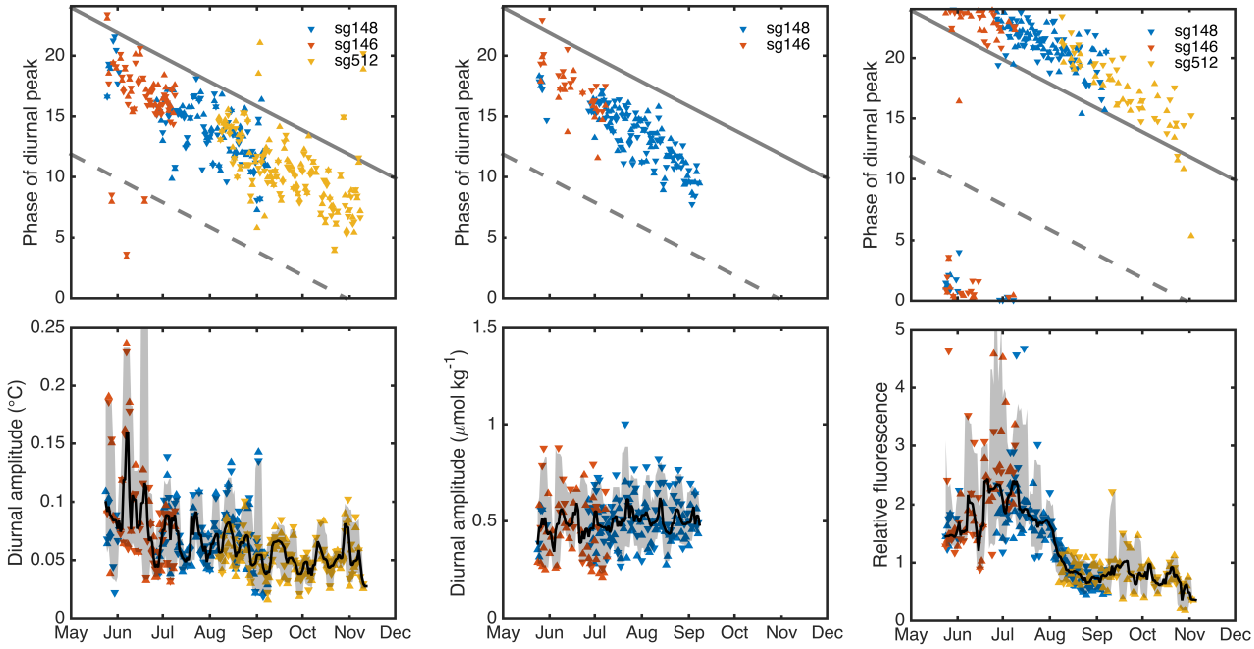
Figure X: Phase (above) and amplitude (below) of cycles in the diurnal band for temperature (A), O_2 saturation anomaly (B) and Chorophyll Fluorescence (C). Slopping lines show the phase propogation of the K_1 diurnal high (solid) and low (dashed) tides. Phase and amplitude were determined by fitting a cosine wave to Seaglider observations over the 2-40m range. The top two meters were omitted due to occasional spikes in sensor data at the surface due to breaking waves or bubbles. Oxygen and temperature peak about 3 hours before high tide, and chlorophyll fluorescence peaks about 3 hours after.



note: tidal phase is based on harmonic analysis of station data from the NOAA tide gauge at Kaneohe Bay. Further investigation is needed to see if there is a lead/lag with Station Aloha.

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Figure X: Composite K1 tidal cycle from Seaglider data over the upper 50m for temperature (above) and dissolved oxygen (below). The phase of K_1 tide as determined from harmonic analysis of the Kaneohe Bay tidal station (NOAA site #1612480 Mokuoloe, HI) is shown in grey. Units above are deg C, and units below are µmol kg^{-1}. The solid black line is mixed layer depth (0.03 kg m-3).