WCRP REPORT

World Climate Research Programme

PROJECT REPORT

Fifteenth session of the Working Group on Seasonal to Interannual Prediction (WGSIP)

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15th Session of the Working Group on Seasonal to Interannual Prediction (WGSIP)
24-26 September 2012,
Max Planck Institute for Meteorology
Hamburg, Germany

Attendees: Adam Scaife (UK Metoffice), Ben Kirtman (RSMAS), Swadin Behera (JAMSTEC), George Boer (Environment Canada), Francisco Doblas-Reyes (IC3), Gokhan Danabasoglu (NCAR), Hervé Douville (MétéoFrance), Peer Hechler (DWD), Thomas Jung (AWI), Rupa Kumar Kolli (WMO), Arun Kumar (NOAA), William Merryfield (Environment Canada), Andy Morse (University of Liverpool), Wolfgang Mueller (MPI), Andrew Robertson (IRI), Celeste Saulo (CIMA), Sonia Seneviratne (ETHZ), Tim Stockdale (ECMWF), Adrian Tompkins (ICTP), Tamaki Yasuda (JMA), Michel Rixen (WCRP)

Excused: Oscar Alves (BoM), Jin Huang (NOAA), Willem Landman (University of Pretoria)

Session Introduction: round table and agenda

Adam Scaife, WGSIP Co-chair, welcomed participants and thanked them warmly for attending the meeting. A quick round table allowed everyone to introduce themselves.

The proposed agenda was presented and adopted, highlighting important key topics, such as the CHFP archive status, CHFP sub-projects, links with EU projects such as SPECS under the ECOMS umbrella, data assimilation efforts which might to be further developed, links with the operational community such as the WMO Extended Long Range Forecast and RCOF initiatives as well as the joined WGSIP-WGCM session to be held on 26 Sept which would focus primarily on decadal predictions and CMIP6 discussions.

Adam Scaife also stressed the important role of WGSIP in offering the members and other participants to update each other on their institutional and regional activities. This meeting would also need to dedicate some discussion on the preparation of the joint meeting with WGCM.

The discussion raised the issue of model verification, which seems more advanced on seasonal than decadal predictions.

Action items and recommendations from WGSIP 14 meeting

Actions from WGSIP14 were reviewed. Most have been completed or are not pertinent anymore. On-going ACTIONs from WGSIP14 have been included in appendix A.

JSC outcomes, WDAC, WMAC, WGSIP role in grand challenges (M. Rixen)

Michel Rixen quickly recalled the WCRP's mission, traditionally focused on global climate prediction and understanding of human influence on climate, and stressed the growing expectation for actionable science in light of the outcomes of the WCRP Open Science, the ICSU Visioning Process, the OceanObs'09 Conference and the World Climate Conference-3 which led to the establishment of the Global Framework for Climate Services (GFCS). The WCRP will contribute mainly on the "Research, Modeling and Prediction" pillar of the GFCS which calls for greater integration of operational and research activities, examples of which are the joint WWRP-WCRP "Subseasonal to Seasonal Prediction Initiative" and the "Polar Prediction Project". WCRP Grand Challenges were presented together with the lead WCRP body. Opportunities exist for WGSIP in several of them, in particular on the "Skilful regional climate information" and the "Cloud and climate sensitivity" which were also discussed at the subsequent joint session. Synergies with the CORDEX initiatives ought to be considered. The new WCRP structure includes now a Modeling Advisory Council (WMAC) and a Data Advisory Council (WDAC). Major recent WCRP events include the Open Science Conference held in Denver, USA, the CMIP5 Workshop, Hawaii, USA and the 4th International Conference on Reanalysis, Silver Spring, USA. The WDAC held its first session in Beijing in conjunction with the JSC33 session and recommended broadening of contributions from the WCRP core projects and WGs, CEOS, CGMS, IGBP, SOLAS and the Reanalysis community to this activity, so as to populate the ESGF and further facilitate model-data comparisons. At the same time, WMAC planned for a WCRP Prize, summer schools on model development and dynamical studies across WCRP activities.

CHFP archive: progress and status (C. Saulo)

Celeste Saulo presented the current status of the CHFP archive that has now 8 models available, some of which are stratosphere resolving, but not all providing all the CHFP variables. The initial allocated storage of 5 Tb is currently being upgraded to 10Tb following the addition of CanCM3 and 4 outputs. 28 users are currently registered but this is likely to increase significantly as we have not yet announced the availability of this data. Initial analyses include a predictability study of the circulation variables and influence of El-Nino/La Nina aims at identifying potential predictors of South-America precipitation by using the SHFP archive that includes 6 models. Scoping workshops are planned a.o. for South-America with the involvement of VAMOS to promote research needed to underpin the provision of skilful future climate information at regional scale.

CHFP analysis: activity so far (C. Saulo, B. Kirtman, A. Scaife)

A discussion followed on the status of CHFP analysis activities. It was suggested to encourage the use of the Climate Predictability Tools (CPT) from IRI in order to promote uptake of CHFP products in NMHS seasonal forecast development activities. The need for some training activities was noted, which could take the form of a workshop for South-America, e.g. in 2013, focused on using seasonal forecasts for application. Rupa Kumar Kolli pointed out the potential issues with bandwidth that could compromise this

effort, and noted that hard media can offer an alternate solution.

Documenting the archive in a peer reviewed study: results so far, which data, designation of tasks, CLIVAR Exchanges Special Issue (All)

A seminal paper exists to refer to the WGSIP archive but a more up-to-date reference is now needed as a foundation to scientific work. Ben Kirtman will lead the write-up and will call for inputs on results including SST maps, climate indices and probabilistic scores. The call for initial figures and a skeleton plan will be made available by 15 November (ACTION 6 below).

Evolution of CHFP (C. Saulo and F. Doblas-Reyes)
From the CHFP data server to ESG: the future of public access to seasonal-to-interannual predictions (F. Doblas-Reyes)

NB this topic was not discussed formally during the meeting. It is expected that SPECS and Miklip will join forces to make progress on this issue. This will take time and CHFP server would need full support to that effect in the next few years.

CHFP and the regional level, RCOFs (R. K. Kolli)

Rupa Kumar Kolli presented the Climate Service Information System (CSIS), a major pillar of the GFCS managed by the WMO Commission for Climate (CCl) that oversees climate prediction within WMO. The World Climate Program structure has been revised and includes WCRP, GCOS, the World Climate Services Program (and UNEP –PROVIA – currently under consideration). Within CCl, the Open Panel of CCl experts (OPACE) 3 on Climate Products and Services has many similarities with WGSIP. He recalled that a joint CCl-WCRP meeting was held in Antalya in 2010. CSIS is the operational core of GFCS with efforts on global (Global Producing Centers – GPC), regional (Regional Climate Centers – RGC and Regional Climate Outlook Forums – RCOFs, a form of consensus meeting focusing on temperature and precipitation with applications in food security and health for example) and national (NMHSs, National Climate Outlook Forums) levels. There are 12 WMO GPCs and 2 Lead Centers:
- Lead Centre for Long-range Forecast Multi-model Ensembles (LC-LRFMME) – jointly operated by KMA/NOAA NCEP and
- Lead Centre for the Standard Verification System for Long-range Forecasts (LC-SVSLRF) – jointly operated by BoM/MSC
Details on the Global Seasonal Climate Update and on the RCOFs concept and consensus process were provided.

Adam Scaife expressed the need for Lead centers to make hindcasts (limited access) and maps (public domain) available. Scientist should promote this idea within their center, for example through EC projects demonstrations. Francisco Doblas-Reyes recalled the challenges to link WGSIP, GFCS and CCl, as even vocabulary is different (e.g. CCl:LRF, WGSIP: seasonal forecast). CHFP could be used for RCOFs training purposes, for example in conjunction with the IRI CPT.

Adam Scaife pointed out the advantage that a lot of WGSIP members are part of GPCs. All members are encouraged to provide seasonal forecasts, even if they are not formally part of a GPC and GPCs are encouraged to provide hindcasts and monthly forecasts to input to the WMO lead centres and the GFCS.. Rupa Kumar Kolli recalled that centers like APCC and IRI already contribute seasonal forecasts.

Andy Morse stressed that seamlessness is important to bring climate and weather communities together. Projections cannot be verified. The Future Earth initiative seems too ambitious, an issue that deserves some comment and feedback from WGSIP.

CHFP Subprojects:

Sea- Ice Historical Forecast Project - (D. Peterson / A. Scaife)

Adam Scaife presented the multi-model experiment consisting of 4 predictions systems and 9 members for 2007 (a low sea-ice year) and 1996 (a high sea-ice year) with and without initialized sea-ice on 1 Nov and 1 Aug. The multi-model response shows some clear patterns in 500hPa geopotential height associated with the Arctic Oscillation, suggesting consistent and increased predictability with appropriate initialization, and an impact on circulation and associated blocking patterns in midlatitudes.

Land surface impacts on seasonal forecasts (H. Douville)

Hervé Douville pointed out the need but lack of global data set. Some off-line land surface data sets such as GSWP and GLDAS have been contributed by GEWEX. Some on-line data sets are also becoming available through data assimilation systems (UKMO, MétéoFrance, ECMWF, etc). Results show that the 20CR early snow cover is as good as NSIDC satellite data and of steady quality back to 1891 with better scores in October and November. There is evidence of an impact of spring soil moisture on summer hot extremes and lagged correlation between the Number of Hot Days (NHD) and preceding Standardized Precipitation Index (SPI), i.e. the drier the soil, the more likely the high temperatures. Results from GLACE-2 for 2 months hindcasts for a 10-year period (1986-1995) show increased predictability with proper land initialization but limited impact on skill. There is both observational and numerical evidence of a relationship between the fall snow cover over Eurasia and the subsequent winter AO, but the observed relationship in not stationary and should be used cautiously for empirical seasonal forecasting. There is also some evidence of seasonal predictability of the land surface hydrology (soil moisture, river discharge), even without predictability of precipitation, based on the initialisation of snow, deep soil moisture and groundwaters. Reanalyses and real-time initialization require improved observations and land surface data assimilation systems.

Adam Scaife mentioned the need for a SPECS-WGSIP experiment on snow cover, and asked if Hervé Douville might lead it. Francisco Doblas-Reyes mentioned that dynamical and statistical models are not in competition and any hybrid might be useful.

Stratosphere Historical Forecast Project - (A. Butler/A. Scaife)

Adam Scaife presented early results on seasonal forecasts with models which extend above 1 mb, with 4 centers contributing such integrations over 4 months lead times over winter and summer from 1989 onwards with at least 6 members per year. UKMO results show no or little change in ENSO skill and structure. However, stratospheric processes seem to be better represented (e.g. sudden warming events), with clear signatures of stratosphere-troposphere coupling in surface climate and improved conditional predictability for key events like the record low Arctic Oscillation (AO) in winter 2009/10. Multi-model analysis is underway with help from the WCRP-SPARC community.

Other Projects: WCRP Polar Prediction Project and the links to WCRP's PCPI (T. Jung)

Thomas Jung outlined the WWRP and WCRP Polar Prediction – currently separate - initiatives and recalled the origin of these and their status. The WWRP one follows a CAS recommendation to establish an IPY legacy project, now endorsed by THORPEX ICSC, which will be centered around a "Year of Polar Prediction (YOPP)" in 2017-2018. The draft Implementation Plan is currently being circulated for comments. He then briefed, on behalf of Ted Shepherd, the equivalent WCRP initiative, for which a planning meeting was held in Toronto, April 2012. He stressed that there seemed to be a lack of willingness from the WCRP to build stronger synergies with the WWRP because topics, communities and the overall context are different. An International Coordination Office is proposed to oversee both initiatives under the WMO GIPPS umbrella.

Adam Scaife noted that a few centers (e.g. UKMO, Environment Canada) could contribute sea-ice forecasts, e.g. from Sea-ice CHFP to an equivalent TIGGE archive and that the evolution of forecasts at the WMO lead centre should be considered in this direction. FDR pointed out the opportunities to learn from the weather community on these regional processes (e.g. stable boundary layers, etc). Rupa Kumar Kolli noted that there is no RCOF for polar regions yet.

WMO Lead Centre for MME (A. Kumar)

Arun Kumar provided details of Global Producing Centers (GPCs) for Long Range Forecasts (LRF), with currently 12 centers delivering products through GPC web sites and GTS or the Internet. Seasonal forecasts are sent to the Lead Center for MME (LC-LRFMME, KMA) around the 15th of the month. Graphical products are disseminated from the LC web site around the 25th of the month based on anomalies (with different bases). A parallel lead center serves as hub for forecasts verification (LC-SVSLRF). The LRF-MME serves as input to RCOFs and the Global Seasonal Climate Update (GSCU). The LRF-MME is being reorganized as a joint CBS-CCl activity, with extensions to monthly and sub-seasonal forecasts and connections with the joint WWRP-WCRP Subseasonal to Seasonal (S2S) effort. AK stressed the need to develop more effective engagement with WGSIP and to better coordinate the many different seasonal hindcasts archives (CHFP, NMME,

ENSEMBLES, APCC, LC-LRF, etc)

WMO Sub-Seasonal to Seasonal Prediction Project (A. Robertson)

Andrew Robertson presented the joint WWRP-WCRP Subseasonal to Seasonal (S2S) effort, initiated at the request of the WMO CAS in 2009. The goal of S2S is to promote cooperative international research for this time range by capitalizing on joint expertise from the weather and climate communities, working closely with operational centers issuing such predictions, as an important contribution to the "Research, Modeling and Prediction" pillar of GFCS. The project will focus on some High Impact weather demonstration case studies (e.g. Pakistan floods and Russian heat wave 2010, Australian floods 2009 or 2011, European cold spell 2011) rather than providing real time forecast data. Some issues on open and real-time data access were discussed. Examples of sources of predictability such as the MJO, sea surface temperature and sea–ice, snow cover, soil moisture and stratospheric initial conditions will be explored, hence providing obvious bridges with WGSIP activities. 12 centers will contribute global forecasts to a TIGGE-like archive in GRIB2 format. The data should also be made available in NetCDF format for the WCRP community. Daily mean TIGGE variables (and some ocean and stratospheric levels) of forecasts and hindcasts will be made available with 3 or 4 weeks delay on a 1.5 degree grid or lower once a week. Total data volume will be of the order of 15 Tb for the first year and 7 Tb for following years, representing about 10% of the total TIGGE archiving cost (180 Tb at ECMWF). Calls for a Project Office are currently being issued.

US Seasonal Forecast MME (B. Kirtman)

Ben Kirtman presented NMME, a North America (Canada included) effort with contributions from 10 operational and research centers. Phase 1 of NMME established protocols for hindcast data public dissemination via the IRI data library and became real-time in Aug 2011. Results focus mainly on temperature and precipitation. Phase 2 NMME will focus on enhancing current NMME capabilities (model updates), MME combinations, drought assessment, initial condition sensitivity experiments (ocean, land) and improved data distribution (via NCAR). It was suggested that CHFP could ingest NMME data because they follow the same format.

SPECS and ECOMS: the EU contribution to s2d climate services (F. Doblas-Reyes)

Francisco Doblas-Reyes recalled that climate information is critical to many sectors of economy but that major investments frequently made without adequate knowledge. Decadal and seasonal predictions still suffer from major systematic errors over major areas. Another issue is the model resolution and the correct representation of SST that may impact blocking frequencies. Multiple forecast systems may improve overall forecast skills. EC-Earth quasi-operational decadal predictions highlight the need and benefit of initialized predictions and illustrate the possibility of overestimate warming otherwise.

The objective of the EU SPECS project under the ECOMS umbrella (also covering NACLIM and EUPORIAS) is the produce seasonal to decadal quasi-operational climate information over land with a focus on Europe, Africa and South-America with a new generation of reliable European climate forecast systems, including initialized Earth System Models (ESM) and regionalized tools. The project will focuse on extreme climate events, and provide an enhanced communication protocol and services to satisfy the climate information needs of a wide range of public and private stakeholders. Coordinated efforts will include a set of Core and Tier 1 experiments with a central repository using CMIP5 standards at BADC, publicly available. A kick-off meeting will be held in Barcelona 6-9 November 2012.

Data Assimilation: Data assimilation for initialized climate prediction (B. Kirtman)

Ben Kirtman provided a background on data assimilation issues for initialized predictions. Typically, the analysis is performed separately for the atmosphere, ocean, land and ice but some form of coupled data assimilation is emerging when observations in one medium are used to generate analysis increments in the other and variations thereof (e.g. best state estimation vs initializing slow manifold). Ocean-atmosphere coupling strongly depends on the quality of surface fluxes, generally provided by operational weather forecasts centers. SST is a key parameter but most systems use subsurface information and salinity (mainly from Argo floats). Improvements in data and models are expected to improve forecasts as well. On seasonal timescales, full-field initialized hindcasts (more realistic) of regional temperature and precipitation are significantly more skilful on average than anomaly initialized hindcasts (less shocks) but differences in skill on multi-year timescales are generally not significant. However, anomaly initialization provides a better estimate of forecast skill from a limited hindcast set. Perturbation methods include lagged ensemble and wind perturbations, ensemble systems, bred vectors and stochastic optimals.

Discussion: should we have a coordinated data assimilation activity, links to WGOMD and GSOP? (All, G. Danabasoglu)

See next point.

Observing System Simulation Experiments for the TAO array (A. Kumar)

A number of TAO moorings require maintenance and there is pressure to limit funding resources to support this effort. Existing studies are woefully inadequate to provide information in a decisional context of the return on investment for different observational platforms for ENSO prediction. Few have focused on prediction beyond equatorial ocean thermal properties. They do not address robustness of their findings (which can be addressed partly through use of multiple models - significant uncertainty will still exist because of the shortness of Argo record).

A more comprehensive, and a better coordinated effort to assess the relative merits of Argo vs. TAO vs. other observing systems is required to

judge their utility for ENSO prediction. A multi-model OSE endeavor is required to inform NOAA and others on the value of observing systems such as TAO. Because of its multidisciplinary nature and most importantly its contributions to current and future knowledge, capabilities, and products, SI prediction OSE efforts are only one piece of information to consider regarding the value of TAO which is used by the WGSIP community for Operational coupled seasonal forecasts systems and for real-time ENSO monitoring.

Gokhan Danabasoglu *suggested looking at how ocean components behave under similar forcing. As a matter of fact, models differ quite a lot, for example on AMOC representation.*

It was proposed to approach GSOP on their plans for comparison of ocean analysis products including assimilation systems used for coupled seasonal forecast systems using ocean data assimilation, and investigate to what extend GSOP might already address this.

Applications: Application of climate forecasts to health (A. Morse)

Andy Morse provided an overview of application of climate forecasts to health issues using seasonal hindcasts and climate projections to derive Malaria Impacts. Hindcasts are initialized in May from DEMETER, ENSEMBLES and ECMWF with target JAS temperature and precipitation over Sahel and Gulf of Guinea areas in West Africa. Projections are based on CMIP5 HadGem2 (UKMO) and IPSL CM5A (IPSL) results for Africa. Uncertainties related to the impact models are found to be large, with a general Southern shift of the malaria epidemic belt over West Africa (drier and warmer conditions). Climate seems to evolve more suitably over the Ethiopian highlands and south Africa (temperature driven). The size of the ensemble is evolving (5GCMs and 4 malaria models), with the addition of socio-economic factors (demography, migration…) to be considered soon. The importance of multi-impact models was highlighted because inherent uncertainties which can be larger than the ones from climate models.

Applications of global seasonal forecasts (A. Robertson)

Andrew Robertson reviewed some applications of global seasonal forecasts for climate risk management. Water resources have competing uses and allocation can be extremely complex. Global forecasts are used in conjunction with the IRI Climate Predictability Tool and user-friendly spreadsheets to infer allocation failure probability associated with various scenarios. In collaboration with the Red Cross/Red Crescent Climate Centre, climate briefings are issued to approximately 100 IFRC disaster managers, including relevant seasonal forecasts, ENSO updates, global and regional information on areas of concern and recommended actions. The importance of networks connecting various stakeholders and decision makers to disseminate the information was highlighted.

Arun Kumar pointed out the challenge of changing climate models, which may require to re-calibrate the application model.

WMO's Global Framework on Climate Services and other climate services initiatives (A. Robertson)

Andrew Robertson, on behalf of Stephen Zebiak, briefed on the Climate Services Partnership (CSP) initiative, an informal non-governmental open and action-oriented process aiming at serving as a repository, clearing house and marketplace to foster collaboration on the Global Framework for Climate Services (GFCS). GFCS aims at enabling society to manage better the risks and opportunities arising from climate variability and change, especially as they concern those who are most vulnerable to climate-related hazards. The framework is organized along 6 pillars: user interface platform; climate services information system; observations and monitoring; research, modeling and predictions; capacity building and will focus on 4 priority areas: agriculture and food security, water, health, disaster risk reduction. The implementation plan will be discussed at the WMO EC Extraordinary Session and will be distributed to stakeholders end of January 2013.

Application of climate forecasts at ICTP (A. Tompkins)

Adrian Tompkins reviewed the complex mechanisms at play between climate conditions (e.g. temperature, rainfall, humidity and wind) and malaria development. However, socio-economic factors, interventions and land use changes should also be taken into account. Epidemic regions are usually found on fringes of endemic malaria regions, with lower immunity populations, and where forecast information could prove useful for early warnings and actions at various time scales. Several malaria models were presented, including the Liverpool Malaria Model (MM), the Bomblies Model and the new VECTRI malaria model of ICTP which includes a surface hydrology (pond coverage) and population interactions (migration, immunity) and interventions (spraying, drugs, bednets) and considers the larvae, vector and host components and biting, parasite and inoculation rates. Recent developments under projects QWeCI, HEALTHY FUTURES and ISIMIP were reviewed. ISIMIP will contribute the IPCC 5th AR with LMM and VECTRI malaria projections. The opportunity of coupled dynamical seasonal forecast for malaria was highlighted, given the increased skill of monthly and seasonal forecast and the ability of the malaria models to run at regional scale. A rainfall bias correction and downscaled temperature based on topography are supporting a seamless approach allowing VECTRI to be coupled to the ECMWF EPS in the near future with improvements on hydrology, population migration, immunity and interventions.

Review of Regional Activities (Report from each group)

ICTP, A. Tompkins

(see previous agenda item)

ECMWF, T. Stockdale

Tim Stockdale reviewed seasonal and multi-model forecasting activities at ECMWF. ECMWF System 4 involves the IFS atmosphere model at T255 L91,

the NEMO ocean model (with NEMOVAR) and HTESSEL land model and covers 1981-2010 reforecast period (51 members forecasts and 15 members re-forecast). System 4 reduces mean state errors significantly, and slightly improves tropospheric ACC, and probabilistic scores over the tropics and Europe compared to System 3 mainly due to increased spread. More recent ENSO events are better represented than older ones in the hindcasts. One current frontier is the QBO with still issues on the simultaneous calibration of phase and amplitude. Other issues were discussed, such as the initialization of O3, because of changes in the satellite observing system, and land surface, which can generate unexpected issues. Results of the EUROSIP multi-model ensemble were presented, showing El-Nino plume corrected for mean and variance to correct overactive ENSO predictions in the ECMWF model and provide multimodel forecasts.

IRI, A. Robertson

Andrew Robertson reviewed IRI seasonal forecast efforts, including multi-model precipitation and dynamical and statistical SST ensembles and model weighting approaches. Recent changes in the system include ocean forcing and an experimental 1-tier system based on CFS and coupled models run at IRI. In future, it is planned to base this system on NMME models. The post-processing is based on pattern-based ensemble means correction, equal weighting of corrected models and forecast probabilities (Gaussian distribution for temperature and Gaussian transformation for precipitation). The map room now provides a flexible format based on percentiles and thresholds. Model spread is not too small but signal might be too strong when using regression models. During the recent decade, dynamical ENSO prediction models outperformed their statistical counterpart to a slight but statistically significant extent, primarily because of their better forecasts when traversing the northern spring predictability barrier. NMME has proven to be useful because of the availability of a suitable series of models.

JMA, MRI, T. Yasuda

Tamaki Yasuda presented seasonal (operational) and decadal (CMIP5= predictions systems at JMA, both based on CGCM3. Seasonal predictions assimilate ocean full fields and decadal predictions assimilate ocean anomaly fields. CGCM5 will become the JMA operational system in 2014. Typhoon predictability is assessed against JRA-25 and a bias in longitude of typhoon formation was identified. The impact of SST over each ocean is assessed for the 2010 hot summer and the Atlantic Ocean was shown to have played a major role. CGCM experiments indicate that Indian Ocean contributed to a rapid termination of El Niño. This supports the hypothesis that the interaction between the Pacific and Indian Ocean is important. Seasonal and inter-annual variability of Arctic sea ice is well reproduced. First results of the next JMA operational seasonal sea-ice prediction system were presented.

JAMSTEC, S. Behera

Swadin Behera outlined the new Application Laboratory created in 2009 and

seasonal to interannual predictions at JAMSTEC based on a semi multi-model ensemble approach called SINTEX-F. The influence of the Indian Ocean Dipole on monsoon was demonstrated and is related to El-Nino. Tropical climate variations seem to have played a role in the extreme European summers. Tropical Cyclone genesis location is generally simulated by SINTEX systems. The SINTEX-F2 simulates well the annual mean of TC genesis frequency as observed. The SATREPS South Africa Project is developing capacity of seasonal climate prediction in South Africa for applications to management of environmental problems through downscaling approaches with the WRF model.

METEOFR, H. Douville

Hervé Douville presented seasonal and decadal (mainly through CERFACS) climate prediction activities at Météo-France. Stochastic dynamics are derived from a 32 winter 4 member couple model runs nudged towards ERA-Interim and improve the pattern anomaly correlations on Z500 in the extratropics. Enhanced horizontal and vertical resolutions improve SST and T2M as well as precipitation in DJF versus ERA-Interim. Seasonal hindcast of sea-ice over 1989-2010 is now available and has been assessed against NSIDC observations. Seasonal hydrological over France found an impact of land surface initialization. Decadal CMIP5 predictions show skill mainly due to the trend. Added value of initialization is found in the first year and North Atlantic and Western Pacific. Models were found sensitive to ocean initialization but not to vertical resolution in the stratosphere.
It was found that there is no added value of sea-ice initialization outside the Nordic Seas for decadal hindcasts. Prospects include the development of system 5, with improved sea-ice and land surface hydrology and increased resolution.

NCEP, A. Kumar

Arun Kumar presented the NCEP current real-time Extended-Range Forecast configuration implemented in April 2011 and known as CFS.v2. CFS.v1 has now been discontinued following numerous improvements on the new system such as doubled horizontal resolution, evolving CO2, CFSR initial conditions, etc. Seasonal and monthly hindcasts are available over period 1982-2010 and 1999-2010 respectively. CFSv1 and v2 contributions to the National MME (NMME) were also discussed.

MPI, W. Mueller

Wolfgang Mueller reviewed the MPI-ESM for EUROSIP, currently being installed at ECMWF. The prediction system is gradually being transitioned from COSMOS to MPI- ESM with the implementation of breeding for initial ensemble perturbations, which is improving surface temperature 1 month lead forecasts and seems to improve over lagged initialization. Bred vectors with 1 year cycle and depth-dependent norm are most beneficial. Future plans include higher resolution over the ocean (from 1.5 deg to 0.4 deg), land surface initialization. Cross support is expected from other projects such as SPECS, CliSAP and MiKlip.

ETH, S. Seneviratne

Sonia Seneviratne presented land related activities at ETH Zurich. The GEWEX GLACE2 experiment shows that despite satisfactory results for North America, overall global skill is low and maybe underestimated. Ground observations reveal lagged correlations between spring moisture conditions and summer hot extremes and suggest potential for forecast skill. Global analysis for regional hottest month: Confirms strong lag correlation in several land areas, both in northern and southern hemispheres between the number of hot days (NHD) and standardized precipitation index (SPI). An analysis over Europe demonstrates a high percentage of hot days related to dry springs and anticyclonic summer weather regimes. Soil moisture is characterized by long persistence. This implies high potential for improved early warning and subseasonal forecasting of drought based on land surface information alone from several weeks to several months. A clear scaling exists between latent heat and temperature changes when assessing the impact of soil moisture-climate feedbacks in CMIP5 21st century projections.

Environment Canada, W. Merryfield

William Merryfield presented the CanSIPS seasonal to interannual prediction system. CanCM3 and CanCM4 show different SST biases, especially over the tropical pacific, CM4 being somewhat too strong on El-Nino and CanCM3 somewhat too weak. Atmospheric (re)analysis *temperature*, winds and humidity are assimilated every 6 hours using variant of incremental analysis update (IAU). Subsurface ocean assimilation of gridded temperature is done off-line and salinity is adjusted to preserve T-S relation for water column stability. The spread in the ocean is created by atmospheric forcing differences between different assimilation run ensemble members. There is a long-lead 9 months skill for western Canada in winter/spring and a long-lead skill for eastern Canada in summer/fall. CanSIPs is involved in many experiments such as the IRI ENSO predictions, the WMO GPC, NMME, APCC and the UKMO real-time decadal prediction ensemble. CanSIPS also contributes to the CHFP, YOTC MJO, GLAC-, IceHFP, CMIP5 decadal predictions and SHFP. In developing products, emphasis is placed on probabilistic forecasts by calibrated fitting of Gaussian PDFs to raw forecast anomalies.

UKMO, A. Scaife

Adam Scaife discussed the UKMO Global Seasonal forecast system 4 (GloSea4) and the soon to be implemented System 5 (GloSea5). He stressed that NAO predictability is usually very low. GloSea5 seasonal predictions did reasonably well in predicting the NAO with a higher correlation than seen in any previous hindcast winters. This appears to result from higher resolution which has improved the representation of Atlantic blocking which has been validated by AMIP simulations. Individual winter pressure patterns can be highly variable but many winters even show similarity between ensemble mean and observed anomalies. Further tests are being carried out on GloSea5 and operational implementation is expected in winter 2012.

RSMAS, B. Kirtman

Ben Kirstman noted that NMME fails across all members to capture drought in 2007, the single year where SST prediction on El-Nino failed and may be related to the resolution of the ocean model. It is speculated that 3 months lead SST has improved in the higher resolution CCSM4.0 model thanks to model improvements and better initial conditions. CCSM4.0 shows increased SST variance and better representation of oceanic fronts and rainfall. A higher correlation is also found between SST and heat fluxes along western boundary currents. In the Southern Ocean, there is evidence that the ocean is driving atmospheric processes.

Decadal Prediction

DCPP report and CMIP5 decadal hindcast analyses (G. Boer)

George Boer provided a comprehensive overview of the history and motivations of decadal predictions and recalled the existence of long timescale processes in the earth system, the potential predictability, the strong interest by the scientific community and the high societal relevance of this time scale. The Decadal Climate Prediction Panel was created as a joint WGCM-WGSIP activity to leverage decadal predictions coming on-line, and to contribute to the IPCC AR5 Chapter 11 by an experimental approach inspired from CMIP5.
WGSIP and DCPP were tasked to provide guidance on bias corrections methods, start dates, sub-daily data for CMIP5 and on which type of data to archive. The panels recommended the submission of raw data whilst allowing reluctantly for some bias-adjusted fields. It also recommended the production of forecasts initialized every year over the period to enhance statistical stability and adding uninitialized simulations to quantify the utility of the initialization of the forecasts. Within potential skill, the forced component increases over time while internally generated skill decreases. The large differences between real and potential internal skill suggest that some important processes are still missing in the models. Both components vary with latitude. Whilst DCPP has been focusing mainly on temperature, precipitation has received less attention and has less skill.

Decadal Forecast Exchange - D. Smith (A. Scaife)

Adam Scaife pointed out that many groups are now developing real-time decadal predictions and that key experiments have been completed and analyzed. The 15th session of the WMO Commission for Climatology recommended an action to start the coordination and exchange of decadal predictions and a proposal went out to various groups to exchange decadal prediction information. So far, 12 groups are taking part to exchange very basic quantities of global Annual Mean Temperature around November (one file for each year, each member). Additional contributions are welcome. Early results suggest that initialized predictions are cooler than uninitialized predictions – a key result that may feed into the next IPCC assessment report. The need for a suitable infrastructure to distribute the data was highlighted and DCPP has a timely opportunity to agree on standards before a full implementation and to agree on open access before restrictions on use

are put in place. It was suggested to upload all decadal predictions on the ESG and some funding to distribute data is being provided via the EU SPECS project.

MIKLIP project (W. Mueller)

Wolfgang Mueller noted that MPI-ESM decadal runs have some deficiencies in the initial years and generally negative anomaly correlations with observed SST at low latitudes. The MiKlip Project is addressing these issues by performing vigorous prediction research, and at the same time providing the best currently possible decadal climate predictions. The project consists of 5 modules focusing respectively on initialization, processes, downscaling, synthesis and evaluation. The phasing of activities will involve new initialization methods (2013), new assimilation schemes (2014) and increase in resolution (2015).

Discussion: evolution of decadal predictions - preparation for DAY-3 - what next? (All)

A discussion proceeded to prepare the joint meeting with WGCM. The emphasis of the decadal prediction effort was debated. It was recognized that model error remains still a major contribution to uncertainty. Skill of decadal predictions has improved, enhancing potential for real-time applications. The balance and prioritization between seasonal and decadal was also discussed, considering the limited computational, financial and human resources. It was recalled that RCPs are not predictions but they help decision making on what emissions should be. CORDEX runs forced by decadal predictions would have to consider issues of bias correction. Tim Stockdale recommended that AR6 should address the importance of seasonal prediction for extremes. Rupa Kumar Kolli suggested using the AR5-AR6 gap to prepare for GFCS. The various topics selected for the joint session discussion were the following:

- *Decadal prediction protocol for CMIP6*
  - *Address bias adjustment issues*
  - *Number of start dates – every year? Case studies?*
  - *No need for sub-daily output?*
  - *Length 5,10,30 years?*
  - *Coordinated assessment to accelerate development? Test for overconfidence?*
  - *"No Assimilation" runs in parallel*
  - *Ensemble size, is 3 too small?*
  - *Include ESMs?*
- *Decadal prediction: a sensitive test of climate sensitivity?*
- *CORDEX downscaling of decadal predictions – try statistical downscaling?*
- *Scenarios: aerosols and solar are important for decadal predictions but initialization and future behavior are not properly catered for*
- *Decadal prediction exchange: future? Near real-time?*
- *AMIP: larger ensemble size to compare with hindcasts?*
- *Relative Benefit? Decadal, Seasonal, Projections (2500, 1800, 2000)*

The WCRP Grand Challenges were also briefly discussed so as to prepare for the joint session.

Review of action items (B. Kirtman)

See appendix A.

Events and meetings

- WGNE Workshop on Systematic Errors in Weather and Climate Models (deadline for abstract submission is 31 Oct), Exeter, 15-19 April
- GODAE/WGNE Workshop on Short- to Medium- Range Coupled Prediction for Atmosphere-Wave-Sea-Ice-Ocean), Washington, 19-22 March 2013
- Seasonal to Decadal workshop (S2D), Toulouse, June 2013
- CORDEX conference, 4-7 November 2013, Brussels
- South Africa – Japan SATREPS Workshop/Symposium, scheduled on October 19/20 2012
- International Symposium on Climate Applications, scheduled for February 20-21 2013
- IFS-VECTRI at the workshop and colloquium to be held at ICTP in April 2013 (jointly with Healthy Futures and co-sponsored by WMO)

Other issues:

The design of a WGSIP logo was discussed. Adam Scaife will propose some options.

Membership:

Rupa Kumar Kolli suggested a stronger involvement of CBS in the future. Memberships were discussed off-line between co-chairs and WCRP JPS.

Next meeting

The next WGSIP session would be held either in:

- Washington (in conjunction with a ETLRF meeting
- Victoria end of September or beginning of Oct 2013

Final decision has not been made yet. **NB Post meeting discussions suggested holding the next meeting some time early 2014.**

The next meeting would include inputs from the GODAE meeting and the S2D workshops.

Joint WGCM-WGSIP Meeting - Decadal Prediction

Objectives of the joint session (WGCM and WGSIP co-chairs)

Adam Scaife outlined the objectives of the session and pointed out that this is the 1st joint meeting between WGSIP and WGCM. The major common topic of both working groups is the decadal prediction effort focusing on initialized predictions. Gerald Meehl recalled that a similar joined WGNE/WGCM meeting was held last year on atmospheric model development.

Overview of WGCM (G. Meehl)

Gerald Meehl recalled that WGCM's mission is to review and foster the development of coupled climate models (AOGCMs) and Earth System Models (ESMs, usually defined as an AOGCM with at least a coupled carbon cycle, can also have dynamic vegetation, chemistry, aerosols, etc.). The working group coordinates CMIP with many MIPs partners and connects to IGBP (AIMES, PAGES), WGNE (Transpose-AMIP) and WGSIP (Decadal Climate Prediction Panel). WGCM also facilitates model validation and diagnosis (e.g. metrics panel, joined between WGNC and WGCM). DCPP has been setup to develop a decadal experimental design for CMIP5 and possibly for CMIP6.

The discussion emphasized the need for WDAC to liaise with the modeling community. It was recommended to have a WGSIP representation on the metrics panel. Adam Scaife suggested considering probabilistic scores as part of the metrics. Veronika Eyring stressed the need for sharing metrics code to facilitate model evaluation. CMIP membership was questioned as the panel moves to the next phase of experiments.

Overview of WGSIP (A. Scaife)

Adam Scaife stressed the research focus of WGSIP whilst the WMO CBS Expert Group on Long Range Forecast has an operational purpose. He also recalled that WGSIP and WGCM now report to the JSC. The flagship WGSIP project is CHFP with 8 goups contributing hindcasts so far served from CIMA in Argentina. It is planned to update these over time to assess the evolution of skill with models. WGSIP sub-projects focus on land, stratosphere and sea-ice initialization and have developed their own experiments evaluate sources of predictability in the climate system that will inform the development of seasonal prediction systems.

Decadal hindcast databases are part of the CMIP5 approach. In contrast, for seasonal forecasts, 12 WMO Lead Centers provide seasonal forecasts in real-time to KMA as part of the WMO seasonal forecast exchange so building a global MME. Exchange of decadal predictions in the future would require addressing permissions from producing centers but could happen following the example of the Decadal Forecast Exchange initiated by Doug Smith and Adam Scaife. The seasonal forecast approach of full field initialization with bias correction contrasts with the anomaly initialization approach adopted of many climate modeling groups to initiate decadal predictions. Initialized

decadal predictions are cooler than uninitialized CMIP5 climate projections suggesting that projections are warming too fast. Adam Scaife suggested that initialized near term climate predictions might therefore be a tighter test of climate sensitivity.

Decadal prediction: lessons from CMIP5 experimental design (F. Doblas-Reyes)

Francisco Doblas-Reyes recalled the progression from the weather and seasonal forecasting initial-value problem to climate projections as a forced boundary condition problem, intersecting at the decadal prediction mixed initial value and boundary condition problem. Predictions are distinguished from projections through the use of model initialization. The CMIP5 near-term core experiments prescribe the atmospheric composition in the historical set of hindcasts and are run forwards into the future with RCP4.5 forcing. It is important to properly consider lead time aspects in skill evaluation. Forecasts produced by different groups of the same period may have different lead times. It is not obvious whether they should be evaluated by forecast time or lead time. The importance of accurate SST and ocean sub-surface initialization was stressed. Full field initialization should be used unless there are concerns about dynamic imbalances in the fields. Ensemble approaches should aim at representing the uncertainties in initial conditions.

Systematic error is model dependent and is very different from one system to another. Hindcast runs are used to provide reliability estimates on predictions and to calibrate them. Model drifts are corrected for by analyzing mean climate and tendencies, which requires for yearly initializations instead of every 5 years, as required by the CMIP5 protocol. By specifying the solar cycle and volcanoes, CMIP5 decadal predictions may be overestimating skill. Hindcasts run as real-time predictions that do not include this additional information will better quantify skill. Skill differs depending on lead time and depending on the initialization approach (full field and anomaly initialization, no initialization), with yearly start dates delivering a more robust result, instead of 5-year start dates. Where there is negative skill, there is likely to be an improvement over time with model improvement reducing systematic biases and improved initialization techniques reducing initialization shock in the system.

Sandrine Bony stressed the interest of precipitation global patterns not only over land but also over the ocean. Colin Jones recalled that some skill on initialized predictions might be related to the density of observations (e.g. high in the North Atlantic).

Decadal prediction: science highlights and IPCC AR5 (B. Kirtman)

Ben Kirtman provided an overview of decadal predictability and predictions contributing to AR5 Chapter 11. Globally averaged correlation skill for initialized and uninitialized actual and potential skill were presented. The first 2 years suggest a strong benefit from initialization. Initialization usually improves correlation and RMSE for Surface Air Temperature (SAT) and Atlantic Multidecadal Variability (AMV) whilst initialization shocks pose

difficulties on the Interdecadal Pacific oscillation (IPO). An analysis of T2m suggests a higher skill for initialized predictions. It was noted that 75% of models agree over the North Atlantic. Observations after 2005 suggest that projections overestimate global warming as initialized predictions show lower temperatures.

Gokhan Danabasoglu noted that ocean models have issues in representing the circulation correctly and it would be worth looking at the impact of data assimilation.

GC1:"Provision of skillful future climate information on regional scales (includes decadal and polar predictability)" (G. Meehl, F. Doblas-Reyes)

Gerald Meehl and Francisco Doblas-Reyes outlined the barriers to the Grand Challenge 1:

- Less decadal predictive skill over the Pacific compared to the Atlantic
- Less decadal predictive skill for precipitation than temperature
- It is still unclear what the best initialization strategy yields the best predictions
- Bias adjustment remains a major factor in decadal predictions and all groups do it somewhat differently
- The concept of “near term” climate prediction typically extends to roughly 30 years, but the focus of most decadal climate prediction studies until now has been on the next decade
- Need for model development
- Need for large samples to obtain robust forecast quality estimates
- Relevance of decadal predictions for climate services
- Limited skill over land regions
- Very limited skill for extratropical atmospheric circulation

Joint WGSIP/WGCM implications in WCRP Grand Challenges GC4: "Clouds and climate sensitivity" (S. Bony)

Sandrine Bony presented recent developments on this grand challenges that has been revisited since the last JSC in Beijing with inputs from GASS, GEWEX, CFMIP, PMIP, WGNE and others and will be overseen by WGCM. Current barriers pertain to the inability to constrain the effects of clouds on climate sensitivity estimates, the lack of understanding of regional circulation and precipitation changes (especially over land) and unreliable representation of the coupling between cloud processes and large-scale dynamics. Rapid progress could be achieved by the critical mass of MIPs efforts, emerging new models (e.g. LES, CRMs over large domains and super-parameterization), and a golden age of Earth Observations. It is proposed to develop targeted research efforts around 5 initiatives:

- Climate and Hydrological Sensitivity
- Leveraging the Past Record
- Coupling Clouds to Circulations
- Changing Patterns
- Reliable Models

Ideas for the future (CMIP6 coordinated set of experiments) (inputs from all)

The joint session ended with a discussion about ideas for a possible future CMIP6 coordinated set of experiment.

Hervé Douville suggested CMIP6 as one integrated experimental design and raised the issue of decadal runs and their position in the core vs tier experiments. Core experiments should make due consideration of available CPU resources and should include more coordinated experiments devoted to model evaluation such as AMIP, but also off-line OGCM and land surface model simulations driven by common atmospheric forcings based on bias-corrected atmospheric reanalyses (as in the CORE-2 and GSWP initiatives). In contrast, large ensemble simulations such as decadal hindcasts should not necessarily appear as core experiments, although this view was not that of WGSIP in general.

CMIP5 offered many more experimental degrees of freedom. Uncertainties differ from CMIP3 and causes need to be investigated.

Adam Scaife stressed the importance of users who show a stronger interest for near term experiments. Historical runs provide confidence for future predictions and projections. He also recalled that hindcast experiments are fundamental to understand discrepancies in warming rates between decadal predictions and projections. As such decadal hindcasts should remain part of the core set of CMIP experiments. He also suggested that it would be interesting to add aerosol forcing in decadal predictions.

Colin Jones suggested that core experiment should contain on near term experiments. RS stressed the value of real-time experiments and wondered what role CMIP could play.

Ben Kirtman stressed that hindcasts are essential to calibrate predictions.

Sonia Seneviratne raised the issue of credibility of predictions. Model physics and development are common to several Grand Challenges, especially number 1 and 4. She also highlighted soil moisture initialization issues for decadal predictions.

Bjorn Stevens stressed the importance of having a compact core set of experiments.

Gerald Meehl recalled that there were historical reasons for the separate decadal and CMIP5 protocols.

Tim Stockdale noted that there are 2 sets of decadal communities: ESMs multi-decadal initialized simulations and the 1-9 year decadal predictions issued with yearly start dates. CPU considerations should be taken into account.

Karl Taylor noted the critical aspect of differing approaches to bias correction and how to consistently compare various sets of predictions.

Greg Flato wondered if there was any interest in the decadal community to tackle GHG like methane and black carbon and air quality. Prescribing short-lived species in near term scenario simulations would be of interest to assess the rapid impact of mitigation policies for these pollutants.

Sandrine Bony highlighted the need for synthesis papers, for example in a special issue of a journal, which would be taken up by the various MIPs efforts and could help planning for the future CMIP6.

The meeting was closed at 12.30 by the co-chairs Gerald Meehl and Adam Scaife.

APPENDIX A. ACTION LIST

	ACTION	Lead	Date
1	Contact CS to ingest hindcasts into CHFP	WM, TS, AK	
2	Investigate distribution of DVD/USB of SST, precipitation, SLP for all models (monthly means) (conditioned to outcome of ACTION 1)	CS	
3	Update data requirements for CHFP	CS	Oct 2012
4	Advertisement of WGSIP activities and CHFP archive in CLIVAR Exchanges, WCRP Newsletter, WMO Bulletin, CMIP email list, GFCS Newsletter (as written contribution)	CS/AS/FDR	Poster, mid Oct 2012
5	Advertisement of WGSIP activities and CHFP archive at WMO Extraordinary Congress (poster) on announcement CHFP archive	CS/AS/FDR	15 Oct 2012
6	Lead write-up of paper, skeleton with required figures, Climate Dynamics	BK	15 Nov 2012
7	Send text for Future Earth comment for submission by WGSIP	AM	Sept 2012
WGSIP14 ACTION 9	Work with CIMA to assess ability to adapt to CMIP5 CMOR protocol	CS, FDR	On-going
WGSIP14 ACTION 14	Investigate which APCC centres' hindcast data may be included in the CHFP database	BK	On hold
WGSIP14 ACTION 16	WGSIP to promote dynamical forecast information at RCOF meetings (D. DeWitt, W. Landman, A. Morse)	DD, WL, AM	On-going

APPENDIX B. MEETING AGENDA

Monday, September 24

09:00 Start of WGSIP Session

Round table introductions (All)
Action items and recommendations from WGSIP 14 meeting (B. Kirtman and A. Scaife)
Key topics for this meeting (A. Scaife and B. Kirtman)
JSC outcomes, WDAC, WMAC, WGSIP role in grand challenges (M. Rixen)

CHFP:
CHFP archive: progress and status (C. Saulo)
CHFP analysis: activity so far (C. Saulo, B. Kirtman, A. Scaife)

Documenting the archive in a peer reviewed study: results so far, which data, designation of tasks, CLIVAR Exchanges Special Issue (All)

Evolution of CHFP (C. Saulo and F. Doblas-Reyes)

From the CHFP data server to ESG: the future of public access to seasonal-to-interannual predictions (F. Doblas-Reyes)

Linking US NMME to CHFP (B. Kirtman)

10.30-11.00 Coffee break

CHFP and the regional level, RCOFs (R. K. Kolli, 30 min)

CHFP Subprojects:
Ice Historical Forecast Project - (D. Peterson/A. Scaife)
Land surface impacts on seasonal forecasts (H. Douville)
Stratosphere Historical Forecast Project - (A. Butler/A. Scaife)

12:30-13:30 Lunch

Other Projects:
WCRP Polar Prediction Project and the links to WCRP's PCPI (T. Jung)
WMO Lead Centre for MME (A. Kumar)
WMO Sub-Seasonal to Seasonal Prediction Project (A. Robertson)
US Seasonal Forecast MME (B. Kirtman)
SPECS and ECOMS: the EU contribution to s2d climate services (F. Doblas-Reyes)
15:30:16:00 Coffee break

Data Assimilation:
Data assimilation for initialized climate prediction (B. Kirtman)
Discussion: should we have a coordinated data assimilation activity, links to WGOMD and GSOP? (All, G. Danabasoglu?)

The comparison of operational ocean reanalysis (A. Kumar)
Observing system simulation experiments for the TAO array (A. Kumar)

Applications:
Application of climate forecasts to health (A. Morse)
Applications of global seasonal forecasts (A. Robertson)
Application of climate forecasts for Africa (W. Landman)

WMO's Global Framework on Climate Services and other climate services initiatives (A. Robertson)

18:00 Close

Tuesday, September 25

09:00 Application of climate forecasts at ICTP (A. Tompkins)

09:15 Review of Regional Activities (Report from each group, 10mins + questions)

ICTP, A. Tompkins
ECMWF, T. Stockdale
IRI, A. Robertson
JMA/MRI, T. Yasuda
JAMSTEC, S. Behera
METEOFR, H. Douville

10:30-11:00 Coffee Break

NCEP, A. Kumar
MPI, W. Mueller
ETH, S. Seneviratne
Environment Canada, B. Merryfield
UKMO, A. Scaife
RSMAS, B. Kirtman

12:30:13:30 Lunch

Decadal Prediction:
DCPP report and CMIP5 decadal hindcast analyses (G. Boer)
Decadal Forecast Exchange - D. Smith (A. Scaife)
MIKLIP project (W. Mueller)
Discussion: evolution of decadal predictions - preparation for DAY-3 - what next? (All)

15:00-16:00 Coffee Break

Review of action items (B.Kirtman)

Forthcoming events and meetings (e.g. 2nd WCRP Workshop on Seasonal Prediction, WGNE Workshop on Systematic Errors in Weather and Climate Models, GODAE/WGNE Workshop on Short- to Medium- Range Coupled

Prediction for Atmosphere-Wave-Sea-Ice-Ocean)

Other issues: e.g. WGSIP logo

Membership: rotations off and new members

Next meeting

18:00 Close

Wednesday, September 26 - Joint WGCM-WGSIP Meeting - Decadal Prediction

09:00 WGCM-WGSIP Joint Meeting on Decadal Prediction
- Objectives of the joint session (WGCM and WGSIP co-chairs)
- Overview of WGCM (G. Meehl) (20 minutes + 10 minutes Q&A)
- Overview of WGSIP (A. Scaife) (20 minutes + 10 minutes Q&A)
- Decadal prediction: lessons from CMIP5 experimental design (F. Doblas-Reyes)

10:30-11:00 Coffee Break

- Decadal prediction: science highlights and IPCC AR5 (B. Kirtman)

- Joint WGSIP/WGCM implications in WCRP Grand Challenges

GC1:"Provision of skillful future climate information on regional scales (includes decadal and polar predictability)" (G. Meehl, F. Doblas-Reyes)

GC4 : "Clouds and climate sensitivity" (S. Bony)
- Ideas for the future (CMIP6 coordinated set of experiments) (inputs from all)

12:30 Close

APPENDIX C. LIST OF PARTICIPANTS

Alves Oscar
Bureau of Meteorology, Australia
O.Alves@bom.gov.au

Behera Swadhin
Team Leader, Low-latitude Climate Prediction Research, Climate Variation Predictability and Applicability Research Program
Research Institute for Global Change/JAMSTEC, 3173-25 Showamachi, Yokohama, Kanagawa 236-0001, Japan
Tel: 81 4 5778 5511
Fax: 81 4 5778 57 07
behera@jamstec.go.jp

Boer George
Canadian Centre For Climate Modelling and Analysis
Environment Canada, Ocean, Earth & Atmospheric Sciences Building, University of Victoria
PO Box 3065 STN CSC, Victoria, B.C. V8W 3V6, Canada
Tel: +1 250 363 8226
Fax: +1 250 363 8247
George.Boer@ec.gc.ca

DeWitt David
daved@iri.columbia.edu

Doblas-Reyes Francisco
Institució Catalana de Recerca i Estudis Avançats (ICREA) and Institut Català de Ciències del Clima (IC3)
Doctor Trueta 203 - 08005 Barcelona, Spain
Tel: +34 93 5679976/+34 93 5679977
f.doblas-reyes@ic3.cat

Danabasoglu Gokhan
NCAR, 1850 Table Mesa Drive
Boulder, CO 80305, USA
gokhan@ucar.edu

Douville Hervé
Météo-France/CNRM
herve.douville@meteo.fr

Hechler Peer
Head, Regional Climate Monitoring Division, Deutscher Wetterdienst
P.O.Box 10 04 65
63004 Offenbach, Germany
Phone: +49 69 8062 2938
Fax: +49 69 8062 3759
peer.hechler@dwd.de

Huang Jin
Jin.Huang@noaa.gov

Jung Thomas
AWI, Bussestrasse 24
D-27570 Bremerhaven, Germany
Tel: +49 (0) 15146722091
http://www.awi.de/People/show?tjung
Thomas.Jung@awi.de

Kirtman Ben
RSMAS/Miami Florida, USA
bkirtman@rsmas.miami.edu

Kolli Rupa Kumar
Chief, World Climate Applications & Services Division
Officer-in-Charge, Climate Prediction & Adaptation Branch
Climate & Water Department
World Meteorological Organization
7bis, av. de la Paix
CH-1211 Geneva 2, Switzerland
Tel: +41-22-730-8377
Fax: +41-22-730-8042
rkolli@wmo.int

Kumar Arun
Chief, Development Branch, Climate Prediction Center, NOAA
Center for Weather and Climate Prediction, 5830 University Research Court, Rm 3000
College Park, MD 20740, USA
+1 301 683 3385
Arun.Kumar@noaa.gov

Landman Willem
Council for Scientific and Industrial Research, Natural Resources and the Environment, and Department of Geography, Geoinformatics and Meteorology, University of Pretoria
Pretoria, South Africa
Tel: +27(0)12 841 3395
Fax: +27(0)12 841 4863
WALandman@csir.co.za

Merryfield William
Canadian Centre for Climate Modelling and Analysis, University of Victoria,
PO Box 3065 STN CSC
Victoria, B.C. V8W 3V6, Canada
Tel: +1 250 363 8263
Fax: +1 250 363 8247
bill.merryfield@ec.gc.ca

Morse Andy
School of Environmental Sciences
Roxby Building, University of Liverpool, Liverpool, L69 7ZT, UK
A.P.Morse@liv.ac.uk

Mueller Wolfgang
Max Planck Institute for Meteorology, Bundestrasse 53
20146, Hamburg, Germany
wolfgang.mueller@zmaw.de

Rixen Michel
World Climate Research Program
c/o WMO
7bis, avenue de la Paix
Case postale 2300
CH-1211 Geneva 2, Switzerland
tel: +41 22 730 8528
fax: +41 22 730 8036
mrixen@wmo.int

Robertson Andrew
IRI, 230 Monell Building
61 Route 9W
Palisades, NY 10964, USA
Tel: +1 845 680 4491
Fax: +1 845 680 4864
awr@iri.columbia.edu

Saulo Celeste
Centro de Investigaciones del Mar y la Atmósfera (CIMA/CONICET-UBA)- Dpto. de Ciencias de la Atmósfera y los Océanos, FCEN, UBA - Unidad Mixta Internacional-IFAECI (CNRS), Ciudad Universitaria, 2do piso, pabellón II
C1428 EHA CABA, Buenos Aires
Argentina
Tel:+ 5411 4787 2693
Fax: +5411 4788 3572
saulo@cima.fcen.uba.ar

Scaife Adam
Met Office, Head, Monthly to Decadal Prediction, Hadley Centre
FitzRoy Road
Exeter, Devon, EX1 3PB, UK
Te: +44 1392 884056
adam.scaife@metoffice.gov.uk

Seneviratne Sonia
ETH Zurich
Institute for Atmospheric and Climate Science
CHN N11, Universitätsstrasse 16
CH-8092 Zurich, Switzerland
Tel: +41 44 632 80 76
Fax: +41 44 633 10 58
http://www.iac.ethz.ch/people/sonia
sonia.seneviratne@env.ethz.ch

Stockdate Tim
ECMWF, Shinfield Park
Reading, RG2 9AX, UK
Tel: +44 118 9499117
Fax: +44 118 986 9450
tim.stockdale@ecmwf.int

Tompkins Adrian
Earth System Physics Section
The Abdus Salam International Centre for Theoretical Physics (ICTP), Strada Costiera 11
34151 Trieste, Italy
Tel: +39 040 2240 579
tompkins@ictp.it

Yasuda Tamaki
Climate Research Department,
Meteorological Research Institute,
Japan Meteorological Agency, 1-1
Nagamine, Tsukuba, Ibaraki,
305-0052 Japan
tyasuda@mri-jma.go.jp