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Exploitation of SENTINEL-2 time series for monitoring ecological quality parameters of french lakes and reservoirs (TELQUEL project)

Thierry Tormos, Pierre-Alain Danis, Tristan Harmel, Malik Chami

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TELQUEL project (2015 – 2017) : SENTINEL-2 time series for monitoring ecological quality parameters of French lakes and reservoirs

Presentation of objectives and first results



^{1,2}Thierry Tormos, ^{1,2}Pierre-Alain Danis, ^{3,4}Tristan Harmel, ⁴Chami Malik

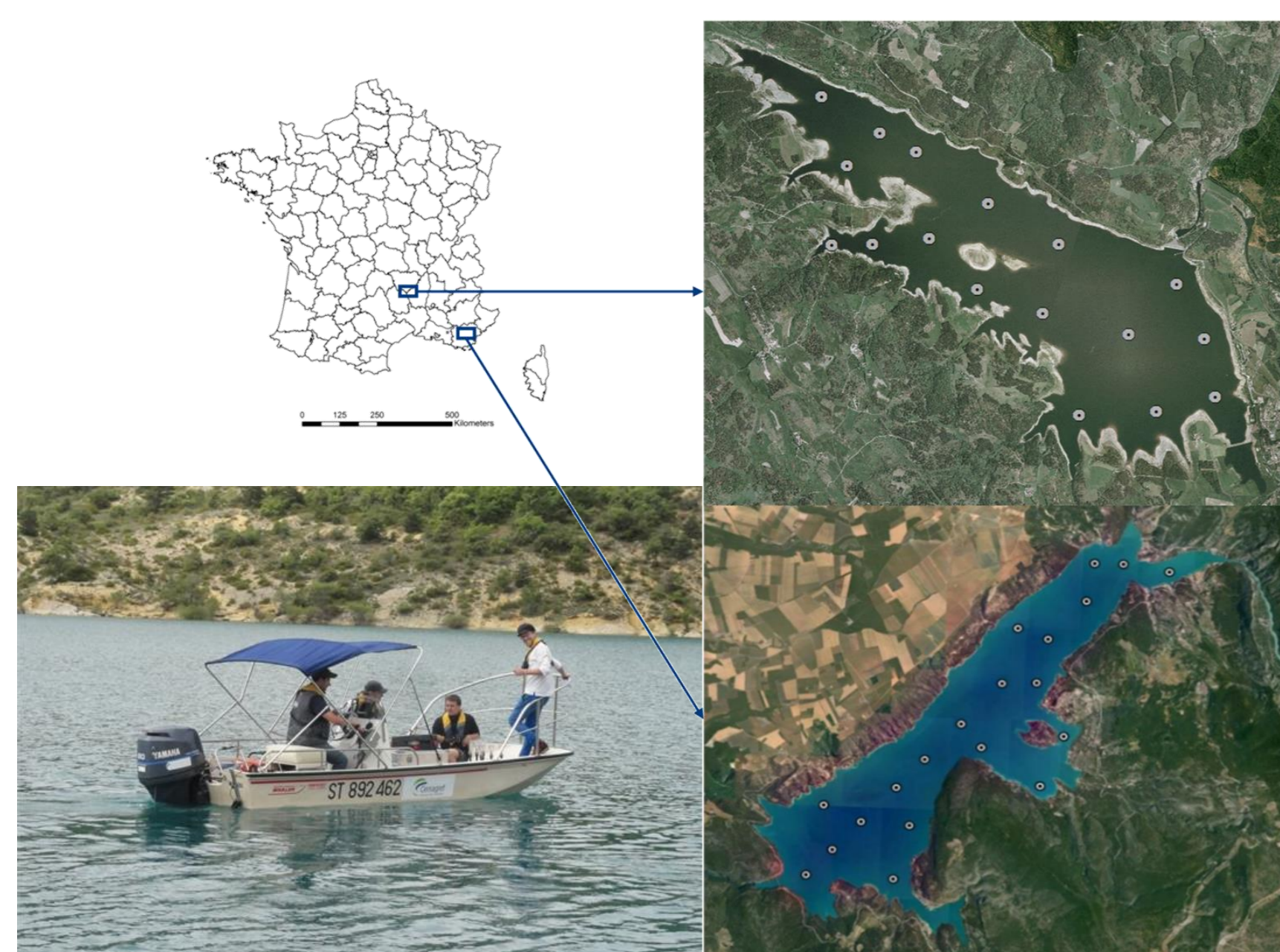
OBJECTIVES

The main objective of the TELQUEL project is to provide quantitative observations to monitor the ecological state of the French lakes.

In this direction, MSI/Sentinel-2 and OLI/Landsat 8 data are exploited to

- (i) identify/develop a specific atmospheric correction algorithm over lake areas;
- (ii) establish bio-optical relationships between the water-leaving radiance and the concentration of the biogeochemical parameters;
- (iii) provide bio-optical algorithms to retrieve water transparency and water constituent concentrations (Chl-a, CDOM and TSM).
- (iv) use the retrieved bio-optical properties and matter concentrations for enhancing the lake water quality evaluation and biogeochemical models.

STUDY SITES & FIELD DATA



Naussac
(1050 ha)

Ste-Croix
(2200 ha)
(only for winter campaigns)

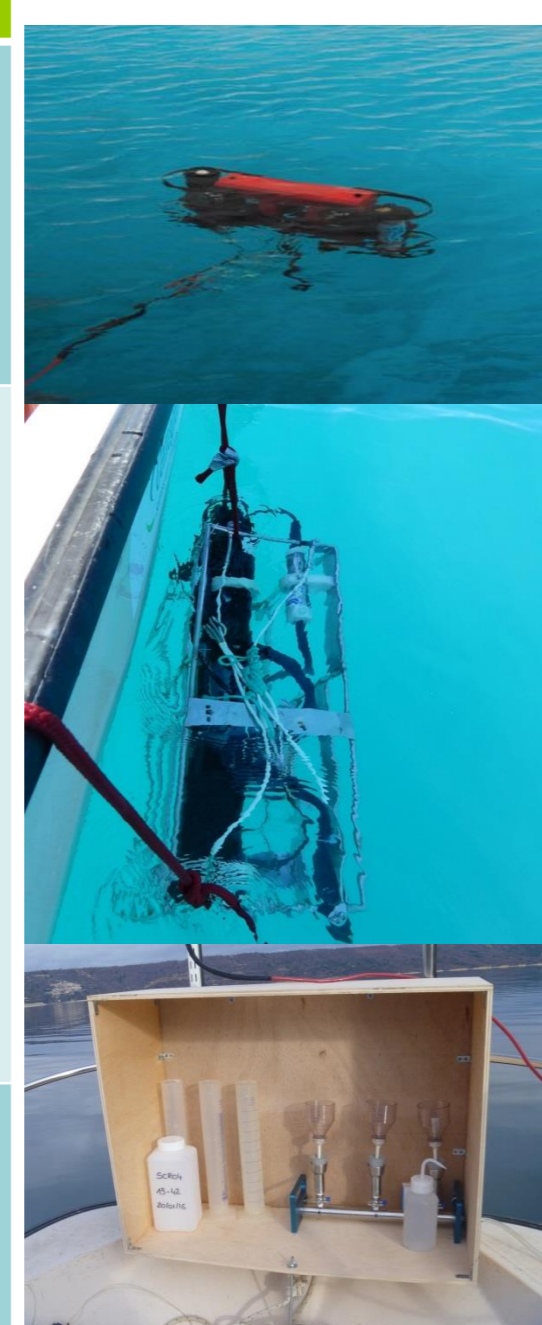
- 8 field campaigns have been planned for collecting apparent and inherent optical properties (AOP, IOP), transparency and biogeochemical concentrations (see table below for details).

- 1 campaign per season over 2 years.

- 4 campaigns have already been done.

- a comprehensive database has been generated for an easy access to the collected data.

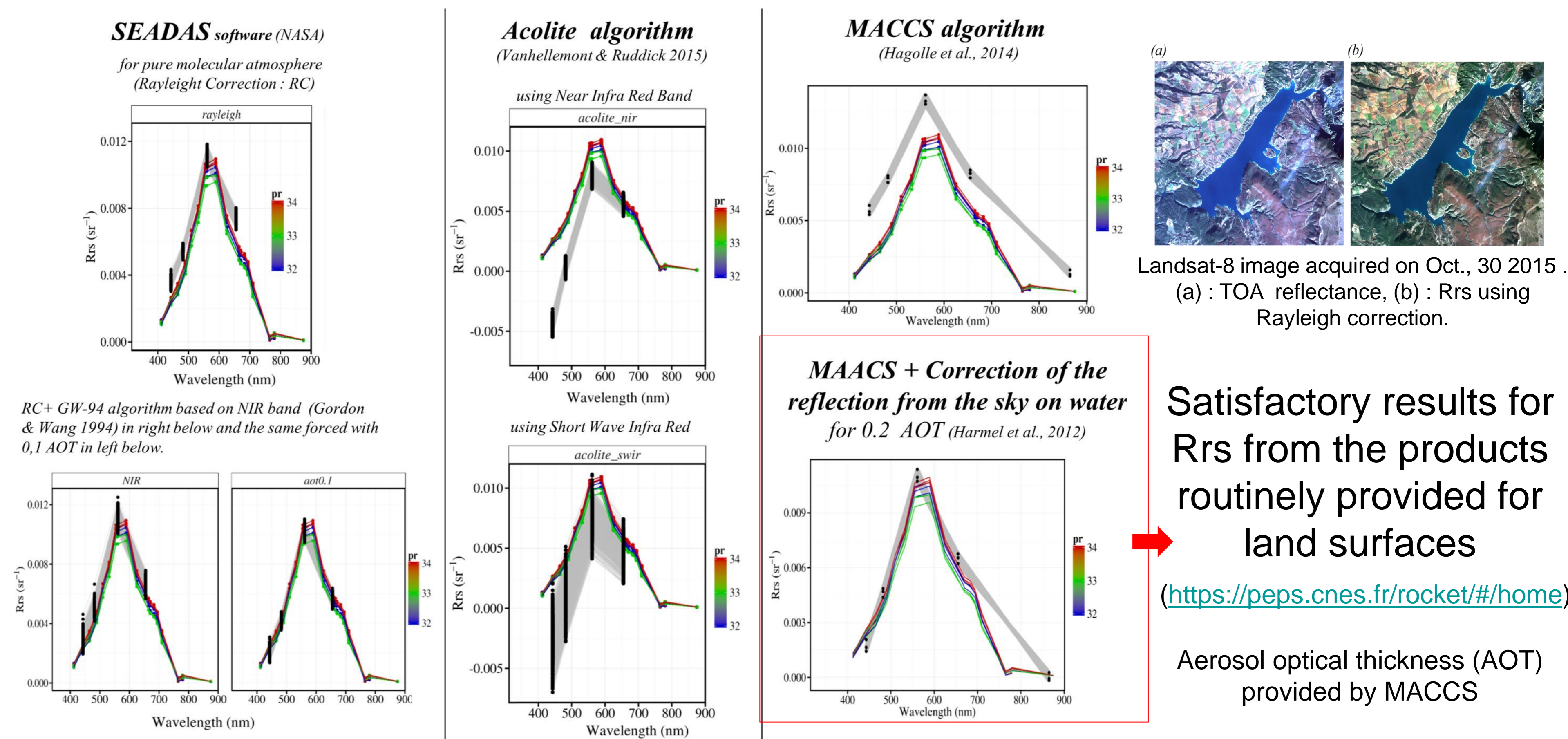
| Data Type | Measures | Materials |
|----------------------------|--|---|
| AOPs | L_u : upwelling radiance E_d : downwelling irradiance E_0 : solar irradiance | C-OPS (Wetlabs Ins.) |
| IOPs | c : attenuation coefficient a : absorption coefficient $acdom$: cdom absorption coefficient bbp : back-scattering coefficient $aphyto$: phytoplankton absorption coefficient | AC-S & ECO BB3 (Wetlabs Ins.) Spectrometer with integrating sphere (in the laboratory) |
| Biochemical concentrations | TSS : Total Suspended Solids SOM : Suspended Organic Matter Chl-A : Chlorophyll-a concentrations | Filtration rampers Concentrations measurements in the laboratory. |



FIRST RESULTS

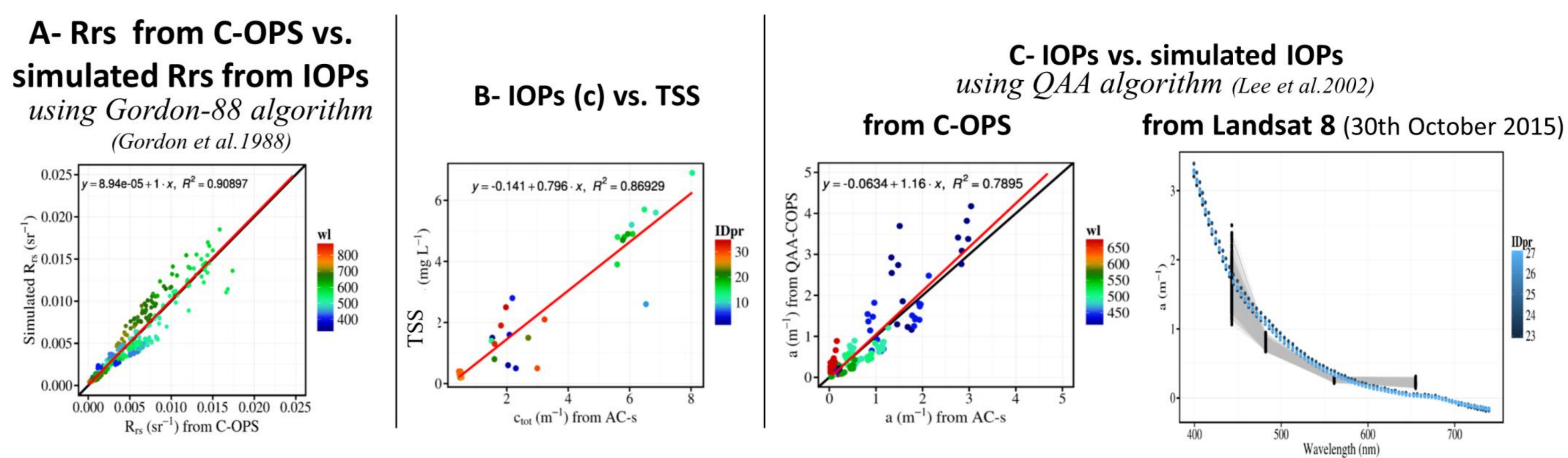
Atmospheric correction algorithm

Remote sensing reflectance (Rrs) of Landsat-8 image recorded on October, 30 2015 over lake Ste-Croix retrieved from different atmospheric correction algorithms (black points) versus Rrs derived from C-OPS in situ data (in color) at different stations.



Bio-optical relationships

Several bio-optical relationships were explored using traditional ocean optics algorithms. **Promising correlations are observed** between (i) Rrs derived from C-OPS and simulated from IOPs (see A); (ii) IOPs and total suspended matter (TSS) concentrations (see B); (iii) measured IOPs and IOPs retrieved from C-OPS and Landsat-8 data (see C).



IN THE FUTURE

1- Exploitation of MACCS algorithm coupled with corrections for both sky (already developed) and sun (ongoing) reflections on water surface.

2- Building specific bio-optical algorithms for OLI and MSI sensors based on Lee et al. 2002 algorithm calibrated from our field data.

3- Testing the biogeochemical products retrieved from Landsat 8 and Sentinel-2 for evaluation and modeling of lake ecological state.

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¹ONEMA, Pôle hydro-écologie des plans d'eau, Aix-en-Provence, France

²IRSTEA, UR RECOVER, Aix-en-Provence, France

³IRSTEA, UR MALY, Lyon, France

⁴UMPC, UMR CNRS 7093, Villefranche-sur-Mer, France

Contacts :

Thierry Tormos; thierry.tormos@irstea.fr

Pierre-Alain Danis; pierre-alain.danis@onema.fr

Tristan Harmel; tristan.harmel@irstea.fr

Malik Chami; chami@obs-vlfr.fr

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