



MERIS Derived Products

ESA MERIS Meeting 2008

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Introduction:

What we are presently researching..

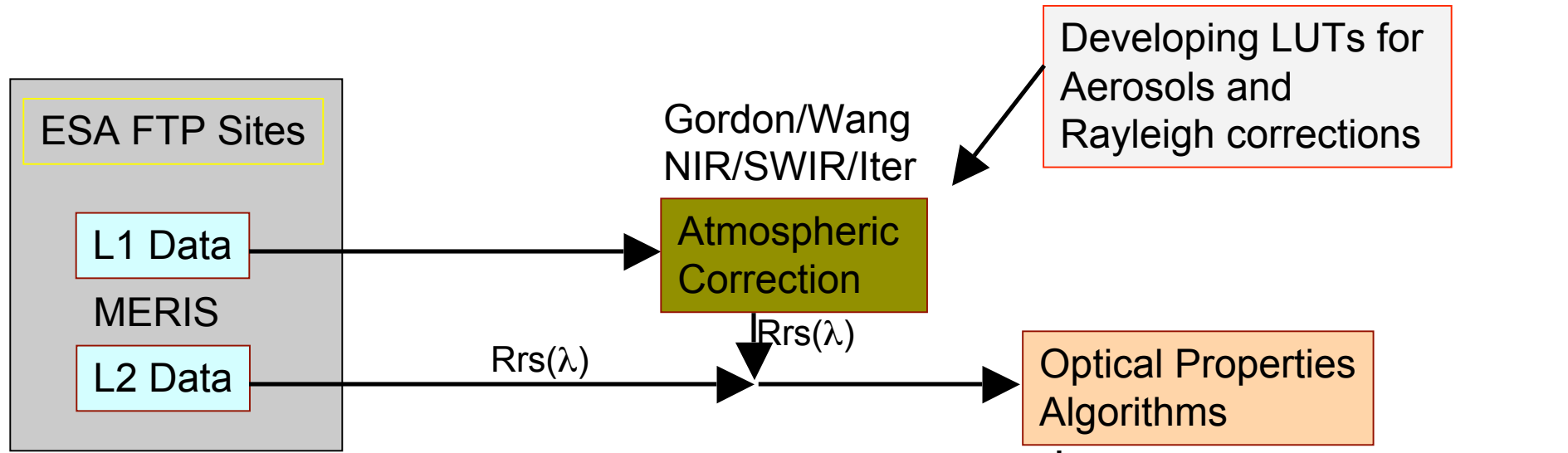
- **Exploiting new applications with MERIS ocean color Imagery**
- **Integrated new algorithms from QAA, Optimization etc. within “Beam” and ocean color software processing.**
- **Defining new applications for:**
 - merging multiple ocean color satellite products
 - Support the temporal gap, (Morning, afternoon variability of bio-optical changes.)
cloud filling gaps..
 - New spectral algorithms for HABS
 - New optimization methods -- bathymetry etc.
- Data Stream – working with the North America data and METOC Halifax.**
– real- time achieve
- **Coordinating with NOAA and NASA – NURC –**
-Welcome coordinating with ESA



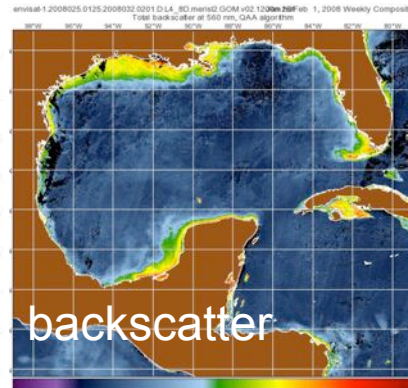
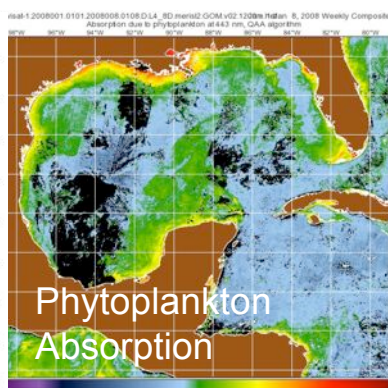
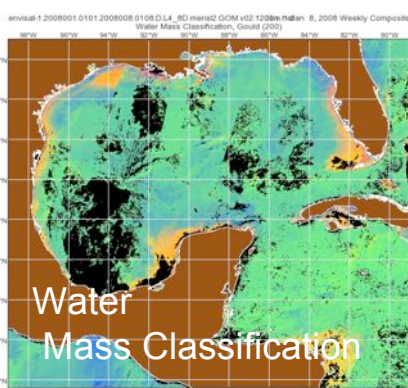
NASA / NOAA / Navy / Universities MERIS / OCM Workshop 2008

- Initial coordination to share resources to plan use MERIS and OCM data.
- Setup 5 regions in US coastal waters.
- Derived MODIS, SeaWiFS and MERIS reflectance data in those areas for all of 2005.
- Mapped data to a common grid for analysis.
- Analysis of match up data on-going.

MERIS Data Processing



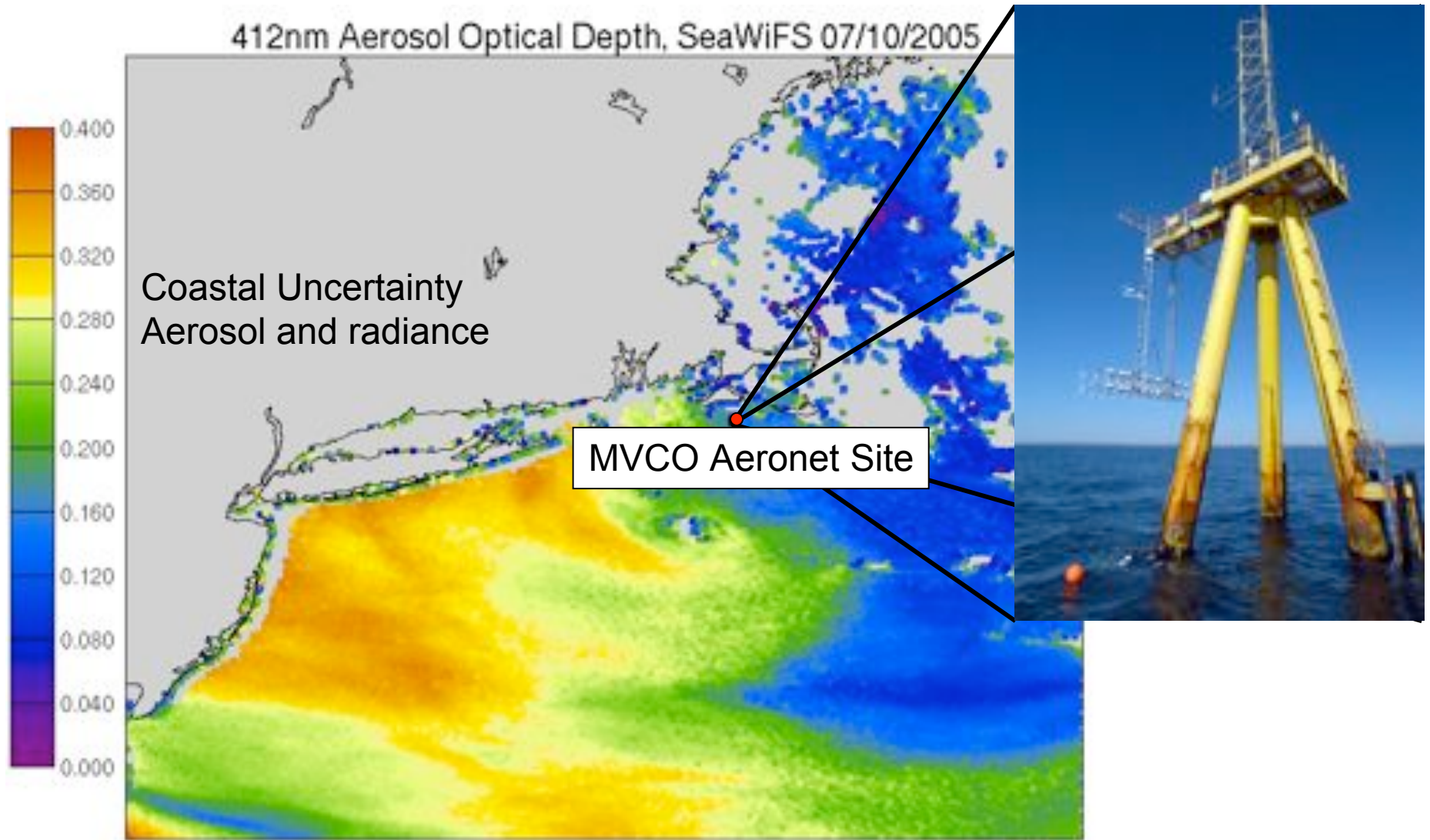
MERIS imagery



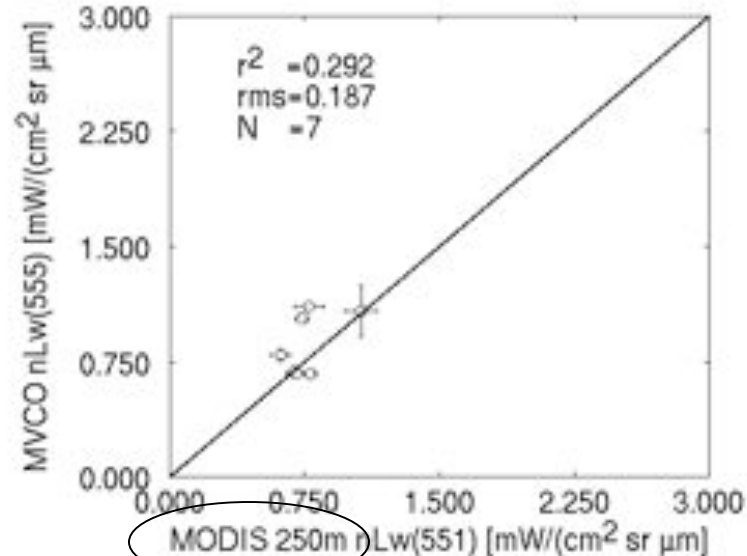
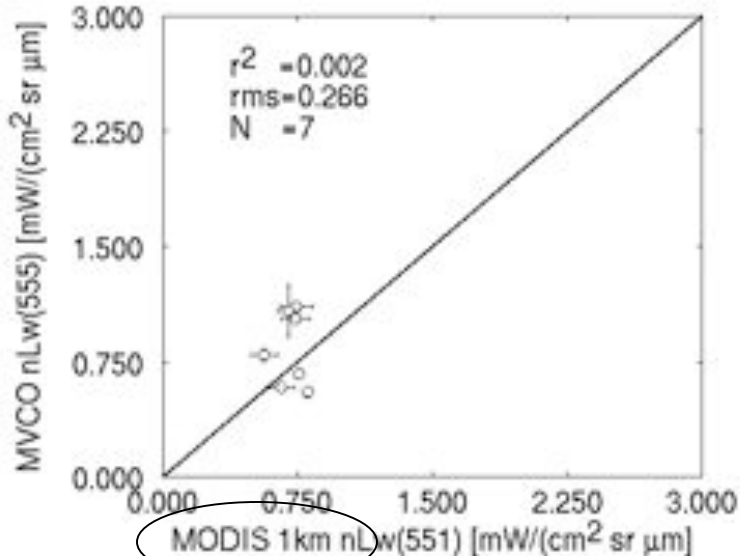
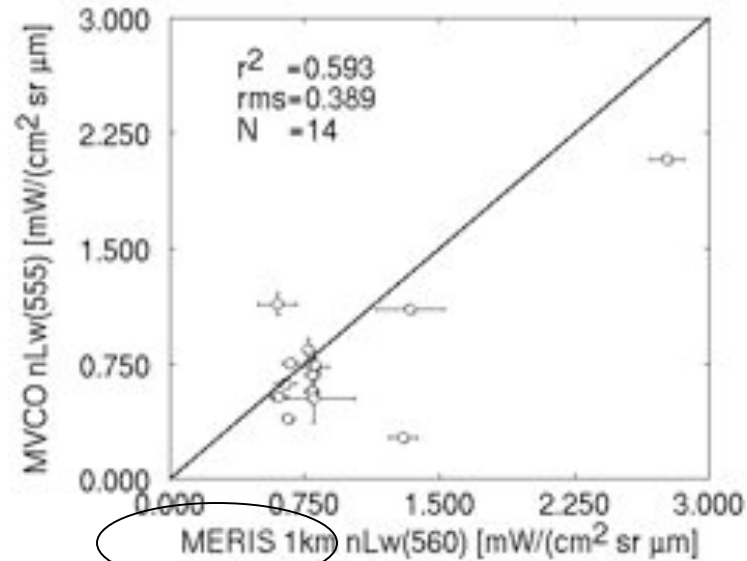
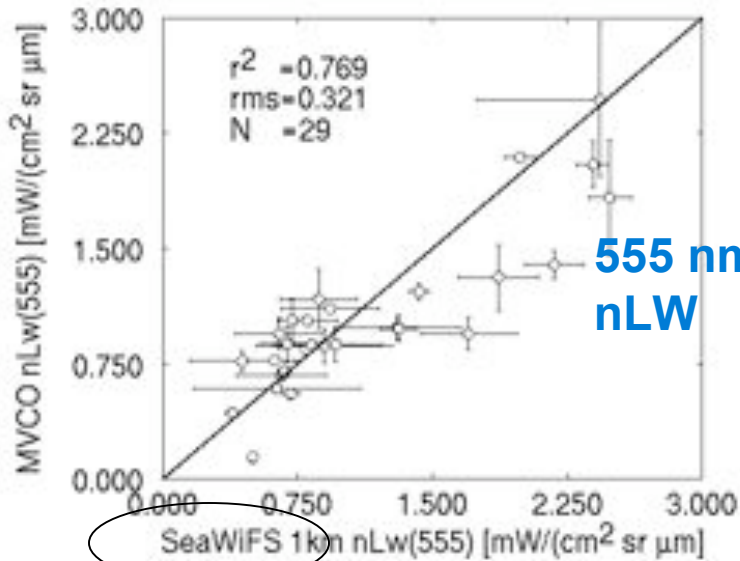
- Phytoplankton absorption
- CDOM/Detritus absorption
- Particulate Backscatter
- Diffuse Attenuation
- Euphotic depth
- Diver visibility
- Laser penetration depth

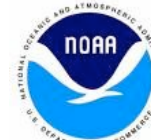


Martha's Vineyard Coastal Observatory



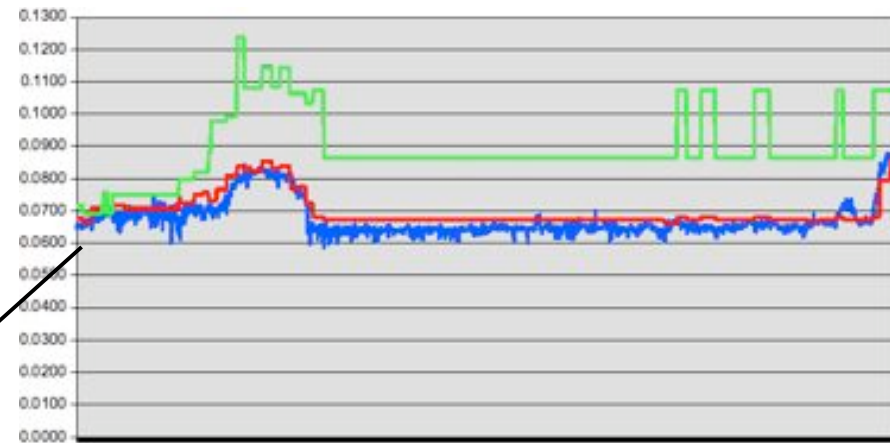
Match-up Examples:





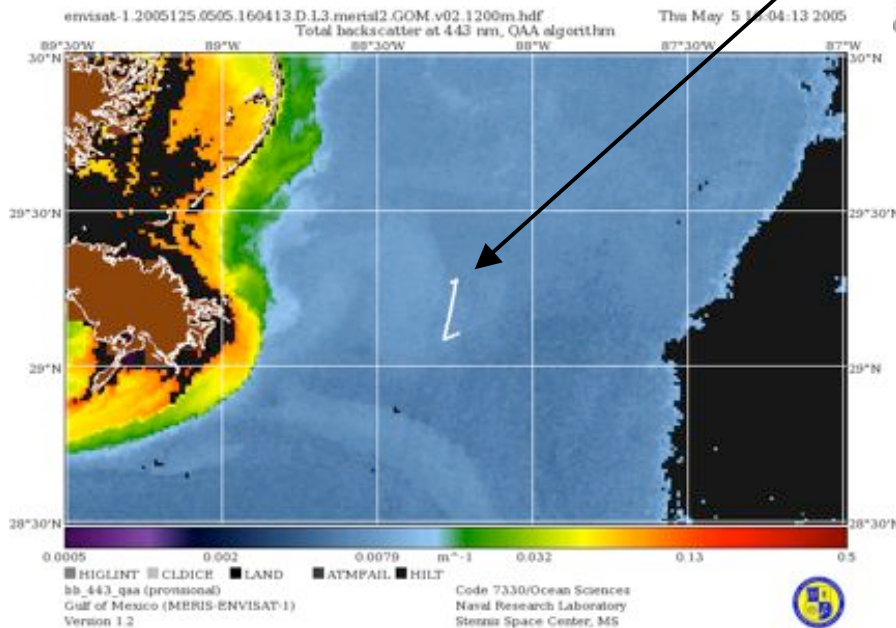
QAA Derived Total Absorption Match-ups

On the 5th of May 2005, NRL collected total absorption (a) from an WetLab's ac9 in flow through mode. The data from this collection are matched with the MERIS.



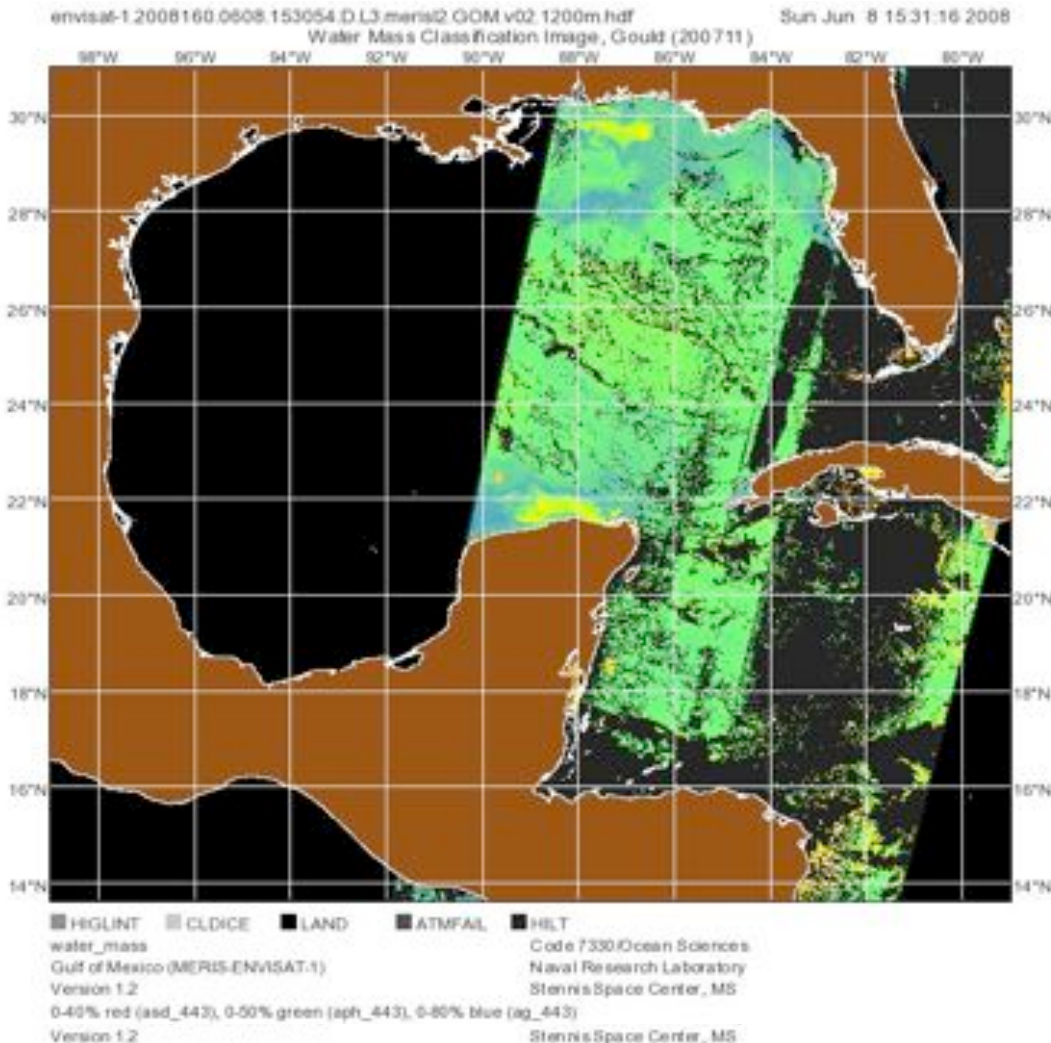
in-situ MERIS MODIS

The blue line shows the insitu a(443). The red lines show the MERIS derived a(443). The green line shows the nearest MODIS scene a(443).





Inherent Optical Products - MERIS / QAA / Water Classification



QAA Total absorption

QAA $a_{dg}(412\text{nm})$

QAA $a_{ph}(443\text{nm})$

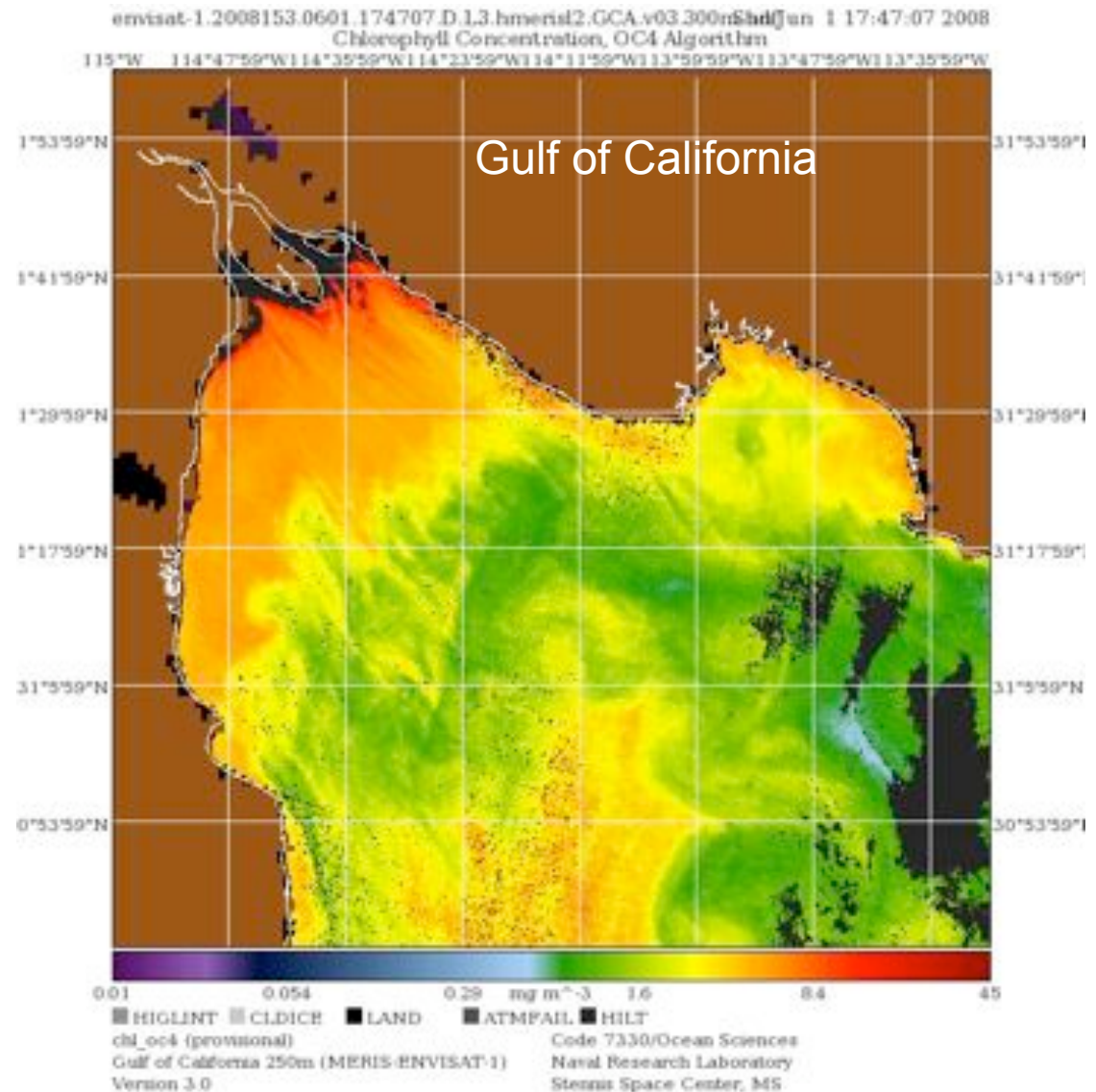
QAA $b_{bp}(560\text{nm})$

Water Mass Classification



300m Resolution Optical Properties

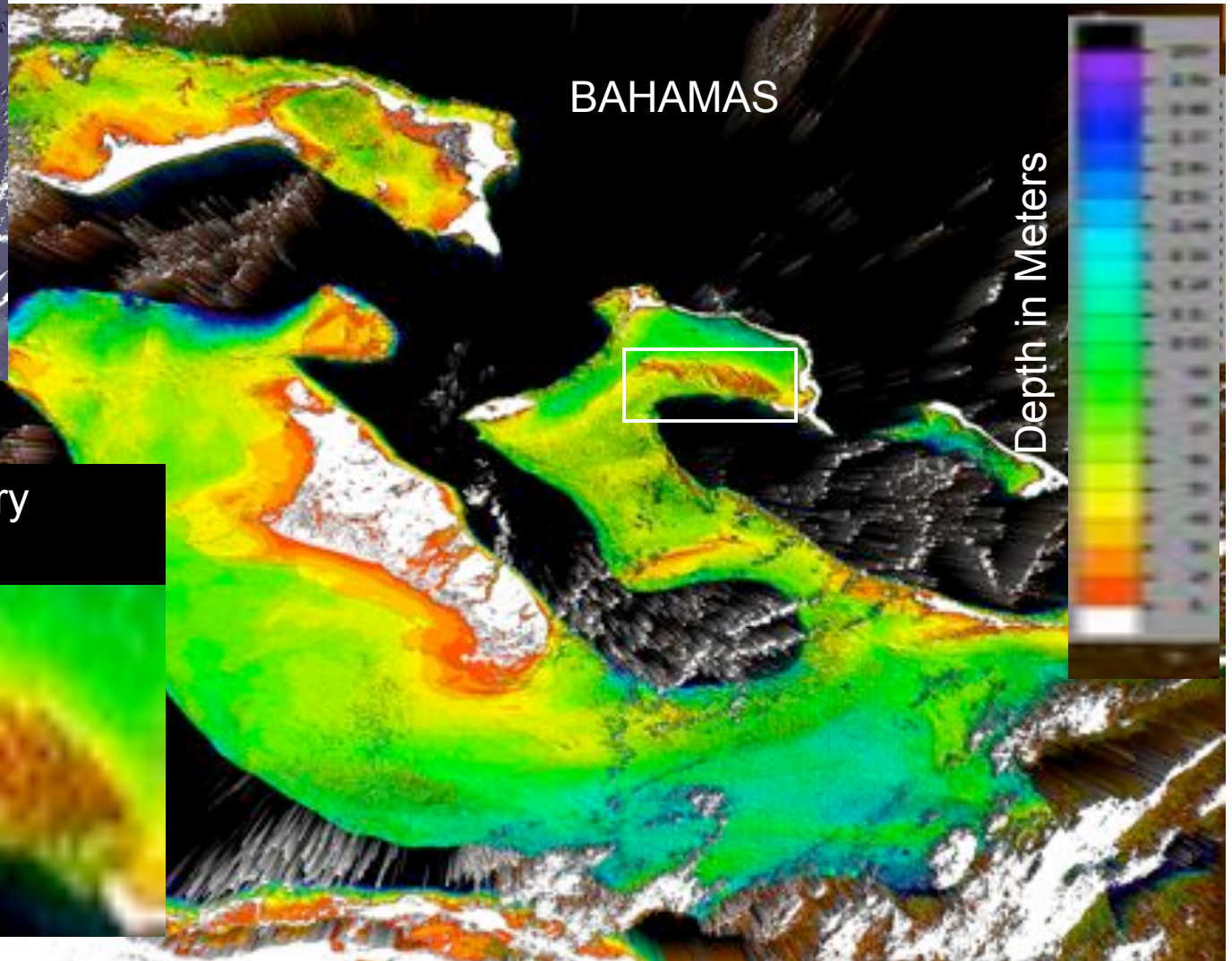
- Total Absorption
- Backscattering
- Diver Visibility
- OC4v4 Chl





Bathymetry - MERIS / Hyperspectral Optimization Process Execution (HOPE)

Bathymetry
Optical properties



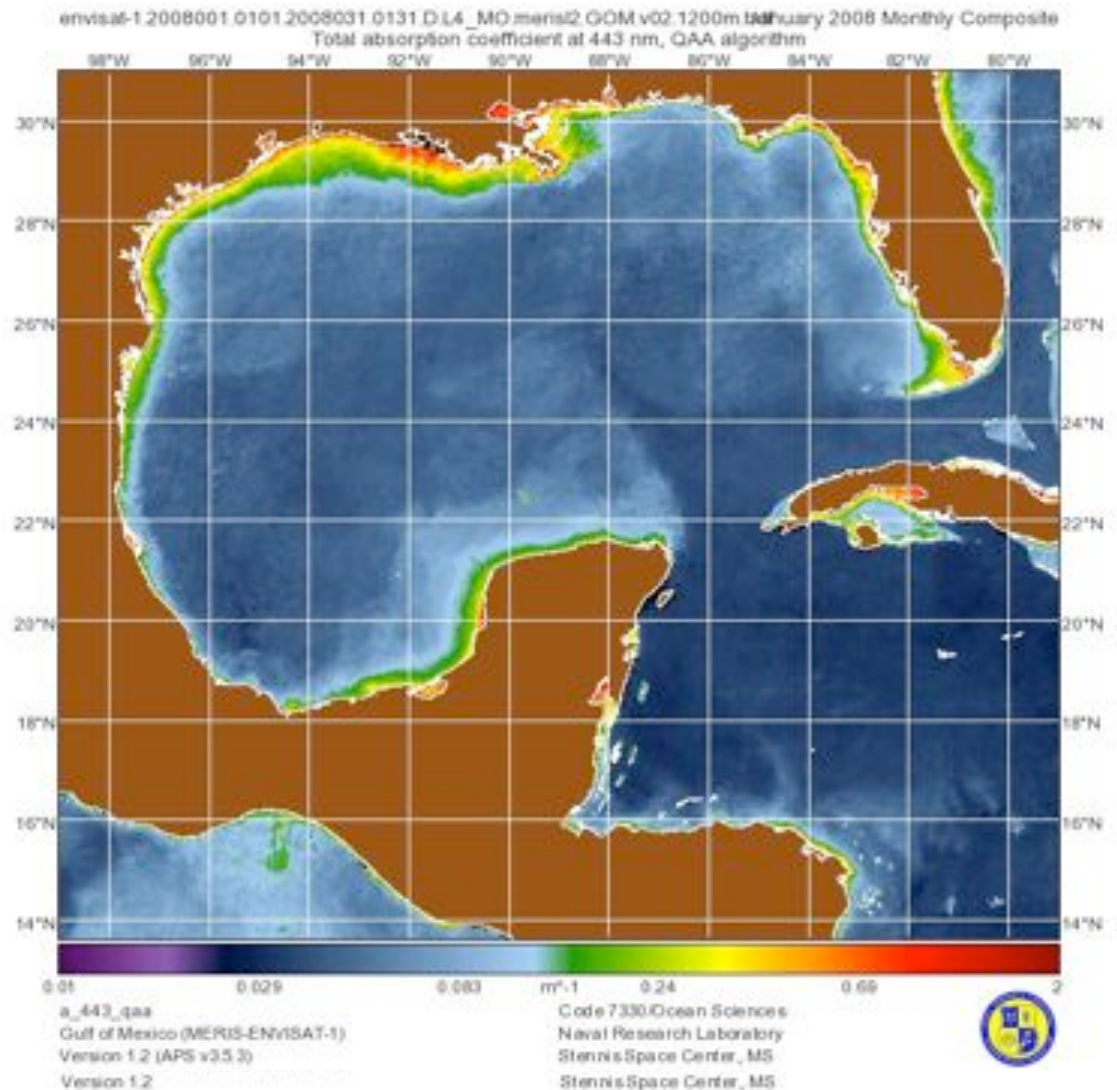
Detailed Bathymetry
~300





MERIS Product Compositing

- QAA total absorption
- Weekly composites
- Monthly composites

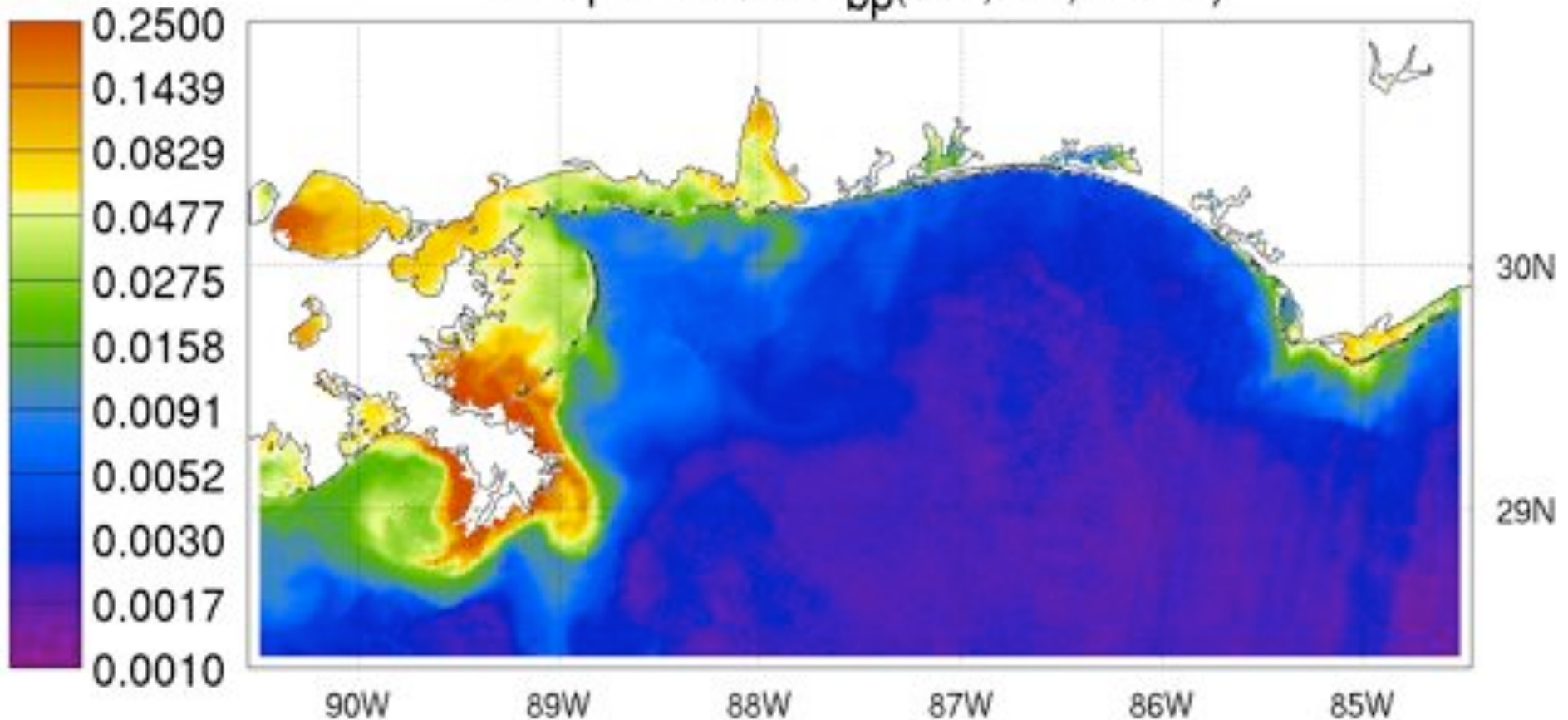




Multiple Sensor Merge MODIS, SeaWiFS, MERIS

[1/m]

Composite QAA $b_{bp}(551,555,560\text{nm})$





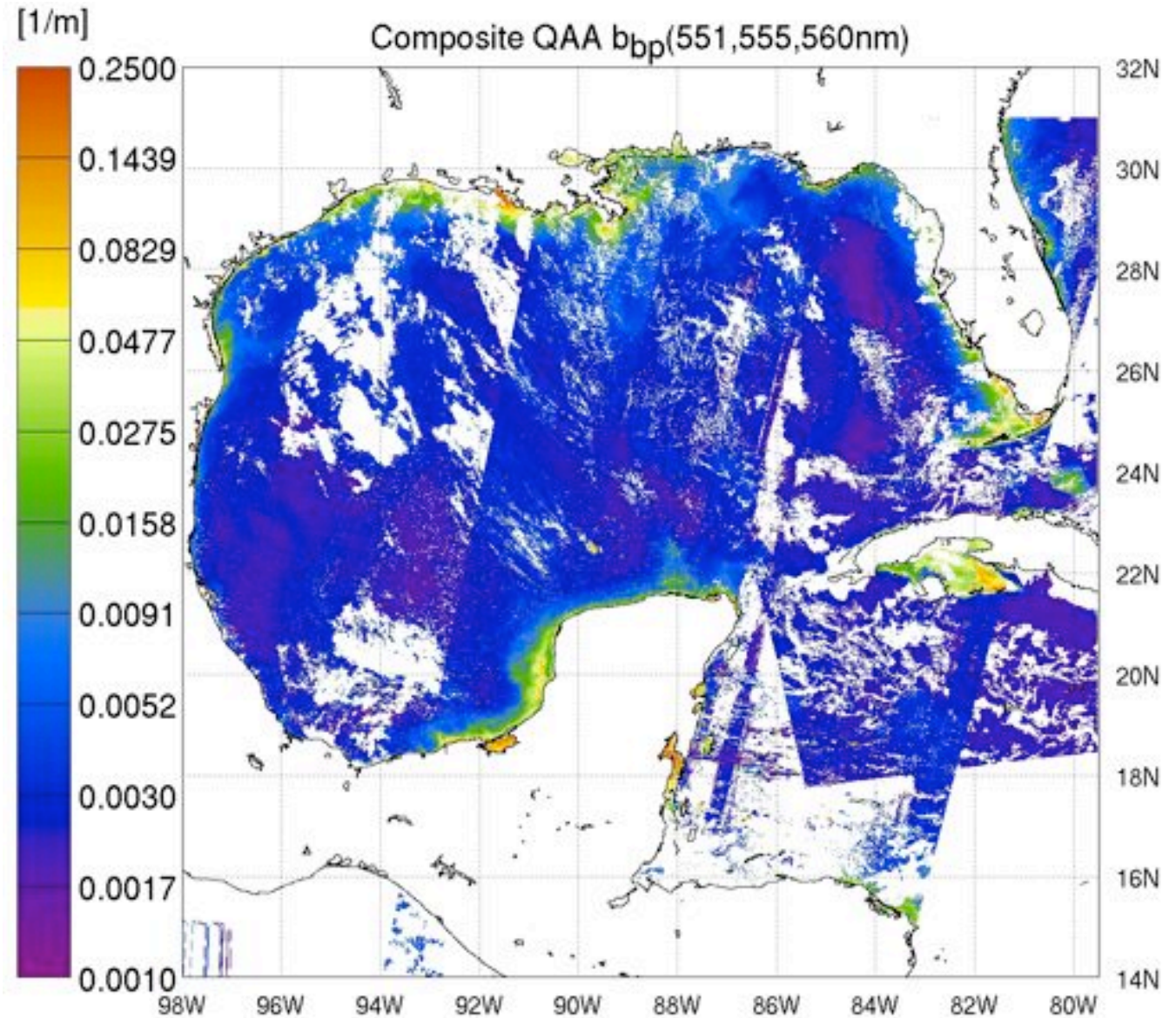
Multiple Sensor Merge MODIS, SeaWiFS, MERIS

MODIS AQUA

SeaWiFS

MERIS

Composite

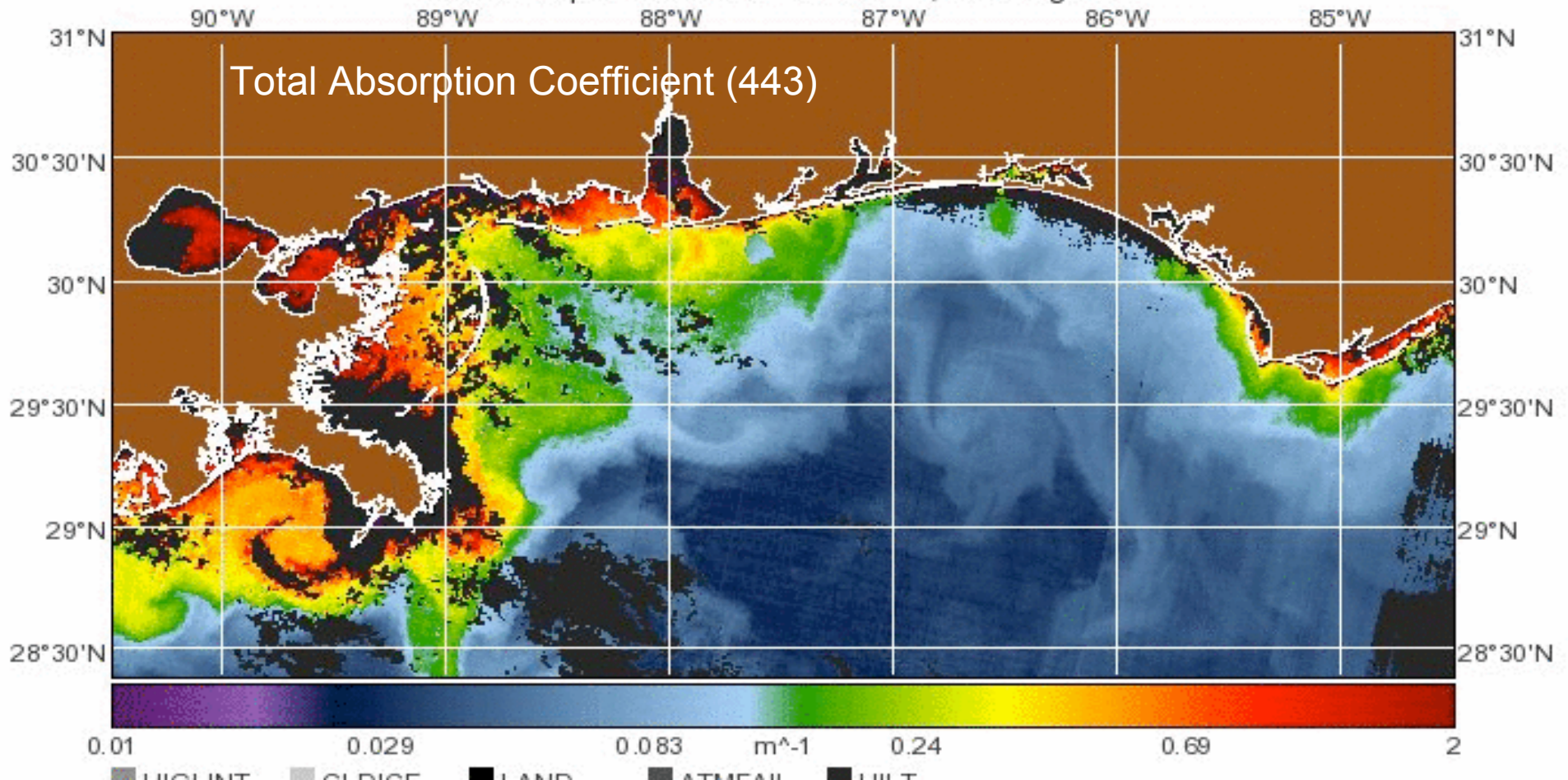


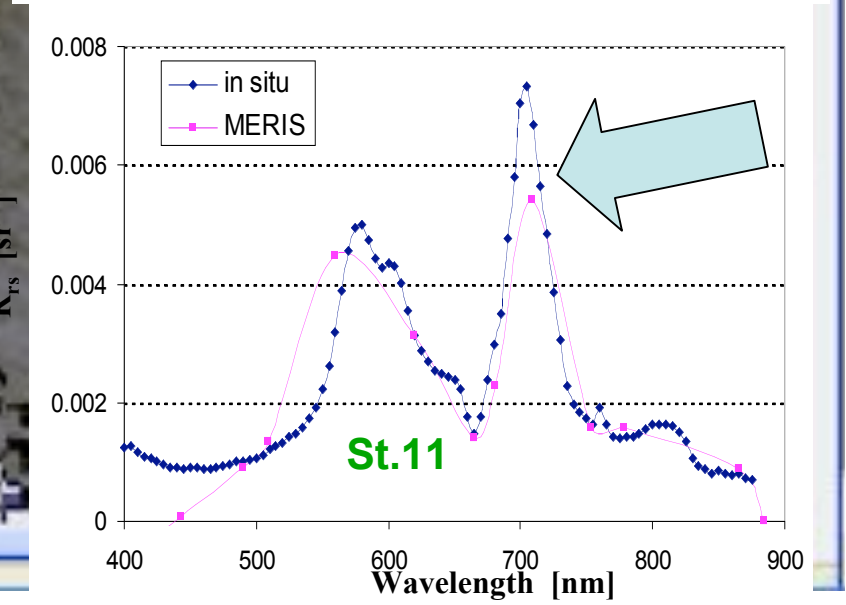
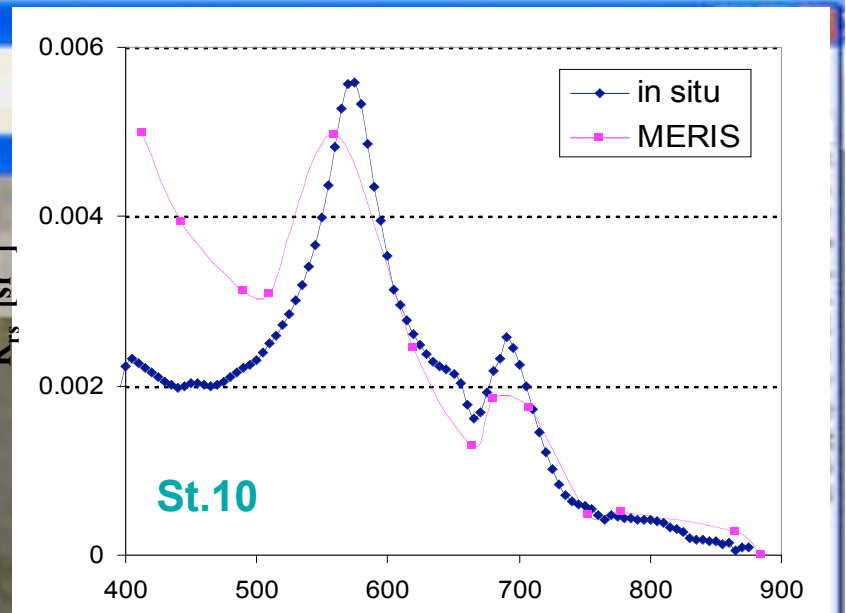
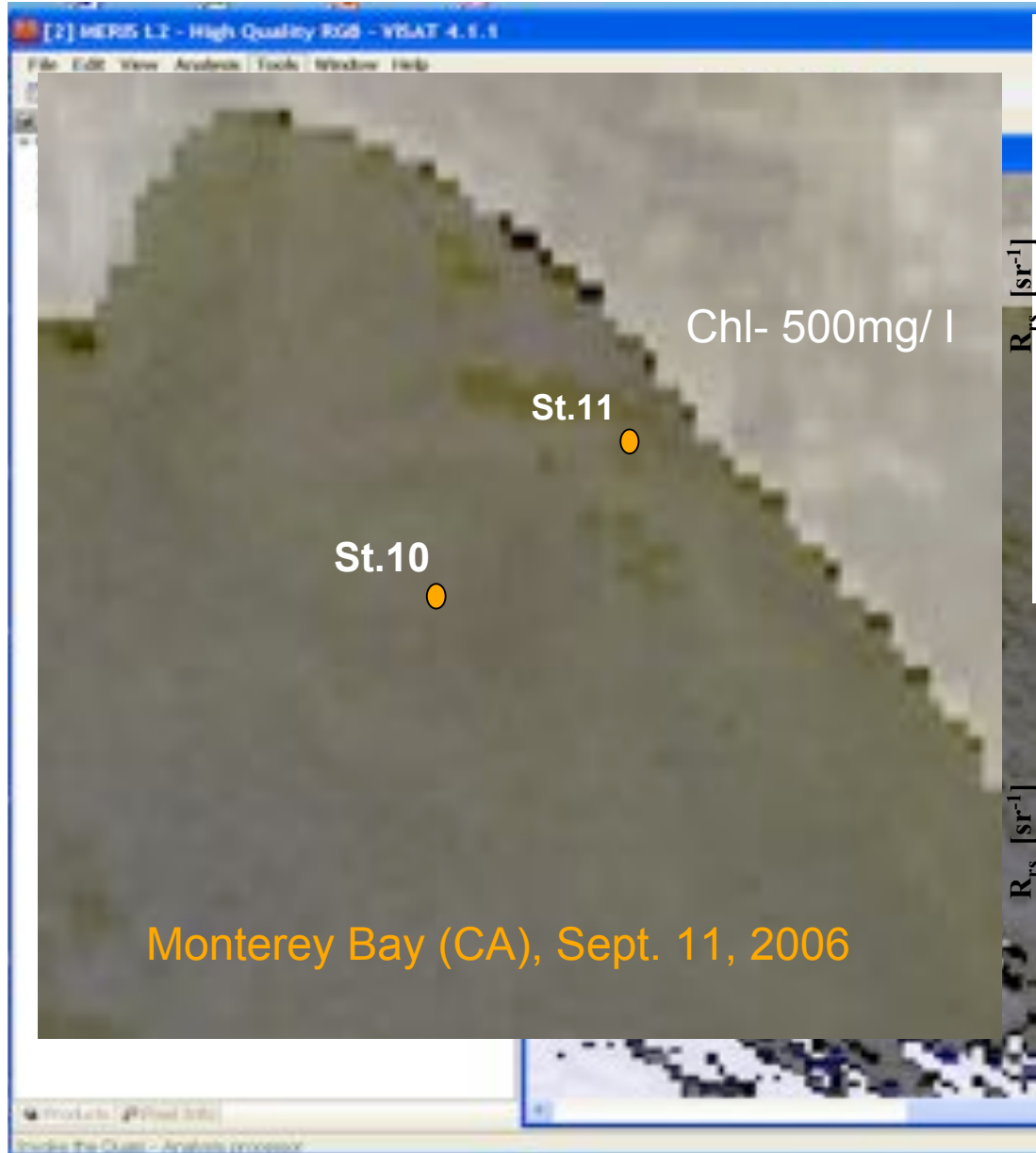


Temporal Analysis Using Multiple Sensors “Feature Tracking”

MERIS 1540, MODIS Aqua 1840, SeaWiFS 1940

envisat-1.2008112.0421.154014.D.L3.merisI2.MSB.v02.1200m.hdf Mon Apr 21 15:40:37 2008
Total absorption coefficient at 443 nm, QAA algorithm





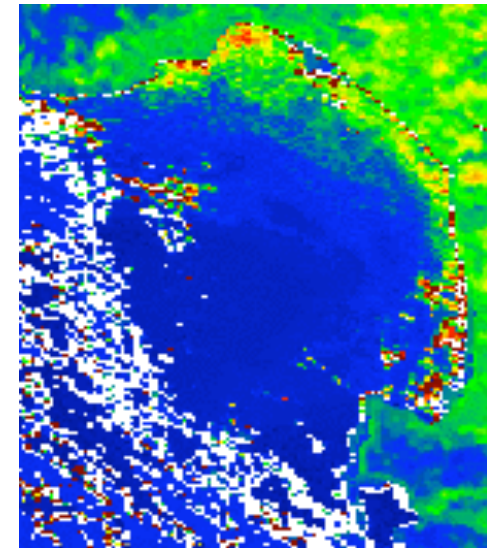
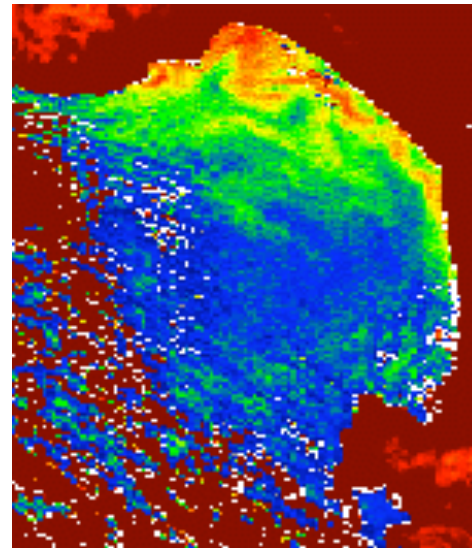
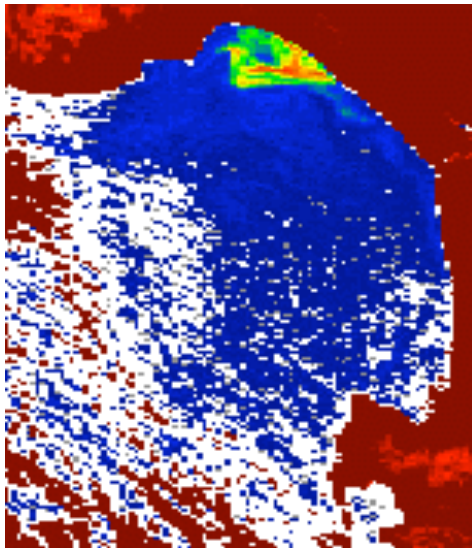


MERIS Sept 11, 2006

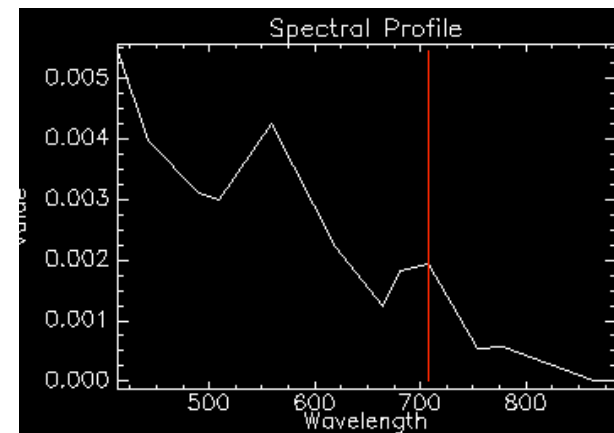
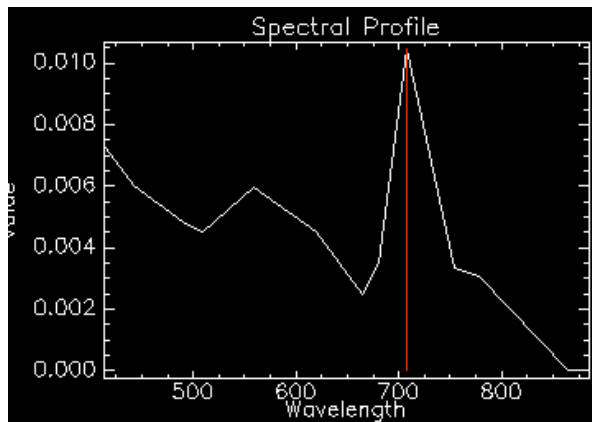
a(443)

Image of Band 9 (709 nm)

bbp(443)



Sample Rrs spectrum





Clarifications

- Beam vs. standard ESA atmospheric correction
- ESA plans for camera characterization / calibration?
- LUTs for aerosols and Rayleigh radiances, (one per camera?)
- Data access / download speed
- 300m US coverage - no ftp access



We like to thank ESA for access to MERIS data.

Thank you for your attention...

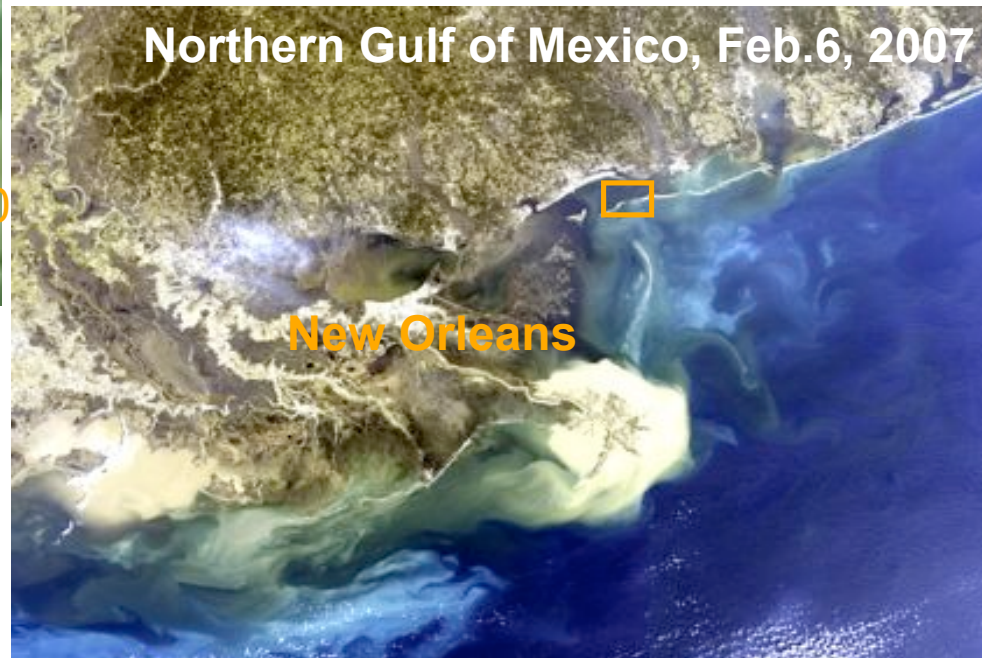
Questions?



Back up slides.....



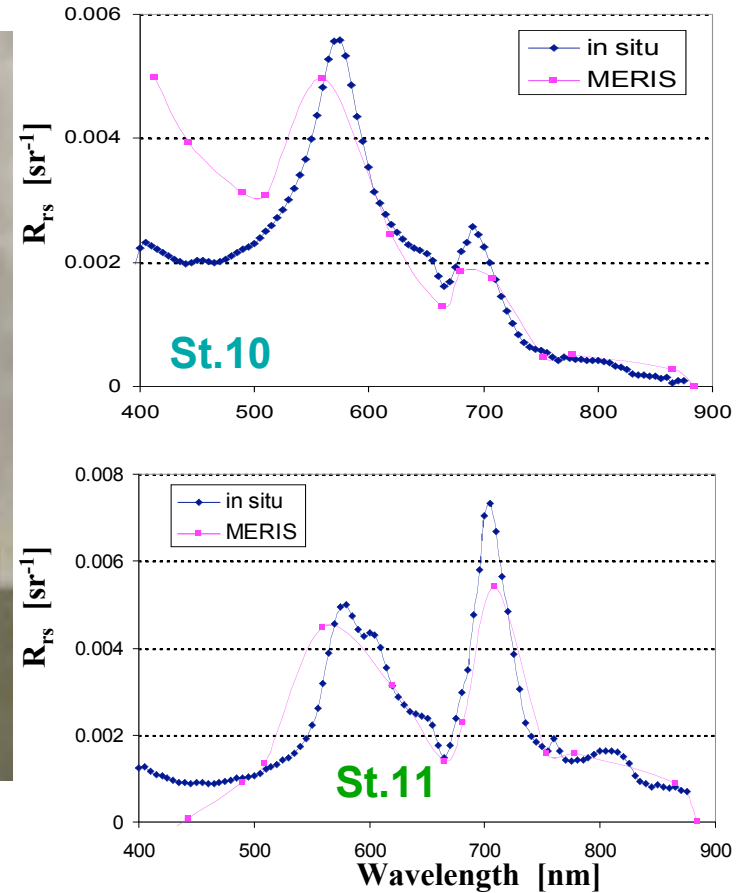
1. Validation of MERIS Reflectance



MERIS remote sensing reflectance (R_{rs}) compared with in situ measurements

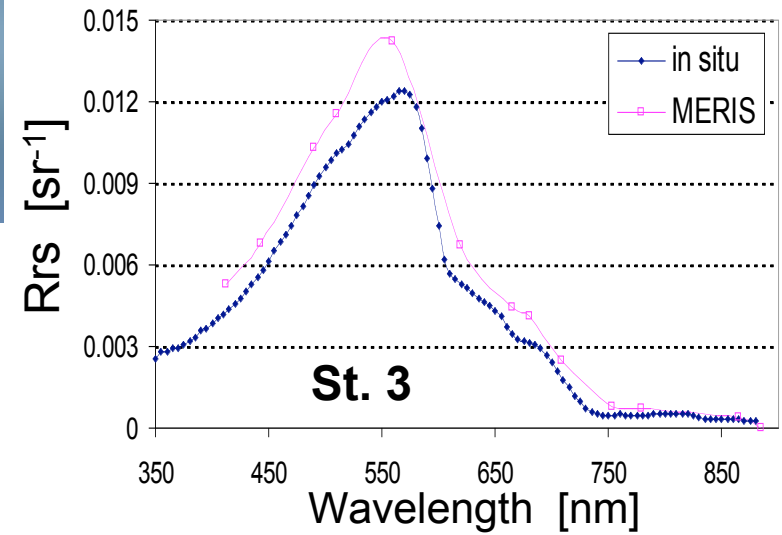
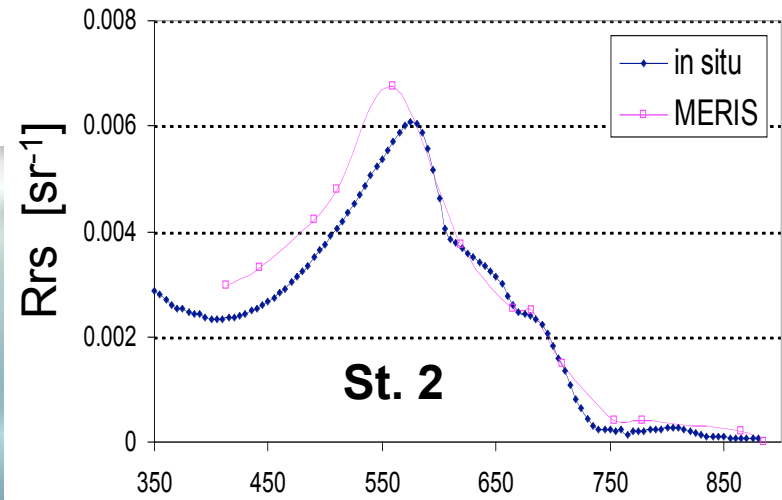


[Chl] was $\sim 500 \text{ mg/m}^3$.



MERIS remote sensing reflectance (R_{rs}) compared with in situ measurements

Northern Gulf of Mexico, Feb.6, 2007






Navy Automated Processing System - APS

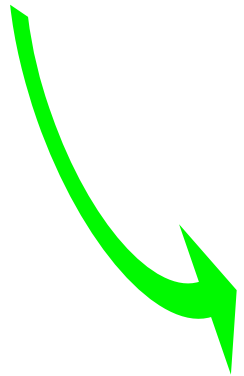
- Job control system for processing satellite data.
- Ingests and generates products from:
 - SeaWiFS (L0 / L1a)
 - MODIS (L0 / L1a)
 - OCM (L1a)
 - MERIS (L2 working on L1a)
 - AVHRR (L0)
- Leverages software (I2gen) generate by NASA

Quasi-Analytical Algorithm (*Lee et al. 2002, 2007*)

Remote sensing measurements


$$R_{rs} = F\left(\frac{b_b}{a + b_b}\right)$$

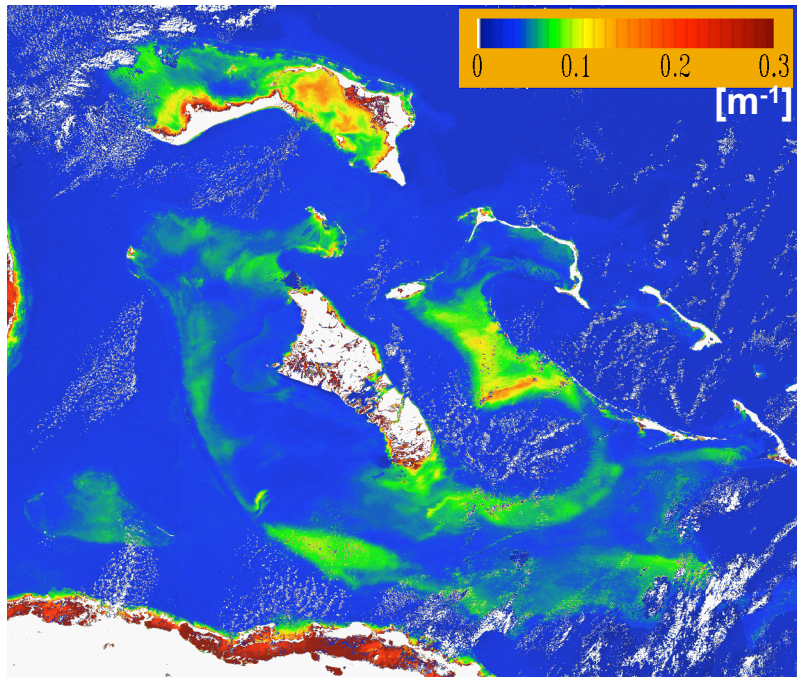
a : total absorption coefficient
 b_b : backscattering coefficient


$$R_{rs} \rightarrow \frac{b_b}{a + b_b} \rightarrow a \text{ and } b_b$$

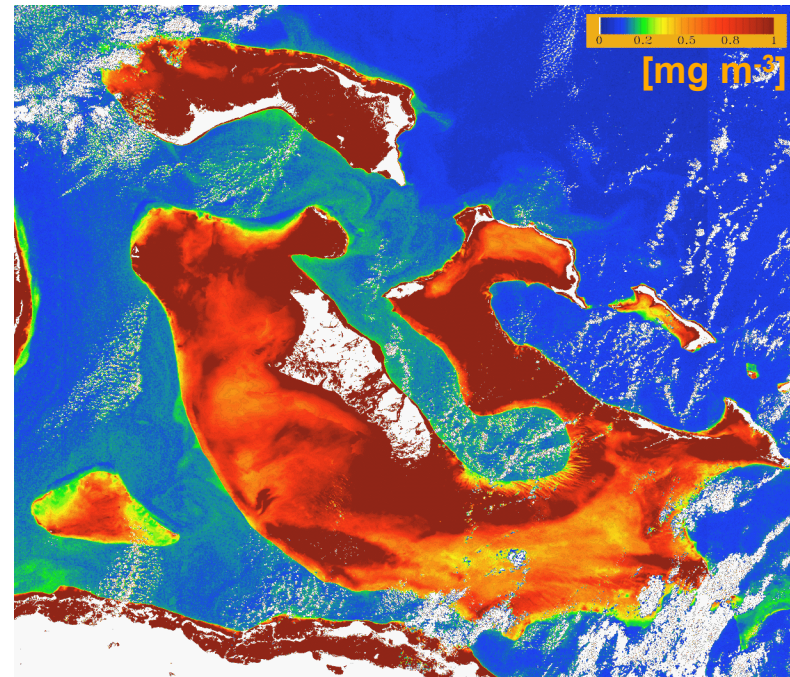


Water properties

$a(442)$ with HOPE



[Chl] with standard algorithm





MERIS Derived Fluorescence Line Height (FLH).



Florida Bay, Oct. 21, 2003.

