The ESA Ocean Colour Climate Change Initiative (OC-CCI): meeting the Global Climate Observation System requirements for ocean colour data

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Chlorophyll-a and remote-sensing reflectance, Rrs, are identified as Essential Climate Variables (ECV) by GCOS, which has specified accuracy requirements for consistent, stable, error-characterized global satellite data products. The European Space Agency's Ocean Colour Climate Change Initiative (OC-CCI) aims to develop and validate state-of-the-art algorithms to meet the GCOS requirements from multi-sensor global satellite data products for climate research and modelling.

OC-CCI is following a data processing paradigm of regular re-processing, utilising on-going research and developments in atmospheric correction, in-water algorithms, data merging techniques and bias correction. The project has released a set of global products (chlorophyll and Rrs at six wavelengths, inherent optical properties and diffuse attenuation coefficient) for September 1997 to end of July 2014 derived from SeaWiFS, MERIS and MODIS-Aqua data that were merged, after band-shifting MERIS and MODIS data to SeaWiFS wavebands and correcting for inter-sensor biases, for generating consistent reflectances.

The uncertainty for Chlorophyll (estimated from relative errors) is within the GCOS 30% accuracy requirement, while most of the Rrs products show a bias not exceeding 5%, except for the green band (~9% at 555 nm). Nevertheless, further improvements are underway, including: better characterisation of coastal waters; improved cloud and sea-ice characterisation; extending the time series with additional satellite data; and greater consistency in processing between sensors. These improvements will be provided in v3 of the OC CCI products due for release in April 2016.

Ocean colour is the only marine ECV in the ESA CCI programme that targets a biological field. Phytoplankton abundance, which can be indexed as chlorophyll concentration, is a key factor in the ocean carbon cycle and, hence, important in all pathways of carbon in the ocean. Since phytoplankton are at the base of the pelagic food web, they are fundamental to understanding how the marine ecosystem responds to climate variability and climate change. Further aspects of the ocean carbon cycle are under investigation in ESA SEOM and STSI projects associated with OC CCI, including: ocean acidification (a GCOS ECV), and phytoplankton primary production, pools of ocean carbon and phytoplankton functional types (none of which are currently GCOS ECVs).

This presentation will present latest results from the OC CCI project including accuracy with respect to GCOS requirements, the application of ocean colour data in climate studies from a variety of perspectives and possible additional ECVs associated with the carbon cycle.