

# XII INCONTRO DEI DOTTORANDI IN ECOLOGIA E SCIENZE DEI SISTEMI ACQUATICI, Trieste, 15 – 17 Giugno 2016

## EFFECTS OF ATMOSPHERIC CORRECTION OVER INLAND WATERS ON WATER QUALITY PARAMETERS RETRIEVAL

Cazzaniga I.<sup>1,2</sup>, Colombo R.<sup>2</sup>, Bassani C.<sup>3</sup>, Giardino C.<sup>1</sup>, Bresciani M.<sup>1</sup>

(1) CNR- Institute for Electromagnetic Sensing of the Environment, Milano, Italy

(2) Remote Sensing of Environmental Dynamics Lab (DISAT), University of Milano-Bicocca, Milano, Italy

(3) CNR- Institute of Atmospheric Pollution Research, Roma, Italy

E-mail address: cazzaniga.i@irea.cnr.it

The use of remote sensing for the detection of water quality parameters requires an accurate estimation of remote sensing reflectance ( $R_{rs}$ ), a key physical quantity for parameters retrieval. The  $R_{rs}$  signal generally only accounts for around 10% of the total signal recorded at sensor, while atmospheric contribution, due to gases and aerosol presence, is predominant.

The first part of my PhD thesis work is focused on the analysis of different techniques for atmospheric correction of satellite images of inland and coastal waters. In the second part, the best technique will be thus selected and applied in time series imagery for assessing water quality by using bio-optical models. The target areas include lakes and coastal waters with different trophic conditions.

### Data

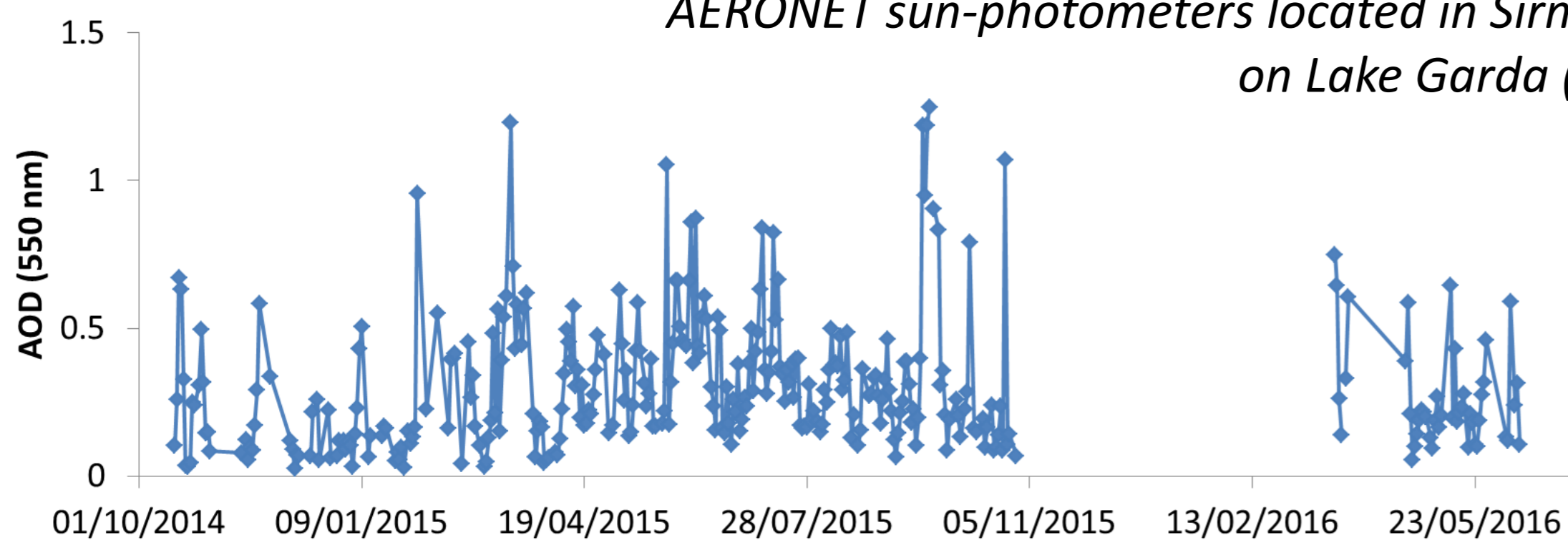
The images acquired by the latest generation of satellite sensors are used to monitor both large and small water bodies.

- Landsat-8 and Sentinel-2 for their high spatial resolution (10-30 m) and
- Sentinel-3, for its high temporal resolution (daily frequency)



- Sun-photometers measurements, available in the study areas are exploited to accurately describe aerosol characteristics.
- $R_{rs}$  spectra and water quality parameters are also gathered from dedicated field campaigns.

AOD daily mean time series (below) and AERONET sun-photometers located in Sirmione on Lake Garda (left).



### Image processing

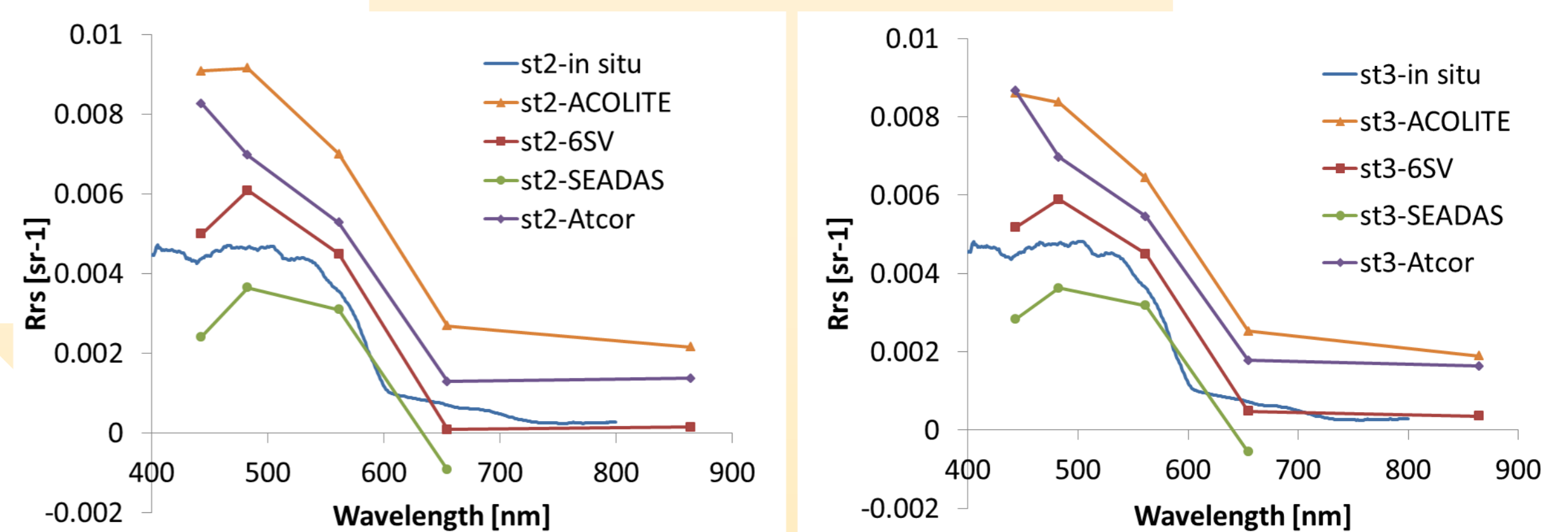
#### ATMOSPHERIC CORRECTION

Atmospheric techniques considered in this work are all based on radiative transfer theory which include the physics of aerosols, whose characterisation can be based on both pre-defined models or on *in situ* measurements.

The following RT codes are used for comparative analysis to retrieve the  $R_{rs}$ : ACOLITE<sup>1</sup>, SEADAS<sup>2</sup>, 6SV<sup>3</sup>, Atcor<sup>4</sup>.

$R_{rs}$

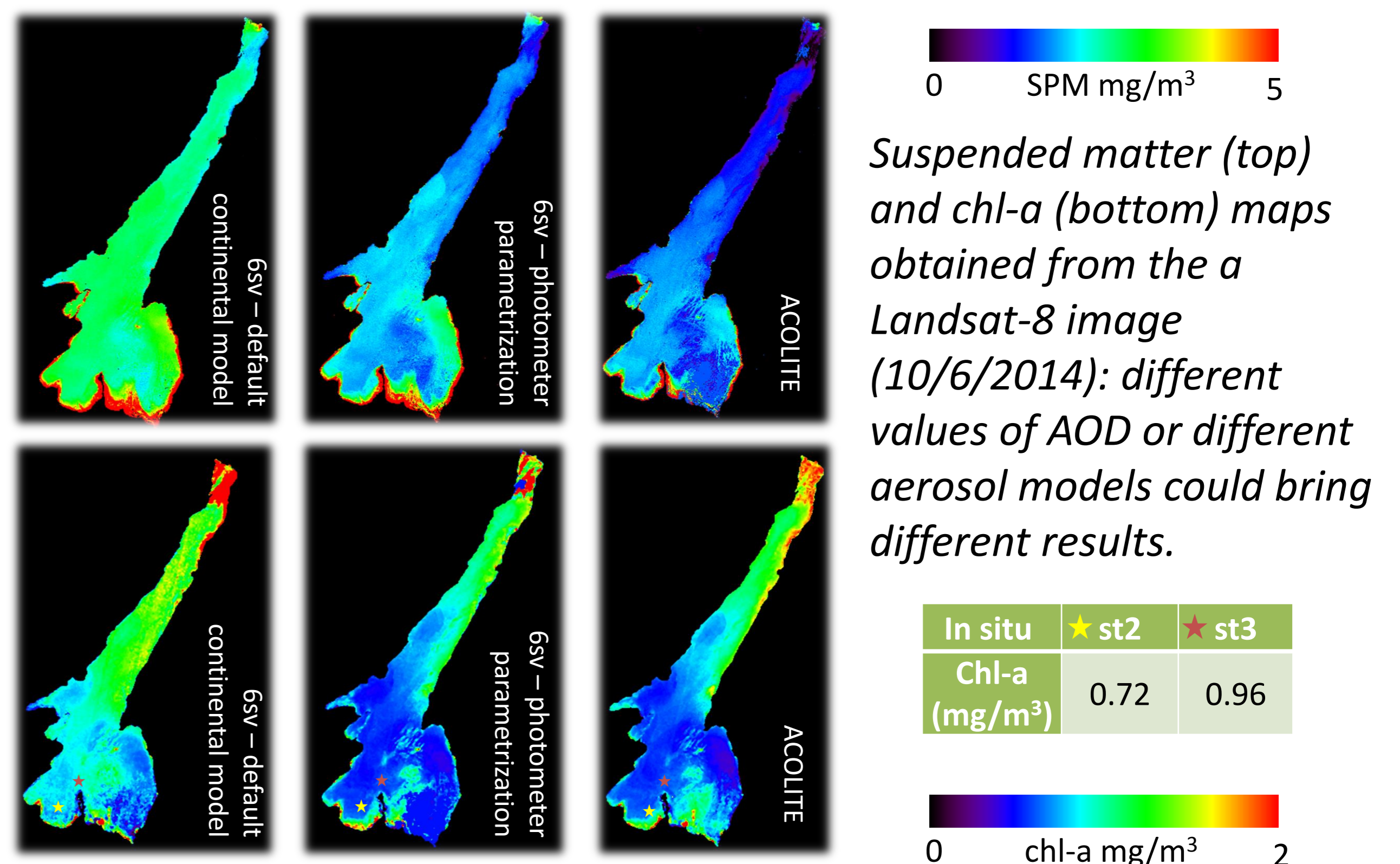
First results show accurate description of aerosol allows a more accurate estimation of  $R_{rs}$ , key quantity for water parameters retrieval.



#### BIO-OPTICAL MODEL

Bio-optical models are then used to estimate water quality parameters from  $R_{rs}$ . In this work the bio-optical model implemented in BOMBER<sup>5</sup> will be used. It estimates chlorophyll-a and total suspended matter concentrations and coloured dissolved organic matter.

#### WATER QUALITY MAPS

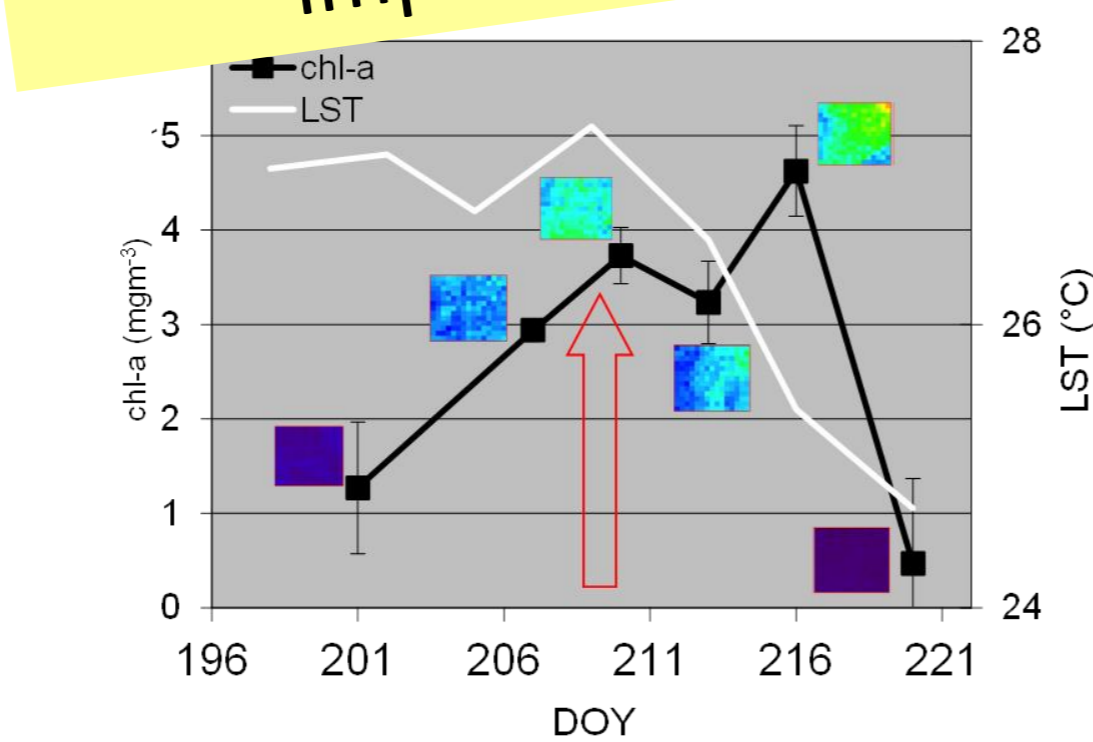
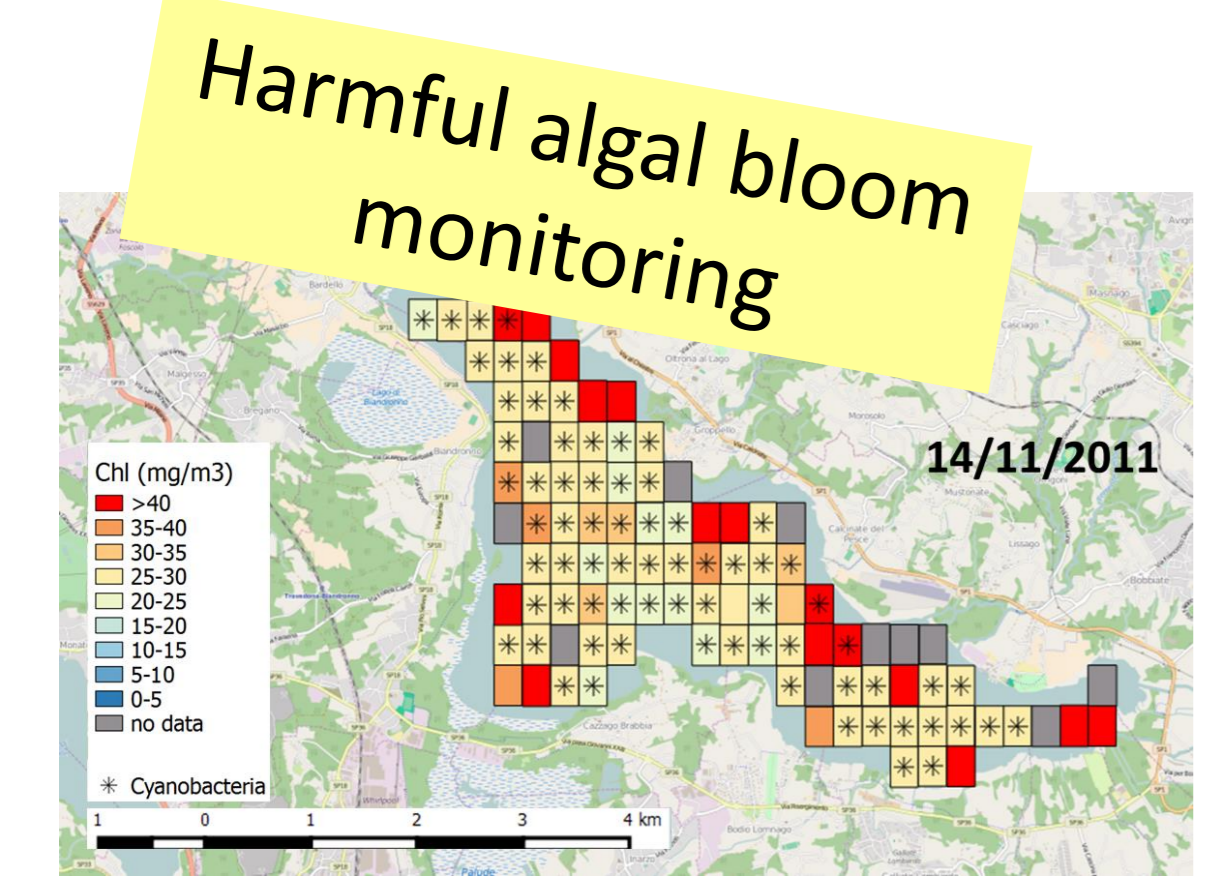
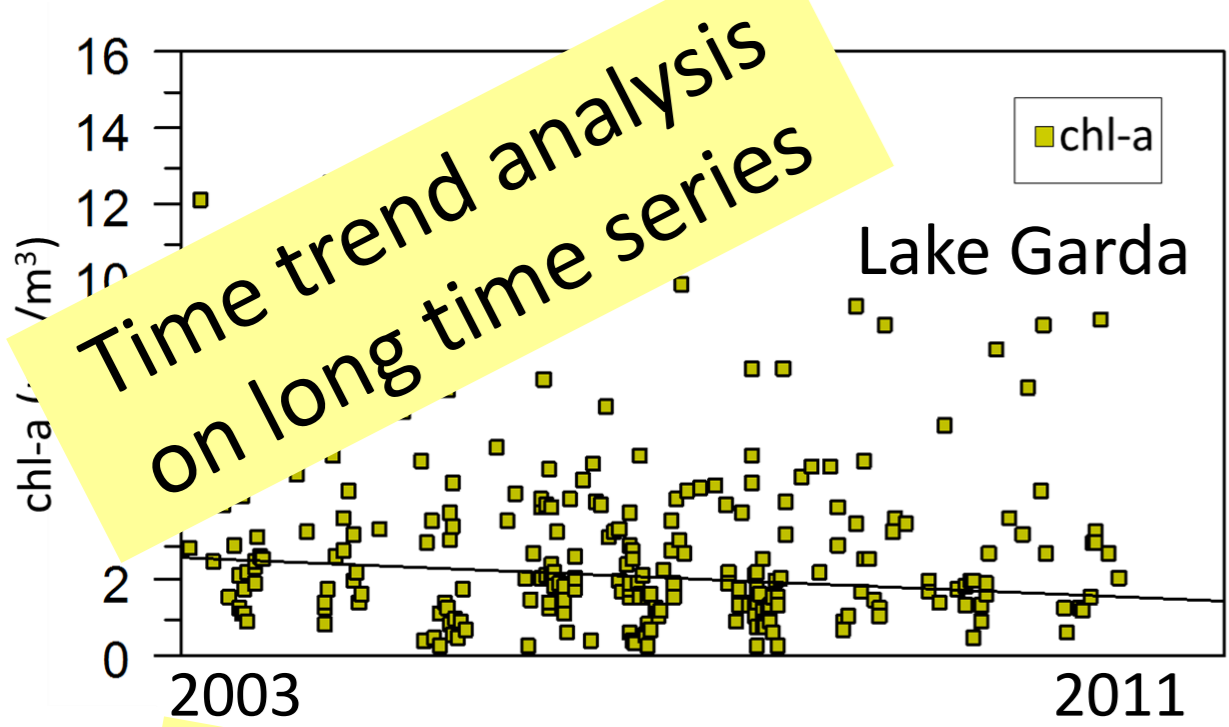


### Application

Time trend analysis on long time series

Anomalies detection

Dust deposition impacts



#### Bibliography

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3. Kotchenova S.Y. et al., Appl. Opt. 2006, 45, 6762–6774.
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5. Giardino C. et al., Comput. Geosci. 2012, 45, 313–318.

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