



**Barcelona  
Supercomputing  
Center**  
*Centro Nacional de Supercomputación*



**EXCELENCIA  
SEVERO  
OCHOA**

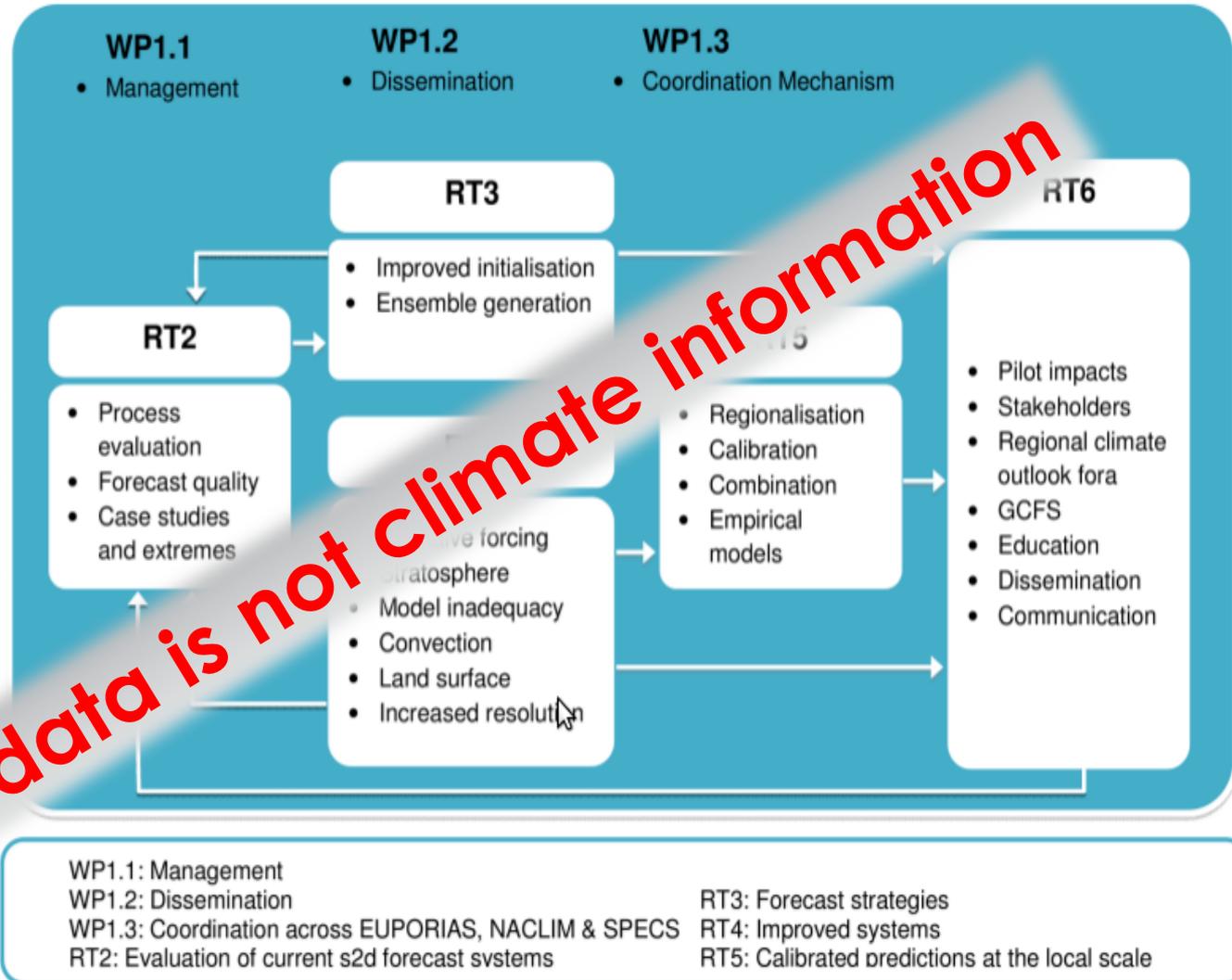
# Some European Activities

Francisco J. Doblas-Reyes

# SPECS

SPECS specs-fp7.eu produced quasi-operational and actionable local climate information with a new generation of reliable European climate forecast systems.

Forecast System	Project Partners
CNRM-CM5	CNRM, CERFACS
EC-Earth	KNMI, SMHI, BSC, ENEA
IFS/NEMO	ECMWF, UOXF
IPSL-CM5	CNRS
MPI-ESM	MPG, UniHh
UM	



**Climate data is not climate information**

# SPECS: Impact of resolution

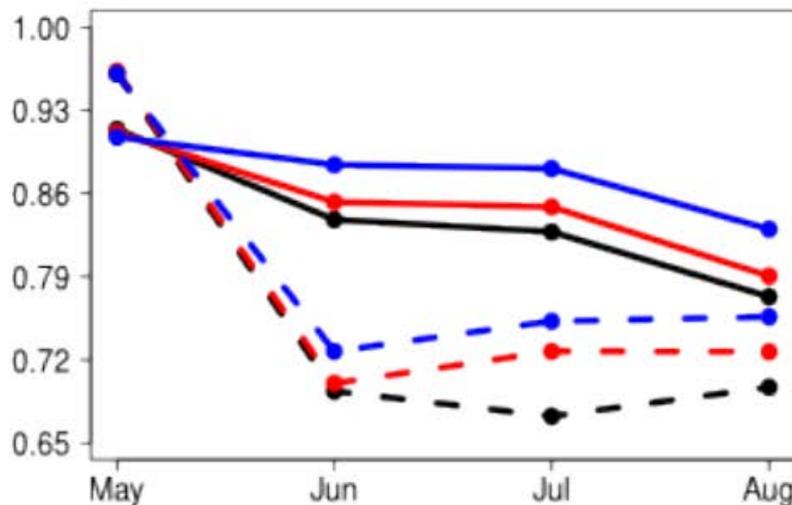
Forecast quality from EC-Earth3.1 seasonal hindcasts (1993-2009, Glorys2v1, ERAInt and ERA-Land initial conditions). Solid for ESA-CCI and dashed for ERSST.

**Blue for high resolution ocean and atmosphere, red for high resolution ocean, black for standard resolution.**

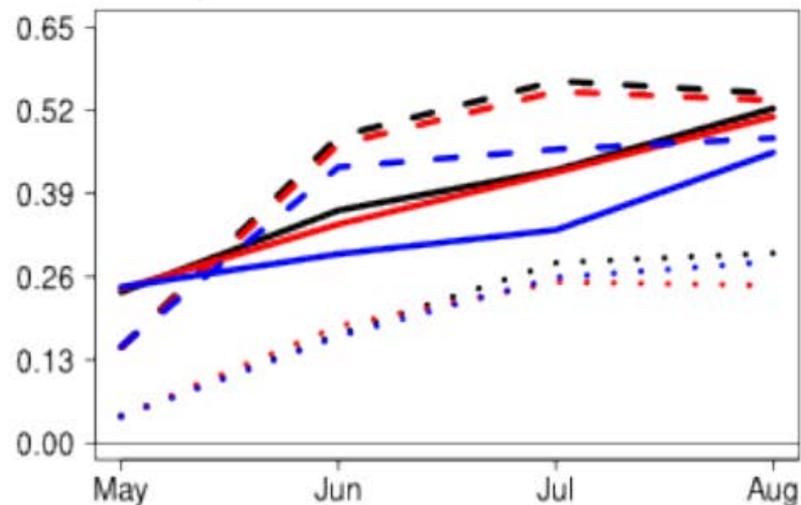
May start dates



a) Correlation



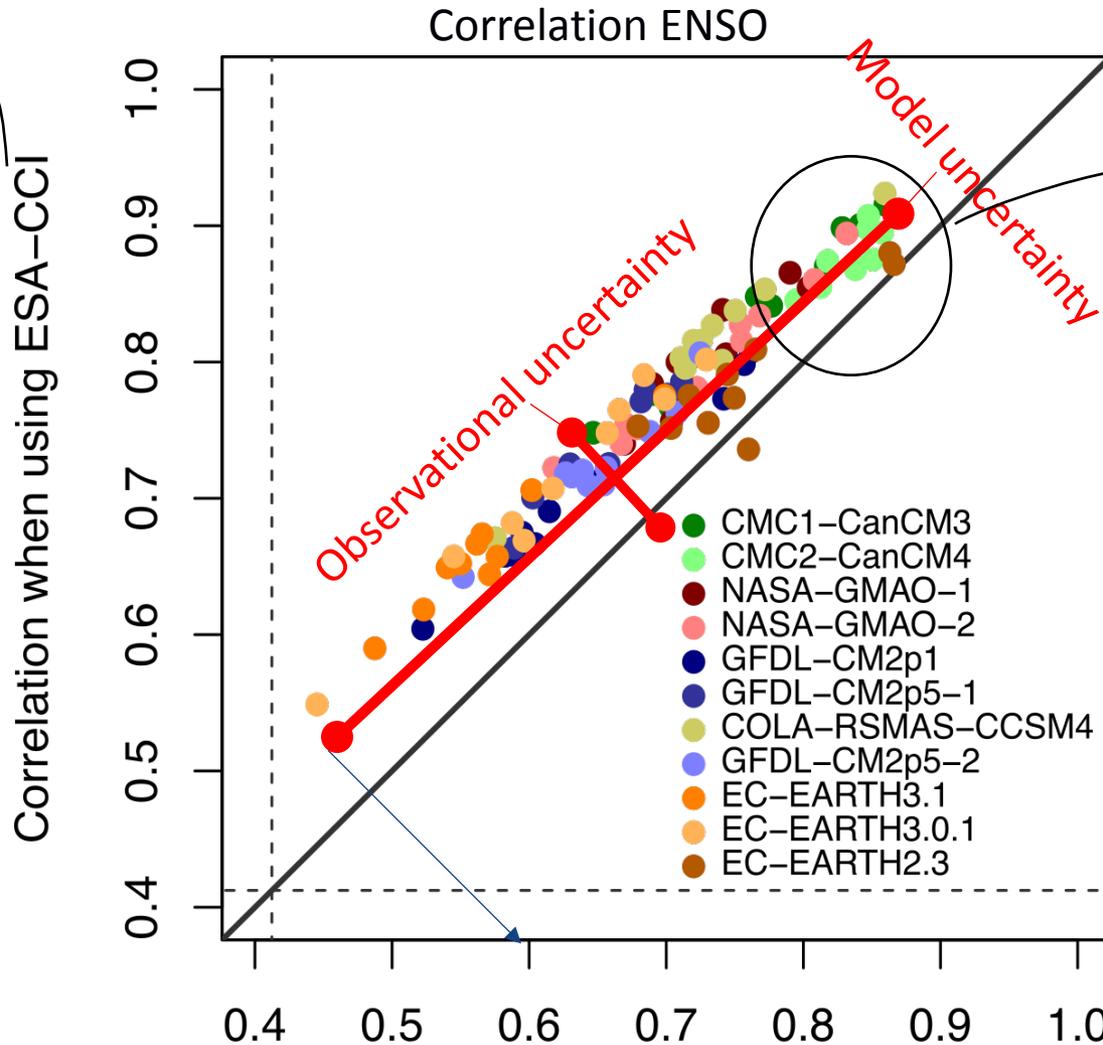
b) Spread and RMSE



# SPECS: A new look at model validation

Models can also be used to estimate the quality of observational estimates.

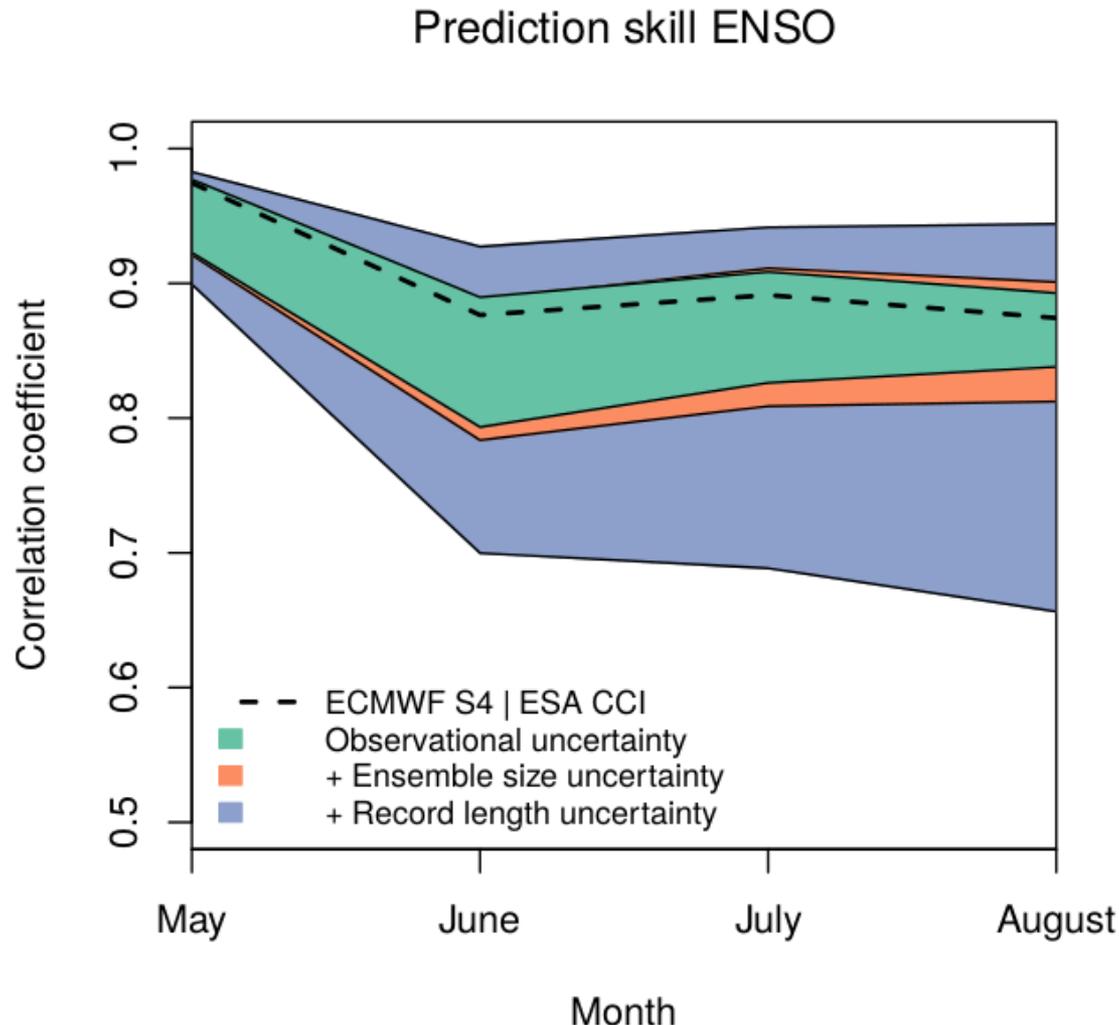
Independent from the models



How important for individual systems?

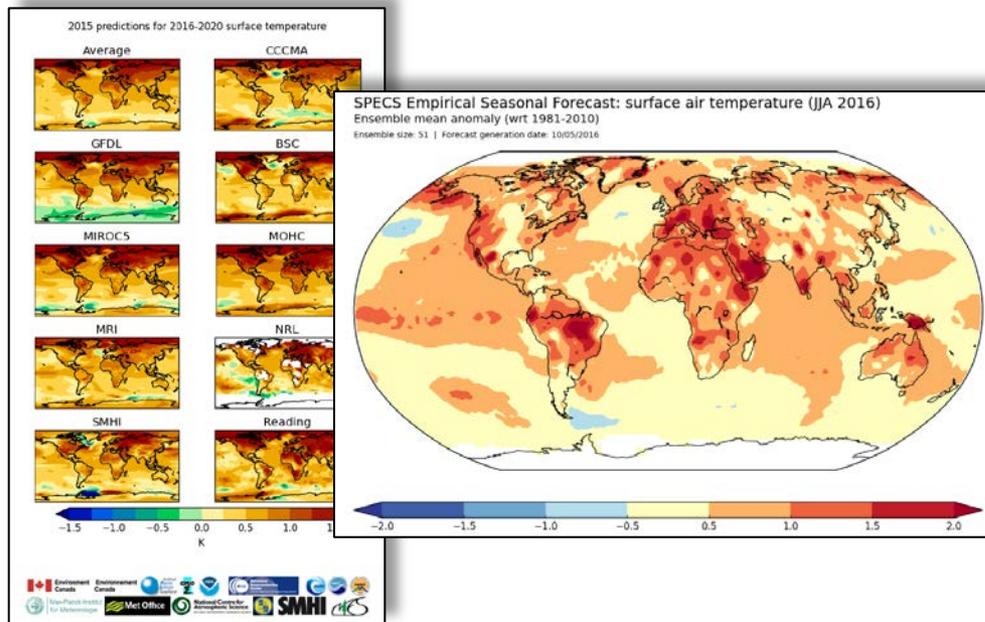
# SPECS: Observational uncertainty

Niño3.4 SST correlation of the ensemble mean for ECMWF System 4 started every May over 1993-2010.



# SPECS: More than better predictions

The operationalisation of decadal forecasts, the creation of robust empirical benchmarks, the exhaustive illustration of the (limited) benefits of downscaling and model combination, the generation of entry-level documentation, and the definition of standards for climate prediction have been rewarding aspects of the project activity



SPECS Fact sheet #2 **What is a decadal prediction?** October 2014

Weather is chaotic which limits its predictability to one or two weeks. This means that it will never be possible to extend normal weather forecasts to seasonal time-scales and beyond.

For example, we will never be able to predict the weather on a specific date in a specific place years in advance. However, **changes in prevailing weather over the course of several months to years are potentially predictable.** For instance we may be able to say if a particular region might expect, on average, colder winters or drier summers. Such changes in weather patterns occur due to the interaction of the atmosphere with more slowly varying parts of the Earth system.

(a) DJF (b) MAM  
(c) JJA (d) SON

% of reliability categories

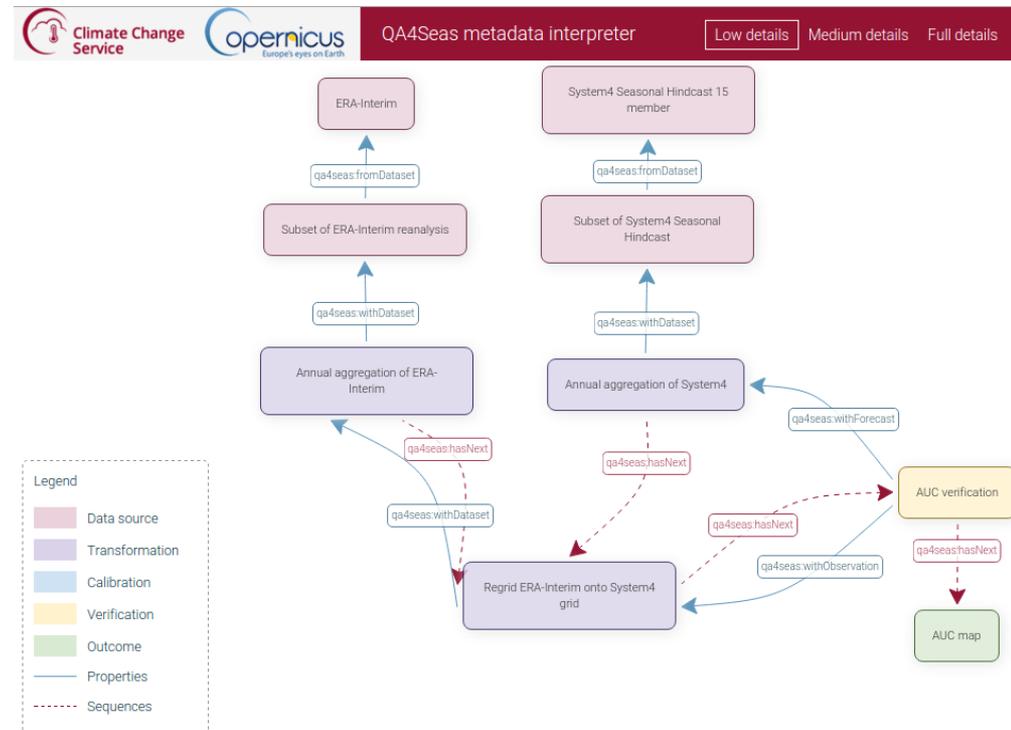
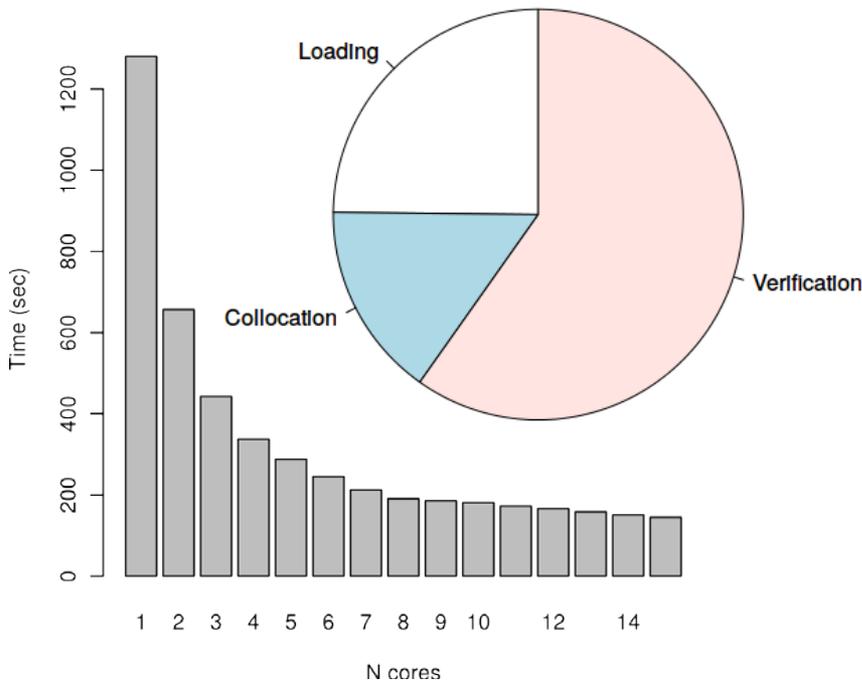
perfect still useful marginally useful not useful dangerous

Weather is a result of energy moving through the Earth system. Energy is originally radiated to the Earth from the Sun, with most being re-emitted or reflected back to space. The amount that remains in the Earth system is modulated by many things: some emerge naturally within the system (*internal variability*), whilst others are controlled by external factors such as variations in solar output, greenhouse gases, and atmospheric particles

Multidisciplinarity is fundamental in climate services, and this should include climate modellers and forecasters, which requires profiles that are not readily available.

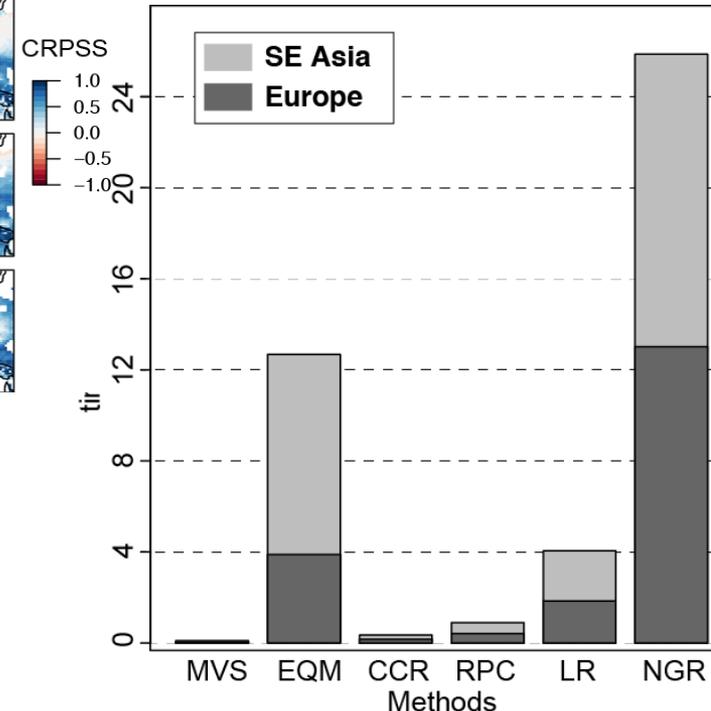
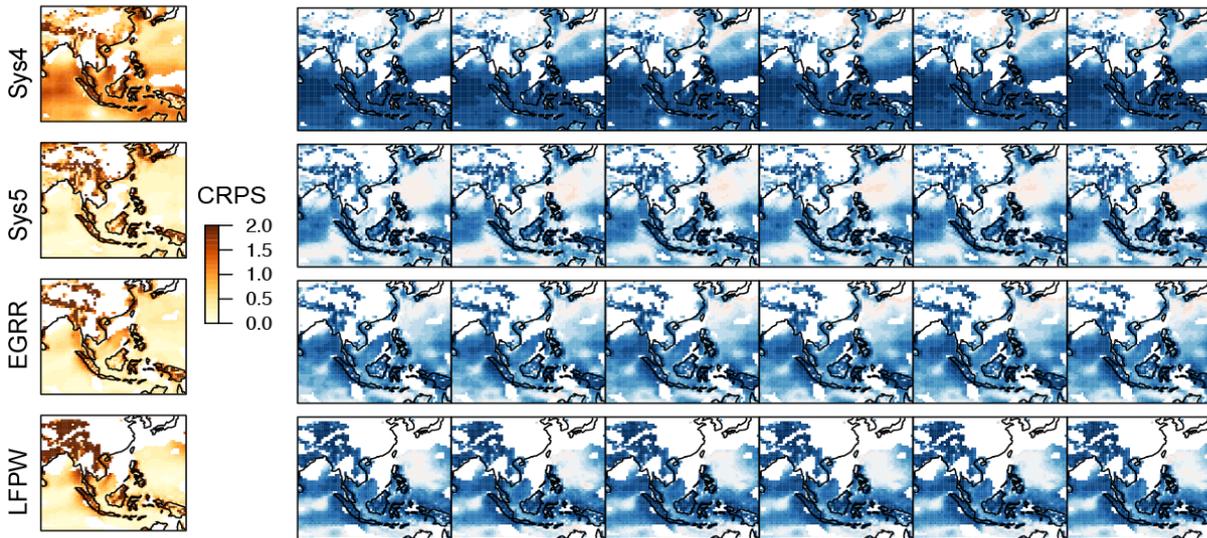
# C3S 51 Lot 3 contract (QA4Seas): verification

- **Computing performance is key:** (left) scalability of a ROC area estimate using loaderR, SpecsVerification and easyVerification.
- **Provenance:** An [RDF-based approach](#) aiming at the reproducibility of objects (NetCDF file, image) with human and machine-readable solution using a semantic metadata model has been created in QA4Seas.



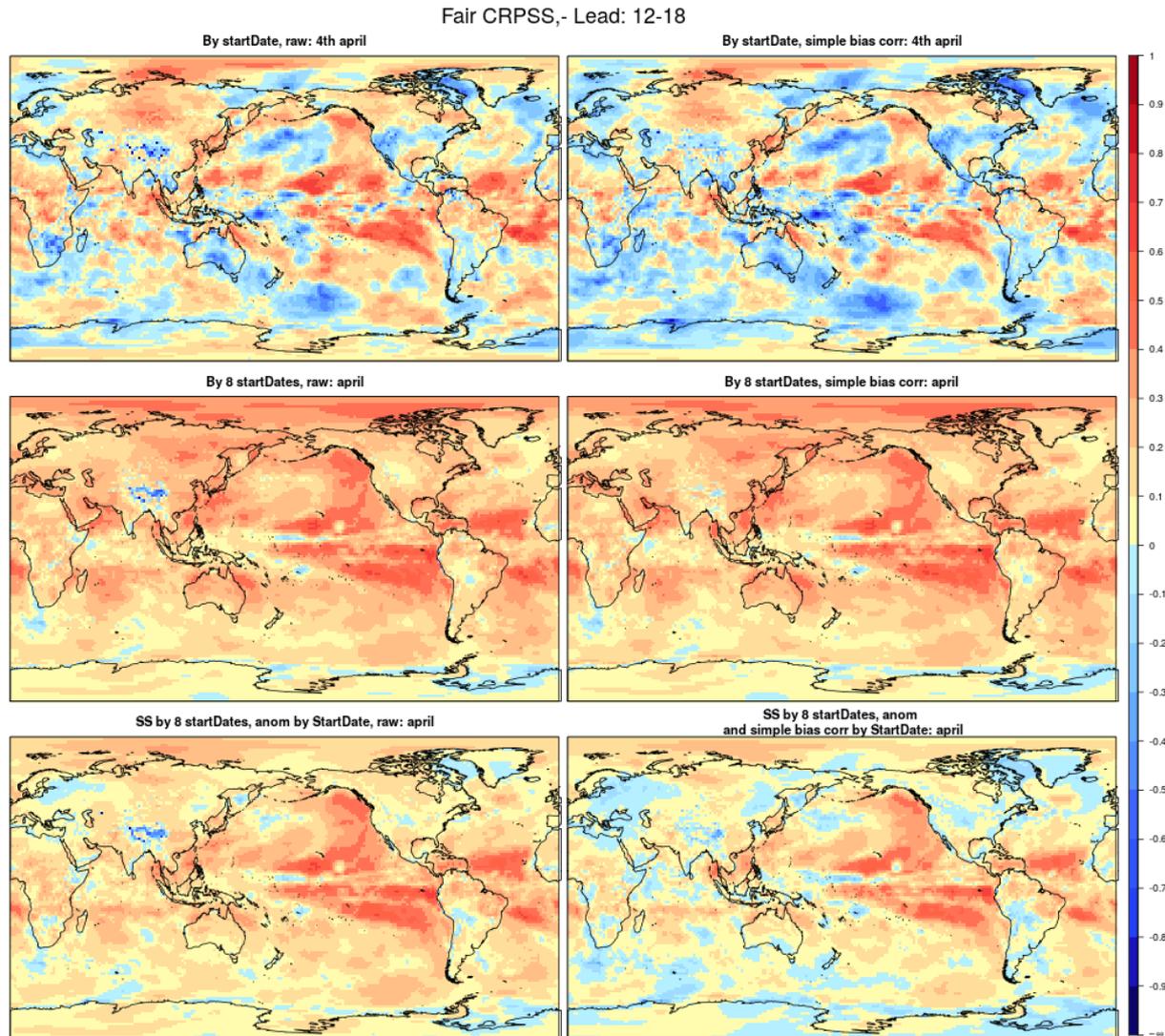
# C3S 51 Lot 3 contract (QA4Seas): bias

CRPSS for near-surface temperature over South Asia in DJF from applying six different re-calibration methods (one per column) to four C3S forecast systems. For comparison purposes, the CRPS obtained for the raw model output is shown on the left.



# More on bias correction: S2S

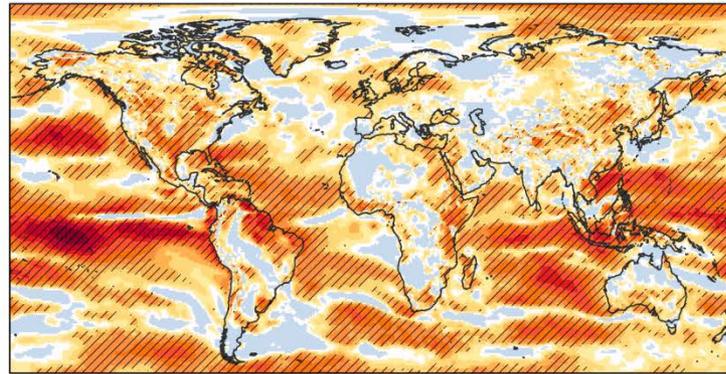
Fair CRPSS for the April monthly ECMWF forecasts (2016 vintage) of near-surface temperature from raw and bias-adjusted data.



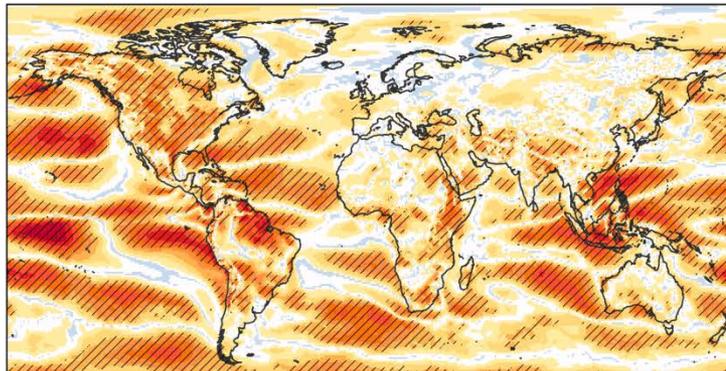
# And more on postprocessing: reconstruction

Correlation of the ensemble-mean prediction of wind speed for DJF (one-month lead time) from ECMWF S4 for raw and reconstructed data using the Niño3.4 time series.

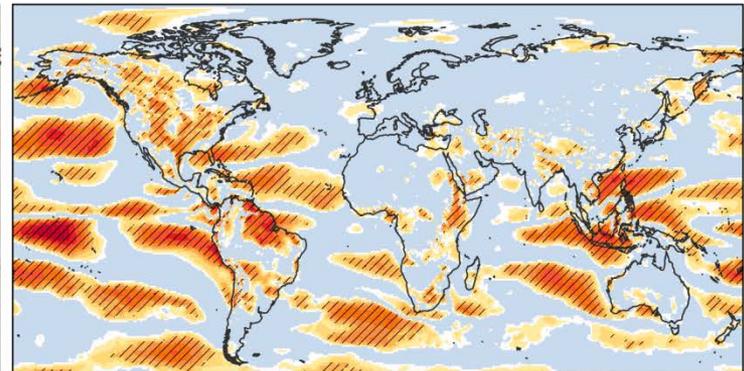
a) Raw data



b) Recon Niño3.4 no-cross



c) Recon Niño3.4 cross



# EUCP: from decadal prediction 2 projections

- European Climate Prediction system (EUCP): 4 years (Dec 2017-Nov 2021), 16 partners, Met Office lead
- Objectives:
  - Develop an innovative ensemble climate prediction system based on high-resolution climate models for Europe for the near-term (1-40 years), including methods to characterise **uncertainty in climate predictions, downscaling, and evaluation against observations.**
  - Use the **climate prediction system to produce consistent, authoritative and actionable climate information.** This information will be co-designed with users to constitute a robust foundation for Europe-wide climate service activities to support climate-related risk assessments and climate change adaptation programmes.
  - Demonstrate the value of this climate prediction system through high impact extreme weather events in the near past and near future drawing on convection permitting regional climate models.
  - Develop, and publish, methodologies, good practice and guidance for producing and using **authoritative climate predictions for 1-40 year timescale.**



European Climate Prediction system