



Global Processing and Products from MERIS Full Resolution Data for the Coastal Zone

User Consultation Meeting

16-17.11.2010

Frascati

A large, stylized graphic on the right side of the slide. It features a globe at the top, with a diagonal strip of satellite imagery showing coastal zones and water bodies. The word "CoastColour" is written in white, semi-transparent text across the lower part of this graphic.

CoastColour

MERIS has been designed as an instrument for coastal ocean colour measurements

CoastColour is ESAs initiative to bring coastal products
from MERIS to the user community
and to advance coastal ocean colour remote sensing

Agenda Tuesday 16.11.2010

- Morning:
 - Presentation from CoastColour project team
 - What does CoastColour offer to users
 - How are users involved in CoastColour
 - Where is the project currently, and how will it continue

- Afternoon:
 - Presentations from CoastColour users
 - What are the problems to be supported with CoastColour products
 - What aspects of CoastColour project are most important for users
 - Recommendations on possible CoastColour activities from now onwards

Agenda Wednesday 17.11.2010

- Morning
 - Demonstration of CoastColour products
 - Sites and parameters
 - Continuation of user presentations
 - Regional perspectives

- Afternoon
 - Discussion
 - Products
 - In-situ Data
 - Applications

Objectives of CoastColour

- **MERIS FR data of challenge/important coastal zones** at a regional scale, processed with best possible algorithms for Level 1, with best possible regional algorithms for water leaving reflectances and IOPs, and demonstrating processing of regional higher level specific products; all products including **per pixel error/uncertainty estimates**;
- Internationally discussed **protocols for complex waters processing** including algorithm performance assessment;
- An **international comparison of processing algorithms for complex waters**, involving all relevant stakeholders and open to the scientific community;
- **Actively demonstrating and promoting MERIS capabilities for complex water processing** to the international ocean colour radiometry community, and increase of usage of MERIS within and outside Europe;
- **Preparation of the future exploitation of MERIS and Sentinel 3 products** for applications in complex waters and for climate change studies.

CoastColour Team

- ESA
 - Simon Pinnock
- Core Team
 - Carsten Brockmann, N. Fomferra (BC, coordination, software, processing)
 - Roland Doerffer (HZG (GKSS), algorithm development)
 - Shubha Sathyendranath, Steve Groom (PML, International coordination, PP algorithms)
 - Kevin Ruddick (MUMM, Belgium , Round Robin)
 - Richard Santer (Adrinord, atmosphere characterisation)
 - Inês da Brotas, C. Sá (University Lisbon, in-situ data and quality management)



CoastColour Team

- **ESA & Core Team**

- Simon Pinnock, Brockmann, Fomferra, Doerffer, Krasemann, Sathyendranath, Groom, Vicente, Ruddick, Santer, Brotas, Sá

- **Consultants**

- Mark Dowell, Zhongping Lee, Yu-Huan Ahn, Stewart Bernart, Thomas Schroeder/Arnold Dekker, Jim Gower, Bryan Franz

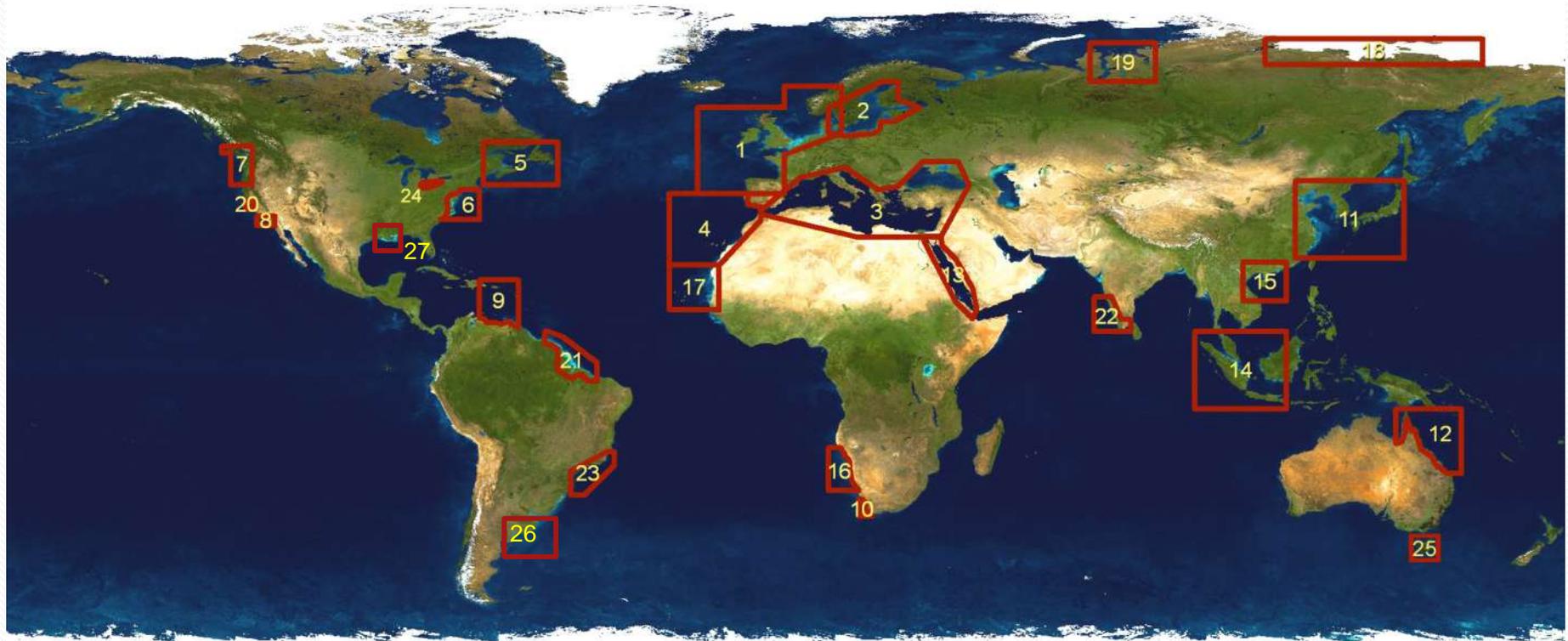
- **Science Team**

- Mark Dowell, Gene Feldman, Paul DiGiacomo, Jürgen Fischer, Hubert Loisel, Kai Sorensen, Prakesh Chauhan, Trevor Platt, Steef Peters



Global Network of Users

Global Distribution of Sites

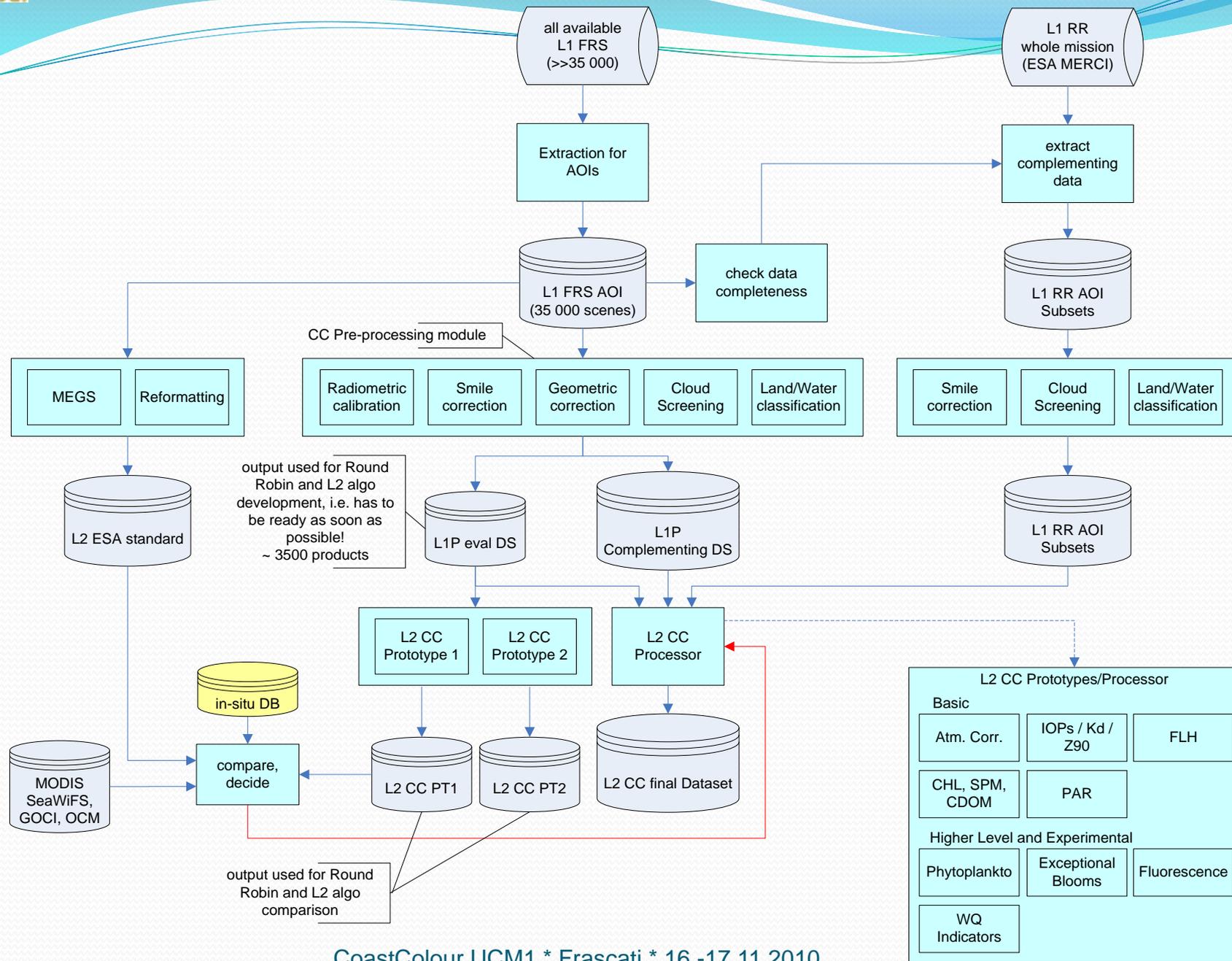


Background Image: Blue Marble © NASA

42 users, increasing, > 35.000 MERIS FRS Products

MERIS Full Resolution Data Set of the Coastal Zones

- These Products will be made available, open and free access
 - MERIS Full Resolution (300m) Full Swath (1200km)
 - Top of atmosphere
 - Standard Level 1b processing, but in netCDF format
 - **CoastColour Level 1P processing**
 - Water products
 - Standard Level 2 products, but in netCDF format
 - **CoastColour Level 2 products**
- Spatial coverage: all 27 CoastColour sites
- Temporal coverage: 2005 – 2010; 2011 NRT service



Products

- Standard products
(for all sites)

- Top Of Atmosphere radiances
- Remote sensing reflectances
- Classification
- Inherent optical properties
- Concentrations of Chlorophyll-a, Suspended Matter and CDOM
- Water clarity (euphotic zone depth, Secchi disk depth)
- Turbidity
- Photosynth. Avail. Radiation
- Aerosol optical depth
- Chlorophyll-a FLH

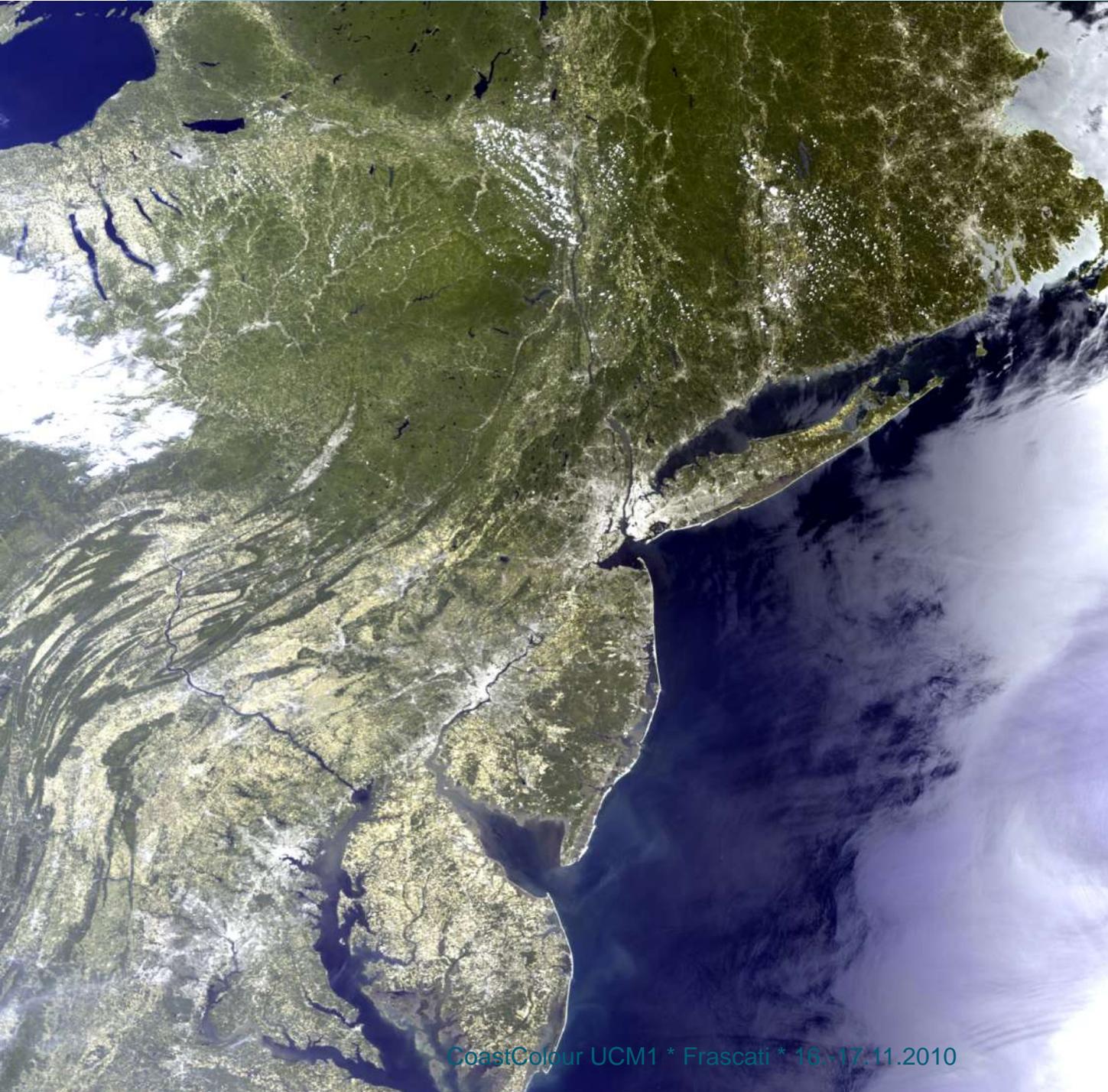
- Experimental products
(site specific)

- Primary production
- Phytoplankton carbon biomass
- Phytoplankton functional types, abundance and particle size distribution
- Distribution and abundance of cyanobacterial blooms
- New products derived from MERIS fluorescence band; algal bloom monitoring using fluorescence band

- Uncertainties in each product, at each pixel

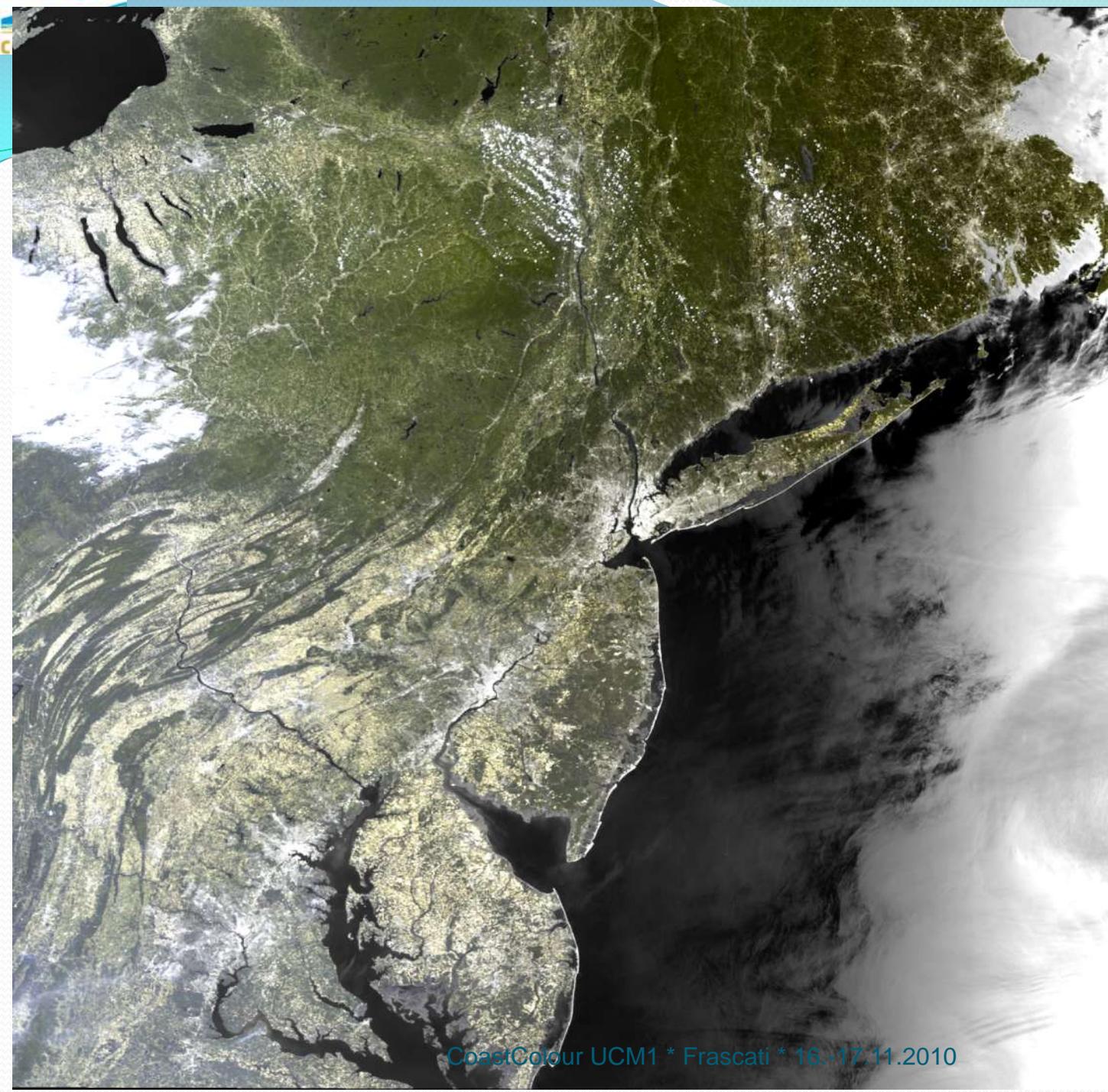
Current Status of new Requirements

- Sites (reserve list)
 - New Caledonia
 - Iceland and Faroer
 - Cariaco off Venezuela
 - African Waters
 - South east coast of Africa
- Temporal coverage
 - MERIS FR from 2002 - 2004
- Products
 - no new requirements currently

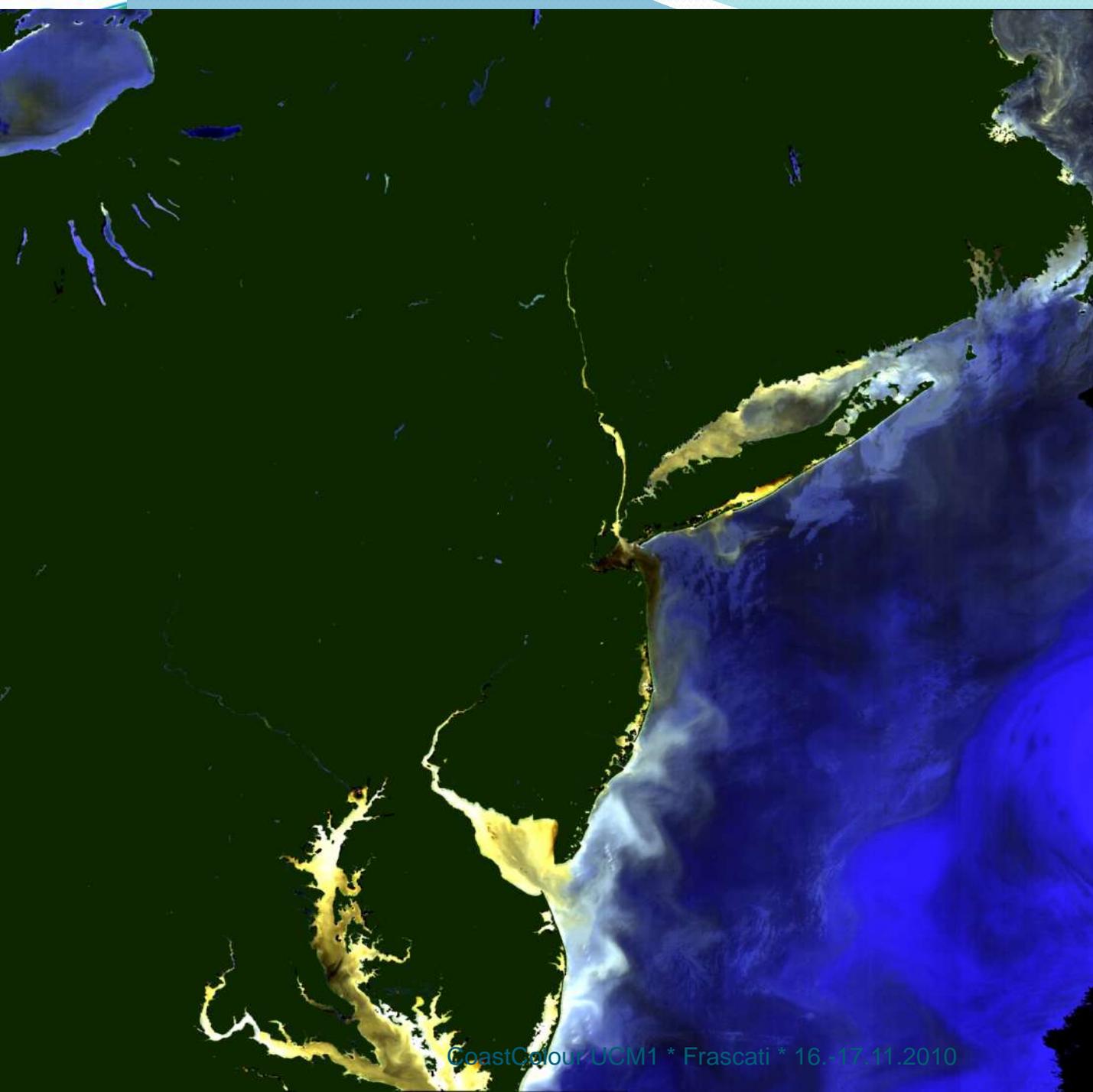


**MERIS FR
20080617**

glint ratio > 10 !!

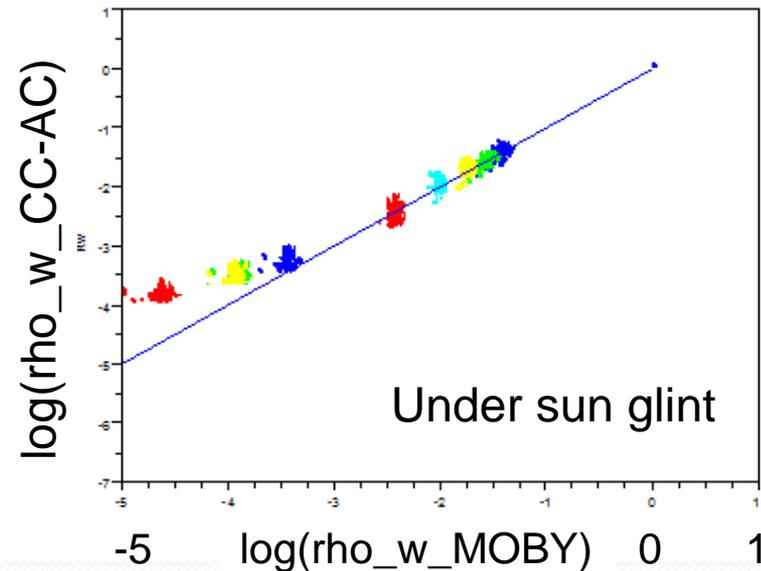
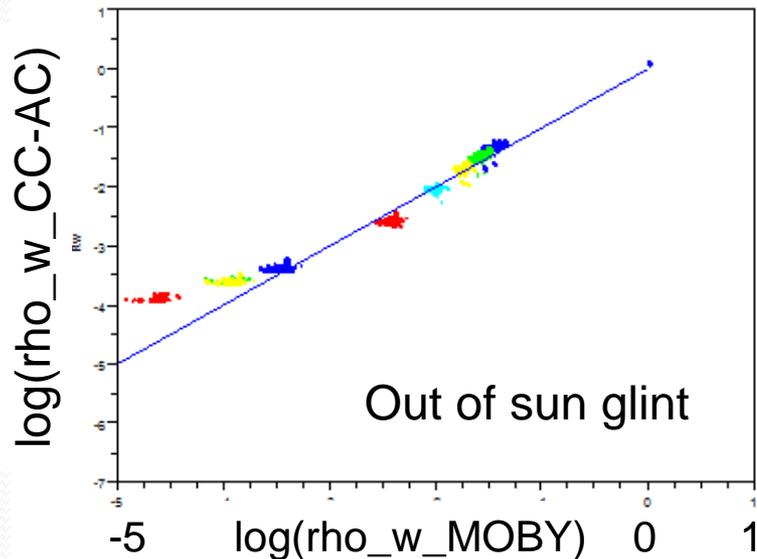


**MERIS FR
20080617
RL_path
band 5**

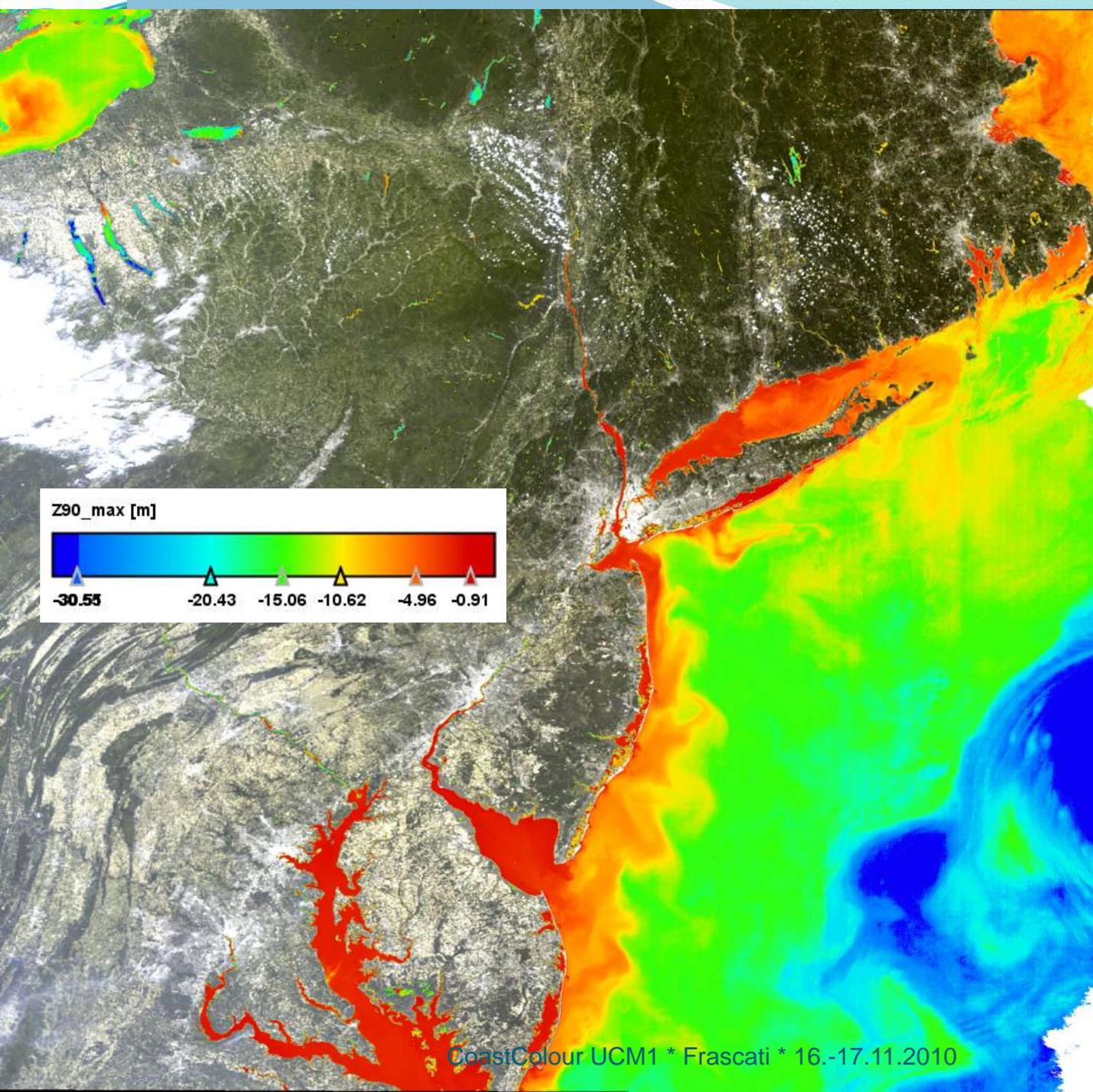


MERIS FR
20080617
RL_w RGB

CoastColour Atmospheric Correction



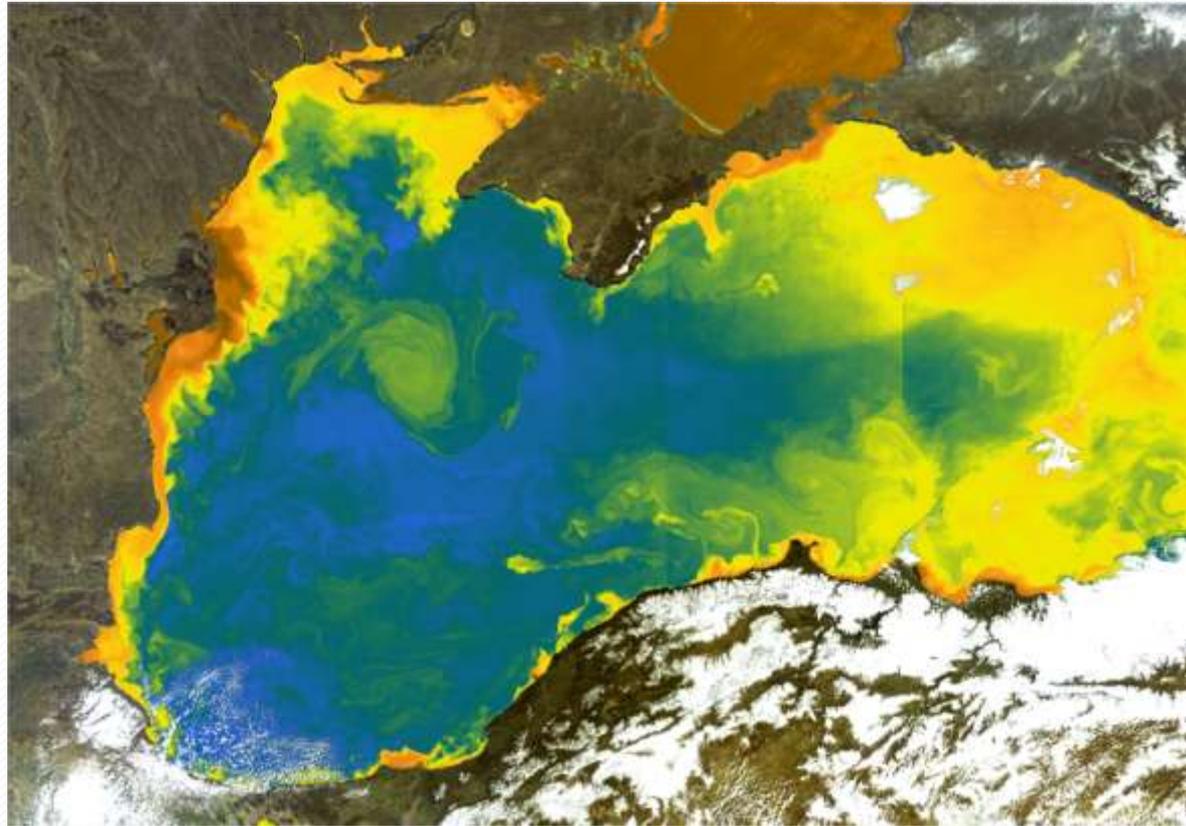
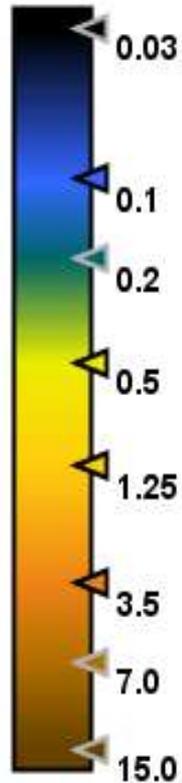
Comparison of water leaving reflectance derived from MERIS L1 data with MOBY data with the neural network AC. Left for cases without sun glint, right for high glint cases



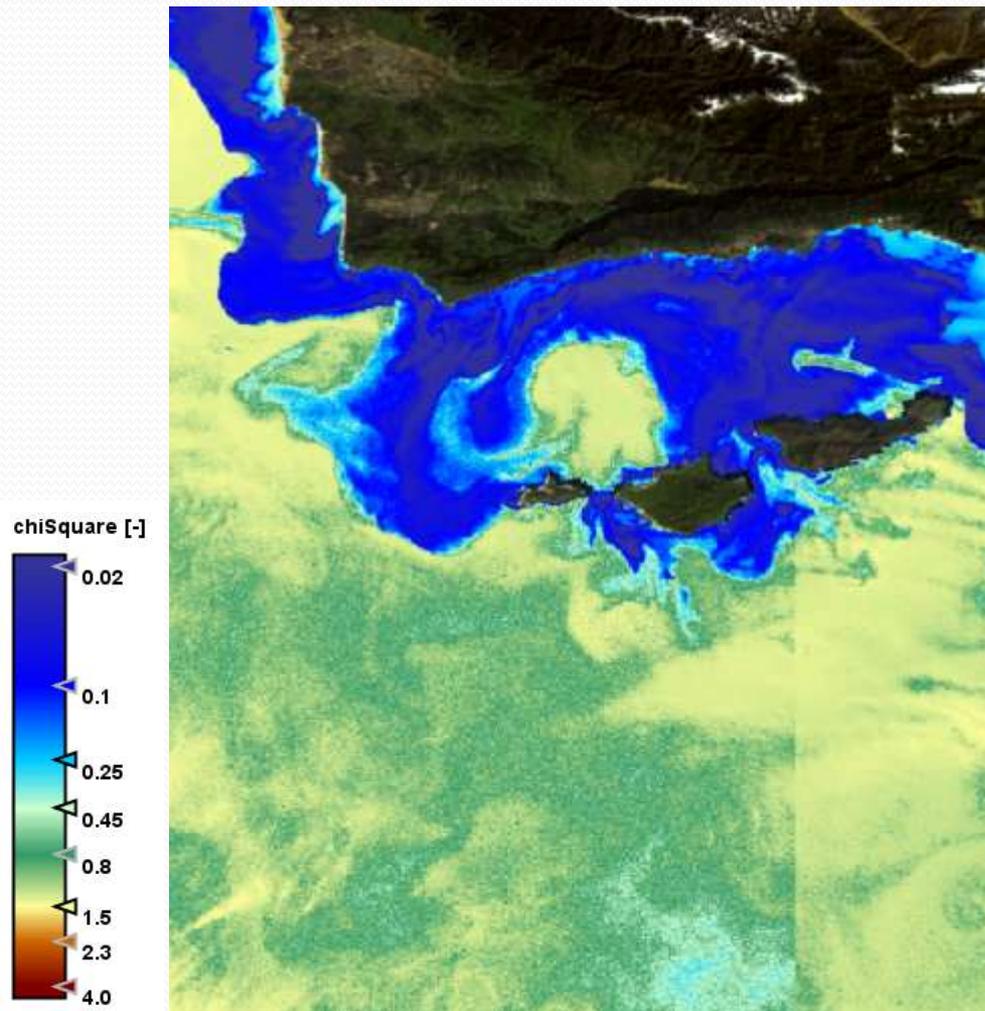
MERIS FR
20080617
z90_max

Product Example: TSM, Black Sea

tsm [g m⁻³]



Example: Product Uncertainty



Quality Assurance

- Quality assurance is critical for the success of the project and the acceptance of the products
 - in-situ data are provided by users and by the CoastColour project
- QA is applied to the in-situ data used for algorithm calibration
- Calibration and Validation of in-situ data will be separated
 - All critical design decisions and results are reviewed by an independent Science Team
- QC is applied to the generation of CoastColour products

In-situ Data

SITE	in situ data	CAL	VAL	RR
Northern West Shelf	T, S, Chla, PP parameters, Turbidity (relation to TSM), TSM, Secchi, nutrients, water reflectance, dissolved oxygen, jellyfish abundance, pCO ₂ , DIC, HPLC pigment data, IOP (apig, atot,bb), *	X	X	YES
Baltic Sea	T, S, Chl, Turbidity (relation to TSM), TSM, Secchi, IOPs, CDOM, phycocyanin and Chl fluorometers, CDOM data, reflectance measurements, cyanobacteria, *	X	X	YES
Mediterranean and Black Sea	Chl, SPM, radiometric measurements	X	X	YES
Morocco	Chl, PP		X	NO
Acadia	AOPs and IOPs, phytoplankton pigments, SPM and CDOM, PFTs, Particle Size distribution	X	X	YES
Chesapeake Bay	SeaBASS / NOMAD archives, US EPA WQMD (1984 to present) and other databases	X	X	YES
Oregon and Washington	Chl, IOPs and suspended sediments and CDOM	X	X	
Plumes and Blooms	T, S, Nutrients, Multispectral radiometry; AOPs, IOPs (including spectral K _d), phytoplankton pigments, POC, DOC, Particle Size Distribution, Aerosol Optical thickness	X	X	GSM?
Puerto Rico	Chla, POC, TSM, IOPs, AOPs	X	X	?
Benguela	radiometry, pigment and aphy and ays data	X	X	YES
China, Korea, Japan	Chl, nLw, CDOM, and TSM, IOPs, cell counting in the redtides and euphotic depth data	X	X	YES
Great Barrier Reef	Chl, pigments, turbidity, TSM, IOPs, AOPs, secchi disk depth, 1% depth	X	X	YES
Red Sea	Chl, taxonomy and cell counts		x	
Indonesian Waters			X	
Beibu Bay			X	
Namibian Waters	Data available from different interdisciplinary research cruises		X	
Cape Verde			X	
Arctic	Water reflectances, concentrations of TSM, Chlorophyll, DOC, POC as well as basic hydrographic data	X	X	

Multi-Sensor RoundRobin

- Objectives
 - Forum for improving the community's understanding of the performance of various algorithms
 - Helping to select the optimal algorithm for a given region and application
- Round Robin Data Package
 - CoastColour Level 1P (TOA radiances)
 - L2 (water leaving radiance reflectances)
 - From MERIS measurements as well as simulated data
 - Protocol
- Participating scientists
 - Run own algorithm
 - Output IOPs and/or concentrations
- CoastColour team
 - Compare participants results, CoastColour L2, standard MERIS L2, MODIS, SeaWiFS
- Benefit
 - Co-author of Round Robin Final Report
 - Co-author of submission to peer reviewed journal

Work Programme

- Activity 1: User Requirements, Algorithm definition and development
- Activity 2: Production
- Activity 3: Validation
- Activity 4: Multisensor Round Robin for selection of final water processing algorithms
- Activity 5: Communication and interaction with international groups and users.

Main expected results from CoastColour

... and where we are

- Internationally discussed **protocols for Case2 waters processing** including algorithm performance assessment;
 - we started to work on own Case2 Water algorithms and did this in an international team: 35 experts from 15 countries are in the team
- A **global set of MERIS FR data of coastal zones** at a regional scale, processed with best possible algorithms for Level 1, with best possible regional algorithms for water leaving reflectances and IOPs, and demonstrating processing of regional higher level specific products; all products including per pixel error/uncertainty estimates;
 - Processing of L1 ongoing; algorithm development for L2 ongoing

Main expected results from CoastColour

... and where we are

- An **international comparison of Case 2 algorithms**, involving all relevant stakeholders and open to the scientific community;
 - Round Robin protocol ready; start of Round Robin in November 2010
- **Actively demonstrating and promoting MERIS capabilities for Case 2 water processing** to the international ocean colour radiometry community, and increase of usage of MERIS within and outside Europe;
 - presentation of CoastColour at 5 conferences in 6 months; 4 more planned
 - strong links with IOCCG & subgroups, LOICZ established
 - increase of users base by 20%
- **Preparation of the future exploitation of MERIS and Sentinel 3 products** for operational Case 2 product applications and for climate change studies.
 - CoastColour paper for RSE Special Issue on Sentinel 3 in preparation
 - link with OC-CCI established

Summary:

- CoastColour is a developer/user interactive program
- To provide highest quality products for coastal waters with MERIS

Thank you!

www.coastcolour.org

office@coastcolour.org