Selecting Algorithms and Blending Retrievals in Coastal Waters

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MODIS Science Team Meeting
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Collaborators and Team Members

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“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

Inherent Optical Properties
- Absorption
- Scattering

In-Water Constituents
- Pigments (Chl), Sediment, CDOM

Analytical algorithms

Empirical algorithms

Local parameterization for coastal & inland waters
In-situ Measurements

remote sensing reflectance data

Cluster analysis (finding $m$ classes)

class statistics $\mu, \sigma, \Sigma$

bio-optical model parameterization ($m$ class models for $k$ constituents)

Satellite image pixel remote sensing reflectance vector $x$

Class Membership function $f_i(x)$

Class algorithm retrieval $C_{ik}(x)$

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

$$C = \frac{\sum_j f_j C_j}{\sum_j f_j}$$
Blended retrievals from inversion algorithms 8 April MODIS Scene
Comparison of MODIS and SeaWiFS Chlorophylls

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