

WCRP REPORT

World Climate Research Programme



ICSU
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Report of the 2nd Session of WCRP Working Group on Regional Climate

Montevideo, Uruguay, 14-15 March 2014

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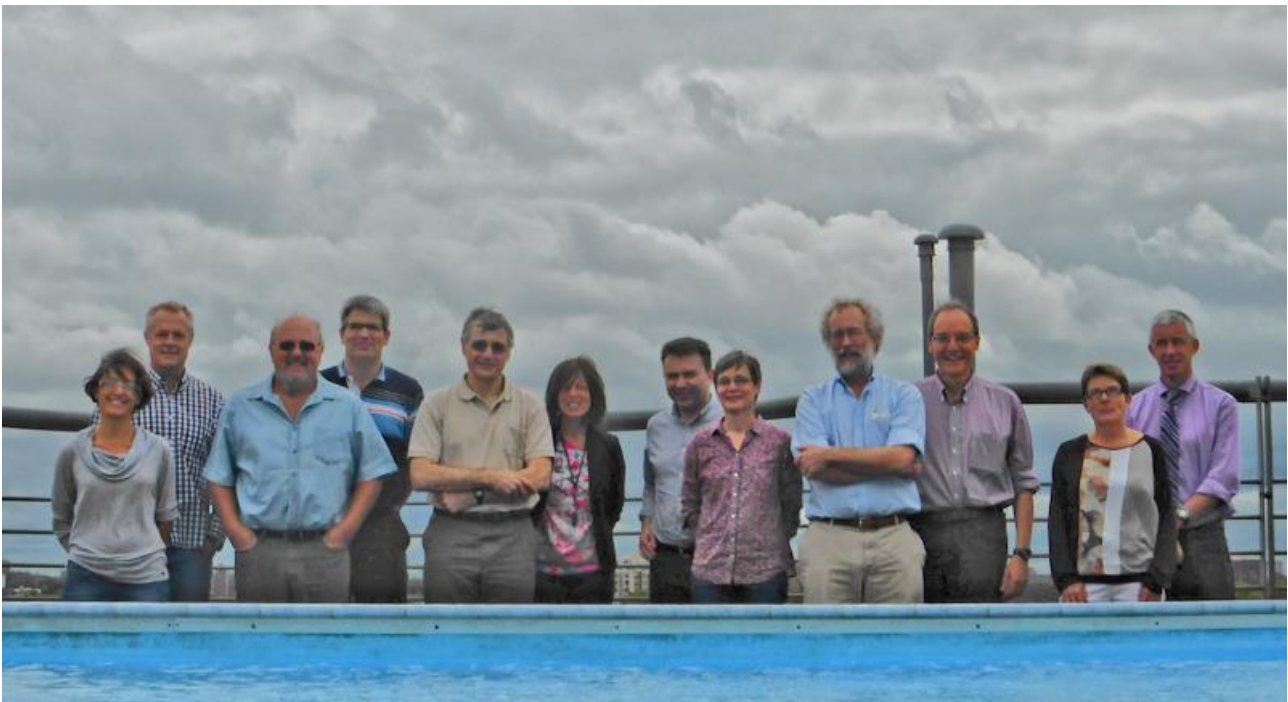
The Working Group on Regional Climate (WGRC) held its 2nd meeting in Montevideo, Uruguay, on 14-15 March 2014

Attending: Clare Goodess (Co-Chair), Bruce Hewitson (Co-Chair), Timothy Carter, Igor Shkolnik, Fernanda Zermoglio, Simon Mason (CLIVAR), Jan Polcher (GEWEX), Annette Rinke (CliC), Willem Landman, Roberta Boscolo (WCRP/WMO), Filippo Giorgi (CORDEX), William Gutowski (CORDEX)

Teleconference: Filipe Lucio (WMO GFCS), Frans Berkhout (Future Earth), Cath Senior (WGCM) and Adam Scaife (WGSIP)

Apologies: Sam Dean (SPARC), David Behar, Seita Emori and Kendra Gotangco

Agenda and full list of participants can be found in the Appendices 1 and 2, respectively.



1. Welcome and Introduction

Clare Goodess and Bruce Hewitson opened the second session of the WGRC by welcoming the members and thanking Dr Marcelo Barreiro for kindly arranging the first day of the meeting to be held at the Science Faculty of the University of Uruguay in Montevideo. The co-chairs noted many of the activities and meetings that WGRC had been involved in since the September teleconference, particularly during October to December, and stressed the need to identify specific, WGRC-led activities and products during this meeting.

This meeting was planned to be back-to-back with the WCRP Conference on Latin America and the Caribbean (<http://www.cima.fcen.uba.ar/WCRP/>) and taking advantage of many WGRC members attending both events.

The agenda of the meeting was reviewed and adopted without changes (see [Appendix 1](#))

The agenda included two presentations by the local scientists:

1. **Extreme Climate Events: from the construction of daily database to detection and attribution** by Dr Madeleine Renom
2. **Multi-annual variability of streamflow in La Plata Basin: Observations and Links to global climate** by Dr Alvaro Diaz

The full abstract of the talks can be found in [Appendix 3](#)

2. WCRP Overview and JSC-34 Actions Items Relevant to WGRC (R. Boscolo)

WCRP mission and objectives were revisited with a special emphasis on the programme role in leading science for the Global Framework on Climate Services, Future Earth for Sustainable Development and Framework for Ocean Observing. WCRP organization was presented as well as WCRP position within the UN organization. It was shown that WCRP is part of the World Climate Programme (https://www.wmo.int/pages/prog/wcp/index_en.html) together with GCOS, PROVIA and the WMO Climate Services Programme.

After a consultation with the climate science community during the WCRP Open Science Conference in October 2011, the WCRP Joint Scientific Committee launched the concept of Grand Science Challenges (<http://www.wcrp-climate.org/index.php/grand-challenges>) as major areas of scientific research, modelling, analysis and observations for WCRP projects and working groups. The six GCs that WCRP identified as high-priority and exciting research to yield "actionable information" are:

1. Provision of skilful climate information on regional scales;
2. Regional sea-level rise;
3. Cryosphere in a changing climate;
4. Clouds and climate sensitivity;
5. Changes in water availability; and
6. Prediction and attribution of extreme events.

A selection of relevant Action Items for the latest JSC session in Brazil in May 2013 were presented and discussed. A remark was made on Action 1 regarding the WCRP engagement with NHMs on the implementation of the RMP component of the GFCS. The members of WGRC think that WCRP should seek engagement with the Universities too.

ACTION 1: Feedback JSC regarding JSC-34 Action 1 “why WCRP should engage only NMHs and not Universities?” (R. Boscolo)

Some further clarifications were requested to Acting Director (AD)/WCRP for **Action 15**:

- To identify optimal choice of leadership for the WCRP research work on provision of skilful/action-oriented regional climate information on interannual to decadal time scales

ACTION 2: Ask AD/WCRP what should be the role of WGRC for the Action Item 15 of the JSC-34 (R. Boscolo)

Finally WGRC members noted that Filippo Giorgi and Rodney Martinez are the JSC liaisons for the group and were pleased that Filippo Giorgi was attending this WGRC meeting.

3. Links with Relevant Working Groups/Panels

3.1 WCRP Modelling Advisory Council (W. Gutowski)

WMAC was established in October 2011 with the task to coordinate high-level modelling aspects across the WCRP, ensuring cooperation with main WCRP partners such as IGBP and WWRP, and to act as a single entry point for all WCRP modelling activities. WMAC:

- Regularly assesses modelling capabilities within WCRP and identifies gaps, overlaps and opportunities for synergy
- Provides advice on priorities for modelling across WCRP including the Grand Challenges
- Facilitates effective communication on modelling issues within the WCRP and with the broader community
- Promotes capacity building in model development, evaluation and applications

WMAC is going to hold their 3rd session in Heidelberg, Germany, in July 2014; meanwhile the group is working on a few new activities/proposals:

- Summer school on model development focused on physics/parameterization for 2015 (at MPI maybe)
- Prizes for model development to Early Career Scientists (ECS): a reward for significant contributions
- Proposal for a dedicated CLIVAR panel on climate dynamics
- Proposal for a WGCM infrastructure panel

Some questions were formulated as feedback to the group:

1. Does the WMAC have interest in statistical models of climate and more broadly, interest in assessments of downscaling?
2. Is the summer school on physical parameterization focused on atmospheric processes?
3. Is the summer school including aspects of hydrological and other modelling relevant to impacts?

ACTION 3: Feedback WMAC the question and discussions raised at the WGRC-2 (W. Gutowski)

3.2 Working Group on Coupled Modelling (C. Senior)

WGCM mission is:

- To review and foster the development of coupled ocean-atmosphere models and earth system models (i.e. with coupled carbon cycle, chemistry, aerosols...)
- To coordinate model intercomparisons (e.g. CMIP, PMIP, CFMIP...)
- To promote and facilitate the models evaluation and diagnosis of shortcomings, and understanding of processes and feedbacks in the climate system

Since 1995 CMIP has been coordinating international multi-model climate experiments for understanding past, present and future climate variability and change. CMIP is now planning its 6th phase (<http://www.wcrp-climate.org/index.php/wgcm-cmip/wgcm-cmip6>) with the scientific focus on the WCRP GCs and an additional theme involving biospheric forcings and feedbacks. The specific experiment design will focus on three broad questions:

1. How does the Earth system respond to forcing?
2. What are the origins and consequences of systematic model biases?
3. How can we assess future climate changes given climate variability, climate predictability, and uncertainties in scenarios?

A recent article published in EOS provides detailed information about the CMIP6 planning see:

<http://www.wcrp-climate.org/images/documents/CMIP6.Eos.final.2014.pdf>

The WGRC noted with interest the progress made on the next phase of CMIP6 and requested the CORDEX SAT to coordinate the CORDEX experimental design with CMIP6.

ACTION 4: Ask CORDEX to address the science questions of CMIP6 in their future experimental protocol (CORDEX SAT)

3.3 Working Group on Seasonal to Interannual Prediction (A. Scaife)

One WGSIP main activity is the Climate-system Historical Forecast Project (CHFP, <http://www.wcrp-climate.org/index.php/wgsip-chfp/chfp-overview>). CHFP is a multi-model and multi-institutional experimental framework for sub-seasonal to decadal complete physical climate system prediction. By the complete physical climate system, we mean contributions from the atmosphere, oceans, land surface, cryosphere and atmospheric composition in producing regional and sub-seasonal to decadal climate anomalies.

The core experiment is an 'Interactive Atmosphere-Ocean-Land-Ice Prediction Experiment' emphasizing the use of comprehensive coupled general circulation models, which includes realistic interactions among the component models. The experiment is to perform seven-month lead ensemble (10-members) predictions of the total climate system. If possible longer leads and larger ensembles are encouraged. The initialization strategy is to use the best available observations of all the components of the climate system. The CHFP data archive (<http://chfps.cima.fcen.uba.ar/>) is hosted by the Centro de Investigaciones del Mar y la Atmosfera (CIMA), Argentina and is reporting a growing number of seasonal hindcasts available. WGSIP is also coordinating the near-term climate predictions that through the WMO Global Producing Centers (<https://www.wmolc.org/>) contribute to GFCS.

The 1st International Workshop on Seasonal to Decadal Prediction, held in Toulouse, France in May 2013 and organized by WGSIP and WGCM, brought together the expertise of the seasonal forecasting and climate simulation communities. The aspects of seasonal to decadal (s2d) prediction that depend on the expertise of both communities include the use of global coupled models of the atmosphere, ocean, land and cryosphere together with the need to properly include the effects of external forcing, to generate an ensemble of forecasts and simulations, to suitably initialize the forecast models including the oceans, to store useful

information and to post-process and analyse the results. The lack of appropriate observations to generate robust initial conditions over a sufficiently long time and the lack of experience on how best to initialize decadal forecast systems likely hampered the skill obtained in the CMIP5 exercise. Several studies show that the CMIP5 CORE protocol based on the production of forecasts every five years from 1960 onwards may lead to non-robust estimates of skill and might not be adequate for a physical understanding of the sources of forecast skill, although such sampling frequency already offers a first-order estimate of the forecast quality.

Taking in consideration these problems, WGSIP together with WGCM and CLIVAR are developing the protocol for decadal prediction experiments for the next CMIP exercise. The Decadal Climate Prediction Panel (<http://www.wcrp-climate.org/index.php/dcpp>) is in charge of putting together a 1st draft that will be circulated to the community.

Given the potential regional focus of decadal predictions the group is interested in establishing links with the DCPD.

ACTION 5: Get in contact with the co-chair of DCPD and propose Simon Mason as WGRC ex-officio member of the DCPD (C. Goodess and B. Hewitson)

ACTION 6: Request to circulate among the WGRC members a copy of the draft CMIP6 protocol for decadal prediction experiments (R. Boscolo)

3.4 TGICA (T. Carter)

The Task Group on Scenarios for Climate and Impact Assessment (TGICA) was established by IPCC in 1996 as a cross-cutting working group with the mandate:

- To facilitate the wide availability of climate change related data and scenarios to enable research and sharing of information across the three IPCC working groups
- To disseminate information in support of IPCC work, as well as IPCC "approved", "adopted", "accepted" and "supporting material" e.g. information on anthropogenic influences on climate, climatological baselines and observations, projected future climate, and other environmental, technological, and socio-economic factors and data relevant to impacts, adaptation, vulnerability and mitigation research

TGICA coordinates the IPCC Data Distribution Centre (DDC, <http://www.ipcc-data.org/>), providing data sets, climate and other scenarios, and other material (e.g. technical guidelines on use of scenarios). In support of IPCC work and in consultation with WG Co-Chairs, TGICA identifies information needs, facilitates research on climate impacts, adaptation, and mitigation, makes recommendations on cross-cutting issues and solicits feedbacks from the user community.

Capacity building is high on the agenda of TGICA as it facilitates the use of data and scenarios for climate-related research in developing and transition-economy regions and countries.

T. Carter as co-chair of TGICA and member of WGRC made some suggestions on potential synergies between the two groups:

- Inclusion of CORDEX data in DDC
- Partners in developing integrated regional scenarios of environment and socioeconomic conditions
- Pool resources for developing Fact Sheets, technical guidelines in support of users wishing to access, interpret and apply data and scenarios for climate change research
- Joint initiative for capacity enhancement of regional climate science and prediction

T. Carter pointed out the difficulty in IPCC with the use of terms that have different meanings within different research communities.

ACTION 7: Provide support to TGICA in formulating a potential document on definitions of critical variable used by the wider climate community (J. Polcher, T. Carter and D. Behar)

ACTION 8: Feed back to the TGICA group on the willingness of WGRC to share resources on the production of fact sheets (T. Carter)

4. Links with Relevant Sponsors Initiatives

4.1 The Global Framework for Climate Services (F. Lucio)

Filipe Lucio introduced the Global Framework for Climate Services (GFCS), which aims to enable better management of the risks of and adaptation to climate variability and change through the development and incorporation of science-based climate information and prediction into planning, policy and practice at global, regional and national scale. The GFCS will provide greater integration and coordination across disciplines, actors and sectors in the climate services agenda for better use of infrastructures, technical capabilities (and resources). The GFCS focuses particularly on several priority areas (initially - water, health, disaster risk reduction, and agriculture) and works to address these through five pillars of action (observations and monitoring, research modelling and prediction, climate services information systems, user interfaces, and capacity building).

The GFCS adheres to eight principles:

1. Priority shall go to building capacity in climate-vulnerable developing countries.
2. The GFCS should ensure greater availability of, access to, and use of climate services for all countries.
3. The GFCS will focus on three geographic domains; global, regional and national.
4. Operational climate services will be the core element of the Framework.
5. Climate information is primarily an international public good provided by governments, which will have a central role in its management through the Framework.
6. The Framework will promote free and open exchange of climate-relevant observational data while respecting national and international data policies.
7. The role of the Framework will be to facilitate and strengthen, not to duplicate.
8. The GFCS is built on user needs through user-provider partnerships that include all stakeholders.

The 1st meeting of the Intergovernmental Board on Climate Service (IBCS) resulted in the approval of an implementation plan and a plan to develop a compendium of GFCS projects. At present, there are more than 40 projects at the global, regional, and national scales; collectively, these are worth over CHF 140 million.

The criteria for designating projects as contributing to GFCS are:

1. Are aligned with at least one of the Framework's priority areas (disasters, water, agriculture and food security, and health)
2. Have a strong climate service focus, with operational services as a core element.
3. Ensure that their outcomes will address the needs of decision-makers and users of climate services.
4. Develop national or regional capacities.
5. Ensure that the project strengthens and supports existing activities.
6. Involve, or contribute to activities in LDCs, SIDSs, LLDCs or other regions or countries highly vulnerable and sensitive to climate-related risks.
7. Have strong prospects for successful delivery.
8. Ensure the country or region in which the project is being implemented has (or, through capacity development activities, will rapidly have) sufficient institutional capacities for successful delivery.
9. Are implemented at the national, regional or global domain.

ACTION 9: Distribute the GFCS documents including the compendium of the projects (R. Boscolo)

The GFCS has also hosted a series of regional workshops and national consultations. Regional workshops stressed the importance of research, the need to maximize resources by working at the regional level, and the role of the Regional Climate Outlook Forums. National-level consultations have led to systematic dialogue with users, an improved understanding of in-country capabilities, an identification of data and observation requirements, and a new understanding of priority research questions. GFCS is seeking contributions from the climate research community in:

- Mapping climate information needs of users and related climate science knowledge gaps
- Developing specific climate research agendas, e.g. Climate Research for Africa (CR4A)
- Proposing research programs to address user-driven priorities for climate research as identified in the GFCS Implementation Plan

ACTION 10: Improve communication and ongoing input to GFCS (R. Boscolo)

4.2 Future Earth (F. Berkhout)

Future Earth (<http://www.futureearth.info>) was launched in June 2012 at the UN Conference on Sustainable Development (Rio+20) with the aim to provide the knowledge required for societies in the world to face risks posed by global environmental change and to seize opportunities in a transition to global sustainability. It builds on more than two decades of successful international collaboration in the WCRP, IGBP, Diversitas and IHDP programmes.

By bringing together existing programmes on global environmental change, Future Earth will be an international hub to coordinate new, interdisciplinary approaches to research on grand challenges and transformations to sustainability. It will also be a platform for international engagement to ensure that knowledge is generated in partnership with society and users of science. It is open to scientists of all disciplines, natural and social, as well as engineering, the humanities and law. One of the most innovative aspects of Future Earth is the idea of co-design and co-production of relevant knowledge. Future Earth will build and connect global knowledge to intensify the impact of research and find new ways to accelerate sustainable development at global, regional, national and local levels.

Future Earth is led by a Governing Council, and supported by two advisory bodies: a Science Committee and an Engagement Committee. These bodies are appointed by and report to the members of the Science and Technology Alliance for Global Sustainability, which currently acts as the Governing Council. The Governing Council, which will be appointed shortly, and its subsidiary bodies involve, as appropriate, representatives from a range of stakeholder communities (academia, funders, governments, international organizations and science assessments, development groups, business and industry, civil society and the media). The work of these bodies is supported by the Future Earth Secretariat – with the interim Secretariat based at the International Council for Science (ICSU) in Paris. The Secretariat coordinates the scientific projects and performs the day-to-day management of Future Earth, ensuring coordination across themes, projects, regions and committees, and liaising with key stakeholders.

Research in Future Earth is divided into three broad research themes. These are:

1. Dynamic Planet,
2. Global Development and
3. Transformations towards Sustainability.

These themes function as broad platforms for strategic and integrated Earth system research under Future Earth. The themes are broad, and each calls for collaboration across a range of research areas and disciplines. The themes were developed by the Future Earth Transition Team through a series of consultations. Supported by the set of crosscutting capabilities, these themes propose an initial structure for the implementation of Future Earth. There are many options for organizing research priorities and themes –

for example around basic human development needs (water, food, energy, genetic diversity) or by earth system components (climate, land, oceans). The proposed research themes are designed to respond to new and urgent calls for research to inform development and to identify the social, technological, economic and other transformations towards sustainability.

The success of Future Earth will depend on active collaboration between nations, disciplines, programmes, researchers and stakeholders to ensure that knowledge is generated in partnership with society and users of science. There are a number of ways to get involved in Future Earth:

- Attend upcoming FE events or contact the secretariat if considering hosting a Future Earth-related event
- Subscribe to the Future Earth Newsletter, follow FE communications
- Connect with our existing research projects or bring existing initiative into Future Earth
- Develop a new initiative

Given the mandate of WGRC, the group felt that they could contribute to the development of strategic research agenda for FE through the consultation with the science community on research priorities.

ACTION 11: Respond to FE request for inputs on development of a strategic research agenda and setting of priorities (all). Frans Berkhout to ensure that WGRC is added to the relevant distribution list.

The recent call for proposals (deadline 4 April) on Fast Track Initiatives and Cluster Activities (http://www.wcrp-climate.org/images/documents/news/Announcement_FTI_CA.pdf) to kick-start integration among the GEC projects was brought to the attention of the group. The call seems open to existing WCRP Core Projects.

ACTION 12: Distribute the information on the FE call for proposal to the WGRC members (R. Boscolo)

5. Updates on CORDEX (F. Giorgi and W. Gutoswki)

The Scientific Advisory Team of CORDEX has undergone a few changes: C. Jones, C. Goodess and B. Hewitson have rotated off and new members joined (see <http://wcrp-cordex.ipsl.jussieu.fr/index.php/about-cordex/cordex-people>). The most active regional activities are: Africa, Euro-CORDEX and Med-CORDEX.

Substantial CORDEX activities are also underway in terms of workshops, completion of simulations and analysis in South Asia, East Asia and Central/South America. CORDEX in the Polar Regions is getting started. CORDEX in North America doesn't get support from the research community, there the modelling groups do not see any added value in regional downscaling with respect to global models.

The International Conference on Regional Climate (<http://cordex2013.wcrp-climate.org/>) organized in Brussels in November 2013 was a great success: more than 400 scientists from 97 countries attended the event. It was recognized that CORDEX has been a successful framework in which scientists around the world have adopted a common protocol to guide the development of high-resolution Regional Climate Model (RCM) and empirical statistical downscaling (ESD) projections, and the intercomparison of these projections, on each continent. The conference provided evidence that much of the work underway is relevant to climate change vulnerability, impacts and adaptation (VIA) studies, and that CORDEX must address several key challenges in order to better serve these communities. The conference raised some reflections for the future of CORDEX:

- The need to find mechanisms for better coordination across the different CORDEX activities

- The revisit of some CORDEX domains as well as to put in place a mechanism for the approval of the domains
- Better integration of statistical downscaling activities
- Promotion of process-based analysis of the results, specifically dealing with the issue of added value
- Development of coupled regional ESMs
- Interaction with users and participation in the process of the use of the data
- Planning for the second phase of CORDEX

Some ideas for the next phase of CORDEX include:

- Increase of resolution (25km) and/or reduce domains (10km)
- Integration of multiple methods (RCMs, SD ...)
- Detailed process based-analysis
- Use of high quality/resolution observation datasets
- Targeted experiments to address scientific problems (land-use, clouds, aerosols...)
- Better interactions with WCRP projects (GEWEX, CLIVAR, CliC...)

It was noted that to date, CORDEX has been a voluntary effort and is still in a research phase. Getting data into standard formats, for example, is time consuming. The WGRC could help to make these points. Some of the concerns of the WGRC members and the community in general regard the fact that the majority of the CORDEX output has not been analysed. There were expressions of reluctance in proposing a new full set of experiments without taking full advantage of what is already available. It was pointed out that the results of the CORDEX analysis could be beneficial for the new runs proposed for the next phase of CORDEX. In order to stimulate CORDEX analysis it was proposed to start a pilot project for Africa that should provide an example for CORDEX analysis in other regions of the world. As part of this process, ICTP (F. Giorgi) _ offered to host a CAG (B. Hewitson's group) postdoc in Trieste.

The outcome of the CORDEX-Africa-Analysis (CAA) pilot project would be a position paper as a sort of guideline on the strength and weakness of CORDEX datasets: can the CORDEX outputs answer some of the questions that the users are posing about regional climate?

ACTION 13: Form the subgroup to develop the CORDEX-Africa-Analysis (CAA) pilot project and associated journal paper in the next 6 months (F. Giorgi, B. Hewitson, F. Zermoglio and W. Gutowski)

There was a strong objection for promoting the future of CORDEX as the 2nd phase of CORDEX; this could discourage new groups that want to start doing CORDEX now.

ACTION 14: Encourage the CORDEX SAT to find a new name for the following phase of CORDEX. To discuss it at the CORDEX SAT meeting in May 2014

It was pointed out that there is not clear information on the CORDEX webpage on how to get involved in CORDEX, where to find the data etc...

ACTION 15: Ask the CORDEX SAT to review the information on the CORDEX webpage and design a point of entry for outsiders (W. Gutowski)

CORDEX is developing metrics in order to evaluate the performance of the CORDEX models and outputs. The goals are to provide an easy way to compare models and models with data. The metrics proposed envisage two categories: one basic assessment common to all the regions and another more regionally targeted.

ACTION 16: WGRC is looking forward to revise the metrics document once the first version is ready (all)

6. Distillation Workshop Concept Proposal (B. Hewitson)

Observations, GCMs, RCMs, statistical downscaling, and understanding of process changes offer widely differing, sometimes contradictory, indications of magnitude and direction of change; attributable to systematic biases, structural error of methods, limitations of methods, scale constraints, unresolved / unresolvable processes, scientific gaps, system stochasticity, etc. As a generalization (which of course has exceptions), the IAV / Policy communities largely lump these all under uncertainty, ignore the integration, and apply simplistic adjustments with subjective selection to obtain a “consensus message” which is adopted in activities dominantly focused on downstream issues. There is no framework for using the data out there for generating/managing/using climate information and the investment in research on this interface problem is small in comparison to other spheres of activities related to climate change.

With the advent of FE, GFCS, and a host of related regional climate service related equivalents, it is arguable that this issue is (one of?) the leading constraints on effective adaptation and policy development. This issue certainly pertains to the WGRC mandate and for this reason it is proposed to organize an experts meeting with a focus on *Assessment, analysis, and integration of climate data information conflicts* or in short *The information distillation dilemma*.

Distillation ... that is, research on how to address, integrate, analyse, adopt the multiplicity of models, ensembles, methods, and scale resolutions of the array of data visible to and used by the IAV communities, with particular attention on the contradictions, differences, and interpretation as a function of the user’s data choice.

The workshop should include invited participants from the communities engaged with observational data, GCMs, RCMs, statistical downscaling, and climate services – this would include other working groups, as well as FE, GFCS, GCOS, etc.

The objectives should be:

- To explore the current modalities for addressing the problem
- To explore research avenues that WGRC could advocate
- To understand the critical facets that translate into consequence
- To develop a position paper for publication
- To foster collaboration and communication between communities

It is suggested to form a task team to seek the WCRP approval, develop the agenda, identify the invitees and approach potential partners.

ACTION 17: Form a task team for the organization of the "distillation" workshop and subsequent production of a white paper: C. Goodess, B. Hewitson, W. Landman, S. Mason, W. Gutowski, F. Giorgi and R. Boscolo. Organize a teleconference (R. Boscolo)

ACTION 18: Prepare a summary page for WCRP JSC endorsement (R. Boscolo and B. Hewitson)

7. WCRP Grand Challenge on Regional Climate Information

The 1st version of the white paper on the Grand Challenge on Regional Climate Information was prepared by F. Giorgi, Carolina Vera and F. Semazzi. The original white paper envisages four Frontiers to advance WCRP research:

- Intraseasonal and seasonal predictability and prediction
- Decadal variability, predictability and prediction
- Reliability and value of long term regional climate change projections
- Definition of usefulness: informing the risk management and decision making space

A possible 5th Frontier on ‘Integrative science to support adaptation planning and decision making’ has been suggested by WGRC members.

F. Giorgi explained how he put together the GC paper and the difficulties that he encountered in getting inputs from the community. He strongly feels that the document now belongs to the community and those individuals and groups that want to take it forward and make significant progress with it.

In a brief presentation, C. Goodess noted some issues for discussion by the WGRC:

- Ownership, leadership and management including links with other WGs and CLIVAR
- Links with other Grand Challenges (e.g., extremes and water)
- Need to define initiatives for the next 5-10 years
- Definitions used in the white paper (e.g., actionable, accessible, skilful, reliable)
- WGRC leadership of Frontiers 3, 4 and (if included) 5
- Need to better define the scientific questions, especially for Frontiers 4 and 5
- How to link with different communities, especially adaptation, social sciences, users and GFCS – especially in the context of Frontiers 4 and 5
- How to input some bigger, longer-term vision (not just ‘more of the same’)

The group was subsequently informed on the core projects ongoing activities that could be part of this GC.

7.1 GEWEX Hydro-meteorological Panel (J. Polcher)

GEWEX (<http://www.gewex.org/>) is guided by four science questions:

- How can we better understand and predict precipitation variability and changes?
- How do changes in the land surface and hydrology influence past and future changes in water availability and security?
- How does a warming world affect climate extremes, and especially droughts, floods and heat waves, and how do land area processes, in particular, contribute?
- How can understanding of the effects and uncertainties of water and energy exchanges in the current and changing climate be improved and conveyed?

The GEWEX hydrometeorological panel (GHP, <http://www.gewex.org/projects-ghp.html>) aims to address the science questions from a regional to an integrated perspective. GHP coordinates the plans and the focus of scientific issues related to the development and implementation of the Regional Hydroclimate Projects (RHPs) and has oversight over all GEWEX regional hydroclimate and land-surface projects.

The principal task of GHP is to guide these projects in the goal of achieving demonstrable skill in predicting changes in water resources and soil moisture as an integral part of the climate system up to seasonal and annual time scales. The RHPs are an essential tool in this endeavour as they bring together various disciplines on water issues. Only at the regional scale can the water cycle be addressed from its physical to human and socioeconomic aspects. The Cross-Cut projects have been proposed as tools for collaboration

with other GEWEX panels and WCRP projects, it is a way for the broader community to get involved in GHP. There is a call for volunteers to lead cross-cut projects with the aim to help GHP to propagate knowledge from one region to the other and synthesize results at the global scale.

The regional work is linked to global data sets and expertise through collaborations within the GEWEX Global Data Assessment Panel (GDAP) and GEWEX Land/Atmosphere system study (GLASS). Outside of GEWEX, GHP collaborates with the Global Runoff Data Center (GRDC), Global Precipitation Climatology Center (GPCC) and HYDROLARE. GHP's regional expertise and data allow to anchoring and strengthening the global products.

7.2 CLIVAR (S. Mason)

Climate and Oceans: variability, predictability and change (CLIVAR, <http://www.clivar.org/>) is the WCRP project aiming to improve understanding and prediction of the ocean-atmosphere system and its influence on climate variability and change, to the benefit of society and the environment.

CLIVAR objectives are:

1. Understanding the causes of climate variability on intra-seasonal to centennial timescales through observations, analysis and modelling
2. Improve prediction of climate variability and change associated with both internal and external processes
3. Support the development and implementation of sustained climate and ocean observing systems
4. Improve the atmosphere and ocean components of earth-system models

The following CLIVAR Research foci were identified in order to guide the community with achievable scientific priorities over a 5-10 year timescale:

1. Trends, nonlinearities and extreme events
2. Decadal variability and predictability of ocean and climate variability
3. Dynamics of regional sea-level variability
4. Consistency between planetary heat balance and ocean heat storage
5. Marine biophysical interactions and dynamics of upwelling systems
6. Intraseasonal, seasonal and interannual variability and predictability
7. ENSO in changing climate

CLIVAR welcomes comments, feedbacks and suggestions on the topics proposed as Research foci.

Both CLIVAR and GEWEX are having pan-project meetings in July in The Hague, Netherlands (<http://www.gewexevents.org/#panclivar>)

ACTION 19: Contact the Pan GEWEX and CLIVAR organizers and propose a side event on WGRC activities to foster discussions on possible synergies and provide updates on CORDEX and the distillation workshop (B. Hewitson, C. Goodess and R. Boscolo)

7.3 Potential links with the Climate and Cryosphere project (A. Rinke)

CLiC (<http://www.climate-cryosphere.org/>) focuses on the understanding of the changing cryosphere and its climate connections. It has four themes:

- Terrestrial cryosphere
- Marine cryosphere
- Ice sheets, glaciers and sea level
- Global prediction and projection of the cryosphere

And related targeted activities and working groups.

Examples of cryospheric science problems of high societal importance are: the fate of Arctic summer sea ice, cryospheric contribution to sea-level rise, permafrost thaw and feedbacks involving carbon releases etc...

CliC is leading the Grand Challenge on Cryosphere in a changing climate whose primary objectives are:

- Increased confidence in climate models and their predictions/projections of cryosphere
- Improved information on the changing cryosphere, relevant for IAV (for example changes in regional temperature, snow, frozen ground, timing sea-ice disappearance, fate of mountain glaciers)
- More comprehensive observational cryospheric data
- Better understanding of processes involved in cryosphere-climate interactions

These primary objectives contribute to the regional information grand challenge through a series of initiatives that CliC is carrying out, like:

- The Arctic Freshwater synthesis
- Arctic CORDEX
- AACA: Adaptation Actions for a Changing Arctic

7.4 Discussion

It was suggested to start a process to rewrite the white paper including the activities of the core projects and rephrasing the frontiers in a more concrete way.

ACTION 20: Form a small team to help to rewrite the white paper on regional climate information grand challenge (C. Goodess). Send comments and inputs to C. Goodess (all)

Several points of discussion were raised by the WGRC co-chairs on how to catalyse the regional research. 1st it was suggested to prepare a working paper on the regional climate priorities, i.e. a skeleton document on tractable regional issues that research communities could start doing thus helping to gain traction. Moreover the working paper should facilitate steering the regional agendas by inputting into regional calls / strategic developments. The working paper is also needed for communicating with major agencies like NSF, Belmont, DFID, development banks etc...

It was agreed that it would be useful for the group to review the outcomes of relevant regional conferences, in particular the Africa Climate Conference 2013 (October 2013, Arusha <http://africaclimateconference.org/>) and the WCRP Conference on Latin America and the Caribbean to be held in Montevideo in the coming week (<http://www.cima.fcen.uba.ar/WCRP/>).

ACTION 21: Prepare the working paper on regional climate priorities (W. Landman, S. Mason, K. Gotango and C. Lennard)

Already both ACTION 13 and ACTION 18 are activities that are part of the implementation of the GC. Everybody welcomed the idea to co-host a joint IPCC TGICA – WGRC meeting in 2015. Other ideas suggested include: Hackathon (<http://en.wikipedia.org/wiki/Hackathon>) and X-prize (<http://www.xprize.org/>).

It was pointed out there are not activities on facilitating the linkages with users: some activities are needed that address the communication necessary to develop networking and engagement with users as envisaged in the proposed Frontier 5 to be added to the white paper

ACTION 22: Prepare a discussion paper for next WGRC meeting on the proposed Frontier 5 and in the areas where we are not making enough progress (F. Zermoglio)

8. The CMIP5 survey (C. Goodess)

Following the CMIP5 survey launched by WGCM in order to assess the accomplishments and gaps of CMIP5 and inform the design for CMIP6 (see http://www.wcrp-climate.org/wgcm/references/CMIP5_Survey_Template_Sent-130628.pdf), a small group of scientists involved in impact studies asked WGRC to gather the same kind of information from the adaptation and vulnerability (IAV) communities. A draft survey form has been prepared by R. Boscolo using google form and available in the shared folder in google drive (<https://drive.google.com/a/wmo.int/?tab=mo#folders/0Bw3wB24UNI06VGZuTFNreEhxMWc>)

ACTION 23: Review the survey and send feedbacks by 22 April 2014 and send suggestions for distribution to relevant networks and communities (all)

Once we receive the feedbacks, C. Goodess will reengage with the original task team and start the distribution.

9. Outreach

The information displayed on the webpage of the WGRC has been revised (<http://www.wcrp-climate.org/index.php/regional-climate>). The "Overview" page should be rewritten and a shared vision statement should be posted on the same page.

ACTION 24: Rewrite the overview page and shared vision statement (C. Goodess and B. Hewitson)

The pages "Projects" and "Activities" should be combined and information about the core projects, TGICA and the distillation workshop posted. Change the "Activities" button in Meetings.

ACTION 25: Make the suggested changes in the WGRC webpage (R. Boscolo)

ACTION 26: Send relevant links for the core projects to R. Boscolo (J. Polcher, S. Mason and A. Rinke)

R. Boscolo reminded the WGRC members to insert items of key events in the table (https://docs.google.com/a/wmo.int/spreadsheet/ccc?key=0Ag3wB24UNI06dFB1RXNWR2liclRncldbnFmX0RidIE&usp=drive_web#gid=0) in the google drive so that the WGRC calendar is up to date.

ACTION 27: Update the table of the meetings which will be attended by WGRC members in the google drive (all)

R. Boscolo agreed to develop some presentations on WGRC and its activities for members of WGRC to present them at meetings and events that they attend.

ACTION 28: Produce some slides set for WGRC visibility and make them available on the google drive (slides to include specific WGRC activities): both a set of slides and one slide (R. Boscolo and C. Goodess)

10. Budget (R. Boscolo)

WCRP asked the WGRC co-chairs to make a list of priorities/activities for 2014 in order to allocate funding. The budget proposed at the end of 2013 included the WGRC session in Montevideo, the expert workshop on

data analysis and climate information, the AOGS side event (proposed by K. Gotango and S. Emori), support to WGRC co-chairs for attending key meetings and some contingency money as opportunities arise during the year for a total of 98K CHF.

WGRC was asked to review the proposals in order to reduce the budget and this was done during the meeting. The participants agreed to keep as priority the expert meeting, the AOGS side event and the contingency amount for an overall new budget of 80K CHF

ACTION 29: Present the revised budget to AD/WCRP and ask for approval (R. Boscolo)

It was stressed that WGRC will encourage co-sponsored and co-funded activities.

ACTION 30: Proposals are welcome for co-sponsor and co-fund activities to be covered with the contingency amount (all)

11. Past and Future activities

A series of short reports on WGRC past and future activities were presented by the WGRC members:

11.1 DRR focal point meeting (S. Mason)

Simon Mason attended the WMO 1st Coordination Meeting of Disaster Risk Reduction (DRR) Focal Points of Technical Commissions and Programmes in October 2013. During the meeting the WWRP-WCRP project on intraseasonal-to-seasonal (S2S) Prediction Initiative was considered highly relevant to the implementation of the DRR work plan. The S2S joint research project aims to improve forecast skill and understanding on the subseasonal to seasonal timescale, and promote its uptake by operational centres and exploitation by the applications community. Specific attention is paid to the risk of extreme weather, including tropical cyclones, droughts, floods, heat waves and the waxing and waning of monsoon precipitation.

ACTION 31: Reach out to the intra-seasonal group (S2S) through Andrew Roberts S2S co-chair (S. Mason)

11.2 3rd International Conference on Climate Services (C. Goodess)

C. Goodess, B. Hewitson and W. Gutowski organized a side event at the ICCS3 (<http://www.climate-services.org/iccs/iccs-3/home>) in Jamaica in December 2013 (with earlier input from David Behar and Fernanda Zermoglio). The event titled "Regional climate modelling and robust foundations for climate services: What does the CORDEX initiative have to offer climate service providers and users?" was designed as an opportunity to inform those in the climate-services community about the CORDEX initiative.

Several pressing needs and gaps emerged from the discussion, including the need to:

- Develop tools for analysis, evaluation and comparison of model outputs and share them across the CORDEX domains.
- Develop and make available high-resolution observational data sets.
- Improve stakeholder engagement, focusing on problem solving and co-exploration, for example, in the context of sectorial and regional data and decision support systems.
- Reduce the gap between scientists and users of CORDEX data.
- Work with intermediary organizations and social scientists who can help translate user needs into research questions.
- Raise awareness of the important climate issues for decision-makers.

- Recognise that more than data dissemination is required. Data are not information although the science community tends to present their model data as if they are ready to use. Climate information needs to be generated from the data and made available.
- Consider downscaling of seasonal forecasts and decadal predictions

B. Hewitson together with S. Zebiak led another side event titled “Climate Services Ethics” on the need to address some crucial question related to consequences associated with climate service provision: What should constitute good practice in climate services delivery?

The need for establishing good practices begins with the need to define requisite references (how do we define “good”?). The community should proceed pragmatically, rather than idealistically, and emphasize that while seeking to meet stakeholder needs, humility, transparency, and honesty in product/service delivery should be maintained.

Recommendations on establishing good practice involve starting with establishing criteria in a form of white papers widely circulated for comment throughout the climate-service community. Criteria then must be published under the auspices of an independent and recognized authority. Next, we must grow awareness, sensitize practitioners, and foster inclusivity. Finally, we must grow community capacity to include the efforts of all players across all levels. B. Hewitson noted that context is paramount and there are multiple ways to approach individual cases that will allow for an articulation of examples, attributes, and conceptual frameworks for operational climate services.

ACTION 32: Circulate the reports on side events at ICCS3 on ethics and CORDEX (R. Boscolo)

11.3 AOGS Session Proposal (K. Gotango and S. Emori)

K. Gotango and S. Emori are convening a session hosted by WGRC at the upcoming Asia-Oceania Geosciences Society Annual Meeting in Sapporo in August 2014 (<http://www.asiaoceania.org/aogs2014>). The title of the session is: *Downscaling Applications in Climate Information and Services for Impacts, Adaptation and Vulnerability (IAV) Assessments*. This session aims to engage both modellers/downscalers, e.g. from the CORDEX community, and researchers/practitioners in the IAV community, to encourage dialogue and to clarify IAV user needs and experiences relating to regional climate information and services.

Presentations for this session may fall under the following themes:

1. Latest updates on modelling/downscaling activities and products (e.g. available scenarios), particularly from CORDEX, for IAV assessment in the Asia Pacific, and insights on climate information from a modelling/downscaling perspective that are relevant to the IAV community, particularly on guidance for interpreting uncertainties due to model dependency, downscaling techniques, internal climate variability or scenarios, so as to still produce useful assessments.
2. Studies demonstrating the interface/interaction between modellers and the IAV community across different sectors (e.g. agriculture and food security, health, water, ecosystem, disaster risk management) and the insights or challenges in the co-design, co-production and communication of climate information and services.

ACTION 33: Thanks to Kendra and Seita for their organization of a session at AOGS 2014 (R. Boscolo)

11.4 Pattern-Scaling Workshop (T. Carter)

T. Carter is on the organizing committee and will attend the Pattern-Scaling, Climate Model Emulators and their Applications to the New Scenario Process Workshop in Boulder in April 2014 (<https://www2.image.ucar.edu/event/PS2014>). Statistical emulators for climate model output, among which pattern scaling has been perhaps the most popular thus far, are techniques for generating (low-dimensional or

fully spatial) projections of future climate using a statistical model designed to reproduce results that would be expected from a projection with a full global climate model. These emulators in general, and pattern scaling in particular, are expected to play an important role in a new process underway by the climate change research community to produce integrated scenarios of future climate and societal change. These scenarios will underpin research by the integrated assessment and impact modelling communities on options for mitigating or adapting to climate change, as well as on estimating impacts that may occur. The research community would like to explore a large number of scenarios, but projecting climate change in each case with a large, computationally expensive climate model is infeasible. At the same time, the option of using emulators as a practical and credible alternative to these models is open to question. This workshop will have three main goals:

- Assess the current state of climate model emulator science
- Assess to what extent current approaches can meet the needs of integrated assessment and impact modellers for climate change information
- Identify and prioritize research directions so that these statistical methods can better meet the needs of applied research in the future.

While impact assessment is often carried out at regional or local scales, and therefore has additional needs (particularly downscaling) beyond general circulation model emulators, this meeting will focus on this 1st step, targeting large-scale/global projections for use in impact and assessment modelling at those scales. Specific issues to be addressed:

- The extent to which emulators produce valid time evolving approximations in addition to across forcing levels
- Assessment of alternative simple modelling techniques in order to achieve maximum traceability to AOGCM results
- Variables of interest to impact/integrated assessment modelling, and the need for consistency across variables
- Limits to the applicability of pattern scaling methods for addressing spatial and temporal resolutions of climate information needed in impact/integrated assessment modelling
- Application of emulators to variables other than temperature or precipitation e.g., scaling of regional patterns of sea level rise
- Uncertainty characterization and quantification

This workshop is organized in the context of ICONICS (<https://www2.cgd.ucar.edu/research/iconics>) the International Committee on new Integrated Climate Change Assessment Scenarios. Support is being provided by WCRP Working Group on Coupled Modelling (WGCM), especially with CMIP6 in mind however there is a large user community applying pattern scaled and other emulated climate model outputs at regional scale. Pattern scaling of regional climate model outputs has also been reported and could be envisaged for CORDEX outputs. ICONICS is proposing a forum to bring together a diverse set of communities who are using and/or developing the new scenario framework in order to exchange experiences, ideas, and lessons learned; identify needs for future work; and identify opportunities for synergies and collaboration. By facilitating the scenario process, this meeting will help ensure a research base sufficient to inform future assessments including a possible IPCC AR6 as well as national assessments.

ACTION 34: Invite the organizers of the ICONICS Forum to attend the "distillation" workshop (B. Hewitson)

11.5 Arctic Monitoring and Assessment Programme (I. Shkolnik)

AMAP is one of the six working groups of the Arctic Council and provides reliable and sufficient information on the status of, and threats to, the Arctic environment, and provides scientific advice on actions to be taken in order to support Arctic governments in their efforts to take remedial and preventive actions relating to contaminants and adverse effects of climate change. The Arctic has experienced substantial climate change and during recent decades Arctic climate change and effects thereof have accelerated. This

has led to profound effects and impacts on the physical, chemical and biological conditions of the Arctic and is expected to lead to fundamental changes across the Arctic.

A particular challenge in the Arctic includes having appropriate adaptation strategies and actions to effectively address multiple environmental stressors that include, for example, climate variability and change, human demographic shifts, industrialization, and increasing demands for energy and natural resource extraction. Some Arctic nations are already developing adaptation strategies which require appropriate information, expertise and tools to better inform and implement these decisions. In 2011 the Arctic Council directed the Senior Arctic Officials “*to review the need for an integrated assessment of multiple drivers of Arctic change as a tool for Indigenous Peoples, Arctic residents, governments and industry to prepare for the future,*”. This resulted in the project “Adaptation Actions for a Changing Arctic” (AACA).

The overall objective of the AACA is to enable more informed, timely and responsive policy and decision making in a rapidly changing Arctic; the project consists of three separate activities. AACA-A was led by the Sustainable Development Working Group and is a compilation of assessments and reports prepared by Arctic Council working groups over the past ten years with findings and recommendations that could inform adaptation options and actions.

AACA-B was led by Canada and Russia and focuses on the adaptation activities that are being implemented by Arctic Council member states on a national, sub-national, regional and local level. Parts A and B were finalized in 2013. In May 2013 the Arctic Council decided to continue its work on the AACA initiative and requested the AMAP Working Group to “*produce information to assist local decision-makers and stakeholders in three pilot regions in developing adaptation tools and strategies to better deal with climate change and other pertinent environmental stressors*”. This has resulted in the AACA-C project which will deliver its overall integrated report to the 2017 Arctic Council Ministerial Meeting. The AACA-C project will cover three pilot regions in the Arctic: the Barents Region, Baffin Bay/Davis Strait Region and Bering/Beaufort/Chukchi Region. All three regions will cover both marine and terrestrial areas.

ACTION 35: Represent WGRC in the ACCA-AMAP project and provide feedback on this arctic project (I. Shkolnik)

11.6 Other meetings

C. Goodess is on the Scientific Organizing Committee of the WMO Technical Conference on Climate Services – Building on CLIPS Legacy, 30 June to 2 July, Heidelberg, Germany (<http://www.wmo.int/pages/prog/wcp/ccl/ccl16/teco/index.php>) and will give a presentation on ‘Research needs for understanding regional climate risks on different timescales’ in the Joint CCI/WCRP session. She will also represent the WGRC at JSC-35 which will take place the same week.

B. Hewitson will attend Adaptation Futures 2014 in Fortaleza, 12-16 May (<http://adaptationfutures2014.ccst.inpe.br/>) and the 3rd Lund Regional Scale Modelling Workshop, 16-19 June (<http://www.baltex-research.eu/RCM2014/>).

12. Outstanding action items from the previous meeting

ACTION 36: Circulate the status of the action items of WGRC-1 and subsequent teleconference among the WGRC members (R. Boscolo)

13. Production of guidance and other documents

It was confirmed that this meeting agreed the production of the following four major documents:

1. A technical glossary (see Action 7)
2. A paper on the CORDEX-Africa-Analysis (see Action 13)
3. A white paper from the expert ‘distillation’ workshop (see Action 18)
4. A working paper on regional climate priorities (see Action 22)

The possibility of the WGRC endorsing documents produced by other groups (e.g., the Climate Services Partnership) was noted – together with the need for an agreed procedure for doing so. It was also noted that the WGRC may wish to agree a policy on producing certain types of documents, e.g., technical guidelines.

ACTION 37: Share the TGICA policy on the development of documents on technical guidelines (B. Hewitson)

14. Next Meeting

It was suggested to organize one teleconference before the JSC-35 meeting, mid June 2014, and one in September 2014.

It was suggested to explore the possibility to hold next meeting in April in Manila hosted by Kendra Gotango.

APPENDIX 1 – Agenda

Friday 14 March - Meeting Room at the Facultad de Ciencias

08h30 A Mini-Van will be in front of the Hotel Palladium to take the WGRC-2 delegates to the University. Estimated time of travel approx. 15 min

Time	Agenda Item
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09h00 **Welcomes & Introductions** - *Local Hosts, WGRC co-chairs and WCRP rep.*

- Report from last WCRP JSC (Roberta Boscolo)
- Adoption of Agenda (*WGRC co-chairs*)

09h30 **Review of the WGRC-1 April 2013 and teleconference September 2013**

- Status of the Action Items (*WGRC co-chairs*)

10h00 **Linkages with Relevant WGs**

- WGSIP (Adam Scaife, online)
- WGCM (Cath Senior, online)
- WMAC (Bill Gutowski)
- TGICA (*Tim Carter*)

11h00 Coffee break

11h30 **Linkages with Sponsors Initiatives**

- GFCS Implementation Plan and priority areas: WGRC potential contributions (Filipe Lucio)
- Future Earth linkages (Frans Berkhout, online)
- Discussion: outstanding action from WGRC-1 on the development of a skeleton of a commentary document on GFCS and Future Earth

12h30 **CORDEX** (*Bill Gutowski and Filippo Giorgi*)

- Update on activities
- Report on the ICRC Brussels November 2013
- Linkages (mechanisms and issues)
- Discussion

13h00 Lunch

14h00 **CORDEX... continue**

14h30 **Distillation Experts Meeting** (*Bruce Hewitson*)

- Concept and proposal
- Discussion

15h00 **Overview of Regional Climate Grand Challenge**

- Introduction (Clare Goodess)
- Links with GEWEX and CLIVAR (Simon Mason and Jan Polcher)
- Links with CliC (Annette Rinke)
- Initial ideas on the implementation of the Regional Climate GC
- Discussion

16h00	<i>Tea/coffee break</i>
16h30	Presentations from local scientists <ul style="list-style-type: none"> • Extreme Climate Events: from the construction of daily database to detection and attribution (Madeleine Renom) • Multi-annual variability of streamflow in La Plata Basin: Observations and Links to global climate (<i>Alvaro Diaz</i>)
17h15	Road map of Actions for WGRC <ul style="list-style-type: none"> • Discussion
18h00	The Mini-Van will take back the delegates to Hotel Palladium. Estimated time of travel approx. 15 min

Saturday 15 March - Meeting Room Stellaris (12th Floor Hotel Palladium)

Time	Agenda Item
09h00	Brief Reports on relevant past activities undertaken by WGRC members <ul style="list-style-type: none"> • Side Event at ICCS3 (Clare Goodess) • WMO DDR Focal Points Meeting (<i>Simon Mason</i>) Brief Reports on relevant future activities relevant to WGRC <ul style="list-style-type: none"> • AOGS Session (Seita Emori and Kendra Gotango) • WMO CCI Technical Conference (Clare Goodess) • Adaptation Futures 2014 (Bruce Hewitson and Fernanda Zermoglio) • Pan-GEWEX & Pan-CLIVAR meetings (Jan Polcher and Simon Mason) • Pattern Scaling... NCAR Workshop (Tim Carter) • Adaptation Actions for a Changing Arctic AACA (<i>Igor Shkolnik and Annette Rinke</i>)
10h45	Budget for 2014 (Roberta Boscolo)
11h00	<i>Tea/coffee break</i>
11h30	WGRC Outreach <ul style="list-style-type: none"> • Review of web content (Roberta Boscolo) • Shared vision statement (Clare Goodess and Bruce Hewitson) • Publicity material (<i>Clare, Bruce and Roberta</i>)
12h30	CMIP6 Survey (Clare)
1300	<i>Lunch</i>
14h00	Production of Guidance and Other Documents <ul style="list-style-type: none"> • Action Items from WGRC-1 (Clare Goodess and Bruce Hewitson) • Criteria/check list for evaluating climate services portals/providers (Bruce Hewitson and Fernanda Zermoglio) • User perspective on CORDEX (Fernanda Zermoglio and David Behar) • Task Teams • Future products under development?

- Others?

15h30 *Tea/coffee break*

16h00 **Summary of Discussions, Agreement on Actions and Wrap Up**

16h45 **Date/Venue of next meeting**

17h00 **AOB and close**

20h00 **No-host dinner?**

APPENDIX 2 – List of Participants

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APPENDIX 3 – Presentations from local scientists

Extreme Climate Events: from the Construction of Daily Database to Detection and Attribution (*Madeleine Renom*)

From 2004 we are working to create a research group focused to extreme climate events in Uruguay and South-eastern South America. The study of extreme events require a reliable daily database, in that sense we generated the daily databases of precipitation, maximum and minimum temperature for all the available data in Uruguay. We analysed different extreme indices, some of them are based on percentile threshold and others based on fixed threshold, primarily for temperature time series. The long-term trend shows a significant negative trend in the occurrence of warm days and cold nights for summer season for the period 1950-2009 however we do not detected changes in the occurrence of heat waves. For winter season the significant trends were detected in the cold days and nights. We also analysed the frost events, and the results shows a decrease in the frost period and some stations present a decadal variability instead a linear trend.

The relationship between the occurrence of extreme events and large scale circulation at multidecadal time-scale were also studied. As principal results, we observed the influence of the SAM in summer season for the period 1946-1975 and for winter season our results suggest that the occurrence of extreme temperature events are strongly correlated with changes in ENSO evolution occurred around 1976.

Multi-Annual Variability of Streamflow in La Plata Basin: Observations and Links to Global Climate (*Alvaro Diaz*)

The observed multi-annual variability of streamflow for three rivers (Parana´ River (PR), Uruguay River (UR) and Negro River (NR)) in La Plata Basin (LPB) during the twentieth century is analysed. Several spectral methods (singular spectrum analysis, maximum entropy method and multi-taper method) are applied to annual and seasonal run-off time series in order to capture low frequency variability (LFV) modes and pseudo-periodic patterns. Very robust quasi-periods in the three to six years band are detected for the three rivers, suggesting a strong link with El Niño-Southern Oscillation.

Pseudo-cycles of eight to nine years appear in NR and UR. No quasi-periods above 10 years are obtained for any of the rivers. The three rivers exhibit significant LFV components associated with increasing trends that show a clear seasonality. Remarkably, for the three rivers, the most intense increasing trend and the minimum streamflow occur at the same time of the annual cycle.

Six global climate indices are selected in order to analyse the relationship between the multi-year streamflow variability modes in LPB and those of global climate: Niño 3.4 (N3.4), Pacific Decadal Oscillation (PDO), North Atlantic Oscillation (NAO), Atlantic Multidecadal, Oscillation (AMO), Southern Annular Mode (SAM) and Global Temperature Trend (GTT). Similar to the rivers, almost all these indices present very robust modes of variability in the 3–4.5 years band. Except for N3.4 and PDO, the indices show significant LFV modes that exhibit a pronounced increase at the common end of their records. The NAO, AMO and SAM seem to behave in a nearly cyclic way with periods longer than 60 years while the GTT increases steadily along the whole register.

APPENDIX 4 – List of Action Items

- ACTION 1:** Feedback the JSC regarding the JSC-34 Action 1: why WCRP should engage only NMHs and not Universities? (R. Boscolo)
- ACTION 2:** Ask AD/WCRP what should be the role of WGRC for the Action Item 15 of the JSC-34 (R. Boscolo)
- ACTION 3:** Feedback to the WMAC the question and discussions raised at the WGRC-2 (W. Gurowski)
- ACTION 4:** Ask CORDEX to address the science questions of CMIP6 in their future experimental protocol (CORDEX SAT)
- ACTION 5:** Get in contact with the co-chair of DCPD and propose Simon Mason as WGRC ex-officio member of the DCPD (C. Goodess and B. Hewitson)
- ACTION 6:** Request to circulate among the WGRC members a copy of the draft CMIP6 protocol for decadal prediction experiments (R. Boscolo)
- ACTION 7:** Provide support to TGICA in formulating a potential document on definitions of critical variable used by the wider climate community (J. Polcher, T. Carter and D. Behar)
- ACTION 8:** Feed back to the TGICA group on the willingness of WGRC to share resources on the production of fact sheets (T. Carter)
- ACTION 9:** Distribute the GFCS documents including the compendium of the projects (R. Boscolo)
- ACTION 10:** Improve communication and ongoing input to GFCS (R. Boscolo)
- ACTION 11:** Respond to FE request for inputs on development of a strategic research agenda and setting of priorities (all). F. Berkhout to ensure that WGRC is added to the relevant distribution list.
- ACTION 12:** Distribute the information on the FE call for proposals to the WGRC members (R. Boscolo)
- ACTION 13:** Form the subgroup to develop the CORDEX-Africa-Analysis (CAA) pilot project and associated journal paper in the next 6 months (F. Giorgi, B. Hewitson, F. Zermoglio and W. Gutowski)
- ACTION 14:** Encourage the CORDEX SAT to find a new name for the following phase of CORDEX. To discuss it at the CORDEX SAT meeting in May 2014
- ACTION 15:** Ask the CORDEX SAT to review the information on the CORDEX webpage and design a point of entry for outsiders (W. Gutowski)
- ACTION 16:** WGRC is looking forward to revise the metrics document once the first version is ready (all)
- ACTION 17:** Form a task team for the organization of the "distillation" workshop and subsequent production of a white paper: C. Goodess, B. Hewitson, W. Landman, S. Mason, W. Gutowski, F. Giorgi and R. Boscolo. Organize a telecon (R. Boscolo)
- ACTION 18:** Prepare a summary page for WCRP JSC endorsement (R. Boscolo and B. Hewitson)
- ACTION 19:** Contact the Pan GEWEX and CLIVAR organizers and propose a side event on WGRC activities to foster discussions on possible synergies and provide updates on CORDEX and the distillation workshop (B. Hewitson, C. Goodess and R. Boscolo)

- ACTION 20:** Form a small team to help to rewrite the white paper on regional climate information grand challenge (C. Goodess). Send comments and inputs to Clare Goodess (all)
- ACTION 21:** Prepare the working paper on regional climate priorities (W. Landman, S. Mason, K. Gotango and C. Lennard)
- ACTION 22:** Prepare a discussion paper for next WGRC meeting on the proposed Frontier 5 and in the areas where we are not making enough progress (F. Zermoglio)
- ACTION 23:** Review the survey and send feedbacks by 22 April 2014 and send suggestions for distribution to relevant networks and communities (all)
- ACTION 24:** Rewrite the overview page and shared vision statement (C. Goodess and B. Hewitson)
- ACTION 25:** Make the suggested changes in the WGRC webpage (R. Boscolo)
- ACTION 26:** Send relevant links for the core projects to R. Boscolo (J. Polcher, S. Mason and A. Rinke)
- ACTION 27:** Update the table of the meetings which will be attended by WGRC members in the google drive (all)
- ACTION 28:** Produce some slides set for WGRC visibility and make them available on the google drive (slides to include specific WGRC activities): both a set of slides and one slide (R. Boscolo and C. Goodess)
- ACTION 29:** Present the revised budget to AD/WCRP and ask for approval (R. Boscolo)
- ACTION 30:** Proposals are welcome for co-sponsor and co-fund activities to be covered with the contingency amount (all)
- ACTION 31:** Reach out the intra-seasonal group (S2S) through Andrew Roberts S2S co-chair (S. Mason)
- ACTION 32:** Circulate the reports on side events at ICCS3 on ethics and CORDEX (R. Boscolo)
- ACTION 33:** Thanks to Kendra and Seita for their organization of a session at AOGS 2014 (R. Boscolo)
- ACTION 34:** Invite the organizers of the ICONICS Forum to attend the "distillation" workshop (B. Hewitson)
- ACTION 35:** Represent WGRC in the ACCA-AMAP project and provide feedback on this arctic project (I. Shkolnik)
- ACTION 36:** Circulate the status of the action items of WGRC-1 and subsequent teleconference among the WGRC members (R. Boscolo)
- ACTION 37:** Share the TGICA policy on the development of documents on technical guidelines (B. Hewitson)