Eleventh IOCCG Committee Meeting

11-13 January 2006,
Busan, South Korea

Click on image for larger view

MINUTES

1. OPENING

1.1 Welcoming Address

The Chairman, Dr. Trevor Platt opened the 11th IOCCG Committee meeting, which was held at Hotel Royal Kingdom, Busan, South Korea and was hosted by the Korean Ocean Research and Development Institute (KORDI). The meeting was attended by a total of 29 Committee members and invited guests (see Appendix I for list of participants). Dr. Platt warmly welcomed the participants and thanked everyone for taking the trouble to travel such a long way. Dr. Yu-Hwan Ahn gave a welcoming address on behalf of KORDI. He noted that it was a privilege to host the 11th IOCCG meeting in South Korea and that it was a pleasure to welcome all the IOCCG members and invited participants to Busan. He hoped that the meeting would provide an excellent opportunity for all parties to come together to share ideas and discuss issues facing governments and communities. He also hoped that the participants would be able to appreciate the uniqueness and richness of the Korean tradition.

1.2 Hand over of IOCCG Chair

Trevor Platt noted that the IOCCG Committee was now 10 years old. During this period, the group had gained international respect for its series of technical monographs and for its training courses and fellowships. In addition, it was recognised as a source of information in the field of ocean colour in general. Dr. Platt pointed out that a number of early supporters of the IOCCG Committee were present in the room, namely Robert Frouin (NASA Programme Manager at the time), Tasuku Tanaka (NASDA/JAXA representative) and André Morel (scientific expert). They had all been very supportive and helpful in the evolution of the IOCCG. Another key player was Venetia Stuart who had helped to give to secretariat the right kind of voice and presence. Dr. Platt noted that after a 10-year growing period, it was time for a new Chairman and it was fortunate that Prof. James

Yoder had agreed to do the job. He was familiar with ocean-colour science, as well as the space agencies and user community, and had a lot of international expertise, and was also well respected and well liked. It was with confidence that Dr. Platt passed over his responsibility to Prof. Yoder, and requested that the Committee give him their best support.

Prof. Yoder noted that when there is a change in chair person, one thinks of legacy of that person leaving behind. In the case of Dr. Platt, it was the entire organisation. In particular, Trevor was very proud of the capacity building efforts, as well as the monographs that came out of the IOCCG. Prof. Yoder remarked that he was pleased to take over the chair of the IOCCG, as well as the great legacy that Dr. Platt had established, and was sad to see Dr. Platt leave. He noted that the Project Office would stay in Canada, as it worked well and would be very expensive to relocate.

1.3 Adoption of Agenda

Prof. Yoder agreed to try and fit in several additional agenda items: a report on the Antares programme (Lutz), an ocean-colour DVD (Doerffer) and information on a training course in India (Lynch). The amended agenda for the meeting was then adopted.

1.4 Adoption of the minutes of the 10th Committee meeting

The final version of the minutes of the 10th Committee meeting was adopted as recorded.

1.5 Status of action items arising from the 10th Committee meeting

The Chairman summarised the status if the 10th Committee meeting action items, most of which had either been completed, or were no longer applicable.
Action item 10/1 - the survey regarding purchase of SeaWiFS data had been successfully completed.
Action item 10/2 - the letter had not been sent to Orbimage because SeaWiFS data was still available.
Action item 10/3 - the survey of a new name for ocean colour had been completed, although the issue of a new name had not been completely resolved. There was considerable debate about the wisdom of using any term except ocean colour, although more than half the respondents were ready to agree to a new name. There was a great deal of justification to change the name to something more scientific. VSR (Visible Spectral Radiometry) was good alternative, although there was no consensus. The Chairman suggested that participants discuss the name amongst themselves as a consensus would never be achieved. Another proposal was SRW (Spectral Radiometry of Water).
Action item 10/4 - the modifications of Korean GOCI sensor had been discussed via email.
Action item 10/5 - The letter had not been sent to NASA, but Dr. Yoder would discuss this further under Agenda item 8.1 (Liaison with CEOS and GEO) as there was a more appropriate recipient.
Action item 10/6 - Peter Regner informed the Committee that the objectives of the proposed Chlorophyll workshop were not in line with the objectives of the GlobCOLOUR Project, so it would not be possible to host the workshop within the context of the GlobCOLOUR Project.

2.0 STATUS OF IOCCG WORKING GROUPS

2.1 Calibration of Ocean-Colour Sensors

Robert Frouin informed the Committee that significant progress had been made last year following the calibration workshop in Fremantle (Oct 2004). Writing assignments had been allocated for the three main chapters. Chapter 1, on definitions and requirements, had been completed, and included an introduction to calibration. Chapter 3, on calibration using natural earth targets (written by Bertrand Fougnie) was almost finished. This chapter was quite technical as each method was described in detail, with some examples. Chapter 2, on calibration using on-board devices (written by Ed Zalewski), would be received soon, so there was some momentum. Dr. Frouin hoped to get the report finished this year. In response to a query from Roland Doerffer

whether the report would include an overview of the calibration methods employed by different sensors, Dr. Frouin responded that this would be considered. He noted that the report would also contain some recommendations about the best way to calibrate sensors and the pros and cons of each method. Dr. Antoine recommended including a table of techniques being used by each agency. Paula. Bontempi noted that NASA had set up a group to investigate calibration issues.

2.2 Global Ecological Provinces

Nicolas Hoepffner gave a brief update on this working group on behalf of the co-chair, Mark Dowell, who was unable to attend the meeting. The terms of reference for the group were reviewed and the preferred new title of the report announced, namely "Using Ocean Colour to Elucidate the Functional Structure of Marine Ecosystems". Since the fall meeting in 2004, the group had revised the contributions for various chapters, given a presentation at the ASLO summer meeting (June 2005), held a small working group meeting during the ocean-colour course in October 2005 and edited the report. The draft report was almost complete: four chapters were finished, three required some editing while the last chapter (Recommendations and Conclusions) still needed to be written. The first three chapters were based on theoretical partitioning, while the others were devoted to applications. Several applications were considered: retrieval of phytoplankton biomass and primary productivity, biogeochemistry and climate modelling, and marine resources and biodiversity.

Regarding the timeline for the report, Mark Dowell and Trevor Platt would be chairing a special session on "Ecological and Biogeochemical Provinces of the Ocean" at the Ocean Sciences 2006 meeting. A discussion on the draft report would take place at this meeting. A final draft of the report would be submitted to the Executive Committee by June 2006, and the revised report should be ready for publication by September 2006. The report would end with a number of recommendations to space agencies and the scientific community e.g. a commitment to a sustained long term time-series of ocean-colour data, and a requirement for continued investment in developing ocean-colour data merging methods. There was some interest in continuing the discussions on ecological provinces after completion of the report. One possibility was to obtain endorsement though the IMBER Research Project. The Chairman inquired whether there was a linkage between the activities of this group and those planning global ocean observing systems. Perhaps the working group could provide information to help set priorities for long-term measurements. These could be included in the recommendations at end of the report.

2.3 Operational Ocean Colour: "Why Ocean Colour?" report

Dr. Yoder briefed the Committee on the activities of the operational working group, on behalf of the chair, Christopher Brown, who was unable to attend. The goals of the working group were reviewed, and it was noted that the focus of the group was currently on writing the IOCCG report. Two successful workshops had been held in the past 6 months: one at the University of Rhode Island from 20-22 September 2005, and the other at JRC, Ispra from 8-10 November 2005. The host institutes (URI and JRC) were thanked for their considerable help making these workshops a success. The group had initiated the compilation of acquired material, as well as preliminary editing. They were still waiting for input for some sections, particularly the Physical chapter. The group hoped to have the final draft of the report ready by June 2006, to be sent out for comment.

Paula Bontempi queried whether the report would cover research-based material as well as operational issues, and expressed her concern about the omission of "research" in the title. Trevor Platt explained that the idea of the report was to justify the societal benefit for the investment in ocean colour, and that the report would enumerate and explain what we could learn from ocean-colour science, whether these bear on research applications or on aspects of a more direct interest to society at large. Some issues fall in both categories, such as climate change. It was intended that the report would provide a balanced view of all these aspects, and deliver information that the scientific and administrative community could use to justify the spending of money on science and technology. Trevor Platt and Paula Bontempi were tasked to devise a new title for the report. Vivian Lutz suggested that the report also address the issue of a new name for ocean colour in the introduction, and this recommendation was accepted.

ACTION ITEM 11/1: TREVOR PLATT AND PAULA BONTEMPI TO DEVISE A NEW TITLE FOR THE "WHY OCEAN COLOUR?" REPORT.

2.4 Comparison of Atmospheric Correction Algorithms

Menghua Wang reviewed the main objectives of this working group, and informed the Committee that, due to unforeseen circumstances, the group was taking a long time complete the report. The group set out to test and compare the performance of four operational atmospheric correction algorithms (SeaWiFS/MODIS, POLDER, OCTS/GLI and MERIS). The following derived parameters were tested: normalized water-leaving reflectances in the visible wavebands; two-band ratio values of the derived normalized water-leaving reflectances (443/555 and 490/555); and the derived aerosol optical thickness at 865 nm. Different cases were examined, e.g. Case 1 waters with maritime aerosols or Case 2 waters dominated by yellow substances. The derived value of Lw(443)N was significantly underestimated for Case 1 waters, although the ratio Lw(443)N / Lw(555)N was reasonable for absorbing aerosols with Case-1 waters. An outline of the proposed IOCCG Report was also presented. Dr. Wang also gave a brief presentation on some of his own research which showed that MODIS SWIR bands (1240 and 2130 nm) can be used for atmospheric correction for turbid waters.

André Morel suggested that some comments be added at the end of the report addressing the problems and successes of various atmospheric correction schemes used by various sensors, and the impact on the construction of Level 3 data. In response to a question from the Chairman about the timetable for the group, Dr. Wang indicated that he wanted to finish the report soon, although all the working group members were very busy. David Antoine expressed concern about the timing of the working group, since many of the tests were done with old versions of the algorithms, which were not necessarily consistent with what was being done today. The Chairman noted that the group was far away from making a draft report, and Nicolas Hoepffner pointed out that it might be out of date when it is was eventually published as things had evolved so rapidly. Prof. Morel proposed that a very short report be published by the IOCCG, in parallel with a paper in a scientific journal. There was considerable support among the members for a scientific paper in lieu of a report/monograph.

2.5 Ocean-Colour Algorithms

ZhongPing Lee briefed the Committee on the progress of the ocean-colour algorithm working group. The working group had completed its activities and a draft report entitled "Remote Sensing of Inherent Optical Properties: Fundamentals, Tests of Algorithms, and Applications" had been submitted to the IOCCG Committee for review. The report was comprised of three parts: the first part discussed the importance of Inherent Optical Properties (IOPs), provided information on the synthetic and in situ data sets used for algorithm testing, and discussed uncertainties in ocean-colour remote sensing products. Part 2 described nine different algorithms for retrieval of IOPs and reported on their performance when applied to the data sets. The overall performance of the various algorithms was compared in charts. The third part of the report contained examples of IOPs derived from ocean colour, and a summary chapter. The report concluded that IOPs were an important parameter that should be derived as a standard product for all ocean-colour missions. This would lead to better and higher quality results than traditional empirical algorithms.

Roland Doerffer pointed out that all the algorithms gave similar results for the total absorption and total backscattering coefficients, suggesting that they were very stable and robust properties. David Antoine noted that it was important to include a synthesis to highlight certain points, as a separate chapter. Shubha Sathyendranath had provided comments, indicating that it was important to include an error analysis in the report. The errors may arise from two sources: principally from poor assumptions in the optical models themselves, or poor tools to retrieve IOPs or biological variables. It was important to identify the sources of error to make further progress. She also noted that Chl was a poor mathematical notation for chlorophyll-a (rather use C, for chlorophyll or P, for pigments, throughout). Dr. Lee noted that each chapter contained a brief explanation about what contributed to the errors.

2.6 Co-ordination of Merged Data-Sets

Paula Bontempi gave a brief overview on the working group on coordination of merged data sets. A successful workshop had been convened by Watson Gregg and Dr. Bontempi in May 2005. A number of invited participants helped to define the requirements, methodology and possible approaches for merging coincident ocean-colour data from multiple sensors. The group had already drafted a report which had been submitted to the IOCCG Committee for review. The report reviewed the benefits of merging data from different sensors, outlined coincident global ocean-colour missions, provided a survey of methodologies in use as well as the requirements for merging. It also dealt with validation metrics, the products to be merged and provided a number of critical recommendations. A summary of the recommendations included the following: Level 3 data access should be granted on all missions in a standard format, IOCCG should provide links to international in situ data sets for validation (must be updated), common products should be merged (chlorophyll; Lwn, PAR, suspended sediments, CDOM), merged products should be consistently and objectively evaluated, a series of round-robin comparisons should be sponsored by IOCCG to compare methods, an IOCCG working group should be set up to examine data stability, merged data should be at the highest possible temporal frequency and spatial resolution, and merged data sets must have the sources defined.

André Morel expressed his surprise that report was oriented towards chlorophyll, bearing in mind that normalised water-leaving radiance was more important. He also proposed including a chapter on the differences between the products provided by the various agencies e.g. various agencies make different atmospheric corrections over turbid waters - what is the procedure when merging these products? Dr. Bontempi replied that the report would not be able to cover everything, and that the data would be used by the operational community, therefore chlorophyll was the main focus. David Antoine addressed the issue of data set stability and noted that reprocessing should nevertheless be encouraged to improve data quality. Menghua Wang commented that an international round robin would be very useful, but the Chair recommended waiting until after publication of the report to capture the recommendations and decide upon new activities.

2.7 Ocean-Colour Remote Sensing in the Coastal Zone

Ron Zaneveld updated the Committee on the activities of this working group on behalf of Curtiss Davis and Christopher Brown who were unable to attend. The goal of the group was to assess current sensors and define the optimal sensor, or suite of sensors, to characterize the coastal ocean for oceanographic and societal applications. The group had not made much progress over the past year, due to relocation of Dr. Davis and other problems. Dr. Brown had requested to stay on the working group but to step down as co-chair. For 2006, it was proposed to draw up an outline of the report and form an international committee (maximum 12 people) which would include experts on all key topics (sensor design, calibration, atmospheric correction, applications, products and product validation). It was also proposed to hold a workshop to create the first draft of the report, possibly in summer 2006. The report would build on IOCCG Report No. 3, and would assume that quality 1-km global ocean-colour data would continue to be available. A geostationary imager would also be included for higher temporal resolution, and a range of coastal ocean problems including bathymetry, wetlands, coastal morphology would be addressed. The IOCCG Committee reconfirmed their approval of the plan of action for the working group, and agreed to appoint Arnold Dekker (CSIRO) as new co-chair. Funding for workshop was also approved.

ACTION ITEM 11/2: CURTISS DAVIS AND ARNOLD DEKKER TO SUBMIT REFINED TERMS OF REFERENCE FOR THE WORKING GROUP TO THE IOCCG COMMITTEE FOR COMMENT, AND TO PROVIDE A LIST OF POTENTIAL WORKING GROUP MEMBERS.

Roland Doerffer pointed out that the working group should try to provide error estimates on a pixel by pixel basis, as it was important in coastal zones to indicate areas where errors could be expected. Ian Robinsons expressed concern about the scope of the working group, which was very wide ranging. He recommended that the working group should be composed of people who can deal with the real issues of Case 2 waters.

3.0 PROPOSALS FOR NEW IOCCG WORKING GROUPS

3.1 Ocean biogeochemistry - modelling and measurement

Mervyn Lynch introduced the issue of modelling and what stance the IOCCG should take on numerical models. Modelling can be used to understand the ocean environment as well as to forecast and predict. He raised a number of questions: how could we enhance our impact on monitoring and management of marine ecosystems, should the IOCCG take a more active role in promoting the incorporation of ocean-colour data in numerical models, and should we be running models based on ecosystems, provinces or global scale models, what do biogeochemical models assimilate and what fields will they output? There were also a number of issues with ecosystem modelling (what models are available and which are most appropriate) and large scale forecasting models (global modelling projects such as GODAE do not yet have a biogeochemical component). Options for IOCCG action include enhancing IOCCG expertise in modelling areas, form an IOCCG working group to recommend actions and the way forward, or co-sponsor a workshop on this topic.

Ian Robinson drew attention to the fact that in Europe the modellers and ocean colour scientists were starting to work together. The users require chlorophyll, but the modellers' requirements are not preconceived. The errors in chlorophyll are usually around 30% which modellers might think are too big to be assimilated. The Chairman noted that there was a lot of overlap with other groups e.g. carbon cycle or ecosystem groups and that this was a very broad area. The International Ocean Carbon Coordination Project (IOCCP) was interested in using ocean-colour data. He suggested that the Committee think about ways to focus this and what specific action IOCCG could take (e.g. who might be interested in cosponsoring a workshop).

ACTION ITEM 11/3: IOCCG TO CONTACT IMBER AND IOCCP TO SEE IF THEY ARE INTERESTED IN DATA MODELLING ISSUES.

Dr. Lynch also addressed a second topic: a proposal for a working group for the promotion of challenging research opportunities in ocean colour for young scientists planning higher degree studies. This could merely be a document on a website to stimulate interest in ocean colour for young scientists. He proposed that IOCCG could generate list of research areas or topics to be posted on IOCCG homepage. Trevor Platt pointed out that this could be potentially dangerous if a student took up a topic that did not lead anywhere, or if two students took up the same topic. The Chairman proposed that students could be informed of current topics at IOCCG-sponsored training courses.

3.2 Determination of Phytoplankton Functional Types (PFTs) from ocean-colour and their use in ocean biogeochemical modelling

David Antoine presented a proposal for a possible new IOCCG working group on the determination of Phytoplankton Functional Types (PFTs) from ocean-colour remote sensing. PFTs are conceptual groupings of several phytoplankton species, which have an ecological functionality in common e.g. nitrogen fixers (Trichodesmium) or calcifiers (coccolithophores). The groupings are not necessarily related to physiological characteristics, but are often based on functionality or characteristics and are often related to average size (pico-, nano- and microphytoplankton). PFTs are of interest to the biogeochemical community because they are relevant proxies of the ecosystem functioning. They can potentially be derived from ocean-colour remote sensing through direct effects (changes in absorption and backscattering coefficients of the cells) or indirect effects (changes in the reflectance spectra caused by changes in associated particles). A number of existing techniques to derive PFTs from ocean colour were reviewed included inversion of reflectance models, reflectance ratios as a function of chlorophyll concentration and the use of HPLC-determined empirical relationships between groups. Provisional terms of reference for the working group were presented. Cyril Moulin was proposed as a possible chair for the working group. Robert Frouin noted that the topic was still in a research phase and queried whether it was mature enough for a working group. Trevor Platt replied that it was a classical subject for an IOCCG working group notwithstanding the fact that it was a developing field. The Chairman noted that this was an important topic and recommended that the proposed chair be approached to submit refined terms of reference for the working group.

ACTION ITEM 11/4: JAMES YODER TO EMAIL CYRIL MOULIN TO REQUEST TERMS OF

REFERENCE FOR THE PFT WORKING GROUP, WHICH WOULD BE CIRCULATED TO COMMITTEE MEMBERS FOR COMMENT.

4.0 AGENCY REPORTS

4.1 NASA SeaWiFS and MODIS Missions

Paula Bontempi gave an update on the SeaWiFS and MODIS missions. Reprocessing of MODIS Aqua (1.1) and SeaWiFS (5.1) data had been completed this summer to ensure global data consistency. Developments in coastal ocean data processing included MODIS Aqua high resolution data processing for coastal ocean applications, SWIR-based atmospheric correction and cloud masking schemes, spectral optimization scheme implementation in coastal regions, improved coupled ocean-atmosphere RT model and utilization of Fluorescence Line Height (FLH) for chlorophyll-a estimation. The SeaBASS validation data set was now being coordinated by Giulietta Fargion. There was a new emphasis on IOPs since future algorithms would be based on absorption and scattering coefficients, as well as carbon parameters (calcite, primary production, particulate organic carbon etc.).

The evaluation products FLH and calcite were available for download from NASA's Ocean Color website, while MODIS PAR was nearly ready for implementation. A redesign study of the Marine Optical Buoy (MOBY) was underway and it was noted that routine deployments would end in March 2007. In addition, many new algorithms had been evaluated and implemented. There were systematic differences between the OC3M (MODIS) and OC4 (SeaWiFS) algorithms even when applied to the same data set. MODIS was generally slightly lower in oligotrophic waters.

Dr. Bontempi also briefly reviewed the latest IOCCG proposal for NASA support. The reviews were very complementary overall, especially concerning support and activities in developing countries. A number of suggestions were put forward:

- IOCCG should host a town hall meeting to review recent activities, solicit feedback from the community on emerging needs and priorities related to ocean colour observations, address needs for improved measurement capabilities, long-term time series and intersections with the emerging GEO process.
- Encourage member space agencies to develop coordinated action plans for: development of a constellation of satellites or sensors that address biogeochemistry of the ocean, financial support for science mission instruments like SeaWiFS used by the international community, an international calibration and validation effort (or at least support by the various governments for such an international and global effort), open sharing of non-US satellite data such as MERIS and others.
- The working groups play a key role, although there seemed to be a lot, some inactive for long periods, and many with US Chairs.
- IOCCG could help in developing a pathfinder for GEOSS.

4.2 NOAA/NASA, NPP and NPOESS missions

Paula Bontempi gave an update on the programme status of NPP and NPOESS. Schedule and cost problems had led to a reorganization of the NPOESS IPO as well as changes to the program schedule and management structure. The program content however, remained intact. Positive attention had been focused on VIIRS to assure that it meets its requirements. NPP would be moved to the afternoon orbit. NASA's role in NPP was to evaluate the algorithms used for environmental data records. The VIIRS sensor was scheduled for launch in April 2009, although the date could slip leading to concerns about the continuity of the ocean-colour data stream. At the present stage of EDU testing, VIIRS sensor observations were expected to be of heritage quality after on-orbit tuning and calibration. Continued monitoring and assessment of test data for ocean colour would be needed as schedules evolve and the programme progresses. NASA has built in unrestricted access to data during the testing phase.

In response to a question from the Chair about which agency would take responsibility for scientific and climate quality ocean-colour data, Dr. Bontempi replied that is was not NASA's responsibility (rather NOAA's) to provide climate data records for NPP or NPOESS.

Scheduled GOES HES-Coastal Water sensor

Ron Zaneveld provided information on the proposed new HES-CW sensor on a geostationary platform. He pointed out that VIIRS only had 5 channels in the visible part of the spectrum, which was not sufficient for many coastal applications. A geostationary satellite could provide better temporal sampling at a higher spatial resolution, with many extra channels. The specifications for HES-CW included more channels in the VIS, and also several channels in the IR. Separate east and west coast satellites would sample all of Hawaii and Continental U.S. coastal waters once every three hours during daylight hours, plus additional hourly sampling of selected areas. Several goal requirements compete with each other, e.g. higher spatial resolution competes with increased sampling frequency or SNR. The top priorities for HES-CW were higher frequency of sampling, goal channels for atmospheric correction, and hyperspectral instead of multispectral. More wavebands could lead to better measurements such as FLH, which would not be available from VIIRS. Additional channels on HES-CW would also aid in bloom detection for HABs.

The Coastal Ocean Applications and Science Team (COAST) was created in 2004 to support NOAA to develop coastal ocean applications for HES-CW. The group was led by Mark Abbott and Curtiss Davis was the Executive Director. Initial activities evaluated HES-CW requirements and suggested improvements. Risk reduction activities would focus on calibration and algorithm development; initially SeaWiFS and MODIS heritage calibration and algorithms would be used. Field experiments were proposed for FY 2006-2008 to develop the required data sets for HES-CW algorithm development and testing. GOES-R is the first of four weather satellite to replace the current GOES weather satellites, with a scheduled launch for 2012. The satellites would primarily meet weather requirements but there was a long list of second tier requirements which were planned, but could be cut for budget considerations. Ocean measurements are at the top of the second tier.

The Chairman pointed out that there was currently no approved plan for ocean colour in the US, which could lead to the loss of continuity altogether. However, with the emergence of GEOSS, the rising level of importance of global observations has had an impact on CEOS, which might provide enough momentum to ensure continuity.

4.3 ESA (European Union)

Update on the MERIS Mission

Peter Regner reported on the status of the MERIS mission, which had completed almost 4 years of operation with satisfactory mission performance. Envisat was expected to continue its operational activity until 2010. MERIS still showed excellent instrument performance with no significant degradation of any of the sensors. The exposure of the diffusers was in line with recommended calibration activities and degradation was limited to bands 560 nm and lower (only 0.7%)

All data products were generated by the Instrument Processing Facility (IPF). Reprocessing of data was required periodically as a result of improvements to the Level 1 or Level 2 product algorithms. The first data reprocessing was completed in July 2004 and after algorithm changes. The second reprocessing was initiated in 2005 and was almost finished. This would result in a coherent data set from mid-2002 to early 2006. There were some remaining problems e.g. partial negative reflectances over Case 2 waters, and overestimation of the surface reflectance in the blue and red. Only MERIS reduced resolution data were archived; full resolution data were processed upon request.

MERIS data were validated using match-up data from the Boussole site, which had a permanent marine optical buoy, specifically designed for the acquisition of radiometric quantities. An overestimation of MERIS reflectances was observed, which needs to be further addressed. Match-ups were also done with MOBY data.

Demonstration Level 3 products were produced in 2004, but at the end of 2005 new Level 3 products were available as a result of the second data reprocessing. Regular generation would continue in 2006. Other multi-mission Level 3 products would be generated within ESA Data User Element (DUE) projects.

On-line ordering of data could be done through the EOLI website (http://eoli.esa.int). There were three options for data delivery: CD/DVD-ROM, internet, or via satellite. Data were available via the internet 3 hr after acquisition in three different formats: 7 day rolling archive for L1 and L2 reduced resolution (RR) data, 7 day web file selector for L1 and L2 RR data covering selected geographic areas, or archived (reprocessed) L1 and L2 RR data through the MERCI interface. Applications for RR data could be done through a simple registration, but a project proposal was required to request full resolution data. A successful user workshop took place in September 2005 which led to a number of recommendations that are being implemented.

ESA Sentinels

Peter Regner also updated the Committee on the ESA Sentinels. He noted that the GMES project (Global Monitoring for Environment and Security) was a joint initiative of the European Commission and the European Space Agency and that GMES was also the European contribution to the Global Earth Observation System of Systems (GEOSS). The GMES multi-mission space segment consisted of a series of five new ESA/EU earth observing missions called "Sentinels". Considerations for the Sentinel-3 payload were an altimeter package, and an imaging sensor suite to address global operational oceanography and land surfaces. The imaging sensor suite would include a wide swath multi-spectral instrument for ocean colour and global land monitoring, for continuity of high quality observations of MERIS, as well as a thermal infrared instrument for SST and land temperature measurements. The GMES-1 space component programme would fill the most urgent data gaps and was scheduled to be launched in 2010/2011. GMES-1 satisfied Sentinel-1 and part of Sentinel-3 requirements. Candidate sensors included a MERIS-type ocean colour sensor. No priority had been assigned to candidate sensors on GMES-1, but the budget for GMES-1 has been approved. In response to a question from Ian Robinson about the need for an ocean-colour sensor on GMES-1, it was recommended that IOCCG should write to ESA to help set priorities. This would be further discussed the following day.

ESA's GlobColour Project

Dr. Regner also briefed the Committee on ESA's GlobCOLOUR Project. This was a demonstration project to merge data streams from MERIS, SeaWiFS, MODIS-Aqua, and Parasol-POLDER, and was driven by end-users (IOCCG and IOCCP). The expected output was a global ocean-colour (Level 3) data set covering 1997-2006, providing a range of daily, weekly and monthly products. The project was managed by ACRI with contributions from a number of different groups and people. There were a number of open issues that still needed to be resolved e.g. only MERIS has an official Case 2 algorithm and only MODIS and SeaWiFS are fully normalized. Pre-merger sensor characterisation was very important and would be carried out in two stages using published literature as well as in situ data (comparisons of radiances and derived products). Three different merging techniques would be considered: TOA radiance merging (the resulting L2 products would be fully compatible), normalised water leaving radiance merging based on bio-optical modelling (several biogeochemical products could be generated simultaneously) and merging of bio-optical properties i.e. retrieved pigments (most frequently used method). Merging algorithm trade-off analysis would be performed early in the project to decide upon the best

The GlobCOLOUR validation protocol would be based on SIMBIOS protocols. Diagnostic data sets would be selected from existing validation sites. GlobCOLOUR was a three year project, split into three phases: phase 1 included definition and prototyping, phase 2 would deal with production and validation (full data set available early 2007), while phase 3 would cover NRT demonstration. A GlobCOLOUR website was being designed with information on the project.

Eric Thouvenot attended the first GlobCOLOUR progress meeting where IOCCG's comments on the requirements baseline document were discussed. Three requirements required additional input from the IOCCG:

- RB-019.00 (Unified spectral grid?). The IOCCG recommended keeping all wavebands, but GlobCOLOUR would like to adopt a unified spectral grid (merging for 412, 443, 490, 510, 555-565 and 670 nm). André Morel pointed out that if the common wavelengths were taken, this would provide as much information as possible. However, it depended on what method of merging the project chose, and since this has not yet been decided, it was difficult to answer the question. If merger methodology was the bio-optical model approach, then all the wavelengths would be used, and the products would reflect this.
- RB-031.00 (need to agree on selection criteria for merging). IOCCG would provide GlobCOLOUR with a draft of Watson Gregg's merging report.
- RB-027.00 (evaluation of merging techniques) - were there any further recommendations from IOCCG for approaches to be tested?

ACTION ITEM 11/5: IOCCG TO SEND DRAFT COPY OF DATA MERGING REPORT TO GLOBCOLOUR PROJECT.

ACTION ITEM 11/6: PAULA BONTEMPI TO GET INPUT FROM WATSON GREGG ABOUT MERGING TECHNIQUES FOR GLOBCOLOUR PROJECT.

Paula Bontempi also noted that there had been no formal cooperative agreement between NASA and ESA for the various merging activities, but this was being addressed. Peter Regner informed the Committee that the 1st User Workshop would take place in Villefranche from 4-7 December 2006, to examine the data merging techniques being evaluated for a limited amount of data (4 months) and to discuss the selection of the algorithm to be implemented on the full data set.

ACTION ITEM 11/7: IOCCG TO SEND REPRESENTATIVES TO THE 1ST GLOBCOLOUR USER WORKSHOP.

4.4 ISRO/INCOIS (India)

Srinivasa Kumar gave an update on OCM on IRS-P4 (launched in 1999) and the scheduled OCM on IRS-P7. OCM produced L1 data for scenes of different sizes, as well as a number of standard L2 products. L3 products (weekly and monthly averages of four products) were being generated on a trial basis. OCM coverage around India was available for browsing on the National Remote Sensing Agency (NRSA) website, and L1 and L2 data could be acquired upon payment. The OCM instrument was functioning normally and data were being received at four ground stations in India, Germany, USA and North Korea. Oceansat-2, carrying a second OCM sensor, was scheduled for launch in early 2007. OCM-2 would have eight spectral bands between 400-900 nm similar to OCM-1. Bands 6 and 7 had been slightly re-tuned for better atmospheric correction, although Menghua Wang expressed some concern by the selection of the new bands.

The Indian National Centre for Information Services (INCOIS) was providing satellite-based fishery forecasts to help improve the economics of fishing operations in India. The programme started in 1985 using SST data from NOAA, but now the accuracy of the forecasts had been improved by incorporating ocean-colour data from OCM-1. A number of PFZ (Potential Fishing Zone) identification keys (e.g. eddies, rings, meanders, fronts) had been derived from four years of data. PFZ information was disseminated to the public in near-real time, and the programme had continuous validation and feedback from the users. The information was disseminated in 10 different languages either in text form, or via electronic digital display boards, or via satellite radio-broadcasting. More advanced users could analyse data online using web-GIS tools. Both pelagic and demersal fishing operations had provided positive feedback, with a 70-100% increase in catches.

4.5 KARI (South Korea)

Hyo-Suk Lim gave a brief presentation on the status of the OSMI mission and the Korean space development plan. According to the national long-term space development plan, a total of 21 satellites would be developed and launched by 2015. KOMPSAT-1, carrying the OSMI sensor, was launched in December 1999 and was in its 6th year of operation. OSMI is a 6-band ocean-colour sensor capable of mapping the global distribution of

chlorophyll. A cross-calibration study of OSMI was carried out in collaboration with NASA's SeaWiFS team. There were some striping problems caused by Rayleigh radiances, but good results were obtained after the cross-calibration study. The distribution of chlorophyll around the Korea Peninsula was mapped over several years. The sensor was still relatively stable except for the IR bands.

4.6 CNES (France)

Eric Thouvenot reported on ocean-colour related activities at CNES. These included contributions to MERIS, cal/val activities (Simbada and Boussoule), contributions to the MERCATOR operational center and to GMES, and the POLDER-1,2 and POLDER-3 (PARASOL) sensors. Five bio-optical parameters could be retrieved from the spectral marine reflectances of POLDER-2, including Chl estimated by a SeaWiFS-like algorithm and Chl estimated with a customized POLDER algorithm. The PARASOL sensor forms part of the Aqua-train (afternoon) satellite constellation. It is a micro-satellite based on a CNES Myriade platform and was launched in December 2004. It was not initially designed for ocean colour use, but a decision was taken by CNES to use it for ocean colour after the loss of ADEOS-II. Compared to POLDER, the 443P (polarised) channel had been removed on PARASOL and the 490P and 1020 nm channels added. The sensor was working well but the ground segment was not yet operational. Global Chl distributions from POLDER-2 and POLDER-3 were quite comparable. POLDER-3 data were noisier than MODIS Aqua, but otherwise the two sensors were comparable. Cal/val activities were still required, and access to in situ data was welcomed. Data had been archived since March 2005. A web server would be available as soon as data quality was optimised. CNES was currently undertaking a study for a 'GMES-minimal' instrument compatible with an enhanced (long lifetime) micro-satellite platform. The implementation of this mission would depend on effective needs at time of GMES i.e. the existence of GMES-dedicated satellites (GMES-1 or SENTINEL-3) and the availability of third party ocean colour data for GMES.

4.7 JAXA (Japan)

Tasuku Tanaka informed the Committee that he was now a Professor at Yamaguchi University, and was no longer representing JAXA. He noted that JAXA had several launch failures, but was taking new initiatives in S-GLI. He gave a brief presentation on some of his own research dealing with the tilting mechanism of GLI to avoid sun-glint around (+/- 20o). Due to the two observing directions (nadir-viewing and tilting) there was a slight overlap in the data sets. With two unknowns (aerosol optical thickness and reflectance of water at 443 nm) it was possible to solve for Chl concentration.

Joji Ishizaka then briefed the Committee on the status of the S-GLI sensor (the second GLI sensor). The sensor would be carried onboard the Global Climate Observation Mission-C (GCOM-C) satellite, which was scheduled for launch in 2011. The GCOM mission would contribute to long-term global earth observations for improving climate change prediction. S-GLI would continue most of the GLI observations (sea surface temperature, ocean colour, aerosols, cloud, vegetation, snow/ ice). The new S-GLI sensor features 11 visible channels with 250 m resolution in coastal areas, and two polarization/multi-direction channels to improve land and coastal monitoring and retrieval of land aerosols. The targets of S-GLI were coastal area monitoring and understanding of coastal area processes. The satellite was currently in Phase B and would be reviewed this year to decide if the research should be continued. The instrument was in a more advanced stage (Phase C). In response to a question from the Chair about the action the Committee could take to favour continuation of the mission, and also open the channels of communication between IOCCG and JAXA, Dr. Ishizaka replied that he would keep the Committee informed.

4.8 CSA (Canada)

Martin Bergeron gave a brief presentation on the specifications of the HERO (Hyperspectral and Environment and Resource Observer) mission - an operational Earth observation satellite that would enhance resource industry productivity and improve environmental stewardship in Canada and globally. The instrument was a visible spectral radiometer capable of observing coastal areas, lakes and estuaries although the area coverage was not optimal for mapping large dynamic coastal waters (mainly designed for land applications such as

mapping of forests, monitoring of mine tailings etc.). HERO was designed as a low weight, low cost mission with an orbit period of 16 days, a signal-to-noise ratio of 600:1 at 650 nm and good spectral coverage with more than 200 spectral bands. The mission could provide 'medium resolution' products from water colour, as well as a greatly increased, hyperspectral resolution diagnostic capability. It could lead to better mapping and monitoring of wetlands, better freshwater management, and support to coastal productivity assessment. The mission was not yet approved, but it would be launched in 2010 if approved.

4.9 CNSA (China)

Prof. Pan Delu gave a presentation on water quality monitoring in China using ocean-colour data. The Yangtze triangle was a key area of Chinese economic development, and the sustainable development of this area was hindered by deterioration of the environment through eutrophication, pollution, red tides etc. Traditionally, water quality was measured by collecting in situ data from research cruises. Satellite data could vastly improve the temporal and spatial resolution of the data. Multi-satellite data were received and archived in China to study water quality (MODIS, AVHRR, FY-1). A new Chinese satellite, HY-1B, would be launched in November this year, carrying the COCTS and CZI sensors, similar to the sensors on HY-1A. COCTS would have 10 wavebands with a spatial resolution of 1.1 km, while CZI would have 4 wavebands with a spatial resolution of 250 m. The first major research plan for the next three years was for bio-optical measurements in the coastal zone to validate ocean-colour algorithms for HY-1B. The other major research area was ocean-colour applications as related to the carbon cycle of the China Sea.

5.0 OTHER OCEAN-COLOUR REMOTE SENSING ACTIVITIES

5.1 The status of GOCI on COMS

Yu-Hwan Ahn informed the Committee about the status of the proposed Geostationary Ocean Colour Imager (GOCI) to be launched in 2008, on board the COMS-1 satellite. A second GOCI was also scheduled for launch in 2014 onboard COMS-2. The scope of the GOCI mission would include detecting, monitoring and predicting short-term biological phenomena such as HABs, studies on biogeochemical variables, monitoring health of the marine ecosystem, coastal zone and resource management and providing information for fishing communities. GOCI would have 6 visible and 2 NIR channels, a 500 m spatial resolution, and band triplets for the measurement of sun-induced chlorophyll-a fluorescence (FLH), although the triplet was a little different from other sensors (660-680-745 nm). The nominal instrument Field-of-View was centered over Korean Seas. A GOCI Data Processing System (GDPS) would be developed over the next few years by the Korean Ocean Satellite Center, which had been established within KORDI. Several new techniques were being developed to analyse the satellite data e.g. a red-tide index, and a fishing ground, which would use physiological characteristics of fish plus SST data from NOAA and phytoplankton information from GOCI.

5.2 Service of fishing ground information using ocean-colour and other satellites

Sang-Woo Kim of the National Fisheries Research & Development Institute (NFRDI) gave a presentation on the role of ocean-colour satellites to determine fishing ground information in South Korea. Since 1992, the Marine Remote Sensing Laboratory (MRSL) at NFRDI had been archiving satellite data from a number of different sensors (AVHRR, GOES-9, SeaWiFS, MODIS Terra/Aqua and OCM) to obtain basic information for the determination of fishing grounds and conservation of the marine environment. Satellite information was distributed through the NFRDI website on a daily basis. Many different oceanographic features around the Korean Peninsula could be derived from satellite data, such as recurring eddies, abnormal cold water plumes etc. A regional algorithm had been developed for chlorophyll-a and suspended solids in the Case 2 waters of the southern and western parts of Korean peninsula. Future plans included further calibration and validation of satellite ocean-colour data and monitoring abnormal conditions, such as typhoons. In addition, the relationships between spatio-temporal distribution of red tides and the meso-scale variation in oceanographic parameters would be investigated.

5.3 New developments for ocean-colour remote sensing in South Africa

Ray Barlow informed the Committee about plans for establishing a remote sensing unit in Southern Africa. The BENEFIT and BCLME programmes were investigating the Benguela ecosystem on the west coast of South Africa while the CEP and ACLME programmes studied the Agulhas ecosystem on the east coast. Remote sensing activities in Southern Africa were rather disparate (Namibia, Cape Town, east coast) so it was decided to form one unit to serve the whole region. A workshop was held last year to discuss remote sensing requirements for the region and to chart the way forward. It was decided that a Marine Remotes Sensing Unit (MRSU) should be established for the southern African region to manage the marine sensor portfolio for the region, including acquisition of remote sensing data and training of students and scientists. The proposed management structure and physical infrastructure for the proposed unit was outlined.

The group had archived SeaWiFS data for 1994-2004 as well as near-real time SST and ocean-colour data from MODIS, and SST from AVHRR. It was hoped to establish an operational system through the development of a data distribution webpage for MODIS data. Another webpage had been established for HABs, which included MERIS imagery as well as data from an optical buoy in Lamberts Bay. In response to a question from Trevor Platt about the GOOS Chlorophyll Pilot Project for the region, Dr. Barlow noted that the MRSU was not related to the pilot project, but it could be incorporated if the unit was expanded.

5.4 Ocean colour monitoring in the East China Sea

Ichio Asanuma gave a short presentation on the use of ocean-colour remote sensing to monitor the East China Sea, which is subjected to large variations in environmental conditions due to river discharge and the building of dams (increased nutrients, decreased sediment flux). A number of programmes were currently using ocean-colour data in the East Asia region (NOWPAP, WESTPAC and KJWOC). Dr. Asanuma requested that IOCCG show support of these existing programmes at international meetings (e.g. CEOS) and plan training courses on the application ocean-colour data in the

Joji Ishizaka also briefed the Committee on the various ocean-colour activities in East Asia. The NOWPAP (NorthWest Pacific Action Plan) group was starting a collaborative effort in this area, within the UNEP framework. Working Group 4 of NOWPAP had a mandate for remote sensing of the marine environment and had produced a National report. The second programme in the area was WESTPAC, under the IOC, which included SE Asia and Australia. The Chair of the remote sensing programme within WESTPAC was Hiroshi Kawamura, while the co-chairs of the Ocean Colour Project were Yu-Hwan Ahn and Joji Ishizaka. The terms of reference for the WESTPAC ocean-colour project included promotion of ocean-colour remote sensing applications in the WESTPAC region, networking with regional ocean-colour experts, improving basic oceanographic science for remote sensing of ocean colour and designing and implementing ocean-colour pilot projects (e.g. red-tide detection). A third ocean-colour related group was the Korean Japan Work Shop on Ocean Colour (KJWOC), which had already held three successful workshops.

6.0 PROPOSALS FOR NEW MISSIONS

6.1 PhytoSat

Robert Frouin informed the Committee about a new proposal submitted to ESA for a space mission to observe phytoplankton species and their sensitivity to climate variability. Mission objectives were to quantify the biologically driven atmosphere-ocean flux of CO2 and to address ecological issues in the coastal zone. This would require accurate retrieval of hyper-spectral marine reflectance and the measurement of inelastic scattering (Raman scattering) and fluorescence. Mission characteristics included daily global observation of ocean colour and aerosols to determine marine reflectance, deriving chlorophyll-a concentration and inherent optical properties, discriminating phytoplankton species and harmful algal blooms, and measuring Raman scattering and natural fluorescence. To achieve the mission objectives, a set of two instruments was proposed: a hyper-spectral scanning radiometer with a spectral range in the ultra-violet, visible, and near-infrared to observe the

full spectrum of ocean colour after atmospheric correction; and a multi-view polarization radiometer to retrieve the aerosol optical properties for accurate atmospheric correction. The key observational requirements for the hyperspectral (open ocean and coastal missions) and polarization measurements were reviewed. The mission concept was a set of two mini satellites, each with the required pair of instruments, on sun-synchronous polar orbits that would be interlaced to enhance daily global coverage. Each of the two mini satellites would carry a payload of two instrument systems: the Advanced Medium Resolution Imaging Spectrometer (AMERIS), and the Monitoring Aerosols in the Ultra-Violet Experiment (MAUVE) and the Short-Wave Infrared Polarization Experiment (SWIPE) instrument suite. The characteristics and calibration of these sensors were also reviewed.

6.2 OCEaNS

Ron Zaneveld gave a brief presentation on a proposal to NASA for the OCEaNS (Ocean Carbon, Ecosystems, and Near-Shore) mission, previously known as PhyLM. He noted that all previous missions were designed for empirical algorithms that rely on the 'bio-optical assumption' that all absorbing and scattering components in the water co-vary in a globally consistent manner, which was definitely not the case. The 'semi-analytic approach' (i.e., spectral matching) would yield a suite of internally consistent carbon/ecosystem products and would not rely on the bio-optical assumption. The effective application of this new approach was prevented by the historic suite of ocean-colour wavebands. Hyperspectral information was required to achieve better spectral resolution and to properly separate out components such as CDOM and chlorophyll. Additional information could also be achieved by expansion to the near UV. The proposed OCEaNS sensor would cover the spectral range 318-1400 nm, with a minimum of an ozone band, 3 near-UV bands, 9 VIS bands, 3 fluorescence bands and 5 atmospheric bands, with a spatial resolution of 750 m. It would also be advantageous to include a Lidar in the mission, although that would be expensive. The earliest launch of the mission would be 2112, if approved.

6.3 Other activities related to new ocean-colour missions.

Paula Bontempi updated the Committee on the advanced planning of NASA's Ocean Biology and Biogeochemistry (OBB) group. The international oceanographic community needed to address a number of broad, high-level questions e.g. how do ocean ecosystems and the diverse communities they support function, how does carbon and other elements transition between the ocean and other global reservoirs? The OBB group was examining the remote-sensing requirements of these fundamental science questions to determine what new measurements needed to be made, what technology was currently available and what needed to be developed. A summary of observational strategies included:

1. Global stocks, rates and phytoplankton functional group identification and quantification
2. Regional stocks, rates and phytoplankton functional group identification and quantification
3. Habitats and hazards
4. Variable phytoplankton fluorescence
5. Mixed layer depth and illumination.
6. Ocean particle profiler and aerosol distributions.

Dr. Bontempi noted that it might not even be possible to measure all of the above from space.

7.0 CAPACITY BUILDING

7.1 IOCCG Scholarships and Fellowships

Venetia Stuart reviewed IOCCG's Scholarship and Fellowship Programmes over the past year. Three travel scholarships (airfare only) had been awarded to students from Estonia, Malaysia and South Korea to attend the AMRS remote sensing conference in Halifax (May 2005). IOCCG also sponsored a student from United Arab Emirates to attend the training course at JRC, Ispra in October 2005 (a second sponsored student from China was unable to obtain a visa in time). In addition, five IOCCG Fellowships were awarded to students from China, Uruguay, Argentina, Brazil and Spain to receive training at foreign institutes. Reports from the Fellowship

students, as well as their host supervisors, were all very positive, and suggested that these exchanges could facilitate longer term collaborations between the institutes involved. The host supervisor of the student who travelled to the USA indicated that the IOCCG Fellowship was insufficient to cover reasonable living expenses, and he offered to supplement the Fellowship. This was gratefully acknowledged, and it was noted that the funding allowance for future students travelling to the USA should be reviewed.

7.2 Report on JRC training course

Nicolas Hoepffner gave a brief report on the EC organised training course on ocean-colour remote sensing (3-14 October 2005). The course was carried out within the framework of the JRC Enlargement and Integration Action 2005, in partnership with IOCCG and the Baltic Sea Regional Project (BSRP). It was a very successful event with more than 130 applications (over half from Turkey). Eighteen students from several countries were selected. IOCCG supported one student and one lecturer (the other IOCCG-sponsored student could not obtain a visa on time). The course was conducted over a two-week period and covered theoretical lectures in the morning, and practical sessions for image processing (SeaDAS, MatLab) in the afternoons. The second week was dedicated to mini projects. All the students were highly motivated and presentations covered a wide variety of topics. The Committee conveyed their appreciation to JRC for their commitment to the course, and to Nicolas Hoepffner and Mark Dowell for conducting such an excellent course.

Dr. Hoepffner also mentioned a proposal from a colleague to conduct a training course in Iran in 2007, with partial IOCCG support. Several institutes in Iran had the capability of organizing and hosting an International training course. It was noted that in light of recent events, the geopolitical context would have to be examined and monitored closely. In meantime the EC would be approached to see if it were feasible.

7.3 Potential CSA sponsorship for a training course in Canada

Martin Bergeron outlined the requirements for a potential CSA sponsored training course in Canada. The course would have to demonstrate benefits of remote sensing for Canadians, it should be in line with the Government Related Initiatives Programme (GRIP), it should preferably be held in a Canadian oceanographic institute and it had a $25K funding potential (to be consumed before the end of March 2007). In response to a question from the Chair about the possibility of focussing the course on inland waters, Dr. Bergeron observed that this was certainly a relevant issue for Canada. It was suggested that the training course be run in conjunction with the Ocean Optics meeting in Montreal (9-13 October 2006), which would attract potential lecturers in the field. Suitable venues could be McGill University, University of Montreal, University of Sherbrook or Laval. The possibility of combining the training course with the proposal of Steve Greb (next Agenda item) was also raised.

7.4 Proposal for training course on remote sensing of inland waters

Robert Frouin outlined a proposal submitted to IOCCG by Steve Greb (Wisconsin Department of Natural Resources) to conduct a training course in Latin America on the use of satellite remote sensing for water quality monitoring. It was noted that remote sensing could provide spatial-temporal information on a number of water quantity and quality issues, both on a local and global scale. The objectives of the 4-day workshop would be to provide information on the capabilities of remote sensing techniques for freshwater systems, to provide a basic understanding of the required expertise, equipment, associated software and costs to analyze the image data and to provide hands-on experience in processing/interpreting remotely sensed images. An international team of instructors would assist with the lectures. The host institute had not yet been identified, but there were several options. The Chairman remarked that IOCCG could not consider committing funds with this level of uncertainty. The possibility of combining this course with the proposed training course in Canada was raised and would be further discussed at the Executive meeting.

7.5 Advanced training course on inversion modelling

The Chairman noted that at the last meeting it was suggested that IOCCG should conduct a high-level training

course, perhaps on inversion modelling. This was a new approach to dealing with ocean-colour data, but was not yet a common methodology. Experts in the area would be required if such a training course were to be conducted. ZhongPing Lee indicated that he would like to participate and Roland Doerffer offered to try and organise such a training course. There was a general consensus that this was a good idea, since all the other IOCCG courses had been on basic training. Ian Robinson cautioned against limiting the course to inversion techniques, but also to include other new advanced methods in retrieving useful parameters (e.g. IOPs). The logistics of the proposed training course would be discussed further off line.

7.6 Development of a series of lectures for distance learning

Trevor Platt presented the idea of preparing video lectures by experts from the Committee on the subject of ocean colour and its applications in the broadest sense, such that they could be used for training courses, or for university courses, similar to the MIT lecture courses available on the internet. Mervyn Lynch supported the idea and encouraged experienced lecturers to sign on as participants. The Chairman agreed to meet with the person who was responsible for the MIT lectures on the web, and would investigate the technology involved.

ACTION ITEM 11/8: JAMES YODER TO MAKE INQUIRIES ABOUT POSSIBILITY OF OCEAN-COLOUR LECTURES BEING RECORDED AT WOODS HOLE.

7.7 IOCCG sponsorship of SPIE Asia-Pacific conference

Robert Frouin informed the Committee about the 5th Asia-Pacific remote sensing symposium, which would take place from 13-17 November 2006, in GOA, India. The theme and focus of the conference was "Remote Sensing for Resource Management and Disaster Warning and Mitigation". A number of sessions were relevant to IOCCG, including ones on hyper-spectral remote sensing, ocean remote sensing applications, and satellite data assimilation. Dr. Frouin requested that the IOCCG sponsor a few students from Asia to attend this conference. This request would be discussed at the Executive meeting.

7.8 Request for funding by A. Gonzalez to attend AGU Symposium

Trevor Platt had received an email from Adriana Gonzalez requesting IOCCG sponsorship to attend the Ocean Sciences Meeting in Hawaii (20-24 February 2006). He noted that in his IOCCG experience, travel scholarships were not usually provided without an announcement or competition. This would be further discussed at the Executive Committee meeting.

7.9 Antares Update

Vivian Lutz gave a brief update on the South American ANTARES network, which was initiated by the IOCCG after the training course in Chile. The goal of the network was to study long-term changes in coastal ecosystems around South America and the Caribbean Sea in order to distinguish natural variability from external perturbations. The network was built on ongoing initiatives at participating institutes. It was proposed to link in situ data from time-series stations with remote sensing observations and also to create a database of satellite and in situ observations. An integrated satellite data management and distribution system had been established through the CESAR (Coastal Ecosystems of the South American Region) project and could be accessed through the ANTARES Portal (http://www.antares.ws). Desirable future activities included strengthening in situ time-series stations, integrating remote sensing data with field data on web sites, including new time-series stations for continental-scale observations, and including satellite data from other sensors, such as MERIS and follow-on missions. The ANTARES programme had been promoted and fostered by IOCCG and POGO. A recent proposal had included Antares in the GOOS Chlorophyll Pilot study, and it was also identified in a work packet related to Ecosystems Societal Benefit Area in the GEO Work Plan for 2006.

7.10 IOCCG DVD Project

Roland Doerffer informed the Committee about a personal project to create an educational DVD for IOCCG

which would help to promote ocean-colour research. The DVD would introduce the basic science behind ocean-colour images, and would also visualize the protocols for on board bio-optical measurements. Other sections would address atmospheric correction, the basic principles of ocean-colour algorithms and various applications. It would end with a section on the activities of the IOCCG. The script was ready but an English speaking narrator was required. Much of the footage had been compiled and refinements to the animations were being carried out. The presentation received strong support from the IOCCG Committee and Dr. Doerffer was encouraged to proceed with his project.

7.11 Indian Ocean GOOS Activity

Srinivasa Kumar informed the Committee about some of the activities of the Indian Ocean GOOS (IOGOOS) alliance, which was composed of 23 member institutions. The objectives of IOGOOS included enhancing ocean observing systems in the region, promoting exchange and utilisation of ocean data, as well as capacity building. An Indian Ocean Panel on Climate had been set up to oversee the implementation of a comprehensive ocean observing network for the region, with contributions by various nations. Several IOGOOS Coastal Pilot Projects had been established to examine the prawn fishery, coastal erosion etc. Mervyn Lynch reported that four potential training courses had been proposed for 2006, with possible IOCCG collaboration. An attempt would be made to couple them with the pilot projects. The first workshop on ocean-colour applications would be launched in Hyderabad in 2006, and it was desirable that IOCCG should endorse the programmes, even though it could not contribute financially. Dr. Lynch would also approach the IOC Perth Office for funding, because IOGOOS was an IOC programme. The Chairman indicated that IOCCG would support the proposal.

8.0 EXTERNAL RELATIONS

8.1 Liaison with CEOS and GEO

The Chairman informed the Committee about the link between IOCCG and GEO (Group on Earth Observations) and how IOCCG could benefit from this cooperation. By way of background, he noted that GEO was a high-level group that started 2 1/2 years ago, with representatives from over 30 nations working together to establish a system of earth observations for societal benefits (not for science). It had received a lot of attention from space agencies around the world and had a lot of momentum. An agreement was in place between many countries to establish a Global Earth Observation Systems of Systems (GEOSS) as a means to coordinate earth observations for various societal benefit areas. An implementation plan for GEOSS was currently being formulated. IOCCG is an associate member of CEOS, which has the role of coordinating earth observation satellites. Since global earth observations have large satellite component, there was some concern in CEOS about a potential overlap with GEO, and the role of CEOS in implementing GEOSS. The Strategic Implementation Team (SIT) of CEOS was tasked to define role of CEOS in GEOSS.

CEOS has since agreed to be responsible for the satellite component of GEOSS through the SIT team, chaired by Dr. Volker Liebig from ESA. As far as IOCCG was concerned, the highest priority for GEOSS was the Global Climate Observing System (GCOS), which specified ocean colour as one of its key measurements. Climate is one of the seven societal benefit areas defined by GEOSS, and this gives IOCCG an opportunity to promote continuity of ocean-colour satellite missions. The IOCCG could use their membership in CEOS to advocate for the ocean-colour component of GCOS, by writing to the chair of SIT, pointing out that ocean-colour observations are part of GCOS, and that it was desirable to have at least two ocean-colour sensors in orbit at one time. This could help to focus the attention of agency representatives of GEOSS to get missions launched and data available. A major concern about the GEOSS initiative was that the scientific community was not yet being fully engaged in the

The Chairman noted that he would revise his draft letter to Dr. Liebig to include key points from the IOCCG reports (e.g. better coverage with two ocean-colour sensor). He would also draw attention to the importance of projects such as GlobCOLOUR, and point out that calibration and validation, as well as the ground segment and data distribution, were key elements. IOCCG had representation at various SIT and GCOS meetings. Paula

Bontempi agreed to coordinate with Ron Burke (NASA representative for CEOS) to ensure that IOCCG interests were conveyed at meetings.

ACTION ITEM 11/9: JAMES YODER TO WRITE TO CHAIR OF SIT (VOLKER LIEBIG) TO ADVOCATE FOR THE OCEAN-COLOUR COMPONENT OF GCOS.

ACTION ITEM 11/10: PAULA BONTEMPI TO COORDINATE WITH RON BURKE (NASA REPRESENTATIVE FOR CEOS) TO ENSURE THAT IOCCG INTERESTS ARE CONVEYED AT CEOS MEETINGS.

8.2 Liaison with IOCCP (International Ocean Carbon Coordination Project)

The Chairman noted that IOCCP had approached IOCCG about potential coordination. At this point nothing specific had been proposed, although ocean-colour measurements had relevance for carbon.

8.3 Liaison with SCOR

SCOR had requested a better geographic balance of IOCCG working group chairs in the future. Trevor Platt had responded by pointing out the working groups themselves were diverse in their make up, and that it was often advantages if the Chair spoke English as a first language. The issue had been resolved.

8.4 Liaison with AMRS (Alliance for Marine Remote Sensing)

Nicolas Hoepffner reported that he was the IOCCG representative on the AMRS board. IOCCG had supported the AMRS conference by sponsoring three students. He noted that AMRS was running out of funds, and were thinking of legally terminating the alliance. The director, Bob Chisholm, did not wish to continue their mandate and stepped down in June 2005. Herb Ripley had volunteered to take over until September 2005, but the group was not successful in obtaining new funds.

9.0 ORGANIZATION AND MEMBERSHIP

9.1 Call for nomination of new Committee members

One of the requirements of Affiliated Programs of SCOR is the regular rotation of scientific committee members. Four scientific committee members (Curtiss Davis, Vivian Lutz, Ian Robinson and Ron Zaneveld) were due to rotate off the Committee. The Chairman reported that he had received a number of nominations for new Committee members which would be discussed at the Executive meeting.

9.2 2007 Committee meeting

Ray Barlow proposed to host the next IOCCG Committee meeting in Swakopmund, Namibia. He pointed out that most of the previous meetings had been held in the northern hemisphere, and he invited participants to return to the southern hemisphere. Swakopmund is on the coast and housed the Namibian National Marine Information and Research Centre (NatMIRC) as well as the secretariat for the BENEFIT Programme (Benguela Environment Fisheries Interaction and Training Programme). The meeting could be held at the Swakopmund Hotel or at Altebrooke. Access to Namibia was easy as there were daily international flights from Europe, as well as direct flights to Walvis Bay from Johannesburg or Cape Town. Having an IOCCG meeting in Namibia would also help to promote ocean-colour remote sensing in the region. Nicolas Hopeffner mentioned that the meeting could also be held at JRC in Italy, and Pan Delu noted that China would like to host the meeting in 2008. The dates and venue for the meeting would be discussed at the Executive meeting.

The Chairman thanked everyone for coming to the meeting and expressed his appreciation for all the interaction. The 11th Committee meeting was then officially adjourned.

APPENDIX I
LIST OF PARTICIPANTS

11th IOCCG Meeting, Busan, South Korea, 11-13 January 2006

IOCCG Members	Affiliation
Ahn, Yu-Hwan	KORDI, Korea
Antoine, David	LOV, Villefranche, France
Asanuma, Ichio	Tokyo University of Information Sciences, Japan
Barlow, Ray	MCM, Cape Town, South Africa
Bergeron, Martin	Canadian Space Agency, Canada
Bontempi, Paula	NASA HQ, USA
Pan, Delu	State Oceanic Administration, China
Doerffer, Roland	GKSS, Germany
Hoepffner, Nicholas	JRC, Italy
Kumar, Srinivasa	INCOIS, India
Lutz, Vivian	INIDEP, Argentina
Lynch, Mervyn	Curtin University, Australia
Platt, Trevor (Past Chair)	Bedford Institute of Oceanography, Canada
Regner, Peter	ESA/ESRIN, Itlaly
Robinson, Ian	University of Southampton, UK
Tanaka, Tasuku	JAXA, Japan
Thouvenot, Eric	CNES, France
Yoder, James (Chair)	Woods Hole Oceanographic Institution, USA
Zaneveld, Ron	Oregon State University, USA

Associate Members	Affiliation
Morel, André	LOV, France
Wang, Menghua	University of Maryland, USA

Invited Participants	Affiliation
Frouin, Robert	Scripps Institution of Oceanography, USA
Ishizaka, Joji	Nagasaki University, Japan
Kim, Sang-Woo	NFRDI, South Korea
Koo, Dohyung	University of Southampton, UK
Lee, ZhongPing	Naval Research Laboratory, USA
Lim, Hyo-Suk	KARI, South Korea
Son, SeungHyun	University of Maine, USA
Stuart, Venetia	IOCCG Project Office, BIO, Canada

Apologies	Affiliation
Brown, Chris	NOAA-NESDIS, USA
Davis, Curtiss	Oregon State University, USA
Dowell, Mark	University of New Hampshire, USA
Gregg, Watson	NASA/Goddard Space Flight Center, USA

Sathyendranath, Shubha	IOCCG Associate Member/POGO Exec. Director, Canada
Sosik, Heidi	Woods Hole Oceanographic Institution, USA
Urban, Ed	SCOR, USA

Publications & Reports | Home