Trichodesmium detection from space and ecological role in the ocean: A review of the state of science, challenges and ways forward

Chairs: Cécile Dupouy (IRD, France), Ajit Subramaniam (Columbia University), Lachlan McKinna (NASA GSFC)

Synopsis

Remote sensing *Trichodesmium* at bloom and sub-bloom concentrations in both open and coastal oceans is important for estimating carbon and nitrogen fluxes associated with this diazotroph, yet it is still technically challenging. Satellite data may be used to estimate several, but not all, forms of *Trichodesmium* assemblages, and the capacity varies from open-ocean to coastal waters. When aggregating on the surface, the organism can form surface slicks (scums) that have distinct spectral signatures in the UV-VIS relative to other floating algae. They may also be detected in radar imagery as they modify the sea surface roughness. When they are actively fixing nitrogen, they disperse vertically in the upper layer of the water column and, then, their spectral signatures become less apparent. The workshop will help compile knowledge from the ocean colour community on the optical/ radar signatures of this phytoplankton genus (colonies, slicks), discuss the capabilities and limitations of current sensors in detecting and quantifying *Trichodesmium* to help inform future sensor design and algorithms for improved detection and quantification of both surface slicks and mixed colonies of *Trichodesmium*. The outcome will also be useful for studying other forms of marine cyanobacteria. In addition, the workshop will review environmental forcing factors regulating its growth and distributions, and will also discuss how satellite data can complement numerical modeling or multivariate statistical approaches data to better understand the initiation, development, and dissipation of *Trichodesmium* blooms in order to quantifying its role in carbon and nitrogen cycling at both regional and global scales.

Key Questions
 1) Optical characteristics (colonies, slicks) of *Trichodesmium*
 2) Remote sensing detection tools (optical, radar)
 3) Modeling help for a global assessment

Draft AGENDA

14:15 – 14:25: Introduction/session overview - biogeochemical significance (*Cécile Dupouy, Ajit Subramaniam, Lachlan McKinna)*

14:25 – 14:45: Bio-geochemical modelling with regard to *Trichodesmium* (*Stephanie Dutkiewicz*)

14:45 – 14:55: *Trichodesmium* abundance in the global open and coastal ocean (*Sara Rivero-Calle*)

14:55 – 15:25: Moderated community discussion (30 min) (*Ajit Subramaniam)*

15:25 – 15:45: Break (20 min)

15:45 – 15:55: IOPs/AOPs- historical overview where we are/state of the art with regard to *Trichodesmium* and limitations/missing measurements or instruments (*Cécile Dupouy, Lachlan McKinna*)

15:55 – 16:05: Passive remote sensing - surface expression of *Trichodesmium*, state-of-the-art and limitations/future work (*Lachlan McKinna*)

16:05 – 16:15: Freshwater Cyanobacterial blooms remote sensing (10 min) – State of science, challenge, methods (*Prof. Ronghua Ma*)

16:15 – 16:25: Hyperspectral Atmospheric Corrections above surface algal blooms (10 min) *(Amir Ibrahim)*

16:25 – 17:00: Moderated community discussion of gaps and formulation of recommendations (35 min) (*Lachlan McKinna, Ajit Subramaniam, Cécile Dupouy*)