OCEAN COLOR CONTRIBUTION TO GEO

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ABSTRACT:

Ocean color remote sensing is the only means of global observation of ocean biological and biogeochemical parameters measurable from space. The information is useful to manage fisheries and coastal environment as well as to understand carbon cycle and marine ecosystem. SAFARI (Societal Application in Fisheries & Aquaculture using Remotely Sensed Imagery, AG-06-02) and ChloroGIN (Chlorophyll Globally Integrated Network, EC06-07) are two pilot studies for GEO related to ocean processes and applications.

1. INTRODUCTION

Ocean color remote sensing is presently only means of global observation of ocean biological and biogeochemical parameters measurable from space. The information is useful to manage fisheries and coastal environment as well as to understand carbon cycle and marine ecosystem. SAFARI (Societal Application in Fisheries & Aquaculture using Remotely Sensed Imagery, AG-06-02) and ChloroGIN (Chlorophyll Globally Integrated Network, EC06-07) are two pilot studies for GEO related to ocean processes and applications.

2. SAFARI

One of the most important applications of the ocean color remote sensing data is use for fisheries. Sea surface temperature has been used to find fishing ground by fisherman for a long time. Ocean color data is also known to be useful for detection of potential fishing zone (PFZ). Narrowing down the PFZ is good for fisherman not only because large amount of fish catch but also efficiency of time and money for same amount of catch. It is further possible to reduce the amount of fuel use and CO_2 release with the efficiency. Phytoplankton abundance (chlorophyll-a) and primary production estimated by ocean color remote sensing is now combined with knowledge of fish population dynamics, and way to help sustainable fisheries as ecosystem-based management are seeking. Furthermore, ocean color information can be use for aquaculture in many ways, including red tide detection and coastal management.

Thus, in order to accelerate the use of earth observation data, including ocean color satellite data, into fisheries research and management, Societal Applications in the Fisheries and Aquaculture using Remotely-Sensed Imagery (SAFARI; www.geosafari.org) project has been started on 2007 funded by Canadian Space Agency and became GEO Task AG-06-02 (Platt et al., 2007). The objective of the project is 1) establish international forum for coordination and exchange of views on use of remotely-sensed data in fisheries, 2) stimulus for new research and operations for the direction, and 3) transfer knowledge from the research sector to operational sector. It is

also expected to link to ChloroGIN, another GEO project described in next section

International workshop on Remote Sensing and Fisheries was held on 26-28 March 2008 in Halifax, Canada. The results of the workshop were published as IOCCG report 8, Remote Sensing in Fisheries and Aquaculture (Forget et al., 2009a). Broacher was also published on 2008 and possible to download from website. On 2008, another international workshop was held during SPIE Asia-Pacific Remote Sensing conference in Neumea, New Caledonia on 2008 (Forget et al., 2009b). Community white paper was accepted in OceanObs'09 21-25 September 2009 Venice, Italy. "Homage to David Cushing: Applications of Satellite Remote Sensing in Fisheries Oceanography and the Ecosystem Approach to Fisheries" was held in ASLO Nice 2009 special session on 27-29 January 2009.

On 2010, a training course supported by SAFARI, "Remote Sensing Applications in Fisheries and Ecosystem Analysis" was held on 11-13 February 2010, at National Institute of Oceanography, Kochi, India, and was followed by International Symposium on Remote Sensing and Fisheries on 15-17 February 2010.

3. CHLOROGIN

Chlorophyll-a is the basic photosynthetic pigment of all plants, including phytoplankton which is the dominant primary producer in marine environment. It is an important variable for marine ecosystem and for global and regional carbon cycle because it can be used to estimate primary production combined with temperature and light data. The method for in situ measurement is simple and well-established, and more recently ocean color remote sensing can provide global high resolution spatial map and more than 10 years of the time change. The information is useful for ecosystem and fisheries management (e.g. Platt et al., 2009; Forget et al., 2009a). However, the information is still limited to be used mostly in developed countries, and it is required to disseminate in developing

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countries. Thus, it is necessary 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 data from satellite and in situ observations.

ChloroGIN (Chlorophyll Globally Integrated Network; http://www.chlorogin.org/world/) is a GEO and GOOS (Global Ocean Observing System) demonstration project that aims to integrate in situ chlorophyll-a data and remote sensing observation and associated products into a single network and promote them to improve understanding of dynamic ecosystem processes which will help in fisheries management. It is a global network of organization-networks for ecosystems, and coordinates activities to strengthen observing capacity in specifically developing countries, providing a timely delivery of data and information that will benefit society.

It was inspired by the Antares network, which is the Latin American network, and initiated following recommendation of "Plymouth Chlorophyll Meeting and Workshops (Extended Antares Network)" in Plymouth sponsored by GEO, GOOS, IOCCG (International Ocean Colour Coordinating Group), PML (Plymouth Marine Laboratory) and POGO (Partnership for Observations of the Global Ocean) on 18-22 September 2006. ChloroGIN can also be seen as a global contribution to the GEO System of Systems (GEOSS) and through the current GEO task EC-06-07 (and in the 2009-2011 workplan in EC-09-01: Ecosystem Observation and Monitoring Network (GEO EcoNet) TASK-EC-09-01 Regional Networks for Ecosystems). It is also closely related to Ocean Colour Virtual Constellation (DA-07-03)。

Presently the network consists of three principal regional centers (Latin America, South Africa and India) and it is linked by good communications to three northern centers (UK, EC-JRC, and Canada), and now Japan is also decided to participate and southeast Asian countries are interested in the participation. And present achievements are followings:
1) Update of ChloroGIN-related web portal at regional centers.
2) Development of ChloroGIN.org global web server link to regional sites.
3) Improved connections between networks and receiving stations.
4) Best practice protocols for in situ measurements.
5) Training event and specific promoting activities.

Two training courses of "Methods and Applications of Ocean Color Remote Sensing in African Coastal and Regional Seas", supported by JRC and IOCCG, in Mombasa, Kenya on 24 September - 5 October, 2007, and in Zanzibar on 12-23 October 2009 were held as capacity building activity.

Progress of ChloroGIN was presented in several meeting, including GEO Capacity Building Committee (CBC) meeting, in Geneva on 31 May – 1 June 2007, GEO Ministerial in Cape Town on 29-30 Nov. 2007, and GEO Coastal Zone Community Practice meeting in Athens Greece on 9-13 June 2008.

Furthermore, on-going actions are followings:
1) Revisit protocols for in situ measurements with regards to consistency, minimum capability of all partners.
2) Investigate potential agencies conducting HPLC analyses to take shipped samples from ChloroGIN sites.
3) Demonstration of in situ capability on web portals.
4) Revisit protocols and identify optimal file format for satellite data.
5) Establish specifications for information system compliancy and development.

4. NEXT STEP

It is now planning that SAFARI and ChloroGIN projects work closely and also with GEO Water Quality WG (WA-07-01). The next possible tasks are followings:

1) Establishment and development of in situ time series stations in waters at least Latin America and in the Indian Ocean rim countries.
2) Extension of ChloroGIN to South East Asia.
3) Improve data dissemination in a timely fashion in member countries of ChloroGIN, especially through the internet.
4) International symposium on the benefits of Earth Observations in management of marine resources and water quality.
5) Workshops and outreach to policy makers and the user community.
6) A global set of synoptic, calibrated, consistent satellite data for ecosystem studies in coastal waters of developing countries.
7) Extension of ChloroGIN to lakes.
8) More training courses will be held in developing countries..
9) Development of low-cost, bio-optical instrumentation for the ChloroGIN Network.
10) Establish an International Secretariat for ChloroGIN and extension of the existing Secretariat of SAFARI to improve promotion and coordination of activities.

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