



BSC-Earth Sciences Dept.

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BSC Earth Sciences Department

What

Environmental forecasting

Why

Our strength ...

- ... research ...
- ... operations ...
- ... services ...
- ... high resolution ...

How

Develop a capability to model air quality processes from urban to global and the impacts on weather, health and ecosystems

Implement climate prediction system for subseasonal-to-decadal climate prediction

Develop user-oriented services that favour both technology transfer and adaptation

Use cutting-edge HPC and Big Data technologies for the efficiency and user-friendliness of Earth system models

Earth system
services

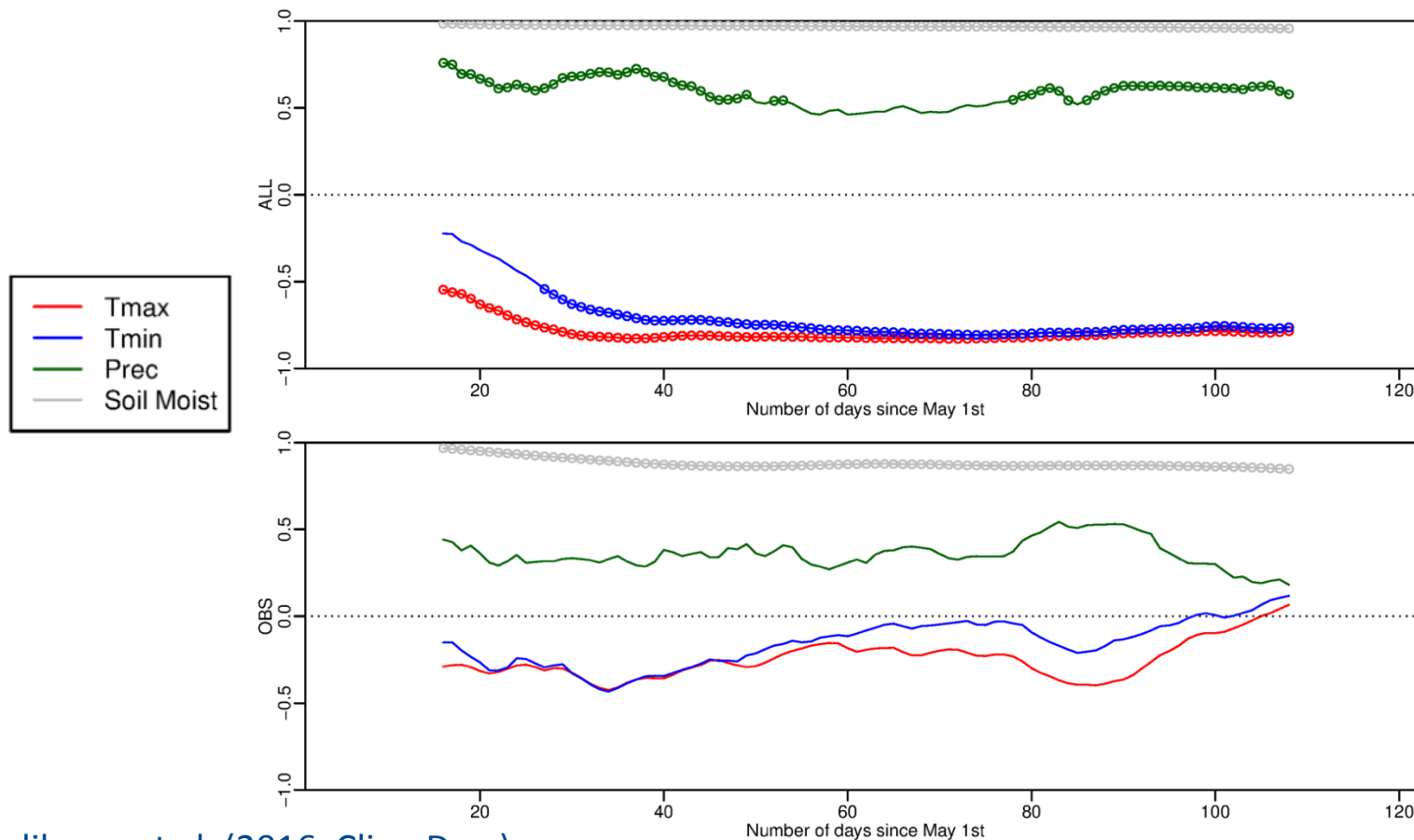
Climate prediction

Atmospheric
composition

Computational
Earth sciences

Correlation between 1st of May total soil water content and 31-day running mean of variables from the SPECS multi-model seasonal forecast (top) and ERAInt (bottom) over North American Great Plains.

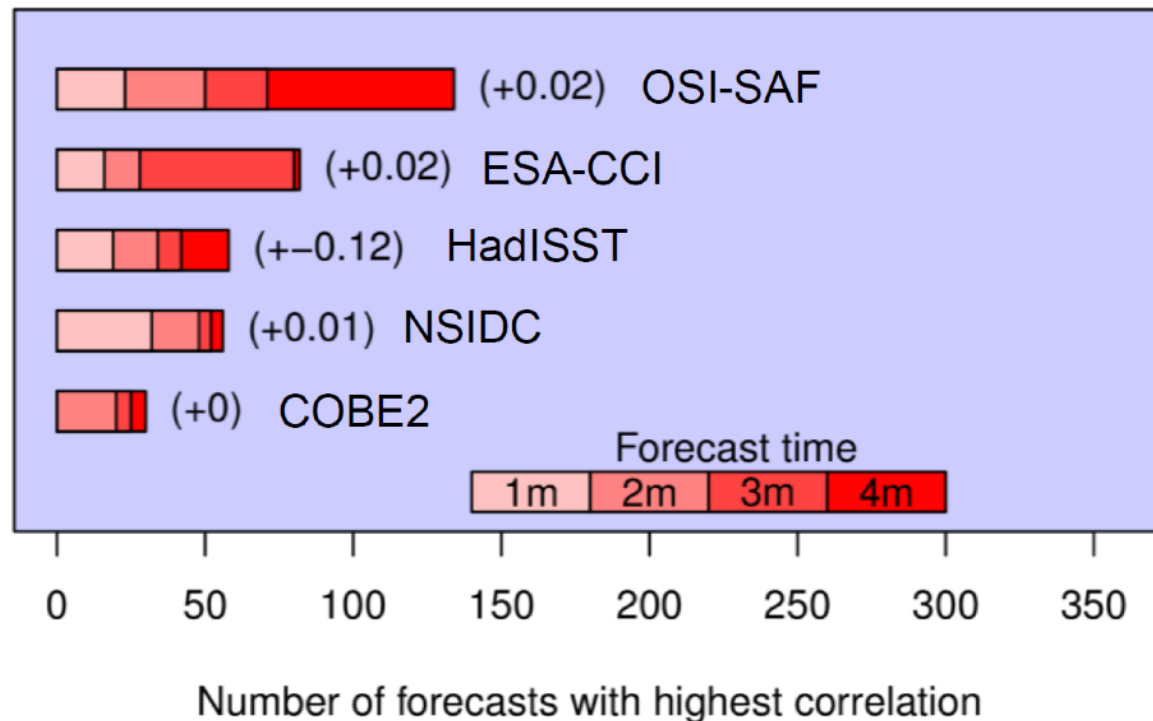
The model shifts quickly to excessive land-atmosphere coupled state.



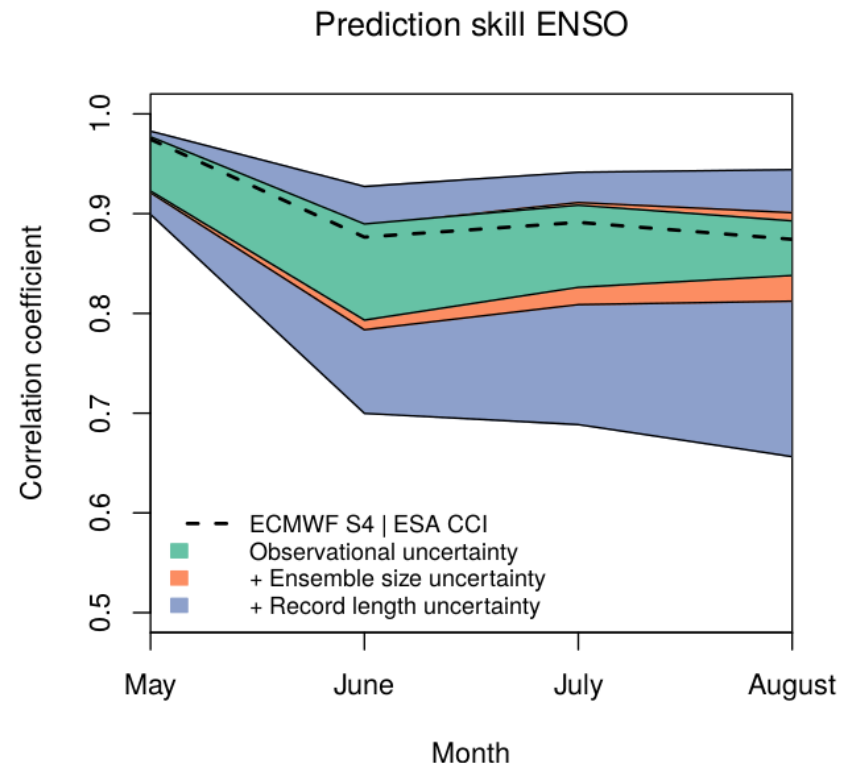
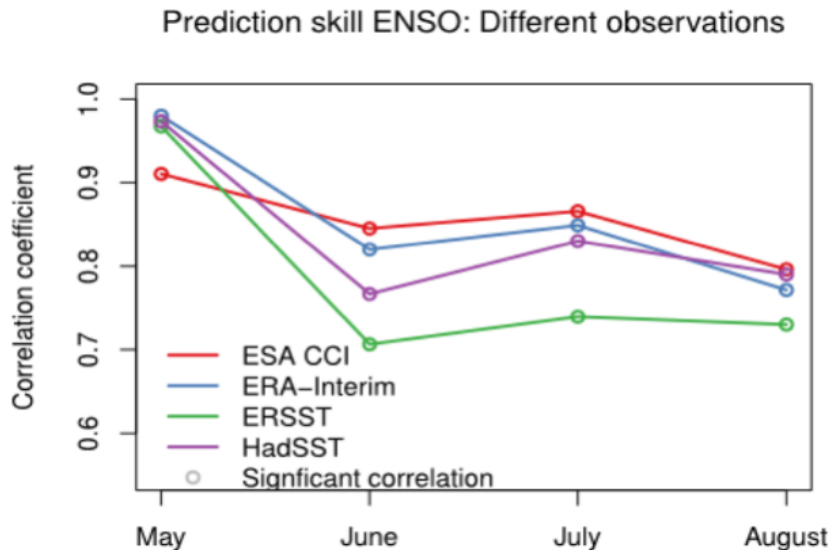
A new paradigm for verification



Predictions with 11 models x 10 members x 4 forecast months = 440 individual forecasts, forecast quality assessment for each of the 440 forecasts against each of the 5 verification products.



Niño 3.4 SST correlation of the ensemble mean for (left) EC-Earth3.1 (T511/ORCA025) predictions started every May over 1993-2009 with ERAInt and GLORYS2v1 ics, and internal sea-ice reconstruction and (right) ECMWF System 4, both started every May over 1993-2010.



Effect of increasing the resolution

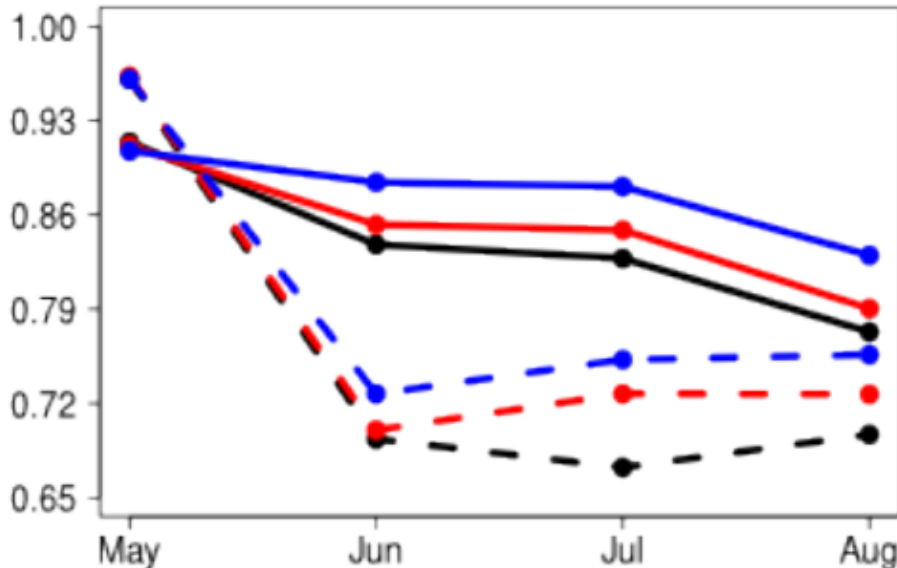


Forecast quality from EC-Earth3.1 seasonal hindcasts (1993-2009, Glorys2v1, ERAInt and ERA-Land initial conditions). Solid for ESA-CCI and dashed for ERSST. Blue for high resolution ocean and atmosphere, red for high resolution ocean, black for standard resolution.

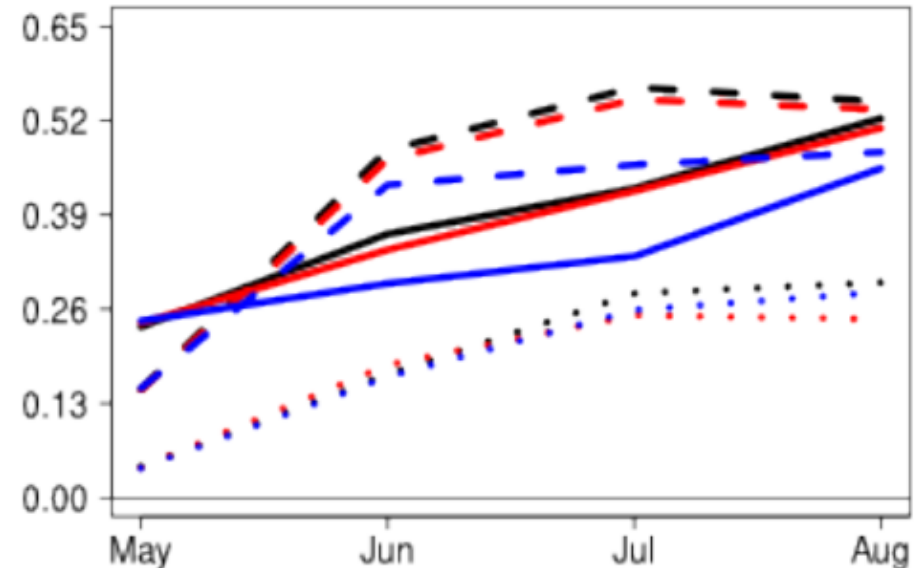
May start dates



a) Correlation

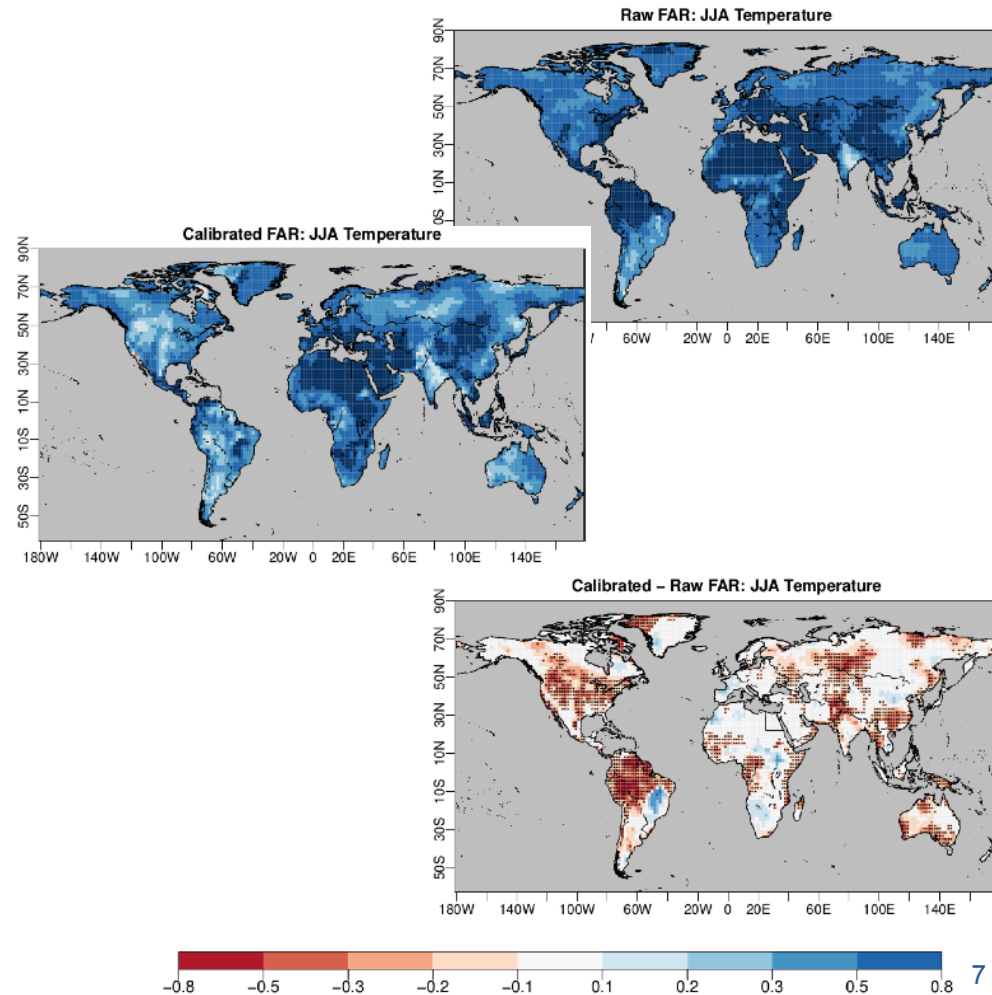
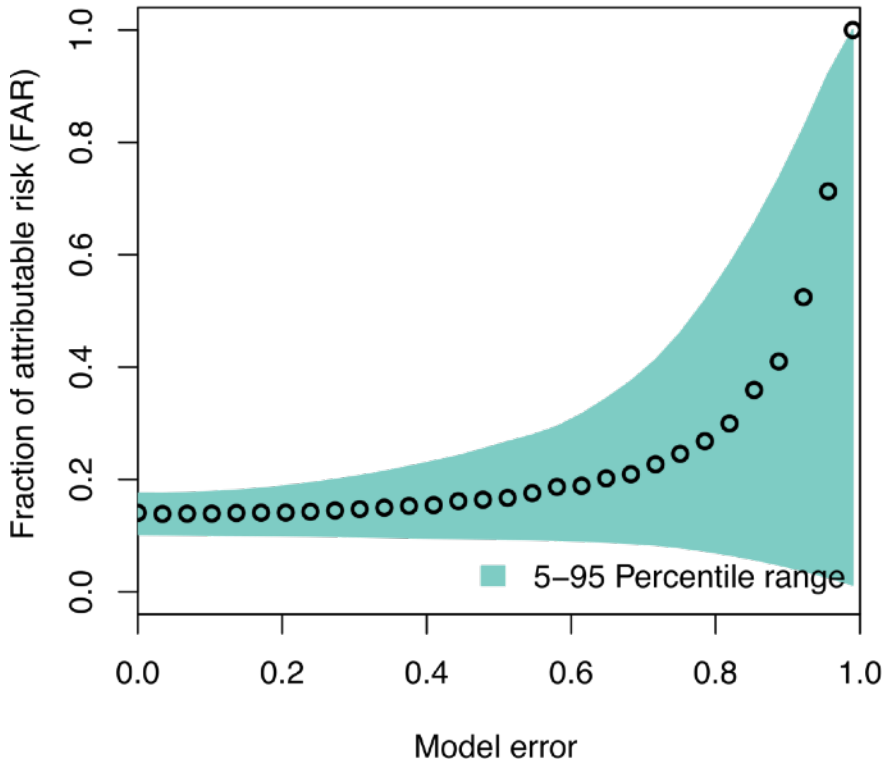


b) Spread and RMSE



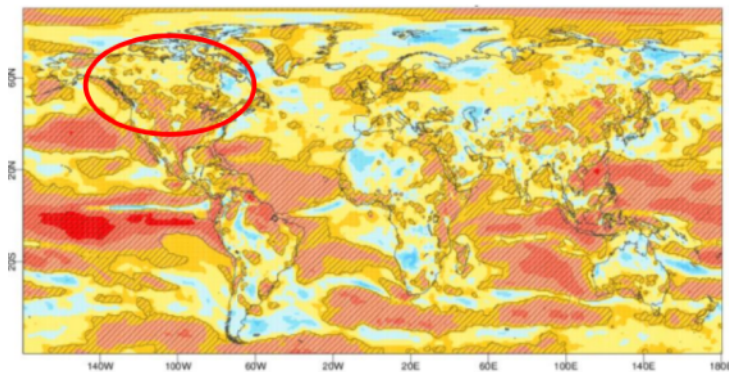
Relationship between Fraction of Attributable Risk (FAR) and model error set in a toy model with reliability error. The FAR increases with model error. Tested with the HadGEM3A attribution system.

Attribution of a one in 10 year event

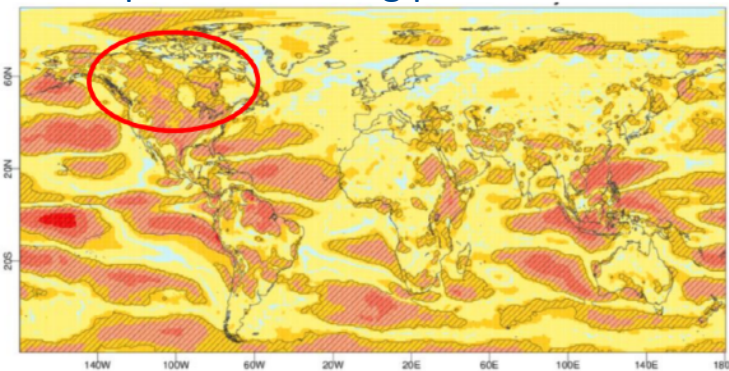


ECMWF S4 10-metre wind forecasts are corrected with the predicted Niño3.4 index on a regression estimated using ERA-Interim data.

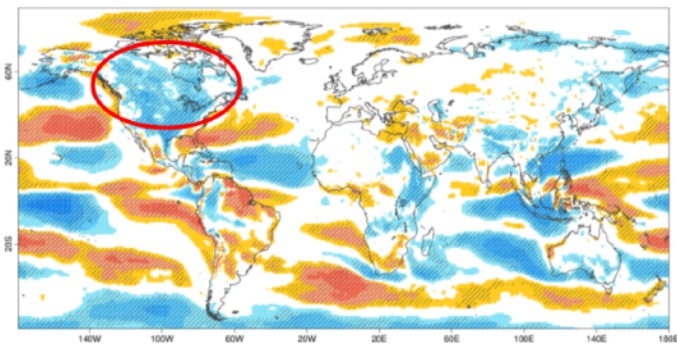
Correlation of the ECMWF S4 ensemble-mean prediction



Correlation of the ECMWF S4 ensemble-mean prediction using predicted Niño3.4



Point correlation of Niño3.4 and 10-metre wind from ERA Interim



Point correlation of Niño3.4 and 10-metre wind from ECMWF S4

