

Title: Bodega Head Intertidal and Surf Zone Chlorophyll-a Fluorescence

Summary: Chlorophyll-a fluorescence data were collected using a WET Labs ECO FL fluorometer (<http://www.wetlabs.com/eco-fl>) with the following manufacturer specifications: excitation/emission wavelengths: 470/695 nm; sensitivity: 0.02 µg/l; and range: 0-125 µg/l. Fluorometers were installed in the mid-intertidal zone (~ 0– 0.3 m above MLLW) Bodega Head (38.318739, -123.074186) in California, USA. The instrument is encased in a custom-made, secondary PVC case and then affixed to the rock using 3 stainless steel mesh straps and stainless steel lag screws screwed into high tension plastic anchors set into pre-drilled holes. The instrument face is oriented downward and towards the water. Observations are logged every 15 minutes. The sensor face is cleaned every 2 weeks when possible but no less than every 4 weeks (depending on sea state). Instruments are typically deployed between January and March and then retrieved between September and November of each year. They are sent back to the manufacturer for servicing and re-characterization annually.

Data processing: Out of water measurements were removed by aligning the fluorescence time series with tidal height predictions (downloaded from: <http://tbone.biol.sc.edu/tide/>) and removing observations when the tide is < 1 m above the apparent tidal height of the fluorometer. The apparent tidal height of the fluorometer is determined by visual inspection of the plotted fluorescence and tidal height data with focus on periods during extreme low tides when the fluorometer is clearly out of water (recorded measurements are close to the dark count offset value (see below) and do not change over the low tide interval delineating an obvious, sharp transition as the instrument is uncovered or covered by the tide). Extreme data spikes (typically > 5 SD of the time series) are removed after plotting and visual inspection of the time series. Subsequently, a backward moving average and SD (n = 15) is calculated for the time series and observations > 2 SD from the moving average are also removed. To scale raw fluorescence observations to chlorophyll-a, WET Labs uses a chlorophyll-a equivalent concentration (CEC) scale factor. The CEC scale factor is calculated as the signal output using a fluorescent proxy approximately equal to 25 µg/l of a *Thalassiosira weissflogii* phytoplankton culture (scale factor = $25 \text{ (}\mu\text{g/l)}(\text{Chl Equivalent Concentration} - \text{dark count})^{-1}$). The dark count is the measured signal output of the fluorometer in clean water with black tape over the detector. Scaling is linear. These values are provided as part of the manufacturer's annual characterization for each instrument. CEC units are calculated from the raw data by subtracting the dark count and then multiplying by the scale factor. Data are further scaled to in situ chlorophyll-a check samples to provide a more accurate estimate of actual chlorophyll-a than data scaled to CEC. Check samples consist of three replicate bottle samples of seawater collected adjacent to the fluorometers approximately every two weeks during deployment periods. Chlorophyll a is extracted and measured using standard methods (Welshmeyer 1994) on a benchtop fluorometer calibrated to certified chlorophyll-a standards from Turner Designs

(<http://www.turnerdesigns.com/>). The time series are subsequently re-scaled to in situ chlorophyll-a based on linear relationship between the check samples and the average CEC for the corresponding date. For this site using data collected between 2005 – 2009, the regression between CEC and in situ chlorophyll-a is linear and highly significant (both: $p < 0.0001$, R^2 range: 0.72). Two scaled output data sets are provided: 1) CEC units using instrument and year specific scaling factors provided by the manufacturer and 2) CEC data re-scaled to in situ chlorophyll-a check samples.

Keywords: intertidal, surf zone, chlorophyll a, fluorescence, Bodega Head, northern California

Vertical position: 0.5 ft above MLLW

Institution: Sonoma State University

Creator url: Dr. Karina J. Nielsen; <http://www.sonoma.edu/users/n/nielseka/index.html>

Creator e-mail: nielseka@sonoma.edu

Project: CeNCOOS: Long-term monitoring of environmental conditions in support of protected marine area management in central and northern California; CeNCOOS: Integrating marine observations to inform decision makers and the general public; Collaborative Research: Scaling up from community to meta-ecosystem dynamics in the rocky intertidal - a comparative-experimental approach; Collaborative Research: The role of calcifying algae as a determinant of rocky intertidal macrophyte community structure at a meta-ecosystem scale

Acknowledgements (support): NOAA; NSF

Contributors: Adele Paquin and Megan Wood assisted with field maintenance, data collection and data processing.

Publisher: CeNCOOS, www.cencoos.org, cencoos_communications@mbari.org

License (restrictions on use of data and distribution): These data may be redistributed and used without restriction. However, the creator would like to be informed of projects developed using these data.

Processing level (QC): Level 2, based on <http://science.nasa.gov/earth-science/earth-science-data/data-processing-levels-for-eosdis-data-products/>

Publication References:

McPhee-Shaw, E. E., K. J. Nielsen, J. L. Largier, and B. A. Menge (2011), Nearshore chlorophyll-a events and wave-driven transport, *Geophys. Res. Lett.*, 38, L02604, doi:[10.1029/2010GL045810](https://doi.org/10.1029/2010GL045810).