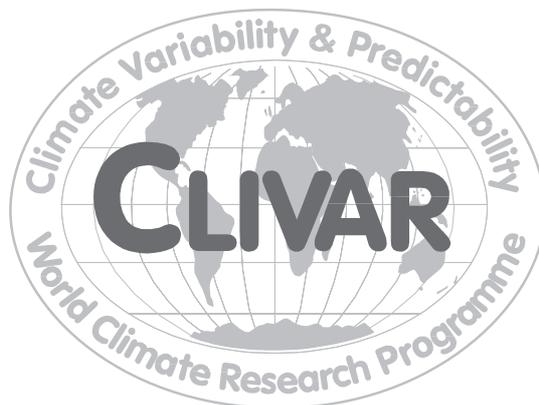


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Report of CLIVAR SSG-15

RECOMMENDATIONS AND ACTIONS ARISING

FUTURE PLANS

1. SSG discussed various organizational options but agreed not to restructure CLIVAR in response to the announced reduction of WCRP funds for 2008. The Group felt that it was essentially too late to make a major organizational change which would disrupt progress and that it would be better to leave the structure as it is out to the 2010 timeframe at which time the project would be reorganized to accommodate a final analysis and assessment phase. It was recognized that severe cuts in WCRP funding mean that WCRP support for meetings will be minimal. Panels and Working Groups will be required to seek other support for meetings, with help from the ICPO, and to seek to reduce costs by arranging meeting in the margins of Workshops/Conferences.
2. SSG to provide guidance on allotment of funds for meetings. Criteria to include degree to which panel interactions will be engaged in as well as the JSC requirement that funds be used for “real outcomes”. The ICPO and V Detemmerman to prepare an analysis if current requests for SSG consideration. Action: Detemmerman, SSG, ICPO
3. CLIVAR to seek major presence at the 2009 World Climate Conference-3 (WCC-3), initially through a letter to Prof V Ramaswamy. Action Palmer
4. SSG co-chairs to write to the Chair and vice Chair of the JSC summarizing SSG concerns about the urgent need to develop a vision for WCRP beyond the sunset dates of the current projects, and emphasizing that this needs to be developed in time to take the opportunity of WCC3 to vet views for the future. Action: SSG co-chairs, ICPO.
5. Seek to hold the 2nd CLIVAR Science Conference in 2011 with a final closure meeting in 2013. Begin search for sponsors and location immediately. Action: SSG, ICPO, Detemmerman.
6. Engage all CLIVAR panels and working groups in providing assessments of achievements and identification of major outstanding questions for input to the 2nd CLIVAR Science Conference. Action: SSG to scope remit; Panel and WG chairs, ICPO.

OUTREACH

7. Communicate to IOC, initially through Neville Smith, major CLIVAR contributions to science issues of direct relevance to IOC members, eg. Decadal variations in sea level, coastal flooding, etc. (Harrison, ICPO and SSG chairs).
8. Cultivate links between WCP and CLIVAR, in particular in relation to applications and the outputs of the TFSP/WGSIP Seasonal Prediction Experiment. Action: Kirtman and others, in consultation with WCP (Kolli).

9. Seek mechanisms by which CLIVAR can input to the WMO Statement on the Status of the Global Climate and other statements on the state of the climate system. Action ICPO in consultation with WCP and CLIVAR scientists
10. Seek to ensure effective CLIVAR involvement with WMO/CCI Task Team meetings on climate anomalies. Action: Kirtman, ICPO for statement in SSG Report.
11. Update CLIVAR slide gallery seeking inputs from panels and working groups for dissemination from the CLIVAR website. Include simple slides on what we do including text to accompany them. Seek guidance from CLIPS on provision of user-friendly text/captions. Action: ICPO
12. At least one of the lecturers for the SSG science lectures to be invited from the development community in future to help provide input on what climate-related questions they are asking. Action: ICPO in consultation with Richard Washington and SSG co-chairs.
13. SSG appoints Professor Roberto Mechoso as the CLIVAR liaison with the Atmospheric Chemistry and Climate cross cut. Action: ICPO to inform AC&C, Mechoso.
14. Noting the active community within Spanish CLIVAR, R Mechoso to explore possibilities for increased cooperation with international CLIVAR and, if appropriate, to make a more formal request through the SSG to sponsor e.g. a scenarios workshop to raise profile. Possible links with MedCLIVAR to be explored noting potential for joint CLIVAR/MedCLIVAR workshop to expose Spanish science activity to the wider CLIVAR community. Action: Mechoso, Boscolo

MODELLING

General

15. Seek to identify areas of increased engagement between climate modelling activities in CLIVAR and WGNE (on issues e.g. of regional modelling, resolution, transpose activity, metrics,) in preparation for Modelling Summit. Action: Global Modelling Panel Chairs.

Seasonal Prediction/TFSP Experiment

16. SSG attendees to provide feedback on the WCRP Workshop on Seasonal Prediction (Barcelona, June 2007) Position Paper *within 1 week* (deadline formally 15 September 2007). Action: All
17. Seek greater GEWEX, CliC and SPARC participation in WGSIP activities, particularly with respect to the TFSP experimentation. with ICPO.. For example, the SSG encourages SPARC to develop their proposal for numerical experiments with appropriate stratospheric resolution to explore potential seasonal predictability arising from stratospheric processes/dynamics. Action: Kirtman, with ICPO
18. The SSG encourages all panels to assess the outputs of the TFSP/WGSIP Seasonal Prediction Experiment

Decadal prediction

19. Seek to engage increased CLIVAR representation on WGCM/WGSIP group designing “short term (2005-30)” prediction experiments from e.g. GSOP, Atlantic Panel and SSG (Palmer) and ask all Panels to comment on the design. Action: Meehl.
20. Work with WCP to determine user requirements for decadal-timescale prediction. Action Palmer, in consultation with WCP (Kolli).

Ocean Modelling

21. To help scope issues of CORE-II data exchange, the Basin Panels are requested to identify likely requirements for regional analysis of data from these runs. Action: Basin Panel chairs, WGOMD, ICPO.
22. The SSG identified a need for enhanced communication between WGOMD and WGCM to ensure in particular that WGOMD is responding to WGCM needs for advice and science input on ocean modeling. The two groups are encouraged to develop a joint strategic vision to take this forward. Action WGCM and WGOMD co-chairs.

OBSERVATIONS AND SYNTHESIS

23. Recognizing that completion of deployment of the initial global ocean observing system for climate and sustaining this system for the foreseeable future is essential to attainment of CLIVAR’s objectives, the SSG fully endorsed the efforts to conduct an OceanObs/Info09 Symposium. The SSG suggested that the symposium should build on the format and success of the OceanObs99, by demonstrating the successes following that first symposium, illustrating the importance to society of the information that can be obtained from the observations and presenting a road map for the next generation of the system based on community developed white papers on what is feasible and most important. The SSG asked that CLIVAR Panels and Working Groups work with the organizers to ensure that the role(s) of CLIVAR science and scientists are fully presented. Action: CLIVAR Panels and Working Groups in consultation with Harrison/Stammer .
24. Arising from the International Hydrography workshop, held in Shonan Village, Japan, in November 2005, a GSOP recommendation to agree renaming of the “CLIVAR/Carbon Repeat Hydrography Programme” to “International Repeat Hydrography and Carbon Programme” is accepted by the SSG. Action: Stammer to feed back to IOCCP
25. Noting engagement of Japanese scientists in coupled reanalysis, the SSG recommends an appropriate individual be invited to GSOP membership. Action GSOP co-chairs.

OCEAN SECTOR PANELS

General

26. SSG recommends inviting IMBER representation on basin panels and GSOP at no cost to CLIVAR. (Action: Basin Panel and GSOP co-chairs).

Atlantic/Mediterranean

27. SSG noted that the CliC/CLIVAR Arctic Climate Panel is “on ice”; action is with CliC which plans to work through existing structures for the time being.
28. The SSG encourages greater interaction between the VACS Panel and MedCLIVAR, in particular from the perspective of the participation of African scientists in MedCLIVAR. Action: Reason, Boscolo

Pacific

29. The SSG encourages SPICE to fully develop links, where appropriate with other CLIVAR panels and working groups, building on its current relationship with the Pacific Panel. VOCALS-SPICE interactions are also encouraged. The Pacific Panel is asked to review the SPICE Plan and make a recommendation to the SSG.(Action: Ganachaud, Mechoso, Pacific Panel)

Indian Ocean

30. Ensure CLIVAR coverage of Indonesian Throughflow and clarify relative roles of Pacific and Indian Ocean Panels in this area. Action: Pacific and Indian Panel chairs.
31. SSG encourages IOP proposal for a resource board for the region and recommends they develop an implementation plan for ship time to maintain the long term observing system of IndOOS. Action IPO co-chairs
32. SSG endorses coordinated study and intercomparison of the predictions of the 2006 and 2007 IOD events, started between IOP and AAMP. Action: IOP co-chairs

MONSOONS AND YOTC

33. SSG strongly encourages YOTC efforts to quantify the extent to which simulation errors are a product of the nature of convective parameterization schemes and the extent to which CRMs can reduce these. Action: CLIVAR monsoon panels/Waliser to carry to YOTC implementation planning.
34. Circulate short explanatory note on the concept of the International Monsoon Study (IMS) and request input to this activity from all relevant CLIVAR Panels and Working Groups (ICPO in consultation with Yasunari, Molteni and Panel/Working Group Chairs)
35. AAMP to provide critical review of Asian Monsoon Years (AMY) Science Plan when a more complete draft is available, providing feedback to AMY and recommendation to the SSG on endorsement. Action ICPO, AAMP co-chairs.
36. Request VAMOS co-chairs to seek to broaden the scope of VAMOS activities to ensure a global view and to develop more global linkages as part of its strategic direction. Action: ICPO, SSG co-chairs

CLIMATE ANOMALIES, INDICES, EXTREMES, DROUGHT & PALEOCLIMATE

37. Extracting ocean information for society: CLIVAR to consider how it might engage/lead on issues concerning communication with society about climate anomalies. Potential CLIVAR WG to cover this and 38 below? Action: Basin Panels, GSOP, SSG in consultation with OOPC
38. Extracting ocean information for society: CLIVAR to consider how it might engage/lead on developing uncertainty estimates on climate analyses and reconstructions, including trends. Action: Basin Panels, GSOP, SSG in consultation with OOPC
39. ETCCDI is requested to seek to provide wider range of indices on their website to cover both atmosphere and ocean indices and to take the lead in coordinating CLIVAR indices efforts (including those by CLIVAR Panels) with those of OOPC and others as appropriate. Action: Zwiers with ETCCDI members.
40. Survey CLIVAR activities in the area of Extreme Events for eventual input to the JSC. Action ICPO in consultation with Panels and Working Groups.
41. In response to the request for international CLIVAR engagement on drought, linking to current US CLIVAR efforts in this area, the SSG recommended the following steps: (i) An article in Exchanges inviting international participation in the US CLIVAR activity; (ii) Information on the US effort, with links, to be sent to all CLIVAR Panels and Working Groups to heighten awareness and encourage international participation, building on existing activities identified by C Reason, L Goddard and J Marengo; (iii) Seek to link with GEWEX efforts in this area, exploring the potential for a joint edition of CLIVAR Exchanges/GEWEX News; (iv) Explore potential involvement of WCP to build linkages to users, eg. Drought Monitoring Centres. Action: US CLIVAR, ICPO
42. SSG agreed to continue CLIVAR/PAGES noting major membership turnover in 2008. Action (on membership) C/P co-chairs, ICPO)

DATA MANAGEMENT

43. Survey fate of datasets from CLIVAR-endorsed process studies and whether these are freely available to the community. Provide links where needed from CLIVAR website. Action ICPO.

SSG, PANEL AND WORKING GROUP MEMBERSHIP

44. Remind all panels and working groups that membership changes are subject to SSG agreement and are not automatic. Wherever possible, alternative suggestions should be given with the Panel's recommendation, and in particular in the case of the nomination of chairs/co-chairs. Action: ICPO
45. The SSG agreed to finalize panel and working group memberships by email. A short paragraph on nominees was requested (already supplied by the Atlantic sector panel). Action: ICPO with Panel/WG chairs

WELCOME, INTRODUCTIONS AND LOCAL ARRANGEMENTS

CLIVAR SSG-15, which took place from 11-14 September 2007 at the Headquarters of the World Meteorological Organization (WMO), Geneva, Switzerland, was opened by Dr Tim Palmer as SSG co-chair at 0900h of the first day. Attendees (Annex A) introduced themselves and Dr Valery Detemmerman of the Joint Planning Staff (JPS) for WCRP outlined a number of local arrangements for the meeting.

A little later in the meeting, the SSG was welcomed to WMO by its Deputy Secretary-General who noted that WMO is following the progress of CLIVAR closely. He emphasized the key role of CLIVAR in coordinating predictions of climate and climate change, so providing direct contributions to WMO member states.

The agenda for the meeting is at Annex B. On Thursday 13 September, the SSG heard two science presentations as follows:

“The changing Southern Ocean carbon sink” by Dr Nikki Gruber, ETH, Zurich

“Climate extremes in a warmer climate – a focus on Europe and the Alps” by Professor Martin Beniston, Chair for Climate Research, University of Geneva, Switzerland.

INTRODUCTION TO SSG-15

In his introduction to the SSG, Dr Palmer emphasized the key aims of the meeting to be to identify where we would like to be at the end of CLIVAR and what the CLIVAR legacy will be. He introduced one potential outcome of CLIVAR, that of progressing, “short term” (decadal timescale) climate projections out to 2030. Such an activity would bring together many aspects of CLIVAR and would also draw in aspects of the other WCRP core projects. Dr Palmer emphasized the analogy with the way in which TOGA had stimulated seasonal prediction, leading to its implementation by operational agencies. Thus the area of short term climate change projections could be a legacy of CLIVAR, moving towards operations by the CLIVAR “sunset date” of 2013.

Dr Palmer also drew the SSG’s attention to the current WCRP financial situation and in particular whether the full current network of panels and working groups could be maintained. The SSG however were not mindful to downscale at this critical stage of CLIVAR’s lifetime especially as climate research is so high profile. The decadal prediction activity itself, addressing as it does the science needed to make multi-billion dollar decisions by society, provides an excellent example of the need for more investment in climate prediction. The SSG needs to be more engaged in seeking resources than in the past whilst coordinated leadership is needed at project, programme and sponsor level.

SPONSOR AND OTHER PROGRAMME/PROJECT INPUT

WMO WCP activities relevant to CLIVAR

Dr R Kumar Kolli (WCP) provided an introduction to current WCP activities, outlining the wide range of these (in particular in the context of applications and services) and drawing the attention of the SSG to the plans for World Climate Conference-3 (2009) In particular he reminded the SSG of the essential need for networking between climate information providers, researchers, users and other stakeholders. He

identified a clear need for close coordination between WCRP/CLIVAR and the Commission for Climatology/WCP to optimize climate applications in real world context; CLIVAR research into predictability, indices, improved modeling, and development of new tools for users (NMHSs) is vital to Global Prediction and Regional Climate Centres' product skills and hence to socio-economic benefits to users. He noted that the Implementation Plan for the WCP Climate Information and Prediction Services (CLIPS) project could include a recommendation for a sustained CLIPS/CLIVAR interface. The Regional Climate Outlook Forum (RCOF) process could also be a useful vehicle for transfer of research accomplishments, capacity building, and for provision of user-feedback to research. In doing so it was important to attain local ownership of climate products; indeed this is crucial for their effective use. Enhancement of regional capacities in research/operations needs to be proactively pursued, particularly in developing countries. CLIVAR expertise (especially from its regional panels) is vital for capacity-building for professional operational climate service specialists as evidenced by the CLIVAR VACS Southern and Eastern Climate Predictability Workshop held at the Tanzanian Meteorological Agency, dar es Salaam in July 2006, co-sponsored amongst others by WMO/WCP.

In discussion of Dr Kolli's presentation, Dr Palmer asked about the links between WCP and the WCRP Task Force on Seasonal Prediction in terms of analysis of planned experimental from the applications perspective. He felt that specific linkages are as yet missing. As a follow-up, Dr Marty Hoerling asked about the relevance of decadal prediction to WCP. Though Dr Kolli felt that the primary interests of users were currently focused on the seasonal to interannual timescale, WCP could seek to determine users requirements for decadal timescale predictions.

Recommendation 8 : Cultivate links between WCP and CLIVAR, especially in relation to applications and the outputs of the TFSP/WGSIP Seasonal Prediction Experiment. Action : B Kirtman and others, in consultation with WCP (R K Kolli).

Recommendation 9: Seek mechanisms by which CLIVAR can input to the WMO Statement on the Status of the Global Climate and other statements on the state of the climate system. Action: ICPO in consultation with WCP and CLIVAR scientists

Progress under the WMO/CAS/WCRP Working Group on Numerical Experimentation

Dr Venkataramaiah Satyan (WCRP) introduced this item on behalf of the Chair of WGNE. He outlined a number of aspects of WGNE's work including routine review of daily forecasts from a number of operational centres using verification statistics to WMO standards. He also outlined current plans of NWP centres many of which are moving to resolutions for global models of 40km or better and 20 km in some cases. There is also an expansion of seasonal (and monthly) forecast activity. Model parameterization, particularly for convective clouds, also remains a key issue. Dr Satyan then summarized the outcomes of the WGNE Workshop on Systematic Errors (San Francisco, 2007) and the importance of metrics. Noting the sensitivity of model systematic errors to resolution, he concluded with some brief remarks on the resolutions employed in climate models which, for a variety of reasons, are almost universally run at resolutions 'inadequate' to simulate, for example, the correct statistics for extra tropical cyclones. Work to develop a good set of climate model metrics is now in progress to help assess the issues.

In discussion, Dr Palmer noted the strong connections between WGNE and THORPEX (see below) and identified the need for more interactions between the WGNE and the Working Group On Coupled Modelling, especially in terms of metrics, resolution and the “transpose AMIP activity. Transpose AMIP is designed to perform short-medium range forecasts from operational analyses/reanalyses using climate models and compare them with operational model outputs and field campaign data.

Recommendation 15: Seek to identify areas of increased engagement between climate modelling activities in CLIVAR and WGNE (on issues e.g. of regional modelling, resolution, transpose AMIP, metrics,) in preparation for Modelling Summit. Action: Global Modelling Panel Chairs.

The Year of Tropical Convection (YOTC) and WCRP/THORPEX interactions

Dr Duane Waliser provided an update on progress with the “Year of Tropical Convection activity, which is sponsored/endorsed both by THORPEX and WCRP, describing its background, development and science and administrative linkages. A YOTC planning group has been set up and will meet in November 2007 to refine the current YOTC science plan and develop an implementation plan. The focus year for data gathering has been set as January 2008-July 2009 though the start date is still uncertain. One area which still needs strengthening is in linkage to the Asian Monsoon Years (AMY) 2007-11 and WCRP monsoon cross cut (International Monsoon Study, IMS) activities.

Dr Satyan then outlined further WCRP links to THORPEX, emphasizing the increasing collaboration which is taking place between the two. THORPEX is a WMO weather research program to accelerate the improvement of forecasts for the 1- to 14-day forecast range. Two white papers are being written covering (a) important general scientific/technical areas for collaboration between WWRP-THORPEX and WCRP and (b) longer term strategic developments, emphasising the potential high societal benefits from significant additional investment in a state of the art predictive capability for weather and climate. Current collaborative research issues between WCRP and THORPEX include:

- Organisation and maintenance of organized tropical convection and its interaction with the planetary circulation
- Seamless prediction with multi-model ensembles (TFSP, TIGGE)
- Data assimilation as a prediction and validation tool for the climate and weather research communities and a design tool for observing networks
- High-impact weather in observations and models (including Regional Climate Models)
- Societal and Economical Research Applications (SERA)

In discussion of the YOTC presentation, Dr Waliser confirmed, in answer to a question from Dr Palmer, that, within YOTC, examination of the impact on performance of running models at resolutions representative of the scales of deep convection is part of the overall plan. He added that YOTC also aims to look at the connections between cloud resolving models (CRMs) and GCMs. The need for greater connection with AAMP, AMY and IMS was also recognised. The YOTC Implementation Plan will provide the specifics.

Recommendation 33: The SSG strongly encourages YOTC efforts to quantify the extent to which simulation errors are a product of the nature of convective parameterization schemes and the extent to which CRMs can reduce these.

Action: CLIVAR monsoon panels/D Waliser to carry to YOTC implementation planning.

IOC programme needs as a sponsor

In the absence of an IOC representative, Dr Howard Cattle (ICPO Director) reminded the SSG of the contents of the IOC presentation at SSG-14 (see the Report of SSG-14 at <http://eprints.soton.ac.uk/50117/>, Section 2.2).

The SSG recognized the importance of the IOC's sponsorship role for WCRP and the need to persuade them of the relevance of WCRP to IOC interests, especially in the area of climate change and the oceans. The SSG noted IOC emphasis on services and WCRP's and CLIVAR's role in particular in bringing the needed research component to these. Dr Cattle informed the SSG of the joint WCRP/CLIVAR display at the IOC Assembly held in June 2007 which he had attended and the very favourable reception by the delegates to IOC of the WCRP presentation given by the Chair of the JSC, Dr John Church.

Recommendation 7: Communicate to IOC, initially through Neville Smith, major CLIVAR contributions to science issues of direct relevance to IOC members, e.g. decadal variations in sea level, coastal flooding, etc. Action: E Harrison, ICPO and SSG co-chairs.

Developments in IGBP IMBER

An update on IMBER, IGBP's project on Integrated Marine Biogeochemistry and Ecosystem Research, was given by Dr Wilco Hazeleger. Its goal is to investigate the sensitivity of marine biogeochemical cycles and ecosystems to global change, on time scales ranging from years to decades. Detailed information on IMBER can be found at www.IMBER.info. Dr Hazeleger emphasized the relevance of CLIVAR research to two of the IMBER themes, namely:

Theme 2 – Sensitivity to global change
Theme 3 – Feedbacks to the Earth system.

He also outlined the work of the joint Surface Ocean Lower Atmosphere Study (SOLAS)-IMBER carbon group and plans for the joint IMBER/GLOBEC/CLIVAR "Spring School" on "Climate driving of marine ecosystems" to be held from 21-24 April 2008 in Brest, France.

In discussion, the SSG agreed the need to build the interactions with IMBER. In particular it is important that IMBER have realistic expectations about what can be provided in terms of the physical forcing on ecosystems. At the same time, Professor Martin Visbeck emphasized his view that IMBER has come a long way in developing such understanding. Dr Palmer asked if decadal time scales are of interest to IMBER. They are, but recognising that many of the feedbacks are on both shorter and longer timescales.

Recommendation 26: Invite IMBER representation on basin panels and GSOP but at no cost to CLIVAR Action: Basin Panel and GSOP co-chairs.

OOPC Report

Dr Ed Harrison, Chair of OOPC provided the meeting with:

- *An overview of the status of the ocean observing system*, which, at January 2007, is estimated to be 57% complete. Dr Harrison pointed to a number of issues, relating to (a) real time and delayed mode data, (b) the current state of progress in ocean analysis/reanalysis, (c) concerns about satellite continuity, (d) the continuing dependence on research funding and the research community for planning, implementation and evaluation of the system, (e) the current pressure to document immediate utility of the system and the need to extract and present ocean information from the observing system and (f) general concerns about funding. Dr Harrison emphasised the fundamental nature of the partnership between OOPC and CLIVAR and the need for continuing strong working relationships, especially since research community input and engagement at every level is critical to the success of the global ocean observing system effort while the push to increase the availability of ocean 'information' makes new demands on the CLIVAR basin panels.
- *Information on recent climate anomalies and trends in climate indices* using information drawn from the OOPC status of the ocean website (see <http://www.unesco.org/oopc>), Since January 2006, the biggest anomalies have been seen in the Indian Ocean (W and SW tropics), in Arctic sea ice extent and in the tropical North Atlantic hurricane region. Most others were of order 1 sigma or less.
- *Views on engagement on issues concerning communication with society about climate anomalies*. In particular how can we communicate better with non-specialists & media. In doing so, Dr Harrison emphasised the importance of information on standard deviations and uncertainties and suggested use of standardized anomalies to increase understanding of what is 'normal' and what deserves attention. There are a variety of indices/indicators of the state of the climate system as well as challenges in agreeing terminology and he suggested that it would be opportune for CLIVAR to exert leadership in this area.
- *Recommendations of the need for improved uncertainty estimates in our historical observational datasets and reconstructed datasets*. Here Dr Harrison noted that there are legitimate questions about trend behaviour in most of our historical data sets, including the reconstructions. Related science and social implications are non-trivial. Working Groups exist for sea surface temperature (SST) and sea ice, but are others needed? CLIVAR needs to identify what its contributions and legacy to this area will be and again could take the leadership here.
- *A summary of meetings ahead*, including OceanObs'09 and meetings which will feed into it (see below). He also emphasised the need to include biogeochemical and ecosystem communities in the next update of the observing system plan.

In discussion, Dr Palmer asked if CLIVAR should have more of an input to WMO statements. Dr Harrison agreed the desirability of this, but noted that there are still a wide number of research questions relating to uncertainty estimates which CLIVAR needs to engage with. Dr Ben Kirtman noted the opportunity for CLIVAR to engage with the WMO/CCI Task Team on El Niño. This is due to meet soon. Since Dr Kirtman is a member, CLIVAR will be well represented. Prof Visbeck noted that what is being asked for is wider CLIVAR involvement in developing what is needed for

assessments with the challenge being how to talk about things which are happening now and how to set them in the context of changes. In terms of the arguments for maintenance of the observing system, Dr Palmer asked about the relative importance to funders of the role of ocean data for climate prediction versus monitoring. Dr Harrison felt this to be a key issue. Funders largely put emphasis on the utility of observations for short term prediction (days to a couple of weeks). OOPC is asking the seasonal prediction community for feedback on the performance of the observing system for seasonal prediction, but there is no real focused response beyond a statement that “there is a need for all the data that can be got”.

Recommendation 10: Seek to ensure effective CLIVAR involvement with WMO/CCI Task Team meetings on climate anomalies. Action: Kirtman

Recommendation 37: Extracting ocean information for society: CLIVAR to consider how it might engage/lead on issues concerning communication with society about climate anomalies. Action: Basin Panels, GSOP, SSG in consultation with OOPC.

Recommendation 38: Need for improved uncertainty estimates. CLIVAR to consider how it might engage/lead on developing uncertainty estimates on climate analyses and reconstructions, including trends. Action: Basin Panels, GSOP, SSG in consultation with OOPC.

Progress in other WCRP Projects - GEWEX, CliC and SPARC

Climate and Cryosphere (CliC)

Dr Barry Goodison updated the SSG on progress in CliC focusing on joint interests with CLIVAR. He outlined current observed changes in the cryosphere, emphasising the growing importance of the topic. CliC has played a substantial role in putting together the IGOS Cryosphere Theme Report (<http://igos-cryosphere.org>) which is being published by WMO and which could provide a basis for increased interaction between CLIVAR and CliC. In addition, WMO Congress-15, when it met in May 2007 supported an IPY/CliC proposal to establish a Global Cryosphere Watch. CliC leads the WCRP's contributions to IPY. The CLIVAR/CliC/SCAR Southern Ocean Region Panel provides one regional IPY focus, through it's lead in the “Climate of Antarctic and the Southern Ocean cluster. In addition, the panel is also engaging in development of the post IPY Southern Ocean Observing System (SOOS) which is being coordinated by the SCAR/SCOR Oceanography Expert Group. Another area of linkage, through the SO Panel, SOOS and WGOMD, is the Southern Ocean modelling activity, SOPHOCLES (Southern Ocean Physical Oceanography and Cryospheric Linkages). In terms of the WCRP cross cutting activities which CLIVAR is responsible for, the main CliC inputs are seen as being through model initialization issues for decadal and seasonal prediction. Interactions in terms of monsoons and climate extremes remain to be defined. In the Arctic, CliC is looking to establish closer links with the Arctic Ocean Science Board and the outcomes of ICARP II (2nd International Research Conference on Arctic Research Planning).

Recommendation 27: The SSG noted that the CLIVAR/CliC Arctic Climate Panel is currently “on ice”. Action is with CliC which plans to work through existing structures for the time being.

The Global Energy and Water Experiment (GEWEX)

Dr Rick Lawford provided an update on GEWEX to the SSG, outlining the different components of the GEWEX programme and their roles. Recent developments include (i) merger of the Coordinated Enhanced Observation Project (CEOP) and the

GEWEX Hydrographic Programme to form the Coordinated Energy and Water Cycle Observations Project (the new CEOP), (ii) near completion of the first version of the GEWEX Roadmap and (iii) identification of a new Director for the GEWEX IPO. GEWEX will hold its next International Science Conference in Australia in September 2009. In terms of the two WCRP cross cuts jointly managed by GEWEX and CLIVAR (monsoons and climate extremes), work is needed to clarify how GEWEX and CLIVAR can best combine their efforts. Dr Lawford noted that GEWEX studies on monsoons will examine the processes driving them, including orographic and land surface processes and anthropogenic forcing. On the other hand, the GEWEX approach to extremes is focussed on case studies to gain better understanding of the processes responsible for extreme events. As well as these areas, Dr Lawford identified the following additional science areas where joint GEWEX and CLIVAR projects could emerge: Global water and energy budget closure; Applications and capacity building; Aerosols; Seasonal prediction. He noted that GEWEX values feedback on its datasets and data systems, inviting more CLIVAR engagement in exercising and validating these. He also advocated joint GEWEX/CLIVAR action in gaining funding for activities. Dr Lawford finished with a guide to navigating the GEWEX Roadmap.

Stratospheric Processes and Climate (SPARC)

Dr McFarlane outlined the current themes and thrusts of SPARC, identifying the following issues for SPARC and CLIVAR:

- Long-range prediction (characterizing variability and troposphere-stratosphere coupling)
- Contributions to upcoming assessments (2010 Ozone Assessment, AR5)
- Convectively coupled dynamical processes (QBO, TTL, ENSO signal in the stratosphere)
- Monsoons and the stratosphere

SPARC inputs to the CLIVAR-organised WCRP Seasonal Prediction Workshop (Barcelona, June 2007), demonstrated the stratosphere to be a potentially untapped source of seasonal prediction. As a contribution to the planned WCRP Task Force on Seasonal Prediction's Climate System Historical Forecast project (CHFP), SPARC will seek to develop an activity to study the available runs and carry out seasonal prediction model intercomparison experiments with enhanced resolution in the stratosphere. In discussion the hope was expressed that SPARC would develop a prospectus for such experiments which themselves would be in line with SPARC's DynVar project. Dr McFarlane agreed to take the overall issue to the SPARC SSG, due to meet in Bremen, Germany later in the month.

Developments in WCRP

Dr Ann Henderson-Sellers fielded this item which focussed on WCRP finances and the consequently substantial cuts in WCRP funds for CLIVAR (and WCRP project) activities.

SUMMARY OF KEY PROGRESS AND ISSUES FROM CHAIRS OF CLIVAR PANELS AND WORKING GROUPS

The written reports from panels and working groups and the accompanying Power Point can be found at <http://www.clivar.org/organization/ssg/ssg15/ssg15.php>. Key issues raised and SSG responses only are recorded here, therefore.

Ocean basin panels

Atlantic

Dr Wilco Hazeleger provided an overview of the Atlantic ocean observing system, progress with the Tropical Atlantic Climate Experiment (TACE) including links with the African Monsoon Multidisciplinary Analysis (AMMA) and PIRATA, and developments in programmes studying the Atlantic Meridional Overturning Circulation (AMOC), including developments in both the North and South Atlantic and relevance to and challenges of decadal prediction. Highlights of panel activities were summarised as:

- Subpolar Gyre workshop Kiel 2007
- Developments towards decadal prediction and in the observing system for AMOC
- TACE observations and an upcoming workshop with AMMA
- Renewed interest in the South Atlantic (SAMOC, WAVES)
- Journal of Climate Dec 06 issue and BAMS paper on Atlantic predictability

Issues for the SSG included needed guidance on membership (taken offline – see below), interaction with the CliC/CLIVAR Arctic Panel (but see the section on CliC above), how to progress South Atlantic observations, CLIVAR's legacy and what happens beyond CLIVAR's sunset date of 2013 and a view that CLIVAR is too broad and should focus on e.g. decadal prediction.

In discussion, Prof Visbeck pointed to the need from a TACE perspective for the panel to re-engage with WGSIP whilst Dr Kirtman noted that model errors in the tropical Atlantic are so large that data assimilation does not get very far in terms of initialisation. It seems that potential predictability cannot be realised because of the inadequacy of both modelling and data assimilation tools. Hence the tools are not good enough to provide adequate information to decision makers. The situation needs to be addressed.

Pacific Panel

As described by Dr Scott Power, on behalf of Dr Axel Timmerman the Pacific Panel Chair, key issues being tackled by the Pacific Panel include, WWB-ENSO interactions (seasonal to interannual timescales), reducing CGCM biases, decadal prediction, better understanding of South Pacific climate, inter-basin interactions, especially with the Atlantic and changes in tropical Pacific climate. The panel sees it's legacies as being:

- Better understanding of ENSO and its interactions (with intra-seasonal variability, decadal climate variability, the annual cycle, climate change, remote ocean basins)
- A (simplified) decadal prediction system for the Pacific
- Increased understanding of climate variability and change and climate processes in the South Pacific
- Improved ability to simulate Pacific climate
- A trained younger generation of researchers

To help progress these the panel has set up four legacy focus groups with defined activities.

Particular issues raised for the SSG were:

- (1) Strong endorsement by the panel for the Southwest Pacific Ocean Circulation and Climate Experiment (SPICE – see later) with a request to the SSG for overall CLIVAR endorsement.
- (2) A request to establish a co-chair for the panel with an observational background (taken under membership issues).
- (3) SSG endorsement (agreed) of the panel's proposal to re-focus limited resources on achievement of major legacies.

In discussion, Prof Visbeck raised the question of the Pacific Decadal Oscillation, which didn't feature in the presentation. There was also discussion of how to best cover the Indonesian Throughflow. This is being covered at least in part by PACSWIN (the Indonesian ThroughFlow: PACific Source Water Investigation) which interacts with the Pacific Panel. Nevertheless, the SSG agreed:

Recommendation 30: Ensure CLIVAR coverage of Indonesian Throughflow and clarify relative roles of Pacific and Indian Ocean Panels in this area. Action: Pacific and Indian Panel chairs.

CLIVAR/GOOS Indian Ocean Panel

Dr Yukio Masumoto outlined the history of the panel, it's role in development of a sustained ocean observing system for the Indian Ocean (IndOOS), the current status of the system and aspects of climate variability over the region. Key issues for IndOOS are:

- Fishing vandalism – to combat which new designs of the moorings are being made to minimize the data loss
- Lack of enough ship-time - bi-lateral cooperation works well for the limited area system; however a "Resource Board" is required for the basin wide observing system
- High level review of IndOOS - To assess progress since the first review in 2005, IOP has asked a second High-Level Review of IndOOS to be convened at the next IO-GOOS annual meeting in Dec. 2007 at which IOP will propose formation of the suggested Resource Board. Dr Masumoto requested endorsement by the CLIVAR SSG for this review which would accelerate the establishment of the Resource Board.

Recommendation 31: The SSG encourages IOP proposal for a Resource Board for the region and recommends they develop an implementation plan for ship time to maintain the long term observing system of IndOOS. Action IOP co-chairs

Dr Masumoto also outlined areas where the work of IOP is relevant to the JSC's cross cutting topics. In particular he raised the prospect of a coordinated study and intercomparison of the predictions of the 2006 and 2007 IOD events between IOP and AAMP. He noted that endorsement by the SSG might help with establishing financial support for the activity.

Recommendation 32: SSG endorses coordinated study and intercomparison of the predictions of the 2006 and 2007 IOD events, started between IOP and AAMP. Action: IOP co-chairs

Finally, Dr Masumoto outlined progress in regional field studies and the panel's links to IGBP projects through the Sustained Indian Ocean Biogeochemical and Ecological Research (SIBER) project.

Dr Marty Hoerling noted that the Indian Ocean is a poster child of climate change. He asked whether the panel was looking at the well established climate change SST signal in the Indian Ocean and its effect on monsoons and global climate. In encouraging this, Prof Visbeck noted that it is important for the panel to broaden its scope to these sorts of issues. There is a need to link across panels – in this case IOP, AAMP, VACS and the Pacific Panel - to progress work on climate variability and change.

CLIVAR/CliC/SCAR Southern Ocean Region Panel

Dr Ian Renfrew presented the panel's activities covering the Southern Ocean Observing System and its development post IPY that is being led by SCAR; regional climate indices and ongoing process studies (including the need for better determination of surface fluxes and the need to push for enhanced air-sea flux observations from resupply and other ships). The presentation ended with a summary of issues and challenges for the panel and its anticipated legacy. Immediate legacy activities include:

- Defining the needs and requirements of a sustained observing system for the Southern Ocean through input to SOOS. These requirements to feed to OceanObs09.
- Contributing to an Antarctic reanalysis effort.
- Building a connection between CLIVAR and carbon cycle science.
- Developing a plan for an integrated IPY synthesis. IPY will generate an unprecedented amount of data in the region, which ought to be assimilated into synthesis/reanalysis products.

In discussion, Dr Palmer asked for clarification of the major science questions the panel is tackling (these include issues such as the dynamics of the Southern annular mode, ice sheet stability and the representation of Southern Ocean processes in climate models) and how it ties across to other panel activities. Prof Visbeck asked if the panel is capturing the issue of Southern Ocean mode changes and the implications for ocean ventilation. Dr Henderson-Sellers suggested talking to the WCRP Working Group on Surface Fluxes in connection with the surface flux issues raised.

Monsoon and African Climate Variability Panels

Asian-Australian Monsoon Panel (AAMP)

Professor Bin Wang began his presentation with a focus on AAMP contributions to the WCRP cross cutting topics. AAMP is working together with GEWEXMAHASRI, co-chairing the planning of the Asian Monsoon year'08 (now Asian Monsoon Years 07-11) as a component of the WCRP International Monsoon Study (IMS) – see below, also. From a seasonal prediction perspective, AAMP organized the monsoon session at the WCRP Seasonal Prediction Workshop in Barcelona (see under WGSIP below) and has endorsed and is working with the planned THORPEX/WCRP Year of Tropical Convection.

Key areas of AAMP activity are: intraseasonal variability (ISV) and predictability; interannual variability (IAV) and predictability; monsoon modelling; dynamic seasonal predictions; interdecadal variations (IDV) and ACC; and observing and monitoring.

Prof Wang illustrated various aspects of AAMP's engagement in these areas and also summarized the outcomes of AAMP-8 (February 2007). A key issue for the future is the need for high resolution for monsoon prediction.

AAMP is currently collaborating with START MAIRS (Monsoon Asian Integrated Regional Study), IPRC and APN on an 'Institute' on "the Asian monsoon system: Prediction of change and variability" to be held in Hawaii in January 2008. AAMP, through Bin Wang's participation, is also participating in the PAGES Working Group on Global Monsoons (see under the CLIVAR/PAGES intersection also). Prof Wang ended his presentation with AAMP's expected legacy at the end of CLIVAR, including organised intercomparison projects and the outcomes of AMY. The SSG noted that AAMP is planning its 9th panel meeting in conjunction with the WMO 4th International Workshop on Monsoons (IWM-IV) in late October 2008 to be hosted by China in Beijing.

In discussion, Dr Palmer picked up on the issue for high resolution modelling of the monsoons which he regards as important, whilst Professor Roberto Mechoso sought clarification of AAMP's science achievements overall.

Variability of the American Monsoon System (VAMOS)

Dr Hugo Berbery outlined the key components of VAMOS covering the North American Monsoon Experiment (NAME) and the Inter-Americas Study of Climate Processes (IASCLIP), La Plata Basin activities, the Monsoon Experiment in South America (MESA) and the VAMOS Ocean-Cloud-Atmosphere-Land Study (VOCALS).

Amongst other successes, NAME has demonstrably accelerated transfer of research into operations while improving the value of forecasts to regional stakeholders through the NOAA Climate Test Bed. In terms of the future of NAME, diagnostic and modeling studies, particularly those based on the NAME04 field campaign, will continue for the next few years and will help motivate needs for sustained observations and additional process studies. While plans are to develop a transition from NAME Tier 3 studies to IASCLIP, there will be aspects that IASCLIP will not cover. In addition, representation of the North American Monsoon System in pan-WCRP monsoon activities is expected. The future activities and functioning of the NAME SWG are currently under discussion.

The research program for IASCLIP is envisioned as one that bridges the gaps between climate research for North America (NAME/CPA) and South America (MESA/SALLJEX/LPB) and for the Pacific (TEPPS, EPIC, VOCALS) and Atlantic (AMI, AMMA). The objectives of IASCLIP are to:

1. Improve the understanding of climate processes in the IAS region key to the multiscale variability and predictability of rainfall in Americas.
2. Contribute to model improvement for prediction of multiscale rainfall variability in the Americas
3. Facilitate capacity building in the IAS region for societal benefit from advancement of climate studies and forecasts

A draft science and implementation plan for IASCLIP has been reviewed by VAMOS and is being revised. A recommendation on VAMOS involvement with IASCLIP will be made once that is received.

The La Plata basin (LPB) activity which is joint with GEWEX is addressing floods and droughts, predictability and climate and land use change impacts in the region. Implementation is currently under way.

MESA milestones and deliverables were briefly presented, as set out in the MESA Science Plan. Dr Berbery also outlined the goals of VOCALS, noting that the VOCALS Regional Experiment would take place in the SE Pacific in October-November 2008. The modelling group for VAMOS were also working under Dr Kirtman to complete the VAMOS modelling plan. The VAMOS legacy would include:

- Special issues of international scientific journals. Many related articles have been or are being published independently of the special issues
- Legacy datasets from different VAMOS Field Campaigns.
- Model parameterizations and skill forecast improvements by using field data and state of the art data assimilation (available from public web sites)
- Better knowledge of the diurnal cycle of rainfall in the VAMOS region
- Improvements in weather, climate and hydrological forecasts and in prediction of weather extremes in collaboration with the NMHS
- Improvements in the observational network, monitoring and data access in NAMS and SAMS region, in collaboration with the NMHS
- Implementation of recommended changes to operational climate prediction systems to improve the skill of warm season precipitation forecasts of the NAMS
- Training and capacity building in interaction with IAI, START and regional agencies
- Outcomes of interactions with other WCRP, IGBP and ESSP initiatives.

In discussion, and in the context of VOCALS, Prof Visbeck reminded the SSG of the legacy of EPIC which had not featured in the presentation but which was an early CLIVAR success in the Eastern Pacific region. There was discussion also of VAMOS as a regional CLIVAR effort and of the role of the American monsoon systems in the overall global circulation. Accordingly the SSG agreed:

Recommendation 36: Request VAMOS co-chairs to seek to broaden scope of VAMOS activities ensuring it maintains a global view and develops more global linkages as part of strategic direction. Action: ICPO, SSG co-chairs

Variability of the African Climate System (VACS)

Dr Chris Reason summarized progress by VACS since SSG-14, including:

- Ongoing development of WCRP-CLIVAR African Climate Atlas.
- The VACS East African programme Lake Victoria project.
- The VACS Climate Prediction workshop, Dar es Salaam, July 2006 which trained 30 operational scientists from NMS's and ocean agencies from 20 African countries in the Climate Predictability Tool (CPT) software.
- A workshop funded by the UK's Royal Society /and the South African Government (NRF) on GIRAFFE (reGionally IntegRated southern AFrican climate and Forecasting for society), described in detail in the presentation.
- Publication of a special issue of CLIVAR Exchanges on AMMA (instigated by Chris Thorncroft, a former co-chair of VACS).
- The Africa breakout session organised by VACS at the WCRP Seasonal Prediction workshop, Barcelona, June 2707.
- The Young African Scientists' Day at JSC Zanzibar organised by VACS. Outcomes include special issue of *Int. J. Climatol.* (10-12 papers) and entrainment of young scientists in GIRAFFE and East African programmes
- A 2006 BAMS article.

- Africa sessions at conferences organised by VACS members – eg that planned for AMS, January 2008 in New Orleans by Kerry Cook.
- VACS hosting of IOP4 at SA Weather Service to develop interactions with the IOP.

Dr Reason reminded the SSG that Africa should not be just viewed from the perspective of its monsoon system. Rather it is a vast continent with distinct regional climate processes and impacts that include monsoons. Despite very limited resources, VACS has made significant progress. For Africa, adaptation to climate change and variability is vital: there is an information gap on decadal timescales, Progress with VACS largely depends on the enthusiasm of a small group of individuals, crucial help from WCRP and external funding. The challenge is to extend this enthusiastic small group to a much larger network throughout Africa and worldwide.

In discussion, Dr Richard Washington noted that the impacts community has weighed in heavily for information out to the 2025 timescale. The World Bank and others are making key efforts from a climate perspective. One issue is whether a methodology can be developed to bridge from seasonal to multi-decadal timescales. In response to a question about VACS involvement in the TFSP experiment (see below under WGSIP), Chris Reason felt that this was unlikely to be the case due to a lack of resources. However Lisa Goddard reminded the SSG that IRI is participating in the TFSP experiments which may be one route for engagement. Valery Detemmerman also noted the possibility of involving the South African Weather Service.

Climate change detection, observations and synthesis panels

Global Synthesis and Observation Panel (GSOP) and the OceanObs'09 Symposium

GSOP activities were covered by Dr Detlef Stammer who described the areas where GSOP contributes to the WCRP cross cuts including GSOP's encouragement of a special IPY period ocean synthesis. A major obstacle to this is assimilation of ice data and GSOP requested SSG agreement to include a CliC representative on the panel to assist here (agreed). Dr Stammer also outlined the work of the International Hydrography Advisory Group (now the IOCCP/SOLAS-IMBER/CLIVAR Global Ocean Shipbased Hydrographic Investigations Panel, GO_SHIP) which had arisen from the discussions at the International Hydrography workshop, held in Shonan Village, Japan, in November 2005. In this context, the SSG agreed:

Recommendation 24: Arising from the International Hydrography workshop, held in Shonan Village, Japan, in November 2005, a GSOP recommendation to agree renaming of the “CLIVAR/Carbon Repeat Hydrography Programme” to “International Repeat Hydrography and Carbon Programme” is accepted by the SSG. Action: Stammer to feed back to IOCCP.

Dr Stammer also gave a comprehensive overview of progress with ocean synthesis and it's evaluation which some 20 groups are participating in. He described the outcomes of the 1st Ocean Synthesis Evaluation Workshop organised with GODAE and held at ECMWF from 31 August to 1 September 2006. A second workshop is being organised at MIT from 24-25 September 2007. GSOP's legacy at the end of CLIVAR was seen as:

- An integrated mechanism for planning and collection of hydrography data, in association with the carbon community.

- Climate data stream
- Sustained ocean synthesis capabilities, possibly in coupled ocean-atmosphere-ice models.
- Capabilities to initialize ocean-atmosphere-ice coupled models through ocean syntheses to improve decadal predictions.
- Synthesis products

To entrain experience in ocean carbon synthesis, GSOP suggested including an expert on ocean carbon on the panel; they also requested SSG agreement to entraining a member with data management expertise. In agreeing to these requests, the SSG also agreed:

Recommendation 25: Noting engagement of Japanese scientists in coupled reanalysis, the SSG recommends an appropriate individual be invited to GSOP membership. Action GSOP co-chairs.

Later in the meeting, Dr Stammer also briefed the SSG on the planning for OceanObs'09 to be held in Venice in September 2009 with support from ESA in particular and jointly organized by OOPC and GSOP. A Science Steering Committee was being set up for which an initial set of candidates had been identified. Engagement by the basin panels in particular and across CLIVAR more generally would be crucial. The SSG were fully supportive of the OceanObs'09 proposals and agreed:

Recommendation 23: Recognizing that completion of deployment of the initial global ocean observing system for climate and sustaining this system for the foreseeable future is essential to attainment of CLIVAR's objectives, the SSG fully endorsed the efforts to conduct an OceanObs/Info09 Symposium. The SSG suggested that the symposium should build on the format and success of the OceanObs99, by demonstrating the successes following that first symposium, illustrating the importance to society of the information that can be obtained from the observations and presenting a road map for the next generation of the system based on community developed white papers on what is feasible and most important. The SSG asked that CLIVAR Panels and Working Groups work with the organizers to ensure that the role(s) of CLIVAR science and scientists are fully presented.

Action: CLIVAR Panels and Working Groups in consultation with Harrison/Stammer.

CCI/CLIVAR JCOMM Expert Team on Climate Change Detection

As described by Dr Francis Zwiers, the ETCCDI provided key inputs to the IPCC AR4. These had arisen from the 5 regional climate change capacity building workshops the group had previously sponsored in various parts of the world, backed by portable software tools enabling blank spaces in the previous IPCC extremes analysis to be filled in. A workshop had recently also been held in the Congo (April 2007), a further workshop will take place in Vietnam (November 2007) and one for the West Indian Ocean is in the proposal stage. Current activities include: ongoing development of ET website; publication of software, documentation, indices; development of an expanded range of indices and an indices review paper; plans for a WMO Guidance document on extremes in non-stationary environments; a document on homogenization providing a collection of typical examples; and inputs to WGCM planning and to other groups. Dr Zwiers concluded with an outline of other recent detection work.

In discussion, Prof Visbeck noted a lack of information on ocean indices on the ETCCDI website, contrasting this with what is found on the OOPC site. In response, Dr Zwiers pointed out that that much of what is on the website is a product of the last Commission for Climatology (CCI) cycle, JCOMM have recently signed up to membership of the ETCCDI and will be seeking to expand the range of indices to include those for the ocean. Dr Stammer commented that GSOP are also covering ocean indices. There needs to be some overall coordination of effort therefore:

Recommendation 39: ETCCDI is requested to seek to provide wider range of indices on their website to cover both atmosphere and ocean indices and to take the lead in coordinating CLIVAR indices efforts (including those by CLIVAR Panels) with those of OOPC and others as appropriate. Action: Zwiers with ETCCDI members.

CLIVAR/PAGES (IGBP Past Global Changes) Intersection

Dr Thorsten Keifer (PAGES Office) provided an overview on CLIVAR/PAGES on behalf of the co-chairs. The overall goal of the CLIVAR/PAGES intersection is to improve the understanding of decadal to centennial climate variability. The CLIVAR/PAGES panel had last met in Victoria, Canada in November 2004 when it had produced a “vision statement” setting out a programme for the coming years based around a series of workshops to link the modeling and data communities in particular. Since then a joint edition of the PAGES Newsletter and CLIVAR Exchanges on “Climate Forcings” had been produced (January 2006) and a workshop held on “Past millennia climate variability: Proxy based reconstructions, modeling and methodology – synthesis and outlook” (Wengen, Switzerland, June 2006) This had resulted in ideas for a synthesis paper, a proxy data uncertainty workshop and a paleoclimate reconstruction challenge activity, now underway. In addition a session on “Abrupt climate change” had been held at association the RAPID Climate Change Conference, Birmingham, October 2006. PAGES also co-sponsored a MedCLIVAR (see below) workshop on “Past climate in the Mediterranean and the Middle East” in Spain in November, 2006. Plans are now well advanced for a CLIVAR/PAGES workshop on “Reducing and representing uncertainties in high-resolution proxy climate data” to be held in Trieste, Italy from 9-11 June 2008. Dr Kieffer also suggested that it would be opportune to have a meeting of the CLIVAR/PAGES panel to review and adjust the vision statement and forward plan.

Global monsoons form a further PAGES focus and there is potential for interactions with CLIVAR monsoon panels here. A “Town Hall meeting” took place at the CLIVAR-cosponsored 3rd Alexander von Humboldt Symposium on Asian Summer Monsoon in Beijing, August 28, 2007 and the PAGES Global Monsoon Working Group will have it’s 1st workshop 2008 in Shanghai. Dr Kieffer also proposed a further joint newsletter edition in the 2009 timeframe.

In discussion, Prof Visbeck asked if we still need CLIVAR/PAGES which was originally set up as a bridging group – can we claim success and declare it has done its job? However, following discussion of the status of CLIVAR/PAGES, the SSG agreed:

Recommendation 42: Continue CLIVAR/PAGES noting major membership turnover in 2008. Action (on membership): CLIVAR/PAGES co-chairs, ICPO.

Modelling Panels

Working Group on Seasonal to Interannual Prediction (WGSIP)

Dr Ben Kirtman outlined the outcomes of the June 2007 CLIVAR-organized WCRP Task Force on Seasonal Prediction (TFSP) Seasonal Prediction Workshop, which attracted 180 attendees from 30 countries. Dr Kirtman also introduced the workshop consensus statement with a request for comments from those attending the SSG meeting. The workshop was also the opportunity for announcement of the WCRP TFSP Seasonal Prediction Experiment (now the Climate System Historical Forecast project, CHFP), which WGSIP now takes responsibility for coordinating. Pan WCRP involvement in the experiment, through diagnostic sub projects in particular, will provide an important component. A further critical issue is that of data management and accessibility. The experiment will encourage assessment of seasonal predictability with respect to a changing climate using IPCC class models (interaction with WGCM) and the testing of weather prediction models on seasonal timescales (interaction with THORPEX). WGSIP is also engaging with WGCM in proposals for decadal prediction experiments under the WCRP's decadal cross cut. In terms of the legacy of WGSIP, Dr Kirtman cited the following:

- Numerous well cited papers, reports and comparison projects – ENSIP, Nino3.4 forecast comparison, QJRMS issue on Seasonal Prediction
- WCRP Statement on Seasonal Prediction – promotion of multi-model activities; standards for seasonal prediction research
- Comparison projects - data sharing – SMIP/SMIP2/HFP/TFSP data
- Decadal prediction and predictability

In consideration of the WGSIP report, the SSG agreed:

Recommendation 16: SSG attendees to provide feedback on the WCRP Workshop on Seasonal Prediction (Barcelona, June 2007) Position Paper within 1 week (deadline formally 15 September 2007). Action: All

Recommendation 17: Seek greater GEWEX, CliC and SPARC participation in WGSIP activities, particularly with respect to the TFSP experimentation. with ICPO. For example, the SSG encourages SPARC to develop their proposal for numerical experiments with appropriate stratospheric resolution to explore potential seasonal predictability arising from stratospheric processes/dynamics. Action: Kirtman, with ICPO

Recommendation 18: The SSG encourages all panels to assess the outputs of the TFSP/WGSIP Seasonal Prediction Experiment

Working Group on Ocean Model Development (WGOMD)

Dr Ann-Marie Treguier, on behalf of Dr Stephen Griffies, described progress by WGOMD including the outcomes of the 7th meeting of the group in Bergen (August 2007), the design of and progress with the group's Coordinated Ocean Reference Experiments (COREs) and ocean metrics. Considerable progress had been made with CORE-1 (500 year spin-up with repeating "Normal Year Forcing"). Seven modelling groups are contributing to the project with three ocean model classes (geopotential, isopycnal, hybrid). A paper on the results is in preparation with 21 authors from 11 institutions. WGOMD is now turning its attention to the CORE-II experiment (Hindcast type experiment with forcing varying from 1958-2004. Experiments have already been performed by NCAR and the DRAKKAR consortium. Collaboration with the Pacific Panel on additional sensitivity experiments to determine dominant sources of error in the simulations is being explored.

Ocean metrics are being developed by Hadley Centre, GSOP, GODAE, PCMDI and others and the question arises as to how we can merge community efforts to a common standard. WGOMD intends to work to propose a suitable set of ocean metrics for model evaluation acceptable to the community, and in particular of use for AR5. WGOMD has also started to set up a **Repository for Evaluating Ocean Simulations** (REOS) to provide a digested summary of metrics, datasets, etc, with comments and recommendations.

Key contributions of WGOMD to date include:

- A review paper which pedagogically documents state-of-art in ocean climate models (Griffies et al (2000))
- Workshops: Topical workshops that facilitate collaboration, communication, and education
 - Princeton/GFDL 2004: State-of-art in Ocean Climate Modelling
 - Hobart/CSIRO 2005: Southern Ocean Modelling
 - Bergen 2007: Numerical Methods for Ocean Models
- CORE: Benchmark experiments for global ocean-ice models.

In discussion, Dr Palmer asked when CORE-II data will be made available to the community. A key issue here is that, whilst some runs are available, there is no identified data repository as yet. Data are distributed on disk at present but the group are going to test ways of data transmission over the web (annual means, for example, are certainly possible). WGOMD would certainly welcome requests for data from panels.

Recommendation 21: To help scope issues of CORE-II data exchange, the Basin Panels are requested to identify likely requirements for regional analysis of data from these runs. Action: Basin Panel chairs, WGOMD, ICPO.

On interactions between WGOMD and WGCM, the SSG agreed:

Recommendation 22: The SSG identified a need for enhanced communication between WGOMD and WGCM to ensure in particular that WGOMD is responding to WGCM needs for advice and science input on ocean modeling. The two groups are encouraged to develop a joint strategic vision to take this forward. Action WGCM and WGOMD co-chairs.

JSC/CLIVAR Working Group on Coupled Models (WGCM)

Dr Jerry Meehl provided an update on WGCM activities based on the discussions at the WGCM meeting in Hamburg, Germany in September 2007. He covered:

Coordinated experiments (CMIP4) to address (a) carbon cycle climate feedbacks (b) decadal prediction (c) new mitigation/adaptation scenarios. Two classes of models will be used to address the two time frames and two sets of science questions:

- A. Near-Term (2005-2030) - higher resolution (perhaps 0.5°), no carbon cycle, some chemistry and aerosols, single scenario. Science questions range around the issue of decadal prediction, e.g. the role of observed initial ocean conditions on the 25 year time scale, potential for prediction of regional extremes etc. A (WGSIP/WGCM) sub-group is developing details of the experimental design (led by G Hegerl and T Stockdale, with M Giorgetta, J Murphy, M Kimoto, R Stouffer, J Meehl)

- B. Longer term (to 2100 and beyond) - lower resolution (roughly 1.5°), carbon cycle, specified or simple chemistry and aerosols, benchmark stabilization concentration scenarios. Science questions concerned include feedbacks, long term climate change

Climate model improvement - cloud climate feedbacks (CFMIP2) and metrics quantifying climate model performance

Regional information (regional models, downscaling, impacts).

Paleoclimate (PMIP2)

Emerging issues, in particular those regarding ice sheets and sea level, extreme events and air quality and climate change.

Dr Lisa Goddard questioned whether, in the context of decadal prediction, ocean models are good enough to answer the question of whether initialization matters. Dr Meehl agreed the importance of this question emphasizing that what WGCM is providing is a coordination framework. The key is not to be too prescriptive so that different approaches can be tested. In response to Dr Stammer he noted that the most serious problem for ocean initialisation is the quality of the salinity field and whether we know it well enough to provide initial conditions for the MOC. In response to a comment by Dr Palmer, the SSG agreed:

Recommendation 19: Seek to engage increased CLIVAR representation on WGCM/WGSIP group designing “short term (2005-30)” prediction experiments from e.g. GSOP. Atlantic Panel and SSG (Palmer). Action: Meehl.

The SSG also agreed:

Recommendation 20: Work with WCP to determine user requirements for decadal-timescale prediction. Action Palmer, in consultation with WCP (Kolli).

CONTRIBUTIONS FROM NATIONAL PROGRAMMES

US CLIVAR

Dr Marty Hoerling, US CLIVAR Chair gave the presentation on US CLIVAR. In doing so he noted that science foci are increasingly being motivated by interactions with service and decision making communities. In this context, US CLIVAR has identified two major foci. These are on (a) drought and (b) decadal variability/prediction. Dr Hoerling described the US CLIVAR coordinated activity DRICOMP (DRought In Coupled Models Project). This aims at assessing (i) the roles of the oceans and the seasonal cycle in drought, (ii) the impacts of drought on water availability, and (iii) distinctions between drought and drying. One question was whether international CLIVAR could catalyze and/or coordinate a similar activity amongst the wider international community. Dr Hoerling then explained the rationale of the US Drought Working Group, which has a role in coordinating evaluations of existing model simulations of drought and suggesting new ones. He also briefed the SSG on the US National Integrated Drought Information System (NIDIS).

Dr Hoerling then turned his attention to the US CLIVAR focus on decadal variability noting that understanding the predictability of, and predicting, decadal climate variations and changes are now viewed as critical research frontiers. Within the US,

predictability of the AMOC is now the focus of a special programme whilst US CLIVAR is considering spinning up a Working Group on decadal. In terms of developing CLIVAR legacy, Dr Hoerling provided the following suggestions:

- **Provide synthesis and assessment on the known causes for and predictability of drought**
 - NIDIS is looking to the scientific community for *annual updates*, and seeking routine expert appraisal of predictability/predictions and products.
- **Motivate and enable a science-based risk assessment of drought and its impacts.**
 - Interface with service community to understand decision community vulnerabilities to drought: develop drought risk assessment for regional, monthly to centennial time scales.
- **Elucidate phenomena having decadal scales**
 - Ocean flywheel? Establish relevance for climate.
- **Clarify observing system needs for monitoring and detecting decadal phenomena.**
 - Identify the essential state variables.
- **Determine predictability of decadal phenomena.**
 - What are the predictors?
- **Making decadal climate predictions/projections**
 - Toward an integrated Earth System analysis

In discussing Dr Hoerling's presentation, the SSG saw a clear opportunity for engaging with US CLIVAR in a wider activity on drought based on the US CLIVAR model. Prof Visbeck pointed to the usefulness of information (through the CLIVAR/PAGES activity) on historical droughts to provide perspective to what we see now. It was also suggested that there may be an opportunity for engaging with WCP in this area. Overall the SSG agreed:

Recommendation 41: In response to the request for international CLIVAR engagement on drought, linking to current US CLIVAR efforts in this area, the SSG recommended the following steps: (i) An article in Exchanges inviting international participation in the US CLIVAR activity; (ii) Information on the US effort, with links, to be sent to all CLIVAR Panels and Working Groups to heighten awareness and encourage international participation, building on existing activities identified by C Reason, L Goddard and J Marengo; (iii) Seek to link with GEWEX efforts in this area, exploring the potential for a joint edition of CLIVAR Exchanges/GEWEX News; (iv) Explore potential involvement of WCP to build linkages to users, e.g. Drought Monitoring Centres. Action: US CLIVAR, ICPO.

Japanese activity on CLIVAR

Dr Tatsushi Tokioka summarized some of the work of the Japanese Frontier Research Center for Global Change (FRCGC), JAMSTEC, contributing to CLIVAR. A Japanese WCRP web site has been opened to inform policymakers of WCRP research activities in Japan (<http://www.jamstec.go.jp/frcg/wcrp/wcrp/index.html>). Dr Takioka outlined current projects on global warming which includes work on the Earth Simulator. He also illustrated some of the work at JAMSTEC on the MJO, including the MISMO field experiment, and JAMSTEC's contributions to HARIMAU and GEWEX/MAHASRI. Finally he described work on the Kyousei Integrated Synergetic System Model of the Earth (KISSME), integrated research on climate

change scenarios to increase public awareness, the JAMSTEC data integration and analysis system, DIAS, and efforts being carried out on seed migration in a changing world.

PLENARY DISCUSSION SESSION – ROAD MAP AND CLIVAR FUNDING AND ORGANISATION

At this stage of the meeting the SSG agreed the desirability of bringing forward the plenary discussion scheduled under agenda item 7. Dr Cattle provided the meeting with a presentation on the background, development and structure of the CLIVAR Road Map (see www.clivar.org/organization/ssg/ssg14/ssg14.php) resulting from CLIVAR SSG-14 (Buenos Aires, April 2007) including the issue of the legacy of CLIVAR addressed as part of the Road Map development.

In discussion of the Road Map and CLIVAR legacy, Dr Zwiers suggested that CLIVAR engage in an IPCC-like assessment of the CLIVAR domain, posing questions for future research. He suggested doing this in a way which would complement the 5th IPCC assessment with a 20 page summary for policy makers and making the case for future support of climate research based around the concept that better science would help spend on adaptation to change more effectively. The aim would be to integrate the current Road Map into a single product. On the other hand, Dr Hazeleger saw the report of the “Learning from IPCC meeting” (Sydney, 2007) as providing the Road Map for WCRP. It was also noted that the CCSP report on free atmosphere temperature change, produced parallel to the IPCC AR4 process had been seen as very useful. CLIVAR might be able to learn from this. Dr Gruber also pointed to a need to make more mention of the overall move within the climate community towards an Earth System perspective.

Dr Cattle then appraised the SSG of the WCRP’s current funding situation and its current consequences for its projects, including CLIVAR. So far as CLIVAR was concerned, its core funding for 2008 will be some 25% of previous levels. CLIVAR also had a share in the funding allocation for the cross cutting projects it manages but this funding has to be used for spend against cross cut activities. However if we take this into account, the total funding allocated against the CLIVAR line in the WCRP budget is still only some 40% of historical values. Future funding levels do not at this stage look any promising. This raises the question as to whether CLIVAR should reorganise or rationalise (reduce) its total number of panels and working groups.

Dr Cattle reviewed a number of possible options for the future structure of CLIVAR structure. These included:

- Keeping the present structure
- Agreeing to terminate CLIVAR early
- Reducing the number of panels by closing some
- Compressing panels into a smaller number (e.g. single ocean panel)
- Reorganizing around the set of CLIVAR Science Themes agreed at SSG-13
- Reorganize around JSC cross cuts.

In discussion of this presentation, the SSG showed a broad overall reluctance to respond to the WCRP financial situation through a reorganisation of CLIVAR structure. Dr Washington noted that reorganisation would undoubtedly lead to a loss of production and suggested that panels are given a chance to raise their own funds. Dr Kirtman pointed to the time it had taken to reorganise US CLIVAR; the timeline for

CLIVAR is not as long as when US CLIVAR was reorganised. Rather we need to be practical and think of how we can work within our current framework. Dr Wengie Dong agreed. Dr Palmer noted that if there is a 5th IPCC assessment the groups would have to be active until at least 2011 implying that it would be wrong for CLIVAR to “wind down.”

As part of the discussion, Prof Visbeck suggested CLIVAR adopt the following approach and strawman timetable in terms of structure:

Year	Phase	Activities
2008	normal	Last time ‘projects’ are approved Last time panels change members
2009	normal	
2010	normal	CLIVAR-Summit
2011	synthesis	Panels move to new ‘home/sponsor’ SSG-remains to the end
2012	synthesis	
2013	synthesis	Farewell-Symposium

The CLIVAR Summit (2nd CLIVAR Science Conference) would focus on how to capitalise on the investment in CLIVAR science rather than having a focus on legacy per se. As the “high point” of CLIVAR it would need to be before the project ends. The Barcelona Seasonal Prediction Workshop provides one example of how it might be run. The idea of a CLIVAR assessment was also picked up in the discussion. The question was what sort of assessment? Several people supported the concept outlined by Dr Zwiers who felt that an assessment was preferable to a large conference, or should at least feed into it. Dr Harrison pointed out that such exercises are most successful when setting out a pathway whilst Dr Legler pointed out the example of OceanObs’99. However it is an immense effort in terms of time to engage with the whole community. Dr Goodison pointed out that the cost of a full assessment could be very high – ICARP had cost some \$750k for example. Dr Mechoso suggested making assessments through the panels, including scoping of new ideas. Dr Legler suggested that panel assessments could be used as input to the Summit, showing the way forward. Topic areas could be on, e.g., understanding of decadal variability, the health of global monsoons ... They should demonstrate the achievements of panels and working groups and identify the big questions.

The SSG also recalled that World Climate Conference-3 would be taking place in 2009. Having the Summit the year after may be too soon. It would be best to move the date of the Summit in the above table down a year or two later. The SSG felt that CLIVAR should have a substantial presence at WCC-3. It was noted that Professor Ramaswamy was representing WCRP on the organising committee for WCC-3 and that seasonal prediction was currently a key theme, which is why CLIVAR presence is essential. The extension to shorter and longer (decadal) timescale prediction was also raised.

During the discussion, Prof Visbeck also raised the issue of what the future WCRP structure will look like which is as yet unknown. One model, suggested by Drs Palmer and Kirtman was that of US CLIVAR. However there were arguments against adopting this for WCRP overall for which regional coordination might be important. Dr Goodison suggested the projects go to the JSC with a collective plan on what the future WCRP might look and how the projects might transition to it, providing a unified voice and vision. There was general support for this approach and for joint action between the projects to facilitate it. Dr Goodison further suggested

that the Montreal IAMAS meeting might provide an opportunity to sound out the community on any proposals.

As an outcome of the overall discussion, the SSG agreed:

Recommendation 1: Not to restructure CLIVAR in response to the announced reduction of WCRP funds for 2008. The Group felt that it was essentially too late to make a major organizational change which would disrupt progress and that it would be better to leave the structure as it is out to the 2010 timeframe at which time the project would be reorganized to accommodate a final analysis and assessment phase. It was recognized that severe cuts in WCRP funding mean that WCRP support for meetings will be minimal. Panels and Working Groups will be required to seek other support for meetings, with help from the ICPO, and to seek to reduce costs by arranging meeting in the margins of Workshops/Conferences.

Recommendation 2: SSG to provide guidance on allotment of funds for meetings. Criteria to include degree to which panel interactions will be engaged in as well as the JSC requirement that funds be used for “real outcomes”. The ICPO and V Detemmerman to prepare an analysis if current requests for SSG consideration. Action: Detemmerman, SSG, ICPO

Recommendation 3: CLIVAR to seek major presence at the 2009 World Climate Conference-3 (WCC-3), initially through a letter to Prof V Ramaswamy. Action Palmer

Recommendation 4: SSG co-chairs to write to the Chair and vice Chair of the JSC summarizing SSG concerns about the urgent need to develop a vision for WCRP beyond the sunset dates of the current projects, and emphasizing that this needs to be developed in time to take the opportunity of WCC3 to vet views for the future. Action: SSG co-chairs, ICPO.

Recommendation 5: Seek to hold the 2nd CLIVAR Science Conference in 2011 with a final closure meeting in 2013. Begin search for sponsors and location immediately. Action: SSG, ICPO, Detemmerman.

Recommendation 6: Engage all CLIVAR panels and working groups in providing assessments of achievements and identification of major outstanding questions for input to the 2nd CLIVAR Science Conference. Action: SSG to scope remit; Panel and WG chairs, ICPO.

CLIVAR OUTREACH

The meeting next had a presentation from Dr Lisa Goddard on how CLIVAR can better develop its outreach and links to users. Malaria forecasts provide one example of climate risk management and climate applications. Dr Goddard emphasized the need to start with user demand, exemplified by the millennium development goals (MDGs), noting that reducing malaria would go a long way to meeting these. Of themselves, the MDGs need translating into national targets. One also has to have in place organizations and policies which will work to ensure positive outcomes – national, regional, international, e.g. health, met services etc. The last of these will have climate information, monitoring and understanding. There was also a task to help educate implementers and the general public. However resources are also needed as well as a method to diffuse information. A tacit knowledge of issues is

involved, namely public knowledge that climate drives malaria risk and that we can predict it. Dr Goddard emphasized that climate is indeed only one relatively small part of this enterprise. Further, in many cases, researchers are not doing the work on the applications of climate information but rather contributing observations, methods for prediction etc. CLIVAR could contribute as an “intermediary, as IRI does. The task is to train implementers to better understand climate and apply climate information. For example we need to show health professionals how to use ensemble outputs from climate models. Dr Goddard raised the example of the US CLIVAR Climate Prediction Applications Postdoc Programme (CPAPP). The CPAPP is aimed at placing PhDs in decision making institutions (DMIs) through partnering of these with the Climate Research Institute (CRI). Supervision of postdocs is joint between the DMI and CRI with the DMI paying half of the cost.

In the following discussion a number of ideas emerged, all involving WCP/CLIPS:

- For our own community:
 - Establish “best practices” (for e.g. seasonal to interannual prediction, use of climate change projections, climate downscaling). CLIPS is starting to produce such a document.
- Engage in outreach:
 - Seek participation in meetings of sectoral decision makers (noting the example of the US in relation to the science of drought) to show the importance of e.g the ocean’s role in climate and how much research is still needed. This might be another route to government in respect of justification for science funding.
 - Provide summaries for policymakers on CLIVAR science.
 - Through CLIPS activity, seek to develop education modules aimed at a wide audience. Help build a body of people who are not climate PhDs but work with climate, targeting undergraduate level.
- Links: trans-disciplinary visitors programme:
 - Build on the example of the US CLIVAR CPAPP but seek to broaden to an international context for which it was suggested that the scheme could be applied to visiting scientists, funded through donor agencies interested in applying climate science.
- Visual version of summary for policymakers
 - Powerpoint presentations, interactive exercises
 - State of science (could include history, future), methodologies, current debates, outstanding research questions
 - Include references and further reading from simple to technical.
 - Examples: WGCM – global modeling, climate change projections; Pacific Panel – ENSO, PDV; Atlantic Panel – THC, AMO, Decadal variability and the THC.

In the context of the last item, Prof Visbeck noted that the CLIVAR slide gallery had proved useful in the past. This could include simple slides on what we do with brief user-friendly descriptions of each – CLIPS could help here.

Dr Washington commented on the need to explore how climate information is used by the development community. We need to establish what questions they are asking. He suggested inviting a representative of that community to give a lecture at the next SSG.

Recommendation 11: Update CLIVAR slide gallery seeking inputs from panels and working groups for dissemination from the CLIVAR website. Include simple slides on what we do including text to accompany them. Seek guidance from CLIPS on provision of user-friendly text/captions. Action: ICPO

Recommendation 12: At least one of the lecturers for the SSG science lectures to be invited from the development community in future to help provide input on what climate-related questions they are asking. Action: ICPO in consultation with Dr Washington and SSG co-chairs.

BREAKOUT GROUP SESSIONS

During the meeting, the participants broke for a number of breakout group sessions charged with reviewing the position papers prepared for SSG-14 and the CLIVAR “Forward Look/Roadmap” in individual areas and identifying focused activities and key deliverables between now and the CLIVAR sunset date. The reports from these groups are summarized below.

Modelling Breakout Group

Dr McFarlane presented the outcomes of the modeling breakout group which had identified a large range of modeling challenges as follows:

- Seasonal prediction: Substantial progress has been made in WGSIP in assessing the state-of-art (c.f. the outcomes of the Barcelona Seasonal prediction Workshop. There is a continuing need to promote best practices in this area (use of multi-model ensembles, coupled models, probabilistic approach and in terms of model validation and calibration. The need to encourage follow-on experiments to the planned CHFP runs was reiterated to identify the role of cryospheric processes, land-atmosphere interactions and stratospheric influences on our ability to predict on seasonal timescales. Activities to test IPCC-class models in a seasonal prediction framework using simple “coupled” initialization are also being promoted by WGSIP as is the need to quantify systematic errors in seasonal predictions in the context of a changing climate.
- Intra- (sub-) seasonal prediction: Important contributions here are being made by the US CLIVAR MJO Working Group.
- Decadal prediction and predictability: Here the importance of initialization, a topic to be addressed by the planned WGSIP-WGCM decadal prediction experiments, is a key question as is how to do meaningful experiments to evaluate their impacts. WGOMD collaboration on this question could be valuable.
- Simulating/understanding modes of variability (MJO, ENSO, MOC, annular modes...): These are CLIVAR foundational issues. How such modes of variability might be affected by climate change is an increasingly important question that CLIVAR needs to continue to seek to address.
- Coupled Ocean-Land-Atmosphere-Cryosphere Initialization
- Seamless Prediction (and what we mean by it)
- Enabling Model Improvement: Understanding, quantifying model errors (e.g. “double ITCZ” problem)
- Challenges for ocean climate modelling? These include representations of deep water formation, overflows in models as well as

- understanding/validation of parameterizations: sensitivity/decadal variability of models with parameterizations compared with models with resolved eddies
- Metrics: One issue is whether CLIVAR should be more proactive in proposing metrics for model performance. WGOMD is seeking to do this for ocean modeling, developing a practical set of metrics for the evaluation of ocean models for climate prediction, building on work in GODAE and by others.
 - Resolution and (versus?) complexity (e.g. aerosol/cloud/radiation coupling) and length of runs.
 - Practical issues for data archiving/access : PCMDI enabled CMIP3 but may have limited additional capacity
 - CLIVAR modeling legacies: These include:
 - Contributions from WGSIP on seasonal predictability
 - WGCM repository of coupled model analyses (CMIP3 etc)
 - WGOMD - recommendations/consensus building on ocean model formulations for climate (e.g. vertical coordinates); protocol for performing hindcasts with ocean-ice models using atmospheric observations/reanalysis

In discussion of the modeling session report, a number of additional issues were raised. Dr Hoerling raised the issue of the low skills in rainfall prediction and the balance of attention to statistical/empirical vs dynamical procedures. In particular what is the evidence that CLIVAR brings to the table to establish the veracity of seasonal forecasts? Dr Kirtman pointed to the TFSP procedures and the strong need for international coordination for dynamical methods. That said there is no suggestion that empirical methods should not be used/developed. In terms of where CLIVAR needs its best practices mission, there was a clear drive to this at the Barcelona conference as well as a good historical base. Dr Palmer noted the success of recent ECMWF predictions of Atlantic hurricanes for which good prediction of ENSO was the key.

Dr Henderson Sellers asked if the group had considered downscaling and regional predictions. This was not discussed by the group but is a major emphasis for GEWEX. Prof Visbeck asked if CLIVAR is doing what is needed in the modeling sphere. Dr Kirtman pointed to the foundation for prediction of our understanding of natural modes of variability for which CLIVAR could take more credit. At present the important new thrust in front of the panels is decadal prediction for which the experiments on the table have a long way to go. There was a feeling that CLIVAR efforts in model development, a pan-WCRP effort that for CLIVAR meant developing both atmosphere and ocean models and their coupling, are not really surfacing. In this context Dr Hoerling reminded the SSG of the US CLIVAR Climate Process Teams which did not really have a counterpart in international CLIVAR. There was clear need for improving the representation of the diurnal cycle in models, especially in a monsoon context (cf the outcomes from the 1st pan-WCRP modeling workshop) and for assessing the observing system requirements from a modeling perspective. Though the WGSIP current membership doesn't have the expertise for this, it should perhaps lay something of the groundwork. Finally interactions with the applications community was raised for which making sure that the necessary model data are available is a key aspect.

ENSO and other modes of tropical variability (TV)

Dr Goddard reported on this group's deliberations. The group had reviewed that Road Map sections under this heading and were broadly content with them with the addition of the MJO and reduction of overlaps. Priorities which emerged was

building of the Indian Ocean array and the need to sustain the entire tropical observing system. From a modeling perspective the key issue is removal of tropical biases in models. This is key to the achievement of many milestones but progress has been slow and the way forward unclear. The Road Map does not articulate a clear direction here though somehow this needs to be done. From the perspective of capitalizing on investments, a need was also identified for:

- Documentation of the simulation and prediction tropical modes and variability and their impacts;
- Similar documentation in terms of observations
- Development of experimental decadal prediction in a tropical context, including coupled initialization research, as identified in the Road Map

In terms of outreach, the group recommended putting together summary slides and a summary for policymakers on ENSO, other modes of TV, tropical biases and how they impact on predictions etc.

In discussion, Dr Hoerling asked whether CLIVAR can show evidence of seasonal predictability beyond ENSO, a question related to the issue of limits of predictability, as Dr Kirtman noted.

Monsoons

Dr Washington summarized the monsoon breakout group's deliberations. It was suggested that there needs to be a unified point of reference for monsoons in CLIVAR to develop an integrated view of monsoons and the role of the oceans play in monsoon variability. This needs a concerted effort amongst the 3 monsoon panels and relevant ocean panels. Important issues include ENSO influences on the Asian Monsoon, WAM and East African Monsoon etc. Beyond CLIVAR, processes in common with GEWEX include land surface and aerosols. IGBP-PAGES also have relevant monsoon activities.

Three potential contributions from CLIVAR monsoon panels are:

- Test bed areas for model resolution, exploring sub-seasonal tropical variability (land surface, MJO, radiation etc). Does improved model resolution help with simulation of these features?
- Predictability: CLIVAR pan-monsoon effort could play a crucial role in assessing predictability in the monsoon regions. Regional panels have better knowledge of the dynamics and regions for assessment and could provide guidance. What are the specific features that are priority for prediction (e.g. onset)?
- What contributions can we give to the decadal predictability effort? What governs changing ENSO-monsoon relationships on decadal variability? What components are predictable?

There is also a need for develops in basic science (process studies) and for establishment of an agreed set of indices that can be used to study monsoons.

In terms of the Road Map, the group were conscious that a number of monsoon-related activities had moved on fast including the development of the concept of the Asian Monsoon Years (AMY) and the establishment of the monsoon cross cut by JSC-28 and which GEWEX and CLIVAR had been asked to lead. The group had

also reviewed the outcomes of the 1st pan-WCRP monsoon workshop and made some specific additions to the recent AMY Science Plan developed in Bali.

Though the group had no specific recommendations for rationalizing of monsoon panels overall, Dr Franco Molteni emphasised the need for a streamlined oversight process, where priorities should be set. Dr Palmer asked how well the monsoon panels are interacting. Prof Visbeck suggested that one way to help stimulate that would be for the monsoon panels to meet together at the same time and location with a day devoted to a joint meeting. Dr Washington felt that whilst the work of the panels should be dictated by the science questions, there were as yet no compelling questions as which tied the 3 panels together. Prof Mechoso suggested however that modelling provided one compelling issue for all.

Observations and Synthesis

Dr Stammer reported on this breakout group which had broken its task into 3 areas: ongoing observations, historical data streams and synthesis. Considering the ocean, for the ongoing data stream: concerted international effort is ongoing covering the CLIVAR+ years. The situation will be revisited during or before OceanObs09. Error information is much needed for individual data sets, but also for the quality of important climate variables. The best state of knowledge of climate indices also needs to be available. For the atmosphere, the data situation is surprisingly poor. The situation has been flagged and the international reanalysis community is working on it. The WCRP Observational and Analysis panel (WOAP) is keeping this under review. CLIVAR did play and is playing some role in fostering atmospheric reanalysis and should claim its share in the success. In addition, in WCRP, detection of extremes is driven by CLIVAR (with CCI and JCOMM) through ETCCDI which also has an influence on data collection for this task. Again, error information is much needed. Cryospheric observations lie in the realm of CliC. Discussion has to concern both IPY data and historical data. Data sharing, data archiving and data standards are of concern for IPY and have to be sorted out.

In terms of CLIVAR datasets, the group wished to motivate putting new resources into cleaning up historical data sets. They also suggested allocating Doi numbers for CLIVAR quality data sets (version numbers) and wondered about the need for quality protocols. They suggested using reanalysis results to identify data quality (residuals) with the same issues arising for both ocean and atmosphere. The group's view was also that process studies produce the few real CLIVAR data sets. They noted that data orphans from CLIVAR process studies have to be archived and suggested that basin panels should report on ocean process studies and availability of data sets in particular.

Recommendation 43: Survey fate of datasets from CLIVAR-endorsed process studies and whether these are freely available to the community. Provide links where needed from CLIVAR website. Action ICPO.

From the perspective of synthesis, CLIVAR, of course, supports joint physical/carbon syntheses (with IGBP and IOCCP). It also has a big role in documenting ocean changes and the group had suggested stimulating a design study for estimating carbon in the ocean every year.

DecCen/ACC

Dr Hazeleger began his group's report by reminding the SSG of some of the motivation for decadal prediction, namely its potentially large societal impact, in

particular for policy makers and potential usefulness for determining adaptation strategies. It presents a challenge in terms of determining the role of initial conditions for decadal predictability against the forcing provided by increasing concentrations of greenhouse gases. Caveats include the fact that there is no distinct spectral peak and the predictable signal might be small and spread large. Verification is a problem, as is the determination of initial conditions both in terms of lack of ocean data in particular and of the lack of coupled model assimilation procedures. In addition, models may not yet be up to the challenge with potential of model climate drift and model errors being especial problems. Nevertheless these shouldn't discourage us as there is much interesting physics involved in the topic to stimulate good science.

The group saw the role of CLIVAR in decadal prediction to facilitate, coordinate and stimulate development of decadal prediction. A WGCM-driven decadal prediction experiment is being designed as input for the next IPCC Assessment following on from the Aspen White Paper. The aim is to seek to separate initial conditions from greenhouse forcing effects using high resolution coupled models. There is a need to broaden the showcase of these experiments to CLIVAR-wide science as well as to the other WCRP projects and IGAC. Indeed, there is a need to:

- Assess existing data to document decadal variability, predictability and impact, synthesising the information
- Revitalize appreciation of natural models of variability compared to greenhouse gas-forced trends
- Extend the currently planned experiments to alternative experimentation (e.g. superensembles, AMIP-style runs etc)
- Develop outreach including linking to e.g. CLIPS and IGBP

Suggested actions by the group were to:

- Provide immediate input to WGCM on the protocol for the prediction experiments
- Have relevant panels review the protocol to provide further feedback
- Develop alternative strategies with the same aims in mind
- Seek to engage CLIVAR panels and partners to contribute to the science

In discussion, Dr Visbeck noted the potential IGBP interest in the decadal prediction topic and that we should heighten their awareness of the issue. Dr Palmer mentioned that he was not sure the pdfs we currently have accurately capture the variability whilst Dr Henderson Sellers wondered whether we should synthesize the uncertainties. On the policy front, Dr Washington noted that Development Agencies are making things up in the absence of any hard information on climate variability. Dr Henderson Sellers raised the question of making an annual survey of climate which the global programmes could input to, for example by providing a short statement on whether extremes suffered were or were not attributable to climate change. One could also seek to provide explanations from what is happening in real time and here CLIVAR should come to the fore providing input e.g. on why events occurred or why we can't explain them. Any assessment of uncertainties especially as to whether or not global warming is a factor would be useful. Such an annual statement comes out in BAMS. One route would be for CLIVAR to seek to input to the WMO/WCP annual climate statement (see **Recommendation 9** above).

JSC CROSS CUTTING TOPICS

The SSG were reminded that the JSC had set up a number of priority cross cutting topics covering the following areas: Anthropogenic Climate Change (ACC),

Atmospheric Chemistry and Climate (AC & C), Seasonal Prediction, Monsoons, Decadal prediction, Climate Extremes, IPY, and Sea Level Rise. JSC-28 had requested CLIVAR manage 4 of these topics, namely Seasonal Prediction, Decadal Prediction and, jointly with GEWEX, Monsoons and Climate Extremes. In addition CLIVAR sees itself as having a role in contributing to all of the others. It was noted that the JSC had made budgetary allocations against nearly all of these headings. Given these JSC-28 directives, it was timely for the CLIVAR SSG to review these topics and discuss the scope of CLIVAR contributions to them.

Anthropogenic climate change (ACC)

CLIVAR's contributions here had essentially been covered by Dr Meehl's presentation on WGCM.

Atmospheric chemistry and climate (AC&C)

Dr McFarlane briefed the SSG on progress with AC&C which was in its first phase and is led by SPARC and IGAC. Unifying thematic areas comprise: Composition impacts on climate; Climate impacts on chemistry; Climate impacts on surface level ozone and aerosols ("air quality"). Research activities cover: (1) 20 year hindcast for tropospheric gases/aerosols (2) Controls on the distribution of tropospheric aerosols/gases (initial focus 5km to the tropopause) (3) Cloud aerosol/climate interactions and (4) Future scenarios, sensitivities and uncertainties.

In discussion, the SSG agreed that Prof Mechoso should act as the CLIVAR link to the AC&C activity which Dr McFarlane agreed to take forward.

Recommendation 13 The SSG appoints Prof Roberto Mechoso as the CLIVAR liaison with the Atmospheric Chemistry and Climate cross cut. Action: ICPO to inform AC&C, Mechoso.

Seasonal prediction

As noted by Dr Palmer, this topic had been effectively covered by Dr Kirtman's presentation and subsequent discussion (see earlier)

Decadal prediction

Again, this had been covered by the WGCM presentation and by breakout group discussion (see earlier)

Climate Extremes

Dr Valery Detemmerman summarized the objectives of this cross cut, as identified in the paper prepared for JSC-29 on this topic. She also reviewed the statements on climate extremes in IPCC AR4. Since the JSC, a number of potential activities had been scoped on which the SSG's guidance would be welcome. These were:

- Design of an intercomparison framework based around consistent definitions of extremes to assess models and observations.
- Apply this to the planned WCRP systematic modelling experiments on seasonal, decadal and ACC timescales
- Encourage regional downscaling experiments
- Encourage coordinated experiments at sufficient resolution to reduce uncertainties in projected changes in tropical cyclones and mid latitude

- storminess, flooding etc
- Assess the observational and dataset framework for study of global extremes, bringing together modellers and experts in observational aspects of extremes
- Seek to further extend existing climate datasets (geographically and temporally)
- Provide a catalogue of key datasets, with access information.
- Determine how extremes are changing and varying and why.
- Build on the outcomes of the IPCC AR4 and seek to link to user needs e.g re-insurance, water agencies, impact studies.

Two particular meetings were being scoped under the cross cut, namely:

1. With experts to discuss potential ways forward in association with AGU Session on Extremes, 11-14 Dec 2007
2. A proposed WCRP GEWEX-CEOP Workshop, week of 19 May 2008, Vancouver, Canada.

Prof Beniston, who had provided the SSG with his lecture on “Climate extremes in a warmer climate” just prior to this session, commented that there is all sorts of consensus on the definition of extremes (e.g. through the MICE activity). He wondered if there is actually a role for WCRP here. In terms of analysis of extremes from coordinated model experiments, others felt that much of this is happening anyway. There is a whole chapter devoted to this in AR4. In terms of a CLIVAR role, it may be better to consider high impact events rather than extremes per se taking an approach similar to that of Dr Palmer for the 2003 European drought. It is not clear who would lead such an activity though. Dr Kirtman noted that WGSIP hadn’t given attention as yet to the extremes issue and wondered if this was more of regional panel interest and susceptible to proposals for diagnostic sub projects under the CHFP initiative. Prof Visbeck noted that extremes are both difficult to observe and to simulate and that there is current discussion on the ability of climate models to simulate extremes. Overall the SSG view was that CLIVAR should continue to focus it’s activities on extremes through ETCCDI but also engage with the regional panels in this area. Further, one possible area which might provide a focus is that of drought for which the US CLIVAR drought efforts may form a potential starting point. However it was not clear which aspects of this would benefit from international coordination whilst Prof Visbeck felt drought would be an inappropriate topic for the Extremes initiative. Overall it was not clear how best to move this cross cut forward, except through ETCCDI.

Monsoons

Prof Bin Wang introduced current efforts under the monsoons cross cut to which CLIVAR contributes substantially through VAMOS, AAMP, aspects of VACS and the links to AMMA. Prof Wang focussed the initial part of his presentation on the development of the Asian Monsoon Years 2007-11 initiative being led by himself for CLIVAR and Professor Jun Matsumoto for GEWEX. AMY stems from grass root scientific and societal imperatives and had been initiated in August 2006. The JSC at its meeting in Zanzibar in March 2007 had endorsed AMY and the International Monsoon Study (IMS) as major initiatives to promote broad-based climate research for the monsoon systems of the world. A Science Plan for AMY is being written and AMY already has a number of regional participants as well as international project participation through CLIVAR (AAMP), GEWEX, ESSP MAIRS and the WWRP. The goals of AMY are to:

- Improve Asian monsoon predictions on intraseasonal and seasonal time scales for societal benefit, by advancing our understanding of the physical

- processes determining the Asian monsoon variability and predictability, and
- Promote applications in order to support strategies for sustainable development.

Its objectives are to:

1. Improve understanding of the ocean-land-atmosphere-biosphere interaction, multi-scale interaction, and aerosol-monsoon interaction in the Asian Monsoon system.
2. Determine predictability of the Asian monsoon on intraseasonal to interannual time scales, the role of land in continental rainfall prediction.
3. Improve physical representation in coupled climate models and develop data assimilation of the ocean-atmosphere-land system in monsoon regions.
4. Develop a hydro-meteorological prediction system (with lead time up to a season) in Southeast Asia.
5. Better understand how human activities in the monsoon Asia region interact with environment

Overarching science questions include:

- What determines the structure and dynamics of the diurnal and annual cycles of the coupled atmosphere-ocean-land system?
- What are fundamental causes for and how predictable is the Asian monsoon Intraseasonal Variability (ISV)?
- How predictable is the monsoon interannual variability (IAV)? What roles do atmosphere-land interaction and Tibetan Plateau play in monsoon seasonal prediction?
- Do aerosols weaken or strengthen Asian monsoon?
- How will the Asian monsoon system change in a global warming environment and under human transformation of land, water and air?

and cross cutting science themes are:

- Multi-scale interaction (Diurnal to intraseasonal)
- Atmosphere-Ocean-Land-Cryosphere-Biosphere interaction
- Aerosol-Cloud-Monsoon interaction.

AMY is organised through a Scientific Steering Committee co-chairs by Professors Wang and Matsumoto and has 3 Working Groups covering observation coordination; data management and modelling and prediction. The next steps were seen as:

1. Finalize Science Plan: Review the science plan and agree on a few priority science questions
2. Develop an implementation plan for the observational, analysis, and modeling activities, addressing each of these science questions.
3. Develop a plan to show how the research will be used in improving predictions.

Prof Wang also briefed the SSG on the outcomes of JSC 28 that had:

- Endorsed the WCRP crosscutting Monsoon Initiative. The JSC commented that the monsoon crosscut should include all the monsoon groups with a broader perspective, led by CLIVAR and GEWEX with participation of SPARC, CliC and WGNE and several activities outside WCRP (particularly THORPEX).

- Requested CLIVAR and GEWEX to agree on how it will be supervised and the development of an implementation plan.
- Agreed proposals for and concepts of an Asian Monsoon Year and an International Year of Tropical Convection (YOTC) which should be considered as components of an International Monsoon Study (IMS) 2007-2011, a 5 year strategy of WCRP monsoon research, which would include issues related to the East African Monsoon, capacity building and application of observations and predictions in monsoon regions for societal benefit.

The JSC had also approved the idea of a second pan-WCRP monsoon meeting which was to be led by Professor. T. Yasunari.

To take this forward, the CLIVAR and GEWEX IPOs propose a small meeting to develop a concept paper that would provide:

- A global structure that integrates regional experiments and promotes coherence among them.
- A clear set of aims and objectives
- A set of priority science questions
- Guidelines for implementation
- Identified contributions to applications and capacity building.

In discussion of Prof Wang's presentation, the SSG expressed the wish to review the AMY Plan, particularly from the perspective of the science questions being asked, and from the perspective of recent developments in modelling, the recognition of the Indian Ocean dipole and the increasing focus on the role of aerosols for the AA monsoon etc. In addition the SSG welcomed the overall IMS initiative, recognising, though, it's challenging nature.

Recommendation 34: Circulate short explanatory note on the concept of the International Monsoon Study (IMS) and request input to this activity from all relevant CLIVAR Panels and Working Groups. Action: ICPO in consultation with Yasunari, Molteni and Panel/Working Group Chairs.

Recommendation 35: AAMP to provide critical review of Asian Monsoon Years (AMY) Science Plan when a more complete draft is available, providing feedback to AMY and recommendation to the SSG on endorsement. Action ICPO, AAMP co-chairs.

REPORTS FROM OTHER PROGRAMMES/PROJECTS

ESF MedCLIVAR

Roberta Boscolo briefed the SSG on progress with MedCLIVAR, the activities of which are funded through the European Science Foundation (ESF). MedCLIVAR is an international program which aims to coordinate and promote the study of Mediterranean climate. MedCLIVAR's scientific priorities, which Roberta Boscolo's presentation illustrated, are as follows:

- Description of the past evolution of Mediterranean climate.
- Assessment of climate variability over the region and it's connections with global climate variability.
- Understanding the mechanisms responsible for the Mediterranean Sea circulation, sea level trends and variability.
- Identifying trends and providing climate prediction in relation to future

emission scenarios.

MedCLIVAR activities aim to:

- Assist scientists in developing coordinated research projects
- Favour the exchange of information, data and expertise
- Establish a network of European, Middle-East and North African institutes and scientists actively involved in regional climate studies
- Encourage the exchange of information and expertises
- Provide a source of information to assist governs and local authorities
- Provide material and documentation to help public to reach a well formed and substantiated opinion on climate issues.

MedCLIVAR initiatives include:

- 5 Workshops
- 2 Schools (targeting Phd students and post-docs)
- Scientist exchange grants (for young and established scientists)
- Publications (workshop proceedings, journal special issues, a recently published book – Mediterranean Climate Variability)
- Information exchange (web page with documentation, bibliography, data archives, sets of data, links to projects and ongoing activities).

Further information is at www.esf.org/medclivar and www.medclivar.org.eu

The SSG expressed overall satisfaction with the MedCLIVAR activity, congratulating those involved in the organization of its activities. In discussion of North African climate issues, the SSG agreed that interaction with VACS could be useful with a request for VACS to pass names of African scientists working in North Africa that they were aware of to MedCLIVAR.

Recommendation 14: Noting the active community within Spanish CLIVAR, R Mechoso to explore possibilities for increased cooperation with international CLIVAR and, if appropriate, to make a more formal request through the SSG to sponsor e.g. a scenarios workshop to raise profile. Possible links with MedCLIVAR to be explored noting potential for joint CLIVAR/MedCLIVAR workshop to expose Spanish science activity to the wider CLIVAR community. Action: Mechoso, Boscolo

Recommendation 28: The SSG encourages greater interaction between the VACS Panel and MedCLIVAR, in particular from the perspective of the participation of African scientists in MedCLIVAR. Action: Reason, Boscolo

Southwest Pacific ocean Circulation and climate Experiment (SPICE)

Dr A Ganachaud provided an overview of the scientific issues pertinent to the Southwest Pacific region and the role that SPICE would play in investigating these. SPICE through it's modelling strategy, entrainment of existing programmes, an ocean field experiment and a South Pacific Convergence Zone (SPCZ) process study. The Science Plan had recently been published and an Implementation Plan developed. From a CLIVAR perspective SPICE would (a) identify key features of the region and their impact on climate simulation on seasonal to decadal timescales and (b) contribute to understanding of pertinent air-sea fluxes and oceanic currents (LLWBCs in particular) to improve climate modelling and prediction. From a legacy

perspective it would seek to establish long term monitoring of selected features (SST, straits...) and training and transition to local benefits (through applications of data or operational products). SPICE will formally submit its plans to the Pacific Panel and the SSG for CLIVAR endorsement later, in the autumn.

Overall the SSG encouraged SPICE to fully develop its links with the Pacific and other relevant CLIVAR Panels. The Pacific Panel should provide a first critical review of the SPICE application for endorsement, passing its views across to the SSG.

Recommendation 29: The SSG encourages SPICE to fully develop links, where appropriate with other CLIVAR panels and working groups, building on its current relationship with the Pacific Panel. VOCALS-SPICE interactions are also encouraged. The Pacific Panel is asked to review the SPICE Plan and make a recommendation to the SSG. Action: Ganachaud, Mechoso, Pacific Panel.

La Plata Basin activities

Dr Hugo Berbery provided the SSG with information on progress on research in the La Plata Basin Regional Hydroclimate Project which also has the status of a GEWEX Continental Scale Experiment. Scientific motivations are:

- Strong interannual and interdecadal climate and streamflow variations and trends
- Compounding effects of land use change: deforestation, intensive agriculture trends and urbanization
- Unknown effect of aerosols advection from biomass burning from tropical areas
- Strong role of mesoscale convective systems in total precipitation
- Potential for better predictability
- Vulnerability to climate change

Main science questions are:

- What climatological and hydrological factors determine the frequency and spatial extent of **floods and droughts**?
- How **predictable** is the regional weather and climate variability and how predictable are their impacts on the hydrological, agricultural and social systems of the basin?
- What are the impacts of global **climate change and land use change** on regional weather, climate, hydrology and agriculture? To what extent can their impacts be predicted?

Implementation is through hydroclimatic monitoring; the PLATEX field experiment; hydroclimate modelling activities; predictability and climate change assessments and capacity building and outreach. Finally Dr Berbery outlined plans for the field experiment, progress with funding of LPB activities including that from CLARIS-LPB; IAI; NASA; NCAR (NSF); CIC-GEE. He also outlined the role of CLARIS which is a Europe-South America Network for Climate Change Assessment and Impact Studies. The SSG thanked Dr Berbery for his presentation.

US CLIVAR drought efforts

The SSG returned to the issue of drought and the potential to build on the US CLIVAR drought initiatives so as to enable CLIVAR to build a more international effort in this area, including engagement of WGSIP and the panels. Overall it was agreed that this should be scoped. Dr Reason noted that there are a lot of efforts on this topic in Africa and could provide contacts. Dr Goddard responded likewise as did Dr Marengo for CPTEC. It was agreed that Dr Legler would circulate the SSG and chairs following the SSG meeting and contribute an Exchanges article inviting participation in a wider effort. A joint CLIVAR/GEWEX newsletter on drought should also be considered. See Recommendation 41 above.

ICPO REPORT

Due to shortage of time, the ICPO Report was not presented. However the powerpoint and written report are at www.clivar.org/organization/ssg/ssg15/ssg15.php

REVIEW OF ACTION ITEMS

Action items were reviewed and revised and, following post-meeting consultations published as contained in this report.

SSG AND OTHER MEMBERSHIP ISSUES

The SSG agreed to tackle these off-line as more information was needed from Panels and Working Groups on membership changes. The ICPO was asked to manage this. It was agreed that new memberships should be for 4 years and renewals for 2 years.

Recommendation 44: Remind all panels and working groups that membership changes are subject to SSG agreement and are not automatic. Wherever possible, alternative suggestions should be given with the Panel's recommendation, and in particular in the case of the nomination of chairs/co-chairs. Action: ICPO

Recommendation 45: The SSG agreed to finalize panel and working group memberships by email. A short paragraph on nominees was requested (already supplied by the Atlantic sector panel). Action: ICPO with Panel/WG chairs

DATE AND PLACE OF THE NEXT MEETING

It was agreed to scope this off-line after the meeting

MEETING CLOSURE

Dr Palmer as meeting chair closed the meeting with thanks to all for participating and to the WMO and WCRP for hosting the meeting in Geneva.

ANNEX A – ATTENDEES AT CLIVAR SSG-15

Name	Capacity in which attending
Tim Palmer	SSG Co-Chair
Lisa Goddard	SSG member
Jochem Marotzke	SSG member
Roberto Mechoso	SSG member
Franco Molteni	SSG member
Michelle Reinecker	SSG member
Tatshushi Tokioka	SSG member
Martin Visbeck	SSG member
Duane Waliser	SSG member
Bin Wang	SSG member/AAMP co-chair
Dong Wenje	SSG member
Jerry Meehl	WGCM CLIVAR Co-Chair
Ben Kirtman	WGSIP Co-Chair
Tregieur A-M.	WGOMD rep
Detlef Stammer	GSOP Co-Chair
Torsten Kiefer	CLIVAR/PAGES rep
Wilco Hazeleger	Atlantic Panel Co-Chair
Scott Power	Pacific Panel representative
Alex Ganachaud	SPICE/Pacific
Yukio Masumoto	IOP co-chair
Ian Renfrew	SO Panel Co-chair
Niki Gruber	SO Panel
Jose Marengo	VAMOS Co-Chair
Hugo Berbery	VAMOD Co-Chair
Chris Reason	VACS Co-chair
Richard Washington	VACS Co-chair
Francis Zwiers	ETCCD Co-Chair (CLIVAR)
Rick Lawford	IGPO Director/GEWEX rep
Barry Goodison	ClC chair
Norrn McFarlane	SPARC rep
Ed Harrison	OOPC Chair
Ann Henderson-Sellers	JPS for WCRP
Valery Detemmerman	JPS for WCRP
Venkataramaiah Satyan	JPS for WCRP
Howard Cattle	ICPO
Roberta Boscolo	ICPO/MedCLIVAR
Rupa Kumar Kolli	WMO WCP
David Legler	US CLIVAR
Jim Todd	NOAA
Marty Hoerling	US CLIVAR Chair

ANNEX B – CLIVAR SSG-15 AGENDA

TUESDAY 11 SEPTEMBER, start 0900

1. Introduction (0900-0945)

- 1.1 Welcome, introductions, local arrangements
- 1.2 Introduction to SSG-15 (T Palmer)

2. Sponsor and other programme/projects input (0945-1235)

- 2.1 WMO WCP activities relevant to CLIVAR (R Kolli, 15 mins)
- 2.2 Progress with WGNE (V Satyan, 15 mins)
- 2.3 Developments in THORPEX (tbd, 15 mins)

Tea/coffee (1030-1100)

- 2.4 IOC programme needs as a WCRP sponsor (H Cattle, 10 mins)
- 2.4 Developments in IGBP IMBER (W Hazeleger, 15 mins)
- 2.5 OOPC Report (E Harrison, 20 mins)
- 2.6 Progress in CliC, GEWEX and SPARC and present and potential future CLIVAR links (Relevant Project Chairs/Representatives) (15 mins each)

LUNCH (1230-1330)

3. Summary of key progress and issues from chairs of CLIVAR Panels and Working Groups (20 mins each)

- 3.1 Ocean basin panels: Atlantic, Pacific, Indian
- 3.2 Climate change detection, observations and synthesis panels: GSOP, ETCCD

Tea/coffee (1510-1540)

- 3.3 Global Modelling Panels: WGSIP, WGOMD
- 3.4 Africa/Monsoon Panels: VAMOS, VACS, AAMP

CLIVAR SSG members-only closed session (1720-1750)

1800 RECEPTION

WEDNESDAY 12 SEPTEMBER, start 0830

3. Summary of key progress, future plan and issues from chairs of CLIVAR Panels and Working Groups - continued (20 mins each)

3.1 continued Ocean basin panels: Southern Ocean

3.2 continued Climate change detection, observations and synthesis panels: CLIVAR/PAGES (T Kiefer)

3.3 continued Global Modelling Panels: WGCM

2. continued Sponsor and other programme/projects input

2.7 Developments in WCRP (A Henderson Sellers, 30 mins including discussion)

2.8 GEO (tbd, 15 mins)

Tea/coffee (1015-1045)

4. Contributions from national programmes

4.1 Science initiatives under US CLIVAR and links to international CLIVAR (M Hoerling/D Legler, 20 mins)

4.2 Others (tbc) (to 1200h max)

5. Breakout group sessions

5.1 Charge to groups (15 mins) – Co-chairs

5.2 How can CLIVAR better develop its outreach and links to users, what practical steps can we take – template for breakout groups to consider (L Goddard) (15 mins)

LUNCH 1230-1330

Breakout groups (1330 – 1530)

To review key science issues from position papers from SSG-14, the “CLIVAR Forward Look” in individual areas and identify focussed activities leading to key deliverables between now and the CLIVAR sunset date (2013)

5.3 Breakout groups as follows:

A. ENSO and other modes of tropical variability (Lead, M Rienecker; Rapporteur, L Goddard)

B. Developments in modelling (Leads, G Meehl, B Kirtman; Rapporteur: TBD)

C. Observations and synthesis (Lead, Martin Visbeck, Rapporteurs, D Stammer)

Tea/coffee (1530-1600)

Breakout groups (1600 – 1800)

- 5.4 Breakout groups continued:
- D. Decadal variability and prediction and the role of the thc (Lead J Marotzke, Rapporteur, W Hazeleger)
- E. Anthropogenic Climate Change (Lead B McAveney, Rapporteur, T Tokioka)
- F. Monsoons (Lead, F Moltini, Rapporteur, D Waliser)

1800 END OF DAY 2

THURSDAY 13 SEPTEMBER, start 0830

5. continued Plenary reporting and discussion session (0830-1030)

- 5.5 Breakout group reports and recommendations (Rapporteurs) (20 mins each including discussion)

1030-1100 Tea/coffee

6. JSC cross-cutting topics including plenary discussion session

- 6.1 Briefing and discussion on status of JSC cross cutting topics: Extremes – V Detemmerman; Monsoons – Bin Wang; Chemistry and Climate - SPARC rep (5 mins briefing + 15 mins discussion each)

Discussion to centre around how CLIVAR contributes to JSC cross cuts, identification of actions to close gaps and issues and suggestions for how these might evolve, in particular whether additional activities are needed to accomplish cross cuts.

Science Lecture (1200-1230) – The Changing Southern Ocean Carbon Sink: Niki Gruber, ETH, Zurich

LUNCH (1230-1330)

- 6.1 continued Briefing and discussion on status of JSC cross cutting topics: Seasonal – B Kirtman; Decadal – T Palmer; ACC – G Meehl;

Science lecture (1430-1500) – (tbd)

1500-1530 Tea/coffee

7. Plenary discussion session (1530-1730)

- 7.1 Introduction to discussion session – CLIVAR organization and finances (H Cattle & V Detemmermann)
- 7.2 Plenary discussion: CLIVAR sunset date: what comes next (beyond 2013 scenarios). What will the legacy of CLIVAR be? Planning for a 2nd CLIVAR Science Conference. Should there be a CLIVAR synthesis book? IPCC SPM for each CLIVAR theme, or for all of CLIVAR? How should the structure

of CLIVAR evolve in the light of finances, cross cuts, legacy activities etc.
Initial consideration of actions.

1730 END OF DAY 3

EVENING – NO HOST SSG-15 DINNER

FRIDAY 14 SEPTEMBER (0900-1230)

7. Plenary discussion session continued if needed (max 1 hour)

8. Reports from other programmes/projects

8.1 ESF MedCLIVAR (R Boscolo, 10 mins)

8.2 South Pacific Circulation and Climate Experiment (SPICE) (R Ganachaud 20 mins - for SSG endorsement)

4. Contributions to national Programmes (cont.) (30 mins max)

9. ICPO Report (H Cattle) (30 mins incl discussion)

1030-1100 Tea/coffee

10. Review of action items; revisit of issues as needed

11. SSG and other membership issues

12. Date and place of next meeting

13. Close

1230 END OF SSG-15

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