Tenth IOCCG Committee Meeting

19-21 January 2005,
Isla de Margarita, Venezuela

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MINUTES

1. Welcome Address and Logistics

The 10th IOCCG Committee meeting took place on Margarita Island, Venezuela, from 19-21 January 2005 and was attended by a total of 24 participants, including scientific committee members, Agency representatives and invited guests (see Appendix I for list of participants). The meeting venue was coordinated with the help of EDIMAR, Margarita's Marine Research Station.

The Chairman, Dr. Trevor Platt, welcomed participants and noted that it was difficult to believe that it was already the 10th meeting of the IOCCG, and that much progress had been made along the way. He informed delegates that there were two reasons for holding the meeting in South America: firstly, the marine science program on Margarita Island included a strong ocean-colour component. Two representatives of this programme, Yrene Astor and Frank Muller-Karger, also welcomed participants to Venezuela and thanked them for helping to highlight their time-series station. Secondly, IOCCG had been trying to help scientists in Latin America to form a network of bio-optical stations, and to help them to raise research funds to run the program. The program, called ANTARES, had held a very successful meeting on the island the previous week. Discussions on the ANTARES Programme, lead by Vivian Lutz, would take place later during the meeting.

2. Adoption of Agenda

The agenda adopted after the addition of two new agenda items: item 5.2, a proposal by Arnold Dekker for a new IOCCG working group, and item 9.2, the MERSEA European Integrated Project.

3. Record of the 9th Committee Meeting

3.1 The minutes of the 9th Committee meeting were taken as being a true and fair record of the business of that meeting, after making a small correction to the launch date of NPOESS, as proposed by Paula Bontempi.

3.2 Venetia Stuart reviewed the action items from the 9th Committee meeting. Most of the items had either been completed or would be specifically addressed in connection with10th Committee meeting agenda items. Referring to action item 9/8b, Mervyn Lynch noted that the ocean-colour workshop scheduled to be held during the Ocean Optics meetings had not taken place, as it was difficult to run workshops and forums within the program. He welcomed suggestions for another forum to hold a workshop highlighting the challenges and opportunities in ocean colour. Paula Bontempi suggested that the ASLO/TOS meeting in Feb 2006 could be a possible venue. The Chairman also welcomed advice on how to proceed with action items 9/9 and 9/15b, which were still in draft form.

4. Status of Current IOCCG Working Groups

4.1 Ocean Colour Data-Binning Issues

The working group Chair, David Antoine, reported that the group had completed its task, and that the report had been printed and distributed by IOCCG. Michael Rast (ESA) thanked the working group chair for incorporating MERIS data at such short notice. The Chairman expressed appreciation for the groups' accomplishments and for bringing the report to a timely conclusion.

4.2 Gothic "R" revision

André Morel (LOV) introduced another item related to the merging of data - the bidirectional correction and the use of the term "Gothic R". This term merges all reflection and radiation elements, and is dependant on wind speed and viewing angle. When this correction was recently applied to MODIS data, it was found that the correction was too strong, in particular toward the edges of the swath. By using another approach, Howard Gordon found that the Gothic R term had been incorrectly computed in the past (Morel and Gentili, 1996). Morel and Gentili repeated the computations by using a backward (instead of a forward) Monte-Carlo method, and confirmed the values obtained by Gordon (see Gordon, Applied Optics, vol 44(2): 241-248; tabulated values over the Internet, anonymous ftp, oceane.obs-vlfr.fr cd pub/morel/Gothic-R-2004). The new values are less sensitive to the wind speed at large viewing angles. The effect of the new Gothic R values remains not negligible for MODIS, reduced for SeaWiFS, and for the MERIS sensor, which has a narrow swath, Gothic R can be considered as constant whatever the wind speed.

4.3 Calibration of Ocean-Colour Sensors

Robert Frouin (Scripps), chair of the calibration working group, reported that a workshop had been held in Fremantle, Australia, following the Ocean Optics conference in October 2004. Twenty-two participants from the international ocean-colour community attended the workshop and contributed presentation material and ideas. In the first part of the meeting, invited experts and representatives of international space agencies gave presentations on various aspects of calibration, including definitions and requirements, the various techniques, and the selection of final calibration coefficients. In the second part of the meeting, issues centred around three major themes: calibration requirements, adequacy of calibration techniques, and definition of a common calibration strategy. Presentations were given by Howard Gordon (University of Miami), Bertrand Fougnie (CNES) , Mayumi Yoshida, (Japan), Jean-Paul Huot (ESA), David Antoine (LOV), Pierre-Yves Deschamps (University of Lille) and Robert Frouin. Copies of all presentation material was available at: http://genius.ucsd.edu/~frouin/IOCCG_Cal/present.html. Recommendations arising from the meeting included the following main points:

- To achieve the requirements for scientific applications (e.g., 30% accuracy for chlorophyll concentration), radiometric calibration should be accurate to a fraction of 1%. This is currently not achievable by standard techniques, so the target accuracy should be 2%. Reflectance calibration has a number of advantages over radiance calibration.
- Sensors should be characterized for out-of-band response, polarization sensitivity, bright target/scattered light response, non-linearity, etc.
- Vicarious calibration is required to meet accuracy objectives.

- Calibration sites should be carefully selected.
- The data used for sensor calibration should be made available to the ocean-colour community to allow investigators to perform their own calibration.
- JAXA, CNES, and NASA calibration schemes all differ. Some resolution is thus required.

Robert Frouin noted that a draft report would be submitted by Fall 2005, and would include the following sections: Definitions, formalism and requirements (Howard Gordon); Calibration using onboard devices (Edward Zalewski) and; Vicarious calibration techniques (Bertrand Fougnie).

Participants expressed concern about the pending loss of MOBY for calibration of ocean-colour sensors, which was addressed at the workshop. This issue would be discussed under item 7.1. There was also some discussion about the desirability of using a standard set of instruments at different sites, to facilitate intercomparisons between sites. Frank Muller-Karger (Univ. of South Florida) agreed that convergence was required on what to measure, and how to carry out the measurements, but many scientists did not follow the protocols laid out in the SeaWiFS technical report series rigorously enough and in some cases, the protocols were not complete. Roland Doerffer (GKSS) noted that standardisation might not be good for certain conditions, particularly for above-water reflectance, where errors might be produced, even if the protocols were followed strictly. André Morel pointed out that the protocols for in-water measurements were very detailed, but above-water measurement needed to be more flexible to take into account the different geometry of ships etc. According to Paula Bontempi, NASA was aware of the need to evolve, and participation by other Agencies such as ESA was required in coming up with a new set of protocols.

4.4 Working group on Global Ecological Provinces

Mark Dowell (JRC), chair of the Ecological Provinces working group, gave a brief presentation on the groups' activities. He noted that the working group was applied, in scope, and fitted in well with Chris Brown's operational ocean-colour working group. Two working group meeting had already taken place: the first meeting, held in Villefranche (October, 2003), focussed on methodological aspects such as defining boundaries and making use of ocean colour and ancillary data, and the second meeting, held in Ispra, Italy (September 2004), focussed on looking at how existing methods and partitions could be put to use with ocean-colour data. A table of contents of the report was drafted and the title of the report was also discussed. A new chapter on retrieval of phytoplankton biomass and primary productivity had been added, as this aspect was much further progressed than other applications. The report would focus on topics related to ocean-colour data, and would not be restricted to ecological provinces.

The working group would submit joint abstract for the ASLO conference in Spain (June 2005) and the first draft of contributions for individual chapters would be ready by Spring 2005. Full drafts of Chapter 3 (Dowell), Chapter 6 (Morales), and Chapter 7 (Dutkewicz) had been completed. The final draft of individual chapters should be ready by the end of June 2005, and the edited version of the report would be submitted for comment to the IOCCG Executive Committee around October 2005. It was hoped that the final version of the report would be ready in time for the next IOCCG meeting.

Following the presentation there was some discussion about using data from time-series stations. Dr. Dowell noted that the working group had discussed this issue, and concluded that both static and dynamic approaches had validity and relevance. Shubha Sathyendranath (POGO) informed the Committee that POGO was promoting a set of ocean time-series stations, and questioned whether these should include bio-optical measurements, since there was also a need for bio-optical in situ data for validation of ocean-colour data. James Yoder (Univ. Rhode Island) agreed that it would be a good idea to take advantage of sites that are already there, and just add bio-optical instruments.

4.5 Operational Ocean Colour working group

The Chair of the Operational Ocean Colour working group, Christopher Brown (NOAA), reviewed the goals of the working group. He noted that the group would focus on writing the "Why Ocean Colour"

report, the final draft of which should have been submitted last year. Several contributions had already been received but he was still waiting for contributions from Ian Robinson (use of ocean colour in modelling) and Frank Shillington (use of ocean colour and fisheries in Southern Africa). Dr. Brown noted that the submission of the draft report had been included in his NOAA performance plan so the new draft report would now be submitted at the end of June 2005. The group would hold another workshop to finalise the document, and the final draft would be submitted to IOCCG by the end of the year. Roland Doerffer suggested that the report should also include a chapter on ocean-colour applications, and perhaps a review on the use of ocean-colour in provinces. There was also a recommendation to include geostationary and hyperspectral applications in a new section on the future of ocean-colour. The Chairman suggested that the title of the report should read "Why ocean colour: A case for visible oceanography of the ocean".

4.6 Comparison of Atmospheric Correction Algorithms

The Chair of the working group, Menghua Wang (NOAA), had submitted a progress report to IOCCG. Due to a busy work schedule, the first draft of the report could not be finished in 2004, but should be completed in 2005. The working group still needed to carry out further detailed analyses to understand differences in the algorithm performance. A workshop was planned for 2005 to discuss the results, and a draft of the report would be distributed to working group members in the near future.

4.7 Ocean-Colour Algorithm working group (ZhongPing Lee)

ZhongPing Lee (NRL), Chair of the Ocean-Colour Algorithm working group, gave an update on the groups' activities. A large data set of in situ measurements (chl, remote sensing reflectance and phytoplankton absorption) had been accumulated by Stephane Maritorena. There was good agreement between the synthetic and in situ data sets, but the in situ measurements had a much wider scatter. The group had applied various empirical and semi-analytical algorithms to the in situ dataset to test their performances. The results of these tests would be included in the report, which was tentatively entitled "Data and Remote-Sensing Algorithms for Inherent Optical Properties". An outline of the report was presented, which included a chapter on why are inherent optical properties are needed in ocean-colour remote sensing, a chapter on synthetic and in situ datasets for algorithm testing, plus nine chapters on the performance of various algorithms. The report would end with a chapter on uncertainties in retrieved parameters from ocean colour, plus a conclusion section. The group plans to meet early this year to finalise the report, which will be sent to IOCCG for review.

4.8 Co-ordination of Merged Data-Sets

Paula Bontempi (NASA) gave a short presentation on the data-merging working group, which was co-chaired by Watson Gregg, also of NASA. The group planned to hold a workshop in April/May this year, and had invited nine participants from various agencies. The objectives of the workshop were to define data and knowledge requirements, assessment methodology, and possible approaches for merging coincident ocean-colour data from multiple sensors. An outline of the report was presented which would include the benefits of merging data, a survey of available missions, knowledge requirements for merging, output requirements, products to be merged (just chlorophyll or also LwN, PAR, etc.), a survey of possible methodologies, and what is needed to achieve success that is not being done. One example of an on-going activity funded by NASA was the REASoN CAN Team, whose goal was to provide a consistent time series of Level-3 ocean-colour data beginning at 1979, with a 9-year gap (1987-1996). Emphasis was placed on consistent algorithms and calibration methodologies. The end product would be Earth Science Data Records (ESDR) of ocean colour (formerly termed Climate Data Records).

The question of data availability was raised by Frank Muller-Karger. He noted that ESA were proposing to do a similar effort, but that 90% of the data was from the U.S. Currently, everyone had access to U.S. data, but very few people can obtain European data - the principal of reciprocity was not being followed. Michael Rast replied that U.S. colleagues had been invited to take part in the initial phase of merging, and that all registered PI's should be able to access MERIS data. He also noted that various EU countries had

different data policy constraints and funding issues, which were imposed on ESA, so it was not always possible to give data away as freely as the U.S. Mark Dowell remarked that there were lots of different merging activities, each of which would have their own recommendations. Paula Bontempi agreed that this would be addressed in the workshop, although not everything could be done in one workshop. The various groups would be approached to provide input. Michael Rast remarked that it was fortuitous that the IOCCG data-merging workshop was taking place at same time as the ESA GlobColour Project, which would enhance close cooperation between GlobColour and IOCCG.

5. Proposals for New IOCCG Working Groups

5.1 Requirements for an ocean-colour sensor in the coastal zone

Christopher Brown gave a brief presentation on this new working group, which would be co-chaired by himself and Curtiss Davis. The goals of the working group were to define the optimal sensor, or suite of sensors, to characterize the coastal ocean for oceanographic and societal applications. This would include: assessing current capabilities, recommending optimal sensor characteristics (including spectral channels, SNR, frequency of sampling) and considering combinations of sensors and platforms (polar orbiters and geostationary sensors). In the first year, the group planned to outline the report and form an international committee which would include experts on all key topics (sensor design, calibration, atmospheric correction, applications, products and product validation) with a maximum of 12 people. A workshop would be held in the Fall of 2005 to create the first draft of the report. It was noted that there might be a potential conflict with Arnold Dekker's proposed working group (Item 5.2). Michael Rast recommended caution when talking about sensor optimisation and suggested that it would be better to define optimisation of requirements rather than sensor design, which should be left to the Agencies. He noted that scientific applications should drive the sensor design. Other participants felt that it would not easy for IOCCG to have two parallel working groups. One solution would be to broaden the problem, and examine how an improved sensor could retrieve more than just chlorophyll. The Chairman proposed that the working group also address retrieval of properties other than chlorophyll, and secondly, include a chapter on the resolution issues (spatial and temporal). Dr. Brown would relay the information to Curtiss Davis.

5.2 Remote Sensing of Optical Shallow Water (OSW)

ZhongPing Lee presented a proposal from Arnold Dekker (CSIRO, Australia) for a new working group to deal with remote sensing of optical shallow water. The group proposed to review the current status of shallow-water remote sensing; identify areas of urgent need of improvements, and discuss adequate approaches for a remote system. They also planned to share available datasets for algorithm testing and cross-comparison, and write an IOCCG Report on remote sensing of optical shallow waters. A workshop would be held in 2005 for five expert groups to come together and share hyperspectral data sets and test each others approaches. These groups would examine semi-analytical or Hydrolight fully parameterized forward models, hyperspectral remote sensing datasets (ship borne, airborne, or space borne), atmospheric correction, and validation data for benthic cover (AOPs and IOPs). The Australian participants were actively seeking financial support for such a workshop. Another workshop would be held in early 2006 to present the results in publishable form, with possible further tests. An IOCCG report would be written with a description of the state-of-the-art of remote-sensing approaches for OSW, and recommendations for future work and future software, methods and sensor requirements.

Committee members expressed some reservations about the limitations of the Hydrolight model, and also noted that the membership of the group was rather limited. Ron Zaneveld (Oregon State Univ.) suggested that coupled ocean/atmosphere models should also be examined, since Hydrolight was only applicable to oceans. Others were concerned that the report might not have lasting value, since it was more research oriented, and suggested that it could perhaps be combined with Curtiss Davis's proposal, although Roland Doerffer pointed out that the requirements for the sensors would be different. Other members felt that it was important to keep the two working group separate, but suggested they could benefit from joint discussions. The Chairman encouraged Arnold Dekker's group to go ahead in a separate way while

maintaining contact with Curtiss Davis's group. Paula Bontempi noted that NASA had funded a group to hold a workshop to deal with error budgets in coastal remote sensing, and they were not represented in either of the proposed working groups. The Chairman suggested that the Davis group meet at same time as other group.

6. South American ANTARES Programme

6.1 Report of the second ANTARES workshop

Vivian Lutz (INIDEP) introduced the South American ANTARES Programme, the objectives of which were to study long-term changes in coastal ecosystems to distinguish natural variability from external perturbations. The programme was initiated after an IOCCG-sponsored training course in Chile. IOCCG first sponsored a workshop for the group in Argentina last year, where a proposal was drafted to IAI to obtain funding for the CESAR Project (Coastal Ecosystems of the South American Region), to be discussed under agenda item 6.2. A second ANTARES workshop had just taken place prior to the IOCCG meeting, and was sponsored by IOCCG, POGO and IAI. The main outcomes of this meeting included the demonstration of the satellite data distribution system through the CESAR project, a comparison of measurements performed at each time series station, incorporation of the Callao (Peru) time-series station into the network, and advancement of the organisation of the network. In addition, a report on the CESAR project was drafted and presentations on ANTARES for the upcoming SPIE meeting were outlined. Currently, there were six time-series stations in the South American network, each of which had a common set of measurements. Participants at the workshop agreed to optimise resources e.g. to share the flow-cytometer. An integrated database would be ideal, but this would require more time and financial support. Scientific objectives for a future proposal were also discussed. The main objective was to ascertain whether there were coherent oceanographic variations in the coastal ecosystems around South America at different time-scales. This knowledge would be transferred to the general public, managers and policy makers for educational and management purposes. The network would also serve the purpose of satellite calibration.

6.2 Ocean-colour data management system for the ANTARES Programme

Frank Muller-Karger gave a brief demonstration on satellite data management for ANTARES. The programme currently focusses on MODIS data since MERIS is not readily available. The University of South Florida receives daily Level 2, 1 km data from NASA. The data are remapped using SeaDAS software and the different products (chlorophyll, SST etc.) are distributed through network via the ANTARES portal (http://antares.ws). Data are readily available in the form of thumbnail images linked to high resolution MODIS data via the Distributed Ocean Data System (DODS) interface. Alternatively, the entire HDF file with all the bands can be downloaded. Local websites in Portuguese, Spanish and French will also be implemented, and will be populated with data, products and tutorials. The long-term strategy for ANTARES was to engage GEOSS (Global Earth Observing System of Systems).

6.3 The CARIACO time-series station

Yrene Astor (EDIMAR) informed participants about the CARIACO time-series station, located in an upwelling area off the coast of Venezuela. The station has been operating for 9 years and had conducted 108 monthly cruises. The objectives were to quantify the oceanographic processes that affect the vertical flux of particulate organic carbon, and to understand how sedimentation patterns reflect climatic and oceanographic variability in the tropical western Atlantic Ocean. Four U.S. and four Venezuelan institutions were involved in the project, which was coordinated by Frank Muller-Karger and Ramon Varela. Data from the station are fed into the SeaBASS database. Optical measurements are taken on each cruise, as well as primary production, chlorophyll, zooplankton, sediments traps etc. Data and results can be found at http://imars.usf.edu. Numerous publications had resulted from the time-series station, as well as several M.Sc and Ph.D theses.

6.4 Results from the CARIACO time-series programme

Frank Muller-Karger gave a brief overview of some of the results from the CARIACO time-series

station. SeaWiFS slightly overestimated surface chlorophylls at low concentrations, when compared to in situ chlorophyll, but there was generally very good agreement. According to in situ primary productivity measurements, the assimilation number increases with temperature above 21oC, unlike the Behrenfeld and Falkowski model. Major findings of global carbon flux were also discussed and it was concluded that the oceanic biological pump sequesters 60% of the carbon in the deep ocean and 40% on continental margins, the latter part of which should be included in models of carbon flux.

7. Status of Current and Future Ocean-Colour Missions

7.1 Report from NASA (SeaWiFS and MODIS sensors, MOBY buoy)

Paula Bontempi began her presentation with an update on the MODIS Terra and Aqua sensors. Last year, NASA had decided to put a temporary hold on Terra MODIS oceans data processing (outside of SST) because of a number of sensor system instabilities. The present focus is on Aqua MODIS oceans data due to instrument stability. The focus of NASA is now on measurements as apposed to missions. NASA had conducted a data product review for MODIS, with a focus on a core suite of measurements (as apposed to 41 products previously). There were still problems with pre-launch polarization and stray light, so the Ocean Biology Processing Group (OBPG) was working closely with the MODIS Characterization Support Team (MCST) on calibration issues. MOBY is currently part of the calibration scheme. After transition to OBPG there was a lot of overall improvement in Aqua data, but there were still some issues that needed to be resolved. An algorithm validation/refinement workshop would take place on 17-18 February 2005 and a MODIS Team Meeting was scheduled for 22-24 March 2005. Data in GSFC DAAC would be updated and distribution via the OBPG. The OBPG was using the OC3 algorithm for chlorophyll concentration since it does not use the 520 nm band. There was only a very small difference between OC3 and OC4 algorithms (used by SeaWiFS). MODIS uses SeaWiFS as a secondary calibration source.

NASA reorganisation
Participants were briefed about NASA's new internal structure. NASA's main focus for 2005 was space exploration. The Earth and Space Science missions were being merged into the Science Mission Directorate, which consists of three systems: the Earth-Sun system, the Solar system and the Universe. The Earth-Sun system was again divided into: Research Sciences, Applied Sciences and Flight Programs. It is possible that NASA may go in a direction that is not science driven with the move to exploration systems.

SeaWiFS Sensor
Even though the NASA contract for SeaWiFS data had expired on 23 December 2004, the number of data users was still climbing. SeaWiFS has provided the longest existing data set documenting the Earth's biological response to changing environmental conditions (7+ years) and the archived data are still available for distribution. There is no indication that the instrument/spacecraft is nearing the end of its scientifically useful life and the instrument is still very stable. While MODIS is not tuned to SeaWiFS, match-ups provide an invaluable tool for cross-calibration activity and allow some verification that MODIS is providing the long-term, stable, well calibrated global products that are needed for NASA's research programs. Comparisons of MODIS and SeaWiFS data look good although there is still some variability and seasonality that should be addressed. Regarding future access to SeaWiFS data, Orbimage has set up price schedules for purchasing the data. Ancillary data were still available, but not the data for orbital predictions (although these were available elsewhere). Some funding might be available to purchase SeaWiFS data in the future. According to Michael Rast, ESA had considered helping out with a SeaWiFS data buy through a 3rd party agreement, but the funding could not be found. NASA encouraged potential partnering for a SeaWiFS data buy, and would also include discussions for quality control of the data.

Quality control of data (including MOBY)
Paul Bontempi noted that funding could not be secured for MOBY for this calendar year, but a reduced

amount of funding might be available next year. Funding issues were being discussed with NOAA. Some participants expressed surprise that only 20 quality control data points had been derived from MOBY over the last seven years. Frank Muller-Karger pointed out that many agencies used the data from MOBY, but did not contribute to the funding of the project. James Yoder suggested that an alternative approach was to develop better links with international observation efforts, perhaps in the form of bilateral agreements with various agencies, so everyone could get access to calibration data. The various agencies represented at the table were canvassed.

Chris Brown reported that NOAA had not kept up with the cost of supporting MOBY, although they would support the ship time for another 18 months. MOBY was in the calibration plan of NPOESS but no funding had been set aside for in situ measurements. NOAA realized the importance of having vicarious calibration and supporting MOBY, but they probably would not have funding to continue supporting the project as they could not continue to fund an old instrument. Paula Bontempi noted that MOBY alone could not serve the purpose of calibrating VIIRS in coastal waters. A replacement needed to be found, although vicarious calibration was still required.

Issues related to procurement of data from Orbimage

The Chairman noted that it was not a simple procedure to get data from Orbimage and that there were many restrictions on the use of the data. He suggested returning to the position brought up at the IOCCG meeting in Florence, that users develop a consortium to buy the data. Christopher Brown reported that NOAA currently buys the data from Orbimage ($200,000), but could not redistribute it. Mervyn Lynch reported that CSIRO in Australia were not happy with the conditions imposed on data use, as they were prevented from using the data on both coasts.. The Chairman proposed that IOCCG carry out a survey of the ocean-colour community to ascertain how many people were buying data from Orbimage.

ACTION ITEM 10/1: IOCCG PROJECT OFFICE TO SURVEY OCEAN-COLOUR COMMUNITY REGARDING PURCHASE OF SEAWIFS DATA

Role of IOCCG in the Chronology

Frank Muller-Karger raised a number of issues that could be addressed by IOCCG. He noted that many international agencies benefit from U.S. assets such as AVHRR, SeaWiFS, MODIS and Quickscat etc. The U.S. supported most calibration and validation efforts, but other nations made full use of the data and protocols developed with U.S. funding. IOCCG should consider writing to other agencies to encourage them to place an offer with Orbimage and also re-establish a SIMBIOS Program. They should buy into the concept of global earth observing systems as partners and implement a reciprocal data policy. U.S. provided a lot of free data but it was difficult to get data from the international community. Michael Rast noted that because of political constraints, ESA had to obey the data policies imposed upon them by the European governments, and he did not think that IOCCG would be able to help. Dr. Muller-Karger suggested that one of the roles of IOCCG should be to try and influence policy, as opposed to just focussing on science and education. The Chairman pointed out that the terms of reference for IOCCG were not consistent with that proposal, and that CEOS would be a more appropriate forum to air these issues. Also, it would be difficult for a non-U.S. Chairman to approach a national issue. Michael Rast proposed that the issue of SeaWiFS and MOBY be tabled at the next CEOS Plenary (perhaps via the SIT). The point should be made that the current status of SeaWiFS was incompatible with the new GMES and GEOSS initiatives of global earth observation.

Mark Dowell pointed out that international scientists were in fact making a big contribution to MOBY from validation point of view, and Mervyn Lynch noted that a lot of resources were fed back into the SeaWiFS Project via the HRPT stations collecting the data around the world. However, there was still some concern about the restrictions imposed by Orbimage. It was agreed that IOCCG should send a letter to Orbimage (with a copy to NASA), regarding this issue.

ACTION ITEM 10/2: IOCCG PROJECT OFFICE TO SEND A LETTER TO ORBIMAGE (CC: NASA) REGARDING RESTRICTIONS OF SEAWIFS DATA.

Dr. Muller-Karger suggested that IOCCG focus on what is happening in the future, for example, the critical needs of ocean-colour remote sensing in the coastal zone. The IOCCG could provide scientific advice on requirements for an ideal sensor through the new working group chaired by Curtiss Daviss. James Yoder also noted that NPP and NPOESS were operational ocean-colour sensors, but measurements for ocean-colour were labelled as non critical. IOCCG should also try to educate agencies so that they change the status of those measurements. Mervyn Lynch suggested that IOCCG should re-explore trying to communicate with CEOS - perhaps through national representatives.

A New Name for Ocean Colour

There was also considerable discussion about the term "ocean colour", which was often perceived as being frivolous by other communities. The Chairman stated that, collectively, the ocean-colour community should present ocean colour as a serious, highly quantified, observation, with a broad spectrum of applications. Frank Muller-Karger suggested that a new term should be invented, something like SST. The acronym should be on the level of variable e.g. ocean surface chlorophyll. James Yoder noted that the term "ocean colour" differed from the terms applied to other areas of ocean remote sensing (e.g. SST, SSH) in that it is rather vague and is not immediately recognisable as a quantitative entity. Terms such as "Remote Ocean Spectroscopy" or "Remote Ocean Radiometry" had been proposed. Other terms proposed were "Sea Surface Reflectance" (SSR), "Sea Spectral Reflectance" (SSR) or "Sea Spectral Radiance" (SSR). Robert Frouin pointed out that these measurements did not only come from the surface, since in-water properties also contributed, and Shubha Sathyendranath noted that spectroscopy implied using a spectrophotometer. Other participants felt that the term radiometry would be too complex so it was decided that Sea Spectral Reflectance (SSR) would the best choice. This would also embrace the derived products such as chlorophyll. It was suggested that the Project Office solicit comments on the new terminology from the ocean-colour community.

ACTION ITEM 10/3: PROJECT OFFICE TO SOLICIT COMMENTS FROM OCEAN-COLOUR COMMUNITY REGARDING USE OF THE NEW TERM FOR OCEAN COLOUR (SEA SPECTRAL REFLECTANCE).

The Chairman noted that the name of IOCCG should also change with time, but not immediately, as he preferred to wait for the community's response to SSR before changing the name.

7.2 ESA's MERIS sensor, and ESA Sentinels

Michael Rast reported that MERIS had been in orbit for almost 3 years. The degradation of the diffuser (used for calibration) was less than 0.5% in the shorter wavebands, and the geolocation accuracy was better than 500 m. The overall quality of the Level 2 products was very good and the atmospheric correction over Case 2 waters had significantly improved. The implementation of a "white water" (Coccolithophore) flag, based on Rayleigh corrected reflectance, had been examined and the results look promising. Sun glint correction was still an issue, but would be addressed in the next reprocessing. The complete archive would be reprocessed in the second quarter of 2005, leading to a consistent archive. Three systems had been created to enhance data distribution: two NRT rolling archives (each holding over one week of Level 1b and Level 2 data), an internet system for extraction of smaller (child) data sets, and thirdly, MERIS data are now broadcast directly over Europe in NRT via DDS (Data Dissemination System) and can be downloaded at low cost. Five Level 3 products were available as annual and monthly averages (chl-a, MGVI, WV, AOT and Angstrom exponent) and can be downloaded from the web at http://www.enviport.org/meris/ A MERIS User Workshop was planned for 26-30 September 2005, at ESA/ESRIN to discuss results from on-going research activities, scientific applications, data quality, development of new algorithms, data products, and user issues. The new version of the BEAM software would be released in February 2005. The software is free of charge, and can be downloaded from the internet. It enables users to view and analyse radiances from all bands and also generate other products which are not part of the regular catalogue e.g. fluorescence index.

Global Monitoring for Environment and Security (GMES)

The goal of this program is to develop operational information services relying on space infrastructure, to support public policies such as environmental governance (global and local), civil security, resources

management, and food and health security. It will rely on a space-based permanent global monitoring system, additional in-situ observations, operational modelling and forecasting centres, and a network of users/ customers. Satellite ocean monitoring forms one of the key elements of Global Monitoring for Environment and Security (GMES). GMES will be operational, and the oceanographic community involved in MERSEA and GODAE are part of the action plan. Various satellites will provide sensors for five "sentinels" which will be the backbone of the future European Earth Observation System to monitor the environment. Sentinel-3 will carry the VIRI sensor and will operate in the visible to infrared, and will continue the MERIS mission.

7.3 Latest results from MERIS, plus DVD on ocean colour

Roland Doerffer presented some of the results from MERIS reprocessing using a bio-optical model with the Neural Network (NN) algorithm. Initially, the NN algorithm had problems in dealing with negative reflectances in some bands (after atmospheric correction) but this was addressed in the reprocessing, resulting in a more robust, but less sensitive, NN algorithm. Other improvements resulted in better definition of yellow substances in Case 1 waters, the data for training of the NN is now based on a much larger data se, and a white scatterer has been introduced into the bio-optical model to estimate the concentration of coccolithophorid blooms.

Dr. Doerffer also informed participants about a DVD being created by GKSS. The title of the video would be: "The Science of Ocean Colour - Remote Spectroscopy of the Ocean". The DVD would contain information on why the ocean changes colour, hydro-optical processes, operation of different instruments and ocean colour from space, and would include a number of animated sequences. It was hoped to have the DVD ready by May 2005.

7.4 ISRO's OCM sensor on IRS-P4, and the scheduled OCM on IRS-P7

Shailesh Nayak (ISRO) submitted a report stating that the OCM (Ocean Colour Monitor) on IRS-P4 was functioning normally. Data were being received at four ground stations. OCM data products included Level-1 data available in scenes of three different sizes, six Level-2 products (chlorophyll, suspended sediments, yellow substances, diffuse attenuation coefficient, aerosol optical depth and normalised water leaving radiances) and four Level-3 products being generated on a trial basis (weekly and monthly averages of chlorophyll, suspended sediments, diffuse attenuation coefficient and aerosol optical depth). Level-1 and 2 products could be acquired by users directly from NRSA upon payment. Oceansat-11 was scheduled for launch in 2007. The payload will include another OCM and a scatterometer. The instrument would have on-board recording for global coverage (1- 4 km) and would include the provision of sun and moon calibration to assess the stability of sensor performance.

7.5 KARI's OSMI sensor and proposed Korean Geostationary Ocean Colour Imager

Yu-Hwan Ahn (KORDI) gave a brief overview of OSMI on the KOMPSAT-1 satellite, which has been operating successfully since its launch in December1999. Cross-calibration efforts had been carried out in collaboration with the NASA SIMBIOS team. The Korean Aerospace Research Institute (KARI) disseminates OSMI data to government agencies, government-supported research institutes and universities. OSMI data are used for marine, meteorological and disaster applications, but the use of this data is limited due to stripping patterns. The Korean Ocean Research and Development Institute (KORDI) was currently working on this problem.

Korea also plans to launch the COMS-1 satellite in 2008, carrying the Geostationary Ocean Colour Imager (GOCI). The main focus of GOCI would be coastal monitoring around the Korean peninsula. The nominal instrument Field of View would be centred over the Korean Sea at 36oN and 130oE. Image acquisition would occur between 10:00 am and 17:00 pm, with a one hour time interval between successive images. GOCI will have 8 bands in the visible and NIR, including a triplet for the measurement of sun-induced chlorophyll-a fluorescence (660-680-745 nm). Data from GOCI would be received by KORDI and KARI, and distributed by KORDI. The spatial resolution of GOCI would be 500 m, but KORDI were considering reducing this to 1 km to increase the field of view. Dr. Ahn requested a

letter of support from IOCCG to recommend this modification of the specifications of GOCI. This would be discussed further via email, with reference to the IOCCG reports.

ACTION ITEM 10/4: LETTER TO BE DRAFTED TO KORDI REGARDING MODIFICATIONS TO SPECIFICATIONS OF GOCI.

7.6 Argentina's MMRS Sensor aboard SAC-C

Ana Dogliotti (IAFE) gave a presentation on Argentina's SAC-C mission, which is a cooperative Earth observing satellite mission between CONAE (Comisión Nacional de Actividades Espaciales) from Argentina and NASA. The satellite was constructed by Argentina and was launched in November 2000. It is part of the morning constellation, with a quasi-polar orbit and a 16-day revisit time. A number of sensors are on board SAC-C, including the MMRS (Multispectral Medium Resolution Scanner). This instrument has a spatial resolution of 175 m and a swath width of 360 km. The noise-equivalent-radiances in all bands are higher than recommended in IOCCG Report number 1, but these will be checked. The sensor has no internal calibration, so the calibration strategy is to perform absolute calibration with extensive ground campaigns and cross-calibration with LANDSAR-7. Products are distributed to end users in a unique processing level defined as Level 1B. Data are not transformed into chlorophyll values at the moment, and there is no validation with in situ data. MMRS images of the Río de La Plata River turbidity front were shown, as well as images taken over the shelf break.

7.7 CNES Ocean Colour Activities

Eric Thouvenot (CNES) submitted a report stating that 7 complete months of POLDER-2 data were now available on the POLDER website at http://polder.cnes.fr. HDF data files could be visualized or downloaded using the "on-line products" menu bar. A validation review had taken place in June 2004 and the new generation of algorithms had resulted in significant product improvements. It was also reported that the PARASOL mission had been successfully launched on 18 December 2004, and the first images were received on 6 January 2005. Two sets of images were shown to participants at the meeting. The PARASOL instrument is similar to the POLDER-2 sensor, although it was not originally planned for ocean-colour use. IOCCG's support had helped to obtain the decision to use PARASOL for ocean-colour observations. The satellite was currently in routine acquisition mode, and the commissioning phase (and associated calibration and validation activities) would last until early March 2005.

7.8 JAXA's proposed S-GLI sensor

Tasuku Tanaka (JAXA) reported that Japan currently had no Earth observation satellites, but scientists were still working on the GLI dataset. Dr. Tanaka gave an overview of GLI data products including SST, chlorophyll, photosynthetically available radiation and primary productivity, all of which were available on the JAXA homepage. A new algorithm had been developed (a "two directional method") to retrieve the surface reflectance and the aerosol optical thickness.

JAXA planned to launch a number of Earth Observing satellites including ALOS (mainly for land observations) in September 2005, GOSAT (for greenhouse gases) in 2008 and the future EarthCARE satellite (to continue water cycle observations). The follow-on mission to ADEOS would be the GCOM series (Global Climate Observation Mission), consisting of GCOM-W (for sea surface observations) and GCOM-C (for atmospheric and terrestrial observations). GCOM-C would have a mission life of 5 years and would carry the S-GLI ocean-colour sensor. Main observation parameters would include primary productivity in the coastal zone, chlorophyll, red tides and coastal pollution.

7.9 NPP and NPOESS Missions

Paula Bontempi gave an overview of NPP (NPOESS Preparatory Project). NPP is a joint partnership between NASA's former Office of Earth Science (OES) and the NPOESS Integrated Program Office (IPO) initiated in 1998. The key program objectives are to provide NASA with continuation of a group of global change observations initiated by the Terra, Aqya, and Aura missions. In addition, it will provide the NPOESS operational community with pre-operational risk reduction demonstration and validation for

selected NPOESS instruments and algorithms, as well as ground processing. NPP will carry four NPOESS instruments including the VIIRS ocean-colour sensor. NASA and IPO together will handle the joint program management but IPO will be in charge of the VIIRS instrument and NASA will handle the Science Data Segment (SDS). Key Level 1 requirements for NPP include a 5 year mission life time, real-time direct broadcast of VIIRS data, and a Science Data Segment with no operational requirements (only research), used to test the usefulness of NPP environmental data records for accomplishing climate research. The launch is scheduled for 31 October 2006. NASA is moving toward "measurement-based", not "mission-based," science and data processing teams and NPP would be the first post-EOS mission to have this new science data processing strategy. NPP data products would be archived by NOAA and they would be assessed for science data quality by NASA's SDS. The objective is to use VIIRS to continue the ocean-colour time series with consistent and comparable data. It was pointed out that ocean-colour was not labelled as critical on the NPP mission and James Yoder suggested that, given the attention of global observations in GEOSS, it might be possible to get radiance or chlorophyll raised on the level of importance. An action was put forward for IOCCG to write a letter to NASA in this regard. It was also noted that there was a good chance that quality of VIIRS data on NPP would be less than that of Aqua data, which should also be addressed.

ACTION 10/5: IOCCG TO WRITE A LETTER TO NASA TO MOTIVATE FOR RAISING THE LEVEL OF IMPORTANCE OF RADIANCE AND CHLOROPHYLL IN THE NPP MISSION.

Christopher Brown gave a presentation on the NPOESS Program at NOAA, which was jointly administered by DoD, NASA and NOAA and managed by the IPO. The concept of this program was different, in that the government presents requirements and the contractor (TRW/Raytheon) determines the best method to achieve these requirements. The NPOESS system architecture consists of a number of different segments (e.g. launch support, space, command control, field terminal and interface data processing segments). There would be a number of ground stations around the world. Regarding the ocean-colour algorithms, the atmospheric correction over oceans will be adapted from the SeaWiFS/MODIS heritage, and the Carder et al., 1999 semi-analytical approach would be used to determine chlorophyll concentration. Absorption and scattering coefficients would be generated as by products. The product suite would include Lw( ), a( ), b( ), and chlorophyll concentration, as well as NOAA-unique products such as POC. Calibration/validation plans are under development, and it was planned to use MOBY for vicarious calibration. Four project components would ensure that NPOESS data and products are made available to the user community in near-real time, that all data are archived and disseminated and that climate data records are produced. The first NPOESS satellite is scheduled for launch in 2009 (the next four will be launched at 2 year intervals) and the program would end in 2019.

7.10 HES-CW onboard the geostationary satellite GOES-R

Christopher Brown reported on the GOES-R geostationary satellite, which would carry the Hyperspectral Environmental Suite (HES) to observe coastal waters (CW). GOES-R is in the planning stages and is scheduled for launch in 2012. It would be the first in a series of advanced environmental observation satellites, and would be a multi- (14 bands) to hyper-spectral (50-60 bands) visible-near-infrared imager. User requirements had been set in terms of thresholds and objectives. Current earth imaging systems lack the repeat coverage necessary to investigate important short-term processes. The objectives of HES-CW are to enable long-term monitoring of coastal ocean areas and to collect high temporal, spatial and spectral resolution observations, on a continuing basis to meet both operational and research needs. The instrument will provide routine coverage of U.S. coastlines, including Hawaiian Islands, every 3 hours at 300 m spatial resolution. Other modes will provide for higher resolution of localized areas. Coastal ocean applications will include detection, monitoring, and prediction of harmful algal blooms, assessment of water quality and clarity, and quantifying the response of marine ecosystems to short-term events. The Coastal Ocean Applications and Science Team (COAST), formed by NOAA, will evaluate HES-CW threshold and goal requirements. Top priority goals are higher frequency of sampling and hyperspectral instead of multi-spectral. James Yoder suggested that it would be advantageous for NOAA to talk to KARI since Korea was also planning a geostationary ocean-colour sensor.

7.11 Remote Sensing in the Yangtze Triangle Area

Pan Delu (SOA) had submitted a brief report describing a remote sensing study in the Yangtze triangle area, an important example of the use and application of ocean-colour remote sensing in China. The objective was to incorporate ocean-colour and temperature remote sensing data into a routine water quality monitoring program.

8. New Concepts in Ocean-Colour Remote Sensing

8.1 Proposal for a satellite radiometer to measure aerosols in the UV

Robert Frouin informed participants about a proposal submitted to NASA for the MAUVE (Monitoring Aerosols in the Ultraviolet Experiment) instrument. The objective was to build and test (on board an aircraft) a prototype of a satellite instrument to monitor globally the scattering and absorption properties of aerosol particles from a typical polar orbit at 800 km altitude. The MAUVE instrument would be the first experiment to allow monitoring of the complete optical aerosol properties from space on a global daily basis. MAUVE would extend the retrieval of ocean optical properties to the ultraviolet, where they become very sensitive to detritus material and dissolved organic matter. The measurements would also allow the exploration and application of new techniques for remote sensing of aerosol properties, such as using multi-angular measurements in the ultraviolet for absorption, and multi-angle differential absorption in the 763 nm O2 absorption band for vertical distribution.

8.2 Proposed PhyLM ocean-colour sensor

Ron Zaneveld gave a presentation on the PhyLM (Physiology Layers Multispectral Mission) proposal. The objectives of the mission were to characterize key upper-ocean carbon cycle components, including phytoplankton carbon biomass and physiology. The approach was a dedicated global ocean mission focused on retrieving multiple upper ocean components using inversion approaches. The inversion approach is more sensitive to Lwn errors than ratio algorithms. The instrument would be an enhanced passive radiometer (SeaWiFS based) coupled with a LIDAR or polarimeter system. The baseline instrument would be the Ocean Radiometer for Carbon Assessment (ORCA). The principle investigator was Michael Behrenfeld and the proposal would be submitted shortly.

8.3 Proposal for the COCOA Sensor

Mark Dowell gave a short presentation on COCOA (Coastal Ocean Carbon Observations and Applications), a mission concept being developed by JPL and a team of scientists (lead PI is Janet Campbell). COCOA would be a geostationary coastal carbon mission which would be proposed as an Earth System Science Pathfinder (ESSP) mission. COCOA would quantify the carbon pools and pathways of the coastal ocean with a pixel resolution of 250 to 300 m. COCOA is basically a hyperspectral imager and would have two modes of operation: a synoptic mode to image the entire U.S. coastal zone 4-6 times per day, and an experimental and event mode to intensively image special regions. The observations, together with ancillary information, would be used to quantify the pools and pathways of carbon in the coastal ocean.

9. European Ocean Colour Projects

9.1 ESA's GlobCOLOUR Project

Michael Rast reported on ESA's proposed GlobCOLOUR Project, the objectives of which were to provide a long time-series of ocean-colour data for research on the marine component of the global carbon cycle, and to demonstrate the current state-of-the-art in merging data streams from different satellite based ocean-colour sensors. In addition, the project would establish the capacity to continue production of this time series after termination of this project, potentially as a GMES service element. The IOCCG Chairman, Trevor Platt, had signed a letter of commitment for IOCCG to act as an advisor and be responsible for the User Requirements Document (URD) (to be delivered in 2005). The proposal and responses should be available by the third quarter of 2005, and the duration of the project would be

24-36 months. A strong validation of final products against in situ data would be performed It was noted that the timing of the ITT may not be optimal because of ongoing parallel activities. NASA had funded the "REASoN" project with the objective of merging Level 3 ocean-colour data from various U.S ocean-colour sensors (CZCS, SeaWiFS, MODIS and VIIRS) as well as OCTS. In addition, the IOCCG data-merging working group would be holding a workshop in the spring, to establish data requirements, assess different methodologies and propose a range of approaches to merge data from international sensors. It was also pointed out that establishing merging requirements for different products, and defining and testing merging algorithms was not a trivial task. Paula Bontempi recommended that ESA coordinate efforts to avoid duplication. Simon Pinnock, the technical officer for the GlobCOLOUR project, had been invited to attend the upcoming IOCCG data-merging workshop.

9.2 MERSEA European integrated project

Nicolas Hoepffner (JRC) gave a presentation on the European MERSEA (Marine Environment and Security for the European Area) system for operational monitoring and forecasting of ocean physics, biogeochemistry, and ecosystems, on global and regional scales. This was a key component of the Ocean and Marine services element of GMES. It was a four year project, and by 2008 there would be an operational system. The project was oriented to modelling and data assimilation, and had 50 partners in Europe and outside. The geographic area covered by the project ranged from global to regional sub-systems. The MERSEA satellite section would focus on altimetry, SST, ocean colour and sea ice. In the first phase of the project, ocean colour data would be processed to standard geophysical products, a complete database would be prepared, and existing products would be compared. Existing datasets would be used to develop an operational system. All different products would be validated and archived and made available to the partners of MERSEA. Another activity is the merging of ocean-colour data from the SeaWiFS, MODIS and MERIS missions (led by Claire Pottier). Three different methods for merging ocean-colour data would be compared on a global scale.

10. Remote Sensing in Southern Africa

Ray Barlow (MCM) reported on remote sensing activities in Southern Africa. Most of the focus had been on the Benguela Ecosystem through the BENEFIT Program and the BCLME (Benguela Current Large Marine Ecosystem) Program. Recently, new programs had started in the Agulhas Ecosystem such as ACEP (studying coelacanths) and ACLEM (studying the Agulhas current). A number of upwelling cells with very high chlorophyll biomass are found in the cold waters off the west coast of Southern Africa. The west coast is also the main recruitment zone for pelagic fish. Routine monitoring of chlorophyll on the west showed occasional red tides and coccolithophores blooms, both verified by field samples. A bio-optical buoy is being set up off Lamberts Bay to monitor red tides. The rapid decay of dense diatom blooms off the west cost often resulted in H2S production and sulphur eruptions, which could be detected by remote sensing. Seasonal variations in upwelling in the northern and southern Benguela were being studied, and work was just starting on primary production in the Agulhas ecosystem. Dr. Barlow also presented some preliminary results from the BEAGLE 2003 southern hemisphere cruise.

11. New Capacity Building Initiatives

11.1 Training course in Uruguay, 4-15 April 2005

Robert Frouin noted that there was a need for training in remote sensing of ocean colour in this part of the world. The emphasis of the course would be on applications of ocean-colour relevant to the South American region. The format of the course would consist of lectures by specialists as well as practical sessions. Applications had been received from 32 students of which 15 had been selected. Prof. Vizziano was trying to find supplementary funding as there was still a shortage of around $4,000 over the amount being provided by IOCCG.

11.2 IOCCG Fellowship Programme for 2004/5

Venetia Stuart reported that 11 students had submitted applications for IOCCG Fellowships, most of

which were of excellent quality. Four students were selected to be funded by IOCCG, and another four were placed on a reserve list, and would be funded if additional funding became available in the New Year.

11.3 Scholarships for 8th International Remote Sensing Conference (17-19 May 2005)

Nicholas Hoepffner reported that this conference was being sponsored by the Alliance for Marine Remote Sensing (AMRS) and Altarum, and would take place in Halifax. IOCCG had agreed to offer a number of scholarships for students from developing countries, with an interest in ocean colour, to attend the meeting. IOCCG had received applications from 21 students. The number of students supported by IOCCG and the value of the scholarship would be discussed at the upcoming Executive meeting.

11.4 Proposed training course at JRC (Ispra, Italy)

Nicholas Hoepffner informed the Committee about a proposed training course on "Methods and Applications of Ocean Colour Remote Sensing in Coastal and Regional Seas" to be held at JRC from 19-30 September 2005. Participants would be drawn principally, but not exclusively, from EU candidate countries. The major part of the finances would come from JRC support for EU Enlargement (dedicated to new member states in the EU). JRC proposed running a training course for approximately 25 students from candidate countries or new member states, with perhaps 3-5 students being supported by IOCCG. A preliminary set of lecture topics and practical sessions was also presented.

11.5 SPIE Conference on "Remote Sensing of the Coastal Oceanic Environment"

Robert Frouin informed participants about a special session to be held at the upcoming SPIE Conference in San Diego (31 July - 4 August 2005) dedicated to remote sensing of the coastal environment. He inquired whether IOCCG could support students from developing countries to attend the meeting. The Chairman noted that this would be subject to availability of funds. SPIE provides some support for students by waiving the registration fee (~$400) and providing some financial support. The Chairman requested more factual information including names of applicants from developing countries. Dr. Frouin also suggested that the IOCCG consider holding a conference every two years. This would be discussed outside context of SPIE.

11.6 DVD on ocean colour

Roland Doerffer informed the Committee that this DVD was being made for internal purposes and inquired whether the IOCCG would be interested in such a project. The Chairman noted that it would indeed be very useful for the ocean-colour community, and for IOCCG to be associated with the project. A number of committee members had material to contribute, although NASA might have problems in releasing data.

12. External Relations

12.1 Relations with SCOR

The Chairman noted that IOCCG could still receive funds from other agencies via SCOR. Venetia Stuart informed the Committee that she had raised the issue of the "sunset clause" for SCOR Affiliated Programs at the recent SCOR meeting. This had since been done away with, and IOCCG would remain an Affiliated Program of SCOR.

12.2 Liaison with POGO and update on the GEO Initiative

Shubha Sathyendranath noted that POGO and IOCCG had worked together on many training initiatives such as ANTARES and the BEAGLE cruise. She also updated the Committee on the GEO initiative, which was moving at a rapid rate. Oceans are grossly under represented in GEO and there was no common voice. Only two of the 20-30 international organizations represented in GEO had an oceans mandate (IOC and POGO). GEO had various groups and committees and POGO was a member of the GEO capacity building sub-group. They had submitted a report to GEO with a list of priorities, proposed

actions and recommended strategies. There is a 10-year implementation plan for GEO which draws heavily on GCOS and GOOS documents and IGOS Theme reports. POGO had emphasized the need for in situ observations for complementing and validating satellite data. Ocean colour was fairly well represented in the GEO implementation plan. For example, the Climate Section had a target to ensure continuity of moderate to high-resolution satellite data for ocean colour. Paula Bontempi remarked that there was no evidence of any attempt at any interaction between GEO and GOOS, and that GOOS not well represented in GEO. This was currently being addressed. James Yoder also noted that there was no realistic way IOCCG could influence any of the GEO processes, which were all done at the ministerial level.

12.3 Liaison with CEOS

The Chairman noted that this matter had been discussed previously in the meeting. CEOS was indirectly well represented in various writing groups of GEO, so remote sensing was fairly well represented. Michael Rast informed the Committee that he was chairing IVOS subgroup of CEOS. IVOS had made a number of recommendations to CEOS regarding calibration of visible and infrared sensors, including the proposal to encourage Agencies to use the refined solar reference spectrum of Thuillier et al. (2003), and a proposal to do an in-depth study on the behaviour of on-board diffuser reflection standards and their stability in the space environment.. All the recommendations had been accepted and tabled at the CEOS Plenary.

12.4 Liaison with AMRS

Nicolas Hoepffner was the official representative of IOCCG on the AMRS board. He reported that most of the activity this year was related to conference being hosted by AMRS and Altarum in Halifax (May 2005).

12.5 Workshop on "Chlorophyll: An Operational, Biogeochemical Variable"

Shubha Sathyendranath reported that POGO had tried to raise funds for the workshop without any success so far. Chuck Trees could perhaps be approached to help with the fundraising, since he had offered to help with the workshop. The only positive reply had been received from Maria Hood, who would be conducting a workshop for all variables related to carbon flux. Michael Rast noted that if this workshop was seen as part of the GlobCOLOUR activity, it might be possible for ESA host it. He would get back to IOCCG on this matter.

ACTION 10/6: MICHAEL RAST TO ENQUIRE WHETHER IT WOULD BE POSSIBLE FOR ESA TO HOST THE CHLOROPHYLL WORKSHOP AS PART OF THE GLOBCOLOUR PROJECT.

13. Membership Rotation

The Chairman noted that under SCOR affiliation, IOCCG was expected to demonstrate regular rotation of scientific committee members. Three scientific committee members (Roland Doerffer, Robert Frouin and Shailesh Nayak) would be rotating off the Committee this year and nominations for new Committee members would be accepted. There should be a balance of regional and discipline representation, and the final nominations would be discussed at the upcoming Executive meeting. Dr. Platt informed the Committee that the Chairman was also required to rotate.

14. Time and Place of Next Meeting

The Chairman welcomed invitations from agencies or institutions to host the next IOCCG meeting. Dr. Yu-Hwan Ahn informed the Committee that KORDI (Korea) would be willing to host the next IOCCG meeting. It was agreed that the meeting would take place during the third week of January 2006 and that the final location (Seoul or Jeju Island) would be decided upon at a later date.

APPENDIX I
LIST OF PARTICIPANTS

10th IOCCG Meeting, Isla de Margarita, Venezuela, 19-21 January 2005

IOCCG Members	Affiliation
Ahn, Yu-Hwan	KORDI, Korea
Antoine, David	LOV, Villefranche, France
Barlow, Ray	MCM, Cape Town, South Africa
Bontempi, Paula	NASA HQ, USA
Brown, Chris	NOAA-NESDIS, USA
Doerffer, Roland	GKSS, Germany
Frouin, Robert	Scripps Institution of Oceanography, USA
Hoepffner, Nicholas	JRC, Italy
Lutz, Vivian	INIDEP, Argentina
Lynch, Mervyn	Curtin University, Australia
Platt, Trevor	Bedford Institute of Oceanography, Canada
Rast, Michael	ESA/ESTEC, Netherlands
Tanaka, Tasuku	JAXA, Japan
Zaneveld, Ron	Oregon State University, USA

Associate Members	Affiliation
Morel, André	LOV, France
Sathyendranath, Shubha	POGO Secretariat, BIO, Canada

Invited Participants	Affiliation
Arias, Glenda	EDIMAR, Venezuela
Astor, Yrene	EDIMAR, Venezuela
Dogliotti, Ana	CONICET, Argentina
Dowell, Mark	University of New Hampshire, USA
Lee, ZhongPing	Naval Research Laboratory, USA
Muller-Karger, Frank	Univ. South Florida, USA
Stuart, Venetia	IOCCG Project Office, BIO, Canada
Yoder, James	University of Rhode Island, USA

Apologies	Affiliation
Asanuma, Ichio	JAMSTEC, Japan
Davis, Curtiss	Naval Research Laboratory, USA
Nayak, Shailesh	ISRO, India
Pan, Delu	State Oceanic Administration, China
Piektowski, Thomas	Canadian Space Agency, Canada
Pinnock, Simon	ESA, Frascati
Robinson, Ian	University of Southampton, UK
Roe, Howard	Southampton Oceanography Center, UK
Thouvenot, Eric	CNES, France

Wang, Menghua	University of Maryland, USA

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