PEACETIME In-Line FLBBCD Processing

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Measurements

Chlorophyll *a* fluorescence (fchl), volume scattering function at 124 deg and 700 nm (VSF), and fluorescent dissolved organic matter (FDOM) were measured continuously on board the R/V Pourquoi Pas ? during the PEACETIME expedition in the Mediterranean Sea from May 12, 2017 to June 10, 2017. The WetLabs ECO-FLBBCD2K (serial number 4701) was set in a BB-box of ~4.5 L after a switching system running 0.2 um filtered sea water through the box 10 minutes/hour and total sea-water the rest of the time. This setup allow to retrieve particulate VSF (β_p) and fchl independently from the instrument drift and box effect. The FDOM is measured during both total and filtered periods. The data was logged with a home-grown data-loggger (Inlinino, http://inlinino.readthedocs.io/). The BB-Box was cleaned twice during the first week and every other day during the rest of the expeditions.

Processing

Period with obvious bad measurements are removed manually (most likely due to large clouds of bubbles). Automated processing software automatically removes suspect minute-binned data which fail the following test:

$$\frac{bin_{95} - bin_5}{2\sqrt{n}} > max(0.02 \times bin_{median}, 0.0025)$$

$$\frac{bin_{std}}{\sqrt{n}} > max(0.02 \times bin_{median}, 0.0025)$$

With bin_{95} and bin_5, 95th and 5th percentile of a bin, bin_{std} the standard deviation of a bin, n is the number of records averaged into a bin, bin_{median} is the median of a bin.

For each minute, the measurements between the 15th and 75th percentiles are averaged and their standard deviation is kept for reporting. The ECO-FLBBCD2K data was synchronized with the In-Line data (e.g. GPS, TSG) of the Pourquoi Pas ?, a delay of ~70 seconds was found. The particulate VSF and chlorophyll *a* fluorescence is computed depending on the switch position. They are obtained by subtracting the filtered from the total values (filtered values are linearly interpolated). These differences take care of the dark and wall effects of the BB-box. The slope coefficient provided by the manufacturer (table below) is used for both parameters. The particulate backscattering coefficient (b_{bp}) is computed using χ=1.076 (nominal angle 124, Sullivan et al, 2013). Note: the reported values for $beta_p$, b_{bp} and fchl do not include the contribution of the fraction below 0.2um.

FDOM is computed with the slope and dark coefficient from the manufacturer (table below). Note that no differences are observed between filtered and total sea water periods.

Instruments calibration

WetLabs ECO-FLBBCD2K serial number 4701 was new and operated for the first time during the PEACETIME expedition. The calibration coefficients (from April 4, 2017) were provided by the manufacturer.

Channel	Slope factor	Dark count

FCHL	0.0073	45
BETA(124,700)	1.639e-6	45
FDOM	0.0909	44

Note: The code InLineAnalysis and configuration used to process the data is available on GitHub.

References

Sullivan, J. M., M. S. Twardowski, J. Ronald, V. Zaneveld, and C. C. Moore (2013), Measuring optical backscattering in water, in Light Scattering Reviews 7, Springer Praxis Books, edited by A. A. Kokhanovsky, pp. 189–224, Springer, Berlin, doi:10.1007/978-3-642-21907-8_6.