



ESA has launched the **CoastColour** project to fully exploit the potential of the MERIS instrument for remote sensing of the coastal zone. CoastColour is developing, demonstrating, validating and comparing different Case 2 algorithms over a global range of coastal water types, identifying best practices, and promoting discussion of the results in an open, public form.

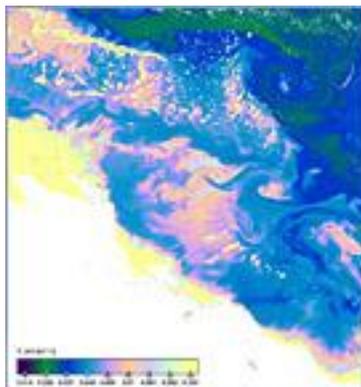


# Newsletter Issue III

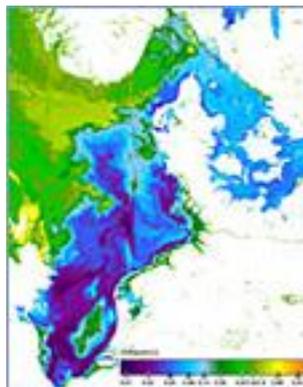
Background Image: Blue Marble © NASA

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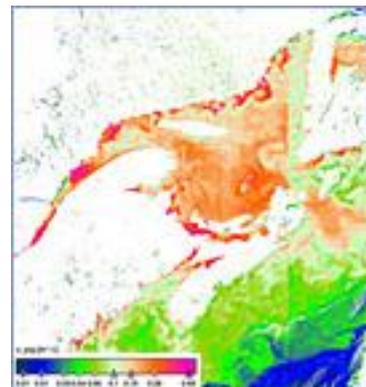
- CoastColour in-situ database*
- Level 1P and Level 2 processing and products*
- Level 2R and Level 2Water Processing*
- Round Robin update*
- 3<sup>rd</sup> CoastColour User Consultation Meeting 19.-20. October 2011 Lisbon**



**Site12: Great Barrier Reef**  
Minimum downwelling irradiance attenuation coefficient



**Site1: North Sea**  
Quality measure of the inversion procedure

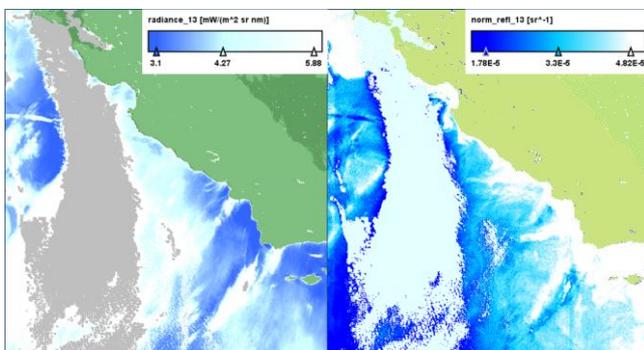


**Site5: Acadia**  
Pigment absorption coefficient

## CoastColour in-situ database

Following the User Consultation Meeting 2 held in Frascati, between the 17-19 October 2010, many users decided to provide in-situ data from their site to the CoastColour team. In total, data has now been made available for 17 of the 27 CoastColour test sites, and contains information about water constituents, their concentrations, and in some cases also water radiometry. This data has been quality-checked and now provides a comprehensive, homogeneous set of data with more than 1,200,000 measurement records. A summary containing metadata of this CC database will be made available on the website.

These user-provided in-situ data are of major importance for the project, as they are used both for algorithm development or to build a basis for the regional algorithm calibration.



Radiance (left) and normalised reflectance (right) of MERIS band 13 of Southern California

## Level 1P and Level 2 processing and products

A big effort was made in CoastColour to improve the Level 1P processing and the regionalisation of higher level algorithms.

### Level 1P

In June this year a dataset comprising a total of about 61,500 improved MERIS FR

Level 1P products (~ 17 TB) for the years 2005 to 2009 and covering all 27 CoastColour test sites was generated. To access these data please send an e-mail to [office@coastcolour.org](mailto:office@coastcolour.org).

The L1P product is a refined TOA radiance product compared to the standard Level 1b product. The Level 1P product provides:

#### 1. Improved geolocation:

Geolocation is realised using the AMORGOS (Accurate MERIS Ortho-Rectified Geolocation Operational Software) tool, developed by ACRI-ST on behalf of ESA. It generates accurate geo-location information for each MERIS pixel with an rms accuracy better than 70m.

#### 2. Improved calibration:

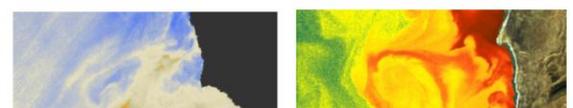
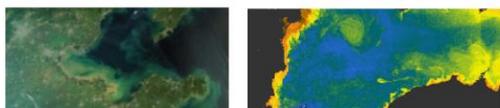
Radiometric calibration has the objective of transforming the measured signal at the sensor into a corresponding spectral radiance. In order to achieve the new 3<sup>rd</sup> reprocessing quality for the CoastColour FR products, the new calibration gains, which were derived using an improved instrument degradation model, were applied.

#### 3. Coherent noise equalization:

A new MERIS equalization module performs a radiometric equalisation of the MERIS data at detector pixel level. It reduces systematic detector-to-detector and camera-to-camera radiometric differences and results in a reduction of the vertical striping in the MERIS L1P products.

#### 4. Smile correction

MERIS is measuring the reflected sunlight using a CCD technique. The instrument is composed of 5 cameras, each equipped with its own CCD sensor. This leads to small variations in the spectral wavelength of each pixel along the image, the so called "smile effect". The standard Level 1b products remain uncorrected but to ease further processing, the CoastColour L1P products are smile corrected and have normalised the wavelengths within one spectral band relative to one reference wavelength.



## 5. Pixel characterization information

a) Land-Water separation and accurate coastlines: After a precise latitude and longitude becomes available, a precise geographical database delineating land and water is queried in order to provide either a land or water attribute at pixel level. The SRTM Water Body Database (SWBD) used in CoastColour is a geographical dataset encoding high-resolution worldwide coastline outlines in a vector format. It covers the Earth's surface between 56° southern latitude and 60° northern latitude. The GlobCover land classification product was used to fill-in for northern latitudes.

b) Cloud Screening: The L1P processing also includes a cloud screening procedure. This involves a combination of several tests on features such as brightness, height of the scattering surface and high atmospheric turbidity. The tests also take high reflection of sun glint into account. A cloud border has been put around every cloud pixel and a cloud shadow is calculated.

c) Sea ice/ snow screening: The MERIS Normalised Differential Snow Index MDSI was evaluated to calculate the risk of sea ice (with and without snow cover).

## 6. Reformatting into NetCDF:

Products of all levels are stored in NetCDF file format. It is a self-describing and self-contained format, supported by a number of imaging applications and software libraries. Applications reading and writing NetCDF-formatted files typically use a dedicated library to do this. These libraries are available for a number of programming environments and languages.

## 7. Ancillary information:

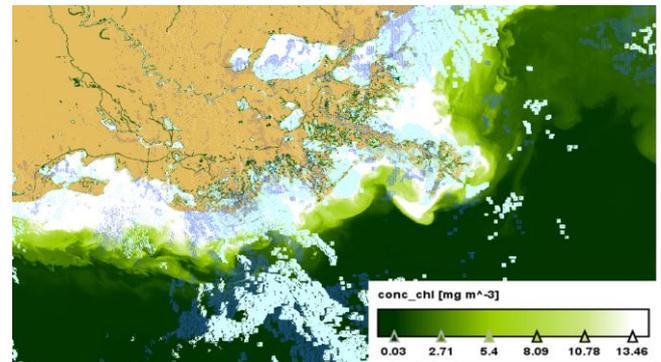
Annotation data is provided within the tie-point grid for all L1P and L2 datasets. They contain geographic coordinates and ECMWF derived geophysical data.

## Level 2R and Level 2W Water Processing

In addition to the L1P dataset, a demonstration dataset comprising marine reflectances (called Level 2R) and several water products (called L2W) has been made available to Champion users. The dataset contains about 10,000 products per level (~3.2 TB) and covers the whole of year 2006.

### 1. Level 2R

An atmospheric correction was carried out on Level 2R products. This was achieved using an artificial neural network (NN) which reconstructed the water leaving radiance reflectances from TOA reflectances. An adjacency effect correction was also investigated for areas close to the coast. Furthermore, a new auto-associative NN element was introduced to determine out of scope spectra.

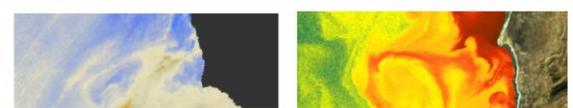
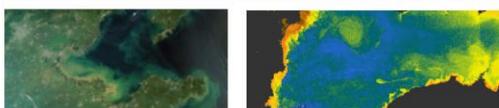


L2W product of the Great Barrier Reef (02.05.2006) showing chlorophyll, SRTM landmask, cloud flag and cloud shadow flag.

### 2. Level 2W

As the result of the requirements listed by users, a new suite of different water parameters has been generated:

- Total absorption coefficient of all water constituents (a<sub>total</sub>)
- phytoplankton pigment absorption coefficient (a<sub>pig\_443</sub>)
- Yellow substance absorption coefficient (a<sub>ys\_443</sub>)
- Backscattering coefficient of suspended sediment (bb<sub>spm\_443</sub>)





- Chlorophyll a concentration (chl)
- Total suspended matter (tsm)
- Downwelling irradiance attenuation coefficient at 490nm (kd\_490)
- Maximal signal depth (Z90\_max)
- Fluorescence line height (FLH - currently not written to all products)
- Maximum chlorophyll index (MCI currently not written to all products)
- Turbidity in Formazine Units (TFU)

Demonstration products have been generated using the neural network inversion technique, which is used as a multiple non-linear regression technique. It parameterizes the inverse of a radiative transfer model.

### Round Robin

17 Algorithm providers participated in a first CoastColour Algorithm Intercomparison Round Robin (CCRR) Workshop, which was held in Brussels on the 28-29th of April 2011. The content of the 4 RR input datasets (i.e. matchups, in situ reflectance, simulated radiance dataset, images) was explained and discussed in detail together with the algorithm providers. Six registered algorithm providers talked about their algorithms and presented preliminary results. A second RR workshop will be held on Friday, 21<sup>st</sup> October, 2011, following the UCM3. The results of the comparison between regional CC algorithms and those of algorithm providers will be discussed to help users find the best algorithm for their region and to discuss the major findings on algorithm performance differences. All algorithm providers will run their individual algorithms on the CC Round Robin data set provided by CoastColour. The results will be delivered before 1<sup>st</sup> of August 2011.

### 3<sup>rd</sup> User Consultation Meeting, 19.-20. October 2011, Lisbon, Portugal

After the successful User Consultation Meeting which was held in Frascati, Italy, the European Space Agency now invites all interested parties and stakeholders to the 3<sup>rd</sup> CoastColour User Consultation Meeting to be held in Lisbon, on the 19-20 October 2011.

The objective of this meeting is to present the CoastColour regional Case 2 products and algorithms, developed during the last months. Improvements of the CoastColour processing chain, including L1P, L2R and L2W processing, will be described in detail. A main focus of the meeting will lie on the validation and discussion of the results of the Round Robin algorithm intercomparison exercise. Deadline for submission of Abstracts for oral presentations and posters is the 15<sup>th</sup> July 2011, and registration is open until the 30<sup>th</sup> of August 2011

([http://www.coastcolour.org/meeting\\_LISBON\\_II.html](http://www.coastcolour.org/meeting_LISBON_II.html)).

In parallel to this meeting the following events will take place:

- A MERIS Validation Team (MVT) Meeting will be holding on 18. October.
- A BEAM Training Course with focus on CoastColour products will take place on 21. October. Users are welcome to register by using the check-button in the UCM3 registration form.
- A workshop for Round Robin participants will also take place on 21. October.

### Project duration is officially extended by 3 months up to 31 March 2012.

CoastColour is funded by the European Space Agency, ESA, Data User Element.  
Duration: 01.01.2010 - 31.12.2011  
The project is affiliated to LOICZ.



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