PEACETIME HyperPro Processing

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Measurements

Downwelling irradiance (E_d) and upwelling radiance (L_u) were measured at most of the station arround solar noon time during the PEACETIME expedition in the Mediterranean sea from May 12, 2017 to June 10, 2017. The Satlantic HyperPro (serial number: Lu 174, Ed 186, Frame 068) was deployed in buoy mode at the back of the ship, 70 to 100 m of wire were released before starting the acquisition to avoid any shaddow contamination by the ship. Sampling acquisition was about 5 minute for every deployment.

Processing

The instrument measure both light and dark L_u and E_d, thereafter the dark measurements (interpolated linearly) are substracted from the light measurements. Spectrum for which the instrument is tilting more than 5 degrees are rejected. Spectrum that are outside the middle 50th percentile are removed, this remove any outliers, mainly due to small clouds passing over.

R_{rs} (remote-sensing reflectance) is defined as the water-leaving radiance (L_w, i.e. the radiance just above the sea surface) normalized by the downwelling irradiance (E_d):

$$R_rs(λ) = \frac{L_w(λ)}{E_d(λ)}$$

To calculate it using the measured L_u (upwelling radiance at the depth of the radiometer), the L_u must first be extrapolated to just below the sea surface, and then a correction is applied for transmission across the air-water interface. See [Ocean Optics Web Book (http://www.oceanopticsbook.info/view/overview_of_optical_oceanography/)](http://www.oceanopticsbook.info/view/overview_of_optical_oceanography/) for more details. The equation to extrapolate L_u to just below the sea surface requires

information on the absorption properties of the surface water. To estimate the particulate absorption spectrum (a_p), a first guess of R_{rs} using L_u (rather than L_w) is used with NASA's OC4 band ratio algorithm to estimate chlorophyll *a* concentration (Chl). The Chl value is then used to estimate a_p (using a global relationship between Chl and a_p derived from the Tara Ocean dataset). The absorption by water (a_w) is also used and is known from published values (Chase et al. 2017).

Reference

Chase et al. 2017 JGR Oceans