

# WCRP REPORT

World Climate Research Programme



ICSU  
International Council for Science

## Report

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## **1. Opening of the session**

### **1.1 Introductory remarks by the Chair – A. Busalacchi**

[http://www.wmo.int/wcrpevent/jsc31/documents/presentations/Intro\\_Busalacchi.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/Intro_Busalacchi.ppt)

Professor Busalacchi opened the session, noting that the meeting would focus on two major items, the WCRP visioning exercise and the role of climate research in support of climate services. He thanked all those who had travelled from afar to participate (see <http://www.wmo.int/wcrpevent/jsc31/documents/jsc-31attendeess.pdf> or Annex A for list of participants). He expressed his gratitude to the WMO Commission for Climatology (CCI) and in particular its Chair, Dr Bessemoulin, for making possible the joint session which would take place on Thursday, 18 February 2010, and the Turkish State Meteorological Service for making all the local arrangements.

Professor Busalacchi acknowledged the important contributions of WCRP scientists to the World Climate Conference-3 and OceanObs'09, as well as major activities in the past year with respect to regional climate downscaling, modelling coordination and climate research in general. The vision for WCRP post-2013 would be strongly influenced by the evolution of climate science in the past decades, he said, but the future would demand more flexibility and agility to respond to stakeholder demands and the needs of society. He lauded the authors of the white papers that would be considered later in the meeting for presenting a framework by which WCRP could meet these challenges.

Professor Busalacchi shared his personal perspective on topics that would demand research advances from WCRP in the future. These included, but were certainly not limited to, decadal predictability and variability, projections of future precipitation, probability of extreme events, sea ice and ice-sheet modelling, seasonal forecasting of the Arctic, aerosols and climate services.

The agenda (<http://www.wmo.int/wcrpevent/jsc31/documents/jsc-31agendaversion6.pdf>, Annex B) was adopted with minor modifications.

### **1.2 Opening remarks by Mr Mehmet Çağlar**

The WMO permanent Representative of Turkey and Director-General of the Turkish State Meteorological Service, Mr Mehmet Çağlar, welcomed the participants. He remarked the importance of the study of climate variability and change to Turkey and said that the work of programmes like the WCRP was helping the people of Turkey to develop adaptation strategies. He described the activities of the TSMS and, in particular, participation in a regional project on disaster risk reduction that included multi-hazard early warning systems for phenomena such as droughts and floods.

### **1.3 WCRP Director's report - Ghassem Asrar**

[http://www.wmo.int/wcrpevent/jsc31/documents/presentations/JSC-31\\_Asrar.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/JSC-31_Asrar.ppt)

Dr Asrar opened his talk by introducing the Joint Planning Staff members and the International Project Office staff, noting their key role in the success of WCRP. He went on to review major events supported by WCRP since the previous JSC session, including the joint GEWEX/ IGPB iLEAPS Conference hosted by

Australia. Cross-cutting activities had made significant progress in the last year and also the World Bank-sponsored project for the Greater Horn of Africa countries would hold its first workshop in April of this year. Two important publications were the Achievements Report and the Intermediate Implementation Plan which are currently being translated into French, Chinese and Spanish, and Russian through the greatly appreciated initiatives of JSC members. A flyer “WCRP at a glance” was now available.

Dr Asrar presented an overview of the income and expenditures for the programme, noting that there had been a significant improvement in its financial status and hence in its ability to support activities. He thanked the sponsors for their continuing confidence in WCRP.

### *DISCUSSION*

Participants were reminded that this year was one of accentuated natural variability and this should be considered in WCRP’s deliberations at least as much as climate change. There was a call for WCRP to make a collective response in support of the IPCC process in light of recent news and concerns about data transparency, etc. There was also a plea to not be defensive, but rather to show willingness to increase our efforts to insert vigor into the process. This topic was further addressed in the executive session. It was suggested that the question of sensitivity of the global system to climate change should be on the list of WCRP “grand challenges”.

## **2. WCRP Visioning**

### **2.1 Introduction – David Griggs**

Dr Griggs gave a brief introduction to the WCRP visioning process, recalling the agreement at last year’s JSC session that the way in which WCRP could most effectively carry out its activities would be if the structure was constructed along interdisciplinary scientific lines. It was proposed that the general structure of four Core Projects be retained but with revised responsibilities to facilitate climate system research at the interface of the physical Earth system components, i.e., the WCRP overall activities would be based on four fundamental interactions of the physical climate system:

- Ocean-atmosphere
- Land-atmosphere
- Cryosphere
- Stratosphere-troposphere

Core Projects or similar structural elements would continue to be the main bodies through which WCRP would carry out its work program. In order to achieve this each Core Project would be supported by an international coordination Project Office. It was agreed that within each of the four Core Projects there exist a common set of basic themes, namely:

- Observations and analysis
- Model development, evaluation and experiments
- Processes and understanding
- Applications and services

Members of the JSC and the community had been identified to write white papers on each of these themes, with an additional paper on capacity building, and these were presented next.

## 2.2 Processes - Jochem Marotzke

[http://www.wmo.int/wcrpevent/jsc31/documents/jsc-31WPprocess\\_2.1.pdf](http://www.wmo.int/wcrpevent/jsc31/documents/jsc-31WPprocess_2.1.pdf)

Dr Marotzke began by noting that the understanding of processes underlies most of WCRP research and hence in discussing how to proceed, it was useful to classify these processes into three categories, namely:

1. processes underlying phenomena, (e.g. East Asian monsoon)
2. ubiquitous processes (eg ocean diapycnal mixing)
3. processes studied for testing parameterisations (eg cumulus convection).

The first category was usually regional in focus and governance should therefore lie within the Core Projects. The second category would also be well served within the Core Projects, but the challenge in both categories was how to organize studies of processes spanning several earth system domains. The third category required engagement of and coordination amongst two very different communities, namely the observations and small-scale modelling communities, to develop and improve models.

Marotzke saw the JSC role as one of

- communication across projects;
- stewardship of the observational chain (from process field studies to sustained research observations to operational for some; this would require close liaison with GCOS, WIGOS, GEOSS and others;
- containment of the tension between fundamental science versus utility for science; i.e. making sure that importance of fundamental understanding of processes was understood keeping the science base healthy; if not, the quality of service to society would decline in the long term;
- catalyst for development of studies where the impetus for initiative arises from outside a single WCRP community, eg ice sheet modelling.

### *DISCUSSION*

A question was raised as to what is the role of applications in driving process studies; Dr Marotzke responded that in his view this would have to be dealt with on a case by case basis. It was remarked that there exists a disconnect between small-scale process studies and global modelers and that it was not clear how to best organize WCRP to make these interactions occur. Some members suggested careful examination of the planning efforts for the model development as a possible approach to identifying strategically the key process studies and coordinating the contributing activities across the WCRP programme to meet such needs.

## 2.3 Observations - Kevin Trenberth

[http://www.wmo.int/wcrpevent/jsc31/documents/jsc-31WPobservations\\_2.2.pdf](http://www.wmo.int/wcrpevent/jsc31/documents/jsc-31WPobservations_2.2.pdf)

A key issue concerning this topic according to Dr Trenberth was that most of the observations needed for climate research are not done by WCRP. Hence other organizations such as GCOS, WIGOS, GEOSS, etc. must play a major role. Dr Trenberth elaborated on three categories of observations, namely those from process studies, sustained observations and enhanced monitoring, each with their own stewardship issues.

The role of WCRP vis-à-vis observations could be summarized as follows:

- Advocate improved observations and analysis
- Data set development
- Data assimilation and analysis
- Advice on best data sets
- Data sets for use in evaluating climate models

- Promote sound data stewardship
- Help to make data accessible and available.

Dr Trenberth also advocated providing “operational attribution” through numerical experimentation in real time (e.g. to allow reliable statements on why the climate is the way it is and mechanisms involved). All of these activities necessitated a “climate information system”.

#### *DISCUSSION*

There was a call for WCRP to coordinate the distribution of *in situ* and satellite observations to the modelling community and it was suggested that WOAP might play this role. A reflection was made that there does not exist a climate observations community that parallels the modelling community and hence this is a challenging undertaking. It was pointed out that there are successful WCRP projects that do bring together process studies, observations and models, such as the CFMIP, and hence there are precedents on which to build. It was remarked that a lot of WCRP research involves designing and building prototypes of next generation observing systems and/or identifying the necessary improvements of the existing networks, thus every effort should be made to maintain such activities and this should be included in the WCRP plan.

## **2.4 Modelling – Greg Flato**

[http://www.wmo.int/wcrpevent/jsc31/documents/jsc-31WPmodelling\\_2.3.pdf](http://www.wmo.int/wcrpevent/jsc31/documents/jsc-31WPmodelling_2.3.pdf)

The authors of this paper suggested that the key role for WCRP was to develop an integrating strategy for climate modelling that also connects models with observations and process studies.

Four major activities were outlined:

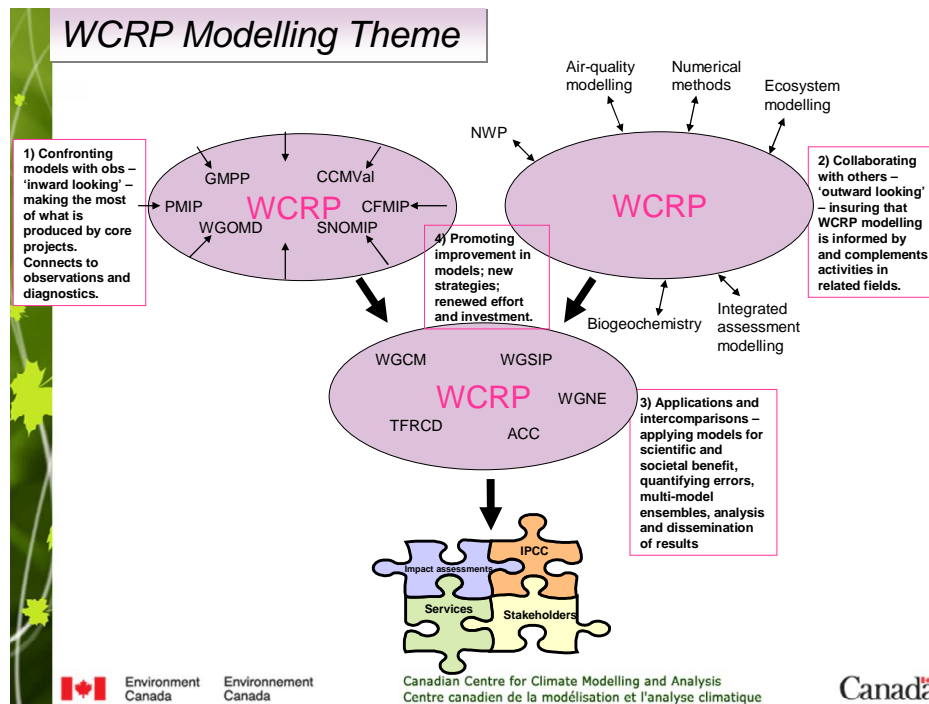
- Promoting the confrontation of models with observations and results of process studies;
- Promoting collaboration amongst various climate science communities (includes numerical weather prediction (NWP), seasonal to interannual prediction and climate projection communities as well as those dealing with biogeochemistry, air quality, terrestrial ecology, etc.);
- Promoting application of models to problems of societal relevance, quantifying uncertainties and making sure they are well communicated and understood;
- Promoting the development of model improvements.

In terms of organization, the authors recommended that well established panels and working groups should be maintained. A need for a coordinating group was identified, which could be described as a “Modelling Council”, to engage JSC members and Chairs of existing/future modelling groups to identify the common integrating themes and define the best approach to achieve them. The “Council” could have a one-day session at JSC meetings and could be responsible for organizing semi-regular WCRP- wide modelling conferences and cross-cutting targeted activities, similar to the World Modelling Summit and US Climate Process Teams. The figure below is a conceptual illustration of how the WCRP modeling efforts can be organized/coordinated.

#### *DISCUSSION*

There was considerable discussion both about the function and form of the WCRP modelling efforts. The proposals in the white paper were generally well received, and in particular, the Modelling Council concept would allow the Projects to be better connected to the WCRP modelling efforts. It was emphasized that the WCRP modelling infrastructure should be flexible to allow focusing efforts where they were most needed, for instance for applications. There was a need to include in the framework a means to exchange learning at fine scales to determine if parameterization was the correct approach or whether these fine-scale processes needed to be resolved in climate models. The sense was that the time was right for a systematic study of the

role of horizontal and vertical resolution in climate models. Model evaluation and quality assessment were also important roles for WCRP; CMIP5 would provide an ideal opportunity to assess how to best combine and evaluate these models. It was noted that confronting models with observations would be a first step in this direction. Some JSC members expressed concern that the Modelling Council would not be able to meet all the needs for coordination across WCRP and that a standing cross- WCRP modelling committee was needed. It was also pointed out that ocean modelling was not discussed in the white paper and that this needed to be taken into account in the future.



## 2.5 Applications for services – Carolina Vera

[http://www.wmo.int/wcrpevent/jsc31/documents/jsc-31WPApplications\\_2.4.pdf](http://www.wmo.int/wcrpevent/jsc31/documents/jsc-31WPApplications_2.4.pdf)

Professor Vera presented some major themes for WCRP support of applications. These included:

- Addressing science needs for delivering more reliable predictions on all timescales;
- Provision of timely and reliable forecasts of the likelihood of hazardous weather and climate, requiring interaction between the weather and climate communities;
- Promote more research and invest in higher resolution models;
- Explore new forecast variables and provide more flexible formats ;
- Improve communication, for instance of uncertainties, by putting information in context, in clear language;
- Promote partnerships to develop meaningful two-way and sustained communication with user communities.

WCRP should also address the need for a new generation of researchers that can conceptualize, develop and implement research that bridges the gap between science and applications.

Professor Vera noted that this theme depends on all other themes and should involve the Core Projects. The presentation was well received but there was no substantive discussion at this time, because it was envisioned that the presentations and discussions associated with the joint CCI/WCRP Symposium on Thursday would help define the scope of applications activities that WCRP research must support towards a Global Framework for Climate Services (GFCS).

## 2.6 Capacity building - Hassan Virji, START Director

[http://www.wmo.int/wcrpevent/jsc31/documents/jsc-31WPCapacity\\_2.5.pdf](http://www.wmo.int/wcrpevent/jsc31/documents/jsc-31WPCapacity_2.5.pdf)

Dr Virji remarked that there seemed to be a clear consensus that WCRP should be involved in capacity building and that this was an underlying theme for all the other themes. However, it was not clear in what kind of capacity building WCRP might wish to engage, for instance focused on physical science, or broader, linked to applications. Dr Virji went on to note that most of the workshops/training that WCRP had co-sponsored in the past, for instance with START, had been “one-off”; Dr Virji felt that there was a need for a broad-based global climate education programme, for instance development of curricula focused on extremes and climate-related risks and vulnerabilities. There was also a clear need for capacity building and institutional strengthening and that funding agencies are interested in supporting these activities.

Dr Virji proposed that JSC reflect on how to broaden this white paper to address all capacity building and include consideration of other strategic partnerships in addition to START.

### *DISCUSSION*

Participants agreed that the WCRP Projects organized a lot of individual training activities, but there is a need for a sustained programme, for instance via partnerships with organizations like START, IAI, etc.

**ACTION:** Develop a long-term plan for sustained capacity building activities for WCRP.

## 2.7 Overall WCRP function and structure – David Griggs

Dr Griggs presented his straw man proposal on the way forward. He felt that there was a strong case for organizing the WCRP sub-structure along the key themes outlined in the white papers. He envisaged that each Core Project would have a group for each theme and that coordination across Core Projects could be via a pan-WCRP coordinating group for each theme. These coordinating groups would consist of Chairs of each of the Project groups and a few JSC members. There would also be a need to coordinate cross-cutting activities such as ACC, SIP, extremes, etc.

In developing this straw man, Dr Griggs reflected on what WCRP does most effectively. In his view this was:

- Assisting the scientific community to coordinate and advance basic science;
- Bringing the international science community together to address major challenges, e.g. through TOGA, WOCE, ACSYS, ISLSCP, ISCCP, etc.

This led him to make the following recommendations:

1. WCRP establishes a coordination group for each of the five activity areas (observations, models, etc), that would meet in parallel for one day at beginning of JSC or at other times as needed;
2. WCRP selects one or more large-scale outcome-oriented “grand challenges” to be a major focus over a 3-6 year period; additionally each core project may select a small number of specific outcome-oriented cross-cutting activities.

Dr Griggs admitted that there were still many outstanding issues, e.g. how to select “grand challenges”, how to phase them, and how to manage them within the Project structure.

#### *DISCUSSION*

The JSC members responses were generally very positive about the proposed new structure. Participants felt that this structure would allow more flexibility and provide mechanisms for setting priorities. It was noted that the WCRP Projects have been very successful and this should be recognized when designing the future structure. Greater clarity on the form and function of the Projects was needed; the current Project Chairs should be consulted on this. There was some concern that to outsiders the new structure would not seem like a big change from the past; Dr Flato said that the differences were subtle, but important. It was pointed out that some Projects, and SPARC in particular, were organized along integrating themes and would not necessarily lend themselves to organization along the five white paper themes. Reducing the number of fixed panels was generally seen as a good approach that would result in more flexibility to address, for instance, the “grand challenges”. Based on the WOAP experience, there was some concern as to how effective would be groups made up of the chairs of other groups.

JSC members generally liked the idea of parallel “theme” meetings during JSC sessions and felt this would help JSC in its coordinating role and make better use of the limited time available to meet. It was suggested that project reporting could take place during the parallel theme meetings and hence free up more time for discussion in the full JSC session.

There were some questions on how the “grand challenges” would be selected; it was suggested that, for example, the first set could be determined at the WCRP Open Science Conference in 2011. Topics could also arise from process studies and from the surveys such as the recent one on modelling. It was remarked that in some sense the current “cross cutting” topics were “grand challenges”. In all cases, community involvement was identified to be a key factor in acceptance and support for “grand challenges”.

### **3. WCRP Open Science Conference – Ghassem Asrar**

[http://www.wmo.int/wcrpevent/jsc31/documents/presentations/OSC\\_Asrar.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/OSC_Asrar.ppt)

Dr Asrar reported that the WCRP Open Science Conference (OSC) was scheduled for 24-28 October 2011 and would be held at the Sheraton Hotel in Denver, Colorado, USA. A web site was set up and running ([www.wcrp-climate.org/conference2011](http://www.wcrp-climate.org/conference2011)) and a first announcement had been published. The aim is to assemble all the WCRP research community and also to engage other key international programmes. The OSC would provide an exclusive opportunity for exchange and collaboration across diverse research communities (e.g. WCRP, WWRP, IGBP, IHDP). At least 1500 participants are anticipated.

Dr Asrar reviewed the main motivations for the Conference, which included appraising the current state of science, identifying the most urgent scientific issues, ascertaining how WCRP could best facilitate this research and develop partnerships critical to progress in the context of fast emerging Global Framework for Climate Services, and facilitating growth of the diverse workforce needed for the future. The Scientific Organizing Committee was still deliberating the programme, but daily Conference themes were likely to focus on:

- Climate system components and their interactions
- Observation and analysis of the climate system
- Improving predictive capabilities
- Climate impact assessments

- Challenges and the future of WCRP

Posters would be a major aspect and quality time would be dedicated to view them with no competition by plenary or parallel sessions.

Dr Asrar presented a preliminary budget estimate and reported that many potential sponsors had already been contacted and had given strong indications of support for the OSC. Additionally there was significant local support both from the scientific institutions in the area and from state and regional associations concerned with climate and climate applications. Dr Asrar noted that it would take a great deal of work to make the Conference a success and he appealed to the JSC and WCRP projects for input and support.

#### *DISCUSSION*

The question was raised as to what extent the private sector and “users” of climate information would be involved. A key challenge would be to strike a balance between providing a forum for getting all the WCRP scientists together and reaching out. A very important aim of the Conference was to build connections across the various projects, but also with other partners such as IGBP and ESSP. With regard to the latter two, it was noted that the IGBP and ESSP Chairs were already members of the Scientific Organizing Committee (SOC). The need to involve scientists from developing economies in the organization of the Conference was stressed.

**ACTION:** JSC members and Project Chairs and Directors to actively support the OSC preparation and seek additional funding support for the Conference in coordination with the JPS/JSC.

**ACTION:** SOC and LOC of the OSC to develop a timeline for major milestones in preparation of the Conference.

## **4. Partner Presentations**

The aim of this session was to inform the JSC on how WCRP could support partner programme goals and to identify potential new areas of partnership, in particular with regard to climate science and services.

### **4.1 IPCC**

#### **4.1.1 WG I – Thomas Stocker, Co-chair**

[http://www.wmo.int/wcrpevent/jsc31/documents/presentations/IPCCWG1\\_stocker.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/IPCCWG1_stocker.ppt)

Dr Stocker began by remarking that WCRP was the most important group contributing to WG I in the past and that a lot was expected of WCRP for the next assessment. Specific areas of research that would make invaluable contributions included:

- clouds and aerosols – processes and sensitivities
- decadal prediction – evaluation and verification
- multi-model ensembles using earth system models
- regional climate change – detection and attribution and projections
- sea level rise and ice sheet instabilities
- geoengineering – assessment of physical basis

Dr Stocker reviewed the outline for the next WG I report, with new chapters on clouds and aerosols (including an entry on geoengineering), near-term and far-term projections and predictability, sea-level change and climate phenomena and their relevance for future regional climate change. The latter approach differed from that of the 4<sup>th</sup> assessment, which was organized by regions. There was also a requirement from WGII for information on regional climate and an atlas would be annexed to the report. The cut-off date for submitted papers for WGI is 31 July 2012 and 15 March 2013 for papers in press and published.

Dr Stocker noted that there were many challenges ahead for the IPCC process, including

- ever increasing amount of material
- broader model diversity and likely increase in uncertainty
- communication of uncertainties – the need to go beyond the scientific community
- making cross-WG cooperation effective
- maintaining highest standards under increased pressure and in a highly politicized environment.

#### *DISCUSSION*

In the context of the ensuing discussion, Dr Stocker expressed the view that scientists themselves are the best and most authentic communicators of the science and should act as “ambassadors” of the science. It was suggested that IPCC might wish to give guidance to scientists on how to better communicate and also to consider how to involve young scientists.

#### **4.1.2 WG II – Vincente Barros, Co-chair**

[http://www.wmo.int/wcrpevent/jsc31/documents/presentations/IPCCWG2\\_Barros.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/IPCCWG2_Barros.ppt)

Dr Barros noted that the WG II assessments were becoming critically dependent on work of physical science community. An important new feature of the fifth assessment would be framing assessment of impacts in the context of information to support decision-making, with an emphasis on assessing and managing risks. Contributions from WCRP on advancing understanding and prediction of climate would be critical information for climate adaptation, mitigation and risk management.

Key inputs from WG I would include:

- detection and attribution of climate change, from global to regional,
- near-term climate change projections and predictability,
- regional climate projections.

It was expected that all sectoral and regional chapters in the WG II report would include elements related to observed changes, observed and projected regional impacts, as well as the economic, social and ecological context for these impacts. Chapters related to natural and managed resources and systems and their uses would include

- freshwater resources
- terrestrial and inland water systems
- coastal systems and low-lying systems
- ocean systems
- food production systems and food security.

Strong interaction with WG I was envisaged in particular on these chapters.

### *DISCUSSION*

Some participants expressed their concern that the WG II plans were overly ambitious, particularly in trying to include socio-economic aspects in each chapter. The question was raised as to whether IPCC was the right group to help nations make impact assessments, or whether the intergovernmental process should focus on this at the global level. An unanswered question was as to whether WG II envisaged cross-reviews with WG I.

## **4.2 IGBP – O. Solomina, Vice Chair**

[http://www.wmo.int/wcrpevent/jsc31/documents/presentations/IGBP\\_Solomina.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/IGBP_Solomina.ppt)

Dr Solomina summarized recent IGBP activities, noting that the Programme was launching a second major international synthesis of key policy-relevant areas within global environmental-change research. Outputs would include not just books, but also published papers, summaries for policy makers and the like. Ten topics were currently under consideration:

- Earth- system impacts from changes in the cryosphere
- Megacities in the coastal zone
- Global environmental change and needs of least developed countries
- The role of changing nutrient loads in coastal zones and the open ocean in an increased CO<sub>2</sub> world
- Geoengineering
- Global nitrogen assessment
- Land-use, land-cover change and climate
- Future Earth-system resilience: Earth system prediction
- Aerosols in the Earth System
- Supporting adaptation responses to climate change

The first three were more mature and already had seed money. WCRP was seen as a key partner, particularly in the first two. Joint efforts were already underway in the areas of land use, Earth system prediction and aerosols. Geoengineering would require significant input from WCRP as well.

Dr Solomina invited the JSC to comment on the list of topics. It was hoped that some of the project syntheses would be available in time for the IGBP Open Science Conference that would be held in 2012. The 3-day Conference included one day dedicated to policy makers, the public and funders of environmental science.

### *DISCUSSION*

There was some question as to who would be the audience for the various products discussed and a sense that this should be carefully considered. The representative from IOC expressed strong support for the efforts related to geoengineering. It was suggested that it was timely to merge IGBP and WCRP data sets, but given the complexity of the IGBP data it would be desirable to have a data management activity within IGBP to organize this. At the moment this did not exist. An observation was made that the cryosphere project would require very close cooperation with CliC and other groups working on this topic in order to provide the needed physical basis.

### **4.3 ESSP – Rik Leemans, Chair**

[http://www.wmo.int/wcrpevent/jsc31/documents/presentations/ESSP\\_Leemans.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/ESSP_Leemans.ppt)

Dr Leemans presented the ESSP structure and activities and emphasized the ESSP role in communicating to policy makers, for instance in the science update presented at the UNFCCC SBSTA meeting last June and also next June. A new journal, entitled Current Opinion in Environmental Sustainability had been launched, with a focus on review and synthesis papers. ESSP together with CGIAR (International Agricultural Research Institutes) would launch their collaborative challenge project on Climate Change, Agriculture and Food Systems (CCAFS) at a Conference in Nairobi 5-7 May of this year. This project could become a major international user of climate services such as climate change scenarios. WCRP input would be needed for this project.

ESSP was planning a series of workshops to explore how best to carry out integrative science. The first scoping workshop would take place in last quarter of this year.

### **4.4 WMO Commission on Atmospheric Sciences – Gilbert Brunet**

<http://www.wmo.int/wcrpevent/jsc31/documents/presentations/THORPEX.ppt>

Dr Brunet reviewed areas of ongoing and potential collaboration between WWRP/THORPEX and WCRP. He noted that the recent session of the Commission on Atmospheric Sciences (CAS) had recommended the formation of a polar project under THORPEX as a legacy of the International Polar Year 2007-2008 (IPY) and that this would require collaboration with WCRP. CAS also noted the growing requirement for sub-seasonal and seasonal predictions of weather, climate, water and air pollution and suggested that the WCRP CHFP and THORPEX TIGGE efforts could be coordinated to address the gap between the TIGGE two-week focus and the seasonal focus of CHFP. The sub-seasonal effort could provide a new opportunity to promote interdisciplinary research on data assimilation methods appropriate for the next generation of reanalysis projects. Dr Brunet said that the sub-seasonal effort should be coordinated with the WMO Commission for Basic Systems activities on long-range forecasting.

#### *DISCUSSION*

It was remarked that seasonal and sub-seasonal forecasting was of great importance to WMO Members and to the GFCS and hence every effort should be made to make progress in this area. Cooperation between the WCRP CLIVAR CHFP and the THORPEX TIGGE should be discussed in detail so that results can be compared and in order that cross-fertilization can take place. In particular, the joint effort could help address ocean –atmosphere coupling. There was a sense that there was good interaction between the weather and climate communities on diagnosis and development of atmospheric models, but that this could be taken further. On polar predictability, cooperation between CliC and THORPEX and should be vigorously pursued.

### **4.5 GCOS – Adrian Simmons, Chair**

[http://www.wmo.int/wcrpevent/jsc31/documents/presentations/GCOS\\_Simmons.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/GCOS_Simmons.ppt)

Dr Simmons began by remarking that GCOS was actually a small programme trying to ensure a very large set of expensive observations. GCOS's aim was to support assessments (e.g. IPCC), policy (e.g. UNFCCC), research (e.g. WCRP, IGBP) and services (e.g. GFCS).

GCOS was developing data record guidelines, including topics such as product transparency and uncertainty estimates. GCOS will liaise with CCI on its development of a strategy for implementing data quality management. Dr Simmons suggested that WCRP should work with GCOS, GTOS and GOOS to consider how to establish peer review of climate datasets.

Dr Simmons raised the question as to whether the current GCOS panel structure and co-sponsoring of panels were effective and robust working arrangements. He felt that there was scope for better interaction between AOPC and WOAP/WCRP, OOPC had stated its desire to strengthen its link with WCRP, especially in the articulation of the need for sustained ocean observations.

#### *DISCUSSION*

The different relationships of the ocean and atmosphere research communities with GCOS panels were discussed. It was observed that there was not an equivalent sustained observing system for the oceans as for the atmosphere and hence the ocean community had relied heavily on OOPC to pursue their requirements. It was noted that representatives of WCRP would increase the participation in AOPC meetings and that there are data sets of importance to climate, such as surface ship observations, that are of decreasing interest to NWP and hence need advocacy from AOPC. It was recommended that the construction sector should be included when considering data requirements for applications because it often represents ten percent of GDP.

## **4.6 ESA and CEOS – Ivan Petiteville**

[http://www.wmo.int/wcrpevent/jsc31/documents/presentations/ESA\\_CEOS\\_Petiteville.PPT](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/ESA_CEOS_Petiteville.PPT)

Dr Petiteville gave an overview of the ESA Climate Change Initiative (CCI), noting that Dr Asrar was a member of the Climate Science Advisory Body that oversees the initiative. The aim was to provide 21 of the 45 GCOS Essential Climate Variables (ECVs) through reprocessing of 30 years of archived satellite data.

CEOS was planning two meetings in 2010 to better coordinate climate-related activities of the space agencies and their partners. He noted that WCRP was an associate member of CEOS.

#### *DISCUSSION*

A question was raised as to what is the link between GMES and the ESA Climate Change Initiative; the representative from ESA replied that GMES is a strong element supporting CCI and will also be a user of CCI through data assimilation.

## **4.7 GEO - Michael Tanner**

[http://www.wmo.int/wcrpevent/jsc31/documents/presentations/GEO\\_Tanner.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/GEO_Tanner.ppt)

Dr Tanner began his presentation by noting the many references to WCRP contributions at the most recent GEO Plenary meeting. He reviewed the mission of GEO and said that WCRP had an essential role to play in GEOSS implementation. He mentioned that GEO was working with IPCC, WCRP and GCOS to organize a workshop on how GEO could contribute to the IPCC process.

#### *DISCUSSION*

There was considerable discussion about the role of GEO and the role and visibility or lack of visibility of WCRP within GEOSS. It was pointed out that WCRP and its members have multiple opportunities to gain increased visibility within the GEO community and should try to optimize these opportunities. Not only is WCRP an active GEO Participating Organization, but every individual member of WCRP also has a voice in

their respective National GEO organizations, in addition to the other GEO Participating Organizations that they hold membership (eg. WMO). Capitalizing on these opportunities for increased visibility would help raise the awareness of the significant contribution that WCRP is making in GEOSS. The sense was that an important area where GEO should contribute would be in increasing access to data sets that are currently not being made available. Dr Tanner noted that the implementation of the GEO Data Sharing Principles as accepted by the GEO Plenary would greatly benefit WCRP and the GEO Climate portfolio. (The GEO Data Sharing Principles are: Full and open exchange of data, metadata, and products shared within GEOSS; Shared data, metadata & products at Minimum Time Delay and Minimum Cost; Free of Charge, or cost of reproduction, encouraged for Research & Education.) It was suggested that public/private partnerships should be explored to improve data delivery. Concern was expressed about the lack of data traceability concerning GEO products and that there was a need for some sort of review process to address the quality of the various products. Dr Tanner reported that the Quality Assurance for Earth Observations (QA4EO) strategy within GEO has begun to address many of these issues and will continue to develop an implementation strategy to be recommended to the GEO Plenary. This effort was being led by ESA, CEOS and IEEE; with major contributions from Australia, Great Britain, European Commission, Germany, Japan NOAA, Russia, USGS and the WMO.

#### **4.8 Integrated Research on Disaster Risk - Gordon McBean, Science Committee Chair**

[http://www.wmo.int/wcrpevent/jsc31/documents/presentations/Disasters\\_McBean.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/Disasters_McBean.ppt)

The Integrated Research on Disaster Risk (IRDR) project will address natural and human-induced environmental hazards through an integrated approach that is international, multidisciplinary (natural, health, engineering and social sciences, including socio-economic analysis) and collaborative. The overall objectives are:

1. Characterization of hazards, vulnerability and risk;
2. Effective decision making in complex and changing risk contexts;
3. Reducing risk and curbing losses through knowledge-based actions.

Dr McBean identified areas where WCRP could contribute to the IRDR project including forecasting of hazards and integrated dynamic modelling of risk associated with floods, storms, drought and temperature extremes. Extremes characteristics, probabilities, and thresholds, were also areas of potential collaboration. In turn, the IRDR project could provide WCRP with connections to the social sciences and disaster risk reduction communities. Dr McBean proposed that IRDR and WCRP exchange letters of understanding on cooperation in research and capacity building in relation to extreme climatic events.

#### *DISCUSSION*

The need to formalize the interaction between the WCRP cross cut on extremes and the ICSU IRDR project was raised.

## 5. Sponsor highlights

### 5.1 ICSU Visioning – Kari Raivio, ICSU Vice President

[http://www.wmo.int/wcrpevent/jsc31/documents/presentations/ICSUVisioning\\_Raivio.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/ICSUVisioning_Raivio.ppt)

Professor Raivio reviewed the decision of the 29<sup>th</sup> ICSU General Assembly that led the way for the ICSU visioning exercise. He noted that the goal was to engage the scientific community to explore options and to propose implementation steps for a holistic strategy on Earth system research including a single institutional framework to replace the current four GEC programmes plus ESSP. This strategy should both encourage scientific innovation and address policy needs. A three-step process had been developed to address function, form and transition from existing structures. An on-line questionnaire resulted in the identification of five “grand challenges” of global sustainability research, three of which were directly related to climate (see <http://www.icsu-visioning.org/>). The next step would be a meeting to outline the institutional framework needed to address these challenges; towards the end of the year another meeting would be held to determine how to transition to this new structure.

#### *DISCUSSION*

Dr Marotzke, who attended the Paris ICSU visioning meeting on behalf of WCRP, noted that that meeting had been tasked with scoping grand challenges that require cooperation across several or all of the GEC research programmes. But ensuing discussion left open whether the challenges were defining the subset of grand challenges that require cross-programme cooperation, or the totality of all challenges pertaining to the GEC programmes. If the latter was the intended interpretation, the grand challenges did not cover the entire research/grand challenge portfolio (e.g., predictability). Dr Raivio noted that the document states that the five grand challenges are a package and that progress on every one and the associate research questions is needed urgently, but that the list of research priorities are neither exhaustive nor necessarily sufficient. It was recognized that the web-based questionnaire was a good method to get comments from those underrepresented in the international planning process, but concern was raised about the limited representativeness and the sometimes trivial nature of the inputs received. It was suggested that now it should be the various scientific oversight and steering groups that should take this further and define priorities. The representative from ICSU expressed the view that if we want to consider institutional change, it is difficult to deal with advisory bodies that are already very well established and sometimes entrenched; there was a real risk of “business as usual”.

**ACTION:** Draft letter from JSC to ICSU Secretariat to include in the ICSU Visioning document a statement on the need for building and maintaining the scientific workforce needed to conduct fundamental climate research. Clarify charge to visioning process, cross-cutting or all GEC activities.

### 5.2 IOC – Building on OceanObs’09 – Luis Valdes (Head, IOC Ocean Sciences)

[http://www.wmo.int/wcrpevent/jsc31/documents/presentations/IOC\\_Valdes.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/IOC_Valdes.ppt)

Dr Valdes reviewed the very successful OceanObs’09 conference, noting that it brought together the physics, carbon/biogeochemistry and biological ocean research communities. Five calls for action resulted, amongst them urging nations to fully implement by 2015 the initial physical and carbon global ocean observing system envisioned at OceanObs’99 and further refined in 2009. He noted that researchers are still the main users of sustained ocean observations and that there was a need to build a broader user community.

A Task Team had been formed to consider the outcomes and recommendations from the OceanObs'09 Conference and, in consultation with the international organizations and expert advice, to:

- Recommend a framework for moving global sustained ocean observations forward in the next decade integrating feasible new biogeochemical, ecosystem, and physical observations while sustaining present observations and considering how best to take advantage of existing structures,
- Foster continuing interaction between organizations that contribute towards and are in need of sustained ocean observations, and
- Report back to its sponsors and disband by 1 October 2010.

In terms of WCRP - IOC interactions, Dr Valdes identified several aspects of WCRP research that were of particular interest to IOC Members, including:

- regional modelling to downscale the impacts of global climate models;
- regional estimates on changing sea levels;
- potential changes in the frequency or intensity of extreme events such as tropical cyclones and their coastal impacts;
- establishing or strengthening direct links between WCRP and IOC Regional Programmes and National Oceanographic Committees;
- widening ocean climate research to include more activities aimed at adaptation and mitigation of climate change effects on the oceans.

Dr Valdes proposed topics of potential mutual interest for future collaboration, which include:

- Strength of stratification in temperate seas and oceanic gyres
- Upwelling systems and changes in wind regimes
- Thermohaline circulation
- Sea-Level Rise (IOC-WCRP TG established in 2009)
- Outreach of scientific knowledge (policy papers, brochures, scientific journal articles)

Dr Valdes said that IOC would like to contribute in an active manner to WCRP outreach and capacity building efforts and would also like to be involved in the planning post-CLIVAR.

#### *DISCUSSION*

There was a question as to whether the link between IOC and the WCRP community was in need of enhancement and if so, how this should occur. The representative from IOC noted that in some countries, like Germany, the link was strong, but that in others it was much weaker, for instance in the case of Spain where the national committee for CLIVAR is composed mostly of meteorologists and oceanographers are in a minority. A suggestion was made that there should be wider geographic representation on the OceanObs'09 follow-up committee.

**ACTION:** CLIVAR to compile a list of nations engaged in oceanographic activities affiliated with the Project.

### **5.3 WMO -World Climate Conference-3 – Avinash Tyagi, Director, WMO Climate and Water Department**

[http://www.wmo.int/wcc3/page\\_en.php](http://www.wmo.int/wcc3/page_en.php)

Dr Tyagi's presentation focused on the outcomes of the third World Climate Conference that was held in Geneva 31 August – 4 September 2009. He lauded the very high level of participation of WCRP scientists in the Expert Segment that had recommended, inter alia, a strengthening of both GCOS and the WCRP in support of a GFCS. The High Level segment agreed to establish a GFCS to strengthen production, availability, delivery and application of science-based climate prediction and services and called for the formation of an independent High Level Task Force (HLTF) that would, after consultation with governments, partner organizations and relevant stakeholders, prepare a report, including recommendations on proposed elements of the Framework. The HLTF had been formed recently and was due to report in January 2011.

#### *DISCUSSION*

Concern was expressed as to the mechanism for technical/scientific input to the GFCS HLTF. It was noted that the summary statement from the WCC-3 technical segment had not yet been submitted to the HLTF and that despite the fact that the Conference declaration implies that the HLTF should deal with technical issues, there was limited climate science representation on the HLTF. The representative from WMO assured the meeting that there would be an activity to regularly assess what research was needed for success of the GFCS.

A panel discussion with the three WCRP sponsor representatives ensued. The primary topic was the GFCS and the need for a mechanism by which science requirements could be effectively fed into the process of defining the "Framework". WMO and IOC affirmed that climate services were key to their mandates and ICSU noted that although their mandate was science, not services, several of the grand challenges identified to date were concerned with providing information that would be useful for climate services.

## **6. Climate Services**

### **6.1 National Climate Services**

The Chair introduced this topic, noting that many nations were in the early stages of formulating plans for climate services, but that it was important for JSC to hear their current or anticipated requirements from WCRP. Presentations were made by

- **Germany** (<http://www.wmo.int/wcrpevent/jsc31/documents/presentations/CSGermany.ppt>),
- **USA** ([http://www.wmo.int/wcrpevent/jsc31/documents/presentations/CS\\_USA.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/CS_USA.ppt)),
- **France** ([http://www.wmo.int/wcrpevent/jsc31/documents/presentations/CS\\_France.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/CS_France.ppt)),
- **UK**,
- **Japan** ([http://www.wmo.int/wcrpevent/jsc31/documents/presentations/CS\\_Japan.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/CS_Japan.ppt)) and
- **Canada** ([http://www.wmo.int/wcrpevent/jsc31/documents/presentations/CS\\_Canada.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/CS_Canada.ppt)).

The approaches to climate services varied significantly from country to country. Common themes were partnerships between government, business and universities and an emphasis on providing useful climate information for a wide range of applications. Some countries, such as Germany and the USA, were spinning

up new “climate service” entities, while others, such as Japan and Canada, were operating within existing structures, usually the meteorological services. In Germany funding for the new climate services effort was being provided by the research ministry and hence there was an emphasis on understanding climate change and supporting research. The UK’s plan was to “operationalize” climate prediction in a “seamless” manner, i.e. on all timescales. Both the USA and the UK were aiming for an “end-to-end” system which would include everything from climate monitoring to attribution. France was focusing on the transition of climate research results into the operational realm. In Japan, the Japanese Meteorological Agency’s climate prediction division was providing climate information, but it was noted that the Ministry of Environment also had a major project concerning extreme events in the future climate. Canada had no formal climate service entity, but was providing climate services including operational climate monitoring, seasonal predictions and future climate projections.

Dr Simmons also made a brief presentation on the European Global Monitoring for Environment and Security (GMES) atmospheric environmental services project that will move from research to operational funding in the 2011-2014 time period (<http://www.wmo.int/wcrpevent/jsc31/documents/presentations/GMES.ppt>).

#### *DISCUSSION*

It was noted that each of the nations who presented had quite different approaches to climate services and that some were more academic, others based purely on operations and some having a more balanced approach. Questions were posed as to how user feedback would be incorporated and in each case the reply was that this would be taken into account, either through direct input or through intermediaries.

## **6.2 Function and form of WCRP in support of climate information and services and capacity building**

Two parallel break-out groups were formed to discuss these topics. Summaries of their reports to plenary are presented below.

### **6.2.1 Climate information and services**

The group felt that WCRP should partner with institutions and projects such as IRDR, environmental agencies and START to achieve an effective dialogue with users to help drive the research priorities. WCRP should promote multi-model ensembles (MMEs) and research into how to use them. WCRP could act as coordinator across national climate services with respect to this topic. WCRP should establish a working group on science underpinning climate services (akin to the role of WGCM to IPCC and WGNE to NWP community) to interface with the operational/user community. This WG should have a flexible structure to tackle research issues common across all national providers e.g. how to use MMEs.

A key issue would be to manage expectations. In this respect it was important to remember that climate services are now where numerical weather prediction was 20-30 years. WCRP had a responsibility to communicate the credibility and skill of predictions that underpin services and promote research needed to do this better. It was noted that the GFCS process was highly politicized so perhaps the best way for WCRP to engage was through national programmes and through defining good measures of credibility and skill, which would be the principal role of the proposed JSC WG. There was also a need to recognize the diversity of delivery mechanisms: interacting with RCOFs may be one way to bring in the latest research.

## 6.2.2 Capacity building

This group felt that the WCRP role was to identify needs and advocate the importance of raising the capacity/capability to continue to undertake climate research, prediction and services. Two different categories of requirements existed (1) qualified people in the developed world, (2) institutional capacity in countries that cannot develop it themselves. WCRP should build on existing entities within WMO/ IOC/ ICSU and networks such as START. WCRP should focus on creating the scientific community we need for the future. Model development and computation science were critical areas. This should be communicated to the ICSU visioning process. Capacity building is also the key to the success of climate services and the GFCS should take this into account. WCRP may have a role in the future regional climate centres, coordinating both research and capacity building activities to support their operation.

**ACTION:** Develop a long-term plan for sustained capacity building activities for WCRP.

## 7. Core Project reports

### 7.1 CLIVAR – Martin Visbeck, SSG Co-chair

<http://www.wmo.int/wcrpevent/jsc31/documents/presentations/CLIVAR.ppt>

Prof. Visbeck outlined the “CLIVAR imperatives” developed at the most recent SSG meeting

- Anthropogenic Climate Change
- Decadal Variability, Predictability, and Prediction
- Intraseasonal and Seasonal Predictability and Prediction
- Improved Atmosphere and Ocean Components of ESMs
- Data Synthesis and Analysis
- Ocean Observing System
- Capacity Building

and noted that a major priority over the next 5+ years would be to strengthen interaction with the ocean biogeochemistry community.

He reviewed some recent CLIVAR activities, many of them related to decadal variability and predictability. He noted that knowing natural decadal variability was as important as being able to predict on these time scales and noted the importance of the ocean synthesis activity for understanding decadal variability. He also lauded the CLIVAR/GOOS Indian Ocean Panel for great progress in establishing sustained observations in that basin. The ocean synthesis activity was also very important for understanding decadal variability. There were still many areas for improvement of seasonal to interannual prediction and the Climate Historical Forecast Project (CHFP) was the flagship element in this effort and there was potential for links to the THORPEX TIGGE project. He noted that the Tropical Atlantic Climate Experiment (TACE) contributed to many of the “imperatives” and that several important field activities were spinning up in the Pacific, including the Chinese-led North Pacific Ocean Climate Experiment (NPOCE). VAMOS was very active in education and capacity building activities, often in partnership with IAI.

Prof. Visbeck raised several issues for consideration by the JSC. He asked the JSC whether CLIVAR should continue to develop its current list of “imperatives”. He noted that CLIVAR did not have a strong connection to the Arctic and suggested that they might join efforts with CliC and GEWEX. CHFP was looking to strengthen participation by the other WCRP projects and CliC in particular. There was concern that CLIVAR efforts in Africa, other than AMMA, were not advancing at all and that there was a need for improved integration of observational and modelling efforts with regards to monsoons. Prof. Visbeck

remarked that data sharing and access worked best when there was a formal oversight structure and encouraged JSC to support such international agreements.

#### *DISCUSSION*

CLIVAR was encouraged to produce review articles in time to provide input to the IPCC process. The Prof. Visbeck noted that the imperatives provide a framework for producing such articles and that they would likely be produced for the WCRP OSC in 2011. It was noted that there was a lot of interest in the Arctic and that the time was ripe for a cooperative effort; a workshop on short-range prediction in the Arctic currently being organized by WWRP could provide an opportunity for initial discussions. It was remarked that the atmosphere seemed to be missing in the CLIVAR presentation and that integrated projects such as the one proposed for the Arctic could provide a good opportunity for this. It was noted that the CLIVAR imperatives were very broad and looked much like WCRP imperatives and that it might be wise to focus on a region in order to bring in all the necessary expertise across WCRP.

A question was raised as to what CLIVAR was doing to prepare for the Aquarius salinity mission; Prof. Visbeck GSOP as the appropriate avenue for this, but noted that the Atlantic Panel was discussing this and that US CLIVAR was considering a process study, as well. In response to the mention of the lack of activity by the CLIVAR Africa Panel, Dr Semazzi, a member of the Panel, noted that there had been considerable progress in the two years since the last meeting, but that various circumstances had made it impossible to meet. Climate services could be a rallying point for future activity.

**ACTION:** JSC supportive of list of CLIVAR imperatives but encouraged SSG to further refine ocean/atmosphere relevance of imperatives and include coupled ocean/atmosphere observations.

**ACTION:** CLIVAR should encourage interaction with WWRP/THORPEX in the area of sub-seasonal and seasonal prediction, particularly on interactions of CHFP and TIGGE.

## **7.2 CliC – Konrad Steffen, SSG Chair**

<http://www.wmo.int/wcrpevent/jsc31/documents/presentations/CliC.ppt>

Prof. Steffen noted that the main goal of CliC was to assess and quantify the impact of climate variability and change on the cryosphere and included wide ranging areas such as the terrestrial cryosphere, ice masses, the marine cryosphere and global prediction. Five key topics were currently addressed:

- Cryosphere input into the Arctic and Southern Ocean freshwater budgets
- The role of carbon and permafrost in the climate system
- Hemispheric differences in sea ice extent and seasonal predictability
- Regional climate modelling and improved parameterizations of the cryosphere
- Ice sheet dynamics and the role of ice sheets in sea level rise

The recent CliC SSG meeting in Valdivia (Chile), 6-9 February 2010, discussed how to prioritize cryosphere issues and define goals, how to engage the modelling community to a greater extent and how to more fully engage in the WCRP cross-cuts. Six new focus topics were introduced:

- Review of sea ice extent and concentration products from passive microwave measurements
- Extension of permafrost studies in continental shelf areas
- Improvement of sea ice parameterizations for Arctic and Southern Oceans
- Support of a new Arctic system reanalysis

- Explanation of causes and prediction of the Arctic sea ice loss involving CMIP5 diagnostic sub-projects
- Continuation of the Southern Ocean observing system

Among the highlighted initiatives was CAPER (Carbon and Permafrost), a new joint WCRP-CliC/IGBP-AIMES initiative looking at permafrost thawing in the 21<sup>st</sup> century and related carbon release (potentially up to 1000 Gt Carbon in upper 1-3 meter, 650 Gt in deeper soil).

The sea-level variability and change crosscut was progressing, and there was now good understanding of the observed change – estimates of different contributions added up to the total observed sea-level rise. A workshop was planned and review papers would be produced as input to the AR5.

Prof. Steffen presented the JSC/CliC “Rapid Loss of Sea Ice in the Arctic” white paper. The observed rapid loss of sea ice in the Arctic was highlighted, along with the large spread of simulated sea-ice extent predictions in present climate models. Observations of sea-ice melt seem larger than in most models, but it was stressed that the most recent models do better reproduce the observed extent. Better knowledge of ice thickness and more coordinated observation and modelling efforts were necessary. Activities to be undertaken included:

- A coordinated multi-aspect study based on the CMIP5 results
- Generation of initial conditions for regional climate models
- Preparation of a roadmap for the ARctic HIIndcast Modelling and preDiction ExperimentS (ARCHIMEDES) initiative.

#### *DISCUSSION*

The new focus for CliC was welcomed, but concern was raised about the number of topics being addressed and the need for a timetable. The representative from CliC noted that the topics have been identified as either short-, medium- or long-term and that the intention was not to try to do everything at once. The representative from WGCM suggested that there should be more coordination with CliC on cloud studies and the WGNE representative noted that there was already a model development activity and that all Projects were encouraged to nominate representatives. Director, WCRP, remarked that careful consideration would have to be given as to how best to set up the interfaces with the various modelling groups and the Projects. Support and interest was expressed for a new field project to follow on from the SHEBA field campaign but there was concern that ARCHIMEDES might be trying to do things that are already been done in other projects. The representative from CliC replied that this was an attempt to better coordinate ongoing activities, and not an independent initiative. A question was raised about cooperation with IGBP; the CliC representative noted that there were joint efforts on carbon and permafrost and that the Asia CliC group was also very active in this area. It was remarked that the white paper on Arctic sea ice was a very good initial step toward a full assessment of science requirements for Arctic climate prediction.

**ACTION:** CliC to prioritise proposed activities and develop a phased approach to their implementation and re-examine what is really short versus mid- and long-term activities, strengthen the CliC SSG to accommodate new required fields of expertise.

**ACTION:** CliC to take the lead in defining the scope of the “Arctic” dimension of Pan-WCRP activities, in cooperation with relevant partners;

**ACTION:** Identify CliC interfaces to WGCM, WGNE, WGSIP and TFRCD.

**ACTION:** JSC thanks the authors of the “Rapid Loss of Sea Ice in the Arctic” white paper and requests CliC with CLIVAR to proceed to scoping a CMIP5 diagnostic project analyzing historical Arctic sea-ice loss as simulated by current climate models and evaluating the range of future projections.

**ACTION:** JSC endorsed the plans for the Polar Predictability Workshop and asked the Workshop Organizing Committee to ensure adequate representation of expertise from all WCRP Projects and other relevant activities such as SEARCH and NERC projects. Outcome should be a plan for a Rapid Sea-Ice Loss activity. Examine GEWEX representation on the Organizing Committee. Following the workshop, define the optimal modalities for cryospheric input to CHFP.

**ACTION:** WCRP modeling groups to consider means of strengthening cryospheric components of climate models, in cooperation with CliC.

### **7.3 GEWEX – Peter van Oevelen (IGPO Director) and Kevin Trenberth (SSG Chair elect)**

<http://www.wmo.int/wcrpevent/jsc31/documents/presentations/GEWEX.ppt>

Dr Van Oevelen reviewed the GEWEX Panel structure and highlighted some recent activities. A major event had been the GEWEX Conference in Melbourne in August. He reported that US funding for the IGPO had been approved for the next 5 years and that a pan-GEWEX meeting was planned for August 2010.

Dr Van Oevelen gave an overview of Panel goals for 2013. For the Radiation Panel (GRP) these included reprocessing of products, transition to operations (e.g. through SCOPE-CM), production of a multi-product dataset for water and energy studies and expanding GRP tools for broader use. They would also revisit the need for a water vapour product and continue to promote improvement in polar regions. CEOP would promote evolution of the regional hydroclimate projects, enhance integration of in-situ and satellite data and place more focus on regional studies (monsoons, high elevation, extremes, semi-arid regions) and hydrological applications. GMPP would continue to focus on atmosphere and land surface processes while promoting model diagnosis and development. Additional priorities in the near-term would be the “monsoons in a changing climate” cross-cutting activity and work on extremes and, in particular, drought.

Dr Trenberth gave a presentation on the future of GEWEX (post 2013) arising from preliminary discussions at the recent SSG meeting in New Delhi in January 2010.

A new set of “GEWEX imperatives” in four categories had been proposed:

#### Data

- Develop improved observational, diagnostic and modelling capabilities, to measure and predict global and regional energy and water variations trends and extremes such as heat waves, floods and droughts; and provide the science underpinning climate services
- Develop climate data records of atmospheric and land variables, complete with metadata and error bars
- Provide descriptions and analyses of observed variations, trends and extremes

#### Analysis

- Develop advanced diagnostic tools and identify pathways of model improvement
- Increase understanding of energy and water cycle processes, understand feedbacks, improve land surface parameterizations
- Develop methods of dealing with non-stationarity of hydrological variables, especially extremes
- Contribute to building a comprehensive end-to-end initiative on extremes

#### Modelling

- Attribute the causes of trends and determine the predictability of energy and water cycles
- Accelerate development of models focusing on land
- Improve capability of predictions of water and energy cycles

#### Applications

- Develop observation sites, data processing tools, data management and archival system, model initialization tools towards transition to operations
- Promote and foster capacity building through training.

The concept of “frontiers” was also introduced for challenges that would require interactions with other partners, including other parts of WCRP. These might include improved representation of hydrological processes in land surface schemes and assimilation of land data.

The Pan-GEWEX meeting in Seattle (August 2010) would provide the opportunity to further develop the imperatives and determine roadmaps to achieve them.

#### *DISCUSSION*

There was considerable discussion. The view was expressed that GEWEX seemed to be bogged down in its past structure and that post-2013 the programme must restructure to focus on land-atmosphere interactions in keeping with the recommendations from JSC 30. Some of the themes in the new “imperatives” were felt to be too general and pertain to all groups, not just GEWEX.

In response to the remark that there was not much activity mentioned on aerosols, it was noted that initially the intention was that cooperation with IGBP on the ACPC would bring in the expertise missing in GEWEX, but that this project was not advancing as quickly as hoped and that it was time to review this arrangement. It was agreed that aerosols were a WCRP-wide issue. GEWEX was encouraged to pursue ground water storage as an important contribution to the sea-level cross cut. Potential links with CliC on turbulent flux over ice were identified. The representative of WGCM recommended that GEWEX should develop activities around water isotopes to help with model diagnostics and issues related to convection; the Director, IGPO, noted that CEOP did have some activity in this area and that new measurement techniques should make this research easier. Using BSRN as an example, there was a discussion how the transition from research to operations should take place. It was noted that ISSCP was moving towards operations at NOAA but that GEWEX intended to maintain an oversight of the data product quality. Director, WCRP, cautioned that we need to develop clear mechanisms to ensure stewardship of these mature data sets from the beginning of such initiatives. We should not defer the task of transfer/transition until the latter part of such activities thus running the risk of not having a home for long-term data records that have taken considerable efforts and resources to produce over multiple decades.

**ACTION:** GEWEX to revise mission statement to emphasise land-atmosphere interactions.

**ACTION:** GEWEX should start addressing the issue of land water storage.

**ACTION:** GEWEX to present its plan for the future to the next JSC meeting in 2011.

## **7.4 SPARC – Ted Shepherd and Thomas Peter, SSG Co-chairs**

[http://www.wmo.int/wcrpevent/jsc31/documents/jsc-31sparc\\_4.4.pdf](http://www.wmo.int/wcrpevent/jsc31/documents/jsc-31sparc_4.4.pdf)

Dr Shepherd led off by noting that SPARC was organized along major themes with no specific panel structure associated. There were seven main activities, of which CCMVal (chemistry climate model validation) was the largest and of highest profile. A comprehensive peer-reviewed report had recently been

completed that would provide critical input to the 2010 ozone assessment. One result of this analysis was that ranking and weighting of models was not possible in a defensible way. In terms of projections, a better assessment of uncertainties through statistical methods was carried out, indicating a super-recovery of stratospheric ozone by the end of 21<sup>st</sup> century. A SPARC data initiative was motivated by the CCMVal report. It would include collection of all available chemical datasets and comparison of their seasonal cycles, etc., working closely with measurement scientists. SPARC was well represented on WCRP modelling groups (WGCM, WGSIP and WGNE) and a workshop on polar predictability on seasonal to multidecadal timescales was planned for autumn 2010.

Dr Peter reported that there was a risk of losing the ability to obtain ozone vertical profiles with the demise of SAGE II. This needed to be addressed if the ozone recovery was to be tracked; ground based networks have improved but are not sufficiently good for the stratosphere.

The Atmosphere Chemistry and Climate cross cut (AC&C) was being carried out with IGBP. Phase I was focused on modelling but also on black carbon which was an issue for climate and air quality. First results were expected in a year.

SPARC was also addressing the aerosol aspect of geoengineering. A report on stratospheric aerosol properties had been issued in 2006 and a 2009 workshop on volcanoes had compared geoengineering and Pinatubo aerosols and found that previous estimates of aerosol optical properties were much too optimistic, thus greatly reducing estimates of radiative cooling by geoengineered particles.

A major concern for the immediate future was continued support for the International SPARC office. Concerning the interaction with IGAC, the two projects had much in common and want to continue in close collaboration, but also had distinct foci and did not see a need to be merged. SPARC intended to expand its activities into stratosphere/troposphere interactions.

#### *DISCUSSION*

The SPARC work on aerosols was welcomed but it was noted that there were other activities on this topic that should be coordinated. Similarly, WGCM was discussing experiments related to geoengineering and this should be coordinated with SPARC. The representative from IGBP reemphasized IGBP's desire to work together on this topic. It was suggested that WCRP could issue a short summary of the status of research on aerosols and geoengineering on a regular (2yr?) basis. Polar predictability was once again noted as a cross-WCRP (and WWRP) topic of interest and should be developed as such. The question was raised as to whether AC&C was really a WCRP cross cut since most of the activity seemed to involve SPARC and IGAC and not the other WCRP projects and that perhaps this should be reviewed, especially with regard to the link to GEWEX. There was some discussion as to whether the CCMVal results should be synthesized in ensembles; it was noted that construction and interpretation of ensembles was a research challenge for all of WCRP.

**ACTION:** Develop a pan-WCRP White Paper to assess what WCRP is doing with respect to the role of aerosols in climate and recommend a way forward in this area of research, together with relevant partners.

**ACTION for all Projects:** Each D/IPO to inform JSC of the proposed dates for the project SSG sessions and forward to JPS the draft session agenda.

**ACTION for all Projects:** In preparation for the WCRP OSC and IPCC AR5, WCRP Projects to propose a suite of diagnostic projects to use, evaluate and promote WCRP CMIP5 data and international reanalyses, and include a brief description of these diagnostic projects in the Projects report to JSC-32.

## **8. WCRP Panel, Working Group and Task Force reports**

### **8.1 Anthropogenic Climate Change – Herve LeTreut, JSC member**

[http://www.wmo.int/wcrpevent/jsc31/documents/presentations/ACC\\_letreut.ppt](http://www.wmo.int/wcrpevent/jsc31/documents/presentations/ACC_letreut.ppt)

A major effort under this cross cut had been to create a WCRP focus on regional modelling and downscaling. The CORDEX intercomparison effort was now well underway with an initial focus on Africa (see below) and a second WCRP workshop on regional modelling and downscaling would be held in Lille, France in June of this year. It was planned that there would be strong representation from the IPCC WG I and WG II communities.

It was recognized that the treatment and analysis of multi-model ensembles, particularly from CMIP5, was an important research topic. A recent workshop on this topic had been organized by IPCC that resulted in a best practice paper, but there was a sense that WCRP workshops to synthesis evaluation work by different communities would be useful.

**ACTION:** JSC, WGNE and WWRP to develop a proposal for a workshop on the science needs for the use of multi-model ensembles on all timescales.

### **8.2 Task Force on Regional Climate Downscaling (TFRCDD) – Filippo Giorgi, Co-chair**

[http://www.wmo.int/wcrpevent/jsc31/documents/jsc-31tfrcdd\\_4.10.pdf](http://www.wmo.int/wcrpevent/jsc31/documents/jsc-31tfrcdd_4.10.pdf)

The Task Force had been given a one-year mandate to create a framework to evaluate and possibly improve regional downscaling models and techniques and to provide a coordinated set of projections/predictions for regions worldwide. The goal was also to facilitate communication with the impact community and the involvement of research community from developing countries. The CORDEX project had been designed to study sources of uncertainty in regional downscaling techniques, with an initial focus on Africa. A diagnostic/metrics team was meeting in Cape Town, South Africa in April 2010. The Lille workshop would focus on input to the IPCC AR5, with participation from WGs I and II.

The CORDEX effort was very successful to date and was becoming a reference for the community, but there was still insufficient involvement from the statistical downscaling, impact and developing country communities. The sense was that there was need for some more permanent oversight of the activity and that it might be timely to start fund raising for CORDEX.

#### *DISCUSSION*

Several comments were made about the need to compare regional and global models and to develop methods to differentiate uncertainty due to regional models versus global models. The TF Chair noted that the current experiment would involve some comparisons. In response to a question concerning rigorous measures of quality for the CORDEX products, the Chair noted that there was a plan to develop a set of metrics to evaluate the different models and that running multiple models and multiple runs should give a handle on uncertainty. A caution was raised about a possible abuse of the regional model when it is run at so high resolution that local processes become not resolved.

There was a general sense that this effort should continue, particularly since regional modelling was likely to be a big part of climate services. The TF should continue its efforts for another year, with particular

attention to comparing regional and global model outputs and taking into consideration other approaches to obtaining regional climate information, including time slices, stretched grids and statistical downscaling.

**ACTION:** Extend the mandate of the TFRCD for one year.

### **8.3 Working Group on Coupled Modelling – Sandrine Bony, Co-chair**

[WGCM](#) - ppt

At least 21 modelling groups were participating in CMIP5 <http://cmip-pcmdi.llnl.gov/cmip5/> and cooperative projects with other WCRP and IGBP groups were being developed. Improvements from CMIP3 included better evaluations, better documentation and use of an integrated Earth system model. There is also a change in the terms of use; some data would be unrestricted, others restricted. A WGNE/WGCM metrics panel had been established to synthesize the outputs and information obtained.

A proposal had been put forward for coordinated geoengineering experiments with stratospheric aerosols. Currently there was a demonstration project, not officially part of CMIP5, conducted by a few modelling groups. Issues of particular interest included:

- Robustness of model responses to geoengineering;
- Response of the hydrological cycle;
- Response to stoppage of geoengineering after a few decades.

The paleoclimate modelling intercomparison project (PMIP) was entering Phase 3 and for the first time it would be related to CMIP and use the same models. The cloud feedback model intercomparison project Phase 2 (CFMIP-2) aimed to bridge all the cloud research communities. 118 locations had been selected to compare model outputs with observations. A cloud simulator had been developed to allow comparison of model and satellite observations to assess 3-dimensional distribution of clouds in models.

Three outstanding issues were raised:

- Coordination of observations for model evaluation
- Coordination and synthesis of different MIPs
- Coordinated analyses of CMIP5 output.

#### *DISCUSSION*

Considerable discussion ensued concerning observational data for model evaluation. It was noted that this was on the agenda for the upcoming WOAP meeting. CCMVal was a good example of selecting a small subset of existing data, but for other data sets the questions remained as to which ones to select and on what basis. An effort along these lines was being undertaken by the Jet Propulsion Laboratory under the sponsorship of NASA in the USA; the view was expressed that this effort should be coordinated with others. Besides existing data, it would be desirable to interact with space agencies to produce products/data sets that would be more suitable to compare with models; this could be incorporated into the GCOS Implementation Plan.

Concern was raised as to what data sets would be used to validate the geoengineering models. A first test could be whether models correctly depicted thermal and hydrological response to volcanoes. WGCM should work with SPARC and other projects on this.

It was noted that ocean acidification was not currently being addressed in CMIP5.

The question was raised as to whether the term “prediction” should be used for 30-year “predictions” / projections; there was a general sense that if the run was initialized it could be referred to as a prediction. It was remarked that most non-technical people would interpret these two words as having the same meaning.

## **8.4 Working Group on Numerical Experimentation – Christian Jakob, Co-chair**

### [WGNE \(ppt\)](#)

Dr Jakob began his presentation by noting that WGNE was tasked to foster development of atmospheric circulation models for weather and climate. Routine forecast verification was being used to look at weather parameters; this approach could be used for climate (e.g. with WGSIP). A climate model metrics panel has been formed. Research is needed to diagnose causes of model errors; several efforts are underway, including the transpose AMIP exercise running climate models in weather mode, an example of seamless research in action. CFMIP was a very good example of an integrated approach with process studies working closely with modelers, and this approach should be extended, for example to polar regions.

The WGNE model development effort currently involved only GEWEX, but the Group expects to widen activities on a need basis; SPARC had requested a seat at the table to bring their expertise. A major concern was the dwindling number of model developers.

A WCRP community-wide consultation on model evaluation and improvement had been organized via a questionnaire. Over 100 independent responses were received from NWP, seasonal, decadal and climate change scientists. The results were currently being analyzed and a workshop would be held in early 2011 to define 4-5 key areas for model development based on the survey results and to draw up an implementation plan.

WGNE and THORPEX were sponsoring a workshop on model error diagnostics in July 2010. The JSC should consider further coordination of diagnostic projects.

### *DISCUSSION*

It was noted that climate modelers do evaluate their models by comparing with observations; the real issue was not metrics, but coordinating them so they use a common way of evaluating. There was also a need to balance standardization with diversification.

Concern was expressed that there was a need to bring ocean model development back in touch with atmospheric model development. WGOMD was working on this, but an assessment should be made as to whether WGOMD and WGCM were sufficiently linked.

The community-wide consultation on model evaluation and improvement was welcomed, but there needed to be a proper synthesis and response to the survey.

**ACTION:** Endorse the proposal for a WCRP workshop on “Physics in Global and Earth System Models” Recommend to use the results of the workshop in defining CMIP5 diagnostics projects.

**ACTION:** Synthesize the results of the WCRP Community-wide Consultation on Model Evaluation and Improvement and publish them in a peer-reviewed literature.

## **8.5 WCRP Observations and Analysis Panel (WOAP) – Kevin Trenberth, Chair**

### [WOAP - ppt](#)

The upcoming WOAP meeting in Hamburg in March 2010 would touch on many topics, including the optimal use of the many existing flux tower networks, dialogue with CEOS regarding, for instance, the new NPOESS satellites, and reanalyses. Regarding the latter, there were many ongoing efforts but there was a lack of coordination amongst these efforts and too few people were evaluating the reanalysis products. There was also a problem with continuity since most of the reanalyses were done in the research domain and key personnel were lost when a particular effort terminated. A reanalysis conference would be held in 2012 in USA, cosponsored by NOAA and NASA.

WOAP was also concerned with data stewardship. The Data Management Task Force had developed a WCRP policy statement (posted on the website). An outstanding issue was finding repositories for data after WCRP projects “retire”.

#### *DISCUSSION*

It was noted that there was no equivalent of WOAP for IGBP. The question was raised as to whether WOAP was considering reanalyses other than those for the atmosphere. The Chair said that WOAP would review progress in ocean reanalysis, but that the work was being done by the CLIVAR GSOP. Indeed WOAP was composed only of delegates from other groups and this meant that the Panel was limited in what it could actually do. There was a request for endorsement of the proposed UK reanalyses of the surface temperature record using daily and sub-daily records.

**ACTION:** WOAP to initiate a WCRP inventory of data sets, in the shorter-term perspective aim this work towards easier access to datasets and visibility of “WCRP” data sets;

**ACTION:** WOAP to examine issue of global observational datasets for CMIP5 model validation and verification including role of CEOP and other activities.

**ACTION:** JSC supportive of a workshop on global surface temperatures; should cover ocean as well as the land-surface temperatures. Communicate this decision to CCI. Send latest version of proposal to JSC members.

## **9. Joint CCI-WCRP Session**

Thursday 18 February 2010 was devoted to a session jointly organized by the WMO CCI and the WCRP. Presentations focused on observational and modelling research needs to improve seasonal to interannual predictions and research requirements for enhancing the use of climate information in impact, adaptation and mitigation studies. The full list of presentations can be found in Annex C. A joint statement ([http://wcrp.wmo.int/documents/Resolution\\_CCI\\_WCRP\\_2010.pdf](http://wcrp.wmo.int/documents/Resolution_CCI_WCRP_2010.pdf)) on enhancing the use of climate information was agreed at the end of the session and appears in Annex D.

## **10. WCRP Visioning: Long-term Functions/Structure**

### **10.1 Introduction – David Griggs**

Dr Griggs led off this session by expressing the view that the WCRP is most effective at doing two things:

- Assisting the scientific community to advance the basic science by providing a mechanism to co-ordinate activities among disciplines, and globally.
- Bringing the international scientific community together to carry out a major scientific push to address a major or grand challenge of climate science

These received general agreement and the following discussions on how to realise these goals resulted in two major items for further discussion:

1.) Whether WCRP establishes co-ordination groups for each of the activity areas:

- Observations and analysis
- Model development, evaluation and experiments
- Processes and understanding
- Applications and services
- Capacity building

2.) Whether WCRP selects one or more large-scale, outcome-oriented, scientific grand challenge(s) to be the major scientific foci over a 3-6 year period. Each grand challenge would require an organizing committee from across the Core Projects. In addition to these grand challenges, each Core Project may select a small number (one or two) of project-specific or cross-cutting challenges as foci.

Discussion groups were formed for the first three activity areas (observations, modelling and processes) and were charged to consider how each activity would operate under the new WCRP structure. Reports from each of the three groups are summarized below as well as the ensuing discussion.

## **10.2 Modelling – Jochem Marotzke**

The main recommendation from this group was the formation of a Modelling Council. The Modelling Council would be a coordination mechanism for various WCRP modelling groups, with strong participation of JSC. The Council would be a communication platform, inviting other modelling groups, for instance from IGBP, to attend. Current thinking was to leave the three main WCRP modelling groups, WGCM, WGSIP and WGNE as they were, with possible revision of this structure after the Council had met. The Council could meet at JSC sessions, and would make recommendations to the JSC.

### *DISCUSSION*

The general sense was that such a group was needed and that the terms of reference should include identification of gaps and formulation of approaches to emerging priorities. The Council would help realize the seamless approach to modelling and progress Earth system modelling. A key to its success would be that it would make recommendations to JSC rather than taking action on its own (as had been the case for the now defunct WCRP Modelling Panel).

## **10.3 Processes – Konrad Steffen**

The group identified three types of process studies:

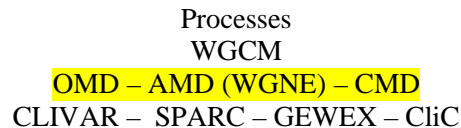
- Process study for model testing
- Processes studies of underlying phenomena
- Process studies which are overarching, but could have regional focus

The discussion was guided by the following questions:

- What is currently not working?

- Endorsement policies - how should they work, who provides guidelines?
- How should we organize process studies within WCRP?
- How to set priorities for process studies across disciplines?
- How could regional expertise within WCRP be preserved?

The group recommended that there should be ocean, atmosphere (including land) and cryosphere model development (OMD, AMD, CMD) panels under WGCM and prepared the following schematic to illustrate their recommendation



#### *DISCUSSION*

There was some discussion as to whether there was a need for the added layer of highlighted panels, for instance, because these activities should be carried out within the projects, and, if they are needed, how the added layer of working groups would work in practice (e.g. might these be virtual entities to improve the connection between processes and modelling groups). Should there be additional groups for land and chemistry model development? A member of the discussion group noted that one of the main reasons behind this structure had been to better link Core Project process study outcomes with the modelling groups and to minimize duplication and better coordinate process study activity across the projects. The view was expressed that the top level should be the three modelling groups based on timescales. Issues that needed to be dealt with was how to feed what was learned in process studies into model development and how do we decide what process studies are needed. Concern was expressed as to how regional studies would be coordinated.

Consensus was deferred until after the report from the observations group.

## **10.4 Observations – Sarah Gille**

The group analyzed the WCRP roles vis-à-vis observations and noted that there was a need to communicate to GCOS, WMO, institutions making observations and others, the observational requirements for climate research. There was also a need to advocate and advise on data standards, ensure data availability, work to sustain existing systems and identify new data needs. Data analysis and validation and data availability for applications were also issues.

The group recommended that existing structures be maintained to supervise disciplinary data stewardship (OOPC; AOPC...), and that a pan-WCRP working group be formed to manage interdisciplinary data issues and to oversee broader data management issues.

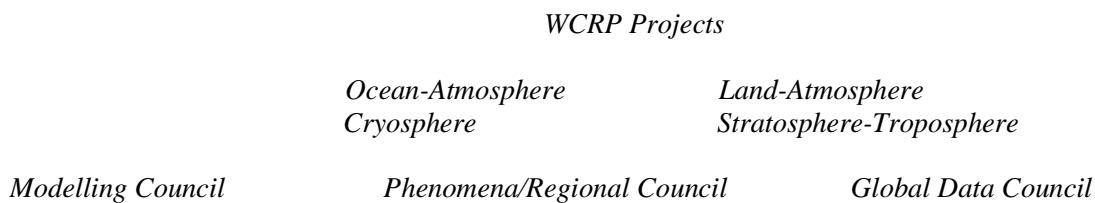
A grand science challenge could be coupled reanalysis and the group suggested that a task force could be formed to make plans, for instance for a reanalysis intercomparison that would bring together the various communities working on reanalyses to evaluate their current state and to take into account land, ocean, troposphere, stratosphere, chemistry, ecosystems, etc.

In the near term, there was a need to catalyze interactions between the observations and modelling communities, including interactions with external organizations such as GEO and GCOS. It was suggested that a WCRP secretariat officer for modelling and observations could help to improve these interactions.

## *DISCUSSION*

There was considerable discussion about exactly what would be the function of a pan-WCRP observations group and how this would differ from WOAP, but there was general agreement that there was a role for such a group. It was suggested that this group could have a more restricted mandate than WOAP, but would look in more detail at WCRP-related data and observations issues. Care would have to be taken when developing the terms of reference to not overlap with GCOS. Finally it was decided that an Observations and Analysis Council should be formed to make recommendations to JSC and that this Council would supersede WOAP.

There was further discussion about the emerging structure based on the three reports. The following diagram was presented as a model based on what had been proposed so far.



The question was raised as to whether there was consensus that there would be a Council to deal with phenomena and regional issues. Some felt that there was a need for a group to oversee phenomena such as El Nino that transcended the project boundaries and that are integrating. Others felt that the mandate of a group concerned with phenomena would be too broad and that phenomena were the main themes driving prediction efforts and hence much of what WCRP was doing. Hence, JSC could be seen as having this role. A case was made for regional panels that would integrate across project activities in a region and interact with regional climate services, but also provide a link to global climate research. In the end there was general agreement that there was not a need for a phenomenon Council and that regional issues would be dealt with within the projects.

**ACTION:** Develop TORs for Modelling and Observations Councils.

## **10.5 Grand Challenges – break-out groups and plenary**

Two parallel break-out groups were formed to discuss how the concept of grand challenges would fit within the proposed overall structure of WCRP, what would be their nature and how they would be selected. Many different views were expressed but it was generally agreed that a grand challenge (GC) would be defined as a burning issue or barrier to progress in climate research. Implementation would involve multiple projects and/or other programmes, but an outstanding issue was the extent to which the projects would take the lead in corresponding implementation activities or whether a separate a dedicated steering committee would be formed. There was also a question as to how these would differ from the existing crosscuts and whether the latter would still be necessary.

Initial discussions had suggested a limited lifetime for GCs of three to five years, but issues were raised as to whether this was realistic, both in terms of being able to accomplish something concrete and in terms of what would attract funding agencies to commit significant resources. Some expressed the view that climate science was moving so fast that we shouldn't create very large long-term projects as in the past (e.g. TOGA or WOCE), but rather focus on shorter timescale efforts that target more specific problems of scientific, but also societal, interest.

The issue of how to select grand challenges was discussed in detail. JSC could define the issue itself, or consider suggestions submitted via white papers from the community. Once a GC had been adopted by the

JSC, town hall meetings and workshops should be held to build community support, develop plans and seek funding. The Open Science Conference in 2011 could be a platform for identifying GCs. Rapid sea-ice loss could be seen as an example of GC, based on the white paper that had been presented to and endorsed by this JSC session.

In conclusion no agreement was reached on whether to proceed with Grand Challenges as a concept or how they might be implemented. It was therefore recommended that the Open Science Conference be widely promoted as a forum to discuss GCs. The next JSC meeting should also discuss possible GCs. Outstanding issues that would need further discussion included how JSC would prioritize GCs, how many there should be, how much Project resource should be spent on these and how Project Office support would be organized.

## 10.6 WCRP future function and form – summary of discussions

Dr Griggs summarized the discussions on WCRP future function and form as follows. There would be four Core Projects working at the interfaces between the physical climate system components as agreed in Maryland. Modelling and Observations Councils would be formed to provide leadership and coordination and would report to the JSC. These Councils would not carry out activities of their own but would include representatives from the Core Projects and relevant external organizations to enable activities to be co-ordinated across the Core Projects. Councils would generally work electronically with the potential to meet for one day immediately preceding JSC meetings. While it was agreed that the idea of WCRP bringing the international scientific community together to carry out a major scientific push to address a major or grand challenge of climate science was very attractive, no decision was made pending further discussion on how these could be implemented in practice. The role of crosscuts would need to be revisited. The JSC requested the current Core Projects to consider the implications of the decisions made on future structure and come back to the next JSC with views on the implications of these decisions on the sub-structure of the Core Projects within the new structure.

At the close of the session, the Chair expressed appreciation to all those who had participated in the meeting and extended special thanks to outgoing JSC members Wu and Ramaswamy, as well as to Howard Cattle who was soon retiring as Director of the ICPO.

## 11. Executive Session

Topics discussed in the executive session included

- Geoengineering
- Climate Services
- Crosscutting initiatives
- IPCC
- Membership renewals and appointments

The following recommendations and actions were agreed:

### *Geoengineering*

**ACTION:** JSC, in partnership with relevant projects to develop a white paper on the role and objectives of WCRP in the area of research on geoengineering, including an assessment of natural processes on climate; as part of activity, produce a WCRP statement on geoengineering.

### *Climate Services*

**ACTION:** Form a JSC Task Force to scope WCRP role in respect to research in support of climate information for Climate Services.

**ACTION:** Develop white paper on research for Climate Services (lead G. Flato).

*Cross cuts*

**ACTION:** Sunset monsoon cross cut, reemphasize of monsoon research in projects and of CMIP5 activity; and ensure that monsoon modelling is in TOR of modelling Council.

**ACTION:** Climate Extremes Crosscut to consider relevant activities of JMA..

*IPCC*

**ACTION:** JSC to draft a WCRP Statement in support of the IPCC process/climate science.

*General*

**ACTION:** Write to major WCRP sponsors informing them of the outcomes of this JSC meeting and thanking them for supporting WCRP IPOs.

## **12. Next JSC meeting**

The next JSC session was to be held approximately one year hence. Additionally, JSC and project Chairs would meet Sunday and Monday after the WCRP OSC in 2011. Guidelines for the next JSC session format should include:

- Projects and working groups present 30 min and 30 min discussion period;
- Cross cuts to report separately;
- Written reports present accomplishments and issues to JSC (at same level as for JSC-31);
- Written reports to be downloadable in single file;
- Oral reports only on issues for JSC.

The meeting closed at 18:30 on Friday 19 February 2010.

## **ANNEX A – List of Participants**

### **JSC Members**

Professor Antonio J. Busalacchi (Chair)  
Director and Professor, Earth System Science  
Interdisciplinary Center (ESSIC)  
Suite 4001, M Square Office Building, #950  
5825 University Research Court  
University of Maryland  
College Park, MD 20740  
USA  
tel: 1-301-405-5599  
fax: 1-301-405-8468  
email: tonyb@essic.umd.edu

Professor Dave Griggs (Vice-Chair)  
Monash University  
Monash Science Centre, Building 74  
Clayton Campus, Wellington Road  
Clayton, VIC 3800  
Australia  
tel: 61-3-9902 0239  
fax: 61-3-9905 9348  
email: dave.griggs@msi.monash.edu.au

Dr Kwabena Asomanin Anaman  
Director of Research  
Institute of Economic Affairs  
Post Office Box OS1936  
Accra  
Ghana  
tel: 233-242-982547  
fax: 233-21-222-313  
email: kwabenaasomanin@hotmail.com

Dr Gregory M. Flato  
Manager, Canadian Centre for Climate  
Modelling and Analysis  
Environment Canada  
PO. Box 1700, University of Victoria  
Victoria, BC V8W 2Y2  
Canada  
tel: 1-250-363-8233  
fax: 1-250-363-8247  
email: greg.flato@ec.gc.ca

Dr Sarah Gille  
Scripps Institution of Oceanography  
University of California San Diego  
La Jolla, CA 92093-0230  
USA  
tel: 1-858-822-4425  
fax: 1-858-534-9820  
email: sgille@ucsd.edu

Dr Filippo Giorgi  
Head, Earth System Physics Section  
The Abdus Salam International Centre for Theoretical Physics  
P.O. BOX 586  
I-34100 Trieste  
Italy  
tel: 39-040-2240-425  
fax: 39-040-2240-449  
email: giorgi@ictp.it

Professor B.N. Goswami  
Director, Indian Institute of Tropical Meteorology  
Dr. Homi Bhabha Road  
Pashan  
Pune 411008  
India  
tel: 91-(020)-25893924 (Office)  
91-(020)-25885171 (Resi)  
fax: 91-(020)-25893958/25893825  
email: goswami@tropmet.res.in

Dr Vladimir M. Kattsov  
Director, Voeikov Main Geophysical Observatory  
7 Karbyshev Str.  
St Petersburg 194021  
Russia  
Tel: 7-812-297-4390  
Fax: 7-812-297-8661  
Email: kattsov@mail.ru

Professor Hervé Le Treut  
Laboratoire de météorologie dynamique  
Institut-Pierre-Simon-Laplace  
Université de Paris 6  
4 place Jussieu  
Case postale 99  
F-75231 Paris Cédex 05  
France  
tel: 33-6-20-45-82-53  
fax: 33-1-44-27-62-72  
email: letreut@lmd.jussieu.fr

Professor Jochem Marotzke (Officer)  
Director, Max Planck Institute for Meteorology  
Bundesstr. 53  
D-20146 Hamburg  
Germany  
tel: 49-(0)-40-41173-440  
49-(0)-40-41173-311/467 (secretary)  
fax: 49-(0)-40-41173-366  
email: jochem.marotzke@zmaw.de

Dr Teruyuki Nakajima  
Director, Center for Climate System Research  
The University of Tokyo  
5-1-5 Kashiwanoha, Kashiwa  
Chiba 277-8568  
Japan  
tel: 81-(0)4-7136-4370 (office), -4371 (secretary)  
fax: 81-(0)4-7136-4375  
email: teruyuki@ccsr.u-tokyo.ac.jp

Professor V. Ramaswamy (Officer)  
NOAA Geophysical Fluid Dynamics Laboratory  
Princeton University  
Forrestal Campus  
201 Forrestal Road  
Princeton, NJ 08540  
USA  
tel: 1-609-452-6510  
fax: 1-609-987-5070  
email: v.ramaswamy@noaa.gov

Professor Fredrick Semazzi  
North Carolina State University  
Department of Marine, Earth & Atmospheric Sciences  
Box 8208  
Raleigh, NC 27695-8208  
USA  
tel: 1-919-515-1434  
fax: 1-919-515-7802  
email: fred\_semazzi@ncsu.edu

Professor Julia Slingo  
Chief Scientist  
Met Office  
FitzRoy Road  
Exeter EX1 3PB  
United Kingdom  
Tel: 44-1392-885014  
Fax: 44-1392-884400  
Email: julia.slingo@metoffice.gov.uk

Professor C. Vera (Officer)  
CIMA  
Pab.II 2 piso  
Ciudad Universitaria  
1428 Buenos Aires  
Argentina  
tel: 54-11-4787-2693  
fax: 54-11-4788-3572  
e-mail: carolina@cima.fcen.uba.ar

Professor Guoxiong Wu (Officer)  
LASG, Institute of Atmospheric Physics  
Chinese Academy of Sciences  
P.O. Box 9804  
Beijing 100029  
China  
tel: 86-10-82995266  
fax: 86-10-82995172  
email: gxwu@lasg.iap.ac.cn

### **WCRP Chairs and Directors**

Dr Sandrine Bony  
(Co-chair, Working Group on Coupled Modelling)  
Laboratoire de Meteorologie Dynamique (LMD/IPSL)  
CNRS/UPMC, Tour 45-55, 3eme étage  
4 place Jussieu, boîte 99  
75252 Paris cedex 05  
France  
tel: 33-1-44-27-50-14  
fax: 33-1-44-27-62-72  
email: bony@lmd.jussieu.fr

Dr Howard Cattle  
Director, International CLIVAR Project Office  
National Oceanography Centre, Southampton  
Empress Dock  
Southampton, SO14 3ZH  
United Kingdom  
tel: 44 (0) 23 80596208 (Direct Dial)  
44 (0) 23 80596777 (Secretary)  
fax: 44 (0) 23 80596204  
email: hyc@noc.soton.ac.uk

Professor Christian Jakob  
(Co-chair, Working Group on Numerical Experimentation)  
School of Mathematical Sciences  
Monash University  
Monash, VIC 3800  
Australia  
tel: 61-3-99054461  
fax: 61-3-99054403  
email: christian.jakob@sci.monash.edu.au

Professor T. Peter  
(Co-chair, SPARC Scientific Steering Group)  
Swiss Federal Institute of Technology (ETH)  
Institute for Atmospheric and Climate Science  
CHN O12.1  
Universitatstrasse 16  
CH-8092 Zürich  
Switzerland  
tel: 41-44-633-2756 / 3903  
fax: 41-44-633-1058  
email: thomas.peter@env.ethz.ch

Professor Ted Shepherd  
(Co-chair, SPARC Scientific Steering Group)  
University of Toronto  
Department of Physics  
60 St. George Street  
Toronto, Ontario M5S 1A7  
Canada  
Tel: 1-416-978-2931  
Fax: 1-416-978-8905  
Email: tgs@atmosp.physics.utoronto.ca

Dr Adrian Simmons  
(Chair, GCOS/WCRP Atmospheric Observations Panel for Climate)  
European Centre for Medium-Range  
Weather Forecasts (ECMWF)  
Shinfield Park, Reading RG2 9AX  
United Kingdom  
tel: 44-118-949-9700  
fax: 44-118-986-9450  
email: Adrian.Simmons@ecmwf.int

Professor Konrad Steffen  
(Co-chair, CliC Scientific Steering Group)  
Director of CIRES  
University of Colorado, CIRES  
Campus Box 216  
Boulder, CO 80309-0216  
USA  
tel: 1-303-492-8773  
fax: 1-303-492-1149  
email: Konrad.Steffen@colorado.edu

Dr Kevin E. Trenberth  
(Chair, WCRP/GCOS Observations and Assimilation Panel)  
Climate Analysis Section  
NCAR  
P.O. Box 3000  
Boulder, CO 80307  
USA  
tel: 1-303-497-1318  
fax: 1-303-497-1333  
email: trenbert@ucar.edu

Dr Peter J. van Oevelen  
Director, International GEWEX Project Office  
Suite 1550  
8403 Colesville Road  
Silver Spring, MD 20910-6374  
USA  
tel: 1-240-485-1855  
fax: 1-240-485-1818  
email: gewex@gewex.org

Professor Martin Visbeck  
(Co-chair, CLIVAR Scientific Steering Group)  
Deputy Director  
Leibniz-Institute of Marine Sciences  
Duesternbrooker Weg 20  
D-24105 Kiel  
Germany  
tel: 49-(0431)-6004100  
fax: 49-(0431)-2489370  
email: mvisbeck@ifm-geomar.de

Dr Daqing Yang  
Director, CliC International Project Office  
Norwegian Polar Institute  
Polarmiljøseneteret  
NO-9296 Tromsø  
Norway  
tel: 47-7775-0145  
fax: 47-7775-0501  
email: daqing.yang@npolar.no

### **Sponsors**

Professor Kari Raivio  
International Council for Science (ICSU)  
Vice President for Scientific Planning and Review  
University of Helsinki, PO Box 3  
00014 Helsinki  
Finland  
Tel: 358-9-191-22203  
Fax: 358-9-19122960  
Email: kari.Raivio@helsinki.fi/kaiju.pitkanen@tsv.fi

Dr Jorge Luis Valdes Santurio  
Intergovernmental Oceanographic Commission of UNESCO  
Head of the Ocean Science Section  
1, rue Miollis  
75015 Paris  
France  
tel: 33-1-45-68-40-11  
fax:  
email: jl.valdes@unesco.org

Mr Avinash Tyagi  
Director, Climate and Water Department  
World Meteorological Organization  
7 bis, avenue de la Paix  
Case Postale 2300  
CH-1211 Geneva 2  
Switzerland  
tel: 41-22-730-8355  
fax: 41 22 730 80 43  
email: ATyagi@wmo.int

**Agencies/Other invitees**

Dr Vicente Barros  
CIMA (UBA/CONICET)  
Ciudad Universitaria - Pab II  
Intendente Guiraldes s/n  
1428 - Buenos Aires  
Argentina  
tel: 54-11-4576-3398  
email: barros@cima.fcen.uba.ar

Dr Gilbert Brunet  
Chair, JSC-WWRP  
Meteorological Research Division (MRD)  
Science and Technology Branch (STB)  
Environment Canada  
2121 Trans-Canada Highway  
Dorval, Quebec H9P 1J3  
Canada  
tel: 1-514-421-4617  
fax: 1-514-421-2106  
email: gilbert.brunet@ec.gc.ca

Dr David Burrige  
Manager, THORPEX IPO  
World Meteorological Organization  
7 bis, avenue de la Paix  
Case Postale 2300  
CH-1211 Geneva 2  
Switzerland  
tel: 41-22-730-8186/44-7765-957-422  
email: d.m.burrige@btinternet.com

Dr Philippe Dandin  
Météo-France  
Directeur de la Climatologie  
Météo-France Dclim – 42, avenue Coriolis  
31057 Toulouse Cedex 1  
France  
tel: 33-5-61-07-83-00  
fax: 33-5-61-07-83-09  
email: philippe.dandin@meteo.fr

Dr Jean-Louis Fellous  
Executive Director  
Committee on Space Research (COSPAR)  
c/o CNES  
2, place Maurice-Quentin  
F-75039 Paris Cedex 01  
France  
tel : 33-(0)-1-44-76-75-10  
fax: 33-(0)-1-44-76-74-37  
email: jean-louis.fellous@cosparhq.cnes.fr

Professor Rik Leemans  
Environmental Systems Analysis Group  
Wageningen University  
P.O. Box 47  
NL-6700 AA, Wageningen  
The Netherlands  
tel: 31-317-484919 (dir) / 31-317-484812 (sec.)  
fax: 31-317-419000  
email: rik.leemans@wur.nl

Dr Simon Mason  
Leader, IRI Climate Program  
The Earth Institute at Columbia University  
61 Rt. 9W, 128 Monell Building  
Palisades, NY 10964  
USA  
tel: 1-845-680-4514  
fax: 1-845-680-4865  
email: simon@iri.columbia.edu

Professor Gordon A. McBean  
Professor and Director, Policy Studies  
Institute for Catastrophic Loss Reduction  
Departments of Geography and Political Science  
The University of Western Ontario  
London, Ontario N6G 2M1  
Canada  
tel: 1-519-661-4274  
fax: 1 519 661 4273  
email: gmcbbean@uwo.ca

Dr Ivan Petiteville  
ESA ESRIN  
Coordination Office  
Directorate of Earth Observation Programmes  
Via G.Galilei  
CP 64  
I-00044 Frascati  
Italy  
tel: 39-069-4180-567  
fax: 39-069-4180-353  
email: Ivan.Petiteville@esa.int

Dr Olga N. Solomina  
IGBP Vice-chair  
Dept. of Glaciology  
Inst. of Geography  
Russian Academy of Sciences  
Staromonetny 29  
RU-119017 Moscow  
Russia  
tel: 7-(0)495-125-90-11/7-(0)495-939-01-21  
fax: 7-(0)495-959-00-33  
email: olgasolomina@yandex.ru

Dr Thomas Stocker  
Co-chair IPCC WGI  
Climate and Environmental Physics  
Physics Institute, University of Bern  
Sidlerstrasse 5  
CH-3012 Bern  
Switzerland  
tel: 41-31-631-44-62  
fax: 41 31 631 87 42  
email: stocker@climate.unibe.ch

Dr Hassan Virji  
Director, International START Secretariat  
2000 Florida Av. NW  
Washington, DC 20009  
USA  
tel: 1-202-462-2213  
fax: 1-202-457-5859  
email: hvirji@agu.org

Dr Kiyoharu Takano  
Director, Climate Prediction Division  
Global Environment and Marine Department  
Japan Meteorological Agency  
1-3-4 Otemachi, Chiyoda-ku  
Tokyo 100-8122  
Japan  
tel: 81-3-3211-8406  
fax: 81-3-3211-8406  
email: ktakano@met.kishou.go.jp

#### **Local Invitees**

Mr Mehmet Caglar  
Director-General  
Turkish State Meteorological Service  
P.O. Box 401  
Ankara  
Turkey  
tel: 90-312-359-7545  
fax: 90-312-360-2551  
email: bilgi@dmi.gov.tr

Dr Ahmet Baban  
Vice Director of the Institute of Environment-TUBITAK  
Marmara Research Centre  
Marmara  
Turkey  
email: Ahmet.Baban@mam.gov.tr

Ms Nuray Akalin  
Institute of Environment-TUBITAK  
Marmara Research Centre  
Marmara  
Turkey  
email: Nuray.Akalin@mam.gov.tr

## **WMO**

Dr Carolin Richter  
Director, Global Climate Observing System (GCOS)  
World Meteorological Organization  
7 bis, Avenue de la Paix, BP 2300  
CH-1211 Geneva 2  
Switzerland  
tel: 41-22-730-8275  
fax: 41-22-730-8052  
email: CRichter@wmo.int

## **GEO Secretariat**

Dr Michael D. Tanner  
Senior Programme Officer  
Group on Earth Observations  
7 bis, avenue de la Paix  
Case Postale 2300  
CH-1211 Geneva 2  
Switzerland  
tel: 41-22-730-8324  
fax: 41-22-730-8520  
email: mtanner@geosec.org

## **JPS for WCRP**

Dr Ghassem R. Asrar  
Director, World Climate Research Programme  
World Meteorological Organization  
7 bis, avenue de la Paix  
Case Postale 2300  
CH-1211 Geneva 2  
Switzerland  
tel: 41-22-730-8246  
fax: 41-22-730-8036  
email: GAsrar@wmo.int

Ms Roberta Boscolo  
World Climate Research Programme  
World Meteorological Organization  
7 bis, avenue de la Paix  
Case Postale 2300  
CH-1211 Geneva 2  
Switzerland  
tel: 41-22-730-8055  
fax: 41-22-730-8036  
email: RBoscolo@wmo.int

Ms Valery Detemmerman  
World Climate Research Programme  
World Meteorological Organization  
7 bis, avenue de la Paix  
Case Postale 2300  
CH-1211 Geneva 2  
Switzerland  
tel: 41-22-730-8242  
fax: 41-22-730-8036  
email: VDetemmerman@wmo.int

Dr Vladimir Ryabinin  
World Climate Research Programme  
World Meteorological Organization  
7 bis, avenue de la Paix  
Case Postale 2300  
CH-1211 Geneva 2  
Switzerland  
tel: 41-22-730-8486  
fax: 41-22-730-8036  
email: VRyabinin@wmo.int

## **ANNEX B – JSC-31 Agenda**

### **Sunday, 14 February**

13:30-17:30 JSC Officers meeting

### **Monday, 15 February**

- 8:30-9:00 Welcome Remarks – Mr Mehmet Caglar (WMO Permanent Representative of Turkey)
- 9:00-9:30 Report on WCRP developments/response post Review - A. Busalacchi (doc. 1.1)
- 9:30-10:00 Report on JPS developments, program, personnel, budget - G. Asrar (doc. 1.2)
- 10:00-10:30 WCRP Visioning: Long-term functions/structure - D. Griggs (doc. 1.3)
- 10:30-11:00 Coffee break
- 11:00-12:00 WCRP Visioning: Long-term functions/structure- cont'd  
Introduction of Thematic White Papers:  
Processes-J. Marotzke (doc. 2.1)  
Observations-K. Trenberth (doc. 2.2)  
Modeling-G. Flato (doc. 2.3)  
Applications-C. Vera (doc. 2.4)  
Capacity Building-H. Virji (doc. 2.5)
- 12:00-13:00 Lunch
- 13:00-14:30 WCRP Open Science Conference planning – G. Asrar (doc. 3)
- 14:30-18:00 Partners (what do you require of the WCRP to support your programme goals, areas of partnership wrt to climate science and services)  
(25 min each: 15 min presentation+10 min discussion)  
IPCC/Cop-15-T. Stocker/V. Barros  
IGBP-O. Solomina  
IHDP-tbd  
ESSP-R. Leemans  
GCOS-A. Simmons  
ESA-Y. Petiteville  
GEO-M. Tanner

### **Tuesday, 16 February**

- 8:30-9:30 Joint Opening Session with CCL
- 9:30-10:30 Reports on high-level activities of past year:  
WCC-3/WMO - A. Tyagi/ M. Visbeck  
Ocean Obs/IOC - J.L. Valdes Santurio

ICSU Visioning - K. Raivio/J. Marotzke

- 10:30-10:45 Coffee Break
- 10:45-12:30 Climate Services, Intergovernmental and National presentations  
(15 min presentation +10 min discussion) (response to WCRP questions)  
WCC-3 Follow-on Task Group  
Germany  
US  
France  
UK  
Japan  
Canada
- 12:30-14:00 Executive Session (Lunch)
- 14:00-15:30 Parallel breakouts  
(function and form of WCRP for supporting climate research and services)
- 15:30-16:00 Coffee break
- 16:00-17:00 Plenary report out

**Wednesday, 17 February**

- 8:30-10:00 Project reports inclusive of crosscuts (highest level accomplishments of past year, issues/challenges for JSC)  
(30 mn presentation, 15 mn discussion)
- CLIVAR (+ WGSIP and Decadal crosscuts) (doc. 4.1 and 4.8)  
CliC (+ Arctic Ice loss) (doc. 4.2)  
GEWEX (+ Monsoon and Extremes crosscuts) (doc. 4.3)  
SPARC (+ AC&C) (doc. 4.4)
- 10:00-10:30 Coffee break
- 10:30-12:00 Project/Crosscut reports (Continued)
- 12:00-13:30 Lunch
- 13:30-16:30 Panel/WG/TF reports  
20 mn presentation + 10 mn discussion)  
ACC-H. LeTreut (doc. 4.5)  
WOAP-K. Trenberth (doc. 4.6)  
WGCM-S. Bony (doc. 4.7)  
WGNE-C. Jakob (doc. 4.9)  
TFRCD- F. Giorgi (doc. 4.10)

## Thursday, 18 February

Joint Day with 15<sup>th</sup> session of CCI

Introductory Remarks by A. Busalacchi/WCRP and P. Bessemoulin/CCI

- 8:30-9:00 Climate System Monitoring and Research Needs  
T. Peterson, National Climate Data Center (NCDC), USA
- 9:00-9:30 Improving our understanding of the hydrologic cycle and its changes:  
Observational and modeling needs  
K. Trenberth, NCAR, USA
- 9:30-10:00 Climate Change Detection and Indices: Overview and Future Perspectives  
F. Zwiers, Canadian Centre for Climate Modelling and Analysis,  
Meteorological Service, Canada  
A. Klein Tank, Royal Netherlands Meteorological Institute (RNMI),  
The Netherlands
- 10:00-10:30 Coffee Break
- 10:30-11:00 Research Needs for Seasonal to Inter-annual Climate Prediction  
J.-P. Ceron, Météo-France  
P. Bessemoulin, Météo-France
- 11:00-11:30 Research Needs for Decadal to Centennial Climate Prediction: From observations  
to modeling  
J. Slingo, UKMO, UK  
V. Ramaswamy, GFDL, USA
- 11:30-12:30 Discussion: Research needs in observations and modeling at seasonal to  
centennial timescales
- 12:30-14:00 Lunch
- 14:00-14:30 Providing downscaled regional climate change information for impact and  
adaptation: The CORDEX framework  
F. Giorgi, ICTP, Italy  
C. Jones, SMHI, Sweden
- 14:30-15:00 Practical Applications of Seasonal to Inter-annual Climate Predictions on Regional  
and National Scales  
L. Ogallo, IGAD Climat Prediction and Applications Centre (ICPAC), Kenya  
R. Kumar Kolli, World Meteorological Organization (WMO), Switzerland
- 15:00-15:30 Bridging the gap between climate change information, stakeholders and  
policy making  
D. Griggs, Monash U., Australia
- 15:30-16:00 Coffee Break

- 16:00-16:30 Enhancing Linkages between Climate Service Providers and Users to Facilitate Climate Adaptation and Climate Risk Management  
S. Mason, Columbia University, NY, USA
- 16:30-17:00 Enhancing climate change research and application in developing countries  
F. Semazzi, NCSU, USA  
B. Hewitson, U. Cape Town, S. Africa
- 17:00 Discussion: Research needs for enhancing the use of climate information in impact, adaptation and mitigation work

**Friday, 19 February**

- 8:30-10:00 WCRP Visioning- Long-term functions/structure: D. Griggs
- 10:00-10:30 Coffee break
- 10:30-12:00 Parallel break outs  
(WCRP coordination for modelling, obs, process studies, applications)
- 12:00-13:30 Lunch
- 13:30-15:30 Plenary Report out and discussion
- 15:30-16:00 Coffee break
- 16:00 Executive Session

## **ANNEX C – Agenda of joint CCI/WCRP session**

Thursday 19 February

*Co-chairs: A. Busalacchi/WCRP and P. Bessemoulin/CCI*

### *Morning session*

Climate System Monitoring and Research Needs - *T. Peterson, National Climate Data Center (NCDC), USA*

Improving our understanding of the hydrologic cycle and its changes: Observational and modelling needs - *K. Trenberth, NCAR, USA*

Climate Change Detection and Indices: Overview and Future Perspectives - *F. Zwiers, Canadian Centre for Climate Modelling and Analysis, Meteorological Service, Canada and A. Klein Tank, Royal Netherlands Meteorological Institute (RNMI), The Netherlands*

Research Needs for Seasonal to Inter-annual Climate Prediction - *J.-P. Ceron, Météo-France P. Bessemoulin, Météo-France*

Research Needs for Decadal to Centennial Climate Prediction: From observations to modelling - *J. Slingo, UKMO, UK V. Ramaswamy, GFDL, USA*

*DISCUSSION:* Research needs in observations and modelling at seasonal to centennial timescales

### *Afternoon session*

Providing downscaled regional climate change information for impact and adaptation: The CORDEX framework - *F. Giorgi, ICTP, Italy and C. Jones, SMHI, Sweden*

Practical Applications of Seasonal to Inter-annual Climate Predictions on Regional and National Scales - *L. Ogallo, IGAD Climat Prediction and Applications Centre (ICPAC), Kenya and R. Kumar Kolli, World Meteorological Organization (WMO), Switzerland*

Bridging the gap between climate change information, stakeholders and policy making - *D. Griggs, Monash U., Australia*

Enhancing Linkages between Climate Service Providers and Users to Facilitate Climate Adaptation and Climate Risk Management - *S. Mason, Columbia University, NY, USA*

Enhancing climate change research and application in developing countries - *F. Semazzi, NCSU, USA and B. Hewitson, U. Cape Town, S. Africa*

*DISCUSSION:* Research needs for enhancing the use of climate information in impact, adaptation and mitigation work

## **ANNEX D – CCI/WCRP Joint Statement**

### **Working together towards strengthened Research and Operations Linkages for Enhancing the use of Climate Information**

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**Joint Session of WMO Commission for Climatology and Joint Scientific Committee for the WCRP**

#### **STATEMENT Antalya, Turkey, 18<sup>th</sup> February, 2010**

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We, the experts representing the World Climate Research Programme<sup>1</sup> (WCRP) and the WMO Commission for Climatology (CCI), having met in a Joint Session on 18 February 2010 at Antalya, Turkey, have deliberated on a number of issues of common interest and agree that our joint efforts are critical to comprehensively address the rapidly emerging societal needs for climate services for adaptation and risk management.

The World Climate Conference-3 (WCC-3), held from 31 August to 4 September 2009 in Geneva, decided to establish a Global Framework for Climate Services (GFCS) to strengthen the production, availability, delivery and application of science-based climate monitoring and prediction services. GFCS is designed to mainstream climate science into decision making at all levels and help ensure that every country and every climate-sensitive sector of society is well equipped to access and apply the relevant climate information. GFCS is proposed to have five major components: (i) Observations of the Climate system; (ii) Climate research, modelling and prediction; (iii) a Climate Services Information System; (iv) a Climate User Interface Programme; and (v) Capacity Building.

WCRP has successfully laid the scientific foundation for the current and future climate services. Its research projects, particularly those pursuing the coupled climate and Earth system models, are poised to push the frontiers of climate predictability further. It is recognized that while climate science has advanced significantly during the past three decades, many scientific challenges still remain. Climate research, including understanding, modelling and prediction aspects, helps characterize climate variability and change and to generate quantitative climate predictions and climate projections, on a range of time and space scales, providing a key pillar for the GFCS.

CCI has worked over the years through the World Climate Programme (WCP) and its components (WCASP: World Climate Applications and Services Programme; WCDMP: World Climate Data and Monitoring Programme) to support provision of climate services, including WMO's Climate Information and Prediction Services (CLIPS) project. Climate Services Information System (CSIS), as a component of GFCS designed to deliver the climate information that users need, will be based on the three-tiered structure of entities at global, regional and national levels that have been initiated, developed and promoted through collaborative efforts of CCI and Commission for Basic Systems (CBS). They include Global Data Centres and Global Producing Centres of Long Range Forecasts (GPCs) and other global climate prediction centres, Regional Climate Centres (RCCs) and other regional institutions, National Meteorological and Hydrological Services (NMHSs) and National Climate Services (NCSs), and would be required to be expanded and strengthened under GFCS.

To support the successful implementation of GFCS, WCRP and CCI agree to closely collaborate to address the following topical issues of direct relevance to climate adaptation and risk management in general and the GFCS in particular:

1. Strengthen and mainstream research observations to serve as prototypes for future climate observing systems, in cooperation with GCOS and WIS;

2. develop climate prediction systems with lead times from seasons to centuries;
3. ensure development of reliable high-resolution products needed for climate adaptation and risk management;
4. promote interdisciplinary research to develop sector applications, tools and tailored information;
5. facilitate flow of user requirements to the research community and climate services producers through user feedback;
6. support the RCCs, NCSs and the Climate Outlook Forums (COFs) mechanism as well as consensus assessments (Annual State of the Global Climate);
7. foster links between WMO Regional Associations (RAs), NMHSs, WCP, CCI and WCRP, for regional and national activities
8. improve the availability of highly-skilled talent to undertake climate research, operational prediction, and communication, particularly in the developing countries.

Having benefited from collaboration between WCRP and CCI in the past and in order to further strengthen this collaboration to achieve the above objectives, the WCRP and CCI agree to establish a joint collaborative mechanism and will seek further partnership with other WMO Technical Commissions, Programmes, co-sponsored Programmes, and other Research entities. The cooperative mechanism will include e.g. attendance to respective high level bodies of each entity (WCRP JSC, CCI sessions), organization in common of climate-related events (CCI Technical Conferences, WCRP Open Science Conferences), Joint Expert Teams on issues of common interest (such as the successful existing Joint CCI/CLIVAR/JCOMM ETCCDI), joint publications, etc.

## ANNEX E – JSC-31 Action List

No.	Action	Responsible	Deadline
<b>Core Projects and WGS Activities</b>			
1	Each D/IPO to inform JSC of the proposed dates for the project SSG Sessions and forward to JPS the draft Session agenda.	D/IPOs	2 months before a session
2	In preparation for the WCRP OSC and IPCC AR5 WCRP Projects to propose a suite of diagnostic projects to use, evaluate and promote WCRP CMIP5 data and international reanalyses, and include a brief description of these diagnostic projects in the Projects report to JSC-32.	WCRP Projects, WGCM, WGNE	Report to JSC-32
3	CLIVAR to a) encourage SSG to further refine ocean/atmosphere relevance of imperatives and include coupled ocean/atmosphere observations; b) compile a list of nations engaged in oceanographic activities affiliated with the Project; c) encourage interaction with WWRP/THORPEX in the area of sub-seasonal and seasonal prediction, particularly on interactions of CHFP and TIGGE.	C-CLIVAR, D/ICPO	a) June 2010 b) cont.
4	CliC to a) prioritise proposed activities of the CliC project and develop a phased approach to their implementation and re-examine what is really short versus mid- and long-term activities, strengthen the CliC SSG to accommodate new required fields of expertise; b) take the lead in defining the scope of the “Arctic” dimension of Pan-WCRP activities, in cooperation with relevant partners; c) identify interfaces to WGCM, WGNE, WGSIP and TFRCD.	Chair & SSG CliC, D/CIPO	Report to JSC-32
5	JSC thanks the authors of the “Rapid Loss of Sea Ice in the Arctic” white paper and requests CliC and CLIVAR to proceed to scoping a CMIP5 diagnostic project analyzing historical Arctic sea-ice loss as simulated by current climate models and evaluating the range of future projections.	CliC and CLIVAR	Report to JSC -32
6	GEWEX to a) revise mission statement to emphasise land-atmosphere interactions; b) start addressing the issue of water storage on land; c) present its plan for the future to the next JSC meeting in 2011.	Chair & SSG, GEWEX D/ICPO	Report to JSC-32
7	Endorse the plans for the Polar Predictability Workshop and ensure adequate representation on it of expertise from all WCRP Projects and other relevant activities such as SEARCH and NERC project. Outcome should be plan for a Rapid Sea-Ice Loss activity. Examine GEWEX representation on the organizing committee. Following the workshop, define the optimal modalities of cryospheric input to CHFP.	Polar Workshop SOC, CliC	ASAP
8	WOAP to a) initiate a WCRP inventory of data sets, in the shorter-term perspective aim this work towards easier access to datasets and visibility of “WCRP” data sets;	WOAP in collaboration with WGCM, GCOS,	Initial consideration by WOAP,

	b) examine issue of global observational datasets for CMIP5 model validation and verification including role of CEOP and other activities.	all Projects, TFRCD	Mar 2010, report to JSC-32
9	WCRP modelling groups to consider means of strengthening cryospheric components of climate models, in cooperation with CliC.	WGCM, WGNE, TFRCD, WGOMD	Nov 2010
10	Extend the mandate of the TFRCD for one year.	Co-chairs, CORDEX	Report to JSC – 32
11	Endorse the proposal for a WCRP workshop on “Physics in Global and Earth System Models”. Recommend to use the expected results of the workshop in defining CMIP5 diagnostics projects.	WGNE with partners	2011
12	Synthesize the results of the WCRP Community-wide Consultation on Model Evaluation and Improvement and publish them in a peer-reviewed literature.	Modelling survey team	1 <sup>st</sup> half of 2010
No.	Action	Responsible	Deadline
<b>Actions for JSC</b>			
13	To develop a pan-WCRP White Paper to assess what WCRP is doing with respect to the role of aerosols in climate and recommend a way forward in the area of research, together with relevant partners.	Ramaswamy and Nakajima with C/GEWEX, C/SPARC, other Projects, ACPC participants	Initial consultation with IGBP in Grenoble, Mar 2010, JSC-32
14	In partnership with relevant projects to develop a White Paper on the role and objectives of WCRP in the area of research on geoengineering, including an assessment of corresponding natural processes; as part of activity produce a WCRP statement on geoengineering.	lead: Slingo, Ramaswamy and Flato with SPARC, CLIVAR SOLAS and WGCM	Initial consultation with IGBP in Grenoble, Mar 2010
15	JSC members and Projects Chairs and Directors to actively support the OSC preparation and seek additional funding support for the Conference in coordination with the JPS/JSC.	All JSC members, Cs and Ds of Projects	20 Mar 2010
16	To recommend to Climate Extremes Crosscut to consider relevant activities of JMA.	JSC, GEWEX	Mar 2010
17	Develop a proposal for a workshop on the science needs for the use of multi-model ensembles on all timescales.	Lead: Flato with WGNE and WWRP	Report to JSC-32
18	Form a JSC Task Force to scope WCRP role in respect to research in support of climate information for Climate Services (leads to be selected from IRI, UK MetOffice, Semazzi).	JSC, D/WCRP	JSC-32
19	Develop a White Paper on research for climate service.	G. Flato	
20	Develop ToRs for Modelling and Observations Councils.	Gille, Marotzke	JSC-32
21	Sunset the monsoon Crosscut, reemphasize importance of monsoon research in projects and of CMIP5 activity; and ensure that monsoon modeling is in ToR of Modeling council.	JSC and Projects	TBD

22	Support workshop on global surface temperatures; which should cover ocean as well as the land-surface temperatures. Communicate this decision to CCI. Send latest version of proposal to JSC members.	Slingo, JSC	TBD
23	JSC to meet in approx one year from now and JSC and project Chairs to meet on Sunday and Monday after WCRP OSC 2011.	JSC	Feb and Oct 2011
24	Projects and working groups present 30 min and 30 min discussion period. Crosscuts to report separately. Written reports present accomplishments and issues to JSC (at same level as for JSC-31); written reports to be downloadable in single file; oral reports only on issues for JSC.	JSC and Projects	At JSC-32
No.	Action	Responsible	Deadline
<b>Cooperation and Communication, Capacity Building</b>			
25	JSC to draft a WCRP Statement in support of the IPCC process/climate science.	Griggs with Slingo, Ramaswamy, Marotzke	Feb 2010
26	Develop a long-term plan for sustained capacity building activities for WCRP.	authors of JSC CB WP with relevant partners	JSC-32
27	SOC and LOC of the OSC to develop a timeline for major milestones in preparation of the Conference.	LOC and SOC of OSC	15 Mar 2010
28	Draft a letter from JSC to ICSU Secretariat to include in the ICSU Visioning document a statement on the need for building and maintaining the scientific workforce needed to conduct fundamental climate research. Clarify charge to visioning process, cross-cutting or all GEC activities.	D/WCRP, JSC	15 Mar 2010
29	Write a letter to major WCRP Sponsors informing them of the outcomes of this JSC meeting and thanking them for supporting WCRP IPOs.	D/WCRP	15 Mar 2010