

# WCRP REPORT

World Climate Research Programme



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## PROJECT REPORT

Report of the 15<sup>th</sup> session of the CLIVAR/WCRP  
Working Group on Coupled Modelling (WGCM)

19-21 October 2011, NCAR, Boulder, CO, USA

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## 1 Introduction

The National Center for Atmospheric Research (NCAR) in Boulder, USA hosted the 15<sup>th</sup> session of the CLIVAR/WCRP Working Group on Coupled Modeling (WGCM) on 19-21 October 2011. WGCM was extremely grateful for the welcome and organization provided by the local host. The meeting agenda can be found in Appendix 1 and the list of participants can be found in Appendix 2.

The particularity of the WGCM 15<sup>th</sup> session was that it started with a Joint session on 19 October with the WCRP Working Group on Numerical Experimentation to explore various areas of collaboration and exchange of expertise. This follows the obvious realization that more and more numerical weather prediction (NWP) models are run for climate research purposes and vice-versa climate models are being run in NWP mode as well. Additionally, both WGCM and WGNE are keenly interested in improving atmospheric models in terms of understanding processes and improving parameterizations, and this common interest provides a logical connection between the two working groups. For example, efforts at the intersection of WGNE and WGCM time scales such as YOTC, MJO, WGSIP and the newly created WWRP/WCRP Sub-seasonal to Seasonal Prediction Panel have been discussed.

The main topics of the WGCM meeting on 20-21 October covered a review of recent WCRP programmatic developments at the Joint Scientific Committee level such as the Model and Data Councils, the progress review of the Coupled Model Intercomparison Project: Phase 5 (CMIP5) and the review of model evaluation and progress towards model improvements. WGCM's partners (including CLIVAR, GEWEX, SPARC, CliC, WGNE, WOAP, IDAG) and the global modeling centers reported on their activities of relevance to CMIP5, including associated coordinated experiments, and progress in model development. Activities relevant to CMIP5 involving satellite data from space agencies and other national activities were also presented and reviewed. The CMIP5 discussion included the prospects and coordination of analyses across the different CMIP5 components and recommendations for analysts. Special attention was dedicated to the PCMDI infrastructure development to host, archive and distribute CMIP5 model results and the IPCC AR5 deadline constraints. The WGCM encouraged the international modeling groups to submit model results in due time whenever possible and submit their scientific papers to peer-reviewed journals with descriptions of their model results before the July 31, 2012 deadline for assessment in the IPCC AR5. It was proposed to fill-in a minimum set of metadata in the METAFOR questionnaire for all CMIP5 contributors so as to facilitate the exploitation of the CMIP5 results for assessment in the IPCC AR5. Discussions addressed various model developments, intercomparisons and publication avenues and their implications for WCRP coordination.

A full list of decisions and actions can be found in Annex A. Annex B includes the meeting agenda and Annex C provides the contacts of the list of participants of the meeting.

## 2 Joint WGCM/WGNE session (19 October 2011)

The session was introduced by Jerry Meehl who thanked the chairs of both working groups, welcomed participants and stressed that this was the first instance of a joint WGCM/WGNE session.

### 2.1 Overview of WGCM, WGNE and WCRP matters

**S. Bony** reviewed the three main **WGCM** missions and stressed the need to balance Simulations – model Evaluation – and process Understanding. A major mission for WGCM is to review and foster the development of coupled climate models - now evolving into Earth System models - in particular through several collaborations which are in place through IGBP/AIMES, SPARC, CLIC and joint activities such as the joint WCRP/WWRP-THORPEX “survey on model evaluation and improvement”. Another major mission for WGCM is to coordinate model experiments and inter-comparisons, which is achieved through several efforts such as CMIP, PMIP, WGSIP, Transpose-AMIP, WGNE/WGCM and CORDEX to address natural climate variability, and to predict climate response to natural and anthropogenic perturbations at various scales. Still another mission of WGCM is to promote and facilitate model validation and diagnosis of shortcomings through the development of metrics and synergies between global modeling, observations and process studies such as the CFMIP observations simulator (COSP), the Obs4MIPS effort, and coordinated CFMIP/GCSS station output.

A number of opportunities for increased collaboration between WGCM and WGNE were noted as being possible. NWP groups may be further involved in CMIP5, for example in the atmosphere-only AMIP runs, Transpose-AMIP, and idealized experiments. The CMIP5 community has an opportunity to provide feedback regarding model diagnostics to model developers. Shortfalls in understanding the link between model errors and model formulation require further coordinated experiments to address physical parameterizations and the effects of model resolution in particular. It was suggested to create dedicated Climate Process Teams (CPTs) to that effect.

**C Jakob** provided an overview of the **WGNE** ToR, focusing on modeling and data assimilation. WGNE was established 27 years ago, under the sponsorship of WCRP and CAS. A recent focus and positive outcome of this group has been the progress in seamless prediction, as demonstrated by the fact that several centers now use the same model for NWP and climate modeling such as the UK MetOffice. The importance of ex-officio memberships of WGNE such as GEWEX is acknowledge and provide WGNE with an opportunity to interface with important efforts such as SURFA which develop the surface fluxes data sets and analyses. NWP models are entering the grey zone, a range of high resolution where the behavior of models is poorly understood and current parameterization schemes is showing limitations. This is an issue climate models may have to address soon

as well. Opportunities for increased WGNE/WGCM collaboration are suggested on initiatives such as AMIP and THORPEX efforts, on topics such as rainfall verification, model uncertainty, ocean-atmosphere coupling, which may benefit both communities.

**M. Rixen** provided an update on **WCRP** matters relevant to both WGNE and WGCM communities. The NWP and climate research communities have a growing common interest to collaborate. NWP groups are looking to extend their forecast capability into the sub-seasonal to seasonal range whilst the climate research community has been pushed to deliver more operational services through the newly established Global Framework for Climate Services (GFCS). A new joint WCRP-WWRP effort called “Sub-seasonal prediction research project” will address the predictability potential at these scales by joining NWP efforts and Climate research forces. The WCRP is currently transitioning from the WCRP Observations and Assimilation Panel (WOAP) to a WCRP Data Advisory Council (WDAC) to coordinate observational and data analysis efforts across the program, and establishing a WCRP Modeling Advisory Council (WMAC), to coordinate modeling efforts across the program.

*Discussion: the audience noted that the US agencies have a similar structure to the one envisioned by the WCRP, that ICSU was not represented in the envisioned councils. Concerns were raised about the rather top-down approach in revisiting the governance of the WCRP which could benefit from some bottom-up community inputs and suggestions*

## 2.2 Review of WGNE/WGCM relevant modeling projects

**K. Taylor** provided a review of **CMIP5**, its structure and funding and tiered approach with the core and optional simulations. Currently 23 groups are providing 50+ models, with more coming in daily. CMIP falls under the umbrella of an internationally coordinated research program where WGCM plays the leadership, organizational and coordination role. The IPCC assessments are however separate from the climate research programs. The main differences between CMIP5 and the previous CMIP3 are a wider variety of models, a more ambitious suite of experiments to address a wider variety of questions (e.g. decadal predictability), a broader community of users, and a more comprehensive set of model outputs. This enables more complete diagnostics and use of the CMIP5 data in dynamical and statistical downscaling. This has resulted in a data volume increase from 35Tb in CMIP3 to an estimated eventual 3000Tb in CMIP5. There is also more complete model documentation, and new strategies for data access and standardization. About half of the planned runs are now available for analysis. The Earth System Grid Federation, with PCMDI playing a leadership role, enables access to CMIP5 simulation outputs to analysts worldwide by linking 13 data nodes. The system has allowed a much wider end-user community but is still experiencing some difficulties such as web searching and bandwidth. These are being addressed and a number of fixes or work-arounds have been devised.

First results from CMIP5 have addressed aspects of the response of the climate system to an abrupt quadrupling of CO<sub>2</sub>, idealized experiments to quantify differences in model forcing and climate sensitivity, cloud radiative feedback sensitivity, and transient climate response versus equilibrium climate sensitivity. Observational datasets such as Obs4MIPs are being developed and will be useful and easy to use in evaluating CMIP5 models. With regards to the decadal prediction experiments that are part of CMIP5, it was stressed that bias correction is critical to compare models to observations. Details and more information on CMIP5 is given on the CMIP website: <http://cmip-pcmdi.llnl.gov>

The CMIP5 timeline is the following:

- March 2011: First model output became available to users
  - June 2012: Data not already in the CMIP5 archive will probably not be included in publications cited by the AR5
  - Journal articles to be assessed in the IPCC AR5 must be submitted – 31 July 2012
  - Journal articles to be included in the IPCC AR5 must be accepted – 15 March 2013
- Late 2013: IPCC AR5 published

**ACTION:** modeling groups and CMIP5 participants are asked to be aware of the publication schedule to maximize the science contribution to IPCC

### 2.3 Climate model metrics

**Peter Gleckler** provided an update on the WGNE/WGCM Climate Model Metrics Panel which aims to quantify model agreement with observations with a broad perspective by looking at different aspects of model skill to serve as a complement to in-depth diagnoses to investigate model realism, improvement and robustness. It was noted that, although not a focus of the panel, a main challenge is to understand to what extent the skill of climate simulations in reproducing observations relates to climate projection skill. Performance metrics allow testing unforced behaviors, external forcings, individual processes, the initial value problem, and increased complexity. The primary focus has been on historically forced AOGCMs, some physical aspects of historical Earth System Models, and AMIP simulations. Metrics allow for a synthesis of results. For example, a first look at ENSO simulations in the AOGCMs shows a slight improvement in NINO3 and NINO 4 interannual SST variability. A Taylor diagram on annual cycle of dynamical sea-surface height does not show any evidence yet that CMIP5 results are demonstrably better. Gauged by simple metrics, the structure of relative model errors is complex and the choice of a metric may impact ranking of models, although outliers remain relatively robust to that choice. The WGNE/WGCM Climate Model Metrics Panel welcomes feedback from WGNE and WGCM. Annual cycle metrics for target CMIP5 benchmark experiments are a first step. In the near future, the idea is to extend them to include ENSO, monsoons, MJO, and specific metrics for the carbon cycle in emission-driven ESMs as well.



*Discussion: it was noted that reanalyses are also used for certain metrics. It was pointed out that it might be useful to have specific albedo, aerosol, and process-oriented metrics, and that issues about trends versus metrics deserved further attention.*

**ACTION:** WGNE/WGCM members to provide feedback to Climate Model Metrics Panel

## 2.4 Transpose AMIP

**K Williams**, reviewed the rationale for the joint WGNE/WGCM Transpose-AMIP effort, which consists in running climate models in NWP-mode, as opposed to AMIP, which is more generally an atmospheric model intercomparison exercise aimed at climate applications. The core experiments are designed to run models initialized from ECMWF YTC analyses spread through annual and diurnal cycles during 2008/2009. All global modeling centers (NWP or climate) can submit their results. Currently, 8 centers have announced their participation, 3 of them have completed their runs and have converted data, but only one has uploaded the results on the Earth System Grid. A number of proposed diagnostic studies are currently being planned. Data formats and downloading procedures are the same as for CMIP5 and diagnostics lists are largely based on the CFMIP component of the CMIP5 list. Example statistics on coupled SST bias, surface net SW downward radiation bias, cloud bias, and cloud histogram clustering were presented. Boundary layer dynamics were discussed in the context of understanding the role of the convection and shear in cold air outbreaks. Transpose-AMIP welcomes the use of their data and the addition of new experiment by centers not listed

*Discussion: the audience noted that it might be challenging to diagnoses many different models, not so much because of common CMIP format, but also because long time series are required for robust statistics.*

**ACTION** the modeling community is encouraged to participate with climate models in Transpose-AMIP, because it allows insights into the role of physics parameterization in climate models

## 2.5 CFMIP

**Sandrine Bony**, presented an update on the **Cloud Feedback Model Inter-comparison Project (CFMIP)** Phase-2 consisting of 3 main activities: GCM analysis through a hierarchy of models, process studies and satellite observations and simulators which support evaluation and process-oriented studies to assess cloud-climate feedbacks. CFMIP activities are closely coupled to CMIP5. Progress was noted on the usefulness of the cloud simulator COSP for CMIP5 (and some NWP) model development and evaluation, and on efforts to collect and facilitate the access to observations to evaluation cloud aspects of CMIP5 outputs. CFMIP model outputs are currently provided at selected locations. Observations for model evaluation are both satellite-based and ground-based (e.g. Atmospheric

Radiation Measurement Program – ARM and CloudNet) (<http://climserv.ipsl.polytechnique.fr/cfmip-obs.html>). A user interface provides easy access to such data and will soon allow for the extraction of multiple satellite observations and 3-hr ERA-interim data over CFMIP stations. CFMIP will allow discriminating cloud changes due to temperature and to radiative forcing changes, will support the diagnosis of cloud feedback involving the contributions of different cloud types and changes (altitude, optical depth, amount), and general studies on climate sensitivity. It is hoped that the observational time series will be able to better constrain the processes. A new generation of climate models is emerging that include very high resolution, super-parameterizations, and global cloud resolving models, and will hopefully help identify the cloud process critical to climate sensitivity. The next Joint Euclipse/CFMIP meeting will focus on cloud bias characterization, the role of clouds in current climate, and climate change cloud feedback.

*Discussion: the audience noted that the US Department of Energy funded a project to collect relevant data between California and Hawaii*

**ACTION** Announce the Joint Euclipse/CFMIP meeting to be held in Paris May 28 – June 1, 2012

## 2.6 YOTC/MJO

**Mitch Moncrieff** introduced YOTC around 3 activities, including global predictions, integrated observations and diagnostic studies, and all contribute to seamless weather-climate prediction. The YOTC focus period 2008/2009 was selected because it provides a set of diverse El Nino and La Nina conditions, with evident MJO activity, but also interesting Kelvin-Rossby wave interactions and situations for case studies for diabatic heating experiments. The presentation included an analysis of tropical cyclones during YOTC, the summer monsoon, and atmospheric rivers. YOTC satellite data include NASA A-Train, TRMM for NASA Giovanni dissemination and CloudSat Data Processing Center. Transpose-AMIP models ([hadobs.metoffice.com/tamip](http://hadobs.metoffice.com/tamip)) are also contributing to this effort. Improved theories on the MJO are currently under development, with potential benefits for both the NWP and climate communities.

**Duane Waliser** provided a background on the MJO task force which originated from the US CLIVAR MJO Working Group. The overall goal of the MJO TF is to facilitate improvements in the representation of the MJO in weather and climate models in order increase the predictive skill of the MJO and related weather and climate phenomena. The MJO WG developed observation-based diagnostics applied to GCMs to study variability, life cycle, mean state and data set sensitivity. These operational MJO forecast metrics allow for quantitative forecast skill assessment, targeted model improvements and the development of multi-model ensemble forecasts. Metrics are organized into 4 sub-projects on MJO processes, boreal summer monsoon, climate scale and diabatic processes. It is hoped that combining different metrics will provide pathways to understanding and improving MJO model performance. About 20 modeling groups are contributing

with AGCMs and AOGCMs to the study of vertical structure and diabatic processes of the MJO in collaboration with GASS.

**ACTION:** recommend participation in YOTC/MJO modeling and analysis effort

**ACTION:** consider how to bring stochastic physics community into YOTC/MJO

**ACTION:** announce the Pan-GASS meeting in fall 2012

## 2.7 WGSIP

**David Dewitt**, on behalf of **Ben Kirtman**, provided an overview of activities within WGSIP, consisting of the CHFP, Decadal and Sub-seasonal projects and stressed the large potential for societal applications at these scales.

About a dozen groups contribute to CHFP, and half of them have already completed their simulations. Results are hosted on the CIMA server at <http://chfps.cima.fcen.uba.ar/>. CHFP mainly addresses three topics and associated experiments. The Glace experiment addresses the importance of land surface and soil moisture for seasonal forecast and associated prediction skill and demonstrates the potential of improved observational networks for useful forecasts at these scales. For the stratosphere, high-top versus low-top approaches are being investigated. Almost half of the 8 participating groups have completed their runs. Case studies with and without initial sea-ice data form the core of the Ice Historical Forecast Project, for which 3 out of 4 groups have now completed their runs. A US National Multi-model Ensemble hindcast effort over approximately 8 months involves 6 models each consisting of 10 to 24 members. Decadal climate prediction activities are overseen by a joint WGCM and WGSIP Decadal Climate Prediction Panel, and address ocean initialization in particular. The group has been very active in a large number of conferences over the last 2 years and exchange basic quantities once per year. Areas for collaborations with the THORPEX/TIGGE effort have been identified, namely on ocean-atmosphere coupling and the impact of resolution on sub-seasonal forecast skill, on the role of scale interactions and ensemble techniques.

*Discussion:* the audience wondered about the models being common to WGNE, WGSIP and WGCM.

**ACTION:** need to document models used in WGSIP to better understand sources of errors.

**ACTION:** propose a list of key model errors to be addressed in modeling groups: e.g. tropical biases, SST drift, wind-stress, etc

## 2.8 DISCUSSION: High resolution AMIP and resolution in climate models:

*The background idea is to have NWP groups run global high resolution models for climate studies at a typical resolution of 20 km, which may contribute to CMIP5, but there are few groups ready to champion this effort. What is fundamentally missing is a control run. The EC Earth Community is ready to contribute and the EC*

*Infrastructure project IS-ENES has a work package including coupled ocean-atmosphere runs at ¼ degree resolution. Ocean-atmosphere coupling at around 10km resolution is very important for e.g. SST and to get realistic frontal structures. It is important to identify which groups are going to use these model-data sets. NWP centers are interested in running their models for climate purposes to understand systematic model errors. The Grey Zone and multi-model ensembles has additional issues at the 10-20 km resolution. Finally, the volume of data at these scales poses serious challenges. Several groups now use the same model for weather and climate prediction.*

**ACTION:** group asked to explore options for volunteer centers to contribute to high-resolution AMIP and climate models in relation to the Grey Zone.

## 2.9 CORDEX

**Colin Jones** review the progress on **CORDEX** activities, which focuses on the sources of uncertainties in regional climate downscaled model evaluation (forcing by ERA-interim boundary conditions) and projections (RCP approach). CORDEX is currently active over several continents, with an initial focus on Africa. It was pointed out that the mandate for the Task Force on Regional Climate Downscaling (TFRCD) was extended by 1-year in Feb 11, but that the Task Force would be replaced by a WCRP Regional Climate Science and Information Working Group (WGRC). A pan CORDEX conference was held in Trieste in March 2011 and training workshops will be held at Cape Town in Nov 2011 and early 2012. A similar group is being formed in South Asia led by IITM. Discussions are now occurring with the South East Asian Bank to support a similar capacity building and impacts/evaluation panel for South East Asia. All capacity building efforts are a WCRP/START collaborative effort. CORDEX East Asia had a workshop in Sept 2011 hosted by KMA. Euro-CORDEX will have a meeting Nov 17-18 to plan CMIP5 downscaling over Europe (esp. 0.11° RCM simulations). The Polar-CORDEX (Arctic and Antarctic), coordinated by John Cassano, U. Colorado will hold the 1<sup>st</sup> planning meeting in Sweden March 2012.

A meeting between AgMIP and CORDEX was held in New York April 2011 to develop a set of climate – agriculture assessment Projects, initially over North, South and central America. The CORDEX project was detailed in a CLIVAR Exchanges special issue on CMIP5. The first review paper of an ERA-interim forced Africa-CORDEX ensemble is now in review with Journal of Climate. Many CORDEX/Regional Climate posters and talks are being presented at the OSC.

Several examples of CORDEX outputs and decision support/impact assessment tools were presented (e.g RiskView in collaboration with the FAO on drought and extreme events, etc).

*Discussion: the audience commented on the temptation and associated risk to select the best hindcast model over a region for use in climate projections, on the opportunity for comparison between global and regional models, on the poor involvement of NWPs in CORDEX to date and on the cost-efficiency of the CORDEX strategy, suitable if super-computing power is not available*

**ACTION:** involve NWP in CORDEX  
**ACTION:** involve CORDEX in process studies  
**ACTION:** compare global and downscaled models

## 2.10 Discussion

### 2.10.1 WORKSHOPS

The CMIP5 will run over 5 days, 5-9 March in Honolulu, Hawaii, and attendance will be limited to 170 people. The selection of abstracts will be made by the Organizing Committee (G. Meehl, chair, S. Bony, R. Stouffer, K. Taylor, M. Latif, J. Mitchell, C. Covey). The conference will be in the format of “short presentation/poster” as in the previous CMIP3 workshop in 2005.

Physics of Weather and Climate Models workshop will be held 20-23 March 2012 and will address climate in a broad sense (weather, ocean, ice, ...). The workshop will consist of oral briefs with solutions proposed.

A Systematic Error “at all time scales and on model components” Workshop was held in San Francisco and a next one is envisaged in Exeter in Spring 2013.

**ACTION:** It is recommended to include a session on resolution and its effect on systematic error at the “Systematic Error” workshop

### 2.10.2 Climate Process Teams

They exist in the U.S., and CLIVAR is asking for advice on how to extend this initiative worldwide and would like to setup a Task Force. It was noted that the sub-seasonal and polar groups are kind of examples of this. The groups recommended this may not be within the CLIVAR purview, but the value of having a large group tackling a particular problem (e.g. YOTC/MJO) at the international level was recognized

### 2.10.3 General discussion on joint activities

The WGNE co-chair stressed that there are already a lot of examples where both WGNE and WGCM already work together

Duane Waliser recalled that 100M\$ NASA funding is available to specify next decade satellite instruments. This group could help guide the industry and provide advice on the balance between new satellites and maintaining the existing fleet, and he recommended that the scientific community meet with industry. NOAA would require guidance whether to invest in a new satellite operation system or invest in modeling efforts. The WGNE/WGCM community has

not only an end-user role but should consider playing an active advisory role for satellite agencies.

**ACTION:** consider the WCRP Modeling and Data Council provide advice to satellite agencies such as NASA

#### 2.10.4 Future meetings

Chairs proposed to host this meeting every 3 years and alternate joint meetings with WGSIP. Video-conferencing was proposed to extend the audience but this adds a level of complexity in the organization.

### 3 WGCM meeting (20-21 October 2011)

The WGCM co-chairs Gerard Meehl and Sandrine Bony welcomed participants, recalled the meeting objectives, which focused mainly on CMIP5 activities, and recognized the utility of the joint WGCM/WGNE meeting held the day before.

#### 3.1 WCRP and CLIVAR Liaison

**Michel Rixen**, on behalf of the **WCRP JSC** chair and **D/WCRP** Dr. Ghassem Asrar, provided an update of the program governance and structure changes which follow the ICSU visioning process, the establishment of the Global Framework for Climate Services and the IOC Framework for Climate Observing. The new WCRP structure will include a WCRP Modeling Advisory Council and a WCRP Data Advisory Council to be approved with their corresponding ToRs at the mini JSC session to be held in Boulder right after the Open Science Conference.

*Discussion: it was commented that the structure might imply too many meetings and too large councils*

**ACTION:** WCRP to review council governance and memberships in light of their efficiency

**Sandrine Bony** provided a short update on the **CLIVAR SSG**. It was stressed that observational data sets should adopt suitable formats to facilitate their exploitation in the modeling community for metrics. Discussions are underway within CLIVAR to set up Climate Process Teams (CPTs). Regarding Decadal predictions, variability is analyzed along predictability.

### 3.2 CMIP5 status and analysis

**Ron Stouffer** provided an update on the CMIP5 METAFOR, whose purpose is to document model outputs with necessary metadata. It was stressed that few people know what it is and few groups have filled out a complete questionnaire so far. Some training was organized but there are still some technical issues. User feedback suggests this is best tackled by a single person at each modeling group. The METAFOR questionnaire will probably be required in the future to have data in CMIP

*Discussion: the UK MetOffice had a similar experience to GFDL's with the METAFOR questionnaire. G. Meehl recalled that CMIP3 was criticized for not providing enough metadata and that this information supports the credibility of CMIP to the community. Data sets could have a DOI associated with them, so as to easily reference them, but a Quality Check would be necessary. Some users found it hard to find the information on the METAFOR questionnaire. For the long-term, it was suggested the modeling council address the need for all models to adopt the questionnaire. The Earth System Grid governance would need to be aligned with this process.*

**ACTION:** recommendation to fill-in at least a minimum set of information in METAFOR (forcing, grid, param, some references) for all models

**ACTION:** make METAFOR link more visible/accessible

**ACTION:** D/WCRP to write a support letter to METAFOR

### 3.3 RCP update

**Brian O'Neil** (on behalf of N. Nakicenovic) provided an update on the new scenario process adopting a **Representative Concentration Pathways** (RCP) approach featured in a special issue of Climatic Change. The RCP database is available in the IIASA website.

With the aim of exploring many alternative socioeconomic pathways consistent with particular RCPs, Shared socioeconomic pathways (SSPs) are being developed to facilitate interdisciplinary research and assessment. The SSP logic and matrix confront challenges for adaptation and mitigation with respect to various forcing levels. It was suggested to select appropriate scenarios, including extreme ones, to highlight potential impacts. This process is well integrated within the IPCC.

*It was noted that there are some inconsistencies in some RCPs vs SSPs which are not documented, and that some scenarios are not considered*

**ACTION:** WGCM could report on RCPs and SSPs with inputs from RCP representatives

## 3.4 CMIP5 working groups

### 3.4.1 Decadal Climate Prediction

**Ben Kirtman** gave an overview of the **Decadal Climate Prediction** effort which has provided guidance on bias correction and discussed issues related to lead time dependent bias correction. For decadal climate predictions, there is the issue of which bias adjustment to apply and which of the full field and anomaly results to make available. These elements will be documented in the NETCDF metadata. It was noted that no bias correction is applied on CORDEX downscaling.

**ACTION:** start addressing attribution studies based on decadal runs

### 3.4.2 PMIP

**Pascale Braconnot** reviewed the recent **PMIP** developments and activities, including the Kyoto meeting in Dec 2010 which reviewed the PMIP3 status and other meetings' contributions such as the Open Science Conference. The 100-year control runs are the minimum for PMIP simulations. Examples of uncertainties on mid-holocene output and last glacial maximum were given. Intercomparison efforts with CMIP3 are still going-on.

*Discussion:* it was stressed that it is up to every modeler to treat top of atmosphere imbalances and that the group can benefit from a connection with the isotope group.

**ACTION (CLOSED):** authorization required to upload non PMIP5 runs on CMIP5 server for increased efficiency: granted

**ACTION:** P. Braconnot to discuss with WCRP JPS/CLIVAR on PAGES/CLIVAR special issue

**ACTION:** various PMIP meetings planned in 2012, discuss support by WCRP

### 3.4.3 C4MIP

**Pierre Friedlingstein** discussed the **C4MIP** effort within the CMIP5 context.

A clear distinction was made between Concentration-driven and Emission-driven simulations. Earth system models now address the carbon cycle and at least 6 groups are participating in this effort. Historical runs are evaluated on:

- the leaf area index (LAI) against MODIS LAI and annual mean and seasonal cycle,
- global primary production (GPP) against gridded FluxNET product, annual mean and seasonal cycle,
- C uptake against atmospheric inversions, decadal mean and IAV

Carbon cycle feedback depends on the scenario under consideration. Whilst CMIP5 still lacks a sufficient number of models, interesting results are starting to appear. E-driven and C-driven models seem to agree at least qualitatively..



### 3.4.4 SPARC

**Veronika Eyring** provided an update on **SPARC** activities related to CMIP5. In particular the SPARC CCMVal Report has significantly contributed to the regular WMO/UNEP Ozone Assessments reports. The report includes recommendations on performance metrics, model development, and consideration of comprehensive troposphere-stratosphere CCM and observational efforts. Future CCMVal activities such as Geo-engineering simulations in support of GeoMIP, as well as simulations with coupled ocean or stratospheric and tropospheric chemistry, are envisaged. The next **CCMVal workshop will be held in Davos, Switzerland 21-23 May 2012**. The SPARC Dynvar currently focuses on a high-versus low-top model intercomparison within CMIP5, where 11 groups are contributing. Some needs for cross-MIPs analyses were suggested, especially on chemistry-climate modeling and validation activities. There are some questions about the representation of O<sub>3</sub> which needs to be documented.

**ACTION:** consider cross-MIPs analyses: CCMVal, ACCMIP, IGAC, DynVar, GeoMIP, Obs4MIPs

**ACTION:** WCRP to consider encouraging efforts to support the IPCC and Ozone Assessment

### 3.4.5 WGOMD

**G. Danabasoglu** provided an update on the recent activities of the Working Group on Ocean Model Development (**WGOMD**), including some new nested and unstructured grid developments in the ocean modeling community. From a physical oceanography point of view, the CMIP3 archive suffered from a number of shortcomings, including issues with remapping of vector fields and the limited number of outputs to construct tracer budgets, to study effects of subgrid scale parameterizations, and to investigate ventilation processes, among others. The additional requested oceanic fields for the new CMIP5 archive will remedy these problems, and these fields are already being used by the community. The 10<sup>th</sup> session of WGOMD will be held 11-13 January 2012 at CNR/ISMAR in Venice. The main focus of this panel meeting will be the discussion, planning, and coordination of the ocean – sea-ice coupled experiments forced with the Coordinated Ocean-ice Reference Experiments (CORE) interannual atmospheric data sets, e.g., the CORE-II project.

COWCLIP addresses wave climate projections and cascading uncertainty. The time scales are disconnected from climate resolution and are quite challenging as coastal effects are primarily driven by the tails of the spectrum (extremes).

**ACTION:** next WGCM meeting needs to invite COWCLIP because the wave component has not been considered enough so far

### 3.4.6 IDAG

**D. Karoly** briefly reviewed the **IDAG** mission, funding, chairs and IPCC AR5 involvement through the CMIP5 20<sup>th</sup> century Detection and Attribution runs. The

WMO CCI Expert Team on Climate Change Detection and Indices (ETCCDI) is preparing a new observational dataset for the Frich extremes indices which will be computed from daily data from CMIP5 model outputs using the same code (unlike CMIP3) at CCCma. Several issues were pointed out. Temperature and rainfall databases are being prepared, but many areas do not have observations. Countries would release only the extreme indices, but not the actual daily data. There may be big shifts in RCP and aerosols as a result of a global change in economies and volcanic activity, but the latest analyses seems to indicate that there has not been any significant change over 2005-2011.

**ACTION:** make the Frich extreme index code available to scientific community

### 3.4.7 CMIP5 workshop and IPCC publication timeline

**G. Meehl** discussed the CMIP5 overview papers, and the peer-review paper recommendation for results to be assessed in the IPCC AR5. Coupled AOGCMs with high top atmospheres will feature for the first time in the IPCC AR5. The description of GeoMIP experiments has already been published. The CMIP5 Workshop will be held in Honolulu, Hawaii, 5-9 March, 2012. Discussions included the issue on the limitation to 170 people at the workshop due to space constraints, and on how many IPCC lead authors should be involved. Priority shall be given to multi-model CMIP5 analyses.

**ACTION:** announcement of the CMIP5 Workshop to all email aliases (CLOSED)

**ACTION:** CMIP5 workshop host to prepare a letter (like for OSC, refer to Jim Hurrell) for US Visa purposes (CLOSED)

**ACTION:** acknowledging WCRP in all CMIP5 publications could help the program in getting increased support from sponsors and stakeholders

## 3.5 Model development and evaluation from observations

### 3.5.1 CIRC

**Eli Mlawer** gave an update of the Continual Intercomparison of Radiation Codes, **CIRC**, (<http://circ.gsfc.nasa.gov>) panel effort which have improved Radiative Transfer models and closure studies. GCM RT codes still exhibited substantial discrepancies relative to reference calculations from detailed “line-by-line” RT models. RT is fundamental for climate change studies (e.g. GHG, aerosols). The code is publicly available and is starting being used in models which can be calibrated at the ARM sites. The users are cautioned that RT code is not necessarily valid for 8x CO<sub>2</sub> or paleoclimate studies.

**ACTION:** WGCM to support and urge membership to participate in CIRC and run the RT code and/or compare with

**ACTION:** make WGCM/WGNE community more aware of the CIRC RT code

### 3.5.2 WOAP

**Karl Taylor** provided an update on the **WCRP Working Group on Observations and Assimilation (WOAP)** which will soon transition to the WCRP Data Advisory Council, the ToRs of which will be reviewed at the mini-JSC following the Open Science Conference. The last JSC asked WOAP to write an “Action Plan for WCRP Research on Surface Fluxes”. Common topics include the estimation of the accuracies of fluxes at different space and time scales, the evaluation of flux products and the evaluation of model-based (including reanalysis) fluxes. Continuation of SURFA by WGNE is encouraged. WOAP proposed to establish a Reanalysis Task Group. The next Reanalysis Conference will be held 7-11 May 2012.

### 3.5.3 Obs4MIPs

**Duane Waliser** presented the new **Obs4MIPs** initiative which aims for a better exploitation of remote sensing data in ESM and Climate models (for e.g. the CMIP5 models to be assessed as part of the IPCC AR4) by ensuring the same quantities are being compared. After much scrutiny and 2 workshops, only around 20 variables are safely comparable. Additional datasets through model-pull for additional satellite observations or model-push for additional model output variables are investigated. The NASA infrastructure is ready to receive datasets on the Earth System Grid side by side with GCM data. Collaborations with other space agencies are cultivated.

**ACTION:** WCRP Data Advisory Council (WDAC) to coordinate and involve all similar activities across space agencies

## 3.6 CMIP5 national activities

### 3.6.1 GFDL, US

**Ron Stouffer, GFDL**, presented recent developments at GFDL which are organized along 4 main streams: coupled atmosphere-ocean-land-ice models with aerosols, decadal predictions, earth system models and high resolution atmosphere-only models. CMIP5 runs are almost complete but only a subset of data are already on the server. The METAFOR questionnaire has been completed for most of the runs. CM3 results showed relatively large climate sensitivity, around 4.3K for 2x CO<sub>2</sub>, a large indirect aerosol effect, and near zero global direct effect.

Decadal predictions tested coupled models with increasing resolution and icebergs cause some interesting problems in models. For earth system models, Concentration and Emission driven runs show similar responses but the emission-driven run is slightly warmer than the concentration run. New models have been applied to regional climate change, chemistry and carbon cycle.

### 3.6.2 NCAR, US

**Gerard Meehl, NCAR** provided an update on the Community Earth System Model (CESM) plans for CMIP5. CESM is a distributed modeling effort centered at NCAR but with close contributions from university, DOE, and other government lab scientists. Most runs for CCSM4 and CESM1/BGC are completed and GeoMIP for G1 and G2 are showing good progress. Decadal predictions consider 2 initialization schemes: an ocean-ice hindcast (CORE-driven) every 5-years from 1960 and a DART weakly coupled scheme for the last 3 decades (the full set of initial states every 5-years being planned). Equilibrium climate sensitivity in the new model versions range from 3.2°C to 4.2°C. The RCP extension results demonstrate that climate change doesn't stop in 2100. Aggressive mitigation in RCP2.6 produces cooling after 2100 but little mitigation in RCP8.5 results in ongoing large warming to 2300. A point of no return was identified where aggressive mitigation in RCP2.6 restores the "conveyor belt" circulation in the North Atlantic, but with little mitigation in RCP8.5 the conveyor belt nearly shuts down. When the globally averaged surface air temperature trend is flat for a decade or so (a hiatus period), model results show heat is being stored in the deep ocean with a La Niña-like SST pattern. Results for hiatus decades show increased heat convergence in the subtropical oceans, and a weakened AMOC and Antarctic Bottom Water formation. Contributions to GeoMIP were also illustrated.

*Discussion: a synthesis paper on aerosol impact would be needed. Deep ARGO floats would be required to investigate heat storage in the deep ocean in detail.*

### 3.6.3 AORI, Japan

**Masahide Kimoto from AORI, Japan** presented the global warming project on the Earth Simulator organized in 3 teams dealing with respective long-term, near-term and high-resolution time slices predictions. The first two include an atmospheric chemistry model with 58 tracers and 184 chemical reactions. The recent earthquake in Japan significantly impacted power availability for the supercomputers. Tuning for CMIP3 has shown this is not necessarily useful for the CMIP5 RCP runs. Results suggest climate change impacts UV on the long-term. An SVD analysis shows 2 main contributions from external forcing and the northern hemisphere with a climate shift in mid 1990s. Dynamic models suggest a reduction whilst Monte Carlo approaches suggest an increase of the predicted number of typhoons. The new physics in MRI CMIP5 runs improve typhoon tracks but average rainfall seems low. Half of the data have been converted to CMIP5 format and have been made available for analysis.

### 3.6.4 LASG, China

**Bin Wang, China**, gave an update on CMIP5 efforts in China spread amongst 5 groups running various models coupling ocean, atmosphere, land and sea-ice, some of them including the carbon cycle or surface waves. More than half of the core runs have been performed and some Tier 1 simulations. Spin-up time is of the order of 500 years. Results on El Niño were presented. The sensitivity of AMOC to RCP forcing was low. The MJO representation has improved from CMIP3

to CMIP5. The main current issues are the low resolution, the double ITCZ (especially in the coupled model) and the bias in the snow simulation. The satellite simulator was used to tune the atmospheric model.

### 3.6.5 ACCESS, Australia

**Tony Hirst from Australia** presented the Australian Community Climate and Earth-System Simulator (ACCESS) program, a partnership between the Bureau of Meteorology and CSIRO, built around an established AOGCM and a new AOGCM/ESM and including also a regional modeling effort for CORDEX. CSIRO Mk3.6 has provided ensemble CMIP5 long-term runs, now completed and published on ESG. The ESM ACCESS coupled system combines HadGEM2 or 3 with MOSES or CABLE land surface. HadGEM3 cases have small differences over the pre-industrial to late 20<sup>th</sup> century surface temperatures which may result from a strong aerosol sensitivity. The CMIP5 long-term and historical simulations are being initiated. Plans are underway to publish the core runs and expand experiment to 'tier 1' and 'tier 2' sets, and also contribute to CFMIP, Transpose AMIP and include atmospheric chemistry. Australia is active in CORDEX in several regions.

### 3.6.6 MetOffice/Hadley Center, UK

**Catherine Senior** provided an update on the **MetOffice/Hadley Center** activities. The HdGEM2-ES includes the physical climate, aerosols, greenhouse gases, chemistry and land and ocean ecosystems. All planned CMIP5 runs are completed and delivered to the BADC. Some additional runs are now being performed on paleoclimate, GeoMIP, etc. Analysis and preparation of publications is in progress by combining bottom-up science and top-down coordination. The spread in CMIP5 seems larger than CMIP3 and climate sensitivity is not reduced in CMIP5. Equilibrium climate sensitivity for the Hadley model is larger than other models. HadGEM2-ES has a weaker climate-carbon feedback than HadCM3. No single reason has been found but greater land differences than ocean, no Amazon dieback, a stronger high-lat carbon uptake and a larger carbon cycle-CO<sub>2</sub> feedback could offer partial explanations. Results suggest an increase of the MOC during the 20<sup>th</sup> century and a rapid decline thereafter, possibly linked to aerosol forcing. Bias correction for decadal prediction simulations makes almost no difference except for teleconnection studies, for example.

### 3.6.7 MPI, Germany

**Marco Giorgetta, Germany** reviewed the recent progress at MPI. MPI runs a suite of Earth System Models for long-term, near-term, diagnostic and paleo simulations, some with dynamic vegetation and high top atmosphere. Most of the CMIP5 runs have now been completed, and half of the low resolution ones have been published. Results on transient climate response, hydrological sensitivity to CO<sub>2</sub> induced climate warming, climate projections for RCPs, allowable anthropogenic CO<sub>2</sub> emissions and Atlantic meridional overturning circulation, and sea ice cover were presented and discussed. The attention of the audience

was drawn to the fact that the time span in Gregory's method for computing equilibrium climate sensitivity is considered critical to interpret the results.

### 3.6.8 IPSL, France

**Pascale Braconnot, France** provided an update from the ESCRIME consortium. The CNRM runs long-term simulations whilst IPSL runs ESMs with or without interactive carbon and aerosols. The contribution of radiative forcing is estimated for all components. The increase in resolution has moved the jet poleward, in better agreement with observations and has improved the ocean transport in the Drake Passage. New atmospheric physics result in a better diurnal precipitation cycle with a peak shift towards the end of the day. This could potentially improve the MJO representation as well. Sensitivity studies have been performed to analyze the features of ocean initialization and nudging domain.

### 3.6.9 EC Earth

**Colin Jones** reviewed progress from the **EC Earth** consortium, a group of more than 20 European Weather and Climate centers and universities from 8 countries. The consortium contributes to CMIP5 and applies a common Global Climate and Earth System Model which consists of the ECMWF atmospheric model, the land IFS H-tessel model, the LIM2/3 sea-ice models, the NEMO Ocean GCM with additional new components of dynamic vegetation, atmospheric chemistry and aerosols and ocean bio-geochemistry which will be coupled to the system in 2012. Delivery of EC-Earth results to the ESG was delayed because a bug was found in the volcanic aerosol optical depth. A good number of runs have been performed and are being processed and transferred to BADC. Some cold bias in SST is probably due to overestimated sub-tropical clouds. Bias corrected initial fields correct for the initial model drift to colder climates. The Wikipedia page <http://eearth.knmi.nl/index.php?n=PmWiki.CMIP5> also includes AMOC results. Future developments include high-top atmosphere for which CMIP5 centennial and prediction runs will be repeated.

### 3.6.10 Canada and Italy

CMIP5 simulations in **Canada** and long-term simulations in **Italy** were reported to be completed.

## 3.7 Discussion topics

### 3.7.1 US CLIVAR

**Mike Patterson, US CLIVAR Office** recalled the IPCC WG1 overriding principles to avoid grey literature and the July 2012 deadline for submitting papers. US CLIVAR agencies have funded 26 climate model evaluation projects (CMEP2). The PCMDI site provides data access tables with the number of datasets available via the ESG for each model and each experiment. Some useful information could be added to the site to assess data availability such as the list of models participating

in each experiment, the number of expected datasets for each model and experiment, and the expected dates for accessibility of datasets via ESG.

*Discussion:* it was commented that something similar was done 2 years ago, but a lot of changes happened since in the schedules of several groups. WGCM could send an email to modeling groups to ask for inputs. The audience also noted that submission of model data after the IPCC deadlines will be useful for future analyses.

**SUGG:** WGCM consider sending a request to all participating modeling centers to identify their expected participation in each CMIP5 experiment, the number of datasets to be provided, and target ESG upload dates for posting on the PCMDI site.

### 3.7.2 GeoMIP

**Alan Robock, GeoMIP**, recalled the main geo-engineering methods, in particular the Solar Radiation Management, currently being investigated and presented their relative effectiveness and associated risk. The need for standardized modeling experiments was stressed as also the potential unexpected collateral effect of geo-engineering approaches are poorly understood. At present, GeoMIP consists of four standardized experiments, with more likely to be added in the future. GeoMIP studies span the various IPCC WGs and is also a SPARC CCMVal activity. The next workshop will be held at the Hadley Center, Exeter, UK, March 30-31 2012.

### 3.7.3 Air quality and climate change

**Jean-Francois Lamarque, Air quality and climate change**, focused on Stratosphere/troposphere ozone and aerosols. Aerosol concentration has been used in several AOGCMs. The Atmospheric Chemistry and Climate Model Intercomparison Project (ACCMIP) is an IGAC/SPARC initiative. Phase 1 of the project is aligned within the CMIP5 model and publication deadline but the list of models is not limited to CMIP5. Some models are not coupled to the ocean, for example, and some experiments are designed to understand the feedback of chemistry on climate. The CO<sub>2</sub> problem seems well constrained but some other species are problematic. The methane lifetime seems critical to get meaningful projections over the 12 year horizon. Phase 2 of the project will focus on emission sensitivity studies and for each RCP.

*Discussion:* the chair commented that separating direct and indirect aerosol impact is difficult but crucial in CMIP5, the indirect contribution being the challenging one.

### 3.7.4 AIMES

**Kathy Hibbard**, provided an update on Analysis, Integration and Modeling of the Earth System (AIMES) activities. The International Land Model Benchmarking (ILAMB) project provides an open source benchmarking framework based on the R statistical package. MAREMIP focuses on carbon stock of marine biota which can be small but impact from carbon flux to marine biota can be large. MAREMIP

is conceptually similar to ILAMB but for the marine environment. Different physical models are being run with different biological models.

*Discussion: the JSC chair ensured that whatever the future structure, the WCRP will make sure the link with AIMES will be maintained*

**RECOM:** metrics approaches between WGNE and WGCM are closely related and cooperation should be ensured.

**RECOM:** benchmark is used in AIMES in the 'metrics' sense metrics. This should be clearly communicated to the community.

**SUGG:** it could be interesting having the same physical model run with different biological models and vice-versa.

### 3.8 WGCM business

The chairs reviewed several action items during the final session which can be summarized below.

The TCMIP-US CLIVAR initiative on a Tropical Cyclone MIP could provide useful inputs to WGCM meetings.

**ACTION:** invite TCMIP US CLIVAR to next WGCM

Decadal climate predictions for 2005-2015 will be available for verification against observations soon and this would need to be reported accordingly. The JSC chair however cautioned that we are still far away from an operational climate service on these scales.

**ACTION:** stimulate papers to analyze and verify Decadal Climate Predictions for 2005-2015

The combined WGNE/WGCM meeting has been useful and it was suggested to repeat such experience every 3-years.

**RECOM:** plan for WGNE/WGCM combined meetings every 2-3 years

The chair raised the issue of the unclear leadership within the Earth System Grid federation and unclear governance.

**RECOM:** need to have an ESG Panel with a chair to make decisions regarding direction and activities within the ESGF

#### 3.8.1 Membership

With the new WCRP structure, Geneva would keep track of the membership list. David Karoly, Pascale Braconnot, Marco Giorgetta, and N. Nakicenovic are rotating out.



It was noted that CLIC representation may be necessary and that South America was not represented.

### 3.8.2 Next meeting

The next meeting will be held on 24-26 Sept 2012 in Hamburg, in conjunction with WGSIP, right after the 17-21 Sept Earth System Modeling Conference there.

## A. ANNEX Action list

1. **ACTION:** modeling groups and CMIP5 participants are asked to be aware of the publication schedule to maximize the science contribution to IPCC
2. **ACTION:** WGNE/WGCM members to provide feedback to Climate Model Metrics Panel
3. **ACTION** the modeling community is encouraged to participate with climate models in Transpose-AMIP, because it allows insights into the role of physics parameterization in climate models
4. **ACTION** Announce the Joint Euclipse/CFMIP meeting to be held in Paris May 28 – June 1, 2012
5. **ACTION:** recommend participation in YOTC/MJO modeling and analysis effort
6. **ACTION:** consider how to bring stochastic physics community into YOTC/MJO
7. **ACTION:** announce the Pan-GASS meeting in fall 2012
8. **ACTION:** need to document models used in WGSIP to better understand sources of errors.
9. **ACTION:** propose a list of key model errors to be addressed in modeling groups: e.g. tropical biases, SST drift, wind-stress, etc
10. **ACTION:** group asked to explore options for volunteer centers to contribute to high-resolution AMIP and climate models in relation to the Grey Zone.
11. **ACTION:** involve NWPs in CORDEX
12. **ACTION:** involve CORDEX in process studies
13. **ACTION:** compare global and downscaled models
14. **ACTION:** It is recommended to include a session on resolution and its effect on systematic error at the “Systematic Error” workshop
15. **ACTION:** consider the WCRP Modeling and Data Council provide advice to satellite agencies such as NASA

16. **ACTION:** WCRP to review council governance and memberships in light of their efficiency
17. **ACTION:** recommendation to fill-in at least a minimum set of information in METAFOR (forcing, grid, param, some references) for all models
18. **ACTION:** make METAFOR link more visible/accessible
19. **ACTION:** D/WCRP to write a support letter to METAFOR
20. **ACTION:** WGCM could report on RCPs and SSPs with inputs from RCP representatives
21. **ACTION:** start addressing attribution studies based on decadal runs
22. **ACTION (CLOSED):** authorization required to upload non PMIP5 runs on CMIP5 server for increased efficiency: granted
23. **ACTION:** P. Braconnot to discuss with WCRP JPS/CLIVAR on PAGES/CLIVAR special issue
24. **ACTION:** various PMIP meetings planned in 2012, discuss support by WCRP
25. **ACTION:** consider cross-MIPs analyses: CCMVal, ACCMIP, IGAC, DynVar, GeoMIP, Obs4MIPs
26. **ACTION:** WCRP to consider encouraging efforts to support the IPCC and Ozone Assessment
27. **ACTION:** next WGCM meeting needs to invite COWCLIP because the wave component has not been considered enough so far
28. **ACTION:** make the Frich extreme index code available to scientific community
29. **ACTION:** announcement of the CMIP5 Workshop to all email aliases (CLOSED)
30. **ACTION:** CMIP5 workshop host to prepare a letter (like for OSC, refer to Jim Hurrell) for US Visa purposes (CLOSED)
31. **ACTION:** acknowledging WCRP in all CMIP5 publications could help the program in getting increased support from sponsors and stakeholders
32. **ACTION:** WGCM to support and urge membership to participate in CIRC and run the RT code and/or compare with

33. **ACTION:** make WGCM/WGNE community more aware of the CIRC RT code
34. **ACTION:** WCRP Data Advisory Council (WDAC) to coordinate and involve all similar activities across space agencies
35. **SUGG:** WGCM consider sending a request to all participating modeling centers to identify their expected participation in each CMIP5 experiment, the number of datasets to be provided, and target ESG upload dates for posting on the PCMDI site.
36. **RECOM:** metrics approaches between WGNE and WGCM are closely related and cooperation should be ensured.
37. **RECOM:** benchmark is used in AIMES in the 'metrics' sense metrics. This should be clearly communicated to the community
38. **SUGG:** it could be interesting having the same physical model run with different biological models and vice-versa
39. **ACTION:** invite TCMIP US CLIVAR to next WGCM
40. **ACTION:** stimulate papers to analyze and verify Decadal Climate Predictions for 2005-2015
41. **RECOM:** plan for WGNE/WGCM combined meetings every 2-3 years
42. **RECOM:** need to have an ESG Panel with a chair to make decisions regarding direction and activities within the ESGF

## B. ANNEX Meeting agenda

**Wednesday, October 19**

**Joint Session with the WCRP/CAS Working Group on Numerical Experimentation (WGNE)**

**08h30 - 10h30**

Welcome (10 min) - G. Meehl, S. Bony, C. Jakob, A. Brown  
Overview over WGCM activities (10 min) - G. Meehl, S. Bony  
Overview over WGNE activities (10 min) - C. Jakob, A. Brown  
WCRP JSC overview (30 min) - A. Busalacchi  
CMIP (30 min) - R. Stouffer and K. Taylor  
Tanspose AMIP (30 min) - K. Williams

**10h30 - 11h00** - Coffee break

**11h00 - 12h30**

Climate Model Metrics Panel (30 min) - P. Gleckler  
CFMIP (30 min) - S. Bony  
YOTC and new MJO experiments (30 min) -D. Waliser, M. Moncrieff, J. Petch

**12h30 - 13h30** - Lunch

**13h30 - 15h00**

WGSIP report (30 min) - B. Kirtman  
High resolution AMIP and resolution in climate models (30 min) - Discussion introduced by tbd  
CORDEX (30 min) - C. Jones

**15h00 - 15h30** - Coffee break

**15h30 - 17h00**

Model development and the prospect of international CPTs (30 min) - Discussion introduced by S. Bony and C. Jakob  
Workshops in particular CMIP5 and Systematic errors (30 min) - Discussion introduced by S. Bony and C. Jakob  
General discussion on joint activities (30 min) - G. Meehl, A. Brown to chair

**17h30 - 20h00** Reception hosted by NCAR at the Mesa Lab

## Thursday, October 20

**0900 - 0915 - Welcome, logistics and Meeting objectives** (G. Meehl, S. Bony)

**0915 - 0945** (10 minutes each)

WCRP update and WCRP Open Science Conference (G. Asrar)

Report from JSC-31 (G. Flato)

Report from CLIVAR SSG (S. Bony)

**0945 - 1030 - CMIP5 status and analysis**

CMIP5 update (R. Stouffer, K. Taylor)

CMIP5 Analysis Workshop planning (G. Meehl)

**1030-1100** - Coffee break

**1100-1115 - RCP update** (N. Nakicenovic)

**1115 - 1235 Working groups closely associated with CMIP5**

(20 minutes each, including questions)

Suggest that each presentation addresses the following issues: status of the MIP; what science have we learned so far? Needs for cross-MIPs analyses? Plans for an introduction paper; plans for workshops and articulation with the CMIP5 workshop;

Dedadal prediction (B. Kirtman)

PMIP (P. Braconnot)

C4MIP (P. Friedlingstein)

SPARC-CCMVal (V. Eyring)

**1235 - 1400** - Lunch

**1400 - 1445 Working groups associated with CMIP5**

(15 minutes each)

WGOMD (G. Danabasoglu)

CLIC and ice sheet status, sea-level rise, ARCHIMEDES subproject (K. Steffen)

IDAG (D. Karoly)

**1445 - 1500 Discussion on CMIP5 Analysis:** workshop planning + how to maximize the scientific benefit and impact of CMIP5 on climate research, e.g. encouraging people (or WCRP groups and panels) to synthesize CMIP5 results on different topics

1500 - 1530 - Model evaluation and development (15 minutes each)

WOAP (K. Taylor)

**1530 - 1600** - Coffee break

CIRC Radiation code evaluation and intercomparison (E. Mlawer)

**1615 - 1630 Observations for model evaluation**

(15 minutes each)

NASA data initiative status (J. Teixeira)

ESA climate initiative (M. Doherty)

**1635 - 1700 Synthesis discussion on observations for CMIP5 and other projects of model evaluation**

Session ends for the day ~1700

*1700-1930 Poster Session and Reception*

**Friday, October 21**

**0900 - 0915**

Review previous day and outline agenda for the day (G. Meehl and S. Bony)

**0915 - 1030 Reports on status of CMIP5 national activities**

(12 minutes each, 3 minutes for questions)

USA, GFDL (R. Stouffer)

USA, NCAR (G. Meehl)

Japan, AORI/U. Tokyo/JAMSTEC/NIES; MRI (M. Kimoto)

China, LASG; BCC (B. Wang)

**1030 - 1100** - Coffee break

**11:00 - 12:30**

Australia, ACCESS (T. Hirst)

U.K., Hadley Centre; Reading (C. Senior)

Italy, ICTP; INGV (F. Giorgi)

Germany, MPI (M. Giorgetta)

France, IPSL; Météo France (P. Braconnot and S. Bony)

EC-Earth (C. Jones)

Other groups, GISS, NGFC, Korea, Denmark, Canada (G. Meehl)

**1230 - 1400** - Lunch

**1400 - 1530 Discussion topics**

GeoMIP (K. Taylor)

Air quality and climate change (J.F. Lamarque)

AIMES (K. Hibbard)

**1530 - 1600** - Coffee break

**1600 - 1730**

WGCM business

Membership

Next meeting: Hamburg, September, 2012

**~1730** Adjourn

## C. ANNEX List of Participants (not including WGNE participants to the Joint WGNE/WGCM session)

### **WGCM members**

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