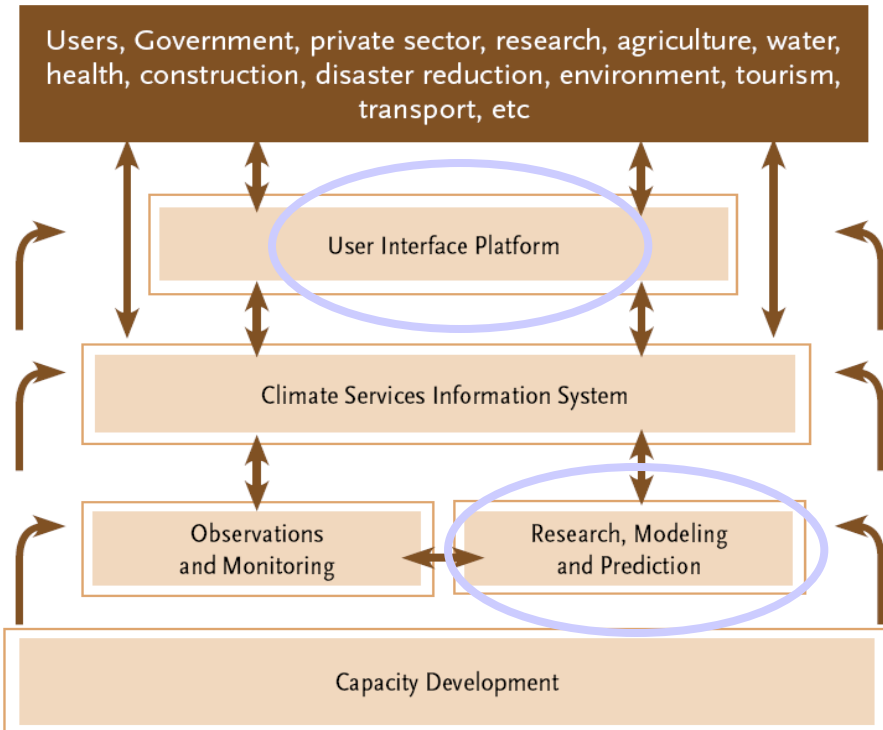


# **WCRP Working Group on Seasonal to Interannual Prediction**

**Adam Scaife & Francisco Doblas-Reyes**

**(WGSIP co-chairs)**

# Near term climate predictions for GFCS: WGSIP with WMO Global Producing Centres





## WCRP Grand Challenge #1

Regional climate information:

Can we provide skilful regional climate predictions at seasonal to decadal time scales and reliable and actionable long term regional climate change projections?

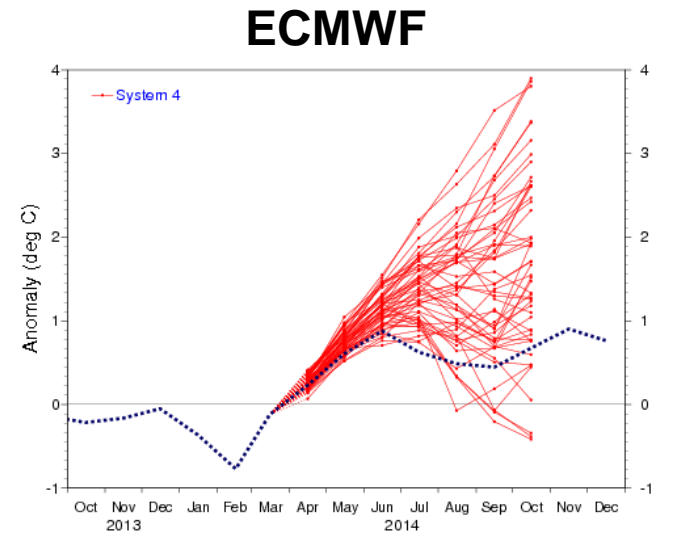
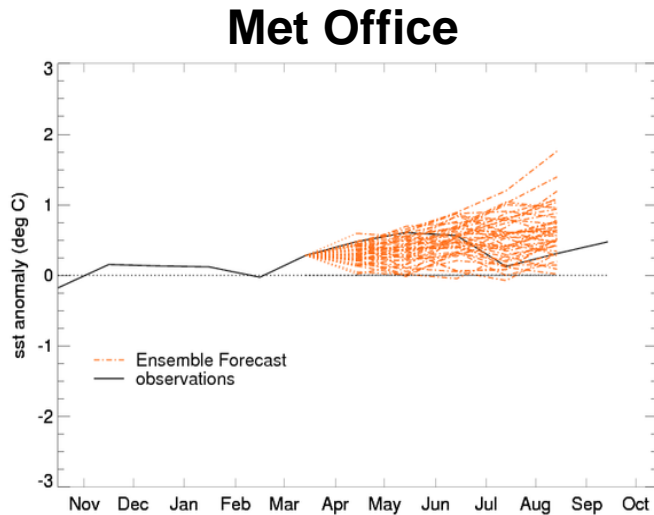
See also the WMO Lead Centre for long range forecast multi-model ensembles: [www.wmolc.org](http://www.wmolc.org)

# WMO Global Producing Centres for real time seasonal forecasts

WMO Global Producing Centres						
 Canada	Montreal	 BGC	Beijing	 ECMWF	 HYDROMETEOROLOGICAL CENTRE OF RUSSIA	Moscow
 Seoul	Seoul	 Tokyo	Tokyo	 Toulouse	 Washington	Washington
 Exeter	Exeter	PCOAMA	Melbourne	 Pretoria	CPTEC	CPTEC

See the WMO Lead Centre for long range forecast multi-model ensembles: [www.wmolc.org](http://www.wmolc.org)

# 2014: El Niño absent again...



ECMWF

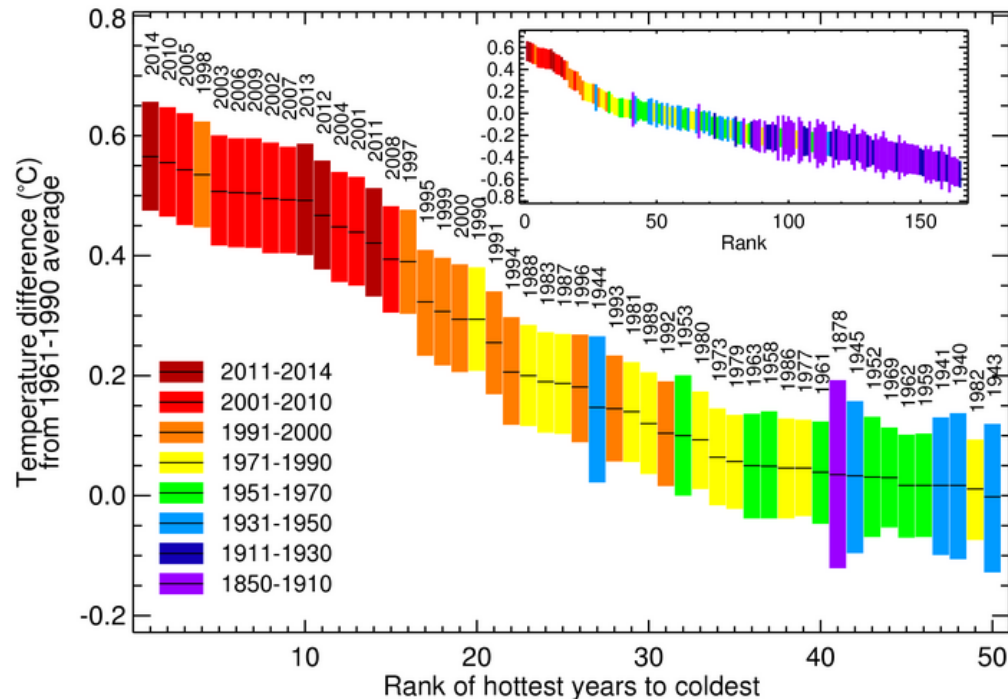
**Forecasts earlier in 2014 were suggesting a heightened risk of a strong El Niño, perhaps even as large as 1997/8**

**Others suggested a minor warming which turns out to have been the case (see black line)**

# Global Temperature 2014

19 December 2013 - The global average temperature in 2014 is expected to be between 0.43 °C and 0.71 °C above the long-term (1961-1990) average of 14.0 °C, with a central estimate of 0.57 °C according to the Met Office annual global temperature forecast.

Taking into account the range of uncertainty in the forecast, it is likely that 2014 will be one of the warmest ten years in the record which goes back to 1880.





**CIMA**

*Centro de investigaciones  
del mar y la atmósfera*

Welcome

**CHFP**

The Climate-system  
Historical Forecast Project

<http://chfps.cima.fcen.uba.ar/>

**CIMA CHFP Data Server**

# CHFP database

“CMIP for seasonal forecasting”

## Select Model

- ARPEGE\*    CCCma-CanCM3    CCCma-CanCM4    CFS\*    CMAM\*
- CMAMlo    ECMWF-S4\*    GloSea5\*    JMAMRI-CGCM3    L38GloSea4
- L85GloSea4\*    MIROC5    MPI-ESM-LR\*    POAMA

(\*) stratosphere resolving models

[Select all](#) - [Clear all](#)

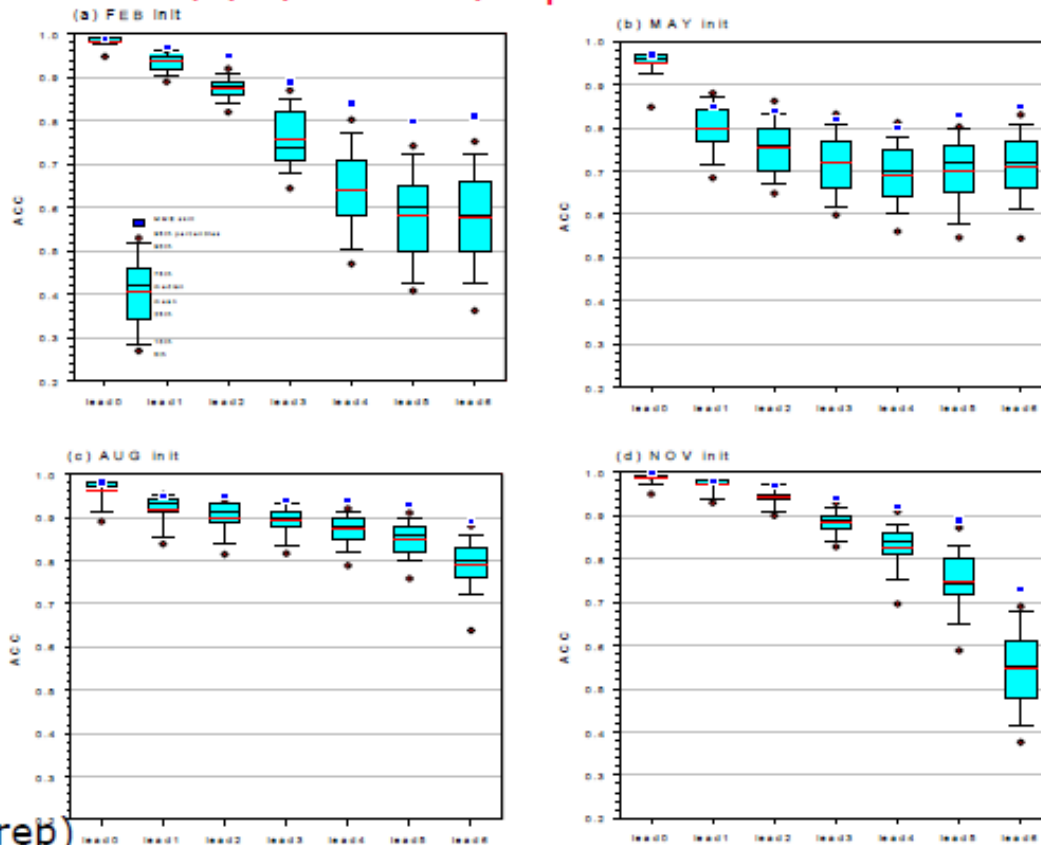
## Select Variables

- clt - Total cloud cover    hflsd - Surface latent flux
- hfssd - Surface sensible flux    mrsov - Total soil moisture
- prlr - Total precipitation    psl - Mean sea level pressure
- rlds - Downward surface longwave    rls - Net surface longwave
- rlt - Top net longwave    rsds - Downward surface solar
- rss - Net surface solar    rst - Top net solar
- snid - Snow depth    tas - 2m temperature
- tasmax - 2m T daily max    tasmin - 2m T daily min
- tauu - Surface DownEast stress    tauv - Surface DownNorth stress
- tauy - Surface DownNorth stress    tdps - 2m dewpoint temperature
- ts - Surface temperature (SST+land)    uas - 10m wind (u)
- vas - 10m wind (v)

[Clear all](#)

# Multimodel forecast analysis

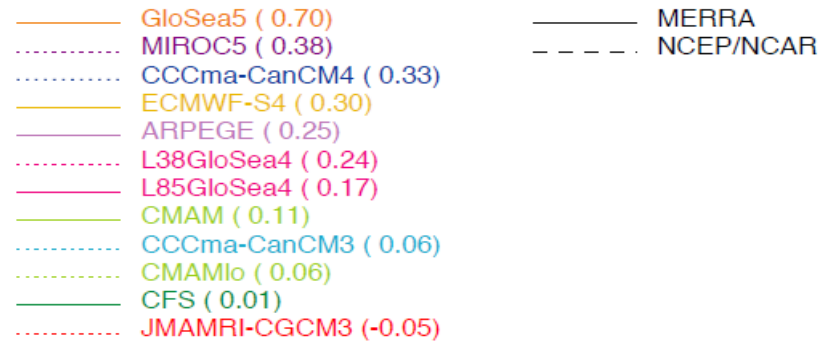
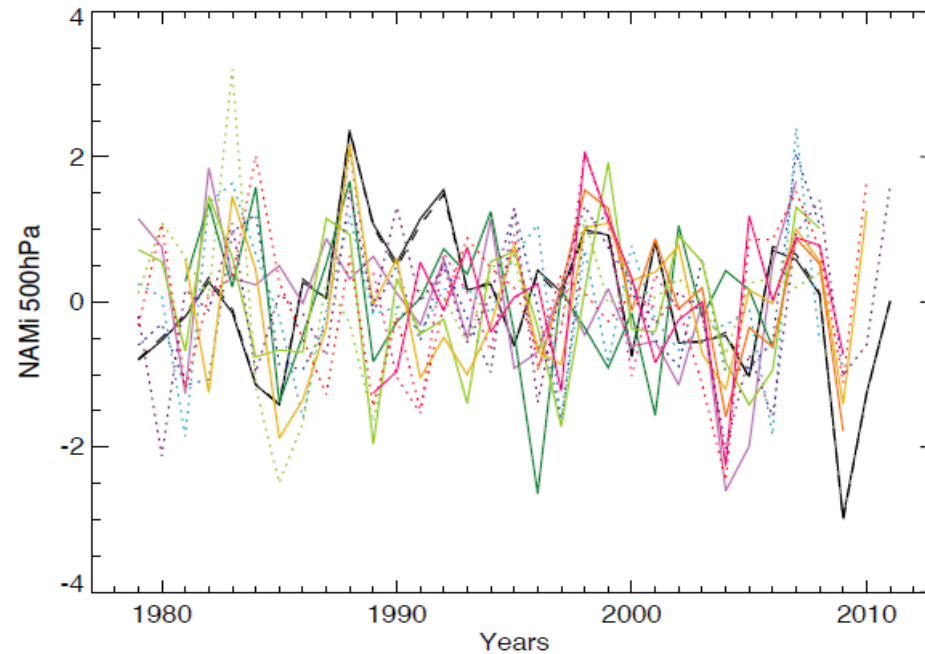
Niño3.4 correlation for four different start dates as a function of forecast time. The correlation of the multi-model ensemble mean is shown in blue and the distribution of the correlation for each ensemble member with the box-and-whisker plots. **A summary paper is in preparation.**





# Multimodel forecast analysis

Northern Annular Mode (500hPa)



Signals to noise is small so large ensembles are needed!

All models show some skill and the predictability of the NAM is much higher than in previous operational systems

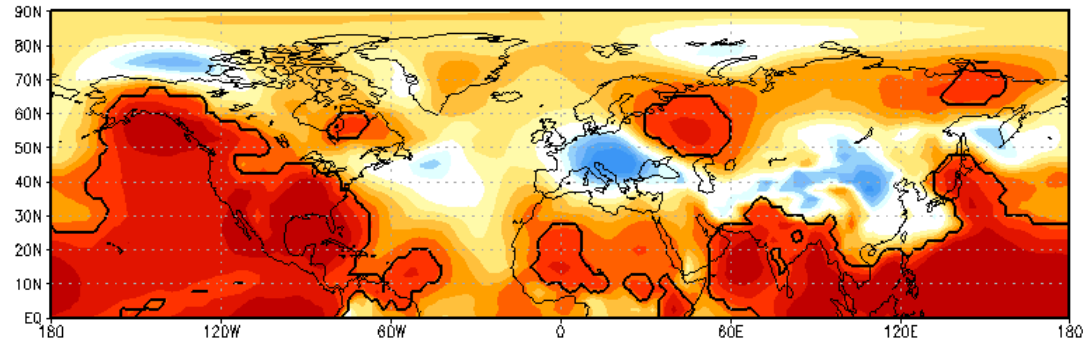
# The stratosphere in seasonal forecasting

DJF PRMSL- El Niño years (10)

High-top Ensemble

$ACC_{30-90N} = 0.47$

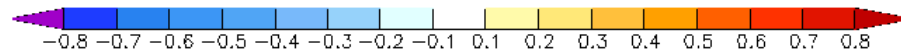
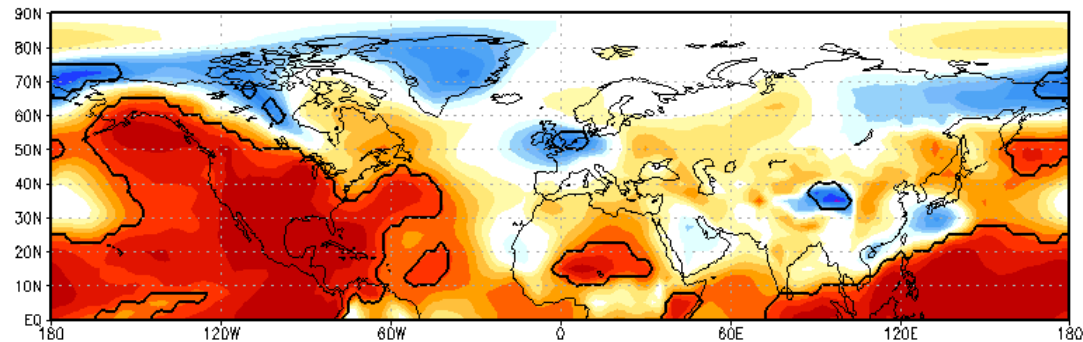
$ACC_{60-90N} = 0.36$



Low-top Ensemble

$ACC_{30-90N} = 0.38$

$ACC_{60-90N} = 0.08$



# THORPEX legacy projects

The subseasonal-to-seasonal (S2S) prediction initiative is a WWRP/WCRP joint initiative with objectives:

- To improve forecast skill and understanding on the sub-seasonal to seasonal timescale with special emphasis on high-impact weather events
- To promote the initiative's uptake by operational centres and exploitation by the applications community
- To capitalize on the expertise of the weather and climate research communities to address issues of importance to the GFCS
- Open data access

	Time-range	Resolution	Ens. Size	Frequency	Hcsts	Hcst length	Hcst Freq	Hcst Size
ECMWF	d0-32	T639/G19L62	51	2/week	On the 1y	Past 18y	weekly	5
UKMO	d0-60	N96L85	4	daily	On the 1y	1989-2003	4/month	3
NCEP	d0-60	T126L64	16	daily	Fix	1999-2010	Once a day	4
EC (exp)	d0-35	0.6x0.6 L40	21	weekly	On the 1y	Past 18y	weekly	4
CAWCR	d0-120	T47L17	33	2/week	Fix	1989-2010	3/month	33
JMA	d0-34	T159L60	50	weekly	Fix	1979-2010	3/month	5
KMA	d0-30	T106L21	20	3/month	Fix	1979-2010	3/month	20
CMA	d0-45	T63L16	40	6/month	Fix	1982-now	monthly	48
CPTEC	d0-30	T126L28	1	daily	No	-	-	-
Met-Fr	d0-60	T127L31	51	monthly	Fix	1981-2005	monthly	11
SAWS	d0-60	T42L19	6	monthly	Fix	1981-2001	monthly	6
HMCRC	d0-60	1.1x1.4 L28	10	weekly	Fix	1979-2003	monthly	10

# Three new WGSIP projects

## Teleconnections

lead by Laura Ferranti(ECMWF) and Herve' Douville(CNRM)  
Focus on ***tropical rainfall and connections to extratropics***

## Drift

lead by Bill Merryfield (EC), Mikhail Tolstykh (RAS)  
Focus on ***transient drift after initialisation with observations***

## Snowcover

lead by Jee-Hoon Jeong(Ch.Uni.), Yvan Orsolini (NILU)  
Focus on ***effects of snow cover initialisation***

# Decadal prediction

The Decadal Climate Prediction Panel (DCPP) promotes coordinated decadal prediction experimental set ups and informal near-real time exchange of multi-model forecasts. It also organises the decadal MIP towards CMIP6 (with four components, and including consideration of a transpose CMIP).

The DCPP is managed by WGSIP, WGCM and CLIVAR;

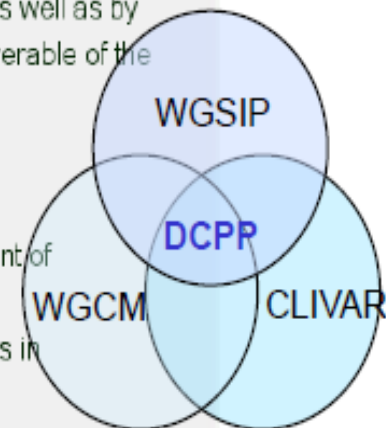
**Chairs: George Boer,  
Doug Smith**

The term "decadal prediction" encompasses predictions on annual, multi-annual to decadal timescales. The possibility of making skilful forecasts on these timescales, and the ability to do so, is investigated by means of predictability studies and retrospective predictions (hindcasts) made using the current generation of climate models as well as by means of statistical approaches. Skilful decadal prediction of relevant climate parameters is a Key Deliverable of the WCRP's Grand Challenge of providing [Regional Climate Information](#).

The DCPP envisions four components:

## Component

- A ○ **Hindcasts**: the design and organization of a coordinated decadal prediction (hindcast) component of CMIP6 in conjunction with the seasonal prediction and climate modelling communities
- B ○ **Forecasts**: the ongoing production of experimental quasi-operational decadal climate predictions in support of multi-model annual to decadal forecasting and the application of the forecasts
- C ○ **Predictability and mechanisms**: the organization and coordination of decadal climate predictability studies including the study of the mechanisms that determine predictability
- **Case studies**: the organization and coordination of case studies to investigate the ability to predict particular climate shifts and variations that have occurred and to identify the processes determining these behaviours



# Decadal prediction

Multi-model real-time decadal prediction exchange will request additional support at CCI16. Very simple: research exercise, we can learn a lot from this; prevent over-confidence from a single model; equal ownership.  
<http://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/long-range/decadal-multimodel>

## Multi-model decadal forecast exchange

The Met Office coordinates an informal exchange of near-real time decadal predictions. Many institutions around the world are developing decadal prediction capability and this informal exchange is intended to facilitate research and collaboration on the topic.

[The contributing prediction systems](#) are a mixture of dynamical and statistical methods. The prediction from each institute is shown below, alongside an average of all the models. When possible, observations for the period of the forecast are also shown. Currently three variables are included: surface air temperature, sea-level pressure and precipitation. These are shown as differences from the 1971-2000 baseline. More diagnostics, including ocean variables are planned for the future. Please use the drop-down menus below to explore the data collected to date.

This work is supported by the European Commission SPECS project.



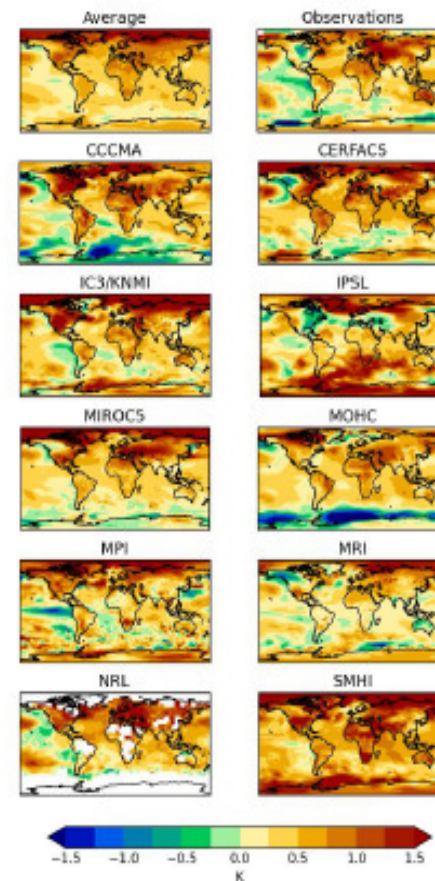
To learn more about decadal forecasts at the Met Office, see our current [decadal forecast](#).

Images last updated 2014-06-25

Issued: 2013  
Period: year 1  
Element: surface air temperature

Decadal forecast exchange 2013 predictions for year 1 surface air temperature

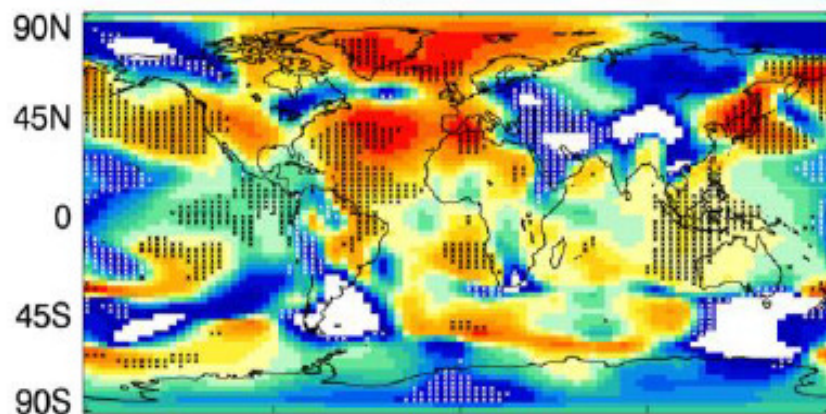
2012 predictions for 2013 surface temperature



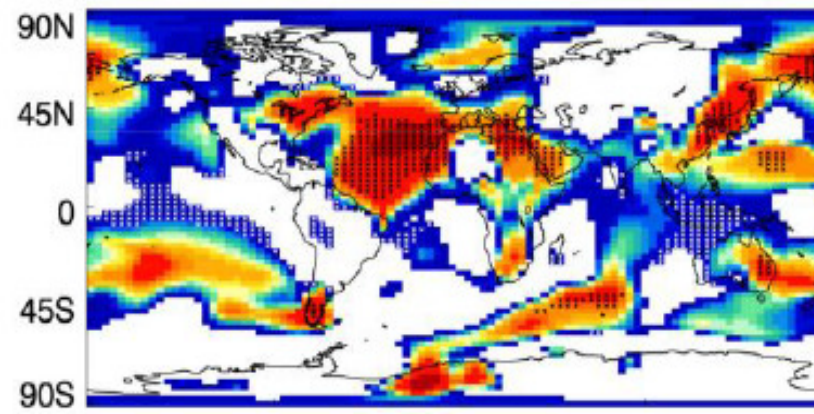
# Seasonal to Decadal Prediction

Ratio of predictable components in reality and models (RPC).  $RPC < 1$  (blue)  $\Rightarrow$  models **overconfident** (agree with each other but not with reality);  $RPC > 1$  (red)  $\Rightarrow$  models **under confident** (unexpected!)  $\Rightarrow$  **also for seasonal NAO**. These results are interpreted as reality is more predictable than models  $\Rightarrow$  models respond too weakly to SSTs? Members are not potential realisations of reality  $\Rightarrow$  affects skill assessment. Can make skilful predictions now, but need mean of large ensemble and to adjust variance. Higher skill possible with improved models.

GloSea5 DJF (months 2-4), MSLP



Multi-model decadal, 2-5 years, MSLP



# WGSIP summary

- **Growing number of seasonal hindcasts in the CHFP database (CMIP for seasonal) and revisited coordinated experiments**
- **Strong links to operational climate predictions**
- **Exciting results on winter predictability and a role for the stratosphere**
- **Three new science projects:**
  - **tropical/extratropical interactions**
  - **drift/shocks**
  - **snow cover**
- **Decadal prediction for CMIP6 jointly with WGCM and CLIVAR**
- **Real time decadal predictions being exchanged**
- **Strong links to GCs and THORPEX legacy projects**