NAAMES 4 BB3 data processing

Nils Haëntjens and Emmanuel Boss

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WetLabs ECO-BB3 serial number 349 was measuring the angular scatterance at 1 Hz at the three wavelength (470, 532, 660 nm). The data was logged with a home-grown data-loggger (Inlinino, http://inlinino.readthedocs.io/). The system is run on an hourly schedule of whole water for 50min followed with 10min of filtered measurements (using a 0.2 µm filter). In processing, the first 400 seconds data collected after switching from total filtered and vice-versa are ignored corresponding to the time it takes to renew the water in the BB-Box. 20-40 L of MilliQ water are run daily through the system to estimate the dissolved backscattering coefficient.

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:

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

Where bin_{95} and bin_5 are 95th and 5th percentile of the bin respectively, bin_{std} is the standard deviation of the bin, n is the number of measurements in the bin, bin_{median} is the median of the bin.

For each minute, the measurements between the 15th and 75th percentiles are averaged and their standard deviation is kept for reporting. Both the dissolved (β_g) and particulate (β_p) VSF are computed depending on switch position. The dissolved VSF is obtained by subtracting the MilliQ measurements from filtered measurements (interpolating in time between successive daily MiliQ values). The particulate VSF is obtained by subtracting the filtered from the total values (filtered values are linearly interpolated). Those differences take care of the dark and wall effects of the BB box. The slope coefficient used (table 1) comes from the latest calibration done by Jim Sullivan of FAU on 6/29/16. A temperature and salinity correction is performed on the dissolved using Zhang et al. 2009.
The particulate backscattering coefficient (b_{bp}) is computed using χ=1.076 (nominal angle 124, Sullivan et al, 2013). Note: the reported value for particulate backscattering does not include the contribution of the fraction below 0.2um.

Table 1. Calibration coefficients of WetLabs ECO-BB3 349 on 6/29/16, wavelength were measured 09/23/2017 with a Satlantic Radiometer.

Nominal Wavelength [nm]	Slope [sr^{-1} $count^{-1}$]	Dark [counts]	Uncertainties
468.7	8.407E-6	55.5	Max(11%,6E-5)
527	4.624E-6	50.8	Max(10%,3E-5)
652	4.090E-6	43.7	Max(17%,5-5)

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.
Zhang, X., L. Hu, and M.-X. He, 2009. Scattering by pure seawater: effect of salinity, Opt. Express 17, 5698–5710