

# GlobColour international context (as seen from IOCCCG)



*Prepared by IOCCCG Project Office*

*Presented by Eric Thouvenot  
(CNES representative to IOCCCG)*

## Summary of last year presentation (1/2)

### IOCCG's perspective of International Context of GlobCOLOUR

As operational oceanography grows, there is an increased demand for data and information relevant to understanding the marine ecosystem at the global level. Many issues could be addressed using the GlobCOLOUR data set, both global and regional.

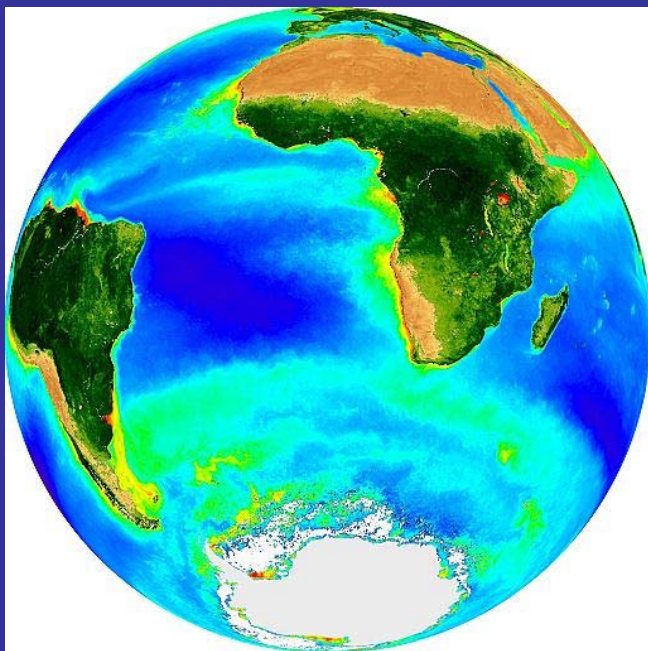
The GlobCOLOUR dataset is also relevant to several of the tasks of the intergovernmental Group on Earth Observations (GEO), which is leading a worldwide effort to build a Global Earth Observation System of Systems.



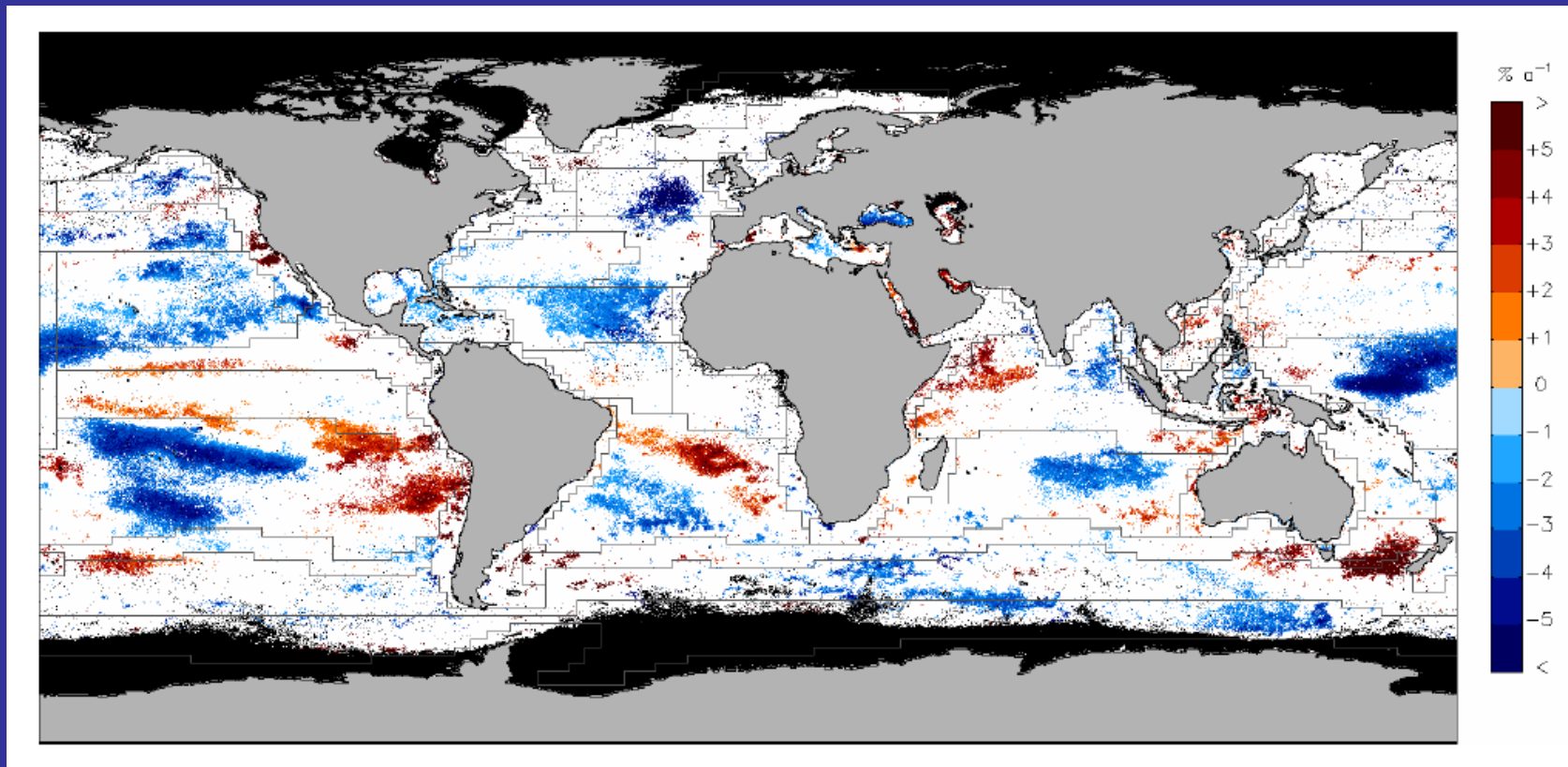
## Summary of last year presentation (2/2)

- We still lack sufficiently long satellite time series to sort out differences between cycles and trends.  
**=> recent results from 10 years of SeaWifs data**
- We need a sustained international effort to make sure we can link one satellite data set to another to build the long time series that we need.  
**=> task in OCR VC**
- GlobColour is definitely a significant step in that perspective

# Examples of results from ten years of SeaWiFS data...



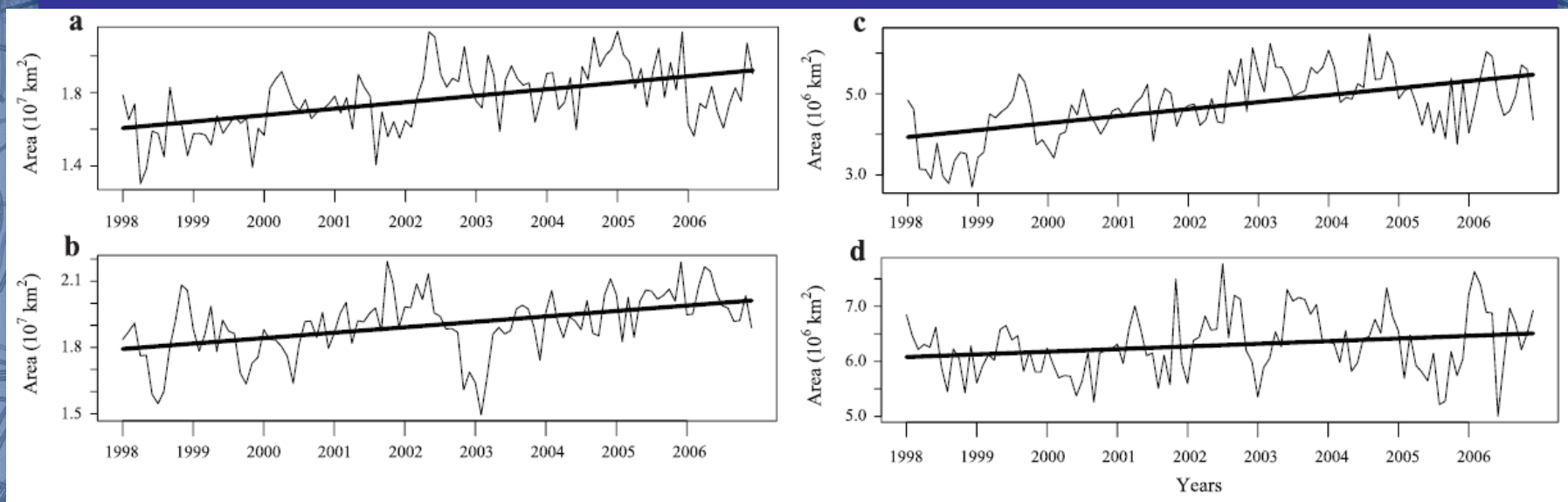
# Variability and Trends in 10-year Global SeaWiFS Time Series of Phytoplankton Chlorophyll a Concentration



*Linear trend of change in Chla (expressed in % a-1) over 10-year of SeaWiFS record.*

*From Vincent Vantrepotte and Frédéric Mélin*

## Temporal trends in the ocean's most oligotrophic waters

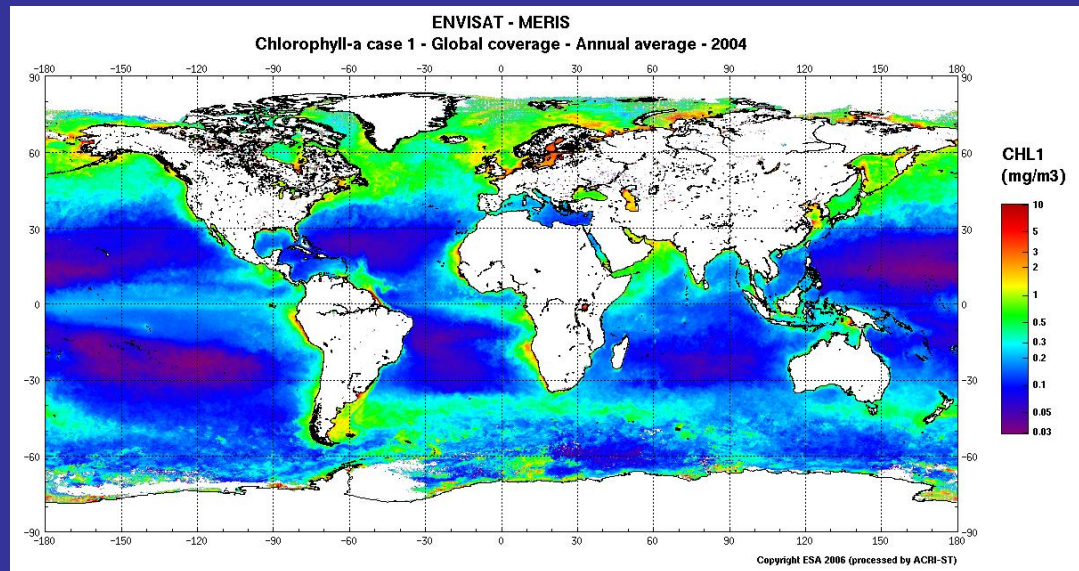


Time series of the monthly mean area (km<sup>2</sup>) with surface chlorophyll less than or equal to 0.07mg chl/m<sup>3</sup> between 5°– 45° N/S latitude with the seasonal cycle modeled removed in

- (a) the North Pacific,
- (b) the South Pacific,
- (c) the North Atlantic, and
- (d) the South Atlantic.

*From POLOVINA ET AL.: OCEAN'S LEAST PRODUCTIVE WATERS ARE EXPANDING (GRL Vol.35, Feb 08)*

# GlobColour and GEO Tasks



*Image from GlobColour Project*

## GlobCOLOUR and GEO



### Relevant International Projects:

The GlobCOLOUR dataset may be relevant to the following GEO tasks (updated for the 2009-2011 Work Plan) :

- Ecosystem and Observation Monitoring Network : GEO Task EC-09-01, that groups :
  - ChloroGIN Project (Chlorophyll Global Integrated Network) (former Task EC-06-07)
  - Global Ecosystems Classification and Mapping Initiative (former Task EC-06-02)
- The SAFARI Project (Societal Applications in Fisheries and Aquaculture using Remote Sensing Imagery). GEO Task AG-06-02.



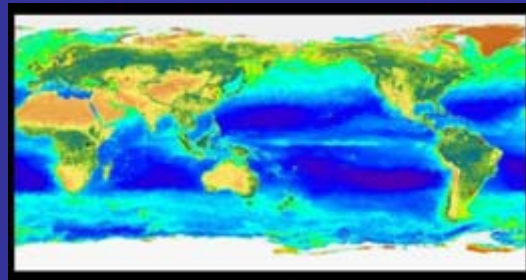
# ChloroGIN Project (in Task EC-09-01)

## Chlorophyll Global Integrated Network



### Goals:

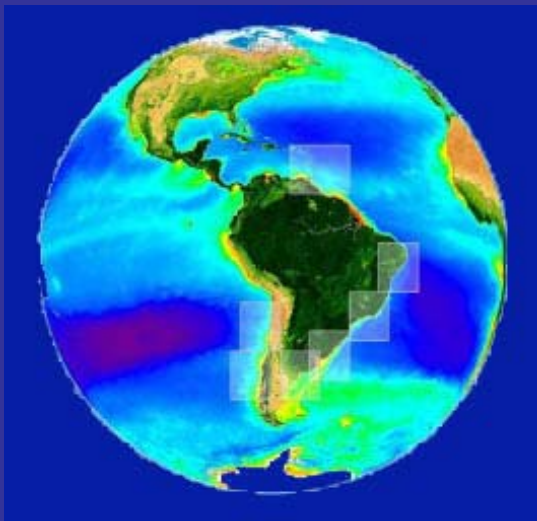
- To develop a global network which will provide information on marine ecosystems for use at national and regional scales, using a combination of Earth observation (EO) data from satellites (Chl and SST) and *in situ* observations.
- To integrate *in situ* and remote observations into a single network - this will improve understanding of ecosystem processes and dynamics and will help in fisheries management.
- To provide a timely delivery of data and information that will benefit society.



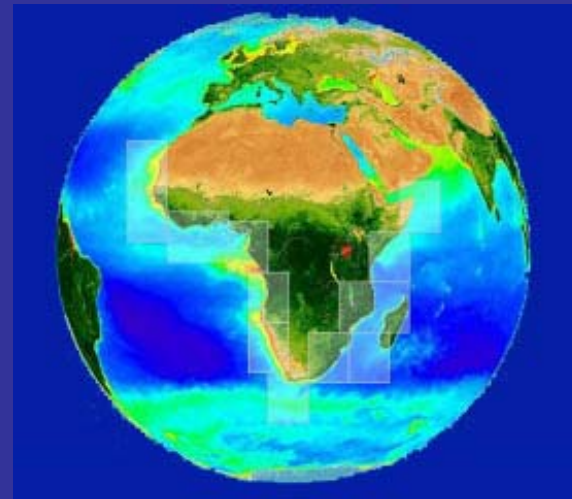
## ChloroGIN Project contd.

- Data delivery may be in near-real time (NRT) or delayed mode time series data (similar to GlobCOLOUR dataset, but not merged data).
- Latin American network (ANTARES) already established with the aim of studying long-term changes in coastal ecosystems. *In situ* and satellite data from around South America shared.
- ChloroGIN Africa web portal was recently established along the same lines as ANTARES.
- GlobCOLOUR dataset may help fill some of the gaps of ChloroGIN

ANTARES (South America)



ChloroGIN Africa



## Global Ecosystems Classification and Mapping Initiative (in Task EC-09-01)



### Aim:

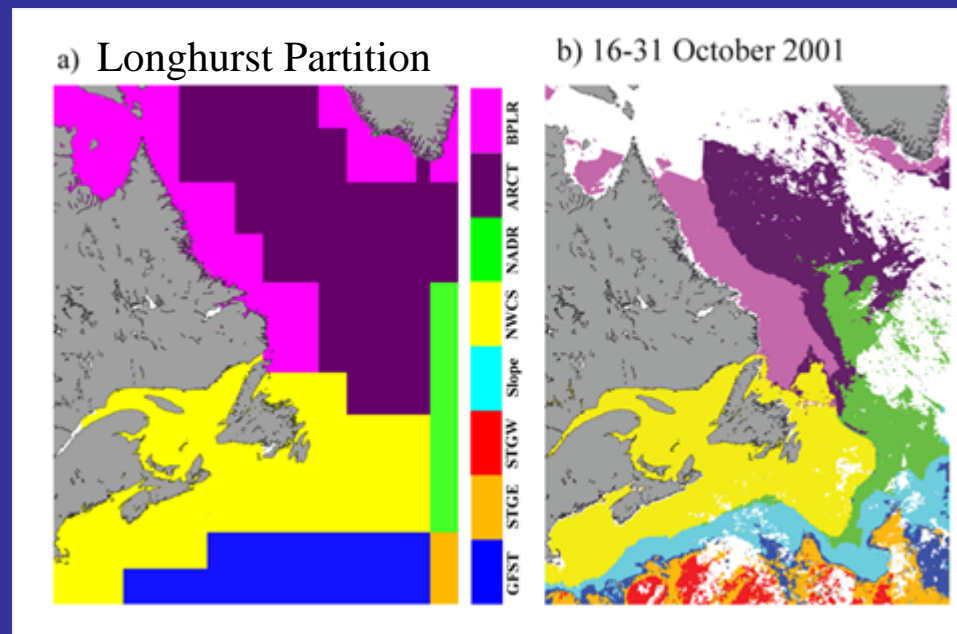
- To establish an ecosystem classification task force, covering freshwater, terrestrial and ocean ecosystems, with a mandate to create a globally agreed, robust and viable classification scheme for ecosystems.
- In parallel with the classification effort, develop, review, and initiate a mapping approach to spatially delineate the classified ecosystems.



Global Ecosystems Classification  
and Mapping Initiative

## Global Ecosystems Classification and Mapping

- Global ecosystems can be classified at the meso-scale (on the order of 10 to 10<sup>3</sup> km<sup>2</sup>)
- A biophysical stratification approach can be adopted for terrestrial, freshwater and marine ecosystem delineation.
- For the oceans, the approach of Longhurst's (1998) biogeochemical provinces can adopted.



Boundaries may move seasonally (Devred 2007)

# SAFARI Project (Task AG-06-02)

## Societal Applications in Fisheries and Aquaculture using Remotely-sensed Imagery

Project initiated: October 2007  
 Funded by: The Canadian Space Agency  
 Chairman: Dr. Trevor Platt

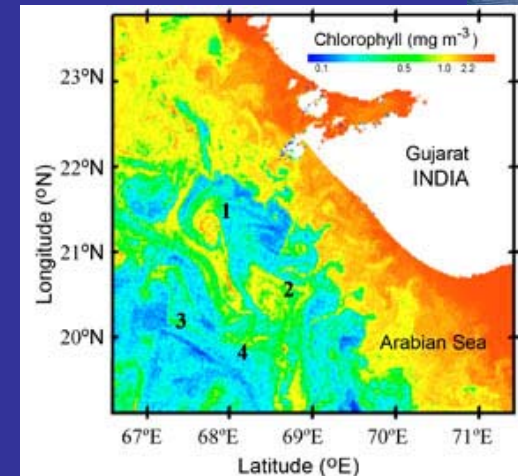


### Project Goals:

- To coordinate, at the international scale, various earth-observation initiatives related to fisheries and aquaculture, and add to their value through synergy.

### Project Execution:

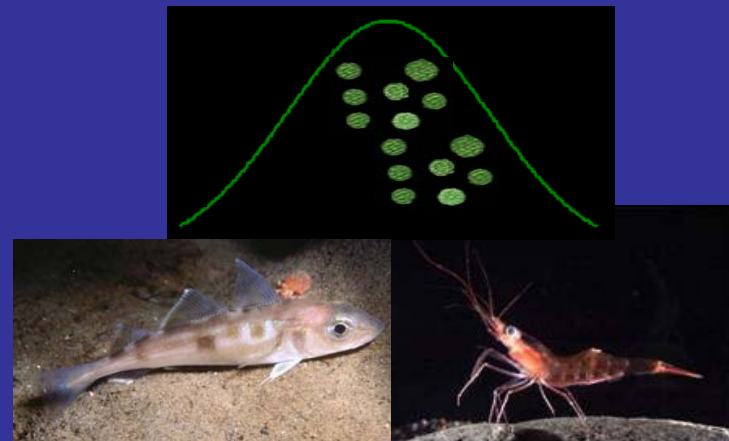
- Host an international coordination workshop
- Publish an IOCCG monograph on the state of the art
- Highlight excellent demonstration projects of EO in fisheries
- Develop an outreach component to increase awareness of the value of EO in the fisheries and aquaculture sector
- Convene an international symposium on this timely topic



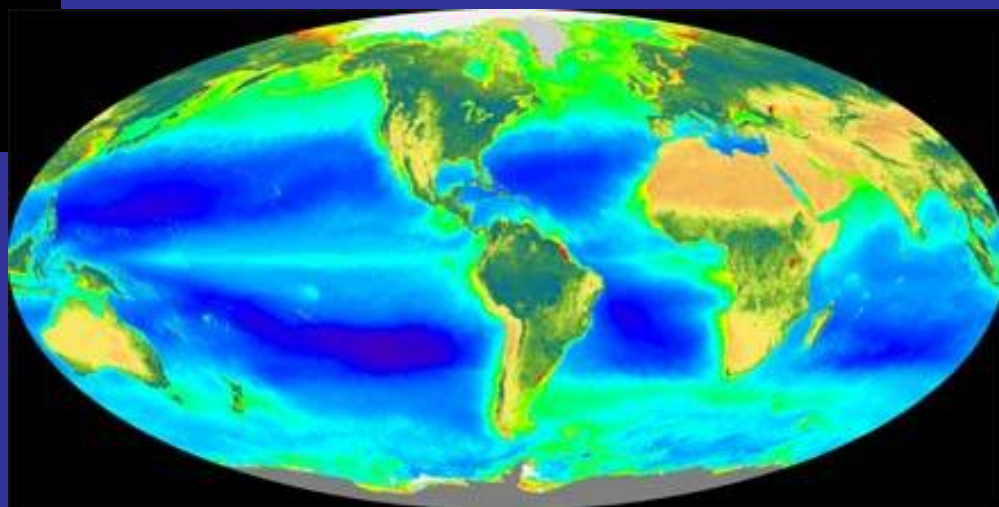
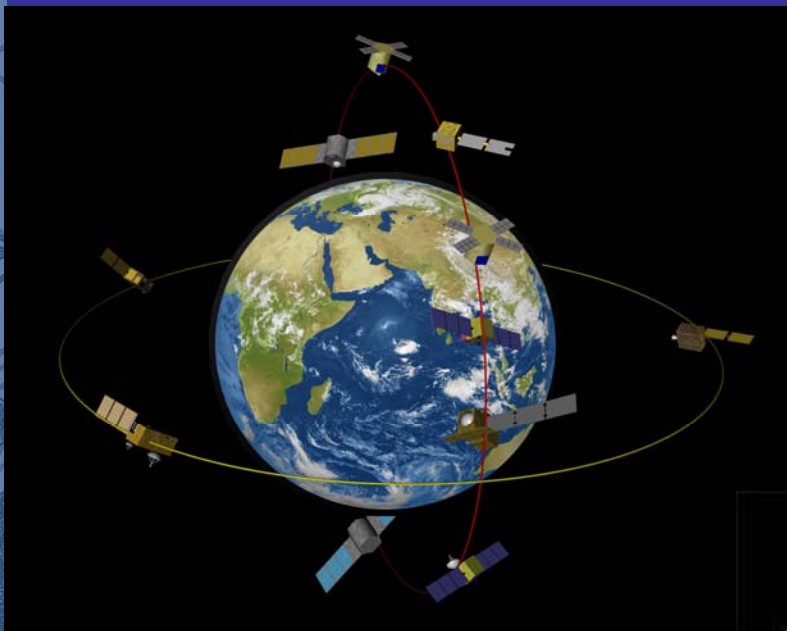
# SAFARI Demonstration Projects

Examples of some elements that may be included in SAFARI and are relevant to GlobCOLOUR:

- An internationally-coordinated programme in the Northwest Atlantic Ocean (SHRIMP) to relate relative abundance and growth of the Northern Shrimp to ecosystem fluctuations, as indexed by remote sensing of ocean colour
- A Canadian programme on development and testing of ecological indicators for the pelagic zone, as deduced from EO data, and evaluation of their utility for ecosystem-based management.
- Southern African work on integrated, ecosystem-based and cooperative management of the Benguela ecosystem.



# Ocean Color Radiometry (OCR) Virtual Constellation (VC)



# What is the Mission of the OCR-VC ?

- The OCR-VC will provide long time series of calibrated ocean color radiance<sup>\*1</sup> at key wavelength bands from measurements obtained from multiple satellites.
- OCR-VC activities will include calibration, validation, merging of satellite and *in situ* data, product generation, as well as development and demonstrations of new and improved applications.
- NASA's *SIMBIOS*, ESA's *GlobColour*, POGO-GEO-GOOS's *ChloroGIN* and CSA/GEO *SAFARI* projects are examples and prototypes of programs the OCR-VC will require to meet its objectives.

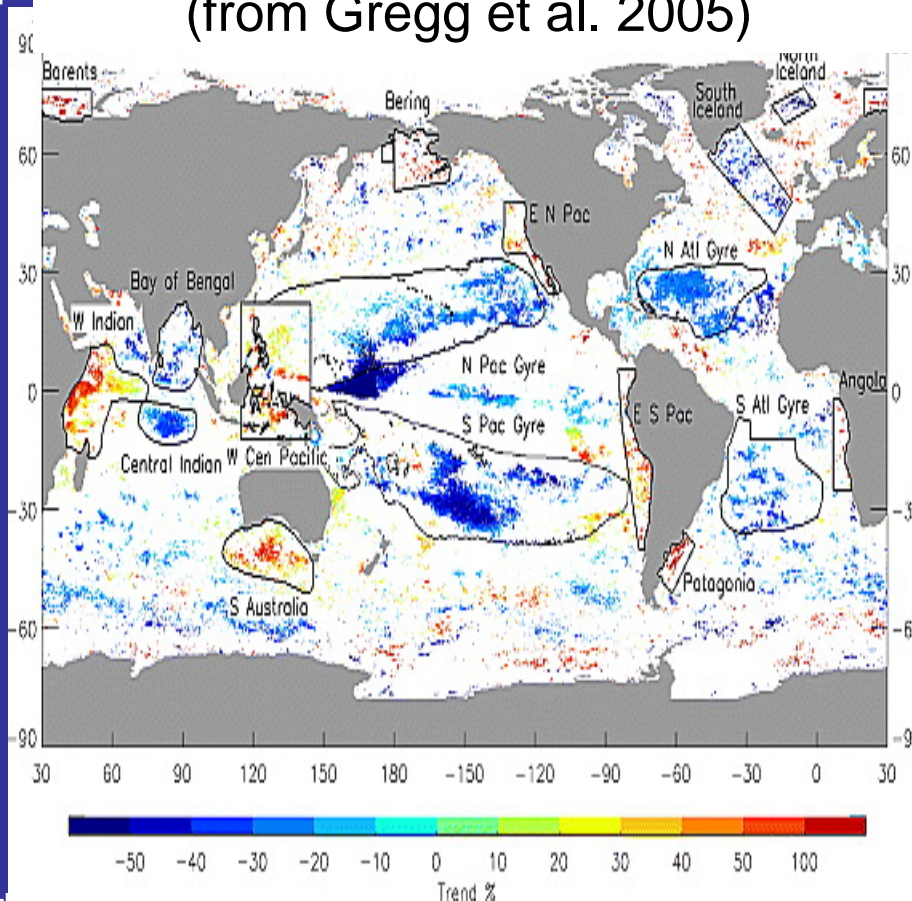
<sup>1</sup> Ocean colour radiance is the wavelength-dependent upwelling solar energy captured by an optical sensor looking at the sea surface. Narrow wavelength bands centered at 412, 443, 490, 510, 531, 555, 620, 670, 681 and 709 nm are the most useful for deriving current OCR data products. At satellite altitudes the relatively weak OCR signal (10-20% of incident solar or less) also has to propagate through the atmosphere before detection. To accurately determine water-leaving radiance reaching satellite altitudes requires additional OCR measurements in the near-infrared and accurate models of aerosol optical properties.



# Products Derived from OCR

- Data products currently derived from OCR are phytoplankton chlorophyll *a*, primary production, colored organic matter (COM), particulate carbon, and suspended sediment.
- OCR data products are the **only** measurements related to biological and biogeochemical processes in the ocean that can be routinely obtained at ocean basin and global ocean scales.

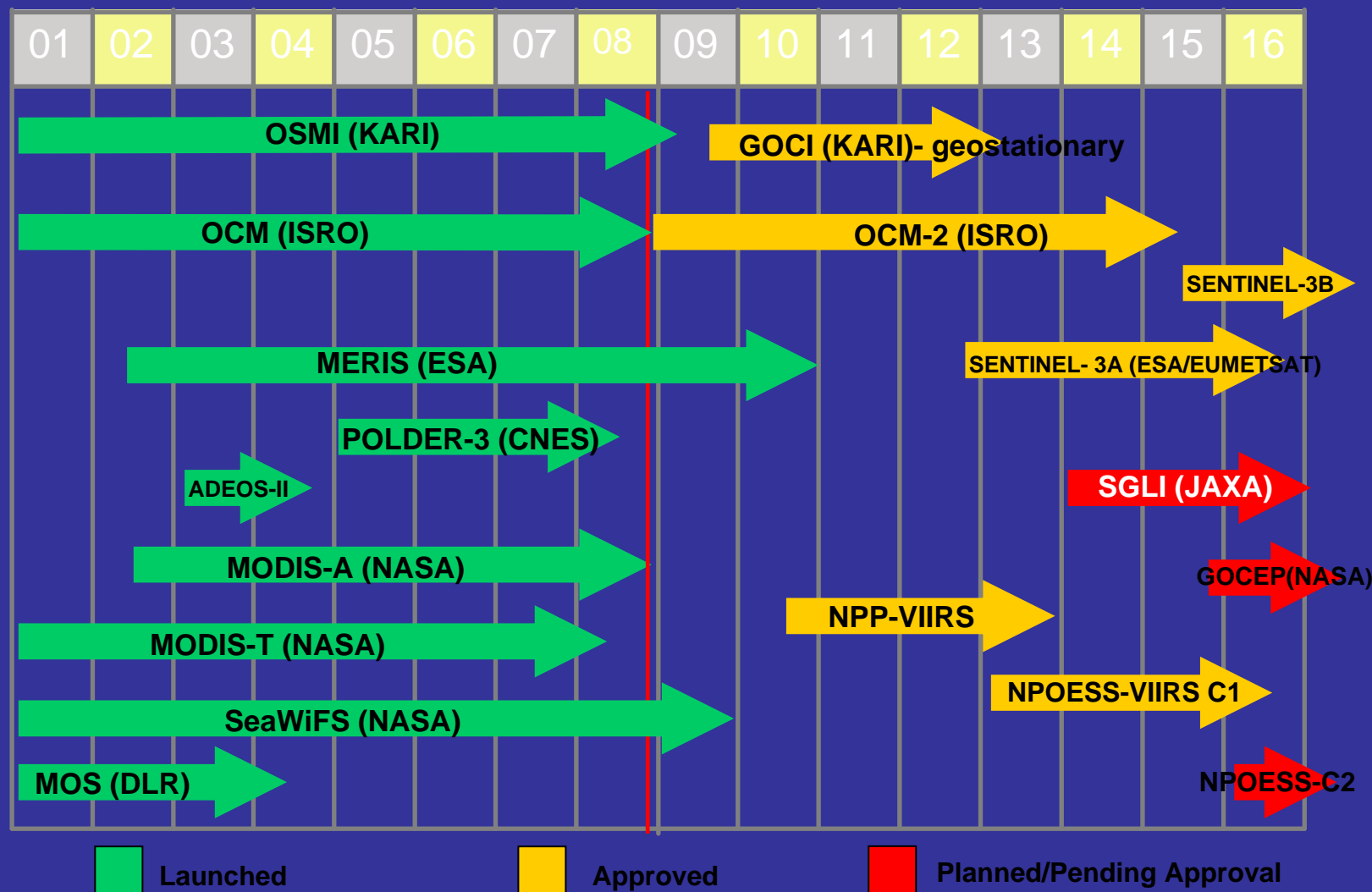
Trends in Chlorophyll (1997-2003)  
(from Gregg et al. 2005)



# GEO and GCOS Requirements Addressed by the OCR-VC.

- Products derived from OCR are specified in the GEO 2007-2009 Work Plan, “Towards Convergence” (27 March 2008) under 4 societal benefit areas: **health, climate, agriculture and ecosystems.**
- The draft GEO 2009-2011 Work Plan endorses the OCR-VC as providing “scientific data products related to marine ecosystems and ocean biogeochemistry for near-surface global ocean and coastal waters.”
- **GCOS lists** “Ocean color, and oceanic chlorophyll-a concentration derived from ocean color” as an Essential Climate Variable (ECV) for “**climate [impacts] monitoring**” as well as “**carbon-cycling** including between the ocean and the atmosphere; and ocean particulate carbon estimated from ocean color.”

# Ocean Colour Radiometry Missions



# Leadership of the OCR-VC

- IOCCG membership includes representatives from space and other government agencies as well as representatives from scientific and operational user communities.
- We propose that the **leadership group** for the OCR-VC come from **implementing organizations**; specifically those individuals from space and other government agencies serving on IOCCG.
- To date, the following IOCCG members have confirmed that their agency will participate in the OCR-VC: Yu-Hwan Ahn, (KORDI), Paula Bontempi (NASA), Paul M. DiGiacomo, (NOAA), Nicholas Hoepffner (JRC), Milton Kampel (INPE), Hiroshi Murakami (JAXA), Rangnath R. Navalgund (ISRO), Peter Regner (ESA-ESRIN), Eric Thouvenot (CNES) and others are likely. IOCCG Chair and Exec. Scientist are *ad hoc*.
- Plan is to select 2 from the leadership group to serve as the **co-chairs** of the **leadership group** with a rotation every 2-3 years.

# Current/Future Challenges

## ❑ Assembling an OCR-VC Study Team

- **Co-Chairs:** Two co-chairs, one from JRC (EU), the other from JAXA
- **Agency Co-Leads:** NASA, NOAA, ESA, Eumetsat, JRC, CNES, JAXA, KORDI, ISRO, INPE, CSA and possibly others.
- Supported by IOCCG Chair (Jim Yoder) & Project Scientist (Venetia Stuart).



## ❑ Preparation of OCR-VC Implementation Plan (by Sept `09)

- **Phase 1** (2008 to ~2012): Until the launch of ESA's Sentinel-3
- **Phase 2** (Post-launch of Sentinel-3), including VIIRS on NPOESS, GCOM-C and overlap with sensors still operating from Phase 1 (e.g. OCM-2).

# OCR-VC Phase 1 activities under discussion

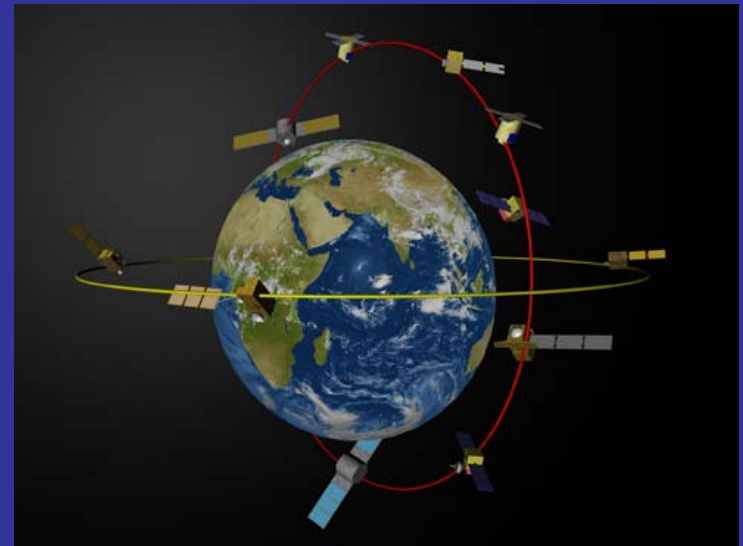
*Proposed Phase 1 OCR-VC activities may include :*

- **Calibration/Validation** (e.g. SIMBIOS-type activities, support for SeaBASS and MOBY)
- **Quality of OCR Data Stream** (e.g. propose improvements to VIIRS on NPOESS, minimum design requirements)
- **Merging Data** (follow-up to GlobColour, possibly merging with OCM-2 data)
- **Product Generation** (e.g. 1-km global product)
- **Applications** (SAFARI Project, expand the ChloroGIN network)
- **New Technologies/Research and Development** (bio-optical sensors on ARGO floats, data from geostationary platforms)
- **Capacity Building** (enhance IOCCG and JRC capacity building activities in Africa, India and elsewhere).



# Requested Agency Commitments

- Provide senior agency representation at OCR-VC Study Team meetings.
- Fund and encourage participation in activities that agency leads oversee.
- Encourage production and sharing of common data and products across missions, especially for cal/val.
- Provide free and easy access to satellite data for merging/ reprocessing.
- Encourage production of new and improved OCR products.



# Summary

- GlobColour is a useful tool for research activities that need long OC satellite time series
- GlobColour data is also relevant to some GEO tasks
- In the future, there is a need :
  - To establish the coordination between activities such as GlobColour and the Ocean Colour Radiometry Virtual Constellation Group
  - To consider integration of data from other OC missions in GlobColour follow-up program