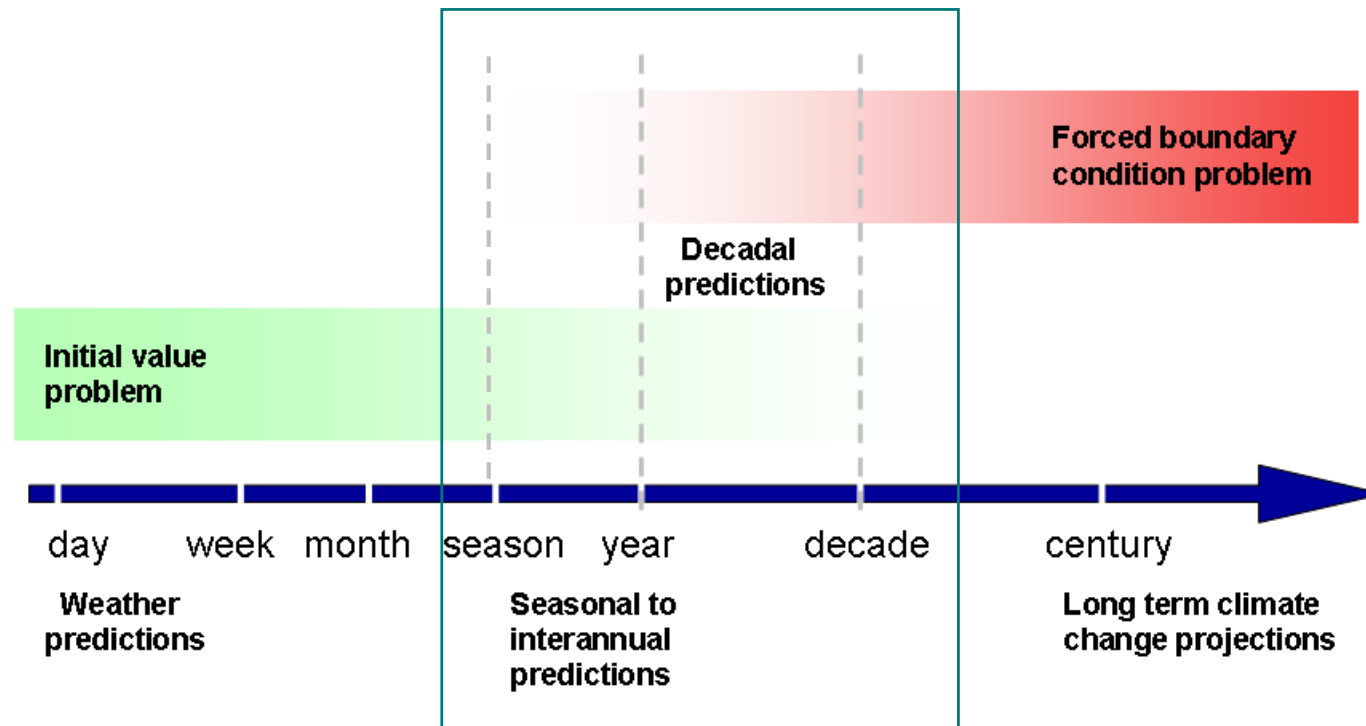


Decadal Climate Prediction Project

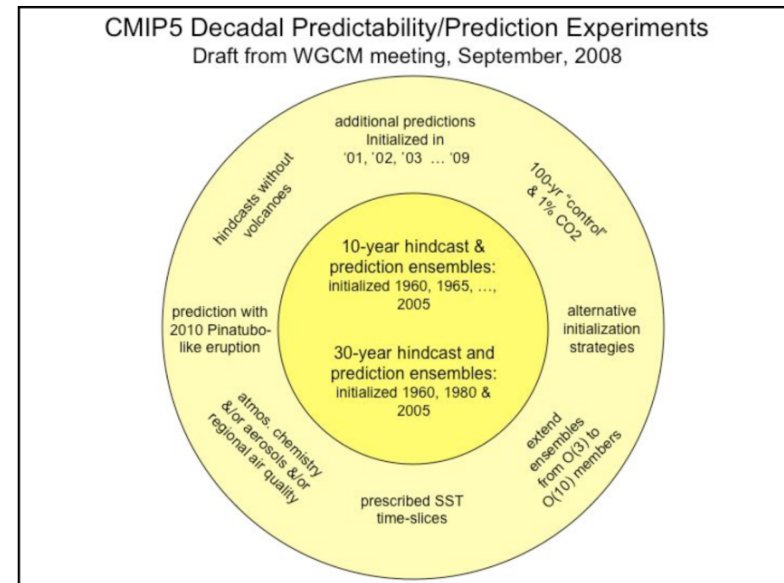
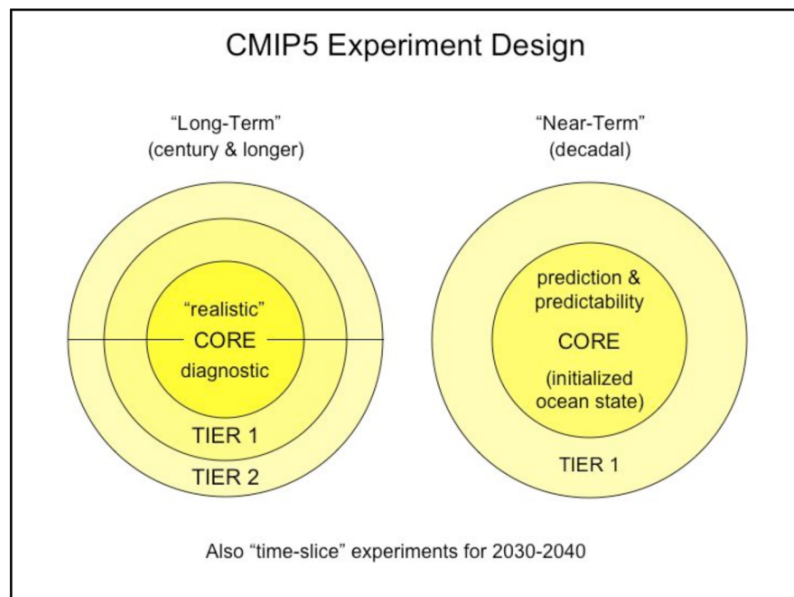
Gerald Meehl and Gokhan Danabasoglu

for the Decadal Climate Prediction Panel (DCPP)



CMIP5: recognition of a new field in climate science:
“decadal climate prediction” was a separate set of
“near term” CMIP5 experiments

- Formulated at Aspen Global Change Institute session (Aug,2008) and approved at WGCM Paris (Oct,2008)
 - formation of a “Joint WGCM-WGSIP Contact Group on Decadal Predictability/Prediction” (now the “Decadal Climate Prediction Panel”)



In CMIP6, Decadal Climate Prediction will be a MIP

Decadal Climate Prediction Panel (DCPP)

○ Origin

- Membership from WGCM and WGSIP and the CLIVAR decadal variability and predictability focus (George Boer, chair)

○ Focus

- the development and support of both the **science** and **practice** of decadal prediction
- the provision of an **archive** of decadal prediction information for **research** and **applications**
- advise on CMIP5 practicalities
- Propose new generation of coordinated experiments for CMIP6

Some things we've learned so far from the CMIP5 decadal prediction experiments

- need long sequence of historical forecasts initialized every year
 - for statistical stability of results
 - to provide historical skill assessment
 - allow drift adjustment
- considerable annual, multi-annual skill for temperature, not so much for precipitation
 - initial condition skill dominates for several years then dies away leaving skill from forced component
 - skill varies a great deal geographically
 - skill higher over N. Atlantic than N. Pacific
 - skill for predicting large decadal shifts in Pacific and Atlantic
 - disconnect between potential and actual skill over land
 - low skill over Southern Ocean
- *model error is a major issue*, requiring bias adjustments to evaluate hindcasts and predictions
- single and multi-model assessments of CMIP5 results still underway

Decadal Climate Prediction in CMIP6

Science framework in CMIP6:

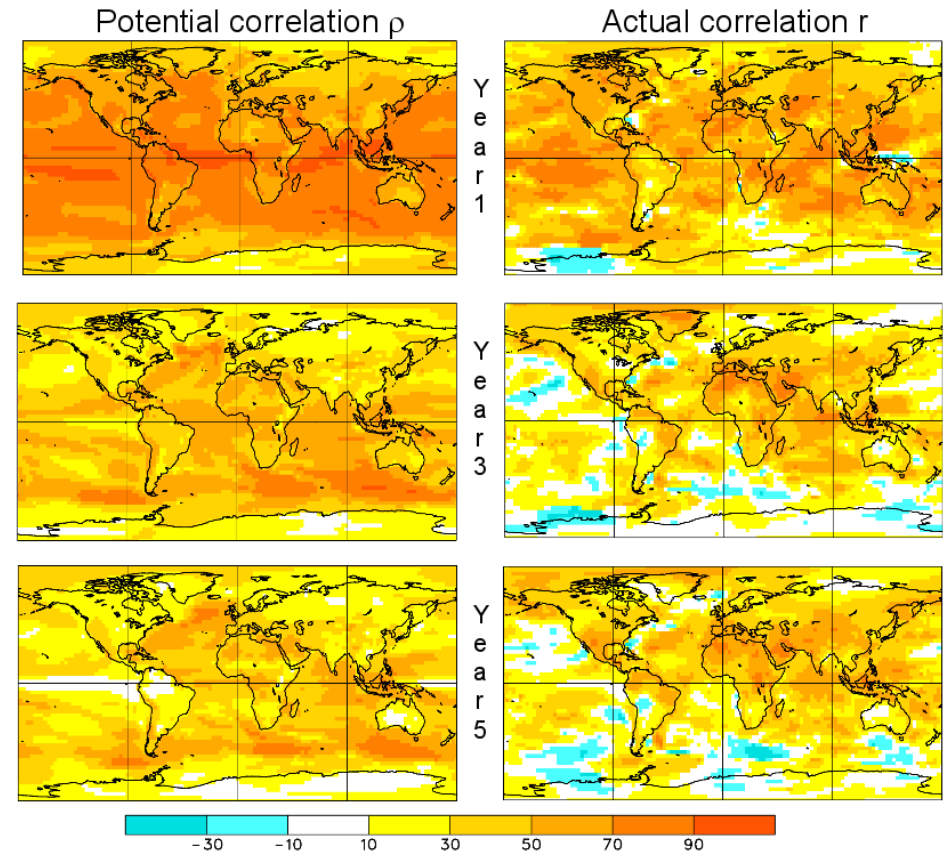
WCRP Grand Challenge #1

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?

CMIP6 science question: ***How can we assess future climate changes given climate variability, predictability*** and uncertainties in scenarios?

Component A: CMIP6-decadal

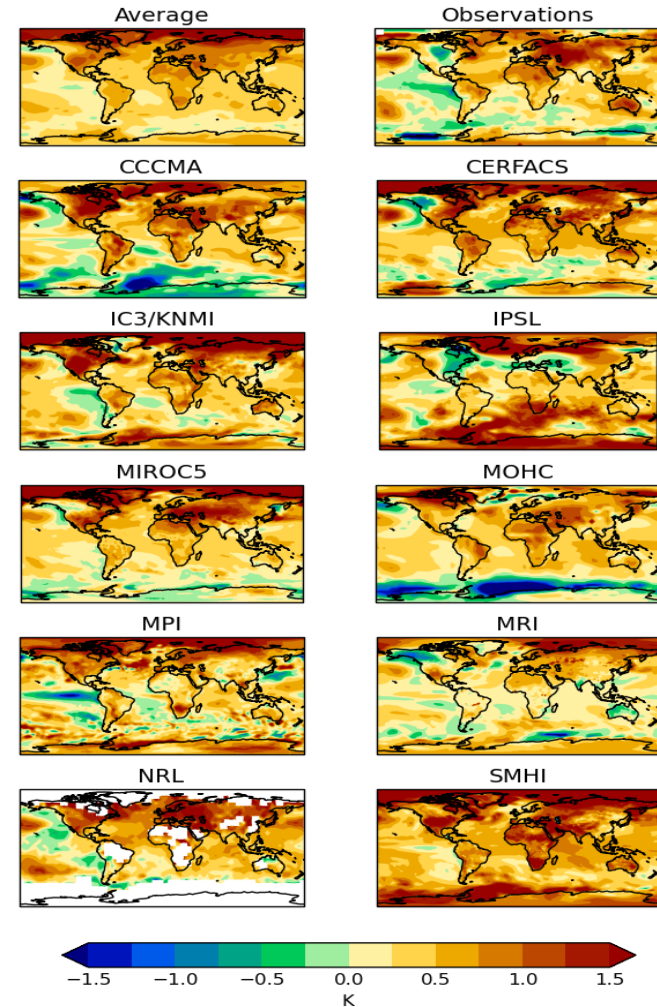
- ensembles of multi-model multi-member hindcasts (*retrospective forecasts*) made each year from 1960 to the present (~ 2014).
- 5-10 year predictions for each start year, recommend 10 ensemble members (3000-6000 years)
- Volcanoes included



Component B: Experimental decadal forecasts

- decadal predictions (not hindcasts) currently being made by a number of groups
- Collection, calibration and combination of forecasts
- forecasts and data made available in support of research and applications
- to evolve as a CMIP6 activity (need guidance as to which scenario to use from ScenarioMIP); 10 year prediction, 10 ensemble members (100 years)

2013 temperature prediction



Component C: Mechanisms, Predictability and Case Studies

- *Predictability*: a feature of the climate system reflecting its “ability to be predicted”
- *Skill*: the “ability to predict” aspects of the system
- **What are the mechanisms and processes determining decadal predictability and permitting (or making difficult) decadal prediction skill?**
- *Component C*: proposals being developed for coordinated multi-models experiments include:
 - *Hiatus+*: the nature and predictability of both positive and negative long timescale variations in temperature and other quantities as exemplified by the current hiatus; connection between Pacific and Atlantic
 - *Volcanoes*: the actual and potential consequences of volcanic activity on predictions of the forced and internally generated components of temperature and other variables
 - Modeling groups running prototype experiments 2014-mid-2015; workshop in mid-2015 to review results and formulate one or two coordinated experiments for Component C

CMIP5 decadal prediction component

11

Near-term Climate Change:
Projections and Predictability

Coordinating Lead Authors:
Ben Kirtman (USA), Scott E. Power (Australia)

Lead Authors:
Akintayo John Adebayo (Botswana), George J. Boer (Canada), Rozana Bojari (Romania), Ines Camilloni (Argentina), Francisco Doblas-Reyes (Spain), Arlene M. Fyfe (USA), Masahide Kimoto (Japan), Gerald Mehl (USA), Michael Parther (USA), Abdoulaye Sarr (Senegal), Christoph Schär (Switzerland), Rowan Sutton (UK), Gert Jan van Oldenborgh (Netherlands), Gabriel Vecchi (USA), Hai-Jun Wang (China)

Contributor Authors:

- Has had a positive affect on research and offers promise for applications:
 - many investigations and publications based on results
 - input to Chapter 11 IPCC AR5
 - expanded interest and activity in decadal prediction
 - predictability studies
 - assessment of local global and modal skill
 - quasi-operational decadal prediction

Decadal Climate Prediction Project

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[Predictability & Mechanisms](#)

[Case Studies](#)

[Meetings](#)

[Reports](#)

[Panel](#)

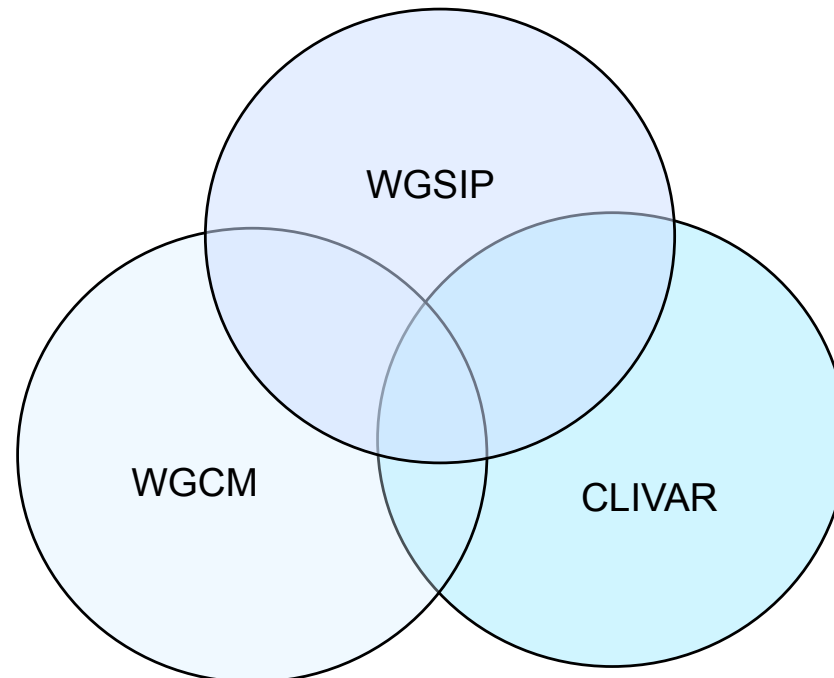
Decadal Climate Prediction Project

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.

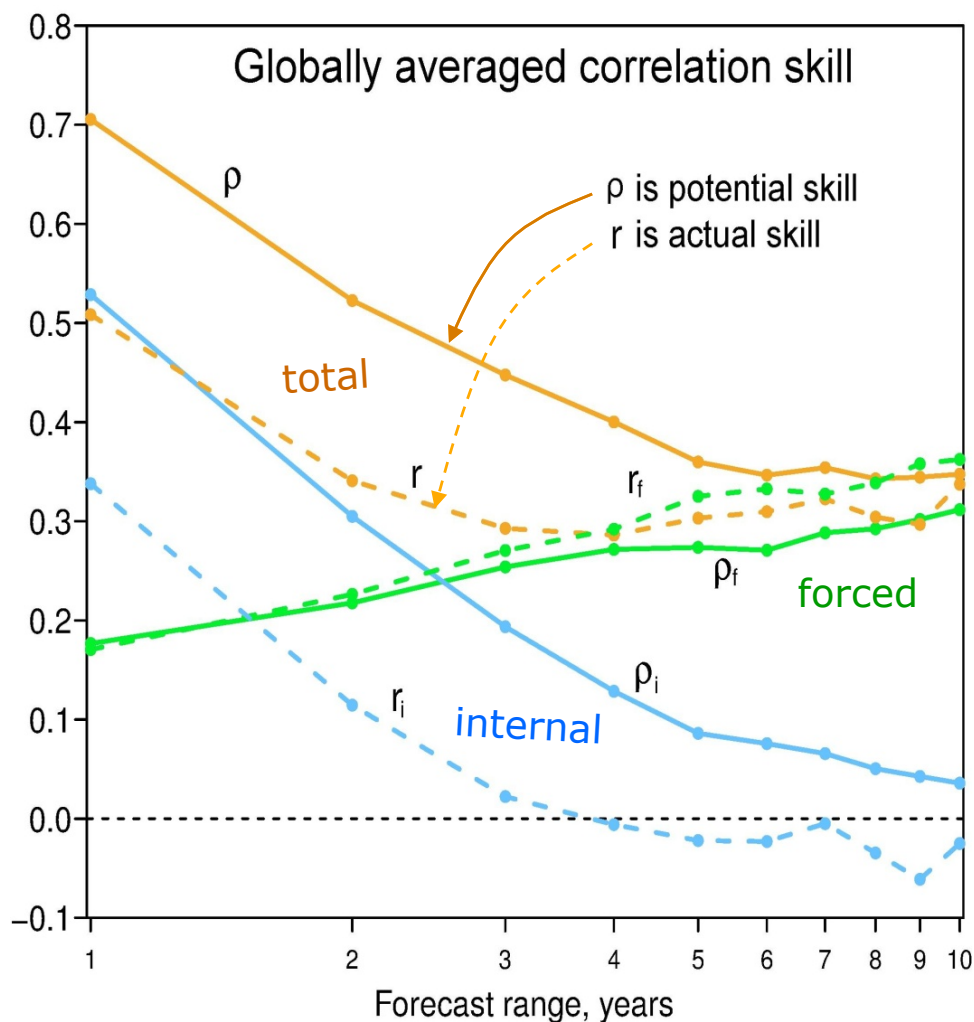
Proposed and organized by the DCPD Panel

DCPP Panel has representatives from:

- WGSIP
 - seasonal to decadal prediction
- WGCM
 - including members of the CMIP and WIP Panels
- CLIVAR
 - decadal variability and predictability focus



Potential and actual skill of annual mean T



- global and local “predictability” and “skill”
- mechanisms determining skill
 - importance of initialization vs external forcing
 - deep ocean processes
 - etc.
- predictability and skill as a function of forecast range - does difference between r and r offer:
 - guidance on mechanisms
 - hope for improvement

Decadal Climate Prediction Project

- Three components
 - A. CMIP-decadal hindcasts
 - B. Experimental multi-model forecasting
 - C. Mechanisms, predictability and case studies
 - Hiatus+
 - Volcanoes and prediction
- Currently
 - Components A, B broadly in hand
 - Components C in development stage
 - CMIP/ESGF data treatment common to all components
- Next steps
 - CMIP6 endorsement/inclusion
 - input from the community via [DCPP Survey](#)



**International workshop on seasonal to decadal prediction
Toulouse France 13-16 May 2013**

