

Outcomes of the Second Operational Climate Prediction Workshop: approaches to facilitate transition of research results into operational use

**Caio Coelho (Joint CBS/CCI IPET-OPSLS co-chair)
CPTEC/INPE, Brazil
caio.coelho@inpe.br**

Acknowledgements: Arun Kumar (IPET-OPSLS chair), Rupa Kumar Kolli (WMO), Anahit Hovsepyan (WMO), Francisco Doblas-Reyes (co-chair WMAC), William Merrifield (co-chair WGSIP), Yuhei Takaya (S2S member)



Presentation plan

- **Introduction to operational climate prediction**
- **Second Operational Climate Prediction workshop (OCP-2): goals and expected outcomes**
- **Research-Operations linkages: inputs from WGSIP, S2S and ET-OPSLS**
- **Potential mechanisms for accelerating R2O and O2R value cycle: building on existing platforms at regional scale**

**WMO International Workshop on Global Review
of Regional Climate Centre Operations
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Introduction to Operational Climate Prediction

The three facets of Operational Climate Predictions (OCP):

- 1) Operational infrastructure for long-range forecast (LRF): referring to Global Producing Centers for LRF (GPC-LRF), Lead-Center (LC) for LRF Multi-Model Ensemble, LC for Standardized Verification System, GPC and LC for Annual to Decadal Climate Prediction
- 2) Delivering Climate Services: conformed by the Global Framework for Climate Services (GFCS) and the Climate Services Information System (CSIS)
- 3) Research to support further advances, with two working groups: one on sub-seasonal to Interdecadal Prediction (WGSIP) and the other one on Sub-seasonal to Seasonal Project (S2S) a joint initiative by WCRP and WWRP

Second WMO Operational climate prediction workshop

- **Goal:** to bring representatives of these three communities together to advance communication and coordination and to have a better understanding of the gaps, needs and factors that will enable improved coordination
- **Expected outcomes:** to identify good practices for developing climate outlooks and their delivery; to develop a guidance document and conceive pilot demonstration projects to put “good practices” in action; **to identify pathways for operations and research interactions**; and to summarize the outcomes in a position paper

Research-operations linkages

**Inputs from WGSIP, S2S and
ET-OPSLs**

World Climate Research Programme (WCRP)

Working Group on Seasonal to Inter-decadal Prediction (WGSIP)

(co-chairs: William Merryfield and Doug Smith)

- **Aims:** facilitate and coordinate research on sources of predictability in the climate system and the ability of dynamical models to exploit that predictability.
- Explores effective ways of initialising climate predictions and methods for extracting and communicating climate prediction information.
- These objectives are achieved through initiatives such as **targeted community research project and enabling access to hindcasts from different climate prediction systems.**
- The objectives are also **facilitated by providing platforms for scientific discussions and for coordination** between different organisations dealing with research and operational aspects (e.g. meetings, workshops, conferences).
- One of the key foci of the WGSIP is to **establish closer cooperation that enhances Research-to-Operations (R2O) and Operations-to-Research (O2R) transfer of knowledge and expertise.** To this end, the **co-chairs of the WGSIP and Expert Team on Operational Predictions from Sub-Seasonal to Long Time-Scales (ET-OPSLS)** have agreed to form a joint task group to close the gap between research and operations.

**Sub-seasonal to seasonal prediction (S2S) project
co-chairs: Frederic Vitart and Andrew Robertson
reported by Yuhei Takaya (S2S project and ET-OPSLs member)**

- Major Phase 1 achievement (2013-18): establishment of the S2S database comprising near real-time and reforecast data from 11 producing centres.
- S2S collaborates closely with WMO Lead Centre for Long-range Forecast Multi-Model Ensemble (LC-LRFMME) to build a platform for pilot exchange of subseasonal forecast model output, and conducts several S2S sub-projects, including one on verification and products development of great importance for OCP
- In the project's ongoing Phase 2 (2018-22) the S2S database will be enhanced, new research activities (sub-projects) covering a wide range of targeted topics will be conducted, and the operational infrastructure and user application aspects of the initiatives will be further enhanced

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- A number of examples of application products, such as MJO index forecast, frequency of extreme temperatures, Arctic SST and SIC, tropical cyclone forecasts and joint activities between the S2S Project and WMO's operational entities and projects (e.g. Regional Climate Centres, National Meteorological and Hydrological Services, Severe Weather Forecast Demonstration Project) demonstrate good practices of existing efforts in bridging research and operations.
- Researchers encouraged to share innovative and practical applications, software and data with the operational community.
- In the future it is planned to improve the time resolution of models available on the S2S database (implementation details to follow).
- S2S data and products are planned to be made operationally available upon the completion of Phase 2.

Inter-Programme Expert Team on Operational Predictions from Sub-seasonal to Longer-time Scales (IPET-OPSLS)

chair: Arun Kumar, co-chair: Caio Coelho

- The research issues of IPET-OPSLS fall under three categories:
 - 1) Configuration and infrastructure of operational forecast system
 - 2) Product generation
 - 3) Verification
- These issues include, for example, determining the relative merits of bursts against lagged ensembles in developing forecast products, merits of equal against skill-weighted averaged multi-model ensemble, the value of dynamical downscaling, quantifying progress in long-range forecast systems, LRF requirements under the evolving observational system, and if different verification measures for forecasts of the different timescales are needed.
- A number of more specific aspects of LRF require further research, in particular in products generation (e.g. based on daily forecast outputs), and verification of forecasts.

Inter-Programme Expert Team on Operational Predictions from Sub-seasonal to Longer-time Scales (IPET-OPSL)

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- When addressing OCP for new timescales, and therefore developing new products, accompanying new verify products need to be developed.
- Further enhancing the link between operations and research and promote transitioning of research into operations remains a challenging task
- This link could be strengthened through building meaningful partnerships for more effective communication and better understanding on the flow of innovation. For this purpose **enabling mechanisms for tangible interaction between operations and research needs to be identified**, and **several joint demonstration projects to be implemented**.

Potential mechanisms for transitioning research into operations: Discussion prior to the workshop

- How to communicate operational needs to research and build up a research agenda to address the needs, and if there are research advances, how to communicate them to operations. In other words, R2O and O2R aspects need to be considered.
- While there is a list of items operations has identified for research to address with relative urgency, the mechanisms (and enablers) through which research can feed operations with the latest findings from the climate forecast research community still need to be clearly identified.
- The same applies for the channels through which operations can formulate its requirements to research to be prioritized in research initiatives.
- **Some of the possible mechanisms and enablers could include:**
- WCRP regularly providing a summary of the most relevant research activities (e.g. S2S-S2D conference, Boulder, September 2018).
- Operations calling regular meetings inviting those of the research community that worked on the aspects previously identified as a priority.
- Clearly identifying joint “research-operational” projects in research programmes and setting up channels for regular communications (e.g. along the lines of WCRP Grand Challenges limited lifetime projects).

Potential mechanisms for transitioning research into operations: Discussion prior to the workshop

- Implementing an online mechanism (wiki, ticketing system, etc.) where operations can interact with a number of members of the research community. This will allow to keep track of the number of open issues and their progress
- Identifying what enablers need to be in place to facilitate successful research and operation interactions, for example, 1) availability of hindcast and real-time forecast data from LC-LRFMME, 2) flexibility by operational centres to do some joint experiments to address key research issues
- Stimulate initiatives similar to the [NOAA Climate Testbed](#) to facilitate coordinated collaboration between the research and operational communities through competitive grants for projects targeting pre-defined areas in need of novel developments in order to accelerate the transition of research to improved operational practices
- All possible mechanisms need to take into account the regional aspects of climate forecasting . Different regions will have different needs and prioritize the research requirements in a different way

Discussion on potential mechanisms for accelerating R2O and O2R value cycle, building on existing platforms at regional scale

- To promote research-operations and operations-research value cycle, participants made some concrete suggestions on potential mechanisms and further development of existing platforms.
- One of the recommendations was **to develop a framework within the community, where research is operationalized through a bidirectional approach i.e. top-down driven by operational needs or bottom up driven by innovative push of research.**
- Most participants felt that the **value cycle would be more easily enhanced if it was driven by operational needs, as needs of the community can already be harvested from, have been often expressed but have been largely untapped from the Regional Climate Outlook Forums (RCOFs).**
- While there had been progress since the earlier days in consulting users and factoring in their needs in directing research and developing products, much more could be done to address some of the basic, persistent scientific questions raised at RCOFs by tapping on established linkages between the operations and research communities. A specific, **first-step recommended action would be the co-authorship of journal publications highlighting issues raised at RCOFs.**

Discussion on potential mechanisms for accelerating R2O and O2R value cycle, building on existing platforms at regional scale

- Another recommendation was to **create a closely-knit joint community between operations and research to develop solutions cooperatively**, which will help to contextualise the research outcomes and aid the design and provision of end-products for the services community.
- The **joint community** will also be a **useful channel to facilitate feedback and improvements between the two groups**. It was acknowledged however that for such activities to sustain, substantial resources (including financial) need to be invested, and proper success indicators need to be developed to robustly assess initiatives.
- Activities within this **joint community** can also be **better promoted and strengthened by sharing model data and adopting data standards**. These in turn can promote regional-specific research, which the region can undertake, before operational centres decide to invest resources to operationalize the products.
- The **visibility and effectiveness of such platforms could be enhanced further by actively and professionally publicising its activities**. Given that the market demanding climate services is developing rapidly, there is a need to tap on these developments, and the recommendations can help to advance the community forward in this regard.

Thank you all for your attention!