Retrieval of hyperspectral CDOM absorption with integrating cavity sphere

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Typical measurements of the absorption coefficient of the chromophoric fraction of dissolved organic carbon (CDOM) are performed on filtered seawaters samples. Though samples could be stored in the dark at 4° for up to 6 months, it is preferable to analyse them within 24 hours from collection as variation of absorption might occur depending on the nature of the sample, and to minimize the effect of possible contamination.

As it is not always practical to analyse samples on board, techniques have been proposed to measure the CDOM with in situ deployed reflective tube absorption meters (i.e. SeaBird ac-9 and ac-s). These techniques allow time effective measurements of CDOM at high vertical resolution. However the typical path-length of the cavity containing the water sample is of 0.25 m, i.e. one eighth of most common protocols used in laboratory analyses, thus limiting the accuracy of the measurements at lower signals.

Integrating cavity absorption meters (ICAM) represent an alternative to reflective tube absorption meters. They have been primarily developed to reduce the effect of scattering of particulate onto absorption measurements. Nonetheless this technique presents also the advantage to increase the effective optical path-length of the light beam due to multiple reflections into the reflecting cavity (up to 2 m for a 10 cm sphere diameter). This peculiarity make ICAM suitable for applications with lower signal such as open ocean case I waters.

Here we present some advances toward the definition of a protocol for the use of a hyperspectral integrating cavity sphere (Hobilabs a-sphere) for the in situ measurement of CDOM. In particular we address aspects related to cleaning, blank measurements, water flow into the cavity and pressure and we present data from the BOUSSOLE bio-optical time series (NW Mediterranean Sea).