RELATIONSHIPS BETWEEN IOPS AND BIOGEOCHEMICAL PARAMETERS IN THE NW MEDITERRANEAN SEA (BOUSSOLE SITE)

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Since 2003, the **BOUSSOLE mooring** is deployed in Case 1 waters of the **NW Mediterranean Sea** (Fig. 1). It is acquiring a **long-term time series of in-situ bio-optical measurements**. A program of monthly cruises provides complementary measurements including underwater radiometry profiles and discrete rosette sampling for **biogeochemical parameters**. Here we show the **relationships** between both the Particulate Organic Carbon (**POC**) and the Suspended Particulate Matter (**SPM**) and the inherent optical properties (**IOPs**) measured at the BOUSSOLE site (beam attenuation coefficient, $\mathbf{c_p}$, and backscattering coefficient, $\mathbf{b_{bp}}$).

DATA ACQUISITION

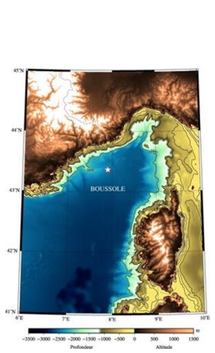

Fig.1 : Map of the NW Mediterranean Sea showing the location of the BOUSSOLE site (left). R/V *Tethys II* and CTD Rosette + IOPs package deployment at the BOUSSOLE site (right).

Biogeochemical parameters:

- [TChl-a] (0-400 m) from Nov. 2005 to Dec. 2015.
- [SPM] (0-5 m) from Nov. 2005 to Dec 2015.
- [POC] (0-400 m) from Oct. 2011 to Dec 2013.

IOPs:

- *Wetlabs C-Star* Transmissometer: beam attenuation coefficient c_p (660) profile (0-400m).
- *Hobilabs Hydroscat-VI* : backscattering coefficient b_b at 420, 442, 488, 550, 620, 700 nm profiles (0-400 m).

RESULTS

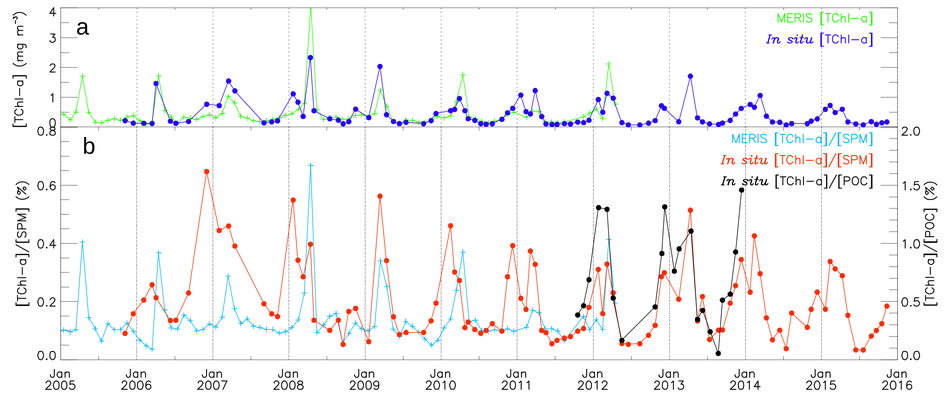

Fig.2 : a) [TChl-a] from *in situ* measurements and from MERIS observations (OC4Me algorithms).

b) Ratio [TChl-a]/[SPM] and [TChl-a]/[POC] from *in situ* surface measurements, and ratio [TChl-a]/[SPM] from MERIS observations (OC4Me and NN algorithms for [TChl-a] and [SPM] respectively).

- Seasonal cycle for [TChla-a] / [SPM] and [TChla-a] / [POC] at surface.
- Decreasing trend of [TChl-a] / [SPM].
- Maximum in winter ➡ Photoacclimation?

BIO-OPTICAL RELATIONSHIPS

POC

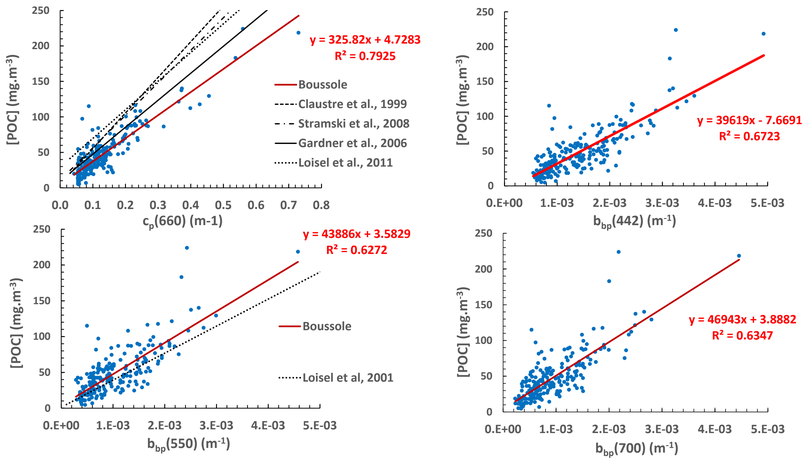

Fig. 3 : Regressions between [POC] and $c_p(660)$, $b_{bp}(550)$ $b_{bp}(442)$ and $b_{bp}(700)$. The relations [POC] vs $c_p(660)$ and [POC] vs $b_{bp}(550)$ were compared to other published relations.

- Significant correlation between [POC] and $c_p(660)$ and [POC] vs b_{bp}.
- Conversion factor: carbon-specific attenuation coefficient

  $\mathbf{c_c^*(660) = 3.07\ m^2\ g\ C^{-1}}$

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  consistent with estimations from various oceanic areas (2 - 3.2 m^2 g C^{-1}).
- Correlation between [POC] and b_{bp} : determination coefficient (R^2) similar for all the wavelenghts.

SPM

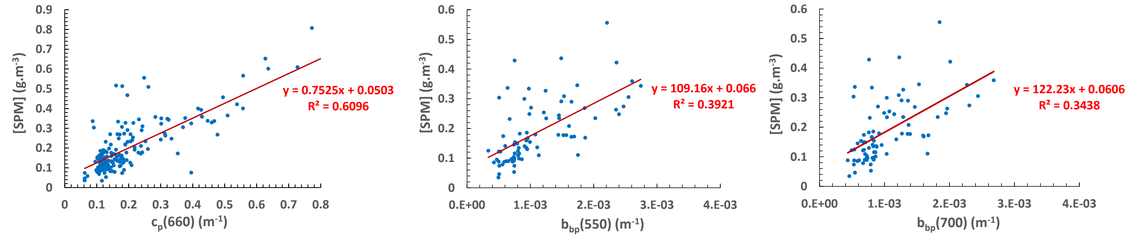

Fig.4 : Regressions between [SPM] and $c_p(660)$, $b_{bp}(550)$ and $b_{bp}(700)$.

$c_p(660)$ *vs* [SPM]	b_{bp} *vs* [SPM]
$\log_{10} c_p = 0.65 \log_{10}$ [SPM]-0.26 (r= 0.7476)	$\log_{10} b_{bp} = 0.55 \log_{10}$ [SPM]-2.62 (r= 0.639)
$\log_{10} c_p = 0.81 \log_{10}$ [SPM]-0.14 (r= 0.967)	$\log_{10} b_{bp} = 1.03 \log_{10}$ [SPM]-2.06 (r= 0.974)

Tab. 1 : Regressions between $c_p(660)$ and [SPM], and between $b_{bp}(650)$ and [SPM] at BOUSSOLE* (red) and from Neukermans *et al.*, 2012 (Case 1+Case 2 waters) (black).

*For BOUSSOLE, $b_{bp}(650)$ was estimated by interpolation between $b_{bp}(620)$ and $b_{bp}(700)$.

- Significant correlation between [SPM] and $c_p(660)$.
- More dispersion between [SPM] and b_{bp}.

CONCLUSIONS & PERSPECTIVES

- Bio-optical relationships between both [POC] and [SPM] and IOPs (c_p, b_{bp}) have been established with *in situ* measurements in the Mediterranean Sea (BOUSSOLE site).
- The ratio between absorption coefficients (a_p and a_{cdom}) and $c_p(660)$ will be examined and compared with the ratio [TChl-a] / [POC] and [TChl-a] / [TSM] measured at the BOUSSOLE site.
- These parameters will be compared with *in situ* AOPs measurements (reflectance) at BOUSSOLE site in order to assess current remote-sensing algorithms.

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