

Case 2 IOP and Associated Constituent Concentration

- **Population**
- **Marine Services**
- **Climate Change**
- **Greatest Uncertainty**

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Why constituent concentration?

- Ecological significance
- Economic significance
- Effect resource policy decisions
- Define water quality standards

Why IOPs?

- Functions of constituent concentration
- Define existing ecological conditions
- Drive ecological (economic?) forecast models



Inversion Approaches

Empirical

- Higher Uncertainty
- Computationally Cheap
- Product-Specific

Spectral Mixture

- *Mertes et al., 1993*

Band Ratio

- *Morel & Prieur, 1977*

Line Height

- *Neville & Gower, 1977*

Principle Components

- *Doerffer & Murphy, 1989*

Neural Network

- *d'Alimonte & Zibordi, 2003*

Hybrid Approaches

- Based in Theory
- Informed by Observations
- Computationally Efficient

Semi-Analytical

- *Lee et al., 2002*

Neural Network

- *Schiller & Doerffer, 1993*

RT-Based

- Lower Uncertainty
- Computationally Expensive
- More Informative

Spectral Matching

- *Doerffer & Fischer, 1994*

Linear Matrix

- *Lyon & Hoge, 2006*

Spectral Look-Up Table

- *Lesser & Mobley, 2007*

**The key to any inversion
approach is knowledge
of the environment**

Case II waters involve more independent constituents compared with Case I ...

$$a = a_w + \sum N_{phy} a_{phy}^* + \sum N_p a_p^* + \sum a_g + \sum N_d a_d^*$$

$$b_b = b_{b,w} + \sum N_{phy} b_{b,phy}^* + \sum N_p b_{b,p}^* + \sum N_d b_{b,d}^*$$

Absorption and
Scattering by
Inorganic Particles
(Nanoparticles?)

Absorption by
Terrestrial and
Marine CDOM

Absorption and
Scattering by
Detrital Particles

What do we make progress in Case II waters (5-10 yr.)?

- Is our knowledge of constituent-specific IOPs complete enough?

Algal

Inorganic Sediments (iron oxide?)

Organic sediments (including pollutants)

Colored Dissolved Matter (potentially several different sources)

Bottom reflectance

- How do we build on our knowledge of the environment?

Excluding a constituent that is present – Error of Omission

Expectations about constituents not present – Error of Commission

Bathymetry???

- Are In situ instruments and deployment methods appropriate?

Optimized for expected ranges in constituent concentration

Positioned based on expected correlation scales

Closure tests and other sanity checks

- Does it make sense to construct a Case II SeaBass?

- Natural laboratories?