

**Fifth Committee Meeting, IOCCG
Hobart, Tasmania, 1 – 4 February, 2000**

MINUTES

The meeting took place at the CSIRO Marine Research Laboratories in Hobart, Tasmania, Australia. Seventeen committee members were present, plus several invited participants (see attached list of participants). Dr. L. Dantzler (NOAA) was represented by Dr. C. Brown, and apologies were received from Dr. A. Lifermann (CNES) and Dr. S. Yoo (KARI).

1. Welcome and Opening Remarks

Participants were warmly welcomed by Dr. John Parslow (local host), Dr. Nan Bray (CSIRO Chief of Marine Research) and the Chairman of the IOCCG. This was followed by the introduction of Committee Members and invited guests (members of the Australian Ocean Colour Working Group, members of SIMBIOS and representatives of the IOC and GOOS).

2. Adoption of the Agenda and Approval of Minutes

The Agenda for the meeting was adopted after the addition of a new agenda item 3 (h) (Publication arising from the ICSOS conference), proposed by the Executive Director of SCOR. The Chairman proposed accepting the minutes of the previous Committee meeting (Refer Document IOCCG5/3). Dr. J. Campbell requested that Agenda Item 10 be modified to read: “Dr. Campbell advised the committee that NASA had conducted its own planning exercise for all remote sensing beyond 2005 and had received over 100 proposed mission concepts (32 of which were for ocean observations). NASA had a commitment to long-term measurements of altimetry, scatterometry and ocean colour, but as yet, did not have an integrated plan. The Chairman agreed to take up this issue with the Agencies”. The Committee then adopted the minutes as presented in the document, modified according to Dr. Campbell’s request.

3. Matters Arising from the Minutes of the Previous Committee Meeting

a) IOCCG Report Number 2

This report was published in mid-1999 (1500 copies printed) and was well received by the scientific community. The mailing list currently stood at approximately 500, with bulk shipments going to IOCCG Committee members and Agencies for distribution.

b) IOCCG Information Folder

Seven new inserts had been prepared for the IOCCG information kit-folder. The Chairman pointed out that the kit-folder could be seen as a vehicle for many uses and suggestions for new inserts were welcome. It was proposed that an insert be prepared for the Indian OCM Sensor and that the cover of the information folder be reprinted to incorporate changes in the sponsoring organizations.

c) SE Asia Training Course

An IOCCG-coordinated training course was successfully held in Bangkok, November, 1999 and would be discussed further under Agenda item number 17.

d) *Coordination of Ocean-Colour Sensors in the Post-2005 timeframe*

For the period beginning in 2005, there is no plan amongst various space agencies to provide a suite of coordinated ocean-colour sensors. The Chairman tried, unsuccessfully, to bring this to the attention of the various space agencies. This item would be discussed further under Agenda Item number 16.

e) *Monograph on Ocean-Colour Studies*

At the previous Committee meeting, Dr. O. Kopelevich had put forward a proposal that the IOCCG publish a monograph on ocean-colour science, but no one had come forward to take responsibility for the task. The Chairman solicited views from the Committee on whether the material could be issued in portions under the IOCCG Report Series. This proposal was in general favourably received. Dr. R. Frouin agreed to take responsibility for developing the overall design of the monograph and also for quality control of the manuscripts. The Chairman suggested that he nominate a small editorial committee to help map out the design and identify authors.

f) *Recommendation for Common Software*

The Committee addressed the question of whether a software package such as SeaDAS with IDL was a suitable platform for developing countries. According to Dr. G. Feldman, SeaDAS was able to incorporate several different sensors with a limited number of algorithms, and the SeaDAS team were willing to incorporate new suggestions and code. He noted that it was not likely that a Windows version of SeaDAS would be produced, but LINUX versions of IDL were available at a reduced cost. According to Dr. O. Ulloa, LINUX was gaining popularity in South America and the free PDL (Perl Data Language) UNIX software which emulates IDL, was also available. However, Dr. R. Navalgund reported that many institutes in India could not afford SeaDAS and that ISRO had developed specific software to process OCM data. A number of other image processing and image display software programmes were mentioned and the Chairman suggested that the momentum of these discussions be continued on the IOCCG web server, perhaps listing the capabilities and limitations of the various programmes. The IOCCG homepage would be updated to include this new initiative.

g) *Royal Society Discussion Meetings*

The Chairman brought attention to the Royal Society Discussion Meetings, and inquired whether there was a desire to host such a meeting with an ocean-colour theme. The advantage of these meetings was that the sponsoring body provided financial and logistic support and the proceedings are published rapidly in the Philosophical Transactions of the Royal Society. There was a two year lead time for these meetings and if there was a strong interest in hosting such a meeting, the Chairman would pursue this issue.

h) Publication from the ICSOS Meeting

The Executive Director of SCOR noted that the proceedings from the “International Conference on Satellites, Oceans and Society”, (Portugal, August, 1998) were being published by Elsevier Press, and would be available by June, 2000. The publication was of a high quality with several colour plates, and information on obtaining copies could be obtained from the SCOR office.

4. Issues Related to the Project Office

The Chairman noted that the IOCCG Project Office was located at the Bedford Institute of Oceanography and that the Canadian Government provided a considerable contribution in kind (office space, postage, communications etc.). In January 1999, Jim Cornall was employed as an information officer for the IOCCG and his duties included the upkeep of the IOCCG homepage. Suggestions for modifications of the homepage were invited from the Committee. It was agreed that the main login page should be modified and that several new sections should be created, namely: Ocean-Colour News, an Ocean-Colour Image Gallery, a list of chlorophyll sources for the standard validation data set, different software packages for processing ocean-colour imagery, and a list of recent publications that use ocean-colour data. Various members of the Committee agreed to provide information on these topics to the Project Office. Dr. P. Schlittenhardt announced that the JRC would continue to support the IOCCG server.

5. Ocean-Colour Remote Sensing in Australia

a) Cal/Val Activities

Dr. Parslow briefed the Committee on the activities of the Australian Ocean Colour Working Group (AOCWG). This group aimed to coordinate participation in international ocean-colour missions, carry out regional calibration/validation activities, develop regional algorithms and foster an awareness of ocean-colour applications. Ships of opportunity and research vessels were used for cal/val activities, as well as platforms and moorings. A proposal will be submitted to SIMBIOS to foster further international intercomparisons.

b) Development of Regional Algorithms

Dr. M. Lynch gave a presentation on the activities of the Remote Sensing and Satellite Research Group at the Curtin University, Perth. This group had developed several models for atmospheric correction, in-water scattering and water-leaving radiance. Algorithms were being developed and tested for several applications including water quality, detecting coral bleaching and spawning, benthic habitats, algal blooms and detecting long-term changes in ocean-colour. The group was also involved in education and training and had developed a windows based software package (Remote Sensing Data Viewer (RSDV) developed by Dr. Fearn) for use with remote-sensing data.

c) *Ocean Colour Applications*

Dr. W. Skirving presented an overview of Australia's diverse ocean biota and atmospheric conditions. Ocean-colour applications for Level 3 products were focussed in three different areas: pelagic (algal blooms, primary production and fish stock assessment), benthic (coral reefs, sea grasses) and water quality (total suspended matter, CDOM and oil slicks and spills).

6. Ocean-Colour Activities at NOAA

The Chairman noted that ocean-colour was moving towards an operational mode. Since the last meeting the IOCCG had acquired a representative of NOAA as a new Committee member (represented by Dr. C. Brown). Dr. Brown briefed the Committee on NOAA's mission, goals and responsibilities, which included provision of ocean-colour products to assess and monitor environmental quality, and evaluation of NOAA operational products. Ocean-colour activities at NOAA ranged from research (calibration, atmospheric correction, algorithm development), through operations (acquisition, processing, distribution and archiving data) to applications (product development and validation, fisheries and environmental monitoring). NOAA's ocean-colour products included chl-*a* concentration, K_{490} , total suspended solids, primary productivity, bloom detection and front and eddy detection. NOAA's data was generated centrally and distributed nation wide via the CoastWatch Program. Recent activities included the provision of radiances for vicarious calibration, development of an automated ordering system for SeaWiFS data, incorporation of regional bio-optical algorithms and the initiative for the geostationary Special Events Imager (SEI).

According to Dr. Brown, NOAA has recently increased its efforts in ocean-related activities. NOAA, in cooperation with the Department of Defense and NASA, are planning to launch a sensor (VIIRS on NPOESS) to guarantee the availability of certain ocean-colour products: chl-*a*, sediment transport and turbidity. The definition of "operational" at NOAA was very specific: data must be processed and provided to users within a short time frame (~12 hours) and archived for retrospective examination and distribution. Dr. J. Campbell proposed that the IOCCG use the term "long-term systematic measurements" instead of "operational", to avoid confusion.

Dr. A. Dekker pointed out that it was important to take the end users into account. Remote sensing had no official status since the products had not yet been specified by the National Bureau of Standards. Management authorities could only use the products after they had been legally defined and endorsed.

7. Definition of "Normalized Water-Leaving Radiance" $[L_w]_N$

Prof. A. Morel pointed out that there were several "operational" definitions of normalized water-leaving radiance, $[L_w]_N$, and not all would produce the same Level 2 products. These included the "*in situ*" $[L_w]_N$, "satellite" $[L_w]_N$ and "true" $[L_w]_N$. Differences

existed between definitions used for field cal/val data and definitions used for data acquired from space. He noted that normalized water-leaving radiance is expressed as a function of the downwelling irradiance (which depends on the solar zenith angle): the correct definition had been given by Gordon and Clarke. For cal/val data, measurements made at nadir are transformed into “*in situ*” normalized water-leaving radiances, but this was not a true value. Furthermore “satellite” $[L_w]_N$ are not measured at nadir.

Many of the Committee members were aware of this problem and agreed that it was important to establish which definition of $[L_w]_N$ was being used by the various Space Agencies. Common definitions were necessary for sensor intercomparisons and merging data products. The Chairman requested that Dr. A. Neumann draft a letter to the Space Agencies summarizing the problem and requesting comments. Prof. Morel would help with the text and Dr. R. Frouin would clarify the definition of normalized water-leaving radiance by providing an appendix for the letter. Prof. Morel also proposed creating an improved f/Q table, extended to higher chlorophyll values, so that the process could be reversed.

Dr. J. Aiken pointed out that SIMBIOS was revising the protocols for satellite ocean-colour sensor validation and the Chairman suggested that, at a later date, the protocols could perhaps be modified with a view to publication in the IOCCG Report Series, and should include a comprehensive definition of terms.

8. Status of Ocean-Colour Missions

a) MODIS

Dr. J. Marra reported that the Terra satellite carrying the MODIS ocean-colour sensor had been successfully launched on 18 December, 1999. Orbit raising was taking longer than expected, so the opening of the aperture doors had been delayed until 25 February, 2000. Modifications to Level 1 algorithms would take place during February and stable Level 1b data were expected by the end of February. Limited data distribution would take place after a news conference on 22 April, 2000. Early ocean validation would take place using data from MOBY and drifting buoys. Data archive plans were in progress: products will be processed by both the Goddard DAAC and the MODIS Adaptive Processing System (MODAPS), which was aiming at a full ocean production of ~230GB/day. At-launch archive rates may be limited to ~50 GB for Level 3 products and ~20 GB for Level 2 data.

b) MERIS

Dr. M. Rast briefed the Committee on the status of the MERIS programme, which was scheduled for launch in June, 2001. He described the suite of MERIS data products and noted that ESA would rely on the support of Expert Support Laboratories (ESL's) for the development and validation of Level 2 products. An ocean task force had been created to establish consistency within MERIS Level 2 above-water processing as well as to provide simulated test data, and to improve Case 2 water reflectance modelling. MERIS had the capacity to record on board an average of 20 minutes of full-resolution data per orbit. Dr. J. Yoder pointed out that MERIS high-resolution data was of particular interest to GOOS and inquired about data distribution policies. Dr. Rast replied that the high-resolution

data would be transmitted via X-band, and made available through an archive. A contract was currently out for tender for ENVISAT data distribution.

c) *GLI and POLDER*

Reviewing the OCTS mission, Dr. T. Tanaka highlighted the excellent quality of OCTS chl-*a* measurements and stated that there was a strong demand for OCTS Global Level 1b data, as well as I-LAC data over Japan. New OCTS datasets would include World Big River Estuaries, Asian I-LAC, offshore Peru I-LAC, Primary Production and Aerosols. Due to the recent failure of the MTSAT satellite, there was now a one year delay in the launch of GLI on ADEOS II. Pre-flight tests revealed low saturation radiances for GLI. The sensor specification would be improved and the possibility of using different bands would be evaluated. NASDA had tentative plans to launch the S-GLI sensor in 2006, as part of Global Change Observing Mission (GCOM), although government authorization had not yet been obtained. Dr. J. Ishizaka also presented a comparison of OCTS and SeaWiFS primary production data: OCTS had consistently higher values than SeaWiFS, which might be attributed to chlorophyll retrieval algorithms.

d) *OCI*

Dr. H. Li presented a comparison of chl-*a* data from the SeaWiFS and OCI sensors and noted that OCI values were routinely higher. The OCI science team had been working on sensor calibration and better results were expected in the future. OCI data was freely available to scientific and educational communities, and was processed and distributed by the OCI Science Data Distribution Center (SDDC).

e) *OSMI*

Dr. S. Yoo was unable to attend the meeting because of the recent launch of the OSMI ocean-colour sensor. He notified the Committee that the KOMPSAT satellite had been successfully launched on 21 December, 1999 and was functioning normally. The solar calibration data and first images appeared to be satisfactory, and the first field validation for TOA radiance comparisons was scheduled to be carried out during February, near Cheju Island. Data would be routinely available after a three-month post-launch early operation period.

f) *OCM*

Dr. R. Navalgund presented an overview of the Indian Earth Observation Systems. The IRS-P4 satellite carrying the OCM sensor was launched on May 26, 1999. The sensor has a tilt mechanism to avoid sunglint and will provide some data over Case 2 waters. The first validation cruise was conducted between 15-29 November, 1999 and the data were being evaluated. A number of different agencies were involved in the IRS-P4 OCM Utilization Programme, which included a pre-launch (MOS, SeaWiFS and *in situ* data) and post-launch phase (validation of algorithms, Announcements of Opportunity, training). Reduced resolution data are recorded on board, but data in Full Resolution Mode (FRM) are routinely acquired by a ground station at Hyderabad, and are available to users at minimal cost. International users can also receive OCM FRM data through existing EO reception stations, licensed by ISRO/Antrix or through International Ground

Stations (IGS) licensed to receive OCM FRM data via X-band. SeaSpace Corporation in California had recently entered into an IRS-P4 license agreement with Antrix Co. Ltd. Dr. G. Feldman pointed out that NASA had intended to respond to the AO but were prohibited from doing so, and inquired whether the IOCCG could mediate. The Chairman agreed to return to this point at a later stage. Dr. A. Neumann noted that it would be of benefit to the ocean colour community if OCM data were received in areas outside of India. The Chairman supported this notion and agreed to write a letter to the head of DLR pointing out the value of OCM data, especially the high resolution data collected over the coastal areas of Europe.

g) *SeaWiFS*

Dr. G. Feldman reported that SeaWiFS had been functioning well since September, 1997, and currently had over 1,200 authorized users. The volume of SeaWiFS data distributed was nine times that contributed to Goddard-DAAC. Two complete reprocessings had been carried out to date, with a third reprocessing scheduled for April this year. Several new evaluation products would also be distributed within SeaWiFS (*e.g.* absorbing aerosols, cloud optical thickness, mean PAR). Currently there were 71 HRPT ground stations around the world with additional ground stations envisaged in areas such as SE Pacific. Dr. J. Marra pointed out that NASA's data-buy for SeaWiFS data would end in 2002 and requested the IOCCG's support to advocate for continuity of SeaWiFS data. The Chairman agreed to draft a letter, on behalf of the IOCCG, commending the excellent work done by DAAC and requesting an extension of the NASA/SeaWiFS data-buy contract.

9. IOCCG and SIMBIOS Future Activities

a) *Areas of Common Interest*

Dr. G. Feldman briefed the Committee on the SIMBIOS Project, which was conceived in 1994 and consists of U.S. as well as international investigators. SIMBIOS has a world-wide ongoing ocean-colour data collection programme, plus an operational data processing and analysis capability. One of the main objectives of SIMBIOS is to implement ways of developing a consistent, long-term global time-series of chlorophyll and water leaving radiances. For multi-sensor comparisons, the SIMBIOS project processes data from MOS, POLDER, OCTS and SeaWiFS using the MSL12 software package. In addition, bio-optical data from over 300 cruises are stored in the SeaBASS archive, which can be used for sensor calibration and validation of satellite imagery.

b) *Diagnostic Data Set*

Dr. G. Feldman reported that the SeaWiFS Project could readily implement any number of diagnostic data sites, however the list of sites was growing rapidly and various agencies would have to commit to these sites while in operational mode. It was important to finalize plans before mission launch. This issue would be discussed further under Agenda item 10(e).

10. Current IOCCG Working Groups

a) *Case 2 Waters*

Dr. S. Sathyendranath, Chair of the Case 2 working group, summarized the various issues discussed during the five day workshop in Ispra (June, 1999) and outlined the contents of the draft report (a copy of which had been distributed to all IOCCG members prior to the meeting). She stressed that the manuscript as it stood was a very early draft presented for comments and constructive criticism. A number of points were raised by Prof. A. Morel including the importance of consistency in terminology between chapters, the desirability of expanding Chapter 2 to ensure completeness, and of expanding the section on atmospheric correction. A number of other minor points were also raised and would be taken into consideration. There was consensus that the report should be self-contained and that the initial parts of Chapter 2 (text-book material) should be retained. Dr. J. Aiken gave a brief presentation on the atmospheric correction over case 2 waters and the IOP bio-optical model. He suggested that it had special benefits for case 2 waters and would resolve the errors and ambiguities arising from current 2-band algorithms. The Chairman thanked the working group for their efforts and noted that it would make an excellent report after the next round of revisions.

b) *Calibration of Ocean-Colour Sensors*

Dr. A. Neumann reported that there had been two meetings of the Calibration Working Group: the first following the SIMBIOS meeting in September, 1999 where a draft outline of the report was prepared, and the second preceding the Committee meeting in Hobart, where the focus of the report was discussed and a proposal was made to use TOA radiances for comparisons. A new draft outline was compiled taking into account pre-launch and post-launch calibration techniques. Members of the working group would commence writing various sections and the draft report would be circulated to the IOCCG Committee later in the year.

c) *Standard Validation Data Set*

Dr. J. Ishizaka noted that the main objective of the working group was to help space agencies and users obtain data to validate ocean-colour missions. The group decided to focus on chlorophyll and recommended that a new section be added to the IOCCG homepage listing sources for *in situ* chlorophyll data sets with active links to each data center. The Committee supported the general approach and recommended that the activities of SIMBIOS (SeaBASS) be referenced. Dr. J. Yoder agreed to contact the National Oceanographic Data Center (Dr. M. Conkright) and the Chairman requested members to submit material to the Project Office.

d) *International Ocean-Colour Cruise*

Dr. R. Frouin outlined the objectives, proposed cost and planned implementation of an international cruise, which would include setting up a Project Office at Scripps, hiring a full-time coordinator and establishing a Planning Committee to write proposals for funding. Scripps were prepared to fund science proposals, but not cal/val or training activities. There was some discussion about the desirability of the IOCCG's endorsing a science proposal with a less-pronounced educational aspect. The Chairman encouraged Dr. Frouin to continue looking for sponsors for the cruise, and proposed that the item be raised again at the next meeting.

e) *Coordination of Merged Data-Sets*

Dr. Campbell reported that SIMBIOS was NASA's contribution to a global long-term ocean biology time series. It was important for various Space Agencies to commit to this concept, so a proposal had been submitted to SIMBIOS to collaborate with representatives from each of the three major agencies that provide ocean-colour data (ESA, NASDA and NASA).

The goal of the working group is to develop and document procedures to be used by each space agency to merge products from international missions. This coordination would initiate the production of a long-term ocean biology time series which would be continued operationally beyond 2002. The proposed approach would be to produce Level 3 binned data products with the appropriate saved information to allow each agency to adjust the data furnished by the other two agencies to be compatible with its own algorithms and products. Two types of data would be shared between the agencies: a diagnostic data set generated during routine processing for selected sites, and Level 3 (space and time binned) data. The diagnostic data set should contain all the information needed to process data from Level 0 to Level 2.

Dr. Schlittenhardt noted that JRC was preparing to submit a proposal to the EC to promote cooperation between NASA, NASDA and Europe, the better to exploit existing data and perhaps to encourage ESA to produce Level 3 products. They proposed to hold four workshops with representatives from NASA, NASDA and Europe to discuss proposals and recommendations.

The Committee encouraged further development of this working group, especially in view of the fact that the European component would proceed with funding and convening a series of workshops. The Committee also requested that the group take into consideration comments made about the large number of diagnostic data sites, and the desirability to articulate criteria for site selection. The Chairman requested that the working group report on their progress at the next Committee meeting.

11. Proposals for New IOCCG Working Groups

a) *"Why Ocean-Colour?" Report*

The Chairman noted that in many agencies, the level of understanding of ocean-colour science was very poor. He proposed that the IOCCG publish a descriptive, qualitative report to raise the profile of ocean-colour remote sensing and to review the scientific and societal justification of ocean-colour in its broadest sense. Dr. G. Feldman suggested that the report capitalize on imagery, which is not produced by other remote sensing missions. Other suggestions included emphasizing quantitative applications, perhaps through the proceedings of the proposed ORBIMAGE workshop on practical applications of ocean-colour data. The committee endorsed the general concept of such a report and recommended going ahead with proposal. The Chairman agreed to take principal

responsibility for preparing the report, and several members of the Committee volunteered to provide material.

b) Proposals for New Working Groups

Dr. R. Frouin presented a proposal to compare and contrast existing atmospheric correction algorithms used by various satellite missions. In this proposal, state-of-the-art radiative transfer models would be used to generate a simulated data set of TOA radiances, for a wide range of atmospheric and oceanic conditions. This data set could then be distributed to various space agencies to run their atmospheric correction code. The data would be analyzed by the working group, recommendations made and the results summarized in an IOCCG Report. A leader had already been identified (Dr. Meng-Hua Wang). There was some discussion on linking this initiative to the “diagnostic data sites” but the consensus was that this would form another proposal. The Chairman agreed to write a letter of endorsement from the IOCCG to Dr. Wang (Dr. Frouin to draft letter) and invite him to submit a one page statement of scope. On the basis of this, a working group would possibly be established.

12. IOCCG and CEOS

The Chairman informed participants that following the Executive meeting in May, the IOCCG had made a formal application to CEOS to become an Associate Member. At the recent CEOS Plenary session in Stockholm (November, 1999) this application was accepted. This new status would provide the IOCCG with a formal avenue for discussions with CEOS and was reflected on the new IOCCG letterhead. As a corollary, the IOCCG had been requested to provide its data requirements for the CEOS/WMO database. After an extensive discussion about which geophysical parameters to specify, the Chairman suggested that a sub-committee be formed to draft a response (headed by Dr. J. Yoder). Later in the meeting, Dr. Yoder reported back on the sub-committee’s recommendations, which included separate requirements for the open ocean and for coastal waters. In addition, radiance measurements were required at a number of different spectral bands. The geophysical parameters selected were: TOA radiance, water-leaving radiance, PAR, yellow substance absorbance at 412 nm, suspended sediment concentration and chlorophyll. The units of measure, optimum and threshold values for horizontal resolution, accuracy, observing cycle and delay of availability were also specified. After the meeting, the final list of requirements would be submitted to CEOS, with a copy to the Coastal-GOOS Panel.

13. IOCCG and the Integrated Global Observing Strategy (IGOS)

The IOCCG recognized the importance of the IGOS initiative and was prepared to advise GOOS on matters pertaining to ocean colour. For this reason, a number of knowledgeable guests had been invited to attend the meeting to provide information for the benefit of the Committee and to explore possibilities for mutual cooperation. The Chairman expressed his gratitude at their participation.

a) Overview and Structure of IGOS

Summarizing the history of IGOS, Dr. A. McEwan noted that the impetus for the creation of a Global Ocean Observing System (GOOS) was raised at the Second World

Climate Conference (1990), and the concept for an IGOS was mooted at the CEOS meeting in Seattle (1996). Six 'prototype projects' were endorsed at the CEOS meeting in Irvine (1997), and the 'IGOS Themes' were proposed in 1998, with the 'Oceans Theme' being the pathfinder. The Oceans Theme aims to identify requirements for long-term observations, including ocean biology and surface carbon flux. In 1999, the IGOS Partnership was formed and endorsed by parent organization, with three main categories of partners: Non-Governmental (CEOS, ICSU, IGFA); Intergovernmental (FAO, UNEP, IOC, UNESCO, WMO) and Programs (GCOS, GTOS, GOOS, IGBP, WCRP).

b) *Liaison with the LMR Panel of GOOS*

The Chairman informed the Committee that the IOCCG currently had formal representation on the LMR panel of GOOS, as he had recently accepted an invitation from Dr. W. Wooster to represent the IOCCG on the panel, and thus provide scientific expertise in remote sensing. The Chairman was unable to attend the recent meeting of this panel in Chile (December, 1999) but the IOCCG would be formally represented at the next LMR Panel meeting in Honolulu (May, 2000).

c) *Activities of Coastal-GOOS*

Dr. T. Malone presented an overview of the activities of Coastal-GOOS, and noted that IGOS included three observing systems: GCOS, GTOS and GOOS, the latter of which consisted of four panels, including the C-GOOS and LMR panels. The C-GOOS panel addressed a broad spectrum of issues ranging from biological, chemical and physical aspects to external forcings. The target was to establish a coastal observing system that was both sustained and integrated. An operational C-GOOS programme would be a user-driven system, with an in-built programme for monitoring and research. Capacity building would cross-cut all of these issues. The science base for C-GOOS consisted of programmes such as CLIVAR, LOICZ, SIMBIOS and JGOFS. The design of C-GOOS would include elements such as an observing subsystem, a communications network and a data subsystem. The design strategy would include developing a global network incorporating existing operational programmes and pre-operational pilot projects. C-GOOS would be implemented at regional as well as national levels and would include networking in coastal laboratories. The GOOS panel was beginning to obtain requirements for remote sensing, including ocean colour, and requested that the IOCCG review these requirements and also inform C-GOOS of additional requirements.

d) *Liaison with Other Panels of GOOS*

Dr. N. Smith presented a brief background on the vision for climate and oceanography, including the carbon cycle, as seen by various global observing systems (GCOS, GOOS, GODAE). Three systems were essential for monitoring global climate: sea surface temperature (SST), surface winds (scatterometry) and surface topography and sea level (TOPEX/POSEIDON). In terms of ocean colour, GODAE recognizes that it is relevant to the programme, but it is not of the highest priority. However, GOSSP put forward a proposal (April, 1999) recommending that ocean colour be on the same level as SST, altimetry and surface winds. It was also apparent that there was a need for integrated data streams in a format that all disciplines could use.

e) *An "Oceans Theme" for the IGOS Partnership*

The Chairman noted that the 'Long-Term Ocean Biology' demonstration project had metamorphosed into the 'Oceans Theme'. The paper was presented at CEOS Plenary meeting in Stockholm in November (Refer Document IOCCG5/13e/2) where it was agreed that further work was needed on the biology, carbon cycle and *in-situ* elements. Revisions were currently underway, and the responsibility of coordinating with IGOS had been passed on by Dr. E. Lindstrom to Dr. J. Marra. The revised document would be reviewed at the next SIT meeting (Cape Town, March, 2000).

f) *Application for IGOS Partnership*

The Chairman explained that after the metamorphosis of the IGOS demonstration projects into themes, it had been less clear where IOCCG sat with respect to CEOS. At the last IOCCG Executive (May, 1999) it was decided that the IOCCG would first apply to become an Associate Partner of CEOS, then an IGOS Partner. After receiving full support for the application from the secretariats of IGBP and the IOC, the Chairman drafted a letter to the Chairman of IGOS. The only response received was that the application would be discussed at the next meeting of the IGOS Partners (June, 2000).

14. Comments on behalf of the IOC

In his capacity as a representative for the IOC, Dr. A. McEwan remarked that the IOC was pleased with the progress of the IOCCG and content with its sponsorship through SCOR. He noted that a close relationship was required between the IOCCG and GOOS panels, since the IOCCG would input its space requirements through GOSSP. Regarding the question of the IOCCG becoming a member of the IGOS partnership, the IOC felt it was not advisable because the IOCCG had a different nature from other partners. The IOC would like to prevent the development of an IGOS that diverges from GOOS. Existing links between the IOCCG and other IGOS partners ought to give the IOCCG some voice. Another option would be an alternative pathway through ICSU. In summary, Dr. McEwan stated that regardless of the difficulties the IOCCG was experiencing, it was important to ensure cross-representation with other groups: the structural status of the IOCCG was not as important as the working level.

The Chairman responded by stating that if the IOC's view was that the IOCCG should not become a partner in IGOS, then it directly contradicted what Dr. P. Bernal (Executive Secretary of the IOC) had conveyed in a telephone conversation prior to the Chairman's sending the letter of application. Dr. McEwan agreed to communicate the IOCCG's position to the IOC and reiterate the Chairman's point. Dr. N. Smith felt that the IOCCG did not need to become member of the IGOS Partners group, since IGBP could make sure that they were part of the delegation.

15. Liaison with JGOFS

a) *JGOFS Synthesis*

In summarizing the history of JGOFS, Dr. B. Tilbrook noted that the IOCCG had taken over the role of the remote-sensing working group within JGOFS, so the working group had been disbanded. JGOFS viewed its links with the IOCCG as critical and requested that the IOCCG send a representative to the next Scientific Steering Committee meeting in Bergen (April, 2000). Ocean-colour data was extremely important to the JGOFS

programme as it aided a better representation of global ocean carbon fluxes. A number of field programmes were ongoing, including studies in the coastal regions around SE Asia. The synthesis phase of JGOFS was expected to continue until late 2003.

b) *Future of JGOFS*

The Chairman referred to his paper “Beyond JGOFS” (Refer Document IOCCG/15b) which was written for the IGBP meeting in April, 1999. He noted that because of the delay in the launch of SeaWiFS, the full potential of ocean colour in marine biogeochemistry had not been fully realized, since most of the field work in JGOFS had been completed before the launch. This should be taken into consideration when discussing future programmes. According to the Executive Director of SCOR, the SOLAS programme was gathering momentum, but there was some concern that it was not a complete plan for ocean biogeochemistry. A meeting was being planned with leaders from programmes such as JGOFS and IGBP (Plymouth, September 2000), to discuss the design of a new ocean biogeochemistry programme.

16. Coordination of Ocean Colour Sensors in the Post-2005 Timeframe

The Chairman noted that one of the issues that arose from IOCCG Report No. 2 was that there was no integrated plan to coordinate operational ocean-colour sensors in the post-2005 era. The Chairman had tried to engage CEOS principals on this subject, but had not received a reply. Now that the IOCCG was an Associate member of CEOS, he would once again to bring this to the attention of senior space agency officials. It provided a good example of why the IOCCG would want to be a partner in CEOS.

17. Training Courses

a) *Training Course in Thailand*

The training course in Bangkok (2-12 November, 1999) was principally funded by NASDA and coordinated by Dr. T. Tanaka and Dr. P. Schlittenhardt (refer Document IOCCG5/17a). Dr. Tanaka noted that it was the first training course to use OCTS and SeaWiFS data and that NASDA was interested in training researchers, scientists and operational users in the use of OCTS data. NASDA would be offering another training course at AIT this year, focussing on operational users and specifically centered on red-tides in SE Asia. Dr. Schlittenhardt commended the Asian Institute of Technology (AIT) for their excellent technical and administrative support. Approximately 90 applications were received, out of which 30 were selected, giving priority to those from SE Asia. The two-week course had a high level of training, with lectures every morning and practical hands-on sessions every afternoon to introduce applications such as SeaDAS, NOOS, Bilko and Primary Production. Dr. Schlittenhardt was also pleased to note that the course had come in under budget.

b) *Future Training Courses*

The Chairman inquired whether there were any suggestions for future training courses. Dr. R. Navalgund noted that ISRO were interested in running a two-week training course on ocean colour, specifically designed for students from the Asian region. Topics to be covered would include optical properties of water, retrieval of oceanic parameters, modeling and hands on computer experience. ISRO would be able to provide support for

Indian participants, but additional funding would be required for students from other countries (perhaps through the Asia-specific UN center for training). The Chairman advised Dr. Navalgund to keep the IOCCG office informed of future developments and noted that the IOCCG might be in a position to offer funding support if the course came to fruition, and if the student body was international.

Dr. T. Tanaka informed the committee that NASDA was interested in funding a training course this year, either in Africa or the Mediterranean region.

Dr. R. Frouin advised the committee that he had been in contact with two scientists from the Middle East Technical University in Turkey (Dr. Sukru Besiktepe and Dr. Aysen Yilmaz), who were interested in hosting a training course on ocean colour in September this year. NATO funding was available for this course, as well as some local funding, but additional funding was required for students from neighbouring countries. Dr. Frouin proposed running the course under the IOCCG umbrella. The Executive Director of SCOR noted that there might be some restrictions on participants if it was a NATO course. Dr. M. Lynch offered to take responsibility to coordinate the course. The Chairman thanked him for volunteering and stated that once the course was viable, it should not be difficult to obtain funding.

Dr. F. Shillington reported that there was strong French support for remote sensing in South Africa. There were tentative plans to run a training course in remote sensing, perhaps by the end of the year, with financial from IRD (Institut de Recherche pour le Développement). The Chairman suggested that Dr. Shillington liaise with Dr. Lynch on the development of the course, and also keep the IOCCG informed, as there may be implications for funding.

Dr. O. Ulloa reported that during a recent survey within South America, it was found that many countries were experiencing problems in archiving ocean-colour data. He suggested that it would be very useful if trained technicians from NASA could go to South America to help out with this problem. The Chairman advised Dr. Ulloa to estimate the costs involved and inform the IOCCG of the scale of the operation.

c) *Ocean-Colour Module for BILKO*

BILKO provides an image processing software package for satellite marine remote sensing and is aimed at students in developing countries (refer Document IOCCG5/3f/1). The Chairman inquired whether the IOCCG should encourage the development of an ocean-colour module, which could also be used for future training courses. Dr. F. Shillington indicated his support for this initiative and his willingness to coordinate the development of such a module in conjunction with Dr. C. Donlon. In addition, Dr. M. Lynch offered to help with the project. Dr. G. Feldman suggested that some of the material prepared by Goddard for SeaWiFS might be incorporated and Dr. T. Tanaka also offered to provide data for the project.

d) *CEOS ad hoc Working Group on EO Education and Training*

At the CEOS Plenary session in Stockholm (1999), it was announced that an *ad hoc* working group on training would be established. The Chairman informed the Plenary that

the IOCCG had an existing interest in training, and the delegates agreed to keep the IOCCG informed on the progress of this working group.

18. Restructuring of Remote Sensing Departments within DLR

Dr. A. Neumann informed participants that DLR had been regrouped into two institutes: the German Remote Sensing Data Center (DFD) and the Remote Sensing Technology Institute (IMF), the latter of which contained four sections, including one for Marine Remote Sensing which was headed by Dr. Neumann himself. This section dealt with algorithm development, calibration and validation, bio-optical and radiative transport models and development of applications.

19. Ocean-colour activities in Latin America

Dr. O. Ulloa noted that there was a growing interest in ocean colour in the South American region. There were currently eight receiving stations (two in Chile and one each in Argentina, Bolivia, Brazil, Uruguay, Venezuela and Peru). Four of these stations were also distributing data. One of the outcomes of the IOCCG-sponsored training course in Chile (November, 1997) was the need for more data.

20. International Society/ Journal of Ocean Colour

In summarizing the history of this proposal, the chairman noted that the IOCCG no longer published ocean-colour related articles in the *backscatter* magazine and that there was no specialized journal for ocean colour. In addition, there may have been a perception in some circles that the IOCCG was an exclusive body. For this reason it was proposed that the IOCCG found a professional society of ocean colour open to everyone, and that the society could be associated with an International Journal of Ocean Colour. The structure of the journal could be modeled on Nature, with news, comments and reviews in the front and quality peer-reviewed papers in the back. A mock-up of such a Journal was available for examination and discussion. After an extensive discussion it was concluded that the cost of such a journal could be prohibitive and that a specialized journal would enforce self-isolation. There was, however, an overall consensus that the news and views section was most important, and that it needed to be delivered in a timely fashion, which precluded the printed medium. It was suggested that the IOCCG homepage be expanded to include an updated news section, as well as an updated list of recently published ocean-colour articles. In addition, Dr. G. Feldman suggested that the IOCCG develop a pro-active mailing list to distribute news in a timely fashion, with hyperlinks to relevant material on the IOCCG web page. Dr. M. Lynch noted that the IOCCG was filling a niche with the Report Series, which might be sustained in a more formal manner by soliciting invited articles or annual reviews. The Chairman concluded that there was not sufficient support to proceed with the development of either the journal or the society at this stage.

21. Membership Policy

The Chairman asked the Executive Director of SCOR to help implement the membership policy, which was drafted at the Cape Town meeting (January, 1998) and which included a rotation of Scientific members in order to meet the formal requirements arising from

affiliation with SCOR. Ms. E. Gross noted that there were 14 scientific members who would be affected by rotation, while 6 members were appointed as agency representatives. It was proposed that one third of the 14 scientific members would be rotated in each of the next three years in order to achieve 100% new scientific membership in four years time. To institute this rotation, current members would be invited to serve second terms of varying length (one to three years). The Chairman suggested that this issue be discussed further at the meeting of the Executive Committee, and members would be notified by mail of their terms of reappointment.

22. Any other business

Dr. J. Ishizaka noted that after the GLI workshop there was a lengthy discussion regarding merging of data in the SE Asia region. NASDA proposed to organize a workshop in conjunction with Dr. G. Mitchell, to collect bio-optical measurements for testing algorithms. Input from members would be appreciated.

Dr. S. Sathyendranath requested that members provide ocean-colour imagery for the Case 2 report, and also urged members to submit papers dealing with ocean-colour to the PORSEC conference (5-8 December, 2000).

23. Time and Place of Next Meeting

A number of venues were proposed for the next meeting, including Monaco, to coincide with the Ocean Optics XV meeting (16-20 October, 2000), Goa to coincide with the PORSEC meeting (5-8 December, 2000), Concepción, Chile (hosted by Dr. Ulloa), Noordwijk (hosted by Dr. M. Rast) or Villefranche (hosted by Dr. A. Morel). This issue would be discussed further in the Executive meeting.

24. Closure

The Chairman closed the meeting, conveying thanks to Dr. J. Parslow and his Australian colleagues for the excellent arrangements. The Chairman also thanked all participants for making the effort to attend the meeting and noted that everyone was impressed with Hobart and the scientific vigour of the programmes at CSIRO.

5th IOCCG Committee Meeting
Hobart, 1-4 February, 2000

Participants List

IOCCG Members

Aiken, James	-	Plymouth Marine Laboratory, <i>United Kingdom</i>
Campbell, Janet	-	University of New Hampshire, <i>USA</i>
Frouin, Robert	-	Scripps Institution of Oceanography, <i>USA</i>
Ishizaka, Joji	-	Nagasaki University, <i>Japan</i>
Kopelevich, Oleg	-	P.P. Shirshov Institute of Oceanography, <i>Russia</i>
Marra, John	-	NASA HQ, <i>USA</i>
Morel, André	-	Laboratoire de Physique et Chimie Marines, <i>France</i>
Navalgund, Rangnath	-	Indian Space Research Organisation, <i>India</i>
Neumann, Andreas	-	DLR, <i>Germany</i>
Parslow, John	-	CSIRO Division of Fisheries, Tasmania, <i>Australia</i>
Platt, Trevor	-	Bedford Institute of Oceanography, N.S., <i>Canada</i>
Rast, Michael	-	ESA/ESTEC, <i>Netherlands</i>
Schlittenhardt, Peter	-	Joint Research Center, Ispra, <i>Italy</i>
Shillington, Frank -	-	University of Cape Town, <i>South Africa</i>
Tanaka, Tasuku	-	EORC/NASDA, Tokyo, <i>Japan</i>
Ulloa, Osvaldo	-	Universidad de Concepción, <i>Chile</i>
Yoder, James	-	University of Rhode Island, <i>USA</i>

Affiliation

Invited Participants

Barnes, Bob	-	SIMBIOS Project, <i>USA</i>
Brown, Chris	-	NOAA-NESDIS, <i>USA</i>
Clementson, Lesley	-	CSIRO, Hobart, <i>Australia</i>
Cornall, James	-	IOCCG Information Officer, <i>Canada</i>
Dekker, Arnold	-	CSIRO, Canberra, <i>Australia</i>
Fearns, Peter	-	Curtin University, Perth, <i>Australia</i>
Feldman, Gene	-	SIMBIOS Project, <i>USA</i>
Gross, Elizabeth	-	SCOR Office, <i>USA</i>
Kutser, Tiit	-	CSIRO, <i>Australia</i>
Li, Hsien-Wen	-	National Taiwan Ocean University, <i>Taiwan</i>
Lynch, Mervyn	-	Curtin University, Perth, <i>Australia</i>
Malone, Tom	-	Chair GOOS Coastal Panel, <i>USA</i>
McEwan, Angus	-	IOC Representative, <i>Australia</i>
Sathyendranath, Shubha	-	Dalhousie University, <i>Canada</i>
Skirving, William -	-	Australian Institute of Marine Science, <i>Australia</i>
Smith, Neville	-	Chair GODAE, <i>Australia</i>
Stuart, Venetia	-	IOCCG Executive Scientist, <i>Canada</i>
Tilbrook, Bronte	-	JGOFS SSC (CSIRO), <i>Australia</i>

Apologies

Dantzler, Lee	-	NOAA-NESDIS, <i>USA</i>
Lifermann, Anne	-	CNES, <i>France</i>
Yoo, Sinjae	-	KORDI, <i>Korea</i>