Third Meeting of the Chlorophyll Globally Integrated Network (ChloroGIN)

Dartmouth, Nova Scotia Canada, 9 - 11 August 2011

Minutes

1. Summary

A total of 25 participants from fourteen countries attended the three-day ChloroGIN workshop. Participants were updated on the status of the seven ChloroGIN nodes, i.e. ChloroGIN-Europe, ChloroGIN-Antares, ChloroGIN-Africa, ChloroGIN-Indian Ocean, ChloroGIN-Canada, ChloroGIN-SE Asia and ChloroGIN-NE Asia as well as Global ChloroGIN. The new FARO initiative (Fisheries Applications of Remotely Sensed Ocean Colour) funded by the Canadian Space Agency, which overarches both the ChloroGIN and SAFARI (Societal Applications in Fisheries and Aquaculture using Remotely-sensed Imagery) projects, provided support for the ChloroGIN workshop. Dr. Douglas Cripe from the Secretariat of the Group on Earth Observations (GEO) updated the participants on the status of the proposal submitted to GEO for additional funding for various ChloroGIN activities. The expansion of the ChloroGIN network to new countries (such as the Philippines) and regions of the globe was discussed. A proposed ChloroGIN Lakes initiative, related to GEO/GOOS initiatives and relevant ESA initiatives, was also discussed. The group also considered: i) Development of a Southeast Asia node; ii) Further development of ChloroGIN Africa; iii) Future development of Antares; iv) Improving in situ data availability and sharing; v) Improvement of the ChloroGIN website. The IOCCG, in conjunction with the EU PRESPO Project, recently published a Handbook of Satellite Remote Sensing Image Interpretation (293 pages) with many case studies, which was recently printed by the FARO Project. ChloroGIN has been included in the new Blue Planet initiative, an umbrella Task for Oceans in GEO.

2. Introduction

Trevor Platt welcomed participants to the meeting. He noted that ChloroGIN is a successor to Antares, which was expanded to the global scale under GEO. The founding meeting of ChloroGIN was held in Plymouth (PML) in 2006, sponsored by GEO and GOOS. To achieve the goal to build a Global Earth Observation System of Systems (GEOSS), GEO has set up a work plan structured around specific socio-economic benefit areas (SBA). Under the Agriculture SBA, the SAFARI program (Societal Applications in Fisheries and Aquaculture using Remotely-Sensed Imagery) was established by Trevor Platt in response to a request from GEO, and was funded by the Canadian Space Agency (CSA). SAFARI has been a very active programme. The international symposium in India (February, 2010) marked the end of the first phase of SAFARI. For the second phase of the CSA project, ChloroGIN and SAFARI were combined under a common umbrella called FARO, which will support the activities of the Secretariat at the Bedford Institute of Oceanography, the ChloroGIN meeting, the publication of a text book on the use of remote-sensing in biological oceanography and a second Fisheries and Remote Sensing symposium, scheduled to be held in Argentina in 2013. FARO will continue to develop the successful SAFARI and ChloroGIN projects.

Trevor Platt noted that the workshop provided a forum to advance ChloroGIN. He mentioned the requirements for global implementation of the strategic plan for coastal GOOS and the draft plan of the Panel for Integrated Coastal Observation (PICO), in which ChloroGIN plays a prominent part.

During discussions, Frank Muller-Karger pointed out that a published manual on methods used in the Cariaco time series is available on the Antares website. He also mentioned that he would like to submit a proposal to NASA under the SERVIR program, with help and support from ChloroGIN. The proposal would focus on Antares, perhaps set in the context of ChloroGIN. The funding would be about \$250K per year.

Trevor Platt and Shubha Sathyendranath were committed to go to Columbia in November, 2011 for a capacity building workshop and training courses including hands-on training (GEO Water Cycle Capacity Building Workshop). Ana Doglioti, Milton Kampel and Eduardo Santa Maria del Angelo were also among the invitees.

3. Session 1: Regional Summaries

3.1 ChloroGIN-Europe

Nicolas Hoepffner presented ChloroGIN related activities carried out at Plymouth Marine Laboratory (PML), Joint Research Center (JRC) and the University of Lisbon. PML hosts the website of ChloroGIN Europe and provides links to websites of regional nodes. PML participates in the MyOcean Project (EU GMES), which is a pre-operational Marine Core Service, and they are also involved in AquaMar (to improve detection of HABS) and in ESA's CoastColour project, which is dedicated to exploiting MERIS full-resolution data in coastal waters. ChloroGIN-related activities at JRC include operational processing and archiving of ocean-colour data, validation campaigns, regional algorithm development, outreach and data dissemination. The University of Lisbon is also involved in ChloroGIN-Europe through validation of satellite products with *in situ* chlorophyll measured with HPLC along Portuguese coast at 589 stations, and through the long-term monitoring of estuarine water quality.

Frank Muller-Karger suggested that ChloroGIN members work together to avoid duplicating efforts, for example on the website. He suggested that each country could have their own page on the website, linking to local data providers, but sharing tools and datasets. Local groups could obtain their own funding and carry out local work. Tiit Kutser added that data from the Baltic Sea Ferry Box program could also be accessed through the web. Trevor Platt pointed out that the ChloroGIN acronym on the website should be expanded to read Chlorophyll Globally Integrated Network.

ACTION 3/1: STEVE GROOM TO CORRECT THE EXPANSION OF THE CHLOROGIN ACRONYM ON THE CHLOROGIN WEBSITE TO READ "CHLOROPHYLL GLOBALLY INTEGRATED NETWORK" AND TO FOLLOW UP ON OTHER SUGGESTIONS FOR IMPROVING THE CHLOGOGIN WEB SITE.

3.2 ChloroGIN-Indian Ocean

Madhu Ramakrishnan made a presentation on behalf of the Indian Ocean ChloroGIN node. ChloroGIN activities have been executed through Satellite Coastal and Oceanographic Research (SATCORE) project funded by the Ministry of Earth Sciences (MoES), Govt. of India. ChloroGIN-Indian-Ocean contributes to the operational use, research and development, and capacity building of ocean-colour data. Operational use of ocean-colour data included:

- Near-real-time processing of satellite-derived ocean-colour data
- Web dissemination of satellite ocean-colour data products to the Indian Ocean region in near real time
- Generation of value-added products from satellite ocean-colour data
- Preparation of an Atlas of ocean-colour data products.

Research and development of ocean-colour data in India involved:

- Validation of existing ocean-colour algorithms
- Improvement of existing algorithms to retrieve ocean-colour products from satellite remote sensing.
- Development of new algorithms using *in situ* measured bio-optical properties.

The data are automatically processed for the domains of India, Sri Lanka, Iran, Maldives, Oman, Tanzania and Thailand. A HAB information service and Tuna Fishery Forecast System are also provided.

The Central Institute of Fisheries Technology (CIFT) also contributes to the Indian ChloroGIN node. CIFT is monitoring the coastal waters to supplement the chlorophyll network in coastal waters of Kochi. *In situ* measurements are made at eight spatial stations and one time-series station monthly. The data are transferred to INCOIS to supplement the chlorophyll network.

3.3 ChloroGIN-Africa

Frank Shillington introduced some elements related to the African ChloroGIN node, including the Nansen-Tutu Centre, training workshops and OceanSAfrica. The African Large Maine Ecosystems (LMEs) are composed of the Canary Current LME, Guinea Current LME, Benguela Current LME, and Agulhas-Somali Current LME, which bring remote-sensing initiatives together. The Nansen-Tutu Centre is a joint venture in agreement between the founding partners and was signed in Cape Town, South Africa on 20th May, 2010. The goal is to improve the capacity to observe, understand and predict the marine ecosystem variability on timescales from days to decades in support of scientific and societal needs including fisheries, coastal management, maritime security, recreation and tourism. One of the core activities at the Centre will focus on education and exchange of young researchers and students from different cultures and countries through the Nansen-Tutu Scholarship Program. The African Operational Oceanography Workshop was held in Cape Town from 13th June to 1st July, 2011. The workshop was given in four modules: GEONETCast receiving station operations, Earth observations, modelling, and data analysis. The OceanSAfrica initiative emerged from the urgent need for a southern African operational oceanography strategy. The Marine Remote Sensing Unit of OceanSAfrica serves as a portal and a southern African hub for all marine remote sensing information, products and services, by providing for research and operational marine remotesensing needs, using a standardized open spatial infrastructure data archiving and metadata system.

John Field introduced the International Centre for Education, Marine and Atmospheric Sciences over Africa (ICEMASA), which is a joint French-South-African research and training initiative on climate change in African margins and the Southern Oceans. ICEMASA is devoted to promote and support development of the local team of researchers, technicians, and students with a high level of scientific expertise in Marine Science. This is the main objective for IRD and the successive IRD/CNRS teams that will serve 2-4 year-stints in South Africa during the next four years and beyond. Dr. Field also introduced the Agulhas Somali Currents Large Marine Ecosystems (ASCLME) programme which aims to acquire sufficient baseline data to support an ecosystem-based approach to the management of the two Large Marine Ecosystems, and the ACCESS programme which aims to maximize the advantage of the unique social and natural assets to attract young scientists into technical and research careers to address regional, and global needs and environmental challenges. The renewed Memorandum of Understanding between PML and University of Cape Town (2012-2017) stresses remote sensing. ChloroGIN will play a major role in the Marine Remote Sensing Unit (MRSU) in Cape Town.

3.4 ChloroGIN-Canada

Trevor Platt presented Canadian work on remote sensing in support of fisheries. Research and international co-ordination is supported by the Canadian Space Agency (CSA). The collapse of the Northwest Atlantic cod fishery in 1992 was the stimulus for work on Earth observations and fisheries.

CSA supports research, operational proof of concept, international coordination and capacity building through: SAFARI (a GEO Task, secretariat in Nova Scotia); ChoroGIN (a GEO Task); Northwest Atlantic Time Series (research transition to operational mode); the International Ocean-Colour Coordinating Group (IOCCG Secretariat in Nova Scotia); and capacity building in all these initiatives through close working relations with the Partnership for Observation of the Global Oceans (POGO).

In Canada, the NW Atlantic Zone chlorophyll time-series based on SeaWiFS is used to develop ecological indicators, delineate ecological provinces, diagnose community structure of phytoplankton, compute primary production (combined with *in situ* data), and support the aquaculture industry (HABs in the Bay of Fundy). The ChloroGIN time series is the global-scale analogue of the NW Atlantic Time Series. ChloroGIN is a GOOS demonstration project, and a task of GEO, both of which provided seed money to initiate ChloroGIN. It is a priority area for GEO capacity building, and is proposed for future support by CSA. The Canadian time-series was based on SeaWiFS, which is a rich information source for research, but is now defunct. In the future, MERIS and other data streams will be emphasized.

3.5 ChloroGIN-Northeast Asia

Shubha Sathyendranath made a presentation on behalf of the Northeast Asian ChloroGIN node, using material provided by Joji Ishizaka, who had been unable to attend. The Northwest Pacific

Environmental Cooperation Center (NPEC) in Toyama, Japan, has agreed to participate in ChloroGIN. The possible contributions to ChloroGIN through the Environmental Watch System of NOWPAP (Northwest Pacific Action Plan) include:

- Links to other ChoroGIN sites;
- Capability of extraction of time series (tentatively show some examples of time series);
- Comparison to *in situ* data from four countries (Japan, Korea, China, Russia) as part of the NOWPAP eutrophication monitoring activity;
- Joji Ishizaka (Nagoya University) is also planning to start a Southeast Asian HAB site as the SE Asian ChloroGIN activity.

The Coastal Environmental Assessment Regional Activity Centre (CEARAC) of NOWPAP has four member states, namely the People's Republic of China, Japan, the Republic of Korea and the Russian Federation and carries out studies on harmful algal blooms, remote sensing, and marine litter. A training course on Remote Sensing Data Analysis will be conducted by CEARAC in Vladivostok, Russia from October 8 to 11, 2011.

3.6 Steps towards a ChloroGIN-Southeast Asia

Shubha Sathyendranath, on behalf of Phan Minh Thu, whose travel had to be cancelled, made a presentation on behalf of the Southeast Asian ChloroGIN node. The SE Asian Sea is part of the Pacific Ocean, with an area of around 3,500,000 square kilometres. There are eight countries surrounding the SE Asian Sea: China, Taiwan, the Philippines, Malaysia, Brunei, Indonesia, Singapore and Vietnam. Over fishing is a major problem for management of living resources. Activities for the ChloroGIN SE Asia node could include national and international cruises. National monitoring stations were established in 1996 in Vietnam, and a number of national cruises have taken place in the region. Data from the oceanographic cruises are currently in the Vietnamese Oceanography Database. Many trainees participated in the GIS and Remote Sensing training course in the Aus-Vietnam project in 1997-1998, and various NF-POGO programmes in 2004, 2006 and 2007. In the future, Vietnam will: strengthen capacity, establish national monitoring stations for Chl-a and marine optics, conduct general surveys in the SE Asia Sea and use remote sensing for natural management.

3.7 Contribution to the set-up of a ChloroGIN times-series in Iberia and African Portuguese speaking countries

Steve Groom gave a presentation on behalf of Vanda Brotas (University of Lisbon), currently on sabbatical at PML. She proposed to establish a network of *in situ* sampling stations along the coasts of Portugal, Angola, Cape Verde and Mozambique with a possible extension to the Azores and Madeira and Brazil. A monthly sampling programme was proposed for data collection, aiming at a long-term series with match up with remote sensing images. Measurements would include chlorophyll a, surface temperature, conductivity as well as nutrients and CDOM.

A document in Portuguese, with a pre-proposal of a network, was sent to the proposed partners and to institutional support contacts. Academic institutional support is between the University of Lisbon (Portugal), University Agostinho Neto (Angola), University of Cape Verde and University of Lurio (Mozambique). A number of other funding organisations are included in the planning.

4. Session 2: ChloroGIN-Antares

4.1 Introduction to Antares,

Eduardo Santamaria gave a brief introduction to Antares, which has been promoted and fostered by both IOCCG and POGO. Antares has received grants from the Inter-American Institute for Global Change Research (IAI) and the Nippon Foundation and is in the agenda of GOOS and GEO under task 'EC-06-07: Regional Networks for Ecosystems. The goal of the Antares network is to study long-term changes in coastal ecosystems around America to distinguish natural variability from anthropogenic perturbations. Capacity building is one of the major targets, and is required to diminish gaps in scientific and technical expertise through training and collaboration.

In 2006, at the Plymouth meeting, Antares was expanded into a global ChloroGIN network. It has both remote sensing and *in situ* components. At the Antares Workshop in Arraial do Cabo, (Brazil, 2009) it was resolved to standardize a core set of measurements to create a common database, to make *in situ* databases from all stations available on the Antares website, and to add new time-series stations to increase understanding of ecosystem variability on a continental-scale.

4.2 Field research at Antares time-series stations

Vivian Lutz presented the Antares time series stations, which are needed to sustain and increase high-quality observations in all regions of the ocean. The *in situ* component of the Antares network is built on ongoing initiatives in different countries in the Americas, relying entirely on local funding at each site. There are different objectives at each site but they all share measurements of surface temperature and surface chlorophyll-a concentration. The aim is to create a database of satellite and *in situ* observations for scientific, educational and management purposes. Common challenges at Antares field stations include lack of human resources which could be addressed through international scholarships (NF/POGO, SCOR) for students to develop projects at the field station, improving sampling capacity which could be addressed through international grants (e.g., associated with the NF/POGO Alumni projects), maintaining continuity in the frequency of field sampling, obtaining funds for new instruments and for training.

Shubha Sathyendranath raised the question of how to get more applications from Antares countries for NF-POGO training courses and Frank Muller-Karger pointed out that some students trained through NF-POGO are lost to other fields, due to lack of continued in-country support. Vivian Lutz suggested that a letter, perhaps from PICO, would be useful to show to management that work being carried out at time series stations was important.

4.3 Ocean-colour data management system for Antares

Frank Muller-Karger presented the overall vision of the data management system for Antares and ChloroGIN. Antares was integrated with ChloroGIN, but each country should have an individualised web site to facilitate obtaining local support and to provide specific products for each country. Each country web site would include web pages in the language for the country with specific satellite data maps and in situ data from local time series to help user understand the satellite data. Basic tools to use data would also be included. Each Antares member would be responsible for part of the Antares website which is hosted by Mexico (UABC). Each country would provide scientific and management 'content' for their pages including *in situ* data to assist in local calibration and validation exercises and provide examples of local applications. One or more institutions would specialize in providing the regional satellite maps; one or more partners would provide data management tools;and everyone would be engaged in the educational content.

The Antares data portal (<u>http://antares.ws/data.html</u>) was maintained by the University of South Florida. A front page for each time series station would be developed by each country. Satellite data access was available until March 2010 after which the service stopped because of MODIS data format changes. The data were used by Argentina, Brazil and Venezuela. A way forward for Antares is to consider submitting a proposal to the NASA SERVIR call for proposals (\$100-250 K/year, 4 years per proposal, deadline 25 October 2011). The funding could be used to implement local websites and populate the pages with data and product descriptions. Online analysis tools could be considered, and the website could contain tutorials in different languages: (Spanish, Portuguese, English). The strategy is to publicize Antares and provide outreach to scientists, educators, resource managers and policy makers.

It was noted that the case studies in the handbook edited by Jesus Morales et al. could perhaps be used for the website, and could be tailored to specific applications in each country.

4.4 Integration of *in situ* and satellite data from Antares stations

Milton Kampel reported on the in situ and satellite match-up study carried out at the Ubatuba station in Brazil, which is characterized by a mixture of Case 1 and 2 waters, with dominance of phytoplankton, but with some important contributions from CDOM and detritus. The median value of satellite 3 X 3 pixels was chosen to compare with in situ measurements. MODIS-aqua level 2 data were used, including reflectance, chlorophyll concentration, Kd(490), indices of CDOM, and POC. The MODIS-Aqua reflectance data had a reasonable performance, with the greatest errors associated with shorter wavelengths (412 and 443 nm). The algorithms for chlorophyll and Kd(490) performed well. The CDOM index did not work, which could be explained by the lack of correlation between CDOM and phytoplankton, and the low performance of the Rrs(412) satellite retrieval. POC algorithm had a reasonable performance, indicating a good potential for application in the Ubatuba coastal waters. Future work includes: better evaluation of the errors associated with in situ and satellite data; more studies of the bio-optical behaviour of the region; evaluation of the semi-analytical retrieval models for CDOM; and regional adjustment of bio-optical models. The comparison of satellite SST and chlorophyll concentrations were done at Antares Stations.

5 Plenary Discussion 1 5.1 Development of SE-Asia node, Phan Minh Thu

The group discussed the possible expansion of ChloroGIN network to Philippines and the proposal that could be put together for submission to the SERVIR program in NASA.

ACTION 3/10. ALETTA YNIQUEZ TO LOOK INTO THE OPPORTUNITY OF SERVIR FUNDING FOR SE-ASIA.

5.2 Further development of ChloroGIN Africa

Frank Shillington and John Field summarised the discussions of the subgroup. Satellite observations are generally quite well covered and distributed in Africa, with low resolution (through AMIS project) and high resolution (through EAMNET project). Programming skills are in short supply and are needed to automate the processing of many images for particular purposes, as opposed to processing individual images. The main focus should be on training at a lower level: data processing and data delivery. GMES now has 10 marine receiving stations in Africa: UCT, Ghana, Dar Es Salaam, and Uganda are the main centres. Training courses, capacity development and capacity retention are needed. Candidates for higher level training for programmers at labs such as PML need to be identified.

There is a high demand for *in situ* measurements, which could be targeted to local needs and problems (search for clients, EAMNET and Devcocast projects). Regional centres need to be developed until they are self supporting. What is required is the *in situ* equivalent of EAMNET funds to equip and train people. AMESD provides high-resolution data to east Africa and Mauritius (JRC EU project co-ordinated by France). The African LMEs should be used as networks for communication in Africa, including IRD Lagos for Francophone Africa, George Wiafe for Ghana and IO-GOOS for the east coast of Africa.

Water quality in freshwater lakes should be further developed (part of GEO). The Lake Chad basin is a GEO project. It was noted that the GEONETCAST project ends in September 2011 and will need a successor. The European ESA Tiger initiative addresses river basins.

5.3 Future development of Antares

Eduardo Santamaria and Vivian Lutz summarised the deliberations of the ChloroGIN-Antares subgroup, which discussed the strategy of advancing the science and broader objectives of ChloroGIN. The ChloroGIN-Antares group aims to contribute to the global integrated network by increasing our understanding of biological oceanographic processes within a number of marine ecosystems distributed around the Americas, using scientific data collected by in situ time series observations and through regional remote sensing. The group discussed how best to integrate with other ChloroGIN efforts, move forward with the Antares website, and how to advance capacity building through POGO and other mechanisms.

The immediate steps to be taken involve responding to a call for proposals issued by NASA to participate in the SERVIR program. The team will develop a proposal to submit by the October deadline. The proposal will emphasize that ChloroGIN-Antares adds value to SERVIR by having a network of experts in the Americas focusing on coastal applications and the integration of in situ data with remote-sensing observations. The Antares team will add value by: (a) helping validate NASA products with local data and knowledge and yet do it at a continental scale; (b) advancing science within developing countries; (c) contributing to knowledge published in the international peer-reviewed literature; and (d) helping to solve local environmental and socioeconomic issues. The scientific applications to be considered include defining environmental baselines within coastal and marine ecosystems in a number of countries, fisheries issues, water quality, disaster relief, human health, and examining long-term trends, among many other themes. The team will help develop the understanding of how climate change affects different regions and the people living in them. More specifically, the Antares observations will help understand how climate change will be expressed through local ecosystem change. The Antares in situ time series observations will provide the basis for understanding the differences of a number of specific ecosystems distributed around the margins of the Americas. The proposal will help integrate the ChloroGIN-Antares program into the GEO framework by addressing GEO objectives. It will address capacity building by teaming up with the IAI and POGO.

There was some discussion on how ChloroGIN-Antares can integrate the very significant global investments of POGO in capacity building and maintenance into this program focused on the Americas. Several models were discussed for possible POGO support, which can be highlighted in the SERVIR proposal. Specifically:

- One training workshop per year (possibly joint with IAI) to help share lessons learned and results/knowledge gained through ChloroGIN-Antares with other SERVIR and ChloroGIN teams;
- Aim to attract NF-POGO alumni to visit and work at ChloroGIN-Antares sites, including focusing NF-POGO research projects on Antares sites;
- Integrate POGO fellows from one Antares country into other Antares country, to crosstrain and learn of common or specific issues;
- Identify candidates from Antares countries to conduct training and capacity building in other countries and help them to incorporate into the ChloroGIN-Antares program upon their return.

There was significant discussion on whether ChloroGIN-Antares should incorporate fresh water/lakes into this proposal, but the team felt that this would dilute their present efforts and not fully capitalize on their expertise and current infrastructure. The consensus was that a separate submission for fresh water and lakes should be submitted to the SERVIR call for proposals, clearly defining the focus of each proposal. Specifically, the ChloroGIN-Antares proposal will focus on coastal zones including coastal, estuarine and marine water quality, and the proposal focusing on fresh water/lakes should ideally not overlap on this theme. Antares is interested in incorporating a freshwater team, but the concern is that the SERVIR call for proposals offers too few resources to do this through the vehicle of a single proposal at this time.

ACTION 3/8. EDUARDO SANTAMARIA TO PUT TOGETHER A SERVIR PROPOSAL FOR ANTARES.

6 Session 3: Synergy with the GEO Initiatives

6.1 GEO Coastal and Inland WG

Steve Greb reported on the GEO Coastal and Inland WG. Much of the world's fresh water is located in northern part of North America. The GEO 2012-2015 work plan has been organized into three major parts to match the key objectives outlined by the GEO-VII Plenary and to provide a clear overview of GEO activities. The three parts are outlined as follows:

- Part 1 Infrastructure. Features the physical cross-cutting components of an operational and sustainable GEOSS.
- Part 2 Institutions and Development. Describes "GEO at work" and the community's efforts to ensure that GEOSS is sustainable, relevant and widely used; it focuses on reinforcing data sharing, resource mobilization, capacity development, user engagement and science and technology integration.
- Part 3 Information for Societal Benefits.

Water SBA has been simplified and now has 5 components:

- Integrated Water-cycle Products and Services. Precipitation, Evaporation-transport, soil moisture, runoff, ground-water integrated data sets.
- Information Systems for Hydro-meteorological Extremes (incl. Floods and Droughts). Construct a global, multi-model and multi-ensemble flood and drought information platform.
- Information Service for Cold Regions. Development of sustained and coordinated pan-Arctic observing and data sharing systems.
- Global Water-Quality Products and Services. Develop information products on the quality of surface and coastal waters for a comprehensive water-cycle decision making system.
- Information System Development and Capacity Building. Program development and professional training in Latin America, Caribbean, Asia, Africa.

Global Water Quality Information System for 2012 - 2015 developed a new task called "Fast Track end-to-end application, including data, products/indicators, information, and knowledge/decision making tools. COST (European Cooperation in Science and Technology) support will cover the costs of networking activities, but does not fund the research itself. There is a proposal opportunity for SERVIR Applied Sciences Team. This solicitation seeks proposals for individual members of a new Applied Sciences Team to support the SERVIR program in developing science applications for international development through the use of Earth observations.

Venetia Stuart raised a question on the scope of this proposed IOCCG freshwater working group and Steve replied that it may be possible to form an IOCCG working group on water quality or remote sensing of inland waters or a combination of both. Similar issues also apply to nearshore waters. Shubha Sathyendranath agreed that it would be good to use the SERVIR ROSES opportunity, and recommended submitting two or proposals from ChloroGIN, one for inland waters and and the other for coastal water. The proposals could also emphasise regional aspects: one for Latin America, one for lakes and one for Southeast Asia.

ACTION 3/9. STEVE GREB TO DISTRIBUTE AND DISCUSS THE RFP (REQUEST FOR PROPOSALS) WITH MEMBERS OF FRESHWATER COMMUNITY.

6.2 Update on GEO funding and Blue Planet

Douglas Cripe gave a report on behalf of the GEO Secretariat. The Group on Earth Observations (GEO) promotes satellite data sharing to benefit fully from all the Earth observation systems (currently there are 250 sensors on 150 satellites observing the Earth). GEO is an intergovernmental group with 86 Members and 61 Participating Organizations. GEOSS implementation requires data sharing principles, which are full and open exchange of data, data and products at minimum time delay and minimum cost, and free of charge or cost of reproduction for research and education.

Oceans are not specifically mentioned in the Societal Benefits Areas (SBAs), but are nevertheless addressed in the Agriculture, Ecosystems, Biodiversity and Water SBAs, and they really touch on all the other SBAs. Dr. Cripe supports the water SBA and also supports the ocean community. GEO are developing a new working plan for 2012-2015. Water-related information for societal benefits includes SB-01 Oceans and Society - Blue Planet and WA-01 Integrated Water Information. GEO is also busy developing a new transverse task for oceans (with POGO). Three main rubrics are:

- Infrastructure (Architecture and Data Management)
- Institutions and Development (Capacity Building, Science and Technology, User Engagement)
- Information for Societal Benefits (All SBA Tasks, plus new transverse tasks on Oceans, Global Land Cover, Global Forest Observation, Impact Assessment of Human Activities)

A Call for proposals (CFP) on Earth Observations in Decision Support, was a joint effort of the GEO Capacity Building committee and the User Interface committee. The CFP would focus on 4 SBAs and have 3 types of projects. Final results selected 71 proposals with the total funds requested being around \$45M USD. A one-page project fact sheet was requested for the ChloroGIN proposal and will go onto a website. Donor agencies browse these fact sheets for potential funding opportunities. GEO will be getting a new full-time person to manage this from the US. A GEO-CFP Support team is currently compiling a list of the primary national, regional and international funding organizations and is seeking to arrange meetings with funding organizations to solicit support for projects. Special sessions at selected fora (e.g., GEO/EGIDA, APN, etc.) will be conducted to educate the broader GEO community (and potential funding organizations) about this CFP. Informational presentations and dossiers on sets of proposals are being prepared to communicate what GEO is trying to accomplish, the benefit to funding organizations, and the benefit to the proposing organizations.

A Water Cycle capacity building workshop will be held in Cartagena, Columbia, from November 28 to December 2, 2011. The workshop is being organized by the Centre of Hydrologic and Spatial Information for Latin America and the Caribbean (CIEHLYC) and is supported by NOAA, NASA, CPTEC, GEO, and Canadian GEO. The workshop will feature presentations and discussions on both freshwater and oceanographic issues. In addition, hands-on training modules will be presented by NOAA, NASA and CPTEC. The ocean component includes the following topics:

- Early warning systems harmful algal blooms;
- Coral reef protection, rivers to reefs connections;
- Assessment of ecosystems through ocean mapping;
- Database and information systems to evaluate fisheries migration in the context of ocean temperature increase;
- Capacity building in image classification and interpretation targeting HABs and ocean temperature; and
- Interdisciplinary observing systems

7 Session 4: ChloroGIN and Inland Waters

7.1 Proposed ChloroGIN lakes initiative

Tiit Kutser gave a presentation on the potential ChloroGIN lakes initiative. Lakes account for 3.5-4% of global land surface area, but they are significant drinking water resource, food resource, economical asset and regulator and integrator of carbon cycle. The goal of ChloroGIN lakes is to develop a global freshwater operational, water-quality monitoring system based on satellite data and in situ time series stations in selected lakes. The work will include:

- Algorithm development;
- Processing satellite data;
- Dissemination of developed products; and
- Capacity building to develop necessary infrastructure for selected lakes of regional importance, to be able to collect time series of in situ data for calibration and validation of remote-sensing products.

The related activities and deliverables include:

- Identifying the lakes suitable for monitoring with medium resolution sensors by developing land masks with the spatial resolution of different satellite sensors.
- Identifying the lakes where time series of in situ data exist by surveying governmental agencies and institutions on existing/ongoing data collection activities. Develop partnerships/agreements with local/state/regional water-quality managers to construct a database of global in-situ water-quality measurement required for calibration efforts.
- Equipping at least one major lake on each continent with a set of instruments to measure inherent optical properties for regional algorithm development, calibration and validation.
- Construction of a database of global in situ water-quality measurements required for calibration efforts.
- Construction of a database of IOP's for at least one major lake on each continent for regional algorithm development, calibration and validation.

- Development of a historic time series of water quality for lakes (trends) for selected lakes to demonstrate relevance to water-quality managers and climate-change studies based on historic imagery and in situ data from ongoing monitoring programs.
- Development of regional algorithms for lake water-quality retrieval and test the potential of having global lake water-quality algorithms.

7.2 ChloroGIN website

Steve Groom reported on the ChloroGIN website, which is a portal linking to regional data providers and which provides a source of information. PML obtained the ChloroGIN.org address for ChloroGIN, and it is retained with an annual fee. The website is designed to be simple to maintain and light on bandwidth. A new ChloroGIN lakes page was recently added to the website. Currently there are only two lakes on the website, but it is still in an early stage of development and it is hoped to add new lakes. ChloroGIS is a web-based GIS and data integration tool, but it requires high band width. A web-processing service demo from the Western Channel Observatory site can examine *in situ* data as well as satellite data. The data can be used in a GIS-type system. The maps will be changed so that they are "zoom-able" and it is planned that more lakes regions will be added.

Trevor Platt suggested that it would be useful if the website had more information about ChloroGIN, and suggested that the vision and objectives of ChloroGIN should be added to the website. Shubha Sathyendranath recommended that it should appear as a dynamic website, and not just a PML initiative with the identity of the regional nodes provided at the top of each page. Trevor Platt suggested that volunteers should write generic text for the website. It was also suggested that a link could be created from the ChloroGIN website to the PRESPO IOCCG handbook.

7.3 Discussion Session on ChloroGIN lakes proposal

Steve Greb reported that, till then, the ChloroGIN project had generally focused on coastal areas of South America, Africa, Europe and Asia. The logical progression of this activity was to extend it to large lakes of the world. The spatial resolution of MERIS is sufficient to capture ample image pixels on these water bodies. Currently, Steve Groom (PML) has been processing images for lakes located in both UK and Lake Balaton in Hungary (Estonian lakes and coastal areas of Portugal (Tagus Estuary) have been added since the ChloroGIN workshop). This activity has been identified as a GEO water-quality activity over the next three years and highlighted as an end-to-end demonstration project. Additional participation from scientists with in-situ optical and water-quality data is encouraged.

Suggestions for future development of the lakes initiative included:

- Enlist more lake scientists to contribute their respective lake data (IOP, AOP, constituent concentration). Efforts will be made in Italy, S. Africa, Peru, Chile, US, China.
- Initiate a project for comparison of in-situ and satellite-generated values for water quality parameters.

• Form a team to further algorithm development for ChloroGIN lakes and other optically-complex waters. Test semi-analytical algorithms across ChloroGIN lakes.

Participants agreed to continue to collaborate and communicate over the next 6 months and discuss future funding opportunities.

8 Session 5: Other related initiatives

8.1 Related GEO/GOOS Initiatives (SAFARI, FARO, PICO, Columbia Workshop)

Trevor Platt reported on other GEO/GOOS related initiatives. GOOS is a permanent global system for observations, modelling and analysis of marine and ocean variables to support operational ocean services worldwide. GOOS provides: accurate descriptions of the present state of the oceans, including living resources; continuous forecasts of the future conditions of the sea for as far ahead as possible; and is the basis for forecasts of climate change. PICO (Panel for Integrated Coastal Observation) recently issued its implementation plan, which is useful for implementing other programs in coastal waters. The existing GOOS structure includes I-GOOS (now being dropped) for governance; scientific guidance and advice panels (PICO, GSSC, OOPC), and implementation bodies (GOOS regional alliances, GOOS Project Office, JCOMM). ChloroGIN is prominently highlighted in the PICO implementation plan. ChloroGIN will provide key satellite remote sensing and *in situ* data in support of multiple phenomena of interest (e.g., HABs), bringing together data providers and users. ChloroGIN supports Data Management and Communications, including dissemination of ocean surface chlorophyll and temperature fields, along with associated in situ measurements of chlorophyll-a, temperature, and ChloroGIN is an excellent model for pilot projects and international light penetration. partnerships. It was suggested that PICO should include the NF-POGO alumni (NANO) as possible agents of implementation. There are many other initiatives with similar goals of observing the oceans, including OceanObs'09 (Venice). The post-Venice framework will be structured around Essential Climate Variables (ECVs).

8.2 Relevant ESA Initiatives (CoastColour and CCI)

Shubha Sathyendranath reported on ESA's CoastColour Project, the objectives of which include:

- MERIS FR data of challenging/important coastal zones at a regional scale, processed with best possible algorithms for Level 1, with best possible regional algorithms for water-leaving reflectance and IOPs, and demonstrating processing of regional higher-level specific products; all products will include per pixel error/uncertainty estimates;
- Internationally-discussed protocols for complex water processing, including algorithm performance assessment;
- An international comparison of 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 is linked to IOCCG, GEO, POGO, SAFARI and ChloroGIN. Preliminary CoastColour products are available for the selected global sites. Ocean colour is identified as one of eleven Essential Climate Variables (ECV) accessible to remote sensing. It targets a key property of marine ecosystem and is the only marine ECV that probes the "living" part of our Living Planet. The ESA project Ocean Colour Climate Initiative focuses on the use of ocean colour for climate research. The CCI also addressed many other ECV's (about 10) amenable to remote sensing. Many members of ChloroGIN were active in the OC-CCI project.

9 Plenary Discussion 2

9.1 Group 1: Improving in situ Data Availability and Sharing

The group, chaired by Nicolas Hoepffner and Vivian Lutz, discussed the lack of *in situ* data available for validation and modelling. Collecting *in situ* data is expensive and in some countries, collection of the data is mandatory for government monitoring, but the quality of the data is not always good. Often data are not processed in a timely manner, or the data is not shared. Some *in situ* programmes are financed by individual projects, and if they are short of funds, the samples may be collected but the data are not processed. The processing has to be done at the individual sites, unlike satellite data, which can be processed at a central location. Once the data have been processed and quality-controlled, they can be posted on a data base. The following issues were also addressed by the group: calibration of instruments; inter-comparison of methods; and the need for more people and more resources.

The group discussed how to increase the number of match-up points for satellite data (frequency of sampling, use of autonomous devices such as buoys or fixed platforms). The group agreed that *in situ* measurements are essential in programmes using satellite information because sensors make an indirect measurement (reflectance) and have to be validated. Validations in many places have shown more than 40% error in chlorophyll, so there is a need for development of new algorithms, which requires *in situ* data. Satellites only observe the surface layers, so there is a further need for water-column information from in situ data. Biological and physiological information have to be sampled *in situ* (biodiversity, phytoplankton composition, rates of primary production). There are ecologically-derived products from remote sensing, but they also need validation with the direct measurements. The group identified other *in situ* measurements, apart from Chl-a, that should be measured whenever possible: inherent optical properties (IOP); particulate and CDOM absorption; backscattering; diffuse attenuation coefficient (Secchi disk; radiometers).

Satellite data are usually freely available, whereas *in situ* data are collected by individual scientists through small grants. Often the data have to be published or used in a thesis before they can be made available. In some countries, governments provide resources for monitoring, and the data are processed within a reasonable timeframe, and made available. Regular monitoring is required to be able to forecast and model the system. Some areas of the ocean can be better modelled by taking advantage of historical sampling records. The group agreed that a workshop

dedicated exclusively to *in situ* data from ChloroGIN was required, to focus on increasing the quality and quantity of the data. It was also necessary to promote a better synergy between *in situ* and satellite data. Technological devices and autonomous instruments (buoys, ferry boxes and gliders) were also discussed.

9.2 Group 2: Improving the ChloroGIN website

The group, chaired by Steve Groom, summarised points that had already been raised during the plenary:

- Add text written by John Field (vision and objectives) to the front page
- Add examples of use/applications by each partner
- Add lessons on how to use the data, including creating a link to the IOCCG PRESPO handbook, link to EAMNet website with Bilko lessons, partners to provide lessons, which could be complemented by a publications page.

The group suggested that the content could be reorganised and supplemented as follows:

- Add more introductory/background text on the home page with introductory text, and link to data portals represented by a satellite image in one corner (similar to EAMNET website); this structure would accommodate different types of people, i.e. those who know the site and want to go straight to the data and those who are not familiar with ChloroGIN and want to find out more about the programme.
- Include the "vision" text and a list of regional nodes.
- Make the objectives "one click away".
- Create a page for each regional node with short background text on each one, and maps of the region.
- Add links to *in situ* data by linking to existing websites that provide chlorophyll and other data. This could be achieved by a clickable map with stars representing sampling stations.
- It would be useful for resource managers/policy makers to have a simple table showing monthly *in situ* chlorophyll concentrations against satellite chlorophyll concentration.
- Create a link to US satellite data providers.
- Add a page for FAQs or link to other forums.
- Provide on-line data extraction tools and basic statistics including box averages, transects and time-series that are user-friendly and can be exported to regions e.g. ChloroGIS shown by Steve Groom and AMIS website shown by Nicolas Hoepffner.

The group also suggested the following aesthetic changes:

- Use Drupal Content Management System (same as EAMNet), possibly using the same template.
- Have menu items in a side bar.
- Make the contacts link more prominent.
- It was suggested that a unified style be used for the partners pages by providing the Drupal template this may be difficult to enforce and should be up to partners to decide.
- There was some debate about using black writing on white background or vice versa. This will be decided when the website is transferred to the new system.

ACTION 3/2. FRANK MULLER-KARGER TO PROVIDE LINKS TO USA SATELLITE DATA PORTALS.

ACTION 3/7. ALL CHLOROGIN MEMBERS TO SEND LINKS TO IN SITU DATA TO STEVE GROOM.

ACTION 3/3. MILTON KAMPEL TO TRANSLATE THE CHLOROGIN VISION AND OBJECTIVES INTO PORTUGUESE.

ACTION 3/4. FRANK MULLER-KARGER TO TRANSLATE VISION AND OBJECTIVES OF CHLOROGIN INTO SPANISH.

ACTION 3/6. TREVOR PLATT AND OTHERS TO WRITE A FEW SECTIONS ON THE USE OF IN SITU DATA AND STEVE GROOM TO PUT IT "ONE-CLICK AWAY" ON THE CHLOROGIN WEBSITE.

10 Session 6: Related Capacity Building Initiatives

10.1 EAMNET

Steve Groom gave a presentation on the EAMNet Project, which is a Coordination and Support Action funded by the European Commission Framework 7 programme. It funds networking, training, fellowships, data provision and research coordination, and was led by the Plymouth Marine Laboratory (PML). The overall objectives of EAMNet are:

- To improve access to marine Earth Observation (EO) data, increase data exchange and encourage increased use of EO in Africa
- To develop long-term sustainable approaches to capacity building and maintenance in marine EO.
- To support development of GOOS Africa as a contribution to a worldwide observation system and improve coordination of existing GMES research and services activities in Africa.
- To create a forum for African engagement in GMES Africa.

EAMNet now provides complete coverage of the African coast, and Indian Ocean in collaboration with AMESD. EAMNet plans to provide high-resolution lake coverage, which is a contribution to ChloroGIN-Lakes. Data will be broadcast via GEONETCast, transmitted by Digital Video and broadcasted to individual receivers. Five new GEONETCast receiving stations were established. Free/open source data processing and analysis tools were made easily available to EAMNet data users, along with clear introductory tutorials demonstrating the use of these processing tools to analyse EAMNet data. For capacity building, the existing marine training structure was reviewed. There is sufficient remote-sensing experience in Africa, but little computer programming experience to batch process satellite images. An M.Sc module in marine EO was designed and tailored to meet wider African needs and demonstrate applications of GMES-related EO data using African examples. Fellowships were offered and aimed to coordinate and harmonize Africa-EU R&D activities, spread best practices, and involve African

stakeholders in GMES service development. Dissemination includes a newsletter every 3 months and symposia.

Trevor Platt raised the question if EAMNet could be done for Latin America and he pointed out that GEOBON (GEO biodiversity) have funding, and perhaps the marine component could access some of the funds. One of the things they are supposed to do is to create a list of ecosystem indicators, but none of these included those derived from remote sensing. Douglas Cripe agreed to get in touch with GEOBON and noted that he did not realise that there was a marine component. CoML and CPR could also contribute.

ACTION 3/5. DOUGLAS CRIPE TO CONTACT GEOBON TO SEE IF THEY CAN SUPPORT THE MARINE COMMUNITY, AND ALSO TO FOLLOW CHLOROGIN LAKES INITIATIVE CLOSELY.

10.2 POGO NF Alumni links

Sophie Seeyave reported on the newly developed Nippon Foundation-POGO alumni group. POGO has 37 member institutes from 21 countries. Enhancing the involvement of developing countries is part of the overall strategy. The Nippon Foundation-POGO visiting professorship programme (2004-2007) provided a unique opportunity for capacity building through visits of eminent scientists to developing countries for training and building facilities. The Nippon Foundation-POGO Centre of Excellence (established in 2007) provides a unique opportunity for a 10-month training programme at the Bermuda Institute of Ocean Sciences. Networking is a top priority for the programme. The NF-POGO Regional Training Programme forms part of the activities of the NF-POGO Centre of Excellence in Bermuda. The programme uses previous trainees as nucleus for the regional programme, and is also a vehicle for identifying suitable candidates for other capacity-building initiatives. Other POGO Capacity Building Programmes include POGO-SCOR Fellowships and POGO-AMT (Atlantic Meridional Transect) Fellowship.

NF-POGO Alumni Network for Oceans (NANO) was established following a Planning Meeting that took place in Oct 2010. The goal of the network is to maximize the benefits to the alumni from the training they have received; to facilitate active contacts among the alumni and with the training faculty; and to promote joint research activities that will build on the training. Since the meeting, NF-POGO has awarded 2 fellowships to former scholars to help the Secretariat develop the Network and create a NANO alumni database and website. The NANO website includes information such as training courses, individual profiles for each alumnus, news announcement from POGO secretariat, activities, opportunities, on-line oceanographic datasets, thematic pages, an on-line survey and an e-newsletter. NANO also supports research projects, and the Nippon Foundation has asked POGO to submit proposals to them by the end of 2011 for projects that could be undertaken jointly by the alumni. A meeting was held in Abingdon, UK, from 26 to 28 September 2011 to prepare these proposals. The meeting was attended by a selection of alumni, instructors and POGO Secretariat staff.

ACTION 3/11. CHLOROGIN MEMBERS TO HELP ADVERTISE POGO AND EAMNET FELLOWSHIPS.

10.3 PRESPO IOCCG Handbook

Venetia Stuart presented the PRESPO IOCCG Handbook on Satellite Remote Sensing Image Interpretation, coordinated by Jesus Morales. The handbook was supported by EU PRESPO, INTERREG IVB Programme, IOCCG and the FARO project. Electronic copies of handbook plus data files are available on the IOCCG and PRESPO websites. This training material is designed for researchers, teachers, and end-users interested in obtaining a better understanding of the structure and functioning of marine pelagic ecosystems using freely-available satellite data. The handbook includes 19 cases studies contributed by 48 scientists from 11 countries. The satellite sensors demonstrated include CZCS, SeaWIFS, MODIS, POLDER-1, MERSI, COCTS, SAR (Radarsat), ATSR, AVHRR, OMI, TOMS, Landsat, SSM/I, QuikScat, DMSP-OLS and TRMM-TMI. The contents are arranged around four themes including Air/Water Quality, Phytoplankton and Macroalgae, Fisheries and Aquaculture, and Marine Ecosystem Characterization. There are strong linkages between the handbook and ChloroGIN: 74% of cases use chlorophyll-a; 50% of cases use ocean colour data and 11 cases are geographically covered by ChloroGIN global nodes.

11 Session 7: Conclusion and Reports

11.1 Reports, action plans and next steps

Trevor Platt summarised some of the ChloroGIN priorities proposed by Stewart Bernard including: global validation and algorithm application across regional ecosystems; development of freshwater ocean colour applications; ChloroGIS reaching users with a powerful standardised interface; and user-driven product development. Short-term actions included: ChloroGIN labelled data submission to cal/val database such as NOMAD/MERMAID and submission of peer-reviewed papers describing the ChloroGIN network framework, protocols and societal benefits with case study summaries.

Trevor Platt suggested that data could be labelled as products of ChloroGIN and other programmes. The main interest is that the data be used. To popularize ChloroGIN, a technical article for EOS could be written, which Douglas Cripe agreed to include in a GEO newsletter. A narrative article could also be written for New Scientist.

ACTION 3/12. TREVOR PLATT TO LEAD A NARRATIVE ARTICLE ON CHLOROGIN FOR NEW SCIENTIST.

ACTION 3/13. NICOLAS HOEPFFNER TO LEAD A TECHNICAL ARTICLE ON CHLOROGIN FOR EOS, AND DOUGLAS CRIPE TO INCLUDE IT IN THE GEO NEWSLETTER.

11.2 Plans for Second International Symposium on Remote Sensing and Fisheries

Vivian Lutz proposed to host the Second International Symposium on Remote Sensing and Fisheries in Mar del Plata, Argentina in March, 2013. A FARO meeting could also be arranged before or after the symposium. Frank Muller-Karger liked the idea of revisiting the roots of

Antares. Shubha Sathyendranath suggested that it is important to provide some co-funding. Trevor Platt suggested that an organising committee for the symposium should be created and the dates should be fixed.

ACTION 3/14. VENETIA STUART TO INFORM DFO ABOUT ARGENTINA MEETING.

ACTION 3/15. NICOLAS HOEPFFNER TO FOLLOW UP ON ACQUIRING FUNDS FROM THE EUROPEAN COMMISSION FOR THE ARGENTINA SYMPOSIUM IN 2013.

ACTION 3/16. VIVIAN LUTZ TO ORGANISE A COMMITTEE FOR THE 2013 SYMPOSIUM AND FIX THE DATES.

11.3 Summary remarks

Trevor Platt noted that ChloroGIN should take advantage of the common ground between GEO, Antares, and EAMNet. Douglas Cripe agreed to contact GEOBON to emphasize the value of work in the marine community, and would also follow the ChloroGIN-Lakes initiative closely. Steve Greb agreed to create link between the water task and Blue Planet task. Milton Kampel agreed to develop case studies using satellite imagery around the Brazilian coasts. It was also noted that it was important to make *in situ* data more accessible, and to keep demonstrating why this is critical to many studies. A questionnaire regarding HPLC analysis of *in situ* samples by NASA would be circulated by the FARO Secretariat, and all ChloroGIN members were encouraged to complete the form. This could provide a mechanism for getting more ChloroGIN data into the NOMAD database.

Trevor Platt thanked the meeting organisers, especially Cheryl Rafuse, and Shubha Sathyendranath thanked everyone for coming.

ACTION 3/17. STEVE GREB TO CREATE WEBSITE LINK BETWEEN WATER TASK AND BLUE PLANET TASK.

ACTION 3/18. MILTON KAMPEL TO DEVELOP CASE STUDIES USING SATELLITE IMAGERY AROUND THE BRAZILIAN COASTLINE.

ACTION 3/19. FARO SECRETARIAT TO RESEND QUESTIONNAIRE REGARDING ANALYSIS OF HPLC SAMPLES BY NASA. ALL CHLOROGIN MEMBERS TO COMPLETE THE FORM AND RETURN IT TO THE FARO SECRETARIAT.

Appendix A:

List of ChloroGIN Actions

Action	Brief description	Status
3/1.	Steve Groom to correct the expansion of the ChloroGIN	Closed
	acronym on the ChloroGIN website to read "Chlorophyll	
	Globally Integrated Network", and to follow up on other	
	suggestions for improving the ChlogoGIN web site.	
3/2.	Frank Muller-Karger to provide links to USA satellite data	Open
	portals.	
3/3.	Milton Kampel to translate vision and objectives of ChloroGIN	Open
	into Portuguese.	
3/4.	Frank Muller-Karger to translate vision and objectives of	Closed
2/5	ChloroGIN into Spanish.	
3/5.	Douglas Cripe to contact GEOBON to see if they can support	Open
	the marine community, and also to follow ChloroGIN lakes	
016	initiative closely.	-
3/6.	Trevor Platt and others to write a few sections on the use of in	Open
	situ data and Steve Groom to put it "one-click away" on the	
2/7	ChloroGIN website.	<u>C1</u> 1
3/1.	All ChloroGIN members to send links to in situ data to Steve	Closed
2/0	Groom.	0
3/8.	Anteres	Open
2/0	Anales. Stave Credulate distribute and discuss the DED (Decuset for	Closed
5/9.	Proposals) with members of freshwater community	Closed
3/10	A letta Vniquez to look into the opportunity of SERVIP funding	Closed
5/10.	for $SE_{-}\Delta sia$	Closed
3/11	ChloroGIN members to help advertise POGO and EAMNet	Closed
5/11.	fellowshins	Closed
3/12.	Trevor Platt to lead a narrative article on ChloroGIN for New	Open
0/120	Scientist.	opm
3/13.	Nicolas Hoepffner to lead a technical article on ChloroGIN for	Open
	EOS, and Douglas Cripe to include it in GEO newsletter.	I
3/14.	Venetia Stuart to inform DFO about Argentina meeting.	Closed
3/15.	Nicolas Hoepffner to follow up on acquiring funds from the	Open
	European Commission for the Argentina symposium in 2013.	1
3/16.	Vivian Lutz to organise a committee for the symposium and fix	Closed
	the dates.	
3/17.	Steve Greb to create website link between water task and Blue	Open
	Planet task.	
3/18.	Milton Kampel to develop case studies using satellite imagery	Open
	around the Brazilian coastline.	
3/19.	FARO Secretariat to resend questionnaire regarding analysis of	Closed
	HPLC samples by NASA. All ChloroGIN members to	
	complete the form and return it to the FARO Secretariat.	

Appendix B:

List of Participants

3rd ChloroGIN Meeting, Dartmouth, Nova Scotia Canada

9 - 11 August 2011

Participant	Affiliation	
Ana Dogliotti (adogliotti@iafe.uba.ar)	IAFE-CONICET, Argentina	
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Emmanuel Devred (emmanuel.devred@takuvik.ulaval.ca)	Bedford Institute of Oceanography, Canada	
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Frank Muller Karger (carib@marine.usf.edu)	University of South Florida, USA	
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