1. INTRODUCTION

The testing and assessing of Ocean color (OC) products accuracy at regional scale play a relevant importance in Satellite-Biological Oceanography. In particular, chlorophyll concentrations derived from satellite measurements are often useful for primary production estimations; this is why it is essential to provide reliable and accurate data. In such a context, this work is focused on evaluating the potential of MODIS Chlorophyll a product in terms of:

- **Chl-a algorithm accuracy**
- **SeaWiFS, Multitemporal Chl-a product**
- **Multi-temporal analysis of MODIS Chl-a product at regional scale**
- **Seasonality or long-term trend**
- **Chl-a spatiotemporal anomalies**

![Assessment of MODIS Chl-a OC3 algorithm accuracy at local scale](image1)

**MULTITEMPORAL ANALYSIS OF MODIS CHL-A PRODUCT AT REGIONAL SCALE**

- **Chl-a algorithm calibration**
  - To improve the satellite chl-a product accuracy, its calibration at local scale was carried out. In a first step, only in situ radiometric measurements (Rrs) obtained by an ASD FieldSpec Pro concurrently with in situ chlorophyll-a data were compared. The Maximum Band Ratio at the basis of the OC3 algorithm was implemented in this analysis, using Rrs measurements achieved during the 16 July 2013 campaign, at specific wavelengths, to compute:
    
    \[ \text{MBR} = \frac{\text{Max(Rrs at 443 nm)}}{\text{Max(Rrs at 488 nm)}} \]

- **Rrs calibration**
  - Finally, the calibration procedure was completed, carrying out a regression analysis between Rrs and Chl-a MODIS. It should be stressed that this kind of analysis was implemented on the respective maximum band ratios (MBRmodis, MBRtrue) rather than considering the single Rrs band, to reduce errors at 443 nm, due to atmospheric effects and thus to maximize the coefficient of determination \( R^2 \).

- **Chl-a algorithm validation**
  - The calibration equation was applied on data acquired during the third measurement campaign (01-02 July 2014), in seasonal conditions (stratified waters) similar to the ones of the calibration dataset (Figure 6).

**SEASONALITY OR LONG-TERM TREND**

![Seasonality or long-term trend](image2)

**CHL-A SPATIOTEMPORAL ANOMALIES**

![Chl-a spatiotemporal anomalies](image3)

**2. TEST SITE**

The investigated area is the Ionian Sea coastal area off Basilicata Region (southern Italy) (Fig. 3). Such an area is typical transitional environment and has a high historical, cultural and economic value for the region. More in detail, the area is characterized by high bathymetric relief and a complex coastal morphology, which makes it a suitable environment for the occurrence of a large number of marine species and habitats. The area is also a hotspot for tourism and recreation, with a number of coastal settlements and tourist destinations.

**3. ASSESSMENT OF MODIS CHL-A OC3 ALGORITHM ACCURACY AT LOCAL SCALE**

To assess the accuracy of NASA Level 2 MODIS chlorophyll-a product (OC3 algorithm) (O'Reilly, 2000), three in-situ measurement campaigns were carried out on 18-19 April 2013 (26 sampling stations), 16 July 2013 (14 sampling stations) and 12 July 2014 (20 sampling stations). The in-situ measurements were performed using an ASD FieldSpec Pro spectroradiometer and a Sea & Sun Products Radiometer (SSP 320). The in-situ data were corrected for atmospheric effects using the algorithm presented in O'Reilly et al. (2000). The satellite data were obtained from the NASA EOSDIS (Earth Observing System Data Information System) archive.

**MULTITEMPORAL ANALYSIS OF MODIS CHL-A PRODUCT AT REGIONAL SCALE**

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**CHL-A SPATIOTEMPORAL ANOMALIES**

![Chl-a spatiotemporal anomalies](image4)

**III. Calibration**

In order to identify chl-a anomalous values occurred in the selected area, a seasonal chl-a variability analysis (at monthly scale) was carried out.

**CONCLUSIONS**

The first part of this work, focused on the assessment of MODIS Chl-a OC3 algorithm accuracy at local scale, confirms that the standard NASA MODIS algorithm tends to overestimate in situ Chl-a measurements in coastal waters, with an average uncertainty higher than 5%. To improve these results, this algorithm was calibrated at local scale (i.e. Ionian sea - South of Italy) using in situ radiometric measurements (e.g. ASD FieldSpec Pro) concurrently with in situ chlorophyll-a data, showing a clear increase of the accuracy of the previous achievements. Obviously, to perform a more robust calibration, a larger number of samples representative of different local optical conditions should be analyzed. The second part of this work, relative to the multi-temporal RST-based analysis, shows that MODIS Chl-a product can be in any case used to describe the general behavior of the tested area in terms of trends and spatiotemporal anomalies. In particular, anomalous areas in terms of Chl-a variations have been detected during the first ten days of February 2011, probably due to an intensive algal bloom.