Project : HYPERMAC - Programme : STEREO -

Project title : Hyperspectral and multi-mission high resolution optical remote sensing of aquatic environments

Project period : 01/12/2016 - 30/11/2019
Budget :

Promotors: RBINS Kevin Ruddick (coordinator),

The project is part of the STEREO programme and is executed in a broader framework of bilateral cooperation with China (call 2015).

Project objectives :
Remote sensing of chlorophyll (CHL) and suspended particulate matter (SPM) concentration from medium resolution ocean colour sensors is now quite mature.

Two key challenges are to:

1. Extract more information on algal and non-algal particles than just concentration. e.g. algal species composition and particle size and composition respectively.
There are emerging algorithms for phytoplankton functional types from space in "Case 1" oceanic waters . However, their application in turbid water is extremely limited because the absorption of non-algal particles typically masks algal particle absorption in the blue-green. Hyperspectral algorithms have been proposed to detect chl c3 in *Phaeocystis globosa* in turbid waters, and to detect the heterotrophic dinoflagellate *Noctiluca scintillans* and the ciliate *Mesodinium*. Hyperspectral data is considered very attractive for the detection of floating and submerged macro-algae coverage and species. Non-algal particle size and composition influence optical properties such as backscatter spectral slope and backscatter:absorption ratio. If these optical properties can be reliably estimated by remote sensing then particle size/type may be inferred18. In all cases good spectral and spatial resolution is crucial and hyperspectral data is preferred.
Q1a. What can be estimated from hyperspectral data for micro-/macro-algae in turbid waters?
Q1b. What information can be extracted for non-algal particle size and type?

2. Exploit more fully the many high spatial resolution sensors that have been designed for land application, but have nevertheless considerable potential for aquatic applications.
The high quality, free data of Landsat-8 and Sentinel-2 have stimulated enormous growth in coastal/inland water applications of aquatic remote sensing19-25. The spectral band sets and signal:noise are quite different from conventional ocean colour sensors, but have great potential, e.g. use of L8 panchromatic band for high resolution SPM and use of S2 red edge bands for CHL in turbid waters. Algorithms must be adapted/designed to optimally exploit these new bands.
Q2a. How should algorithms be best designed for limited spectral band sets and signal:noise?
Q2b. How do limited bands and signal:noise affect quality/availability of retrieved parameters?

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