

RES-NRSC-2022-002

Name of ISRO Centre/Unit

National Remote Sensing Centre, Hyderabad

Title of the research proposal

Development of Fluorescence Line Height (FLH) based algorithm for chlorophyll and phytoplankton blooms detection

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Area of Research

Ocean Colour Remote Sensing / Biological Oceanography / Ocean Bio-Geo-Chemistry

Summary of the proposed research and expected deliverables

Phytoplankton is a microscopic, single cellular organism drifting on the surface water, human eyes or sensors cannot observe it. And in fact, a bulk effect of more than hundreds of cells is what human or remote sensors observe. Therefore, the interaction of bulk cells with light might be described by the theory of single-particle scattering, which is a framework to understand the microscopic level of light interaction with a single cell and present the fundamental theories needed for Chl-a bio-optical modeling. Phytoplankton cells are considerably variable in size, from less than 1 mm to larger than 10 mm. The cells are not only varied by six orders of magnitude in size but can be seen in the form of unicells to a cluster of cells, filaments or colonies. The structure of cells can be different between each phytoplankton species and show different behaviors, for instance, in diatoms silica cell morphology or cyanobacteria gas vacuoles. Despite the diversity in size, form, structure, and behavior that influence the specific optical properties of the phytoplankton, all phytoplankton species contain a green pigment Chl-a. Chl-a is an essential indicator for estimating phytoplankton biomass and lake productivity using Chl-a bio-optical models. These models estimate Chl-a through three pathways: phytoplankton absorption, fluorescence, and backscattering.

However, several reflectance based algorithms were developed well validated in the open oceans. However, due to the complexity of the coastal waters estimation of Chl-a is still needs to evolved beyond the reflectance based methods towards the fluorescence based techniques. Given that the Chl-a is proportional to the Sun Induced Fluorescence (SICF) emission, many studies started to examine its validity to measure Chl-a concentration in coastal waters, results showed a good correlation between Chl-a and SICF using MODIS and MERIS sensors.

The present study aims at developing and validating the FLH based models / algorithms in the turbid coastal waters all along the Indian coast using the upcoming Oceansat-3 OCM sensor.

Scope of the Work:

- This above project is one component of the ongoing research activities under Oceansat-3 (EOS-6) ocean colour monitor.

Deliverables:

- Developing and validation of techniques / methodologies /a algorithms for retrieval of surface chlorophyll in the turbid coastal waters using fluorescence / FLH based methods.
- Detection / identification of phytoplankton blooms using fluorescence / FLH based method.