# IOCCG Working Group on Phytoplankton Functional Types

Established in 2006 with Cyril Moulin as Chair

Chair passed on to Shubha Sathyendranath in 2008

Terms of Reference of the WG (on IOCCG website):

Prepare a report to be published within the IOCCG series.

Report to consider relevance, definition, current understanding, review existing techniques, compare algorithms, applications including primary production, biogeochemical models, recommendations
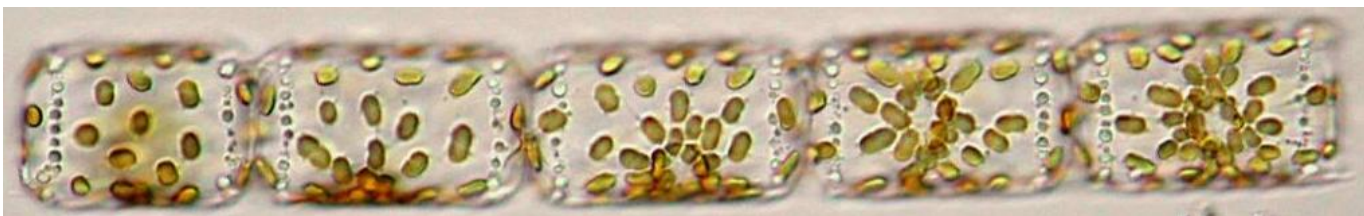
Remote Sensing of Phytoplankton Functional Types
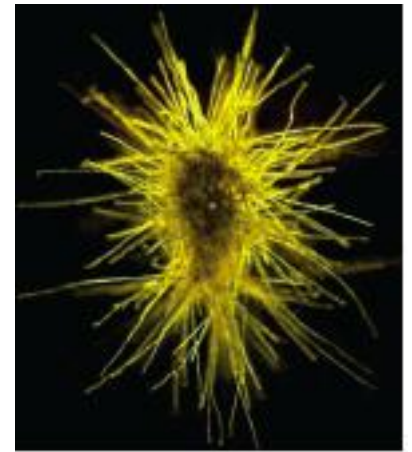
Chapters:

Introduction

In situ methods of measuring phytoplankton functional types

Detection of single algal blooms by remote sensing

Detection of phytoplankton size structure by remote sensing

Methods for detecting multiple functional types

Directions for further work, Concluding remarks

Chapter 1: Introduction

Shubha Sathyendranath, Heidi Sosik, Lesley Clementson, Jesus Morales, Anitha Nair, Colleen Mouw, Jim Aiken and Venetia Stuart and others?
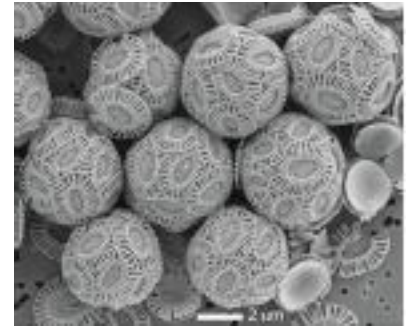
What is a phytoplankton functional type?

Functional Types and Related Terms

Some Important Phytoplankton Functional Types

Why study functional types?

Why study phytoplankton functional types from space?

The need for complementary approaches

Distribution of phytoplankton functional types

Chapter 2: In situ methods of measuring phytoplankton functional types

Heidi Sosik, Julia Uitz, Heather Bouman, Shubha Sathyendranath
and others

Microscope

Pigment analysis

Flow Cytometry

Optical Methods

Genetic Methods

Inherent Optical Properties

Fluorescence

Discussion & conclusion

Chapter 3: Detection of single algal blooms by remote sensing

Chuanmin Hu, Jamie Shutler, Shubha Sathyendranath, Ajit Subramaniam, Emmanuel Devred and others
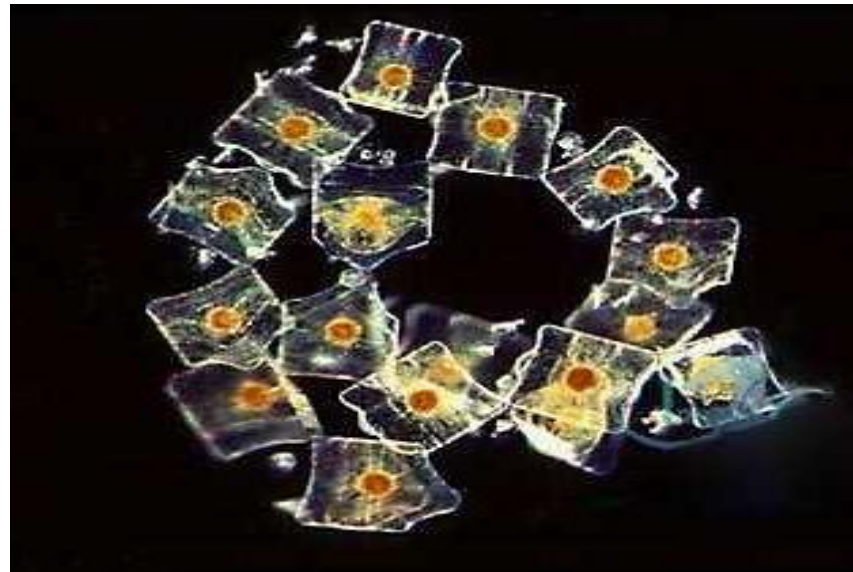
Coccolithophores

Diatoms

Cyanobacteria

Green tides of macroalgae

Sargassam

Discussion & Conclusion

Chapter 4: Detection of phytoplankton size structure by remote sensing

Robert J. W. Brewin, Shubha Sathyendranath, Annick Bricaud,
Aurea Ciotti, Emmanuel Devred, Takafumi Hirata, Tihomir S. Kostadinov,
Hubert Loisel, Colleen B. Mouw and Julia Uitz

Introduction

Abundance-based approaches
    Comparison of methods

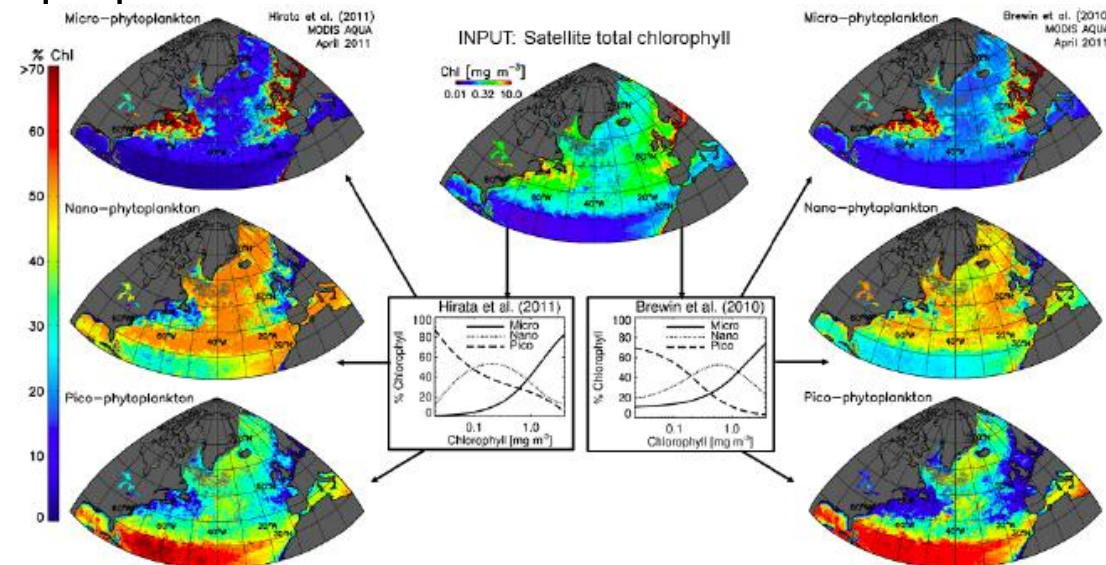Approaches based on spectral optical properties
    absorption-based approaches
        Comparison of methods
    Back-scattering-based methods
        Comparison of methods

Discussion & Conclusion

Chapter 5:
Methods for detecting multiple functional types

Séverine Alvain, Astrid Bracher, Shubha Sathyendranath and others
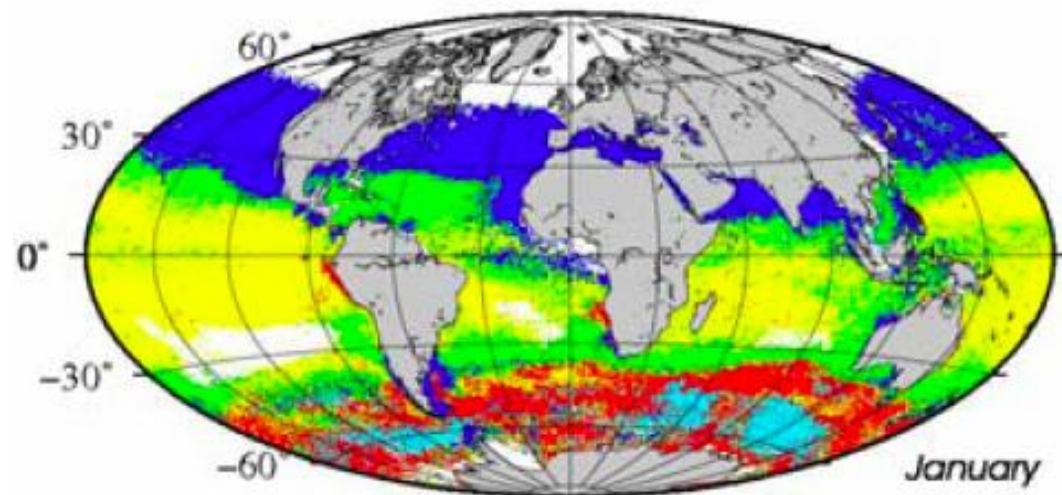
Introduction

Theoretical Bases:

Methods based on spectral reflectance

Differential Optical Absorp

Abundance-based method

Discussion & conclusion

Chapter 6
Concluding Remarks

- PFT products: Observation or inference? Independent?

- What sets the limits on detection of phytoplankton types

- What could improve detection of PFTs?

- Errors in estimates

- What sets the limits on detection of phytoplankton types?

- Linking remote sensing and modelling

- Need for complementary in situ observations

Convincing the Sceptics

Many remain sceptic of ocean-colour PFT products
    "It is not possible"
    "I have read some papers and remain unconvinced"
    "Theoretical studies show you can't detect more than two"

- What is required to convince them of the utility of these products?

- Showing that derived distributions look "reasonable" is not enough

- Rigorous and continued testing is required. But how?

- Can we find the unexpected and verify the finding? (Paraphrasing Ajit)