WCRP Working Group on Seasonal to Interannual Prediction

Adam Scaife & Francisco Doblas-Reyes

(WGSIP co-chairs)

WCRP modelling groups:

Working Group on Coupled Modelling (WGCM)

Working Group on Seasonal to interannual Prediction (WGSIP)

Working Group on Numerical Experimentation (WGNE)

Working Group on Regional Climate (WGRC)

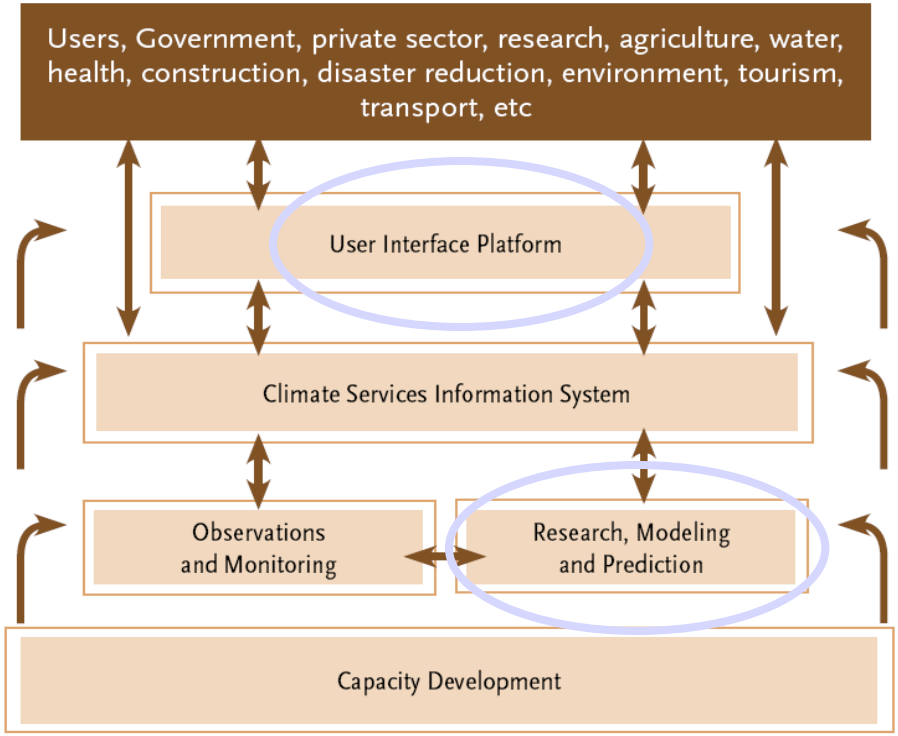
WCRP Grand Challenge #1

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?

Near term climate predictions for GFCS:

WMO Global Producing Centres



See also the WMO Lead Centre for long range forecast multi-model ensembles: www.wmolc.org

(1st) International workshop on seasonal to decadal prediction

Toulouse May 13-16,
special thanks to George Boer and Laurent Terray

CERFACS WCRP World Climate Research Programme cnrs FONDATION BNP PARIBAS NOAA METEO FRANCE Toujours un temps d'avance

Most leading seasonal forecasts models now included in CHFP

13 systems

'CMIP for seasonal'

CIMA CHFP datasets availables by: Component - TyLevel - Frecuency

Atmosphere

	Surface																						
Frecuency	Monthly																						
Model/Vble	clt	hflsd	hfssd	mrsov	prlr	psl	rlds	rls	rlt	rsds	rss	rst	snld	tas	tasmax	tasmin	tauu	tauv	tauy	tdps	ts	uas	vas	
ARPEGE					174	174															174			522
CCCma-CanCM3	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120					120	120	120	2280
CCCma-CanCM4	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120					120	120	120	2280
CFS					53	53								53							53			212
CMAM					60	60								60							60			240
CMAMlo					60	60								60							60			240
ECMWF-S4	120			120	120	120	120	120	120	120	120	120	120	120	120	120	120	120		120	120	120	120	2400
JMAMRI-CGCM3	128	128	128		128	128	128	128	128	128	128	128	116	128	128	128					128	128	128	2292
L38GloSea4					56	56							56	56							56			280
L85GloSea4					84	84							84	84							84			420
MIROC5	99	99	99		99	99		99	99	99	99	99	99	99	99	99	99	99			99			1683
MPI-ESM-LR	60	60	60		60	60	60	60	60	60	60	60	60	60	60	60	60	60		60	60	60	60	1260
poama		120	360		360	360	360		360			360	360	360			360		360		360			4080
Total:	647	647	887	360	1494	1494	908	647	1007	647	647	1007	1135	1320	647	647	639	279	360	180	1494	548	548	**18189**

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

Sub-projects: three experiments

Land Surface: the GLACE and GLACE2 experiments:

- **Soil moisture experiments in seasonal mode**
- **Led by R Koster**

Stratosphere: Stratospheric Historical Forecast Project

- **High Top – Low Top hindcasts**
- **Led by A Butler**

Sea Ice: Ice Historical Forecast Project

- **Case studies with/without initial sea-ice data**
- **Led by D Peterson**

Ice Historical Forecast Project

Drew Peterson, Dirk Notz, Steffen Tietsche,
Matthieu Chevallier, William Merryfield, Adam Scaife

Max Planck Institute MPI-ESM (Steffen Tietsche and Dirk Notz)

UKMO GloSea4 (Arribas et al., 2011, 2012)

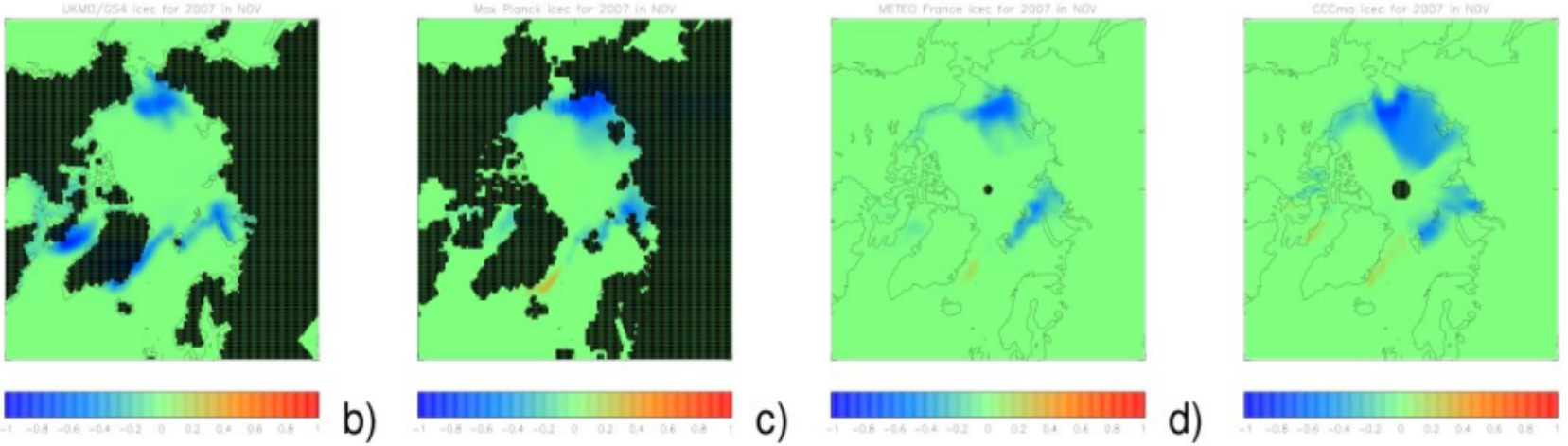
Meteo-France CNRM CM5.1 (Voldoire et al., 2012, Chevallier et al., 2012)

CCCma CanSIPS (Merryfield et al., 2012)

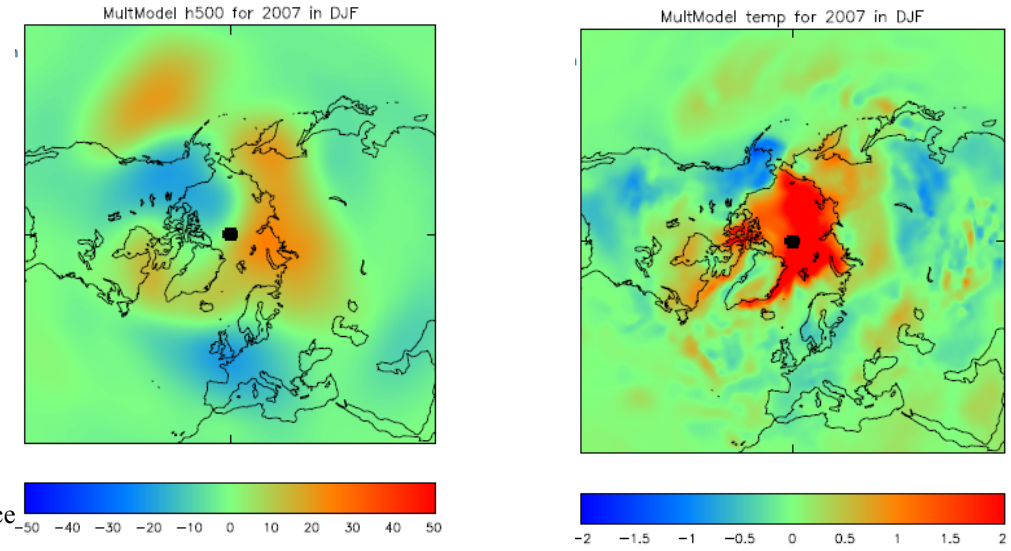
- 9 members for 2007 and 1996
- with and without sea ice initialised according to observed extents
- 1 November and 1 August initialisation for Winter and Autumn

Difference in Sea Ice due to Initialisation

UKMO **MPI** **MeteoFr** **CCCma**



Nov



DJF

Stratosphere Historical Forecast Project

WGSIP-SPARC collaboration

Amy Butler, Adam Scaife, Alexander Lawes, Natalia Calvo, Andrew Charlton-Perez + WGSIP members

High Top Hindcasts

Parallel to WGSIP-CHFP

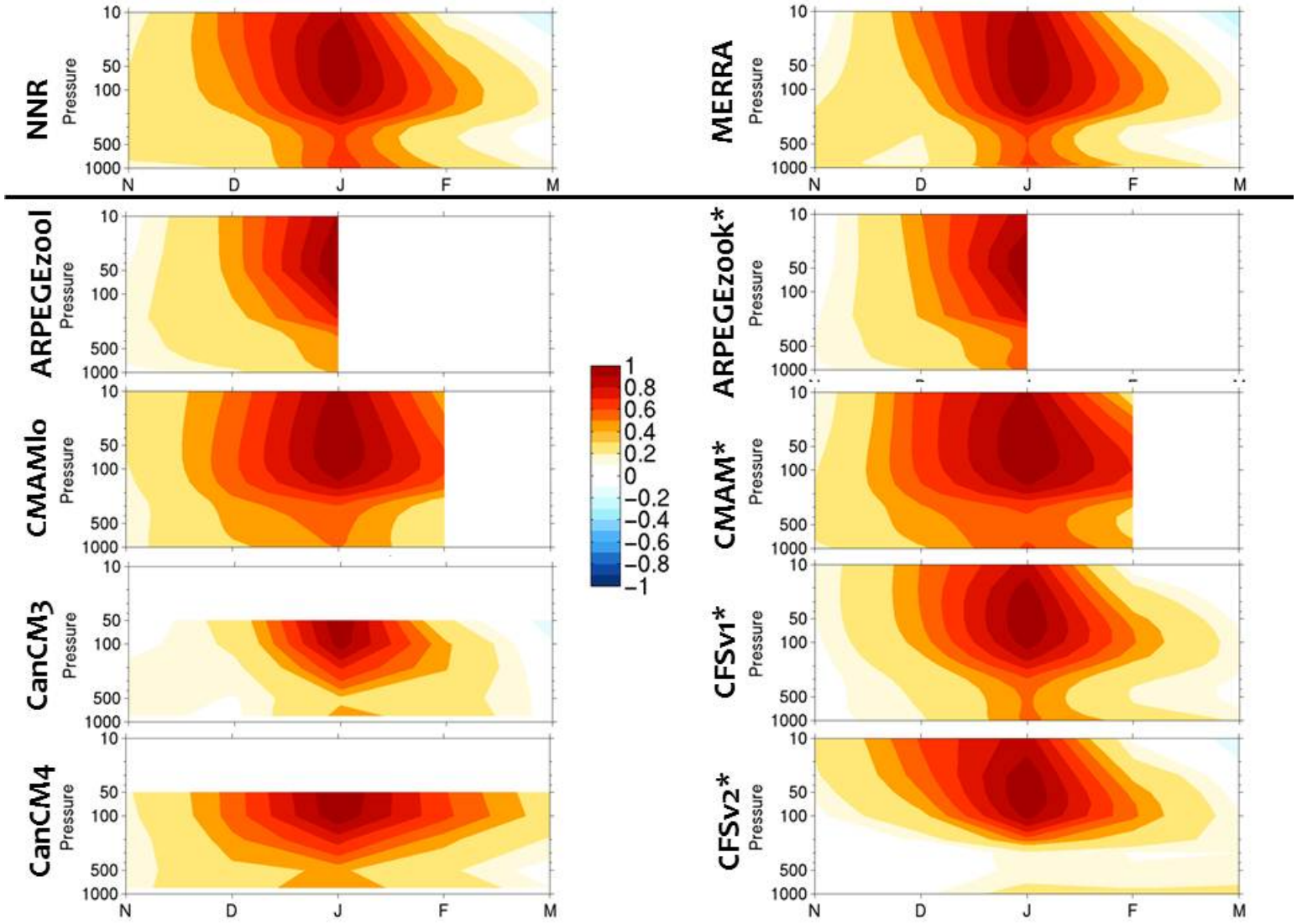
Extended models

Initialising extra atmosphere, better represented stratosphere

Integrations

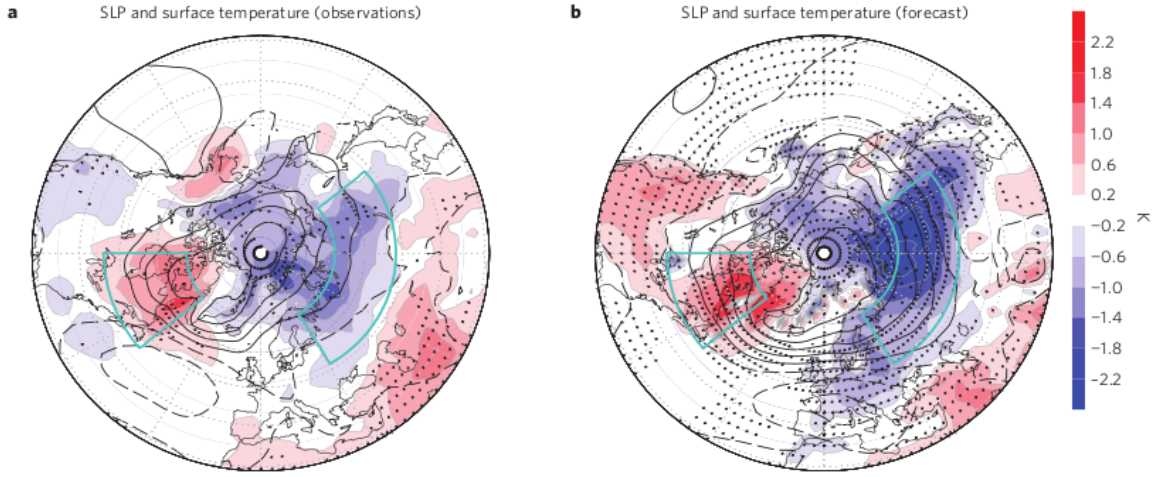
- 4 month lead times (1st November and 1st May start dates)
- 2 seasons (DJF and JJA)
- Case study years: 1989 onwards
- At least 6 members per year, preferably more

Seasonal Hindcasts from High Top Models show strat-trop links

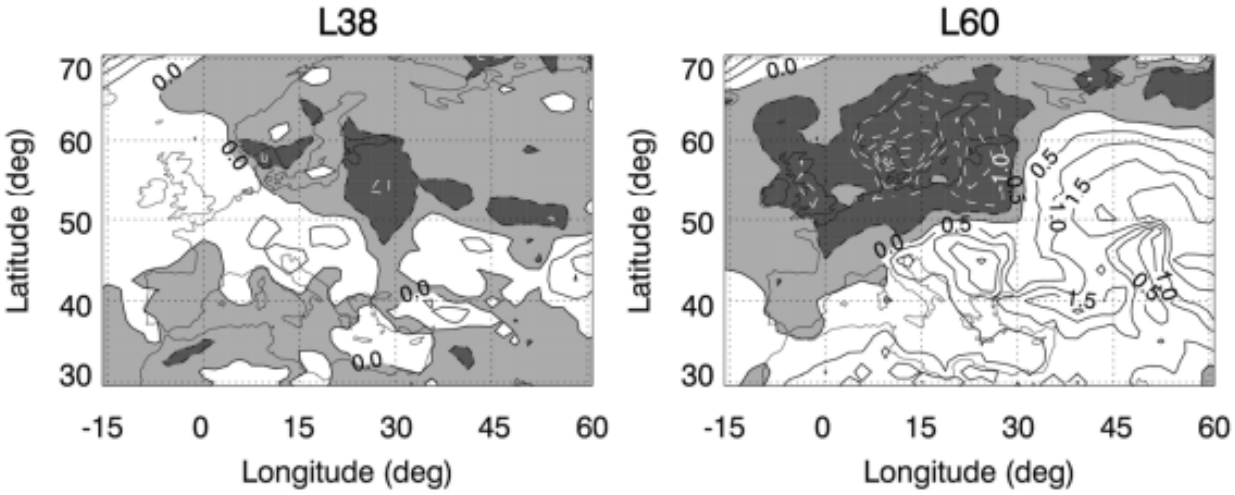


Amy Butler

Impact of stratosphere on surface forecasts



Sigmond et al 2013



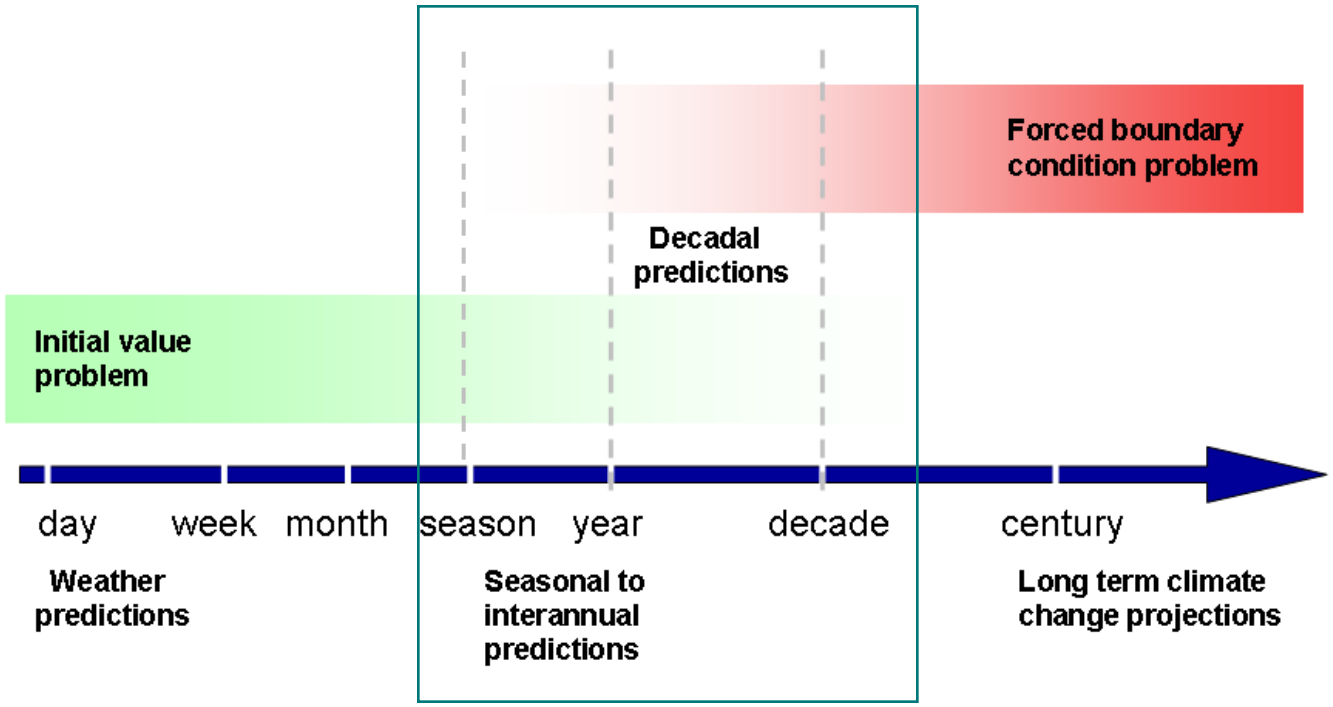
Marshall and Scaife 2010

European cooling due to –ve NAO

Better predicted in deep domain model

Lasts 1-2 months

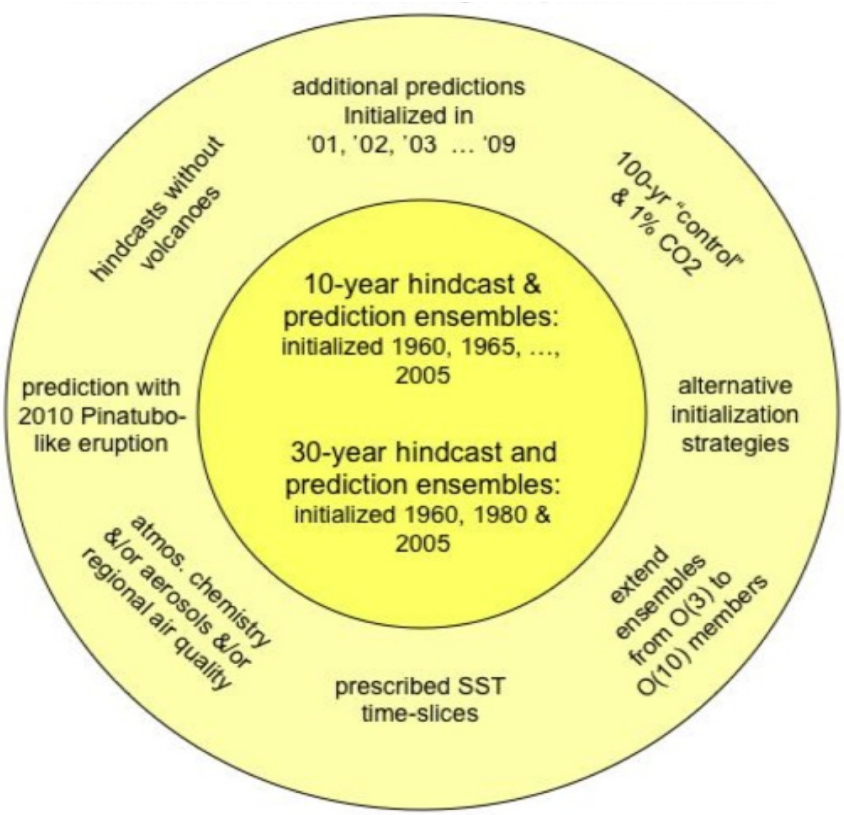
Decadal Prediction



WGSIP DCPP WGCM

Decadal *Hindcasts* for CMIP5

CMIP5 Protocol



WGSIP and WGCM developed this CMIP5 framework

Part of our discussion is to think about 'What next?'

CMIP5 decadal predictions

Predictions (yr 2-5) from 6 CMIP5 systems

Initialized solid, uninitialised dashed

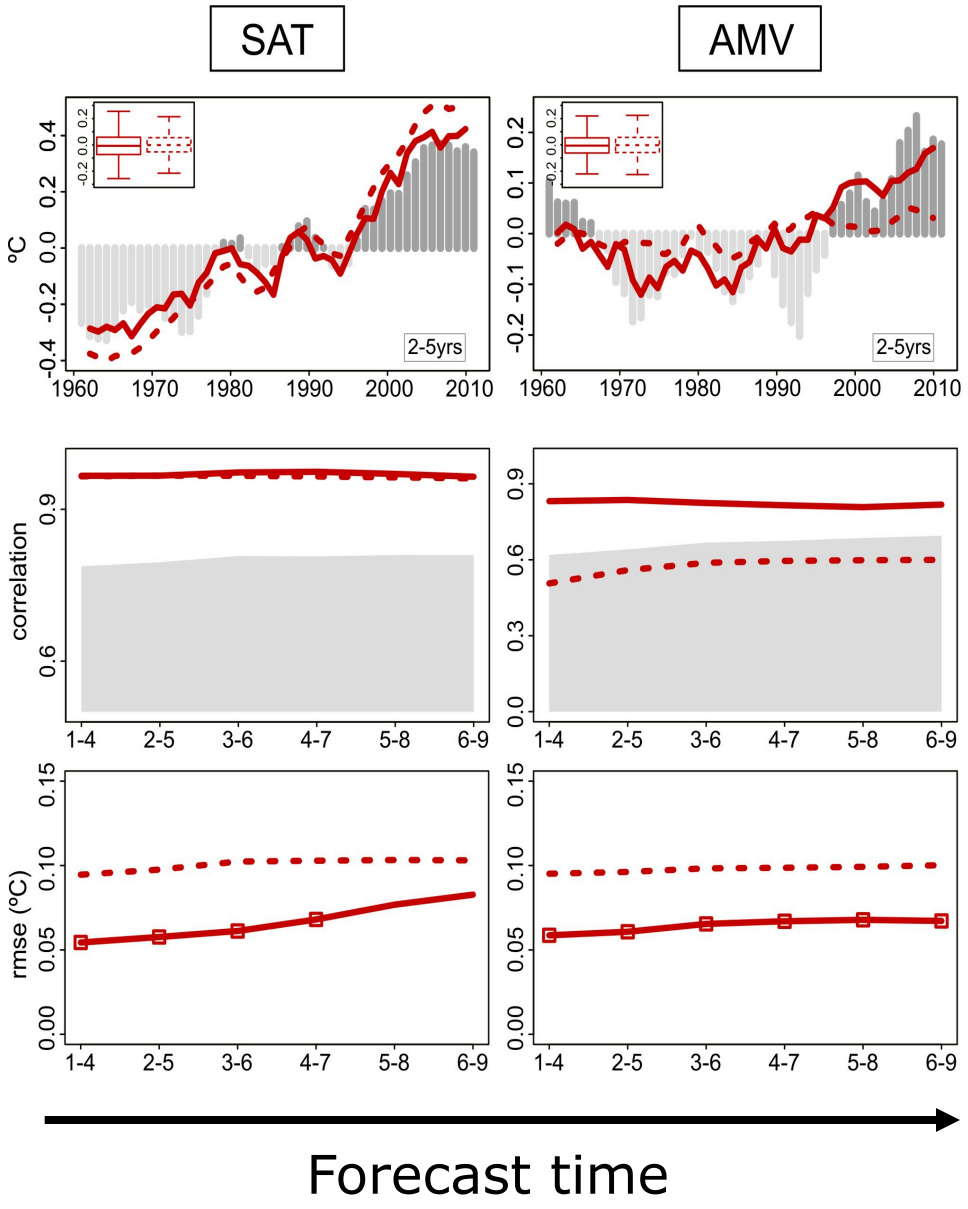
Global-mean T and Atlantic multi-decadal variability

Correlations and RMSE below

BUT

Outstanding issues with protocol

See proposal for a joint WGCM/WGSIP/ CLIVAR for CMIP6….



Doblas-Reyes et al. (2013)

Real Time Decadal Forecast Exchange

Doug Smith, Adam Scaife and the decadal prediction community….

15th session of the WMO Commission for Climatology recommended action to start the coordination and exchange of decadal predictions

Proposal went out to various groups to *exchange* decadal prediction information

research exercise – we can learn a lot from this
prevent over-confidence from a single model
equal access, ownership and recognition

Uni. Tokyo – *Kimoto Masahide* , **MRI –** Masayoshi Ishii, **SMHI –** *Klaus Wyser,Colin Jones,* **KNMI –** *Wilco Hazeleger, Bert Wouters,* **IC3 –** *Francisco Doblas-Reyes, Virginie Guemas,* ***GFDL*** *– Tony Rosatti,* **MPI –** *Daniela Matei, Wolfgang Muller, Holger Pohlman,* **RSMAS –** *Ben Kirtman,* **CCCMA –** *George Boer, Bill Merryfield,* **UKMO-Hadley –** *Doug Smith, Adam Scaife,* **READING UNI** *– Ed Hawkins, Chun Kit Ho,* **NRL** *– Judith Lean, David Rind,* **NOAA** *– Arun Kumar*

And others….

Real Time Decadal Forecasts:
2012-2016 relative to 1971-2000

Forecasts

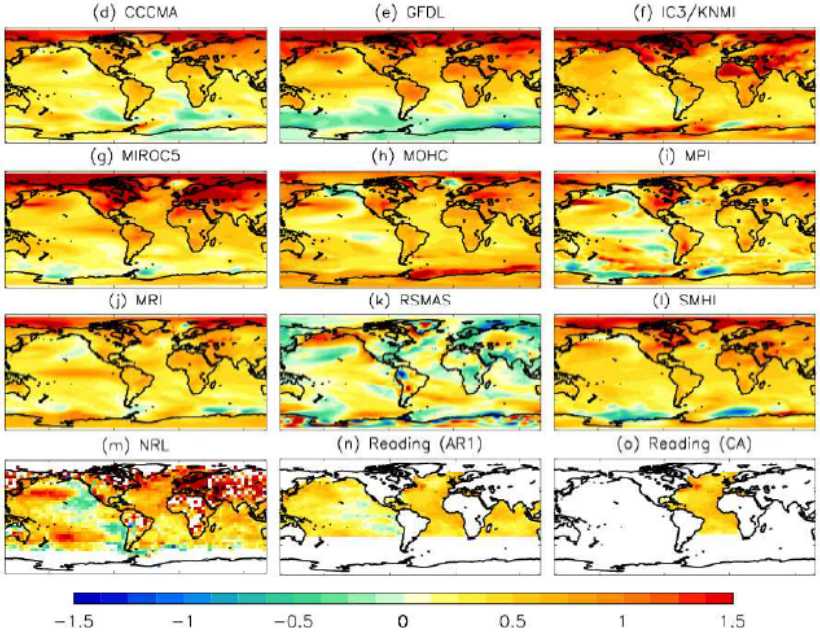


Figure 3: Forecast temperature anomalies (as Fig. 2) for the 5-year period 2012 to 2016.

Effect of initialisation

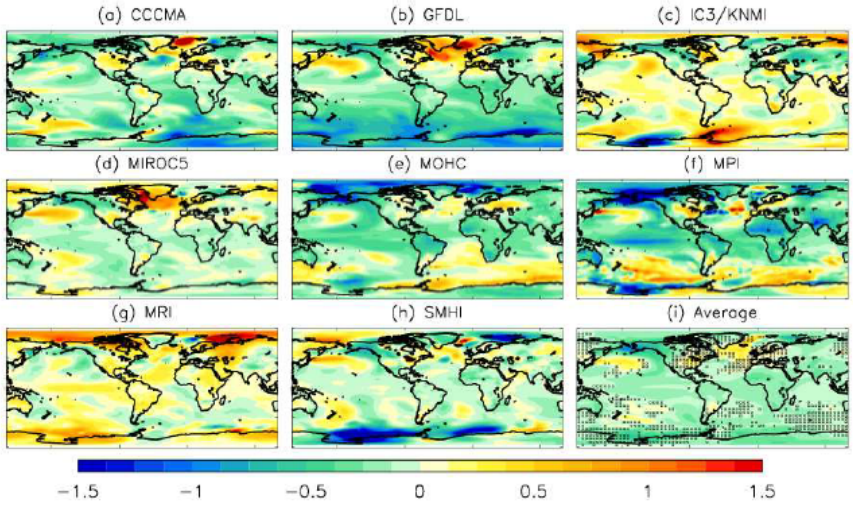


Figure 6: Impact of initialization (initialized minus uninitialized ensemble means) on forecasts of the period 2012 to 2016. Unstippled regions in (i) indicate a 90% or higher probability that differences between the initialized and uninitialized ensemble means did not occur by chance (based on a 2 tailed t-test of differences between the two ensemble means assuming the ensembles are normally distributed).

Smith et al, Clim. Dyn., 2012

Decadal Prediction for CMIP6: a proposal

WGSIP with WGCM and CLIVAR to lead development of a decadal prediction component for WGCMs CMIP6 plans using the Decadal Climate Prediction Panel

Provisional agreement with WGCM (Jerry Meehl) as part of the WGCM development of CMIP6

CLIVAR to be involved via WGOMD – please suggest a member

If JSC approve then we will send a representative to the upcoming Aspen meeting on CMIP6 to kick this off

WGSIP activities summary

Growing number of seasonal hindcasts in the CHFP database (CMIP for seasonal)

Decadal hindcasts done for CMIP5 and analyses appearing in literature

Real time decadal predictions being exchanged (Smith et al 2012)

A proposal to lead the decadal prediction protocol for CMIP6 is made jointly by WGSIP/WGCM/CLIVAR following provisional agreement amongst these groups – we hope the JSC approve!