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Executive Summary

The 21st session of WGSIP was held in conjunction with the International Young Scientists School (27-31 May), and the Computational Information Technologies for Environmental Sciences - CITES-2019 conference.

The main outcome of the session was the selection of three new sub-projects for the Working Group, targeting the goals of the new WCRP Strategic Plan and which will focus specifically on predictive capabilities, quantifying the risks of extreme events, and information for decision making. Emphasis will focus in particular on monsoons, temperature trends, ocean prediction, extremes and unprecedented events, forecast calibration, and capacity building. To achieve these goals, the CHFP and S2S databases will be enhanced and complemented where needed.

Contents

Attendees of the WGSIP21 session, from left to right, Hong Li Ren, Asmeron Beraki, Debra Hudson, Lauriane Baté, June Yi Lee, Yuhei Takaya, Laura Ferranti, Ramiro Saural, Michel Rixen, Adrian Tompkins, Mikhail Tolstykh, Angel Munoz, Valentina Khan, Bill Merryfield, Doug Smith and Yvan Orsolini

Attendees of the International Young Scientists School

ATTENDING: Lauriane Batté, Asmerom Beraki, Laura Ferranti, Debbie Hudson, June-Yi Lee, Bill Merryfield, Yvan Orsolini, Ramiro Saurral, Doug Smith, Yuhei Takaya, Mikhail Tolstykh, Adrian Tompkins

INVITED PARTICIPANTS: Anca Brookshaw (remotely), Valentina Khan, Ángel Muñoz, Hongli Ren

EXCUSED: Johanna Baehr

JPS: Michel Rixen

This report only summarizes discussions and outcomes of the 21st session of the WCRP Working Group in Subseasonal to Interdecadal Prediction. Full presentations delivered during the meeting are available at https://www.wcrp-climate.org/wgsip21-agenda

1. Introduction

Co-chairs W. Merryfield and D. Smith welcomed all participants and thanked Evgeny Tyrtyshnikov, the Director of the Institute of Numerical Mathematics (INM) of the Russian Academy of Science (RAS) for hosting the 21st session of WGSIP held in conjunction with the International Young Scientists School (27-31 May), and the Computational Information Technologies for Environmental Sciences - CITES-2019 conference (3-6 June).

A quick round of introduction allowed everyone to introduce themselves. The new members Debbie, Lauriane, Yuhei and June-Yi were warmly welcomed.

Bill recalled the current structure of WCRP, reviewed the remit of the different entities of the programmes and recalled the history of WGSIP, including its close ties with the operational centers and IPET-OPSLS, and with WWRP via the S2S project. He outlined an important objective of the 21st session to develop new sub-projects in the context of the new WCRP Strategic Plan.

The agenda of the meeting was approved as drafted with no subsequent changes, bearing in mind the possible need to adjust scheduling with the school programme.

Michel provided an update on the implementation of WCRP Strategic Plan, in particular around its objective 2 on “Frontiers of predictions and associated uncertainties for sub-seasonal to decadal time scales across all climate system components.”. He then briefly presented the outcomes of the JSC40 session discussions and preceding 2-day Implementation and Transition workshop, including the tentative timeline and conceptual framework. Reports of those were being drafted at the time of the WGSIP session. He highlighted the upcoming AGU Fall Meeting, 7-13 Dec 2019, where WCRP will celebrate its 40th anniversary together with a series of Town Halls, Union session and Early Career events. In closing, he presented the new proposed structure for WMO in the context of its Constituent Body Reform for approval at the 18th World Meteorological Congress in June 2019.

Progress on actions from WGSIP19 and WGSIP20 were reviewed and are summarized in Appendix A.

2. WGSIP alignment with WCRP Strategy

Doug presented the overall WCRP Strategic picture, highlighting Objective 2 and its emphases on prediction capabilities and extremes but also the other strategic objectives where WGSIP could contribute. He highlighted opportunities to address variability and quantify risk, including verification in this context.

An open discussion followed, which is summarized below.

2.1 Strategic objective 1

ENSO is a fundamental process in energy exchanges between the atmosphere and the ocean on multi-seasonal time scales. There are encouraging results on prediction of energy and carbon flows on decadal time scales.

In terms of climate dynamics, teleconnections and the understanding of the trigger to Rossby waves are rapidly developing within S2S. Packages to identify weather types can support model verification.

Decadal variability modulates seasonal time scale (e.g. sea ice), and it is important to understand non-stationarity of those combined phenomena.

2.2 Strategic objective 2

Characterizing climate variability in terms of weather typing or frequency of different weather regimes is a promising approach for improving understanding of dynamics and predictability bridging climate and weather time scales and is a current research emphasis at IRI.

Large ensembles efforts, such as the US CLIVAR initiative and the UNSEEN (UNprecedented Simulated Extremes using ENsembles) approach, are relevant to extremes and quantifying risk. The ocean plays a crucial role in climate prediction and some renewed emphasis in WGSIP would be appropriate in light of TPOS2020. The combined use of S2S, CHFP, CMIP and other data bases can support these efforts.

2.3 Strategic objective 3

Decadal prediction fits both strategic objective 2 and 3 and is particularly relevant to the UNFCCC Global Stocktake, in understanding the past and future response of the climate system to forcing. There is no solid boundary between climate prediction and projections. The role of external forcing, especially solar and aerosols, on decadal timescales needs further investigation.

2.4 Strategic objective 4

There is conditional skill across scales/processes which can also be extracted by heuristics/statistics from multi-models exploiting dynamics after post processing. Outputs can be tailored to particular needs.

3. Current WGSIP projects updates and outcomes

3.1. Teleconnections

A question was posed as to how to translate the outcomes of such teleconnection projects in conditional skill and operational terms. A risk exists to use only one's own reanalysis.
Looking at spectral response of models could help providing more insights into large scale processes and their representation in climate predictions.

3.2. SNOWGLACE

This sub-project has delivered some very interesting results and shall connect closely with the new GEWEX/GASS/LS4P and Third Pole Experiment Multi-Model Intercomparison Project (TPEMIP) initiatives.

3.3. Shocks and drifts

A lot of effort has been invested in developing the Long-Range Forecast Transient Intercomparison Project (LRFTIP) database on shocks and drifts, and increasing emphasis is planned for its exploitation leading to dissemination and publication of research results, for example on the analysis of the development of ocean biases including on subseasonal time scales, drawing on the ocean hindcast dataset being developed for Phase II of the S2S project.

There was some discussion of whether WGSIP should formulate and propose to the research community rigorous definitions of "drift" vs "shock", which thus far have tended to exist in the eye of the beholder. For example, drift could be viewed as the response of an imperfect (biased) model to perfect initial conditions (balanced in terms of the model's dynamics), whereas shock could be viewed as the response of a perfect (unbiased) model to imperfect initial conditions (representing the observed climate state but containing imbalances with respect to model dynamics that trigger "fast" transients) However, it is not easy in practice to distinguish clearly between drifts and shocks, being a complicated response to imperfect observations, initial conditions and models, including imbalances between Earth system components. A follow-up international effort could be to develop solutions to reduce shocks and drifts (via digital filters for example) towards improved skill, using metrics developed under LRFTIP to quantify improvements.

3.4. CHFP

There is some (perceived) economic value in hindcasts and some centers, like JAMSTEC are not too keen on publishing their model on CHFP. There is some overlap between CHFP and C3S which also stores hindcasts. There is currently a variety of formats between different databases, which could be aligned towards more seamlessness across systems and time scales.

4. Research & modelling centers updates

Briefers were invited to focus on updates since the last session and to include Global Producing Centres and Lead Centres matters as applicable. All presentations are available on the meeting web page.

4.1. BoM – D. Hudson

BOM, as well as KMA use the Unified Model and have a collaboration with the UK MetOffice to further develop the model and fine tune verification. Future versions of this ACCESS-S system will transition to BoM-developed weakly coupled EnKF for data assimilation. A recent science focus has been on stratosphere-troposphere coupling in the Southern Hemisphere and the implications for predictability of surface climate. There are several active projects focused on the applications of sub-seasonal to seasonal forecasts, including forecasting extremes (e.g. likelihood of heatwaves) for the agriculture sector and ocean forecasts to support warnings of coral bleaching and fisheries management.

4.2. Metéo France – L. Batté

System 7 uses the same hindcast period for seasonal forecasts as system 6 and follows C3S requirements, the main change being a higher resolution (ORCA 1/4°) version of the ocean model NEMO3.6 that was introduced for System 6. A prognostic physics scheme (PCMT) is being used for deep convection. In some on-going research presented regarding different soil moisture initializations to assess impacts on skill, the CTRL is initialized off line with no correction, PERT uses perturbed precipitation with a multiplicative coefficient, and with INIT only the initial stage is corrected.

4.3. ICCP – J.-Y. Lee

The Institute for Basic Science (IBS) Center for Climate Physics (ICCP) Earth System Predictability Project is focused on enhancing predictive capability for earth system components such as soil moisture, wildfire occurrence, marine biogeochemical processes, sea level and statistics of climate extremes on time scales of months to decades, which align well with contemplated WGSIP research foci and the WCRP Strategic Plan. It was noted that 3 groups in Korea are contributing to CMIP6 (ICCP, KIOST and KMA).

4.4. UKMO – D. Smith

It was noted that NAO skill depends on teleconnections with tropical rainfall and initial conditions in the stratosphere. The high correlation skill for European summer rainfall requires a large ensemble. Regarding the S/N paradox, the new hypothesis being investigated is the possible lack of small-scale eddy feedback.

4.5. ECMWF – L. Ferranti

The plot showing skill increments as functions of ensemble members per day, number of lagged days (up to 5) and subseasonal forecast range (up to 32 days) was found very interesting. For forecast weeks 2, 3 and 4, the advantage of increasing ensemble size by incorporating lagged forecast outweighs the diminished skill of the lagged forecasts, provided the number of ensemble members per day is sufficiently large. Saturation is not reached beyond 19 days lead time suggesting longer lags may further enhance performance for longer forecast ranges and below certain ensemble sizes.

4.6. INM RAS – M. Tolstykh

INM RAS has developed a coupled model that will be applied to subseasonal and seasonal forecasting. A question was posed as to the potential contribution from coupling to wave/sea state models. It was commented that there might be some benefit, although not large.

4.7. CSIR – A. Beraki

A new CSIR global coupled model that can operate in a stretched grid mode to provide enhanced resolution over southern Africa was viewed as a very interesting development.

4.8. h. NILU – Y. Orsolini

It was commented that although the coupled nudging initialization in NorCPM is intended to limit initial shocks, the scrambled snow initialization likely will generate some shocks.

4.9. JMA/MRI – Y. Takaya

The next-generation JMA/MRI-CPS3 seasonal prediction system with ~55 km resolution is due to go into operation by 2022. The benefits of a seamless approach, from subseasonal to decadal time scales to address systematic errors was highlighted. Incorrect positive low-cloud feedback on SST in the eastern equatorial Pacific during El Nino was corrected by introducing an improved scheme to describe stratocumulus development.

4.10. ECCC + NMME – B. Merryfield

An improved 2-model seasonal prediction system CanSIPSv2 is scheduled to become operational in July 2019. Decadal predictions for CMIP6 are from CanESM5, whose very high Equilibrium Climate Sensitivity of 5.8°C was noted as being among several CMIP6 models having high ECS.

4.11. IRI – Á. Muñoz

IRI's new seasonal prediction system is NMME-based, using Extended Logistic Regression for calibration, and a SubX-based subseasonal forecasting system also using ELR has been developed. The utility for decision making of IRI's PDF-based Flexible Forecasts was noted. The new IRI Climate Prediction Tool (CPT) was presented, evolving now into the NextGen system to account for nearby patterns.

4.12. Climate prediction research and operations in China – Hongli Ren

Invited expert Hongli Ren summarized the spectrum of current climate prediction activities in China, which has complex regional climate dynamics including the East Asian Monsoon, and significant climatic vulnerabilities. Recent initiatives include a new earth system model for CMIP6, a China Multi-Model Ensemble (CMME) for seasonal prediction, and a Climate Phenomenon Prediction System that uses dynamical models and physics-based statistical models to predict climate variability indices. Attendees were impressed by the work presented, which can contribute significantly to the work of WGSIP in many areas and motivates increased engagement of WGSIP with China's climate prediction research and operation communities.

5. Links to services and engagement with WMO operations

5.1. ACToday: Adapting Agriculture to Today's Climate for Tomorrow – A. Munoz

NextGen fulfills user needs for tailored predictands beyond seasonal means, e.g. onset/demise dates for rainy/dry seasons, planting dates, energy consumption, etc., with typically a 12-month implementation schedule in South and Central American countries. It was commented that the NextGen system applies naturally across time scales and offers bridges between Research and Operations as a great tool for objective multi-model climate predictions for use e.g. in RCOFs. The calibration is done in each model space, then in probability space in the multi-model space. For rainfall, the pdf is transformed in a gamma distribution. IRI's Flexible Format system is used.

5.2. Update on S2S and its integration with WMO operations – B. Merryfield

S2S Phase 2 is supported Nov 2018 – Dec 2023 with a new array of sub-projects. The need to archive ocean data was noted, in particular to identify ocean biases, and it was suggested at the April 2019 S2S SG meeting to collaborate with WGSIP on the evolution of ocean biases on S2S time scales. The list of ocean variables currently includes a set of 2D fields and would be reviewed on a regular basis. There will be a one-month access gap on the S2S ECMWF

database because of the physical migration to Bologna. Some efficiencies might be gained by identifying data sets not being used.

5.3. Update on WMO IPET-OPSLS activities – Y. Takaya

The presentation and discussion focused on further enhancing the operation-research link through engagement between WGSIP and the WMO IPET. Opening operational data for research including hindcast data from LC-LRFMME will be mutually beneficial. Reference was made to the outcome of the IPET-OPSLS meeting held in Barcelona in 2017, where it was suggested that LC-LRFMME could complement CHFP as a source of multi-system hindcasts for research. However, LC-LRFMME systems are periodically changing, whereas CHFP is intended as a permanent archive, and WMO serves data in Grib, vs. NetCDF from WCRP. Therefore it was proposed by WGSIP that CHFP and LC-LRFMME set up a "pipeline" for grib2-NetCDF conversion and data export to CHFP, which once established could be repeated with relatively modest effort for all existing and future hindcast datasets.
Another recommendation of the Barcelona meeting was forming a joint task group aimed at closing the gap between research and operations, and there was agreement this should be put into action, possibly by tacking a specific issue on advancing operational infrastructure chosen from a previous joint document on research requirements for advancing operations. Overall, strong connection needs to be maintained between this expert group and WGSIP.

5.4. Recent WGSIP engagement with WMO – W. Merryfield

The role of Regional Climate Centers was emphasized as a useful interface for practical applications where WGSIP and WMO can collaborate on the Research-Operations linkages.

5.5. WMO North Eurasia Climate Centre and North Eurasia Climate Outlook Forum – V. Khan

A major evolution in this RCOF region involving 9 neighboring countries is the move to objective outlooks, where NextGen could be used (Cyrillic version available soon). Other regions, e.g. South Africa are also moving to objective combination of models. There is a lot of potential for decadal prediction in the region. The fire model uses precipitation and temperature without inputs from land types.

This is a very challenging area for seasonal forecast, even in Canada, where conditional skill could be explored in the context of strong polar vortices. It was suggested to use weather types at the multi-model level, as they help identifying additional sources of predictability. C3S also has a fire product based on IFS.

Suggestions for WGSIP engagement with RCCs and RCOFs include (i) support of RCOF sessions through WGSIP members attending and exchanging current scientific and technical knowledge, (ii) collecting feedback from RCCs on new requirements for LRF products, (iii)

provide technical and scientific guidance to RCCs incorporating WMO's new annual to decadal predictions into their outlooks, and (iv) help support regional training, e.g. pre-RCOF.

The desirability of formalizing a joint WGSIP/IPET-OPSLS task group aimed at closing the gap between research and operations (see 5.3 above) was reiterated.

5.6. Discussion on how WGSIP can further engage with WMO to facilitate R2O/O2R knowledge exchange

All centers were encouraged to publish their hindcasts on CHFP. RosHydroMet will do so soon. Training and translation of objective forecasts into practical guidance is still sorely needed from a value cycle perspective. This applies across all time scales.

Further suggestions adding to those above (including under 5.5) were that WGSIP could gather feedback from RCCs on research needs perhaps via a survey, as well as feedback from RCCs on the performance of consensus and individual model forecasts in the respective regions.

6. Updates on related initiatives – W. Merryfield

6.1. C3S – A. Brookshaw

Decadal prediction and extreme event attribution are developing C3S activities, soon to be tendered. NCEP, JMA, ECCC and BoM seasonal forecasts to be added in next 1-2 years.

C3S was invited to get engaged into the workshop planned around the 2020-2021 timeframe.

6.2. APPLICATE – L. Batté

A current APPLICATE focus is evaluating skill of existing EU seasonal prediction systems and S2S subseasonal systems in the Arctic, including for sea ice. Impacts of model enhancements are then being considered. Among these, the ongoing efforts of the Barcelona Supercomputing Centre, the Université Catholique de Louvain-la-Neuve, and Météo-France on melt pond and/or land fast ice parameterization, and of the UKMO on soil moisture and snow initialization were noted.

6.3. PAMIP – D. Smith

The driver of PAMIP was to understand the role of sea-ice on mid latitude/NAO, but previous model studies show a broad NAO response which depends on forcing and background state. PAMIP will provide coordinated simulations from many models to identify robust emergent constraints. First results point to a negative NAO response to Arctic sea-ice reduction and further analysis is underway to assess the magnitude of the response.

6.4. PPP – M. Tolstykh

Seasonal forecast is mainly focused on sea-ice extent. APPLICATE is a YOPP endorsed project, which metadata portal points to the various sites where data are being archived. The site will be maintained for a while after 2022 and providers have been requested to serve their data after that.

6.5. FRAMS – W. Merryfield

Prediction of dates for freezing of Arctic sea ice tends to be more robust than for retreat because retreat depends more on the atmosphere and SST plays big role, e.g. in the Chukchi Sea with hence a stronger impact there on the timing of ice advance. FRAMS-supported Arctic sea ice forecasts are already informing WMO Pan-Arctic Regional Climate Outlook Forum (PARCOF) seasonal outlooks.

6.6. DCPP and GC-NTCP – D. Smith

There is an appetite from RCOF Arctic for decadal forecasts, and WMO networks should be made aware of the Annual to Decadal Climate Update. SPARC will provide source data for real-time volcano runs.

6.7. IPCC WG1 report – J.-Y. Lee

Early results indicate that multiple CMIP6 models have very high Equilibrium Climate Sensitivities, and it remains to be seen if or how this will impact CMIP6 decadal hindcasts and forecasts. The question was posed as to the observations being used for the comparison of Equilibrium Climate Sensitivity. Runs from e.g. MiKlip are being initialized, hence suggesting that all GCMs projections are overestimating warming.

7. Scoping and selection of new WGSIP-led Projects

Co-chairs outlined the various topics proposed during the consultation held prior to the WGSIP21 session. The projects below were retained after two sessions of brainstorming. Attendees supported the idea to continue the current sub-projects for a while, to ensure synthesis and dissemination of outcomes.

GPCs will open up their hindcasts data on seasonal time scales (pending one response), which could then also be published on CHFP after transformation from Grib to NetCDF format, offering the possibility to verify models and track progress on model generation.

CHFP has a lot of value and maybe the best option forward is to populate it with GPC/LC hindcasts with whatever period they can provide. Meteo-France for example offered to provide hindcasts from 1993 to 2016 (also published at Lead Centers). Resourcing of CHFP remains an issue.

Attendees felt that an additional sub-annual effort under CMIP auspices was potentially duplicating existing efforts on seasonal or decadal time scales.

There is currently a diversity of archives along time scales and the Research-Operations landscape. This could be rationalized and streamlined significantly.

It was commented that hindcast data also represent an opportunity for furthering research on postprocessing and multi-model calibration.

Three levels of effort were identified:

1. Continuous record of hindcasts of systems to track performance: CHFP could handle if the number of variables to archive is not too large
2. With more variables at higher frequency, a distributed approach would need to be pursued (C3S, NMME, etc)
3. A common platform for all data seems difficult to implement for the moment

Option 1 with useful interfaces on option 2 seemed likely the best and most pragmatic approach.

After much discussion, the new projects outlined in the following sections were proposed.

7.1. Prediction capability

The main objective of this project is to mine existing hindcast datasets, including but not limited to the CHFP, in order to fill knowledge gaps in relation to key predictive capabilities. Performance of individual systems will be assessed and intercompared, as will multi-model combinations. The initial targets were chosen based on their societal importance (monsoons), potential fertile ground with respect to predictability and new applications (oceans), and fundamental relationship to system performance (temperature trends). Insights into processes that underlie predictability and pathways for improving predictions will also be sought. These components may be views as sub-projects of the CHFP.

The new projects are outlined in greater detail in concept notes that will be posted in WGSIP's web space.

7.1.1 Monsoons: The proposed focus of this sub-project is on assessing and improving prediction capabilities. A specific focus is the Asian summer monsoon, but additional aspects of the global monsoon system, both regional and as a single entity, will be considered. It seemed important to also address teleconnections between various monsoon in this context. Besides precipitation, temperature, and wind, geopotential height at 850, maybe 50 and 200 hPa could be useful.

7.1.2 Ocean forecasting: The inherent predictability of the oceans is relatively high, yet there have been relatively few efforts to evaluate seasonal prediction skill for ocean variables other than SST. Seasonal hindcast data for additional ocean state variables including sea surface height (SSH) and three-dimensional temperature, salinity, and ocean currents is available for a range of models in the CHFP and NMME data archives, and efforts are underway to add such data to the C3S Climate Data Store. This sub-project will examine the abilities of multiple systems to predict such less-studied ocean variables, emphasizing predictands that may be societally relevant such as interannual variations in SSH. A key issue that will be addressed as part of this

study is the dependence of forecast quality on datasets used for verification, which for this study will consist primarily though not entirely of ocean reanalyses. This is motivated by the relatively large uncertainties of and differences between ocean reanalyses, and by the possibility that better verification datasets might be obtained by combining multiple reanalyses, in much the same manner that multi-model forecasts generally outperform individual models.
Related initiatives and contact points: C3S; S2S; potential synergies with CLIVAR also will be explored.

7.1.3 Temperature trends in seasonal forecasts: Seasonal temperature forecasts derive some of their skill from long-term temperature trends (and decadal forecasts even more so). However, how well seasonal forecasts represent observed global and local trends has been investigated only for a few individual systems, and little has been published on this topic recently although some internal analyses e.g. within the NMME point to significant deficiencies for some models in representing global and regional temperature trends. This issue will be reexamined using hindcast data from a variety of seasonal forecasting systems, principally those in the CHFP data base. Temperature trends in these hindcasts will be assessed, and further analysis will aim to identify causes of unrealistic trends in relation to radiative forcing, initialization methods etc. Such information will provide valuable indications for how skill for predicting temperature and possibly other variables could be improved. These analyses will be extended to subseasonal and decadal predictions if resources permit.
Related initiatives and contact points: WMO LRF-MME, NMME, C3S

7.2. Quantifying the risks of extremes

This project will use initialized hindcast datasets, including CHFP, to assess the current risk and predictability of extreme events. The risk of extremes, including unprecedented events, will be quantified following the UNSEEN (UNprecedented Simulated Extremes using ENsembles) approach. A variety of extremes, potentially including compound events, will be examined, and the associated dynamical processes will be investigated to gain a better understanding of potential drivers and predictability.

The hindcast datasets employed for the Prediction Capability project will also enable comparative assessments of skill for predicting the risks of extreme events e.g. outer quintiles or deciles.

7.3. Information for decision making

This project aims first of all to assess and improve calibration methods for ensemble probabilistic forecasts that are needed in the process of translating forecasts from imperfect models into products for decision making.

Secondly, it will undertake capacity building in the form of training schools and guidance for the operational community.
Related initiatives and contact points: IPET-OPSLS, S2S, SERA

8. TPOS 2020 proposal for periodic assessments

TPOS 2020 in its 2nd Report has recommended the initiation of routine and periodic intercomparisons of operational sub-seasonal and seasonal to interannual prediction systems in order to track progress in improving forecast performance and reducing model biases, especially in the tropical Pacific. This would fill an important gap because currently there is no community-wide systematic effort in place to quantify progress of such prediction systems on a regular basis (similar to what CMIP does for climate projection models). Operational centers would also be encouraged to carry out additional simulations besides hindcasts (e.g. AMIP and free coupled runs) with their new systems to further inform these assessments.

In terms of hindcast skill and model bias assessment, specific statistics could be collected from each center and could include CMIP-like Taylor diagrams, for example. These assessments could also be extended retroactively using CHFP to evaluate past performance and track performance. The option could be open for each center to put their data on CHFP or to provide their statistics; the former, if done routinely through arrangements with the WMO LC-LRFMME as previously discussed would help systematize the process. WGSIP's LRFTIP project could contribute to metrics for and evaluation of model biases. ECCC offered to coordinate this effort.

The need for additional experiments such as free coupled runs would require some thought, as the spin-up and memory of the ocean spans >10 years so that model adjustments and properties of historical and/or equilibrium simulated climates may tend to be mixed. Encouraging operational centers to perform such simulations routinely with system upgrades would require buy-in from the WMO, and possibly regional efforts such as C3S, NMME and CMME. The most effective path may be to formulate a joint implementation plan with the WMO IPET-OPSLS presuming it views such an initiative positively. Such a plan could be folded in with the envisaged systematic transfer of hindcast data to the CHFP, and could be discussed and facilitated by the proposed joint task group.

TPOS2020 is also interested in optimizing the TPOS observing system and understanding the contribution of each component through Observing System Simulation Experiments (OSSEs). ECMWF and JMA are already performing these experiments and USA could possibly join too.

9. WGSIP Business

9.1. Next WGSIP session and workshop

Attendees suggested a WGSIP22 session in about a year after the WGSIP21 session, organized back to back with a workshop focused on Ensemble Prediction of Extremes. Initial options included Hamburg in fall 2020 or Trieste in Winter-Spring 2021. Holding those within AOGS 2020 could turn out to be expensive.

In parallel, APCC in Busan offered to host those sometime in fall or winter 2020, which seems quite effective and would also give more lead time for preparation. The idea would be to have a 2-3 day workshop and 2-3 days for the WGSIP22 session. Incidentally, it appears WGSIP has never met anywhere in Asia so this would be a commendable first. Dr. Jin-Ho Yoo, Director of the Climate Services and Research Division, confirmed that APCC is very positive for hosting

the workshop and WGSIP session. October is a nice period to visit Busan. The main Lecture hall at APCC can hold about 70 people and there are several smaller meeting rooms which can hold about 20 people.

9.2. Memberships

A call for self-nominations is currently being issued. Co-chairs will examine all applications received in light of terms of current memberships and expertise required to support the newly established sub-projects and to maintain a strong Research-Operations connection with IPET-OPSLS.

9.3. Review of draft actions list

The draft action list was reviewed and is summarized in Appendix A.

APPENDIX A – ACTION LIST

(actions from previous sessions are consolidated in this new list)

Existing sub-projects

1) SNOWGLACE: connect to GEWEX initiative on Third Pole/LS4P (Yvan)
2) Shocks and drifts: 1-2 publications (Ramiro + Francois Massonnet + Bill+ Mikhail)
3) Teleconnection: explore causality framework, Michel to forward publications from Alex Runge to Laura
4) CHFP: institutionalize transfer of hindcast sets with Lead Centers (including NMME, China, JAMSTEC & SINTEX, RoshHydroMet) + complement variable list when appropriate. Initiate discussions with WMO IPET-OPSLS and LC-FRFMME for this purpose. (Ramiro+Laura+Bill)

Collaboration with S2S

5) Request S2S to add surface wind speed to S2S data base (Yuhei)
6) Scope addition of hindcast climatologies for S2S ocean fields to LRFTIP database, collaboration on subseasonal time evolution of ocean biases with S2S ocean project led by H. Hendon (Bill)

Collaboration with WMO and TPOS2020

7) connect to WMO IPET-OPSLS R-O through joint membership, update each other during meetings; officialize proposed joint task team on R-O (co-chairs, Laura, Yuhei)
8) Explore with IPET-OPSLS and LC-LRFMME possibility of institutionalizing transfer of GPC hindcast data to CHFP (co-chairs, Ramiro)
9) Develop initial proposed framework for seasonal prediction system evaluation emphasizing the tropical Pacific, seek feedback from TPOS2020 and IPET-OPSLS (Bill)

New sub-projects

10) Develop concept notes on:
    PREDICTION: Bill+Yuhei
    EXTREMES Doug+ Hong-Li Ren
    INFORMATION FOR Decision making: Angel Muñoz + Lauriane
    + pursue initial steps for these projects.

<u>Ocean</u>

11) S2S / C3S Laura/Bill Ocean variables - Mich to forward S2S ocean table+ C3S table, + Lauriane in the loop
12) obtain S2S ocean list - Mich
13) strawman on ocean verification (skill and bias) – Bill
14) observations impact/data denial (2 separate actions) - Laura+Yuhei
15) Mercator to be approached wrt ocean reanalyses - Lauriane
16) connect with Ocean Predict/GODAE, CLIVAR GSOP - Bill

<u>Extremes</u>

17) Explore collaboration with US CLIVAR wrt large ensemble (in relation to sub-project on extremes - Bill + Yuhei
18) other groups to develop similar “ensemble members vs lag” plots as shown in Laura’s ECMWF presentation, which will help inform IPET-OPSLS request for guidance on burst vs lagged ensembles - Debbie/BOM, Yuhei/JMA, Mikhail

Business

19) Identify dates and venue for WGSIP22 session and workshop on Extremes: explore AOGS, University of Hamburg, ICTP and APCC options - Mich, asap
20) Prepare initial announcement for 2020 workshop on extremes, engage with GC Extremes and S2S - co-chairs, June-Yi)
21) Review WGSIP web pages - all
22) formulate membership plan for 2020 - co-chairs
23) organize a teleconference before JSC 41 - co-chairs, Mich

APPENDIX B – CONTACT LIST

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APPENDIX C – NEW SUB-PROJECTS

	JB	LB	AB	LF	DH	J-YL	WM	YO	DS	RS	YT	MT	AT	AM	HR	…	CONNECTIONS
1. PREDICTION CAPABILITY (SP 2.1)																	
Monsoons																	CLIVAR-GEWEX IPO IITM
Temperature trend																	
Ocean				ECMWF													GSOP, TPOS2020, S2S
Extremes (including outer quantiles, etc)				ECMWF													GC Extremes
2. EXTREMES (SP 2.2)																	US CLIVAR large ensemble, GC Extremes
Extremes/unprecedented/UNSEEN methodology																	
Risk, compound events																	
3. INFORMATION FOR DECISION MAKING (SP 4.2)																	S2S, SERA, ET OPSLS
Calibration	TBD																
2 tier systems across time scales																	
Capacity building																	

Tentative tasking for new sub-projects and their component

The
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