CDOM absorption methodology

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I. Description

CDOM absorption was quantified following the NASA Ocean Optics Protocols, Revision 4, Volume IV protocol (Mitchell *et al.* 2003) using a Lambda 35 UV/VIS dual-beam spectrophotometer (Perkin-Elmer) with matched 10-cm quartz cuvettes. The instrument resolved optical density from 300-800 nm in 1 nm increments using a slit-width of 2 nm and a scan rate of 240 nm min^{-1}. Daily characterization of the spectrophotometer was carried out against a baseline of air/air in the sample/reference beam: 1) confirmation of a flat air/air baseline, 2) purified, particle-free water in the sample beam and air in the reference beam and 3) air in the sample beam and water in the reference beam. Instrument performance did not vary over the 5 months of sample analysis. Variability in air/air or water/water baselines were within ± 0.0005 OD. Cuvettes were cleaned with successive rinses of 10% HCl and 100% Ethanol at the start and end of each analysis day and were filled with purified water for storage.

II. Sample collection and processing

Briefly, glass storage bottles (Qorpak, GLC-01151) were acid-washed, allowed to dry and muffled at 450°C for 4 hours. Bottles were used within 1 month of preparation. Water samples were retrieved from the field and filtered within 8 hours of collection through Nucleopore polycarbonate filters (0.2µm, Whatman 111106) under low vacuum. Filters were soaked in 10% acid for at least 15 min prior to use and were rinsed with purified, particle-free water immediately prior to filtration. Filtrate was collected directly into prepared Qorpak bottles and stored in a refrigerator at 4°C until measurement. A field-blank of purified water was also filtered for each cruise.

Samples were placed in a water bath and brought to a constant temperature prior to measurement. CDOM absorption was quantified against a reference of purified water in triplicate from each sample bottle. Field blanks were processed along with samples. Some samples showed a dip/peak near 725 nm due to temperature differences between the reference and sample cuvettes (Mitchell *et al.* 2000). Every effort was made to keep samples and purified water at a constant identical temperature to prevent these artifacts.

III. Data Processing

Spectra of optical density (OD) were null-corrected to the mean OD from 700-710 nm:

$$OD_{cor}(\lambda) = OD(\lambda) - \overline{OD(700-710)}$$

Field blanks were close to baseline values and showed more noise than sample measurements. Replicates of null-corrected spectra were collectively fit to an exponential to retrieve a smooth curve (OD_b):

$$OD_b(\lambda) = OD_m \cdot e^{-(\lambda-\lambda_m)/k}$$

where λ_m is the minimum wavelength measured (300 nm), OD_m is the fitted value at λ_m and k is the slope (nm^{-1}). Fitted field blank spectra were applied to all samples for a given cruise.

CDOM absorption (a_g, m^{-1}) was retrieved:

$$a_g(\lambda) = [OD_{cor}(\lambda) - OD_b(\lambda)] \cdot \frac{2.303}{l}$$

where l is the cuvette pathlength (0.10 m). The mean ± standard deviation of a_g triplicates drawn from a single sample bottle is reported.

IV. References

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