Selecting Algorithms and Blending Retrievals in Coastal Waters

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MODIS Science Team Meeting
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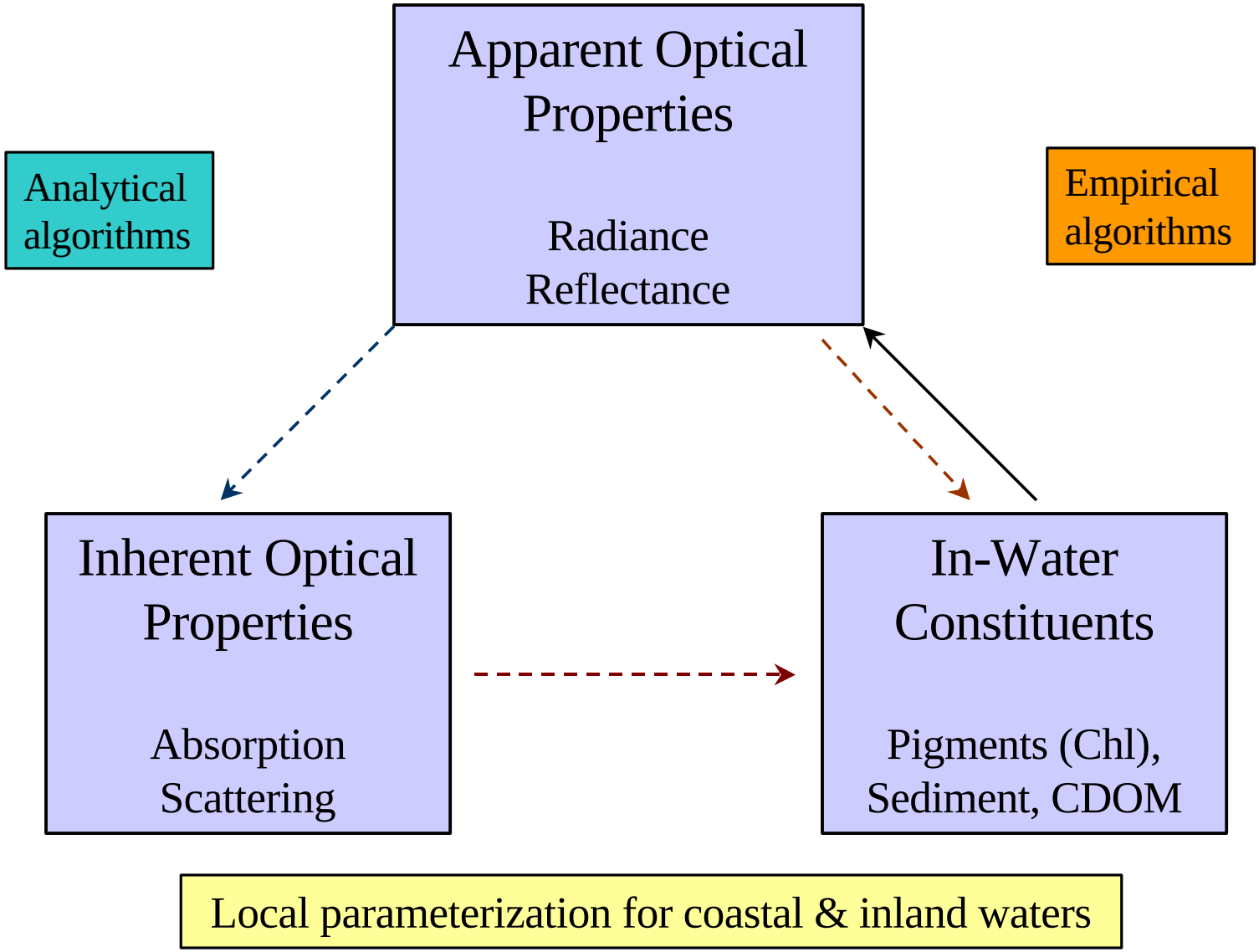
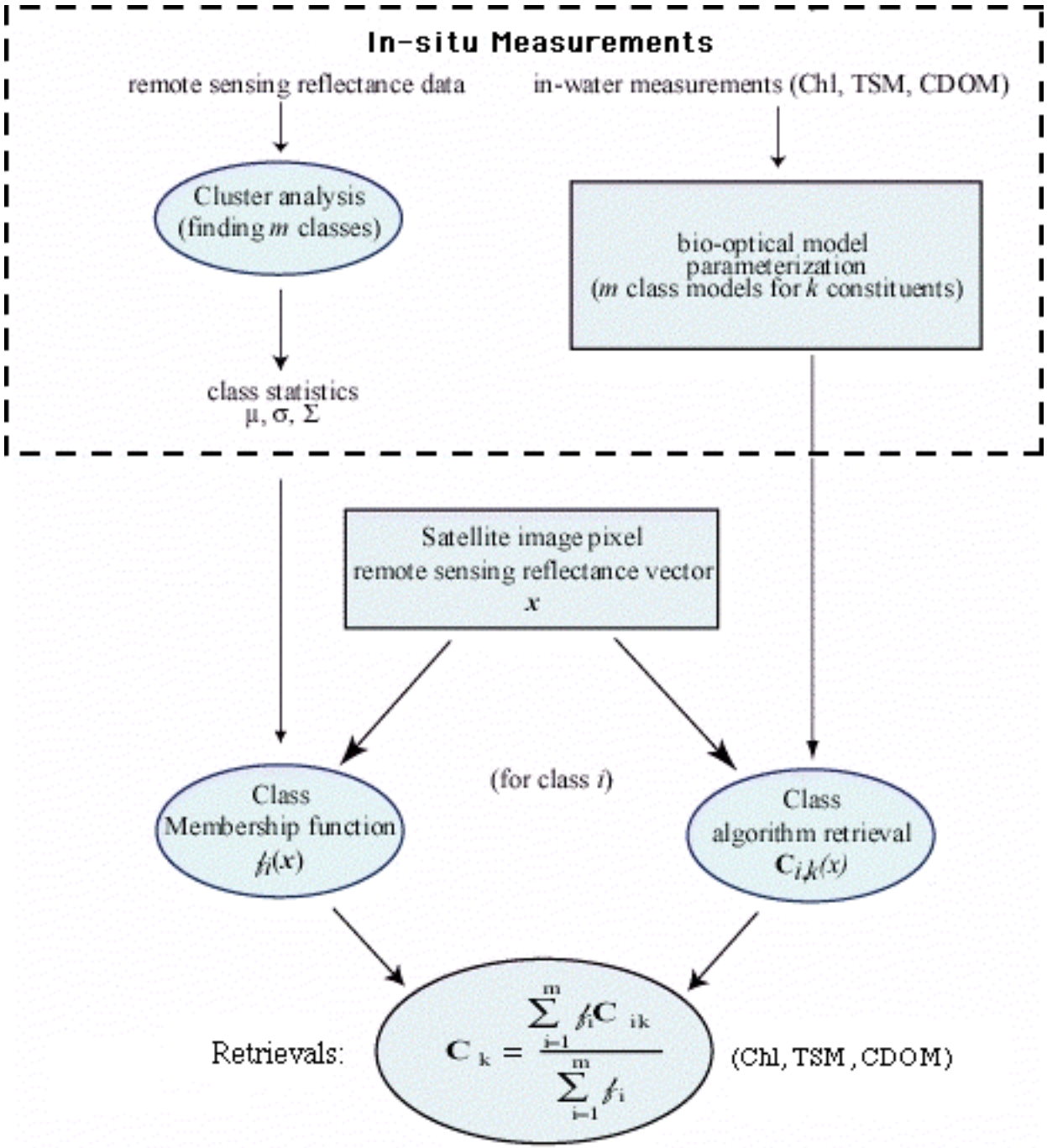
Collaborators and Team Members

- Timothy Moore
- Hui Feng
- Mark Dowell

"*A Fuzzy Logic Classification Scheme for Selecting and Blending Satellite Ocean Color Algorithms*"
(submitted TGARS, January 2000)

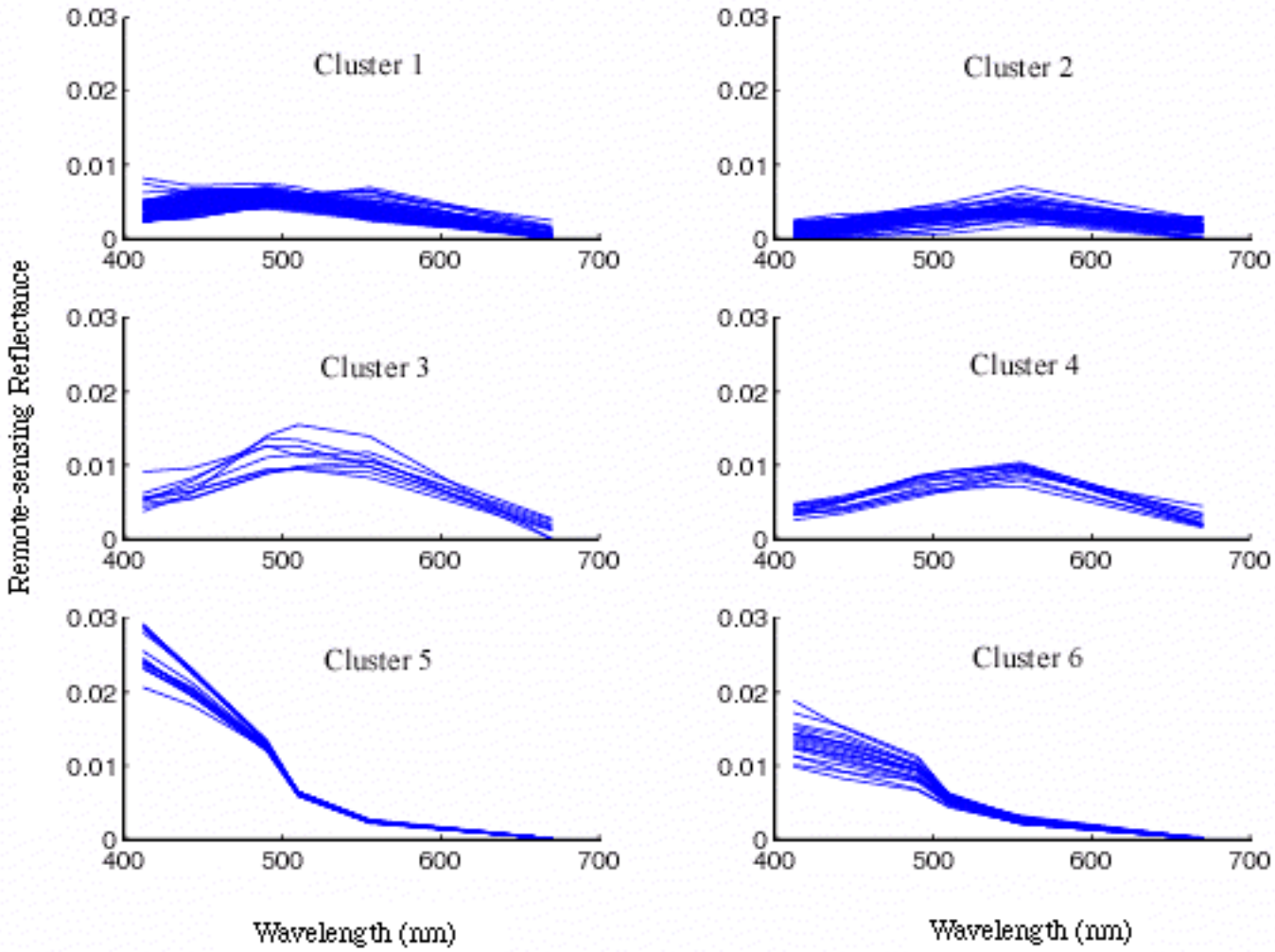
First MODIS Image: Mississippi Delta

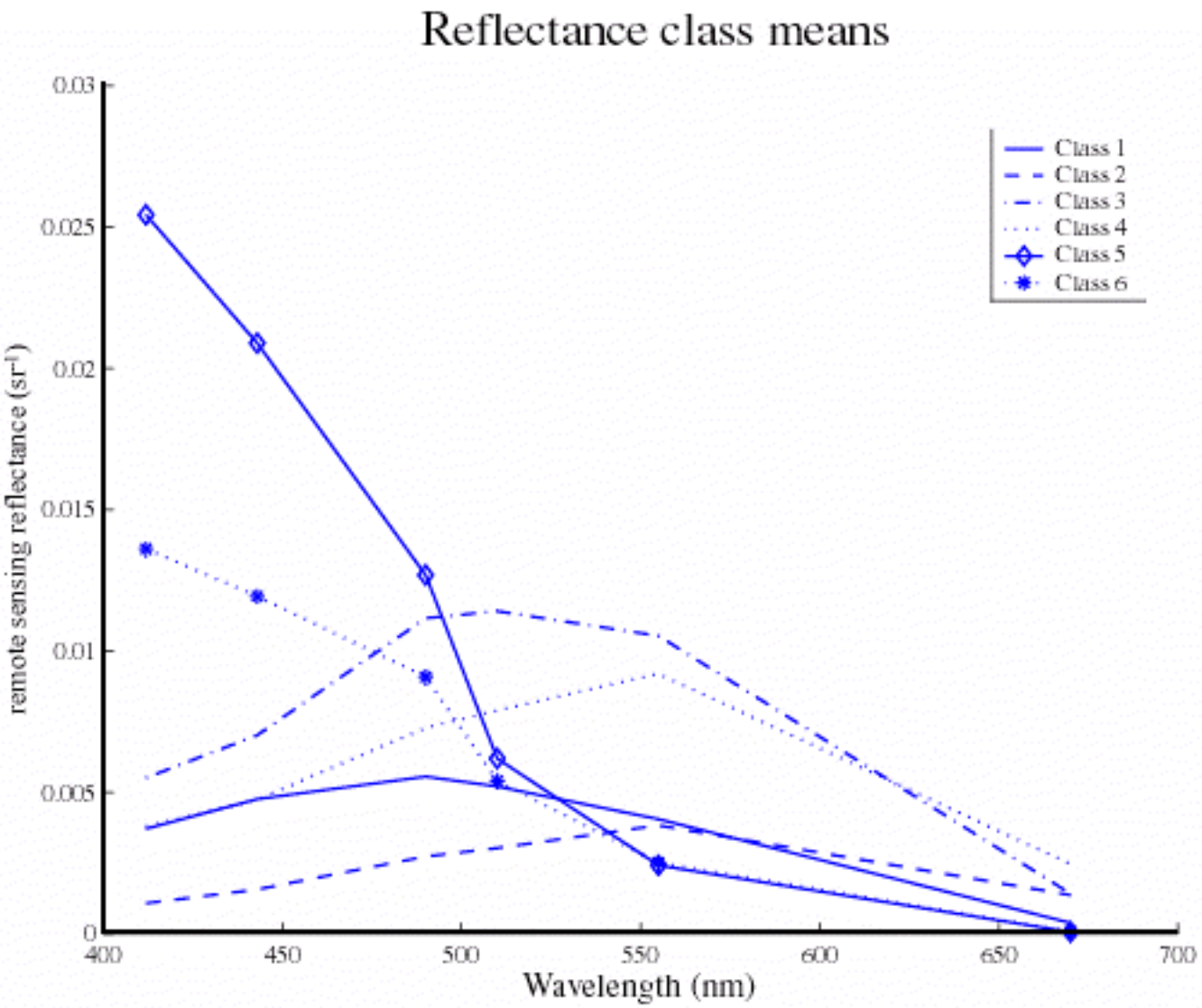

Apparent Optical Properties
Radiance
Reflectance
Analytical algorithms
Empirical algorithms
Inherent Optical Properties
Absorption
Scattering
In-Water Constituents
Pigments (Chl), Sediment, CDOM
Local parameterization for coastal & inland waters

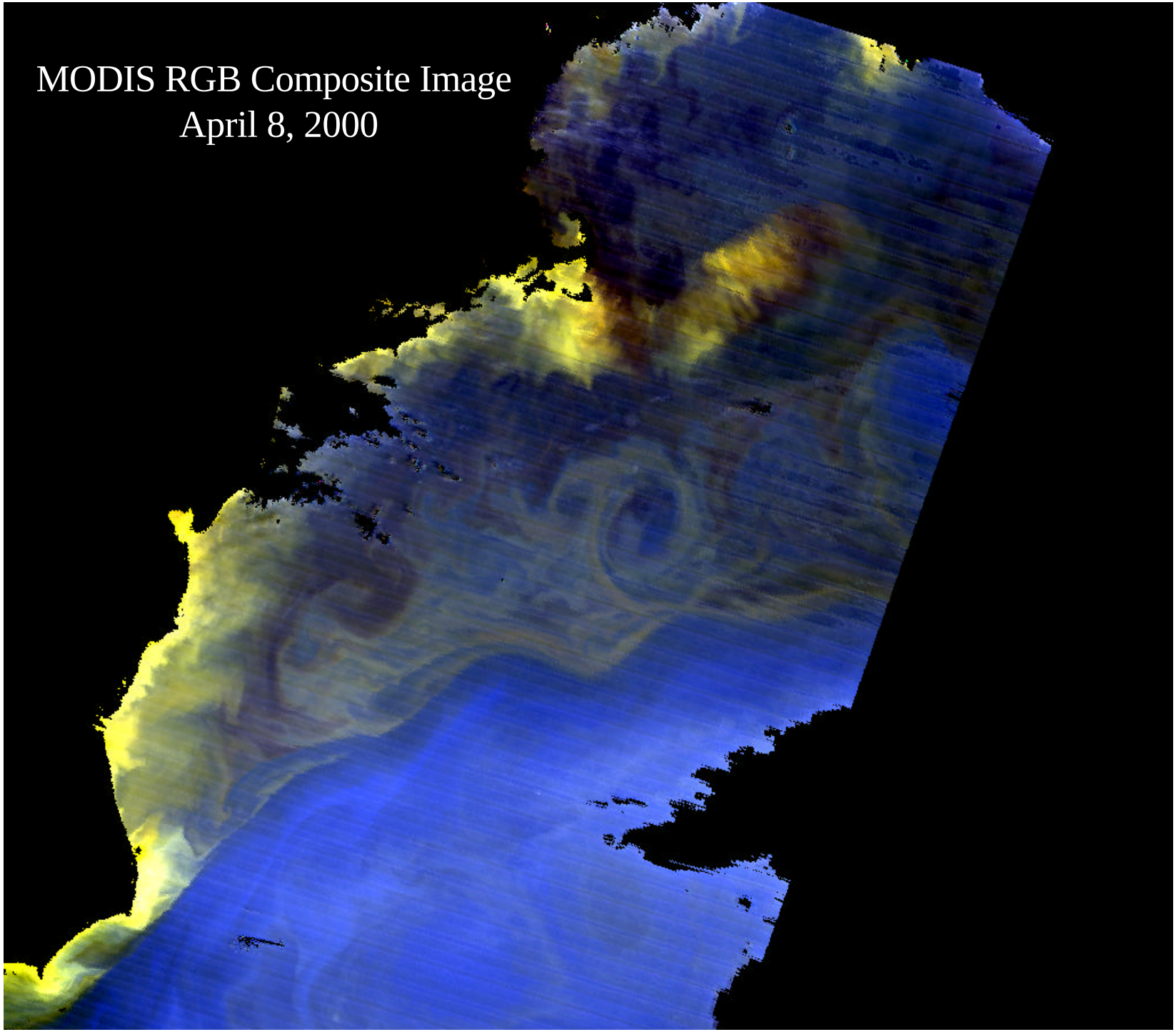

In-situ Measurements
remote sensing reflectance data
in-water measurements (Chl, TSM, CDOM)
Cluster analysis
(finding m classes)
bio-optical model
parameterization
(m class models for k constituents)
class statistics
μ, σ, Σ
Satellite image pixel
remote sensing reflectance vector
x
(for class i)
Class
Membership function
fi(x)
Class
algorithm retrieval
Ci,k(x)
Retrievals:
$C_k = \frac{\sum_{i=1}^{m} f_i C_{ik}}{\sum_{i=1}^{m} f_i}$
(Chl, TSM, CDOM)

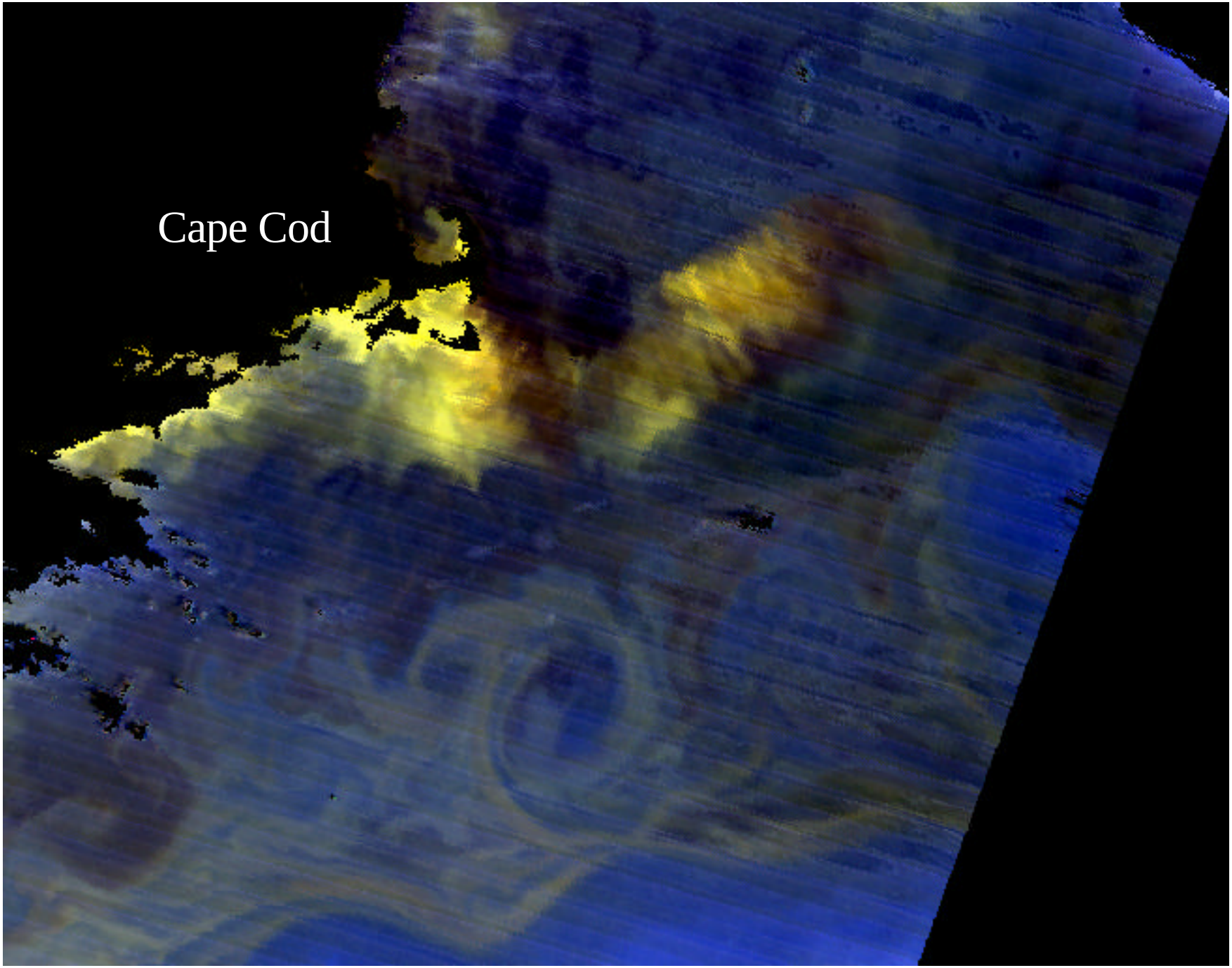
Unsupervised Classification of In-situ Reflectance Data

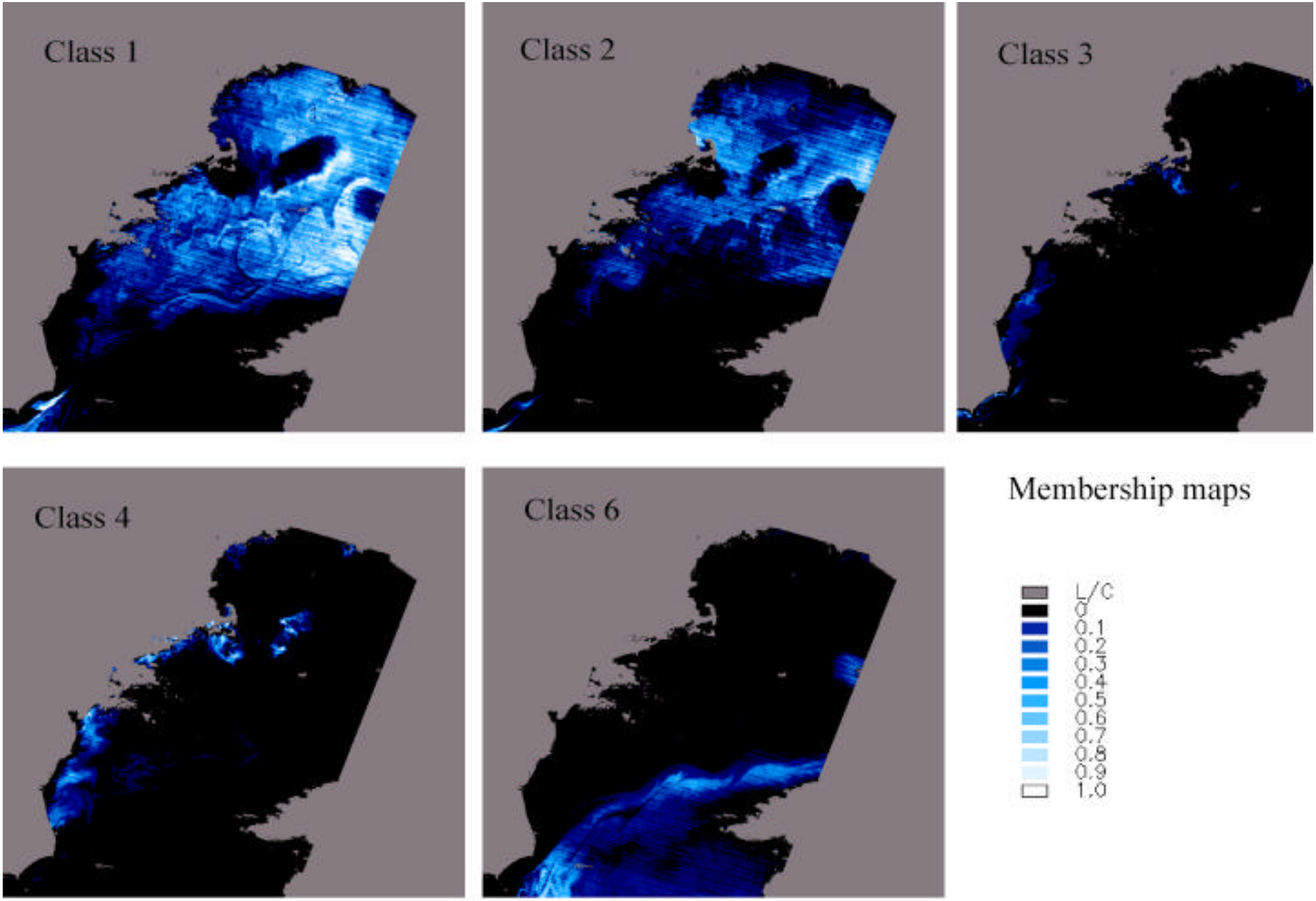
(159 measurements from Northwest Atlantic Ocean)




Reflectance class means
Class 1
Class 2
Class 3
Class 4
Class 5
Class 6
remote sensing reflectance (sr⁻¹)
0.03
0.025
0.02
0.015
0.01
0.005
0
400
450
500
550
600
650
700
Wavelength (nm)

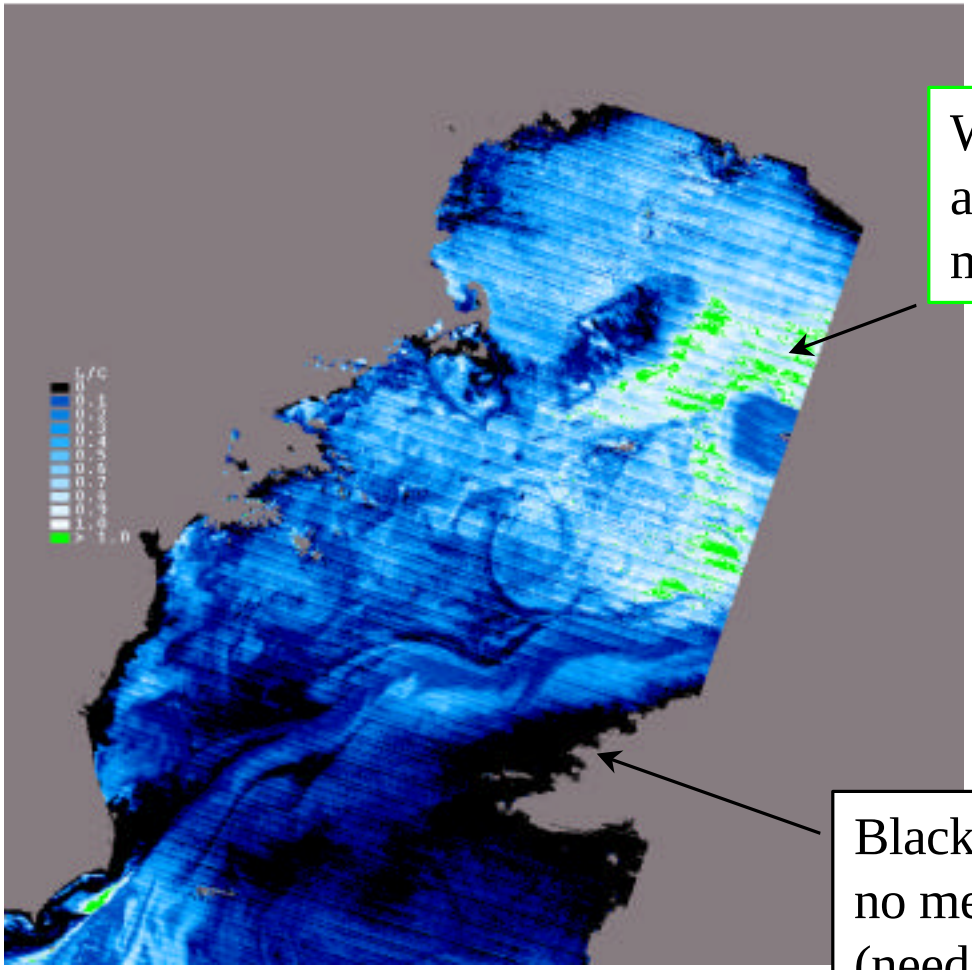

MODIS RGB Composite Image
April 8, 2000


Cape Cod



Memberships range from 0 to 1 indicating likelihood of belonging to a class

Sum of Membership Functions



White & green areas indicate high membership

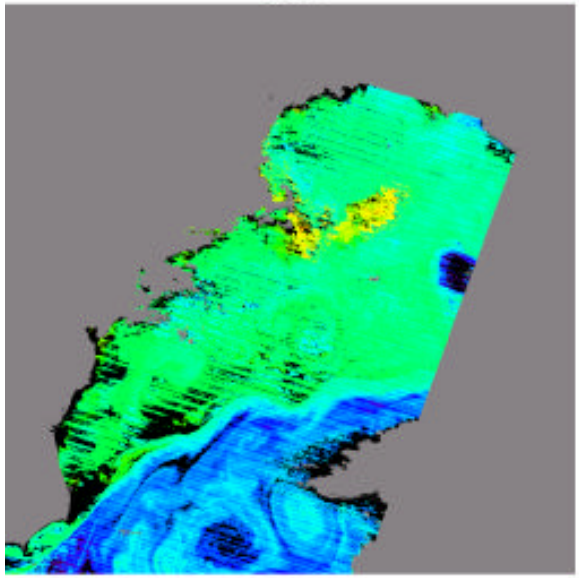
Black areas indicate no membership (need more data)

Retrieval of constituent C is weighted

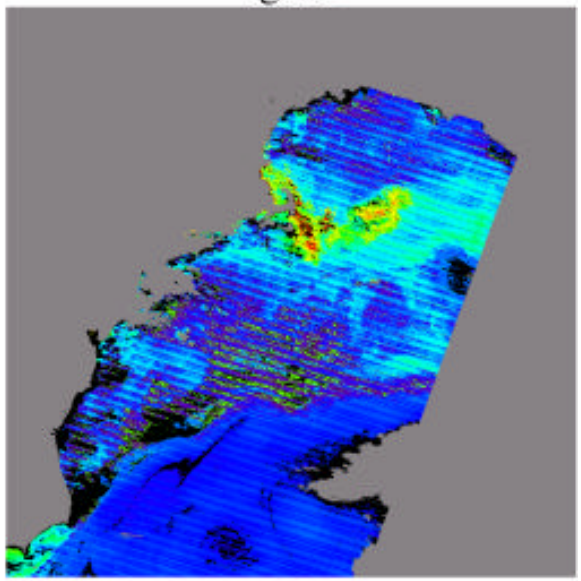
$$C = \frac{\sum_j f_j C_j}{\sum_j f_j}$$

of retrievals from class-specific algorithms, C_j, where weights are based on memberships, f_j.

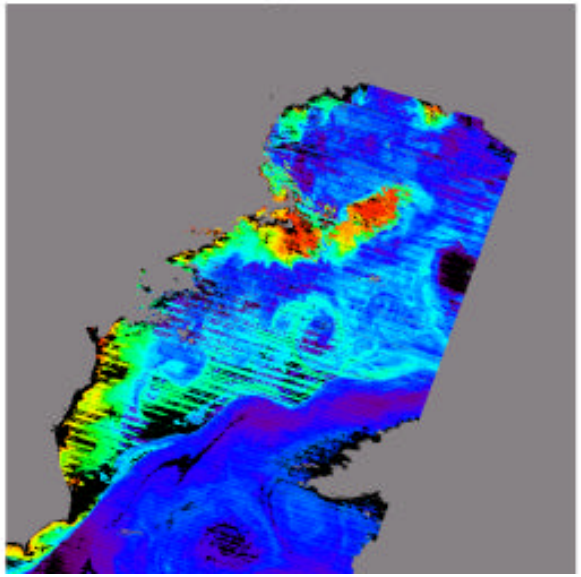
Chl



ag375



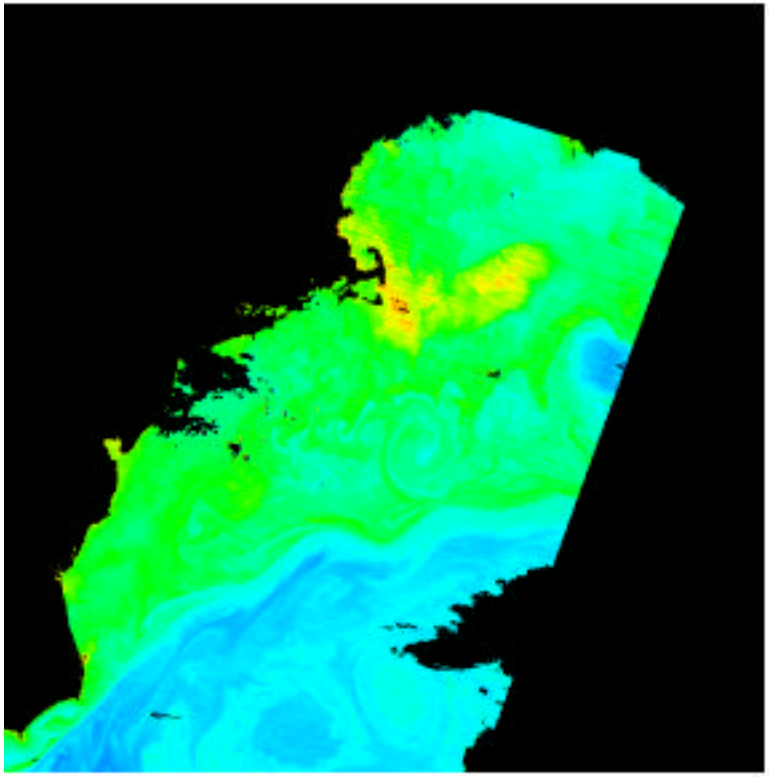
bbp550



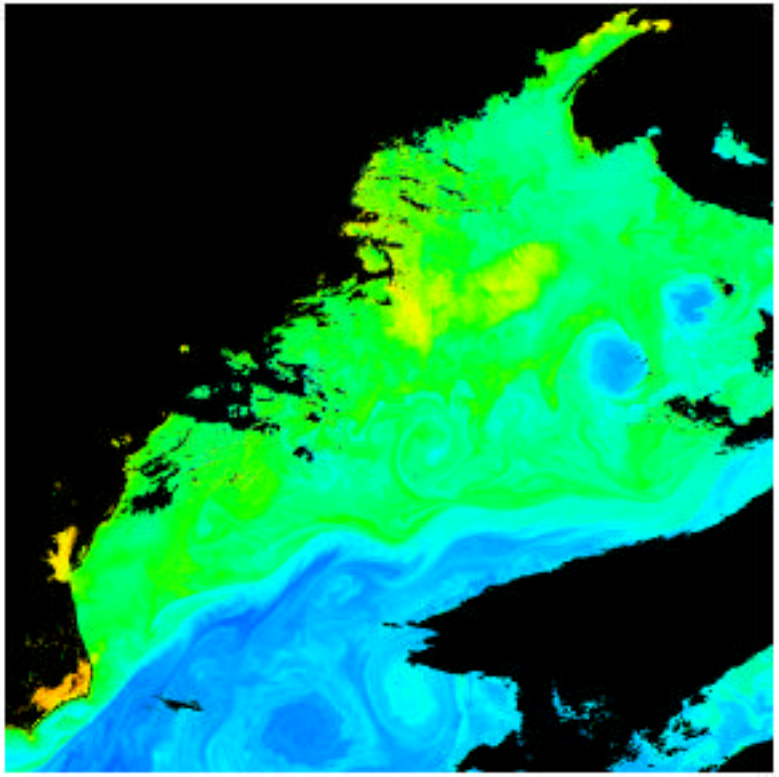
Blended retrievals from inversion algorithms
8 April MODIS Scene

Comparison of MODIS and SeaWiFS Chlorophylls

MODIS - Chl (OC2)



SeaWiFS - Chl (OC2)



Data were acquired on 8 April 2000, and the
same chlorophyll algorithm (OC-2) was applied in both images.