

**Third Committee Meeting, IOCCG  
Cape Town, South Africa, 19-21 January, 1998**

**MINUTES**

The meeting took place at the Breakwater Lodge, Graduate School of Business, Cape Town, South Africa. All committee members were present except for Drs. Lifermann, McClain and Navalgund who had conveyed their apologies. Several observers also attended the meeting (see annex I for list of participants).

**1. Welcome and Opening Remarks**

Dr. Platt, chairman of the IOCCG, welcomed the delegates and thanked local participants for their help with arrangements for the meeting. He noted that although this was the third committee meeting, it was only the second meeting of the full committee since the IOCCG had received the bulk of its funding from national space agencies, and since the project office had been opened in Halifax.

**2. Adoption of the Agenda**

The adoption of the agenda was proposed by the chairman and was taken as read, apart from the addition of an agenda item for OCTS Data Distribution.

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

- a) A workshop on Minimal Requirements for Future Ocean Colour Sensors was convened by Prof. Morel in Villefranche, October 7-9, 1997. A report on this workshop was circulated for later discussion (Agenda Item number 6).
- b) The Chairman of the IOCCG wrote to the Chairs of all projects within the IGBP to encourage the provision of cruise data to support ocean colour validation.
- c) The Chairman wrote to officials in NASA about reception of MOS data over US airspace. A MOU had been drawn up and a license had been obtained, although there were still financial problems.
- d) Liaison between the IOCCG and CEOS had been consolidated and would be addressed under agenda item number 11.
- e) The IOCCG was a co-sponsor of a training course on Remote Sensing of the Oceans, held in Chile, November, 1997. This item would be addressed under Agenda Item number 10.
- f) The committee was brought up to date on the status of the IOCCG homepage, which was well established, thanks to the help of DJL Software Consultancy in Ispra. It was suggested that the homepage might be used as a tool to help compile a list of the ocean colour community on a world wide scale.

#### 4. Issues Related to the Project Office and Publication Outlet

One of the initiatives from the Project Office was the IOCCG contribution to the *backscatter* magazine, usually 5-6 pages per issue. The Chairman noted that this required the help of committee members to provide suitable articles for publication, including results of scientific studies. During the past year, the response had been excellent and all published articles had been well received. The circulation of the magazine was around 10 000, and it was suggested that the IOCCG encourage further distribution and readership by polling the ocean colour community (through the WWW) regarding their knowledge and readership of the magazine, and offering two free introductory issues of *backscatter* for non-subscribers. The poll could also ascertain the users main field of interest (algorithm development, data use and so on).

The Project Office also undertook steps towards preparation of an information kit for the IOCCG. The company "Allura Communications" was approached for help with the design of the kit-folder and four preliminary conceptual designs were submitted, which were shown to the participants. There was not much consensus among the participants as to which design would be most suitable, although it was generally agreed that the information kit and homepage should have elements in common. Several participants felt that the idea of a satellite with a swath was overused, although others felt that a modified version of this conceptual design would be suitable, possibly incorporating a jig-saw design. Although there were some reservations, it was generally felt that a kit-folder was desirable for the IOCCG. It was agreed that the kit-folder should promote the activities of the IOCCG as well as be used for educational purposes. It could be distributed at conferences, meetings and exhibitions and it was felt that at least 5 000 to 10 000 copies should be printed. An *ad-hoc* committee was formed to handle the comments and to proceed with the design of the kit-folder.

#### 5. Status of Ocean Colour Missions

##### a) MOS

Dr. Neumann gave a brief overview of the German MOS mission, noting that there were two MOS instruments currently in orbit: one on the Russian satellite, Priroda, and one on the Indian IRS-P3 satellite. The Priroda instrument accidentally received cable damage in 1996 and despite a spare cable being sent up in May 1997, had provided no data. The IRS-P3 instrument, on the other hand, had been performing well, providing almost two years of data. It was anticipated that this instrument should be able to perform for a further two years. MOS utilizes three operational receiving stations as there are no onboard data storage facilities:

- (i) a German ground station,
- (ii) a ground station in Hyderabad, India which provided data for the Arabian Sea Cruises and
- (iii) a station on Maspalomas, Canary Islands, run by the ESA.

Data from these stations can be made available through requests to DLR.

The main activities for 1998 were Cal/Val campaigns, intercomparisons with SeaWiFS data and a second International Workshop on MOS/IRS and Ocean Colour, which was scheduled to be held in Berlin on 10-12 June, 1998.

The participants agreed that MOS data over the USA would be valuable for nearshore algorithms and that a letter should be drafted to ISRO to clarify the price of a decoder and also to inquire whether OCM data would be freely available for scientific use. Dr. Yoder agreed to draft such a letter. Dr. Neumann also provided information on requirements for MOS/IRS reception.

**b) SeaWiFS**

Dr. Campbell reported on the NASA SeaWiFS project, which had been very busy since the successful launch of the Orbview-2 satellite in August, 1997. The SeaWiFS spacecraft and data belonged to Orbital Sciences, and NASA had purchased the rights to use the data for scientific purposes. Calibration of the sensor had been refined and data were being reprocessed from level 0. Archived products were being replaced with newly processed data as of 2 January, 1998 (revised chlorophyll concentrations were approximately 30% lower than originally calculated). In future, any changes in calibration should come after level 1A. The SeaWiFS algorithm for chlorophyll concentration used remote sensing reflectances at 490 and 550 nm. Authorized users have access to SeaWiFS data through Goddard DAAC or from HRPT ground stations and decryption boxes were available from Orbital Sciences Corporation. Over 400 authorized users and 48 operational HRTP stations were currently registered, including several “near realtime” stations. Algorithms for case 2 waters were being developed with the goal of having an operational algorithm by the time MODIS was launched. Dr. Campbell noted that US funding was available to run a workshop on “Case 2 Waters and Atmospheric Correction” and suggested that the IOCCG could help to coordinate such a workshop.

**c) MODIS**

Dr. Campbell reported that MODIS was scheduled to be launched in June 1998, onboard the AM-1 platform. The MODIS sensor had 38 channels, nine of which were available for ocean colour. The MODIS product suite would include phycobiliproteins, fluorescence, coccolithophores, chlorophyll and instantaneous PAR. The MISR instrument, which would be on the same platform, had four fairly broad bands with nine different viewing angles. One of the characteristics of MODIS was that it did not tilt, so sunglint would be a problem. In future, the best products would probably be merged data products e.g. SeaWiFS and MODIS. The data policy for MODIS was free and open access, including access to merged data products.

**d) MERIS**

Dr. Rast gave a brief overview of the European MERIS program. He reported that the number of spectral bands on the sensor had been reduced to 15 (the 765 nm band had been removed). The satellite, which had originally been scheduled for launch in June 1999, was rescheduled for the end of 1999. An engineering model had already been built and the flight model was under construction. Algorithms were being developed, and would be validated using synthetic data. The data distribution policy was complicated since the ESA had 40 member countries. An announcement of opportunity would be posted on the web and free data would be available for scientific research for several months. Dr. Neumann advised participants that a DLR project entitled MAPP (MERIS Application and regional Products Project) had been

initiated to promote and support the application of MERIS data. ATBDs (Algorithm Theory Baseline Documents) were being formulated for incorporation into the MERIS Level 2 processing steps. Dr. Rast mentioned that the ESA policy was to stop processing at Level 2, but participants agreed that the IOCCG should endorse the concept of encouraging the provision of Level 3 products.

**e) OCTS, GLI and S-GLI**

Mr. Tanaka reported that despite the fatal loss of the Japanese ADEOS satellite on 29 June 1997, due to a solar panel shut down, there was nevertheless ten months of data from the OCTS sensor, which was extremely valuable for science and research. Version 3 processing of OCTS data was underway, and several important bugs had been removed, although there were no significant changes to the algorithms for atmospheric correction. Agreements had been signed between NASDA and NASA/NOAA and JRC for cooperative use of OCTS data. Agreements would also be signed with ESA and CSIRO and perhaps also South America.

The loss of ADEOS had influenced the launch of ADEOS-II, since the design of the solar panel was almost identical. The earliest launch date of ADEOS-II was June 2000 and the final processing algorithms from Level 1 to Level 2 for the GLI sensor on board ADEOS-II were being developed.

NASDA also managed the Earth Observation Satellite (EOS) program. The TRMM satellite had been successfully launched and the first images looked promising. The Advanced Land Observation Satellites (ALOS) were also recently authorized by the Japanese Government and NASDA had begun discussions on the ADEOS-III satellite which would carry the S-GLI ocean colour sensor.

Dr. Kawamura gave a brief presentation on the validation of OCTS data. Since October 1997, a new algorithm (Version 3) had been used to process data, providing better cloud detection, precise mapping (~1 pixel), new atmospheric corrections for chlorophyll-*a* and SST and a new inwater algorithm for CZCS type pigments. Validation of this algorithm was being done in collaboration with the Japanese oceanographic community and the Fisheries Agency of Japan, as well as international collaboration. Sea truth data had been provided by Australia, Canada, Indonesia, UK, and the US while OCTS calibration had been performed in collaboration with NASA (AVIRIS, MOBY), JRC (Venice Tower) and CNES (POLDER intercomparison). Approximately thirty match-up data sets had been provided for chlorophyll and optics, which yielded a good agreement for chlorophyll concentrations up to 2 mg m<sup>-3</sup>, but at higher concentrations the OCTS Version 3 algorithm was found to underestimate chlorophyll.

**(f) POLDER**

Dr. Lifermann was unable to attend the meeting but would submit a progress report on the French POLDER sensor at a later date.

**(g) OSMI**

Dr. Yoo presented a report on the development status of the Korean OSMI sensor, which was scheduled for launch in August 1999, despite severe setbacks in the Korean economy. A

three-month, post-launch early-operation period was envisaged, after which data would become available. Data would be processed up to Level 3 and all developmental processes were on schedule. Calibration/validation programs for OSMI included two bio-optical cruises in the Yellow Sea (1998, 2002) as well as CPR surveys using ferries across the Yellow Sea. In addition, there would be annual cruises to the East China Sea and co-operative programs with US Naval Programs in the East Sea and Sea of Japan. OSMI had 6 spectral bands with an in-orbit band selection capability. Eight standard bands would be calibrated before flight. Dr. Yoo requested advice from the IOCCG regarding the role of the OSMI sensor, which had been designed to obtain a global data set. The committee suggested that OSMI should complement the current and planned global sensors, and that the orbit times might have to be changed for better coverage. These recommendations could only be made after a report by the IOCCG subgroup on Complementarity of Ocean Colour Sensors (see Agenda Item number 18). The committee also agreed that it was of paramount importance that OSMI be characterized and calibrated pre-launch in the spectral bands used by SeaWiFS, MOS and OCTS, as well as other planned sensors, to ensure a high compatibility of ocean-colour data in the future. The Chairman resolved to write a letter of recommendation to the Korea Aerospace Research Institute.

**(h) OCI**

Dr. Yoder gave a brief overview of developments with the Taiwanese OCI sensor, which was scheduled for launch in 1999. The sensor had similar spectral bands to the OSMI sensor but had a low inclination equatorial orbit, designed specifically for equatorial waters. There had been no international announcements for calibration data and it was difficult to achieve international co-operation due to government restrictions in communication. However, Taiwan was a member of SCOR and the committee recommended that a Taiwanese representative be invited to attend the next IOCCG meeting.

**(i) OCM**

Dr. Navalgund of the Indian Space Research Organization was unable to attend the meeting but submitted some of the characteristics of the OCM sensor. Dr. Neumann summarized some of the features: the sensor had 8 spectral bands with a high spatial resolution of 350 m, a push-broom camera with on-board storage facilities capable of providing global data, with LAC and GAC modes. Data would be made available for scientific applications at copy cost. The OCM program had been approved by the Indian Government, funds were available and the IRS-P4 satellite was scheduled for launch at the end of 1998, with no expected delays.

## **6. Workshop on Minimal Requirements for Future Ocean Colour Sensors**

Prof. Morel reviewed the draft report from the workshop held in Villefranche on 2-3 October, 1997. The new generation of ocean colour instruments was highly sophisticated with an increasing number of spectral bands. The report aimed to define a minimum set of spectral bands recommended for all future instruments. This would ensure:

- easy intercomparison between sensors as well as inter-flight comparisons
- full compatibility of all operational algorithms,
- meaningful merging of data

- long-term continuity of ocean-colour observations, and
- the building up of a coherent data base for biogeochemical, physical and climatological studies and related modeling activities.

It was concluded that 6 to 7 channels would allow good observation of approximately 97% of the earth's ocean. Although it was not possible to reach an agreement on which channels to include, there was nevertheless a certain commonality between the channels adopted by various agencies. Prof. Morel also stressed that even though it was possible to reduce the number of channels, it was important NOT to reduce the radiometric accuracy.

Dr. Aiken suggested that a band be included at 510 nm to measure variability in carotenoid ratios, although Prof. Morel pointed out that these differences were only apparent in the absorption spectrum and not in reflectance ratios. The committee recommended that a section be included on the differences in absorption spectra and the reflectance signal. It was also recommended that a paragraph be inserted at the front of the report stating that the aim was not to establish an ideal sensor, but to recommend the minimum set of channels for continuity of data sets.

Publication of the report was discussed and the committee agreed that it should be published in a form that could be cited in the literature. It was decided that the IOCCG should apply for a World Library Catalogue Number and that the report should be published as part of an IOCCG Series.

## **(7) SIMBIOS Project**

Dr. Yoder gave a presentation of the NASA SIMBIOS project on behalf of Dr. McClain who was unable to attend. The objectives and activities of SIMBIOS were to ensure the development of internally-consistent research products from multiple satellite data sources, to develop methodologies for calibration of sensors, to promote co-operation between ocean colour projects, to develop methodologies for merging data from multiple ocean colour missions, to quantify the relative accuracy of the data products and to generate merged data products using data from multiple ocean colour missions. In summary, the goal was to achieve a long time series of ocean colour observations that were well calibrated. It was pointed out that SIMBIOS did not have the funding to merge data sets, but just to study the means. SIMBIOS had 19 validation sites around the world, using ocean colour data from multiple sensors.

Following the presentation there was much discussion among participants as to the potential overlap of SIMBIOS and the IOCCG. It was concluded that as SIMBIOS was only a national program, some type of international collaboration was also desirable. However, the IOCCG did not have the resources for such an endeavour. The role of the IOCCG would be to support the work of SIMBIOS and to encourage groups to work together and to supply data. It was suggested that agencies should be encouraged to analyze their chlorophyll data versus some common standard to facilitate a merger. A recommendation to this effect was drafted by Dr. Rast and is attached to these minutes (Annex II). Dr. Rast pointed out the need for a long time series of measurements from ocean colour sensors and the need to be able to relate measurements to

one another. He recommended that data providers supply top of the atmosphere radiances and chlorophyll concentration together with a statement on how these quantities were validated.

#### **(8) International Ocean Colour Cruise**

Dr. Kopelevich and Dr. Frouin presented a report on a proposed International Ocean Colour Cruise, which would aim to promote international cooperation in ocean colour studies. It would combine scientific research, training, field experience and distribution of educational material. An appropriate ship would be one of the vessels from the P.P. Shirshov Institute of Oceanology, which would cost around \$8 000 per day. The specific goals of the cruise would include a comprehensive validation of models and algorithms, vicarious calibration of satellite ocean colour sensors, intercalibration of spectroradiometers from different countries, collection of new data, training courses by leading specialists and promotion of applications of satellite ocean colour data. Financial support for such a cruise could be obtained from Space Agencies, Universities, Institutes, Science Programs and Industry, both in a general form or as support for individual participants. Dr. Frouin mentioned that several agencies had been contacted in this regard and there was some interest. The best time frame for such a cruise would be in the year 2000 and the cruise could be planned to consist of several legs, each 2-4 weeks in duration.

The committee endorsed the idea of the cruise, in principal, and saw many ways in which this initiative could support the aims and objectives of the IOCCG. However, there were some reservations about the standard of scientific measurements with such large numbers of people onboard a big ship as well as the problem of funding. The group encouraged Dr. Frouin to form a planning committee to further pursue the idea of an international ocean colour cruise.

#### **9. Establishment of a Quasi-Permanent Calibration Site**

Dr. Rast informed the committee of the latest developments of the IVOS (Infrared and Visible Optical Sensors) subgroup of the CEOS Working Group on Calibration and Validation (WGCV). It was recommended that all agencies use the same sites as bright and dark targets for vicarious calibration of ocean colour sensors. This initiative was being promoted by CEOS and it was agreed that the IOCCG should continue to support and encourage the work of CEOS and that Dr. Rast should keep the committee informed. Dr. Morel argued that it was not relevant to calibrate against these targets as ocean colour sensors should be calibrated against weak signals.

#### **10. Training Courses**

The Chairman brought the committee up to date with respect to a recent training course on Remote Sensing of the Ocean, held in Chile (10 - 22 November, 1997). The IOCCG was one of the co-sponsors of the course and invested approximately \$16 000. Drs. Platt and Kawamura from the IOCCG were invited as course instructors. From all accounts, the course was extremely successful and provided a great stimulus for ocean colour in that area of the world. The committee agreed that it was desirable to run another training course, either in Thailand or Africa. Dr. Schlittenhardt noted that the National Research Center for Thailand (NRCT) might

be prepared to help organize such a course, but that negotiations would have to be put on hold until after the remote sensing conference in February. Mr. Tanaka pointed out that NASDA was interested in the training course in Thailand and that NASDA would become a co-organizer with JRC/EC. Ms. Gross noted that there was at least one IGBP regional office in Bangkok which might help locally. Another suggestion was for the course to be held in East Africa or Senegal, but no firm decisions were made in this regard.

## **11. Liaison between CEOS and IOCCG**

The chairman briefed the committee on the latest activities of CEOS in relation to ocean colour issues. One of the recent initiatives of CEOS was the establishment of the Strategic Implementation Team (SIT) to examine the long-term applications of ocean colour data. The SIT was also instrumental in developing and executing the Integrated Global Observing Strategy (IGOS) using six demonstration projects that reflect and incorporate the principals of an IGOS. One of these projects was the Long-term Ocean Biology Measurements, which was handed over to the IOCCG to implement, since its aims were entirely met by the activities of the IOCCG. The outcome of these projects would be discussed at the SIT meeting in Paris (March, 1998).

The committee also considered the problem of data merging at a global scale. It was recognized that the IOCCG should take responsibility for ensuring a long-term data series and that there was some liaison with CEOS regarding this issue. The committee acknowledged that the IOCCG did not have the resources to produce a large, merged, data set but that it could implement a strategy to achieve this. The IOCCG could make recommendations to CEOS promoting the idea of data merging, which would help funding agencies allocate their funds. It was proposed that a small working group be formed to document recommendations to CEOS and to request funding from the Space Agencies. The committee decided to wait until after the March SIT meeting to see how to proceed on these issues.

## **12. Relations between IOCCG, SCOR and IOC**

The chairman brought the committee up to date with the latest developments regarding the administration of IOCCG funds. Due to the difficulties in accessing funds through the IOC, it was decided to approach SCOR to provide financial management for the IOCCG. This was approved in April 1997 and since then a good working relationship had been established with SCOR. The IOCCG has also officially become an Affiliated Program of SCOR. Having obtained the approval from SCOR, the Chairman wrote to the Executive Secretary of the IOC requesting immediate transfer of the balance of the IOCCG trust funds from the IOC to SCOR. This was not done, so the Chairman wrote further letters to the Executive Secretary and Chairman of the IOC requesting a comprehensive accounting of the IOCCG funds. The financial statements subsequently provided by the IOC were vague and contradictory and only a small portion of the funds were transferred to SCOR. Donor agencies subsequently wrote letters to the IOC expressing their displeasure at the way the IOC handled the IOCCG trust funds, and requested a full accounting of the funds. The Chairman then asked the committee for their views on how to proceed with this matter. The committee collectively decided to write a letter to the IOC



confirming their confidence in the chairman and formulating a protest against the past events. This letter was drafted, signed by the members, and mailed to the Chairman, IOC.

### **13. Remote Sensing Activities in the Benguela Region**

Dr. Shillington described the activities of the BENEFIT (Benguela Environment Fisheries Interaction and Training) co-operative program in the Benguela current ecosystem, involving Angola, Namibia and South Africa. Remote sensing of the region (SST and ocean colour) was an important tool for monitoring the system and for improving the understanding of interactions between the southern and northern Benguela. The CSIR Satellite Applications Center had been receiving and archiving LAC data from SeaWiFS, and regional institutes were involved in the processing and scientific interpretation of the data. Several cruises were also planned to study the physical and chemical oceanographic features of the region and to develop and validate local ocean colour algorithms. Dr. Tanaka mentioned that NASDA would be able to provide OCTS data for the region. Proposals had also been submitted to take part in the AMT-6 cruise.

### **14. The Atlantic Meridional Transect**

Dr. Aiken gave a brief presentation of the results of the latest AMT-5 cruise. Several different variables were measured, including daily optical data using a Satlantic Free-Falls Probe as well as photosynthetic pigments. Chlorophyll retrieval using the SeaWiFS algorithm was tested daily against *in situ* measurements. So far, twelve match-up data sets of AMT and SeaWiFS data had been produced. A good agreement had been obtained between AMT water leaving radiances and SeaWiFS data, as well as with the chlorophyll data. The focus of subsequent cruises would be on upwelling systems with higher chlorophyll levels: Benguela, Mauritania and NW Spain.

### **15. Calibration of Ocean Colour Sensors to Common Standards**

Dr. Neumann reported that some effort had been made by NASA (SIMBIOS/SIRREX) and at the inter-agency level (e.g. DLR/JRC) to calibrate ocean colour sensors to common standards, although there was no real concerted effort at an international level. He noted that in-orbit sun calibration data was available from current sensors. The committee agreed that the IOCCG should take an initiative to form a working group to evaluate these data and to promote intercalibration experiments in 1998. Dr. Neumann agreed to convene a workshop to discuss these issues, either at the MOS-workshop in Berlin, the CEOS WGCV meeting in Ispra (March) or at the CEOS/IVOS meeting in Tokyo (July).

### **16. Validation of Ocean Colour Sensors to Common Standards**

(a) *Validation of Retrieved Signal.* Prof. Morel advised the committee that calibration of algorithms for atmospheric correction (*i.e.* validation of retrieved signal) was a long-term issue and that it was rather premature to take precise action now. Within a year or so, comparisons of radiances could be made with data from OCTS, SeaWiFS and MODIS. The goal would be to adopt a scheme for atmospheric correction and ocean colour interpretation for identical sensors.

(b) *Validation of Final Products.*

Dr. Yoder suggested that in order to deal with validation of the final products, the committee should identify a standard validation data set that could be used to assess algorithm and sensor performances. The committee agreed that a common data base was essential for comparison of sensors and advocated that a small working group be established to examine this issue. Drs. Kawamura and Yoder resolved to convene a meeting before the next IOCCG committee meeting to establish such a data base, using the OCTS data set as a starting point.

## **17. European Calibration/Validation Programs**

Dr. Shlittenhardt gave a brief overview of the calibration/validation activities of the JRC/SAI. One of the main programs was the COLOURS project, which was run in collaboration with major European Institutes. The project aimed to collect a long-term time series of optical and biogeochemical measurements at three different test sites (Adriatic Sea, North Sea, English Channel) to support European coastal/shelf colour remote sensing applications. The specific objectives were to develop and validate algorithms for European coastal and shelf waters. Software was being developed and modified to merge data sets from various sensors. Dr. Shlittenhardt also mentioned the new CIP initiative (Catalogue of Interoperability Protocol) which was supported by CEOS and all member agencies. The main objectives of the CIP were to provide a tool for integrating different Earth Observation catalogue services and to provide a standardized framework for the design of Earth Observation user-information systems.

## **18. Need for Multiple Ocean Colour Sensors**

- (a) *Complementarity of Ocean Colour Sensors.* The Chairman informed the committee that, at the latest CEOS SIT meeting, it was perceived that there was a certain redundancy in ocean colour sensors. The committee recommended that this issue be addressed urgently and that a strong statement be prepared. The committee recognized that:
- (i) spatial and temporal continuity of ocean colour measurements were essential
  - (ii) it was necessary to protect against failure of a sensor, so some redundancy was required to ensure that there were no breaks in the ocean colour record
  - (iii) operational requirements of various sensors may not be compatible, and that
  - (iv) not all sensors were equivalent - the objectives and capabilities of the various instruments were different and they were designed for different applications.

It was also necessary to distinguish between research sensors (such as CZCS) and those in routine operation and it was recognized that many National Space Agencies wanted to expand their technology, which should be respected. In addition, satellites were not always launched on schedule. It was suggested that the group focus on the operational requirements: there should be at least 2 to 3 sensors in orbit at one time to ensure full coverage (taking into account problems with sun glint etc.) and that the orbit characteristics be examined (equatorial crossing times etc.) to ensure that satellites complement each other. If there was indeed redundancy, the IOCCG should recommend that the orbits be changed. It was also important to examine the set of spectral bands. A small working group, consisting of Drs. Platt, Yoder, Tanaka and Parslow, to be chaired by Mr. Tanaka, was formed to document these recommendations and to make proposals to the various agencies.

(b) *Merged data products*. Dr. Rast mentioned that SIMBIOS was investigating how to merge data at a national level, but that there was still the need to produce merged data sets at an international level. The committee acknowledged that it was necessary to have a concrete plan for merging data sets, but it was difficult to know how to proceed. It was suggested that data merging could be presented as a pilot project for GODAE, although ocean colour applications would start only in 2002. It was also pointed out that it would only be feasible to merge data sets after the completion of the SIMBIOS project. In the meantime the IOCCG should encourage collaboration between various agencies and perhaps recommend the establishment of a group for merging data sets. This item would be addressed on the next agenda.

## **19. Educational Materials concerning Ocean Colour**

The committee was asked whether there was a need for the IOCCG to take the initiative for the preparation of educational materials on a CR-ROM, aimed at expanding the user base for ocean colour data. The committee recommended that this item be suspended for the time being, considering the large workload of the IOCCG. It was also pointed out that the IOCCG information kit would cover part of this initiative, through inserts in the kit-folder. Dr. Neumann mentioned that CEOS and CNES had produced an educational CD-ROM on Remote Sensing and Applications which would be useful for educational purposes.

## **20. Membership Policy**

The Executive Director of SCOR circulated a draft copy of the IOCCG Membership Policy for approval. Members generally accepted all of the clauses with a few minor revisions. The draft policy was taken as the basis for a final membership policy, and is attached to these minutes (Annex III).

## **21. Work Plan for 1998**

The Chairman circulated a draft copy of the proposed work plan for 1998. All the proposed items were accepted by the committee, including the addition of the following workshops/subgroups which were an outcome of the committee meeting:

- (i) *In-orbit calibration of sensors* - Dr. Neumann
- (ii) *Complementarity of Ocean Colour Sensors*. An analysis of the characteristics of various ocean colour sensors planned or launched and requirements of world-wide operational ocean colour systems - Drs. Platt, Yoder, Tanaka, Parslow
- (iii) *Data set for Calibration*. To be used for comparison of various ocean colour missions (based on the work done by OCTS) - Drs. Kawamura and Yoder
- (iv) *International Ocean Colour Cruise* - Drs. Frouin and Kopelevich
- (v) *Data Merger* - on hold
- (vi) *Case 2 Algorithms* - Dr. Campbell

## 22. Other Business

- (a) *OCTS Data Distribution Policy*. Dr. Kawamura informed the committee that Intensive Local Area Coverage (I-LAC) data (700 m resolution) of daily OCTS chl-*a* and SST was now available from the NASDA/EORC homepage. This high resolution data was able to capture the fine features of oceanography in the coastal regions of the world. The I-LAC project was carried out in cooperation with I-LAC partners (NASA, NOAA, ESA and JRC). OCTS images of the US waters had been distributed by NASA through the internet but the distribution of data outside of the I-LAC regions was still being addressed.
- (b) Dr. Parslow briefly mentioned the formation of the Australian Ocean Colour Working Group (AOCWG) which was formed to improve national communication, coordination and representation of scientists working in ocean colour. A homepage for this group would be set up shortly on the CSIRO Earth Observation Center website.
- (c) *Case 2 Algorithms for Atmospheric Correction*. Dr. Campbell mentioned that NASA had funding to convene a workshop on algorithms for Case 2 waters for the MODIS sensor. It was suggested that this workshop be made international by including the MOS sensor. Dr. Aiken mentioned that PML were also working on atmospheric correction for Case 2 waters, for all three current sensors, and that they would have a scientific assessment in a few months time. Dr. Campbell was tasked to get information from Dr. Neumann and to bring a report of the workshop to the next IOCCG meeting.

## 23. Time and Place of the Next Meeting and Closure

It was suggested that the next meeting be held in conjunction with the Ocean Optics XIV meeting in Hawaii (November, 1998), barring any conflicts with other ocean colour related meetings. An announcement would be made in due course.

## 24. Closure

The Chairman thanked participants for an enjoyable and productive meeting. The fruitful discussions and constructive business was an indication of the need for a co-ordinating group and it was important to ensure that funding was continued. The Chairman also expressed his thanks to SCOR for their help and support in the evolution of the IOCCG: Prof. Field, the President of SCOR and Elizabeth Gross, the Executive Director of SCOR. In addition, he thanked Dr. Shillington and his group for making the meeting possible. There being no further business, the meeting was adjourned.

**Third IOCCG Committee Meeting - Cape Town  
Participants List**

**Committee Members**

AIKEN, James	- Plymouth Marine Laboratory, United Kingdom
CAMPBELL, Janet	- NASA HQ, Washington, USA
FROUIN, Robert	- Scripps Institution of Oceanography, USA
KAWAMURA, Hiroshi	- Center for Atmospheric and Oceanic Studies, Japan
KOPELEVICH, Oleg	- Russian Academy of Sciences, Russia
MOREL, André	- Laboratoire de Physique et Chimie Marines, France
NEUMANN, Andreas	- German Aerospace Center, Germany
PARSLOW, John	- CSIRO Division of Fisheries, Tasmania, Australia
PLATT, Trevor	- Bedford Institute of Oceanography, Nova Scotia, Canada
RAST, Michael	- ESA/ESTEC, Netherlands
SCHLITTENHARDT, Peter	- Joint Research Center, Ispra, Italy
SHILINGTON, Frank	- Department of Oceanography, University of Cape Town
TANAKA, Tasuku	- EORC/NASDA, Tokyo, Japan
YODER, James	- University of Rhode Island, USA
YOO, Sinjae	- Korea Ocean Research and Development Institute

**Absent**

LIFERMANN, Anne	- CNES, France
McCLAIN, Charles	- NASA/GSFC, USA
NAVALGUND, Rangnath	- Indian Space Research Organization, India

**Other Participants**

BARLOW, Ray	- Sea Fisheries Research Institute, Cape Town
BERNARD, Stuart	- Department of Oceanography, University of Cape Town
CARTER, Robin	- ENVIRONTEK/CSIR, Stellenbosch
FIELD, John	- President, SCOR
GROSS, Elizabeth	- Executive Director, SCOR
MANTEL, Jon	- Sea Fisheries Research Institute, Cape Town
PROBYN, Trevor	- Sea Fisheries Research Institute, Cape Town
STUART, Venetia	- Project Scientist, IOCCG
WALDRON, Howard	- Department of Oceanography, University of Cape Town
WEEKS, Scarla	- Department of Oceanography, University of Cape Town

## International Co-operation

- In the time frame 2000 - 2001, several complementary ocean colour observing systems from different international providers will be in space
- Minimum requirements for future operational, regional and global ocean colour observing systems are being developed
- There is strong need in the science/ user community for global and multi-temporal ocean colour data on a long term basis for establishing environmental parameters such as global productivity,

The IOCCG considers it as a high priority to enable the user community to relate the measurements that are been made and will be made by present and future sensors.

**The IOCCG therefore recommends that all ocean colour satellite data providers allow access to the following quantities associated with the ocean colour data provided by their systems:**

- Top of atmosphere radiance as seen by the sensor in  $W m^{-2} sr^{-1} nm^{-1}$  including the absolute error in %
- The way the validation of the above quantity has been performed
- The Chlorophyll-*a* concentration as derived by the system specific algorithm in  $mg m^{-3}$  and the absolute error in % associated with the above value as verified/validated *in situ*
- The way the validation of the above quantity has been performed
- The calibration parameters for sensor system and data products as specified by CEOS

**The IOCCG supports the objectives of SIMBIOS and encourages the development of other national programs and international collaboration to further SIMBIOS goals.**

**The provision and exchange of both radiance data and Chlorophyll concentration data for the establishment of regional, global and multi-temporal products is strongly encouraged by the IOCCG.**

## IOCCG Membership Policy

February 4, 1998

- 1) The International Ocean Colour Coordinating Group will consist of about twenty members of two types:
  - Scientific Members, appointed in their personal capacities, who fill the needs of the IOCCG for specific expertise
  - Members representing various agencies and other appropriate organizations which have interests in the topic of ocean colour remote sensing and in providing support for the activities of the IOCCG.
- 2) There should not normally be more than two Representative Members from each agency.
- 3) The Scientific Members will serve three year terms of membership and, with a specific scientific justification, may be invited to serve a second term.
- 4) To initiate the desired rotation of the Scientific Members, the current IOCCG members will be invited to serve second terms of varying length, beginning on January 1, 1999
- 5) The Chair of the IOCCG will be appointed from among the members of the Group, for a period of three years, and may be reappointed for a further term as Chair. The Past-Chair will provide continuity by serving as a member of the Group for an additional three years.
- 6) The IOCCG committee will meet at least once a year, and the Executive (see item number 7) will normally meet once between these IOCCG committee meetings.
- 7) An Executive Committee, consisting of not more than 6 members, will be established to assist the Chair in the management of the Group's activities between its full sessions, and to ensure accountability for the use of the funds.
- 8) The costs of travel to meetings of the IOCCG and its related activities will normally be paid from its budget only for the Scientific Members of the group and for participants invited to attend a meeting for specific reasons.
- 9) IOCCG membership should be reviewed annually by SCOR.

Work Plan for 1998

- 1) IOCCG-sponsored publications in *backscatter* magazine: four issues per year (approx. \$3,000 US per issue)
- 2) CEOS Newsletters (2 issues per year)
- 3) Maintaining and updating IOCCG homepage
- 4) Preparing and printing a kit-folder for the IOCCG: members to provide text, images (various aspects of ocean colour research, instruments, people)
- 5) Drs. Platt and Yoder will make presentations on behalf of the IOCCG at the “International Conference on Satellites, Oceanography and Society (ICSOS),” August 17-21, 1998, Lisbon, Portugal.
- 6) The IOCCG will continue its involvement with CEOS and the Integrated Global Observing Strategy (IGOS) through its participation in the pilot project “Long-term Ocean Biology Measurements”. One or two members from the IOCCG committee should attend the relevant CEOS meetings, as requested.
- 7) IOCCG-sponsored Ocean Colour Training Course in South East Asia or East Africa: no firm commitment on this issue.
- 8) One IOCCG Committee meeting (Hawaii, November, 1998) and two meetings of the Executive.
- 9) Proposed workshops arising from the Cape Town meeting:
  - (i) In-orbit calibration - Dr. Neumann
  - (ii) Complementarity of ocean colour sensors. An analysis of the characteristics of various ocean colour sensors planned or launched and requirements of world-wide operational ocean colour systems - Drs. Platt, Yoder, Tanaka, Parslow
  - (iii) Establishment of a data set for calibration of various ocean colour sensors, based on work done by OCTS - Drs. Kawamura and Yoder
  - (iv) International Ocean Colour Cruise - Drs. Frouin and Kopelevich
  - (v) Workshop on algorithms for case 2 waters - Dr. Campbell
- 10) Publication of report from Prof. Morel’s workshop.
- 11) Publication of a report from the subgroup investigating “Complementarity of Ocean Colour Sensors”