

WGSIP Activities

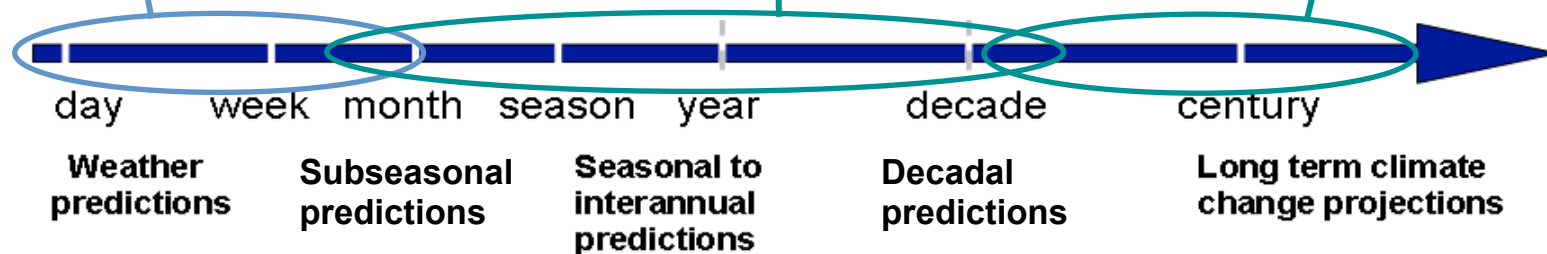
Pan-WCRP Modelling Meeting, Exeter, 9-13 October 2017



Working Group on Numerical Experimentation (WGNE)

Working Group on Sub-seasonal to Interdecadal Prediction (WGSIP)

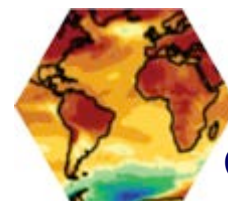
Working Group on Coupled Modelling (WGCM)



Interactions and cross-membership



Decadal Climate Variability
and Predictability (DCVP)
Working Group



Grand Challenge
on Near-Term
Climate Prediction

WGSIP

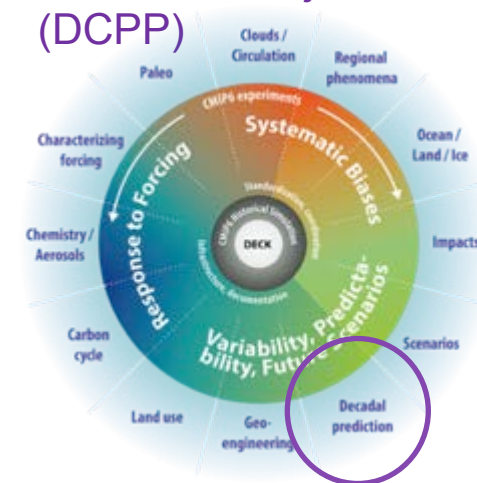


Subseasonal-to-Seasonal
S2S
Prediction Project

IPET-OPSLs



Decadal Climate
Prediction Project
(DCPP)



WGSIP Functions

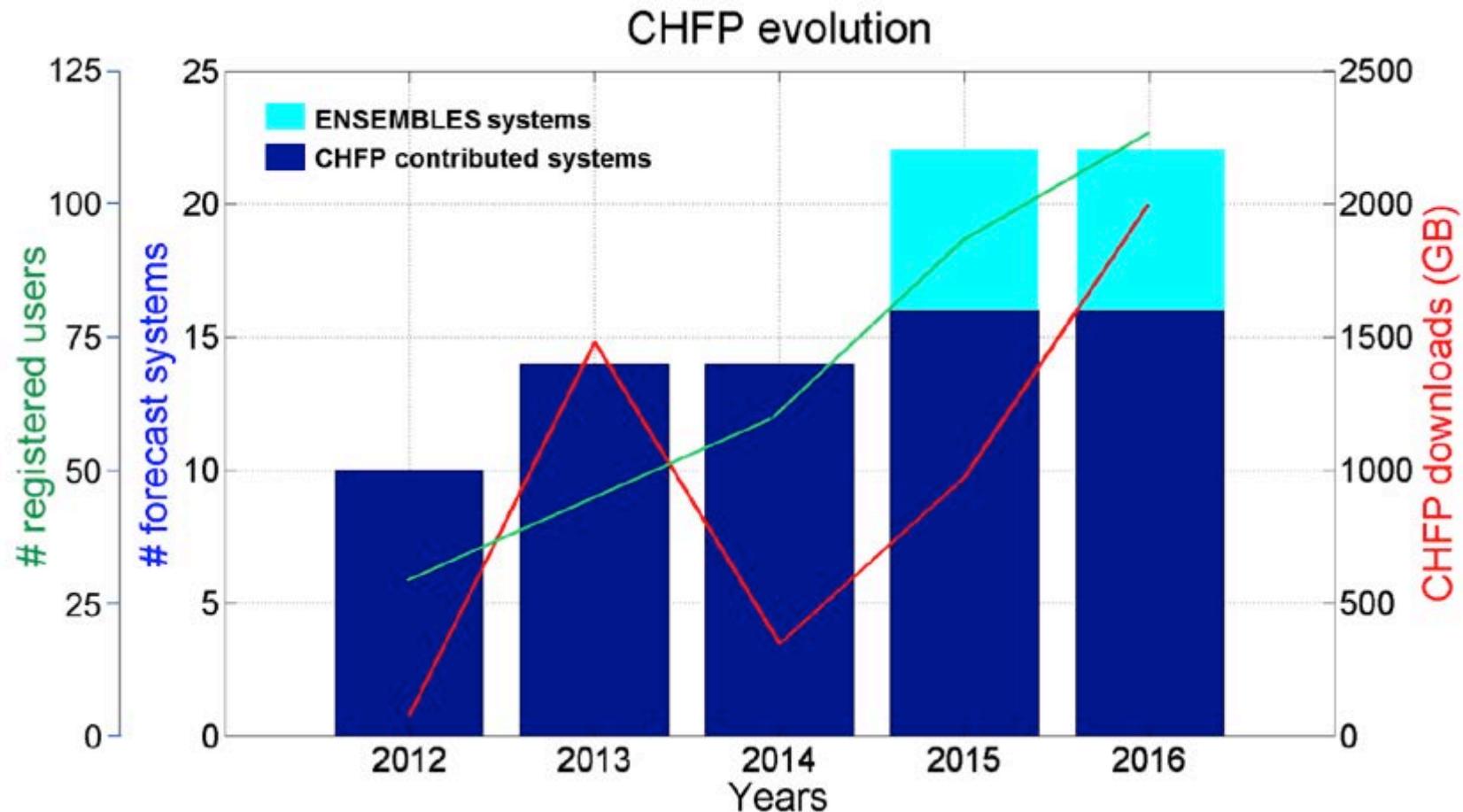
- WGSIP works to facilitate and coordinate research into
 - sources of predictability in the climate system
 - ability of dynamical models to exploit predictability
 - most effective practices for initializing and obtaining information from climate predictions
- WGSIP achieves this by
 - initiating targeted community research projects
 - promoting the storage and dissemination of historical climate prediction datasets
 - organizing scientific meetings
 - facilitating coordination and communication between groups working on different aspects of climate prediction research and operations

WGSIP Projects

- Terms of reference: A primary function of WGSIP is to “Develop a programme of numerical experimentation for subseasonal-to-interdecadal variability and predictability, with an emphasis on assessing and improving predictions”
- Addressed through a series of projects, each involving international collaboration and targeting research gaps identified by WGSIP.
- Common focus of projects is multi-model intercomparison of performance, processes and model behavior
- Larger sample enhances statistical confidence and generality of results, diversity can point to reasons for model differences
- Links to operational climate prediction, aiming to address scientific problems identified
- Historical Forecast Projects (HFPs) \equiv MIPs for climate prediction systems

Current WGSIP Projects – CHFP

- Climate-system Historical Forecast Project (CHFP) is an extensive multi-model archive of seasonal hindcasts
- Supports investigations into seasonal predictability of the climate system and multi-model ensemble forecasting



Current WGSIP Projects – CHFP

- CHFP data served at CIMA:




Centro de Investigaciones
del Mar y la Atmósfera

[What is CHFP](#)
[What is SHFP](#)
[How to Access Data](#)
[ENSEMBLE data](#)
[Documents & Guides](#)



The Climate-system Historical
Forecast Project
at Centro de Investigaciones del Mar y la Atmósfera

The Working Group on Seasonal to Interannual Prediction (WGSIP) develops a programme of numerical experimentation for seasonal-to-interannual variability and predictability, with an emphasis on assessing and improving predictions.



WCRP
World Climate Research Programme

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WCRP Climate-system Historical Forecast Project (CHFP)

Select Variables

- ☐ cR - Total cloud cover
 ☐ Infsd - Surface latent flux
 ☐ prb - Total precipitation
 ☐ rlds - Downward surface longwave
 ☐ rlb - Top net longwave
 ☐ rrs - Net surface solar
 ☐ srdd - Snow depth
 ☐ tasmax - 2m T daily max
 ☐ tauw - Surface DownEast stress
 ☐ tauy - Surface DownNorth stress
 ☐ ts - Surface temperature (SST+land)
 ☐ uas - 10m wind (u)
- ☐ Infsv - Total soil moisture
 ☐ prl - Mean sea level pressure
 ☐ rls - Net surface longwave
 ☐ rlds - Downward surface solar
 ☐ rst - Top net solar
 ☐ tas - 2m temperature
 ☐ tasmin - 2m T daily min
 ☐ tauw - Surface DownNorth stress
 ☐ tds - 2m dewpoint temperature
 ☐ uas - 10m wind (u)

CHFP/SHFP Atmosphere - Surface - Monthly

Component	Select Initial Start Month															
	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Atmosphere	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ocean	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Land	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Type of level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Levels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Surface	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Invariant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Frequency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 hs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Daily	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monthly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Invariant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Clear all


Select Model

- ☐ ARPEGE*
 ☐ CCCma-CanCM3
 ☐ CCCma-CanCM4
 ☐ CFS*
 ☐ CMAM*
- ☐ CMAMlo
 ☐ ECMWF-S4*
 ☐ GloSea5*
 ☐ JMAMRI-CGCM1
 ☐ JMAMRI-CGCM2
- ☐ L38GloSea4
 ☐ L85GloSea4*
 ☐ MIROC5
 ☐ MPI-ESM-LR*
 ☐ poama

(*) stratosphere resolving models

Select all - Clear all

Current WGSIP Projects – SNOWGLACE



WMO WGSIP INITIATIVE:
“SNOWGLACE”:

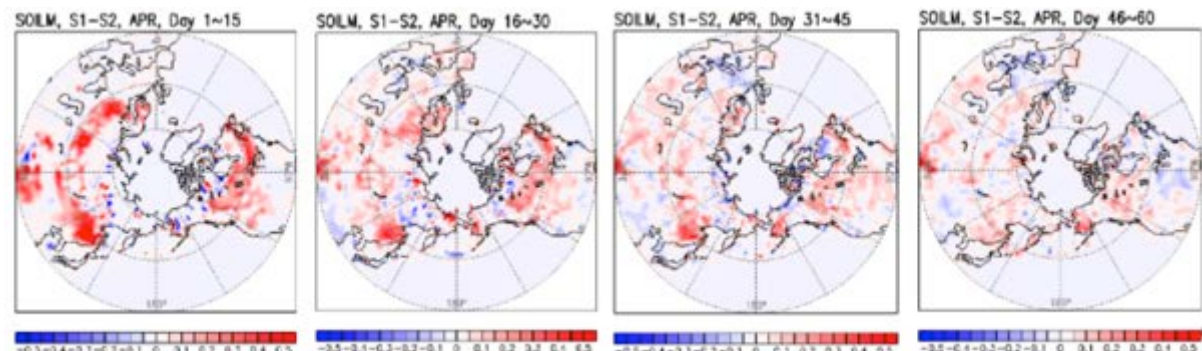
An international project aimed at quantifying snow initialisation impact on subseasonal-to-seasonal forecasts

Yvan J. Orsolini^{1,2} and Jee-Hoon Jeong³

¹ NILU - Norwegian Institute for Air Research, ² BCCR - Bjerknes Centre for Climate Research,
³ Faculty of Earth Systems & Env. Sciences, Chonnam National Univ., South Korea

- Modeling strategy follows that of GLACE2 initiative (compare forecast sets having realistic vs climatological land initializations)
- Participants: ECMWF, BSC (Spain), NILU (Norway), Chonnam National University - UNIST (South Korea), KOPRI (South Korea), IAP (China), Gøteborg University (Sweden)

Increase in soil moisture potential predictability attributable to realistic snow initialization as a function of lead time, 1 Apr initialization



Current WGSIP Projects – Teleconnections



WMO WGSIP INITIATIVE:

**“Interaction/teleconnection between
tropics and extra-tropics”:**

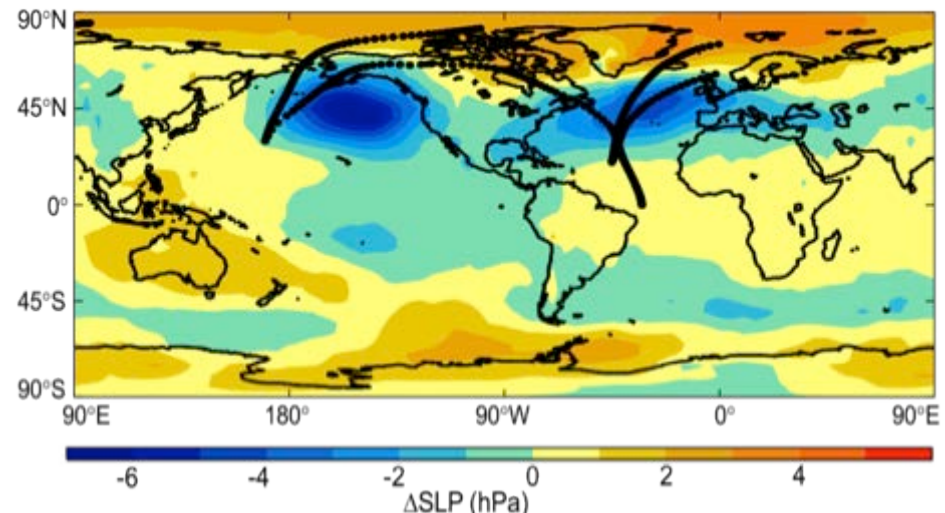
**An international project aimed at diagnosing tropical-extratropical
interactions at seasonal and sub-seasonal time scales**

Laura Ferranti¹ Adam Scaife² Herve Douville³

¹ European Center for Medium Range weather Forecast, ² Met Office Hadley Centre, ³ Meteo France

- Aim is to evaluate ability of current dynamical forecasting systems in representing tropical-extratropical teleconnections, using tropical rainfall to anomalous tropical atmospheric heat sources

Atmospheric teleconnections arising from El Niño in boreal winter. Dots represent approximate pathways of barotropic planetary waves having azimuthal wave numbers 1 and 2, propagating on the observed climatological background wind (after Scaife et al [2017]). Colors show associated changes in sea level pressure in hPa, indicative of atmospheric circulation changes.



Current WGSIP Projects– Shock/Drift



WMO WGSIP INITIATIVE:

Long-Range Forecast Transient Intercomparison Project (LRFTIP)

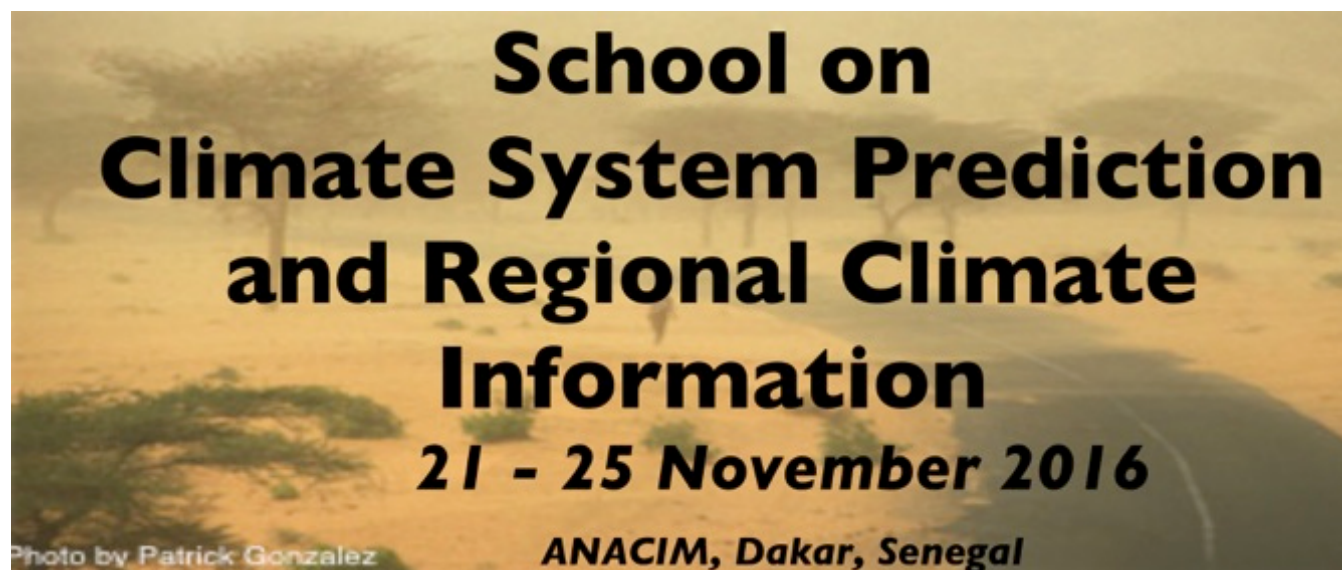
An international project aimed at characterizing transient behaviour of initialized forecasts on subseasonal to decadal time scales

William Merryfield¹ (lead, S2D component), Mikhail Tolstykh^{2,3} (lead, S2S component),
Francisco Doblas-Reyes⁴, Tamaki Yasuda⁵, Woo-Sung Lee¹

¹ Canadian Centre for Climate Modelling and Analysis, Environment and Climate Change Canada, ² Institute of Numerical Mathematics, Russian Academy of Sciences (INM RAS), ³ Hydrometcentre of Russia (HMCR), ⁴ Catalan Institute of Climate Sciences (IC3),
⁵ Japan Meteorological Agency (JMA)

- Purpose is to enable multi-model intercomparison studies of the transient behavior of coupled long-range forecast models evolving from observation based initial conditions
- **Models:** Archive of hindcast and ancillary climatologoes so far includes
 - **4 subseasonal** forecast models (S2S)
 - **19 seasonal** forecast models (CHFP, ENSEMBLES)
 - **15 decadal** forecast models (CMIP5, ENSEMBLES)
- Details presented in WGNE/WGSIP/S2S/OMDP Tuesday joint session

WGSIP outreach



This one week school will include lectures by leading experts from the world Climate Research Programme (WCRP) Working Group on Seasonal to Interannual Prediction (WGSIP) on predictability over the sub-seasonal to decadal timescales, with concrete examples from some of the world's leading operational centers. Lab-based classes will introduce the participants to the new S2S Project subseasonal and CHFP seasonal forecast databases.

- 35 students from Benin, Cameroon, Congo, Ghana, Mali, Niger, Nigeria, Senegal, South Africa, UK

Recent/upcoming WGSIP co-organized meetings

SPECS/PREFACE/WCRP Workshop on Initial Shock, Drift, and Bias Adjustment in Climate Prediction

10-11 May 2016, Barcelona, Spain

International Workshops on Subseasonal to Decadal Prediction

Second International Conference on Subseasonal to Seasonal Prediction (S2S)

[Second International Workshop on Seasonal to Decadal Prediction \(S2D\)](#)

Boulder, CO USA

17-21 September 2018

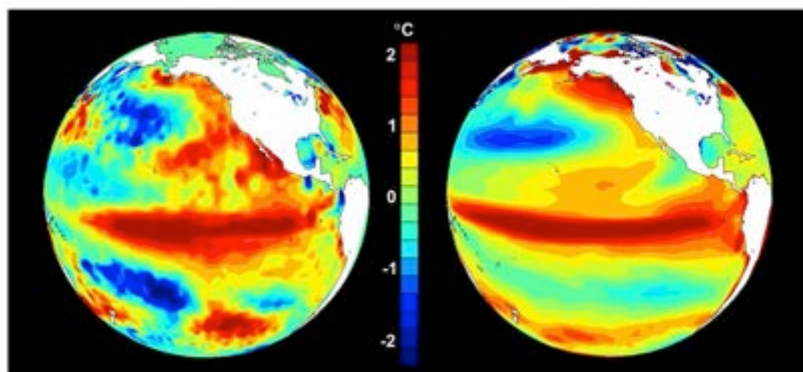
BAMS, Nov 2017 →

Eos, accepted



Advancing climate forecasting

Better forecasts, new products: The World Climate Research Programme coordinates research aimed at improving and extending global climate forecasting capabilities.



The Climate-System Historical Forecast Project

Providing Open Access to Seasonal Forecast Ensembles from Centers around the Globe

ADRIAN M. TOMPKINS, MARÍA INÉS ORTIZ DE ZÁRATE, RAMIRO I. SAURRAL, CAROLINA VERA, CELESTE SAULO, WILLIAM J. MERRYFIELD, MICHAEL SIGMOND, WOO-SUNG LEE, JOHANNA BAEHR, ALAIN BRAUN, AMY BUTLER, MICHEL DÉQUÉ, FRANCISCO J. DOBLAS-REYES, MARGARET GORDON, ADAM A. SCAIFE, YUKIKO IMADA, MASAYOSHI ISHII, TOMOAKI OSE, BEN KIRTMAN, ARUN KUMAR, WOLFGANG A. MÜLLER, ANNA PIRANI, TIM STOCKDALE, MICHEL RIXEN, AND TAMAKI YASUDA

UNCERTAINTY IN SEASONAL FORECASTING. Any prediction of the future evolution of the Earth system requires an associated assessment of its uncertainty. This is true whether the forecast is for the days ahead or is a longer-term prediction for the following months and seasons.

For seasonal forecasts, the uncertainty associated with inexact initial conditions, which can grow rapidly in time, is usually addressed by running multiple forecasts with perturbations applied to the initial state of the ocean and atmosphere (Arribas et al. 2011; Stockdale et al. 2011). The idea is that the perturbed initial conditions are of a suitable magnitude to represent the uncertainty in the observational measurements and the analysis tools

that are used to process them. As the forecast evolves, the differences between the forecasts, known as the ensemble “spread,” should therefore reflect the typical forecast error, or “uncertainty”; in other words, the eventual real-world evolution should be contained within the cluster of this forecast ensemble. In tandem, uncertainty in forecasts is also contributed to by our inexact representations of the Earth system physics. This contribution to uncertainty is sampled by employing different Earth system models (Yun et al. 2005; Weisheimer et al. 2009; Smith et al. 2013), the so-called multimodel approach, which is often supplemented by the use of perturbations to physical processes, known as stochastic physics schemes, to further account for structural errors in a particular

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Aims for this meeting

- WGSIP 19
- Discuss opportunities for new generation of WGSIP projects, taking into consideration input from the research and operational communities
- Identify joint activities with other groups (e.g. WGNE/transpose-CMIP)
- Develop WGSIP contribution to WCRP strategy
- Enhance coordination with the operational community (in particular IPET-OPSLS) towards developing a 2-way research-to-operations exchanges
- Enhanced coordination with DCPD, GC-NTCP and new WMO lead centre