WCRP
World Climate Research Programme

Report of the 6th session of the WCRP Modeling Advisory Council

9-13 October 2017, UK MetOffice, Exeter, UK

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Disclaimer

Executive Summary

The WMAC-6 session was held at the UK MetOffice, Exeter, UK on 9-13 October 2017 in the context of the pan-WCRP Modeling Meeting held the same week. The main objective of the meeting was to review progress and challenges on modeling issues across the programme. Breakout groups discussions during the week also suggested a number of specific actions for WMAC to take forward in light of the WCRP sponsors' review and development of the new WCRP Strategic Plan.

The present report is meant to complement the detailed PowerPoint Presentations available on the meeting web site and to synthesize discussions held during the week and actions agreed upon during the Council's session.

Informal WMAC-6 evening session …

Christian Jakob discovering his farewell gift...

Contents

PRESENT: Christian Jakob (Co-chair), Gerald Meehl (Co-chair), Gokhan Danabasoglu, Francisco Doblas-Reyes, Michael Ek, Greg Flato, Pierre Friedlingstein, William Gutowski, Gerhard Krinner, Bill Merryfield, Jon Petch, Cath Senior, Julia Slingo, Keith Williams, Ayrton Zadra

EXCUSED: Judith Perlwitz, James Renwick

WCRP JPS: Michel Rixen

1. Plenary session (WGCM, WGNE, WGSIP, OMDP, CORDEX, S2S, DCPP)

WMAC Co-chairs, Christian Jakob and Jerry Meehl welcomed all participants and thanked the UK MetOffice for hosting such meeting, the first of its kind to bring together all WCRP modelling groups to review progress and challenges on all important modelling issues across the programme so as to feed into the Sponsor's Review process and ultimately the development of the new WCRP Strategic Plan.

1.1. WCRP Sponsor's Review (J. Slingo)

Dame Julia Slingo, former Chief Scientist at the UK MetOffice, highlighted the ongoing WCRP Sponsors' Review which was expected to be finalized sometime later in fall. With the new strategy being developed, partnerships are becoming more crucial. WCRP should continue to focus on underpinning climate science. WMO shall not take model development for granted. In particular Tier-0 global models. WWRP and WCRP need to be strong advocates on this issue. Whilst the focus should remain on model development and climate science, stronger links with the service community need to be developed.

1.2. WCRP/Joint Scientific Committee Update (M. Rixen for G. Brasseur)

Michel Rixen, recalled the mission of the programme to determine the predictability of climate and the effects of human activity on climate. The overall mission is still highly relevant, but needs to be put in a new context of climate services, the Paris Agreement, etc, hence requiring a new emphasis to address those societal challenges. The New WRCP Strategic Plan (2019-2029) and Implementation Plan (2019-2024) are being developed now to that effect.

1.3. Commission for Atmospheric Sciences (K. Williams)

Keith Williams, on behalf of CAS President Oystein Hov, highlighted the CAS focus on six societal challenges (urbanization, IG3IS, high impact weather, water, aerosols, evolving technology). WGNE is the link between CAS and WCRP. Seamless prediction, future infrastructures, science for services, nurturing talents, innovation and resources are priorities to be discussed at the CAS Science Summit.

1.4. WCRP Modeling Advisory Council (WMAC, C. Jakob and J. Meehl)

WMAC Co-chairs outlined the goals of the week to hold individual and bilateral WG sessions, to discuss issues of common interest across the attending groups present, so as to improve modelling coordination across WCRP and to contribute to the strategic planning of the WCRP and its partners.
In short, WCRP science challenges, as synthesized at the 'Out-of-the-Box' meeting, can be summarized as follows:

- Where does carbon go?
- How does the weather change with climate?
- How does climate influence the habitability of the earth and its regions?

There are many (perhaps too many) modeling efforts: 3 working groups, 4 core projects, 7 grand challenges, several prediction projects, CMIP and other, for a total of 67 projects. There is a need to simplify and provide focus to support some core activities. Despite many efforts, model development has still has not achieved the central status in the program that it deserves. The way ahead is to set clear goals and priorities. It was suggested to empower the three core modeling working groups and make them central to the effort by having every modeling activity affiliated with one of those. This will challenge WGs.

1.5. WGNE (Working Group on Numerical Experimentation)

For this meeting, WGNE aimed at refining strategic directions for the coming years in light of recent WGNE workshop on systematic errors, and at reviewing links to GASS/GLASS.

1.6. WGCM (Working Group on Coupled Models)

The expectation from WGCM during the week was to review and foster development of coupled OA-and Earth System Models. CMIP is based on common experiment protocols, and agreed forcings and output and a central effort coordinated by the WG. The Grand challenge on clouds circulation and climate sensitivity and the Grand challenge on carbon feedbacks in the climate system are two other main activities of WGCM. Stronger engagement with regional climate modeling and downscaling is also expected.

1.7. WGSIP (Working Group on Subseasonal to Interdecadal Prediction)

WGSIP has crucial interaction with a number of groups, in particular the CLIVAR Decadal Climate Variability and Predictability group, the S2S prediction project, the Grand Challenge on Near-Term Climate Prediction. Decadal Climate Prediction Project (DPP), IPET-OPSLS WMO Lead Center for long-range forecast multi-model ensemble. It facilitates and coordinates research across the subseasonal to interdecadal time scales on sources of predictability, ability of dynamical models to exploit predictability, most effective practices for initializing and obtaining information from climate predictions, etc. The expectation for the week was to improve coordination on those issues.

1.8. OMDP (CLIVAR Ocean Modeling Development Panel)

OMDP aims at coordinating activities addressing ocean modeling needs, modeling biases, such as the Coordinated Ocean-ice Reference Experiments (CORE-II). A new focus is the evaluation of high-resolution (0.1 degree) ocean models via a dedicated inter-comparison project.

1.9. CORDEX (Coordinated Regional Downscaling Experiment

CORDEX aims at advancing and coordinating science and application of regional climate downscaling through global partnerships. The meeting will offer the opportunity to discuss some closer coordination between CORDEX and CMIP (including HighResMIP). CORDEX covers every major land area plus the polar regions.

1.10. S2S (S2S Prediction Project)

The goal of this project is to improve S2S skill and understanding, with a special emphasis on high-impact weather. This 5-year project started in 2013. There are subprojects on teleconnections, MJO, Monsoons, Africa, Extremes, Verification. A signature achievement is the development of the S2S database (outputs available in a 3-week delayed mode). There are plans to add ocean and sea ice variables. A proposal has been submitted for a second five years phase to enhance data base, include new models and new research activities (MJO, initialization of ocean, sea ice, land, aerosols, ensemble generation). S2S needs higher resolution for regional model forcing.

1.11. DCPP (Decadal climate prediction project)

DCPP is organized around 3 Components:

- contribution to CMIP6
- (operational) Decadal Forecast Exchange
- Dedicated experiment on variability

Improved coordination across the decadal effort in WCRP was a desired outcome of the week, in order to plan the next phase of the project. A major event entitled “International Workshops on Subseasonal to Decadal Prediction” will be held 17-21 September 2018 - NCAR, Boulder (CO) – USA, and co-organized with S2S and WGSIP.

1.12. WWRP (World Weather Research Programme) and GAW (Global Atmospheric Watch)

Driven by the CAS six emerging challenges and the societal challenges of urbanization, high impact weatherm water and aerosols and new technology and policy support, the focus for WWRP is on minutes to months. The WWRP implementation plan (2016-2023) covers seamless prediction, strengthened partnerships and enhancing early career scientists. WWRP has 3 core projects (polar prediction, S2S and HIWeather). The Global Atmospheric Watch focuses on atmospheric composition matters. The week was expected to identify further opportunities for joint WCRP-WWRP/GAW collaboration.

2. Break-out session reports

Eight breakout groups were organized on joint topics of interest. Each session was conducted twice for approx. 90 mins, allowing everyone to attend 4 different topics during the day. Detailed questions and outcomes are available on the meeting web page and are summarized below.

2.1. Modelling the regional climate - Regional and high-resolution global models (B. Gutowski, J. Bacmeister)

The overarching recommendation of this group was to establish a task force or forum to sustain further dialogue on modelling the regional climate to address common issues such as the development of common atlases, sharing of diagnostics, statistical downscaling. It was proposed to develop a common baseline between HighResMIP and CORDEX simulations at 25km. It was recognized that High Resolution modelling has multiple goals, from improvement on variability down to actionable climate information. Post-processing remains a challenge for both approaches, as errors evolve in time too. There are opportunities at yet fine scales (e.g. GCM DYAMOND and CORDEX Flagship Pilot Studies) but they come with observational issues (availability of suitable data sets, esp. precipitation).

2.2. Earth System Modelling in WCRP - Needs from the physical system and opportunities for collaboration (P. Friedlingstein, G. Krinner)

A number of systematic biases in the physical representation of the Earth System prevent further progress on fully coupled Earth System Models (ESMs) and there is a need to develop new approaches such as hybrid/asynchronous coupling. Regional climate models are growing in complexity and scope and can serve as good testbeds for global ESMs. Going from weather prediction to multi-century projections requires a very different level of interactive ESM components. Users of prediction will need different level of information (beyond “just” weather/climate), so there is a need to develop a strategy to ensure models across the spectrum (from weather to climate) do account for the right level of complexity providing the relevant services. The Paris Agreement and Stocktaking will require a robust understanding of fate of CO2 emissions on decadal time-scales (“real-time” verification of emission, assessment of climate mitigation,…). There is hence a need to develop a clear model/observation strategy to provide robust understanding of carbon feedbacks on decadal time scale (hindcast and forecast). There is a clear impact of human activities on land (e.g. land management, water management, urban expansions on local/regional to global climate) and the importance and impact of those processes need to be assessed.

2.3. Modelling infrastructure, data standards and protocols (V. Balaji, K. Taylor)

With the advent of seamless modeling, there is an opportunity for greater coordination on infrastructure issues between the WCRP working groups across prediction and climate research. Can and should community archives be brought under ESGF umbrella? Stable funding for infrastructure is still an issue: all institutions benefiting from the infrastructure should contribute as well. FTEs may be an equitable currency. Technical oversight bodies need to make pragmatic choices between stability/extensibility, usefulness/complexity, etc. Data harmonization such as CMIP6 brings huge benefits but is expensive. New technical issues requiring collaboration. WIP

protocols need to pay greater attention to experimental design and data structure from the prediction side: e.g forecast start time and ensemble axis. There is perhaps an opportunity to converge on netCDF/CF (recall that CF is “Climate and Forecast”). Data movement could be reduced by “bringing analysis to the data”, long-promised, rarely achieved. Potentially containers/clouds is a breakthrough technology to enable this. A further separation of infrastructure issues into requirements (WIP), implementation (ESGF, ESDOC, ...), and operations (CDNOT) could perhaps be explored.

2.4. New observations and the use of models for designing developing observing systems (C. Cardinali, D. Waliser)

Model development and evaluation can help identifying gaps in observing systems and require continuation of existing weather backbone framework but also consideration for equivalent climate requirements. Current gaps span the whole spectrum of Essential Climate Variables. The prioritization of future observing systems going way beyond the former era of Earth Science discovery mission approach and suggests instead an international fleet of complementary and synergistic contributions, with partnerships becoming more common. Modeling/OSSE tools are sorely needed across weather, climate and other Earth Science areas across a range of complexity (e.g. simple sampling, hypothesis testing, forecast/projection OSSEs) to identify, prioritize and design new observing systems.
The space agencies alone do not own/manage all the modeling expertise and resources to optimally address next generation needs, hence closer partnership with and direction from the modeling community is needed. How will the new WCRP organization address this?
Recommendations included the following:

- Taking advantage of upcoming new satellite systems, with early engagement by WGs in satellite mission product and GCM compatible forward operator algorithms/code.
- Assessing use and value of currently available satellite and other in-situ networks of data by aggregating WCRP/WWRP WG reports on the use and value of the currently available set of satellite and other observations. Maybe based on needs/value assessment and/or workshop on use and value in addressing WCRP/WWRP needs
- WCRP/WWRP can have a significant impact on what new missions get developed, but the identification and prioritization of those needs to be more specific and quantitative. This is an independent consideration beyond the operational weather satellite systems.

2.5. Diagnostics, metrics and evaluation (P. Gleckler, M. Mittemaier)

There is a need to explore synergies between climate and NWP evaluation capabilities across the WGNE/JWGFVR and WGNE/WGCM metrics and diagnostics panels. A path to inspire different communities to identify, develop and establish routine benchmarks for tracking model performance changes over time should be identified. Those two groups could improve sharing of diagnostics across WCRP WGs.

There are pros and cons of large quantities of rapid and automated CMIP6 evaluation going public. In terms of science, there is an opportunity for forecast experts to intersect with climate by exploiting Transpose-AMIP-like simulations to analyse temperature, precipitation, winds, clouds, etc. and apply a range of NWP- and climate metrics. T-AMIP was suggested as a possible “proto-DECK” in that context (e.g. for a future CMIP cycle). The maturity of “routine metrics” is very diverse and working groups shall strive to advance this via targeted assessments.

2.6. Towards seamless weather and climate predictions (F. Vitart, K. Williams)

Historically, weather forecast and climate prediction efforts have been conducted separately, with on one hand high resolution, a focus on the atmosphere and persisted boundary conditions, whilst on the other hand we witnessed the development of couple Earth System Models. More recently, those distinctions are getting smaller, with climate models being tested in NWP mode (e.g T-AMIP) and NWP models getting coupled to other components of interest. Seamlessness is generally speaking more a philosophy than a mantra. Prediction information is currently not seamless across time scales nor across the research-operations continuum. Reforecast and testing, coupled data assimilation, infrastructure and standards, scale-aware physics were highlighted as priorities in this context. Benefits for the community range from confidence in climate change evaluation by testing systems in the short range, reduced systematic errors and cross-cultural nurturing. There does not seem to be a contradiction between efforts towards seamless predictions and increased complexity in Earth System Modelling. It was suggested to re-structure WCRP and WWRP around selected common groups. Exascale computing represents a big opportunity for bringing the weather and climate community together, because of the level of complexity required

2.7. Linking models to user communities (A. Robertson, D. Jacob)

With regard to Sub-seasonal and seasonal forecasts, NMHSs/RCOFs can play an important linkage to users in developing countries. NHMHs provide a legitimate source of forecasts, but the landscape is rapidly evolving with private companies playing an increasing role. The choice should be up to users but they need information on forecast credibility. WMO products carry some sort of “certification” whilst products originating from the private sector sometime lack transparency. Purchasing power of private companies creates inequalities. WMO Lead Centre needs to serve the wider community, in particular those who cannot afford to purchase eg. ECMWF products. Good graphical forecast formats are critical in conveying information effectively.

With regard to decadal predictions and climate change projections, developing countries critically need capacity building to make proper use of climate change scenarios. In-country technical and scientific capacity is growing due to CORDEX, but more climate science expertise in universities is needed as well as expertise to work with climate change information. Climate services can play a key role to link CORDEX with users. One question is whether the Lead Centre/RCOF structure used for the dissemination of seasonal forecasts is also appropriate for the distribution of CORDEX products on an operational basis. Customers want plausible ranges but still need a probability assigned. In-county experts needed to judge confidence level from scientific understanding perspective (since more objective measure of confidence is not achievable, unlike in seasonal forecast case)

2.8. Multi-model synthesis and associated uncertainties (P. Doblas-Reyes, G. Flato)

Multi-model ensembles are widely used in seasonal and decadal prediction, in climate projection, and in regional downscaling. Often what we have are ‘ensembles of opportunity’. Ensemble provides information about uncertainty (or at least ‘spread’, which is not the same), and can be used to provide probabilistic information, but what is the adequate level of uncertainty is not easy

to estimate. There are many issues related to ensemble size and properties: how many models are necessary? how/if they should be weighted? how can lack of independence be accounted for? Literature is developing on this, and a weighting scheme has been used in US climate-change assessment, while for climate prediction weighting has been tested in many different contexts. There is a need to better synthesizing results from multi-model ensembles, deriving and communicating information relevant to different users. Can we take advantage of communication experience in different areas (e.g. IPCC language)? How much of this is WCRP issue versus climate service providers? For some purposes (e.g. providing climate information to end users) multi-model synthesis is essential. However, for other purposes (e.g. boundary conditions for regional downscaling) there is a need for a representative subset. We have not yet taken full advantage of applying insights from evaluating prediction skill to long-term projection and vice-versa.

2.9. Discussion session (WMAC Co-chairs)

The summary of breakout sessions was followed by a short plenary discussion on overarching issues and next actions for WMAC, which are briefly reported here:

- There is a crucial funding issue to secure data and computing infrastructures to support community effort, e.g. the Earth System Grid Federation. Efforts should ensure that legacy data sets and archives do not get lost
- There is an opportunity to share evaluation tools in a number of areas and to increase synergies between the JWGFVR and Metrics Panel
- The on-going Sponsors' Review will provide recommendation for a new structure of the Programme. Until such new structure is in place, modelling groups should be encouraged to indicate their closest or more natural parent entity within the programme, so as to streamline some organizational and communication practices
- CMIP puts an enormous pressure on modelling centres and some of them suggested to possibly skip the next CMIP7 cycle if timeline is too tight
- Attendees indicated that the format of the meeting had provided numerous opportunities to exchange with other groups and to contribute actively to broad strategic discussions, and it was suggested to consider repeating this experience sometime in the future, maybe also around observations and data issues

The meeting closed with a short farewell ceremony to thank Christian Jakob for his extraordinary leadership and active engagement in WCRP activities as former member and co-chair of WGNE and as co-chair of WMAC. At the same time, we thanked Francisco Doblas-Reyes, stepping down as Co-chair of WGSIP and stepping in as new Co-chair of WMAC.

3. WMAC session

The WMAC dedicated session started with a brief introduction by co-chair, emphasizing the fruitful interaction between modelling groups and broader exchanges during breakout group discussions over the preceding days, which was the main objective of the pan-WCRP modelling group meeting in the context WCRP developing its new Strategic Plan.

The meeting proceeded with some personal viewpoints related to the WCRP Sponsors' Review by Dame Julia Slingo followed by modelling groups updates taking stock of the various meetings during the week.

The full presentations are available on the meeting web page. The following is meant to synthesize corresponding discussions.

3.1. WCRP Sponsors' Review – Dame Julia Slingo

Dame Julia Slingo provided an update on the WCRP Sponsors' Review, which is almost complete but slightly delayed due to some personal issue. Until completion and final validation by the WCRP Sponsors, the outcomes of such review will not be made public in draft form. Nevertheless, she shared with WMAC members the wish for the panel to make some strong recommendations and the pan-WCRP modeling meeting during the week has been helpful to collect further evidence in different strategic areas. Key points emerging from the fruitful exchange with WMAC members is summarized below.

In essence, it seems that the two mission goals of the program are still very much valid but changes are expected on how WCRP is expected to deliver, when there has been an organic growth in WCRP structure. The need to reposition WCRP in the context of Future Earth and the need to address the seamless agenda was highlighted. Modeling represents the fundamental technology for WCRP but there is a growing expectation for it to address wider societal needs, from understanding and analyzing the changing climate, to predict and project its future evolution and to support decision making, but are models fit for purpose? There is leadership in model development across WGNE, WGSIP, and WGCM, the latter being somewhat dictated by the IPCC agenda. Furthermore, some distinction has to be made between science for model development and modeling for science, the latter appearing to have grown more significantly over the last decade in WCRP. Models need to be improved, especially when there is a clear expectation to move into full Earth System Models and whilst there are still fundamental systematic errors on the physical components. There are opportunities to pursue model development efforts in closer collaboration with other partners, such as WWRP and AIMES.

WCRP, on behalf of WMO and other sponsors needs to advocate for resources for climate modeling as much as WMO advocates already for data exchange, satellite missions, etc, as one can reasonably assume a 40:1 return on investment.

Model evaluation should also an integral part of the model enterprise and a more unified infrastructure or framework.

Some of the important questions for the climate research community and WMO include:

- How can WCRP help sustaining Tier 0 capability in climate modeling, prediction and projections? At least a few of those Tier 0 (EPECC-like) centers would be needed across the globe
- Shall model and data software development become more prominent in the programme?
- How should WCRP re-invigorate model development and address fundamental systematic errors?
- Should WCRP actively engage with computing and data system provider to address next generation codes and exascale computing?
- Should WCRP initiate some international field programmes (like TOGA COARE)?

Some 67 WCRP affiliated modeling efforts have been identified via the survey, but overall governance is sometimes unclear and oversight should be streamlined towards better overall coordination. Only about 16 of them have an explicit focus on model development, in other words involving improvement in numerical codes. It was noted that CMIP has grown significantly and offers tremendous visibility and return on investment for those involved.
CMIP addresses 3 main and equally balanced priorities: climate change, systematic biases and variability and predictability.

Historically, WGNE has served as a WG for model development in the atmosphere, whilst WGCM spearheaded AOGCM development and matured into CMIP, and WGSIP underwent a similar evolution, adding more components such as the carbon cycle into the mix. CAS is concerned with similar questions as to its evolution maybe into a broader model development working group. A similar body would be needed for data issues across the weather-climate enterprise. It was argued that model development (including those issues addressing model biases, shocks and drifts) is not likely to easily attract external resources but deserves dedicated financial support because of its importance across the weather-climate enterprise. Similarly,

CMIP, given its ambition, scope, and significant contribution to IPCC under stringent cycles, is clearly under-resourced and currently at risk on several fronts: data infrastructure, super-computing, quality assessment and reliance on external inputs such as forcings, etc.

It was recalled that the WIP, whilst focusing on CMIP initially, was established towards a broader scope on the long-term to address infrastructure issues across the programme. The WMO CBS could play an important role in this evolution in the future.

Core Projects should clearly link and contribute to the mandate of Modeling Working Groups in their respective area of expertise and own right.

With respect to regional considerations, the programme shall continue to focus on the physical science but also recognize the relevance to society, hence the need for handshakes and communication with boundary organization, otherwise running the risk of dilution.

DCPP may be considered as a kind of spin-off from CMIP which has not increased operational relevance being addressed in close connection to CBS via the decadal forecast exchange. The same relevance applies to the S2S project and CMIP if one considers the respective contribution to climate services and policy on regular cycles.

A WMO Chief Scientist position in the future could possibly play an advocacy role on several of those issues with relevant agencies.

3.2. WGCM update – Jerry Meehl

It was suggested the planned CORDEX conference in 2019 could become a joint HighResMIP-CORDEX effort. This could be discussed at the upcoming PRIMAVERA meeting later in fall 2017. The WIP currently coordinates infrastructure issues for CMIP but shall be expanded to support the other modeling groups into a more unified and coordinated effort. Dame Julia Singlo noted the need to understand the leveraging factor of CMIP coordination and ballpark requirements for the whole CMIP enterprise. She further indicated that the review will challenge sponsors on funding issues. It is about supporting the coordination function of WCRP, and it is critical to ensure the enduring components are supported. In that context, the Grand Challenges shall be equivalent to WWRP projects as time limited efforts and dedicated call for proposals could be issued to seek support and contributions.

3.3. WGSIP – Bill Merryfield

Dame Julia Slingo recommended balancing the focus in the new strategy. Hindcast sets are of tremendous value and this has nothing to do with climate change but climate variability and predictability. In that context, WGSIP could play a stronger role in characterizing risk and capturing uncertainty. It was also suggested to merge all WCRP decadal groups in that context, in particular DCPP and DCVP.

3.4. WGNE - Keith Williams

It was noted that WGNE plays a dual role of promoting communication between NWP centers but also coordinating a forum for atmospheric numerical experimentation, hence the critical need to keep connection to model centers. Similarly, WGCM relies on the work of many centers and this should be maintained for the success of CMIP. Process parameterization should be an active area of research for model development. Dame Julia Slingo suggested that model development could be addressed in a similar way to the UK MetOffice Foundation science. Process studies like GASS or GLASS should be deeply rooted in field experiments and conducted jointly with WWRP. It was noted that the EU EPPEC initiative is about bringing various pieces of WGNE-type of work together. The question was posed as to the continuation of a WMAC-like group in the future WCRP structure and it was suggested that such group could be elevated at the WMO level.

3.5. S2S – Michel Rixen on behalf of S2S co-chairs

It was pointed out that S2S is not a fundamental model development project similar to WGNE but is rather similar to WGSIP and reports to this group. At the subseasonal time range, models start to drift and it is difficult to rely only one member. The role of the coupling to the ocean was discussed in the context of T-AMIP and a future broader T-CMIP-like effort currently in pilot mode under the WGSIP shocks and drift sub-project.

3.6. CORDEX – Bill Gutowski

A dialogue has started with WGCM and HighResMIP, and it is suggested to established a small Task Force to promote further dialogue with areas of focus such as added value, opportunities and limitations in comparisons, high resolution observations to enhance complementarity and mutual benefits across those efforts. The question was posed as to whom CORDEX should report in the future.

3.7. OMDP – Gokhan Donabasoglu

It was pointed out that OMDP is the only group with an explicit "model development" mandate. International collaboration is needed to target persistent model biases. High-resolution modeling involves multiple challenges, including scale-aware physics, diagnostics and data volumes, infrastructures and conventions. WGNE is publishing a BAMS paper on the outcomes of the Systematic Errors and associated research priorities. It was also suggested to coordinate closely with CliC with regard to sea-ice issues in relation to the modeling of convection in the Labrador Sea.

3.8. Closing discussion and WMAC business

Given the expect strategic developments, it was recommended not to hold a WMAC meeting at the next JSC in China in spring, but instead to wait until the JSC digests the WCRP review and develops the new strategic plan, likely by mid-2018, to which WMAC and the modeling WGs can respond. The next WMAC meeting could likely be held in late 2018 or early 2019, perhaps in conjunction with proposed CMIP Analysis Workshop in spring 2019, or 2019 JSC meeting.

All proposed new memberships have been approved by the JSC and will take early next year. Christian Jakob is stepping down as co-chair and members thanked him warmly for his truly outstanding leadership on WMAC and also welcomed Francisco Doblas-Reyes stepping into this role and Michael Ek as new member as of 1 Jan 2018.

The meeting ended by agreeing on the final actions and recommendations of the session, which are summarized in Appendix A.

APPENDIX A – ACTIONS AND RECOMMENDATIONS

1. WMAC proposes to make model development a more central activity within the WMO as a whole. Our preferred option to do so would be a Working Group on Model Development that spans all WWRP/GAW/WCRP (and maybe AIMES) model development activities. – WMAC to propose this for consideration by the JSC
2. WMAC recommends that each of the WCRP modelling efforts is formally affiliated with one of the three modelling working groups. – CJ to send modelling activity survey table to WG chairs, WGs to organize affiliations
3. WMAC is going to organize a meeting of the WGCM WIP with equivalent groups in the WWRP/GAW communities to begin a discussion on cross-community efforts in modelling infrastructure and model data archives – WMAC to organize
4. WMAC and WGCM to facilitate an ongoing discussion on the future funding of CMIP activities. The first step should be a position paper by the relevant groups. – WMAC and WGCM co-chairs to progress
5. WMAC recommends that CORDEX be formally re-affiliated with WGCM – WMAC to propose this to the JSC for consideration
6. CORDEX will ensure that the next conference on modelling the regional climate (planned for 2019) will include a significant representation of the high-resolution and stretched grid global modelling communities. – CORDEX co-chairs to report at next WMAC session
7. WMAC strongly supports the idea of WCRP-led assessment reports on key community issues. In the modelling realm, early candidates could be a report on the climate models' ability to simulate key phenomena (e.g., ENSO, precipitation) and/or the use of multi-model ensembles. – WMAC to communicate this to the JSC
8. WMAC expresses its concern about the plethora of activities in the Decadal prediction area. As a first step for simplifying the structures we strongly suggest merging the CLIVAR DCVP with the DCPP into a single body. – WMAC to communicate to JSC
9. WMAC recommends that WGCM, CORDEX and HighResMIP form a closer relationship possibly through a taskforce – WGCM and CORDEX co-chairs to draw up a proposal
10. WMAC remains concerned about the slow progress in reducing systematic model errors in all spheres of climate modelling. WMAC to promote more coordinated activities in this area and discuss at its next meeting with the aim to propose a practical activity.
11. The use of Exascale computing in our field will be a challenge to all modelling groups in WWRP/GAW/WCRP. WMAC feels that it is timely to consider related issues across the programmes. This will be an agenda item at the next WMAC meeting – WMAC to organize a presentation on these issues at its next meeting.
12. WMAC expressed its excitement about the very high-resolution (~ 1 km) climate modelling initiatives, such as the EPECC European proposal that is under construction. WMAC feels that WCRP needs to stay abreast of such initiatives and support them. We recommend that the next JSC meeting invites a presentation by a representative of the very high-resolution climate modelling community. – JSC to organize
13. Repeat the joint meeting of the modelling working groups every 3 years. – WMAC to organize

APPENDIX B – CONTACT LIST

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