4. WGSIP Projects: Teleconnection

The aim of this initiative is to evaluate the ability of the current state-of -the-art dynamical forecasting systems in representing the tropical-extratropical teleconnections. The analysis, based on observational and model data from several seasonal forecast systems, uses a common framework for a straightforward intercomparison. Tropical rainfall anomalies are used to represent the response to anomalous tropical atmospheric heat sources.

Planned analysis:

A) Precipitation (almost completed):

- precipitation variability relationship across the tropical regions / SST-precipitation relationship;

- the predictive skill of precipitation across the different tropical basins;

B) Covariance and Rossby wave source analysis:

- the predictive skill of the NAO and PNA via tropical teleconnections

Data: The model data is taken from CHFP and EUROSIP archive, GPCP

Expected outcome:

- estimate the model accuracy in representing remote atmospheric responses originated in the tropics.
- improved and more reliable seasonal forecast predictions for the extratropical regions

REFERENCES:

Kumar et al. 2013: "Understanding prediction skill of seasonal mean precipitation over the tropics" Journal of Climate Vol. 26 p.5674-5681

Manola et al 2013: "Drivers of North Atlantic Oscillation Events", Tellus A, 65, 1-13.

Molteni et al. 2014: "Understanding and modelling extra-tropical teleconnections with the Indo-Pacific region during the northern ". Climate Dynamics. Ref.: Ms. No. CLDY-D-14-00256R2

Scaife et al. 2016: « Tropical rainfall, rossby waves and regional winter climate predictions». QJRMS Version of Record online: 20 OCT 2016 | DOI: 10.1002/qj.2910

Precipitation: Early Results

collecting together hindcasts of past year to year climate variability

establishing the level of skill in tropical rainfall

examine multi-model teleconnections between the tropics and extratropics on seasonal timescales

Some early results of rainfall analysis:

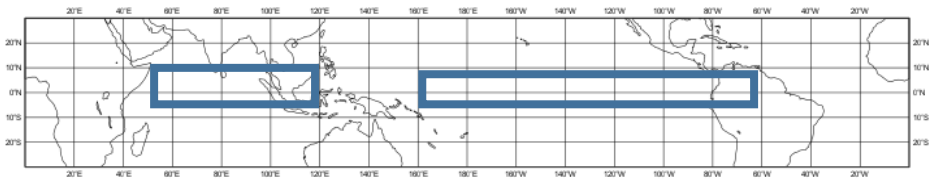
Encouraging levels of winter seasonal prediction skill are found in all tropical ocean basins

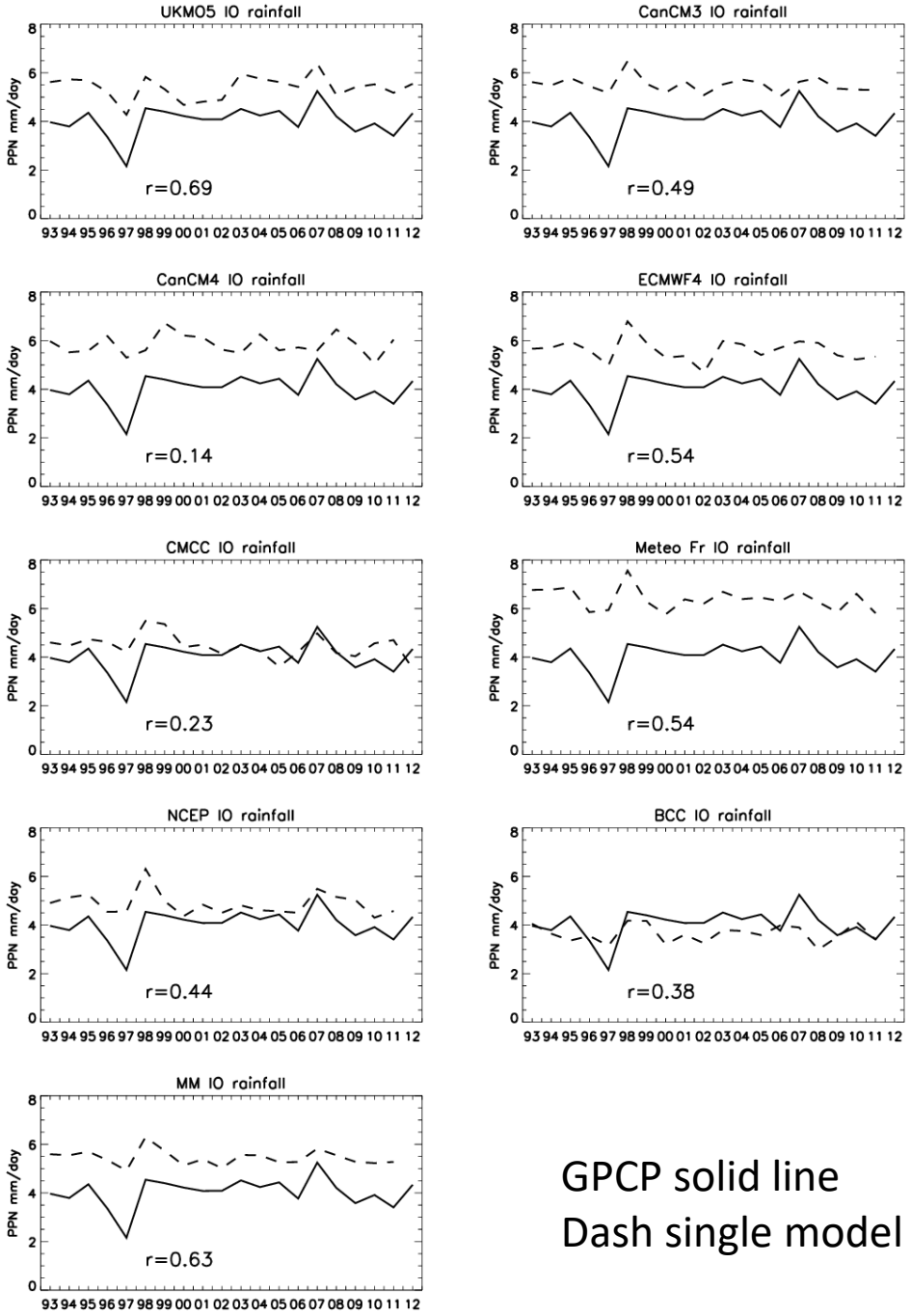
The East Pacific in particular shows very high skill (r ~ 0.97)

The West Pacific is also highly skilful

The Atlantic and Indian Ocean have lower but highly statistically significant skill (bad for the NAO)

Ensemble mean signals are similar in size to observed rainfall so chaotic unpredictable variability is relatively small in seasonal mean rainfall





GPCP solid line
Dash single model

5. WGSIP centres update: ECMWF update

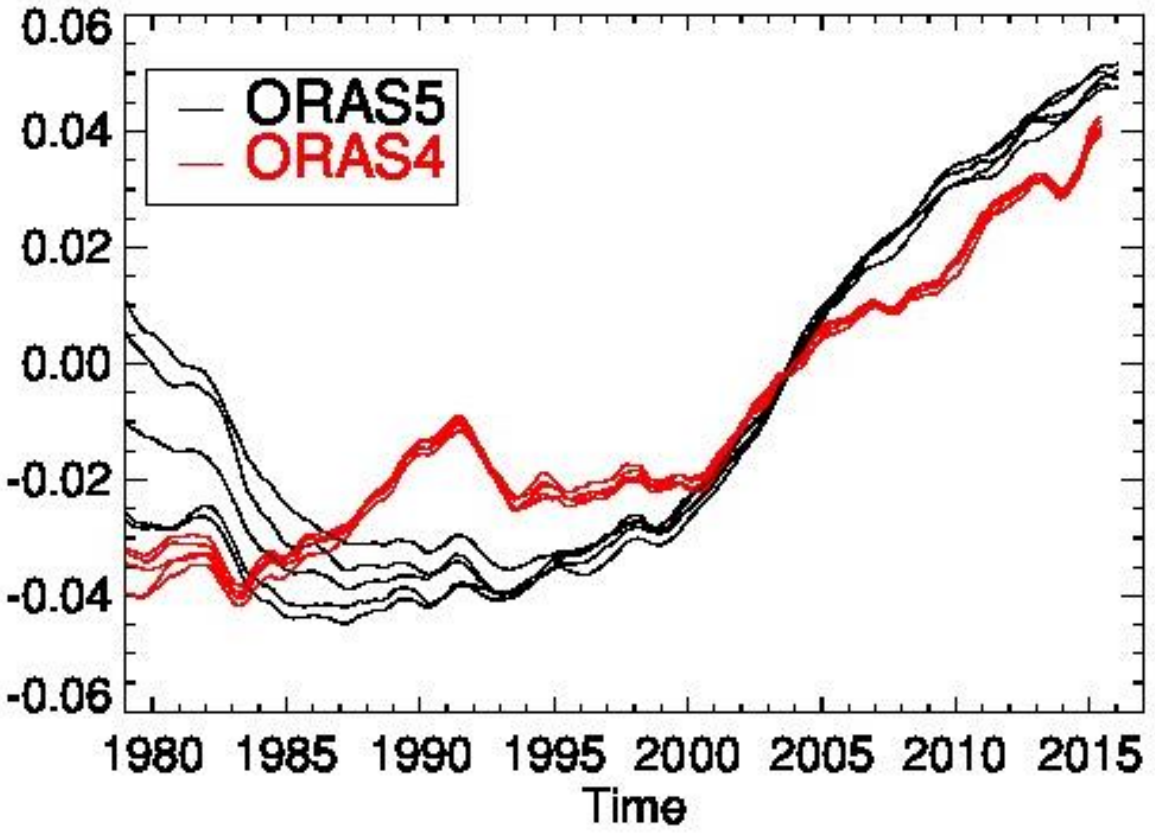
- Progress with ocean data assimilation (CERA and ORAS5)
- S2S database giving insights
- Decadal variability of seasonal forecast skill
- Upgrade of the seasonal forecasting system

ORAS5: new ECMWF eddy permitting ocean/sea-ice reanalysis

(1979-present)

- ¼ deg ocean –Sea Ice Assimilation
- Latest observational data sets: more continuity in time
- Several other improvements

Total Column Ocean Heat Content



Ocean Heat Content

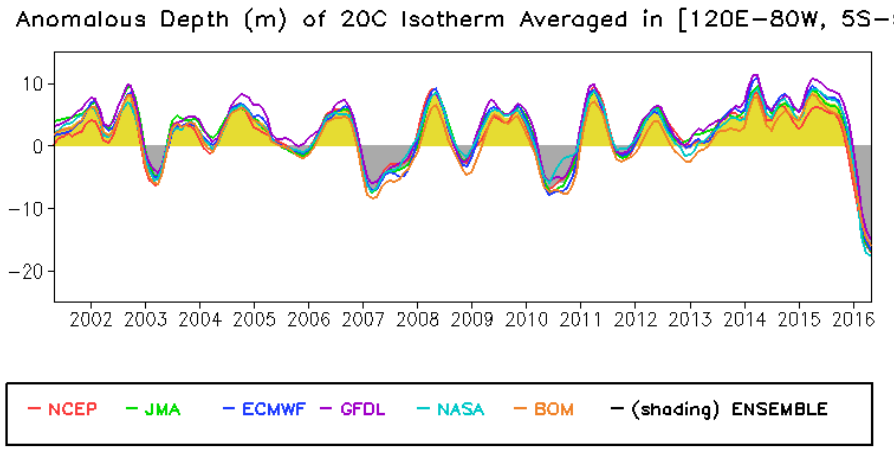
- Less temporal variability than ORAS4
- Slightly larger trends
- Spin down lasts for ~ 1 decade

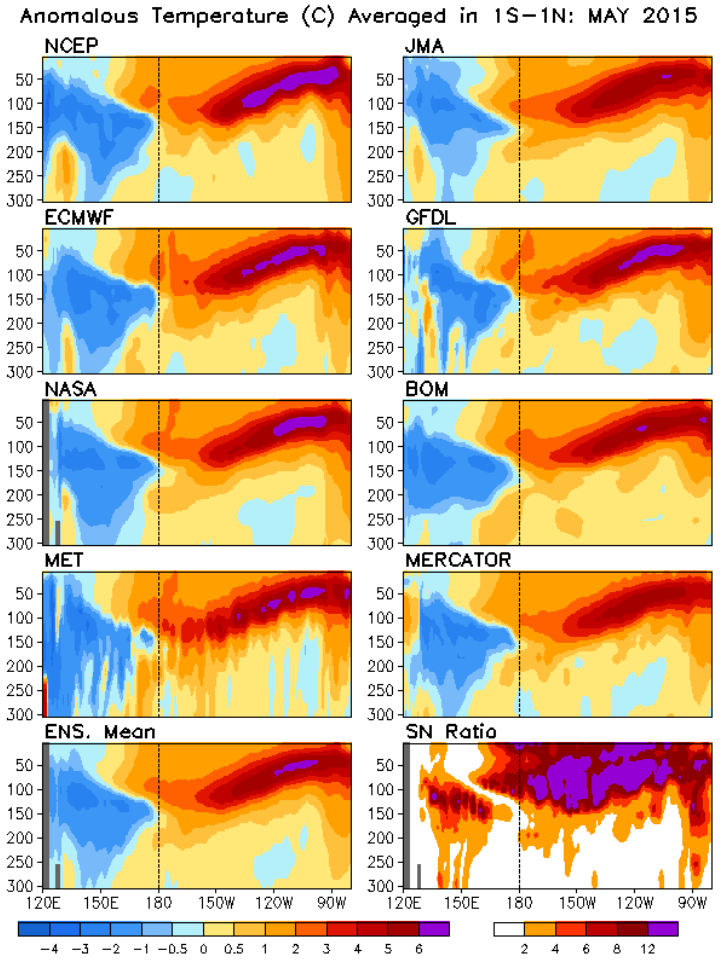
Ocean Re-Analyses:
Demonstrating the value of ocean observations

GODAE OceanView

ORA-IP

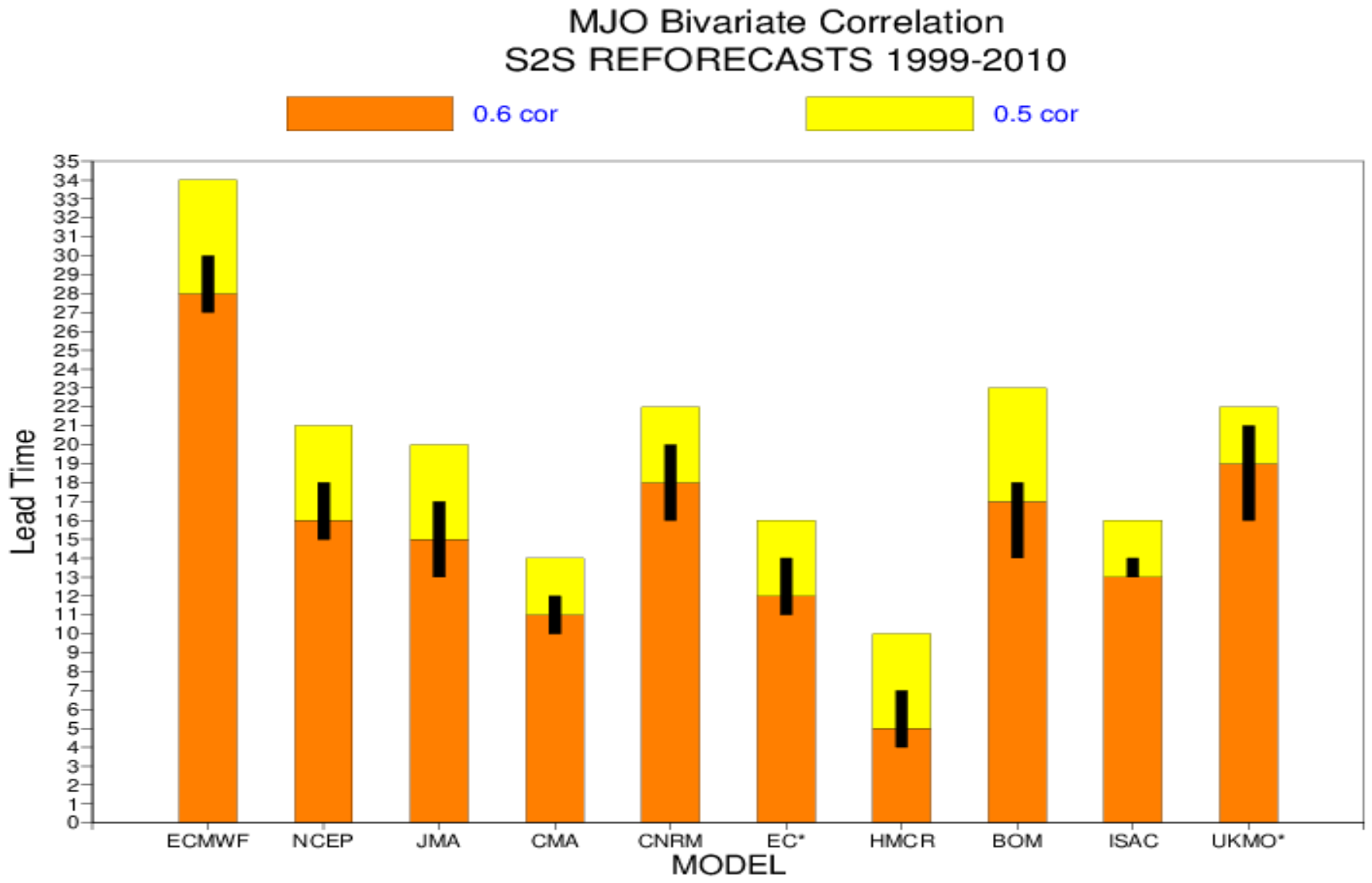
- **Intercomparison of ORAIP (Clim Dyn Special Issue)**
- **ORA-IP archive:**
  - Climate Indicators and metrics with uncertainty estimates
  - Bench-mark to measure progress. Version control
- **Multi-ORA real-time monitoring of climate: T and S**
- Next: Multi-ORA for initialization of coupled models?





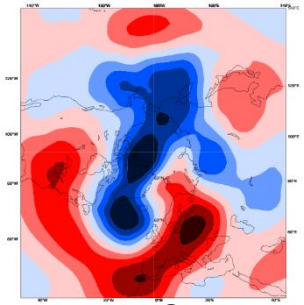
Temperature and ENSO monitoring, Yan Xue, NOAA
http://www.cpc.ncep.noaa.gov/products/GODAS/multiora_body.html

Bivariate Correlation with ERA Interim – Ensemble Mean
1999-2010 re-forecasts



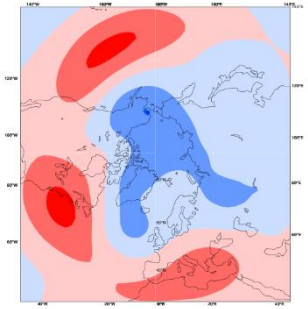
MJO Teleconnections: Z500 3rd pentad after Phase 3 NDJFM

EI 0.48

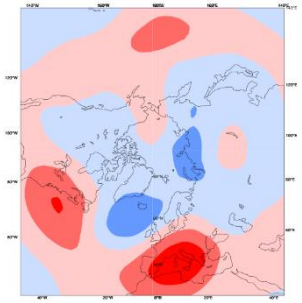


NAO Index: mean=0, std=1.0

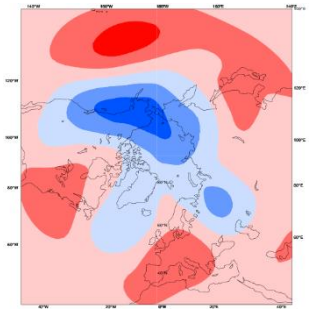
BoM 0.15



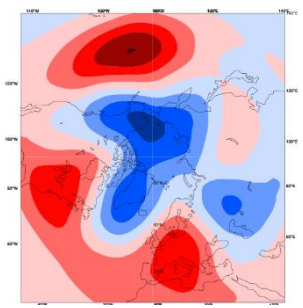
CMA 0.14



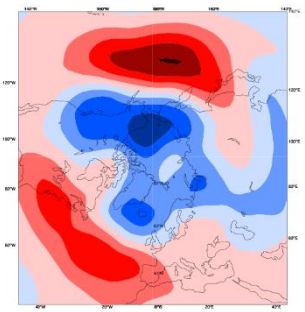
HMCR 0.13



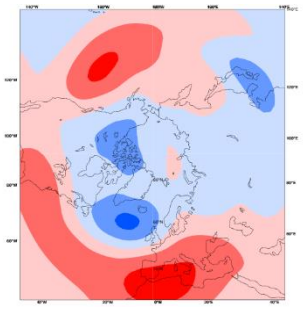
NCEP 0.32



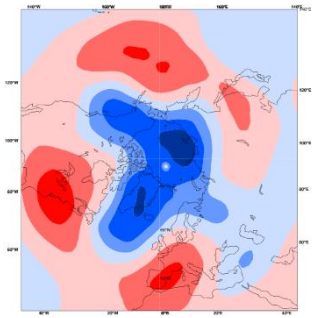
ISAC 0.25



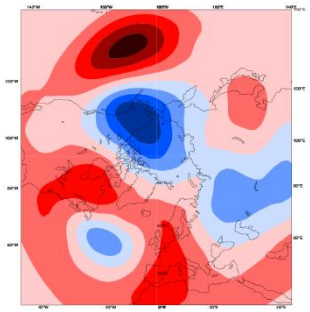
CNRM 0.15



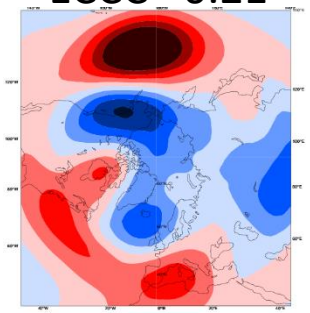
UKMO* 0.28



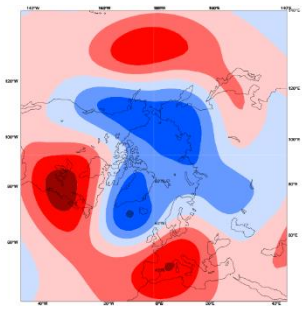
JMA 0.22



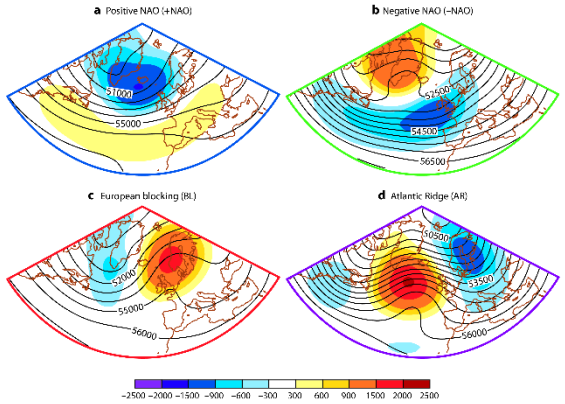
ECCC* 0.21



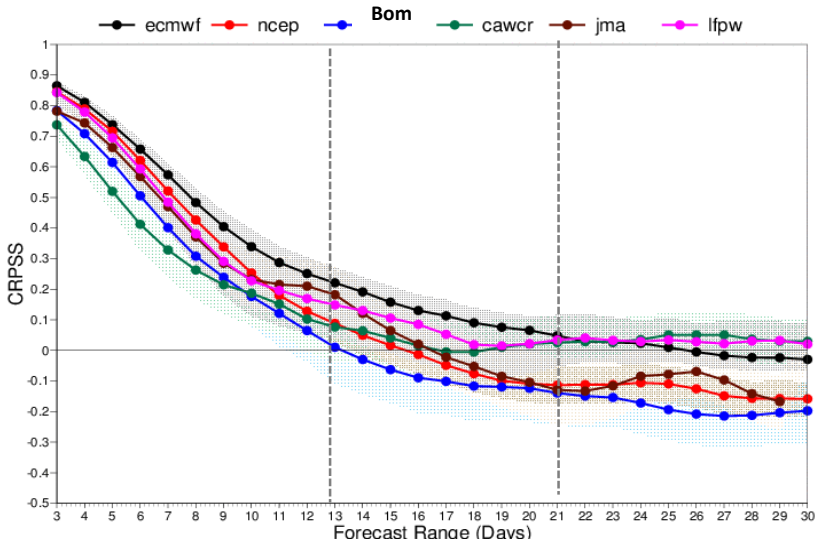
ECMWF 0.31



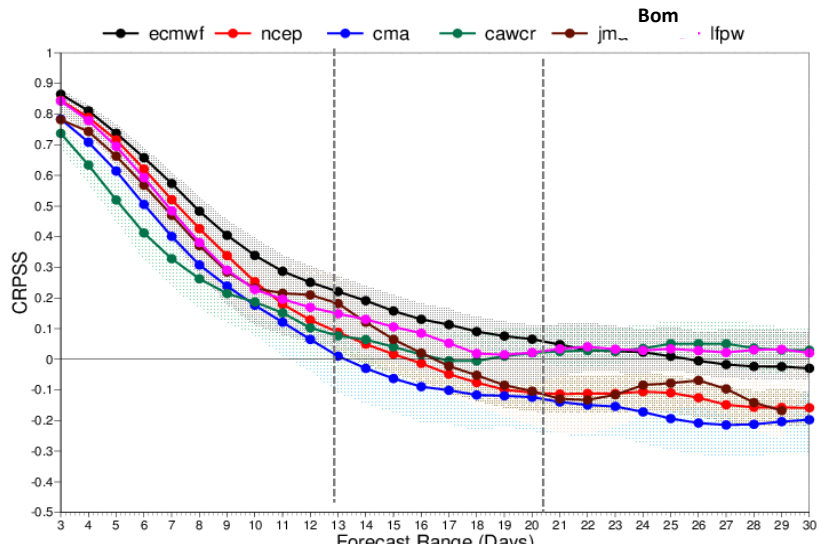
Predicting skill associated with the Euro-Atlantic Regimes:



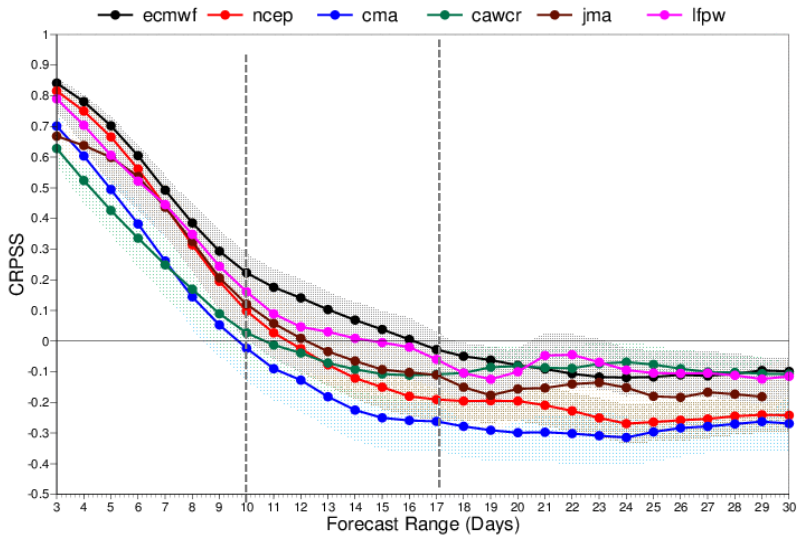
NAO +



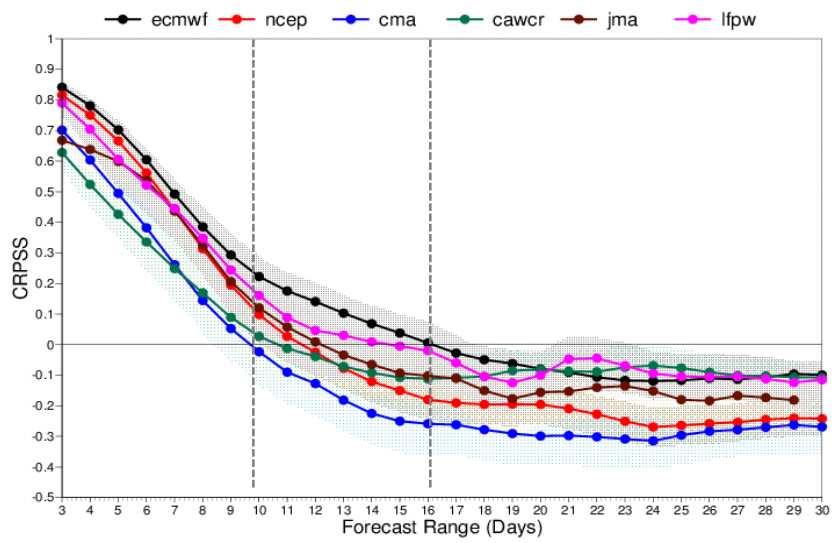
NAO -



Blocking

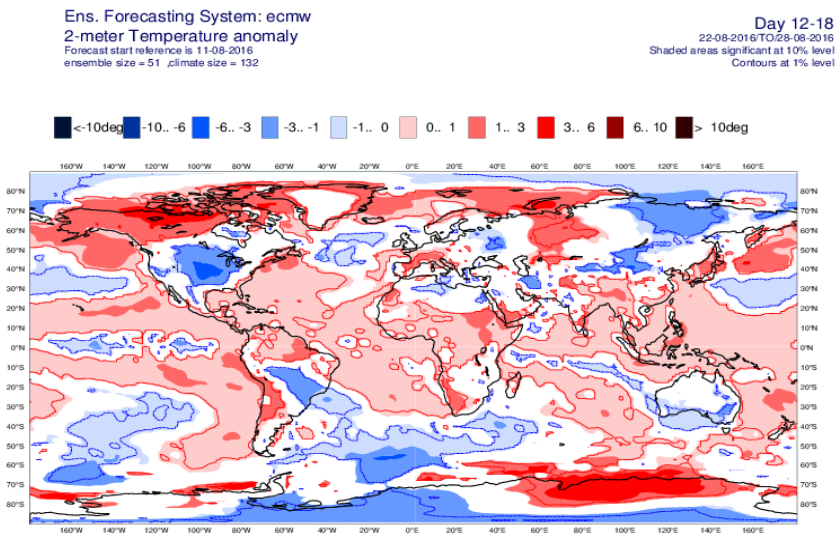


Atlantic Ridge

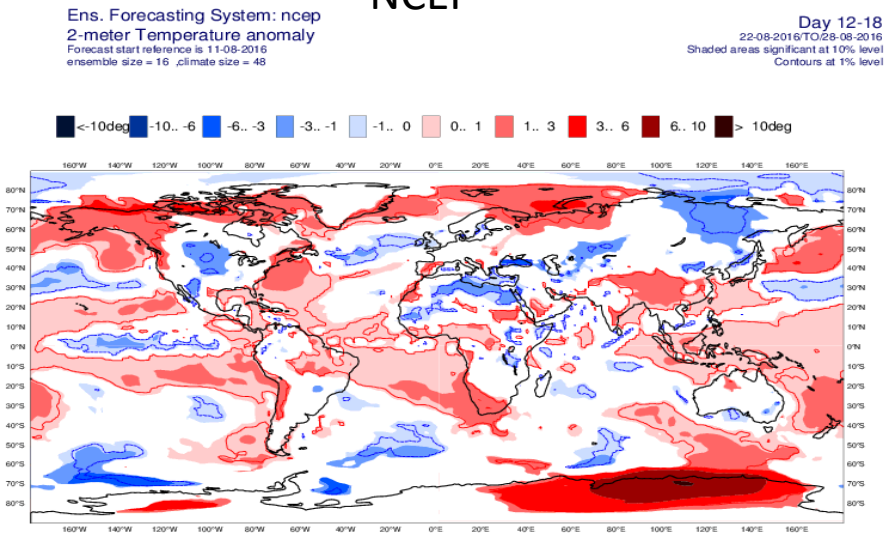


S2S product website: http://www.ecmwf.int/en/research/projects/s2s/charts/s2s/

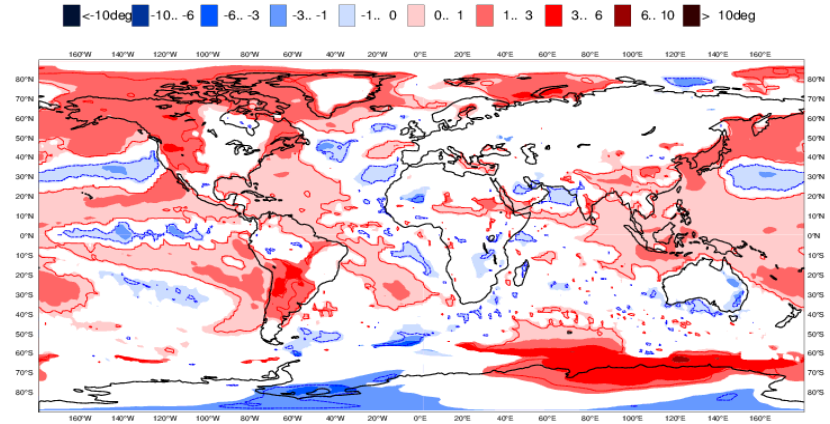
ECMWF



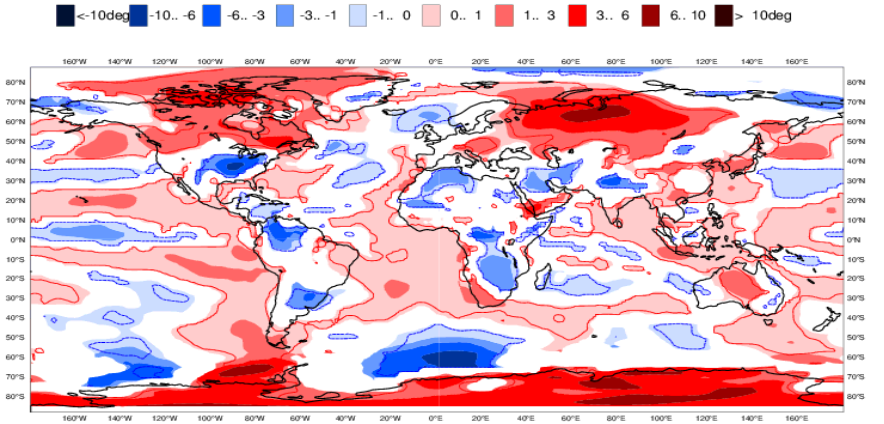
NCEP



JMA



BoM



S4 Forecasts

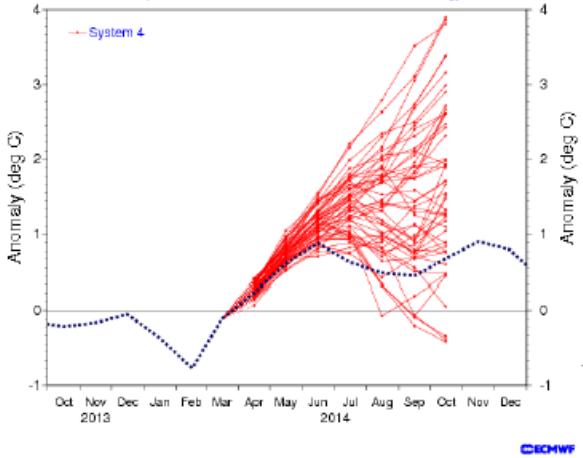
Forecasts starting in May more discerning than those starting in April

Predictability limit? (spring barrier)

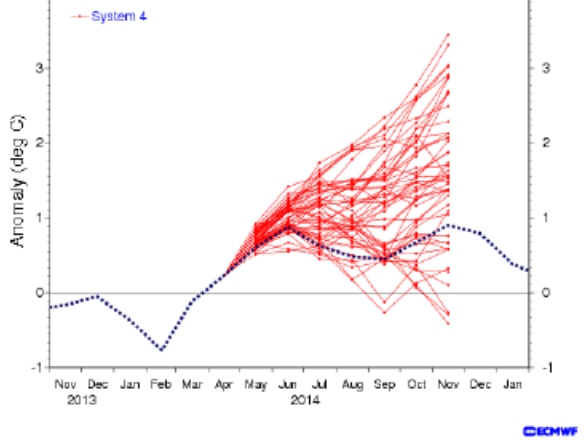
Or underconfident forecasts?

2014

April

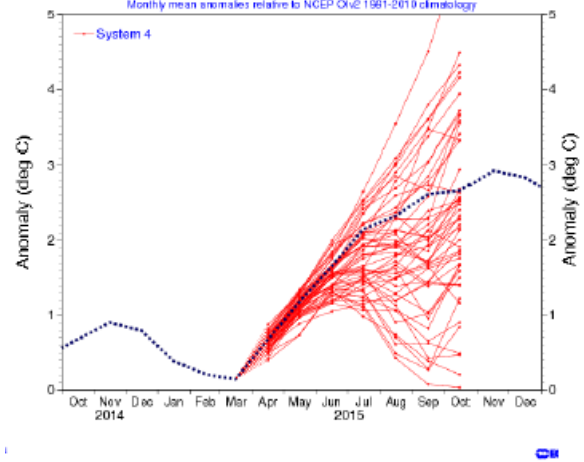


May

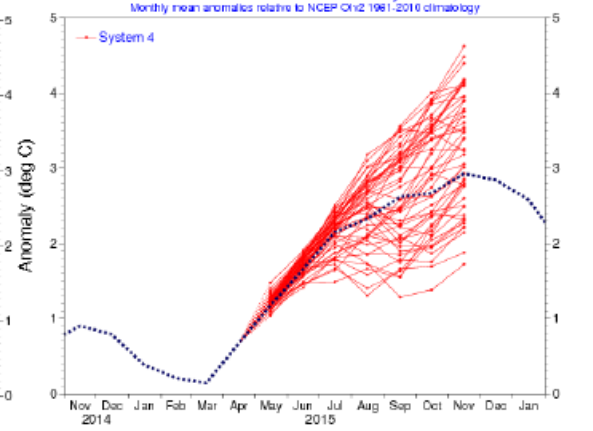


2015

April



May



*… Some recent results of **seasonal hindcasts for the entire 20th century** highlight the importance of evaluating model results over sufficiently long time periods. Conclusions reached from experiments only covering a few decades can easily be contradicted by results covering the whole century. These results emphasize the need to carry out validation experiments over long time periods and therefore also the need for substantial computing resources. …*

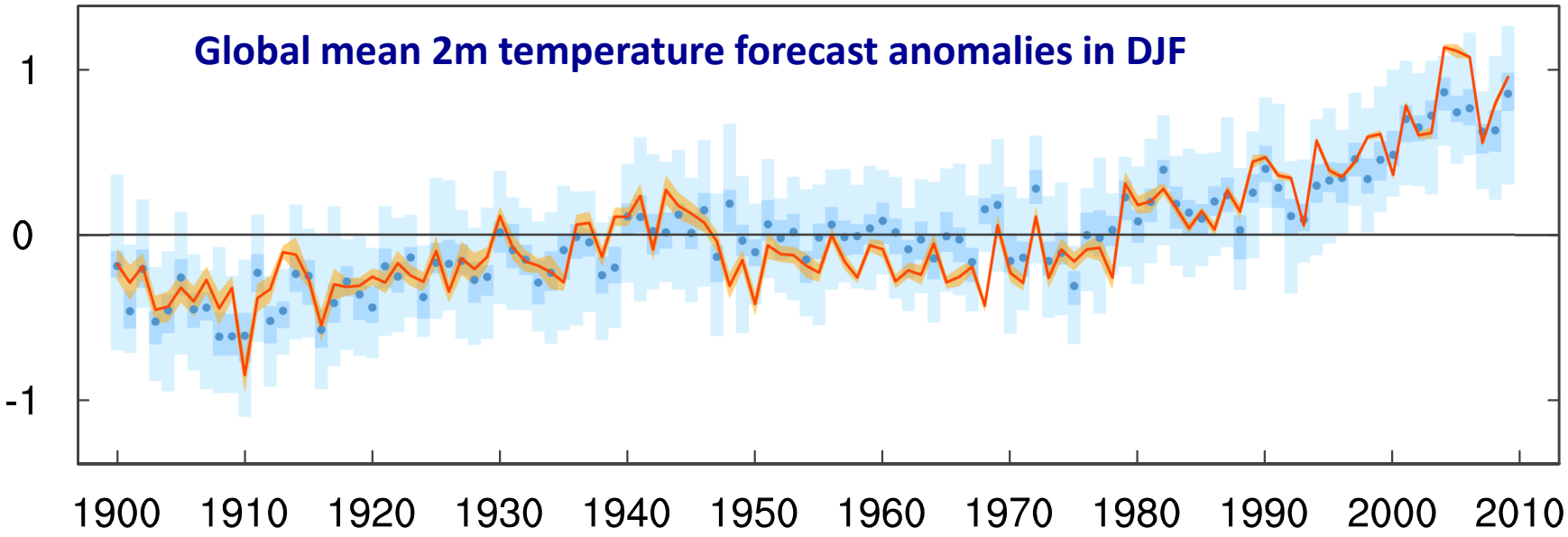
Atmospheric Seasonal Forecasts of the 20th Century (ASF-20C):

Multi-decadal variability in predictive skill of the winter NAO and PNA

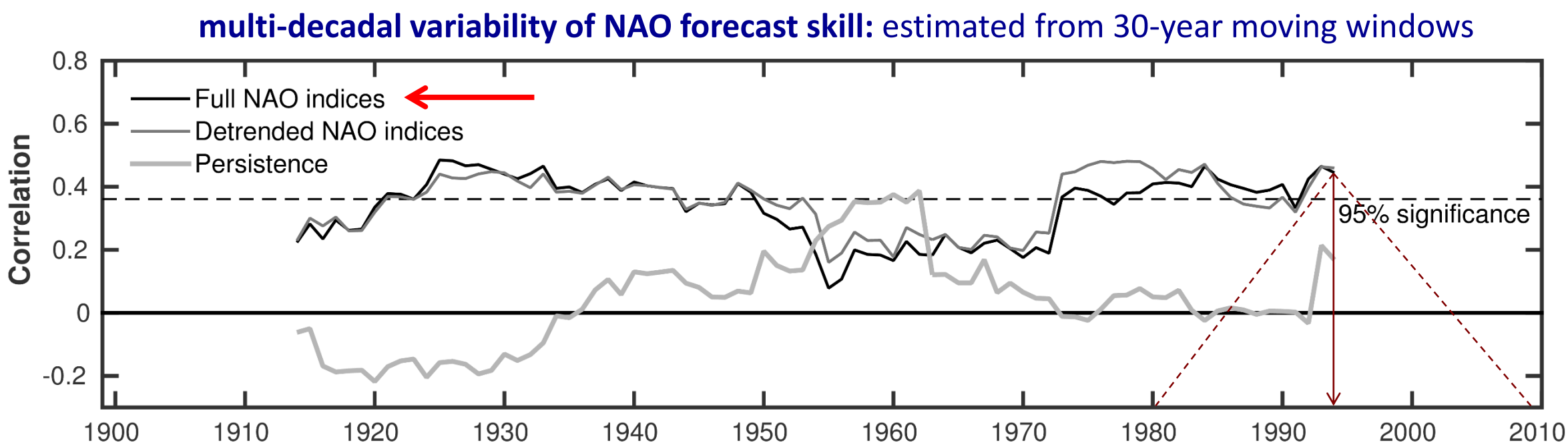
A. A. Weisheimer, N. Schaller, C. O'Reilly, D. MacLeod, T. Palmer and J. Heatley

B. University of Oxford

- ERA-20C from 1901 to 2010 as initial conditions for atmospheric seasonal forecasts
- SSTs and sea-ice are prescribed using HadISSTs (as in ERA-20C)
- Seasonal re-forecast experiments with the ECMWF model covering the period 1901-2010
  - CY41R1, T_L255L91, standard settings
  - 4-month forecast started on 1st of Nov/May/Feb/Aug to cover main seasons
  - Large ensemble of 51 perturbed members for probabilistic analysis of extremes

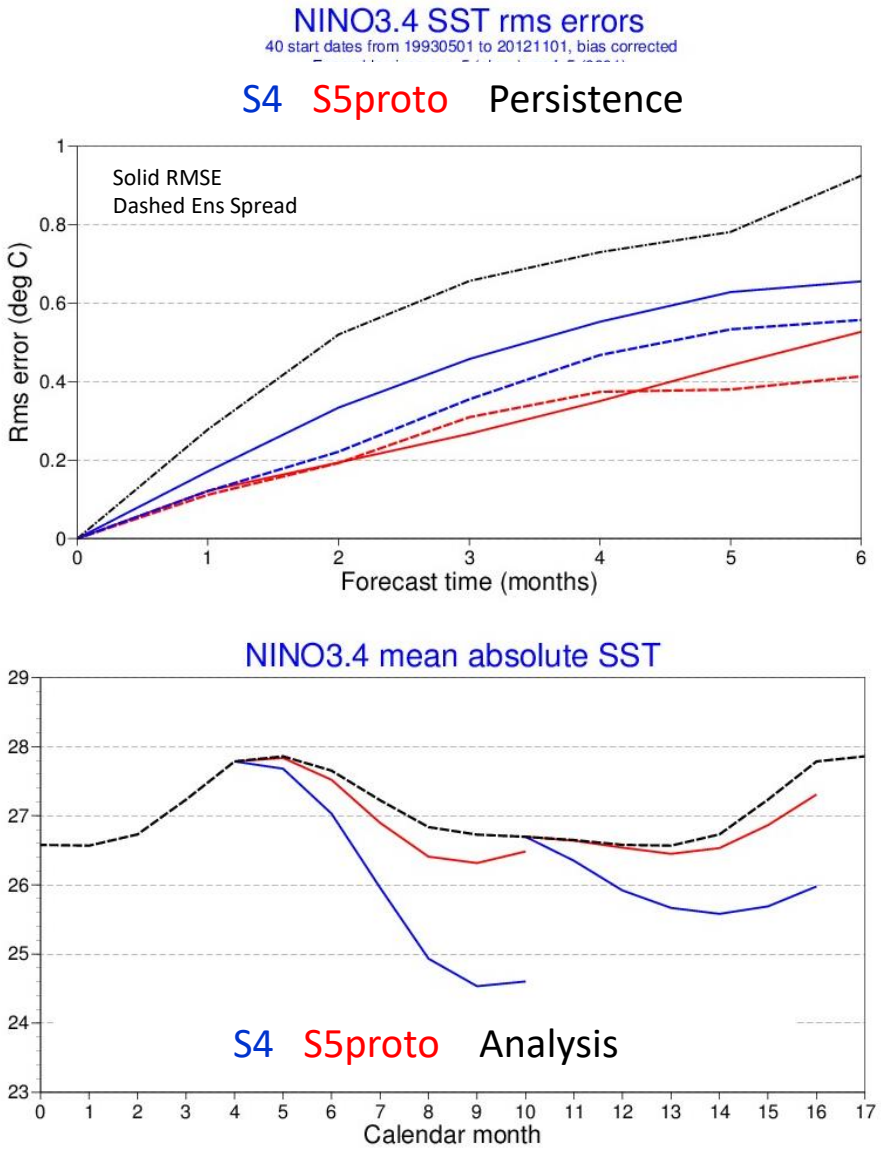


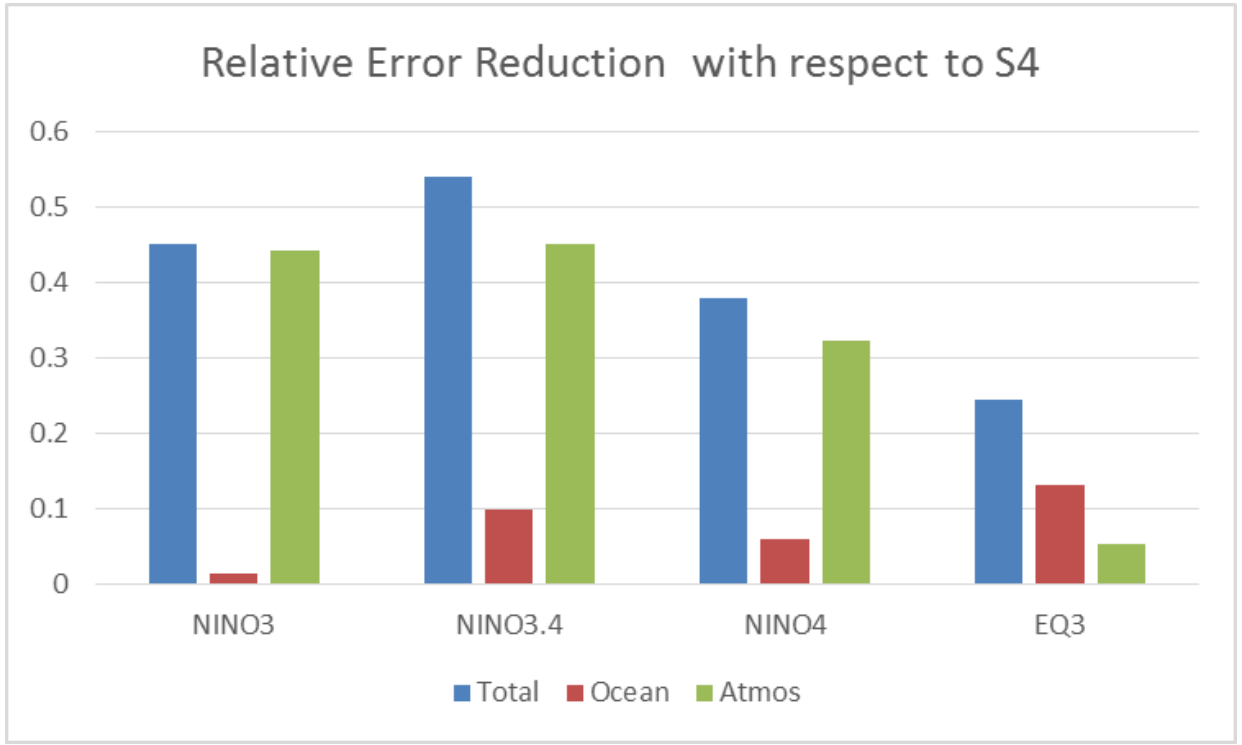
DJF global mean 2m temperature in ERA-20C (red) and the re-forecast ensemble of ASF-20C (blue). Uncertainty estimates from the reanalysis and the re-forecast ensemble are shown in orange (full range of the 10-member ensemble) and with blue shades (light blue: full range; darker blue: interquartile 25%-75% range; blue dots: ensemble median), respectively.



Weisheimer et al., submitted

Recent Progress in ENSO Prediction (2011-2016)





Seasonal forecasting system update:

- An upgrade (System5) is planned for 2017 (current target is July)
- Higher spatial resolution for both oceanic (1/4deg NEMO V3.4) and atmospheric components (under test Tco 319 vs Tco399).
- Dynamical sea-ice model (LIM2), and wave-ocean coupling in ocean mixing, stokes drift, non-local wave breaking.
- The ocean initial conditions will be created by ORAS5 (5 ens member reanalysis of 1/4 deg Ocean and sea ice from 1979 onwards).
- The atmospheric component based on CY43R1.The atmospheric initial condition will be based on ERA-Interim.
- Interactive stratospheric ozone.
- It is expected that by the end of 2017 the digital data of ECMWF seasonal forecast will be freely available under Copernicus Climate Change service.
- EUROSIP products will be superseded by the C3S multi-model products

9. WGSIP: Sub-seasonal forecast exchange and ET-OPSLS update

Mr Park representing the LC-LRFMME briefed the ET on progress in setting up a system at the LC-LRFMME for real-time generation and display of multi-model subseasonal predictions based on a selection of models available in real-time from the ECMWF archive of the WWRP-THORPEX/WCRP S2S research project. At the time of Bejing meeting subseasonal models from 4 GPCs were used: ECMWF, Exeter Tokyo and Washington.

A range of forecast products has been developed including probabilities for tercile categories of weekly averages of 2m temperature and rainfall as well as the MJO and BSISO indices. Verification has also been generated using SVSLRF diagnostics (ROC curves and scores) as well as correlation for a few case studies.

After some discussion it was decided it would not be appropriate to open up the LC-LRFMME real-time pilot subseasonal website products to NMHSs and RCCs. We agreed that was better to wait until:

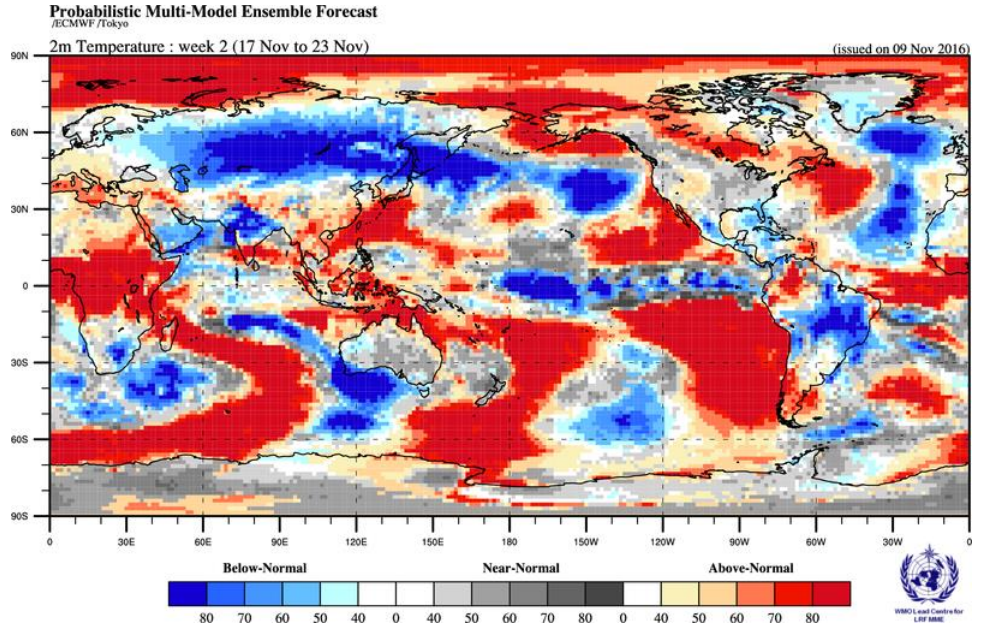
- more models will be included in the multi-model combination, the day of nominal issuance had changed (not done yet)
- a larger sample of verification statistics will become available.
- feedbacks from the S2S steering group are received

A major point of discussion was the need to shorten the elapsed time between the initialization time of the component models (which varies) and the release of the multi-model products. Because of the rapid decline in skill in the first few days the time taken to construct the multi-model can erode any skill increase gained by the multi-modelling process. Currently the delay is up to a week.

More GPCP are part of the exchange: : GPC Beijing, Melbourne and Montreal
More variables are collected : Z500, MSLP and v850.

Current conditions ……

Any response from the S2S steering group?



Decision for the next CBS session (CBS-16)

- **consider approving the designation criteria for GPC-NTCP (**Near Term Climate Prediction**) and LC-NTCP [CBS-16/Doc 3.6(2), draft 2];**
- **consider designation of Met Office as LC-NTCP and those centres with current submitted applications for GPC-NTCP after considering a review of these applications by ET-OPSLS [CBS-16/Doc 3.6(5), draft 2];**
- **authorize the Management Group (MG) to review further proposals for GPC-NTCP with assistance from ET-OPSLS and recommend on their designation during the intersessional period;**
- **consider designation of GPC-LRF for those centres with current submitted applications after considering a review of these applications by ET-OPSLS [CBS-16/Doc 3.6(4), draft 2]**

The secretariat asked the ET members to review the LC-NTCP, GPC-NTCP and GPC-LRF applications (by email).

The informal exchange has been in place successfully for 6 years demonstrating that roles and functions are largely being carried out already.

The ET-OPSLS agreed not to use the "GPC-NTCP" nomenclature and a designation process. However the secretariat advised that to comply with WMO Technical Regulations there must be at least some centres with a formal commitment to carry out the roles and functions – and so a designation process was required. "GPC-NTCP" was chosen for general consistency with existing GPC roles. The ET-OPSLS was concerned that research centres might not have long-term support for NTCP centres.

LC-NTCP and GPC-NTCP: Met Office, Exeter, UK, GPC-NTCP: BSC, Barcelona, Spain, GPC-NTCP: DWD/MPI, Offenbach, Germany, GPC-NTCP: ECCC, Canada, GPC-NTCP: IAP, China

GPC-LRF: DWD, Offenbach, Germany