Météo-France as RA-VI RCC-LRF node
Current practice, products and plans

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Workshop on OSF production over MedCOF region (AEMET)

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Outline of this talk

Current approach for RCC RA-VI bulletins

Synthesis map elaboration and verification bulletins

Current and future products

Downscaling methods used at Météo-France for sectorial applications

Current approach for RCC RA-VI bulletins

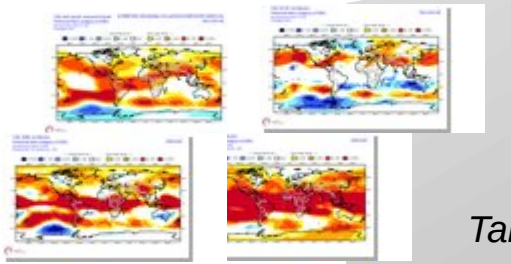
Multiple sources of information:

- analysis of ocean state for the month prior to forecast initialization
- ocean forecasts from C3S (Pacific, Indian indices), IRI ENSO synthesis, MF model outputs
- atmospheric circulation forecasts
- modes of variability over Europe and projected impacts
- weather regime synthesis and projected impacts
- temperature and precipitation probability maps

Expert judgement based on these sources of information → not 100 % objective

Limited traceability, but reasons for favoring one outcome are highlighted in the bulletin

Current approach for RCC RA-VI synthesis maps

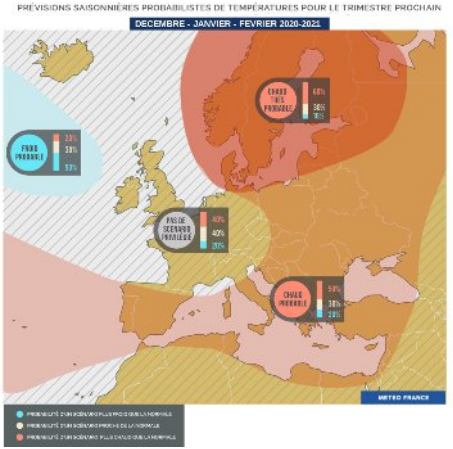


Analysis of predictability

Mitigate or confirm main signal

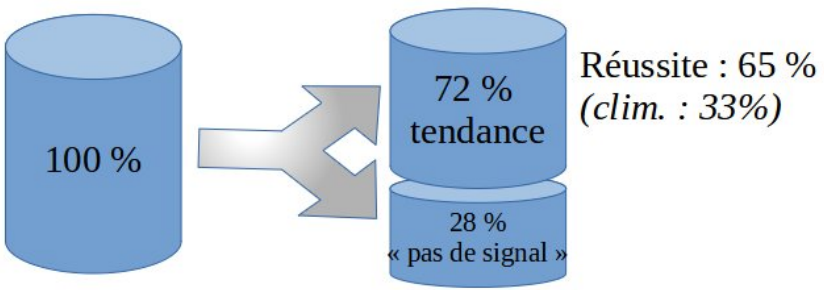
Revise 2mT / Precip signal

Taking into consideration most likely circulation



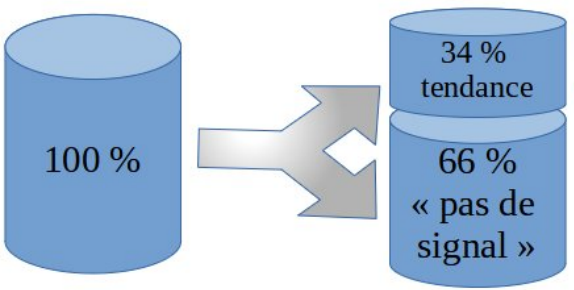
Evaluation (over France) : comparison between most likely scenario and observed tercile
90 forecasts since end of 2015

Température



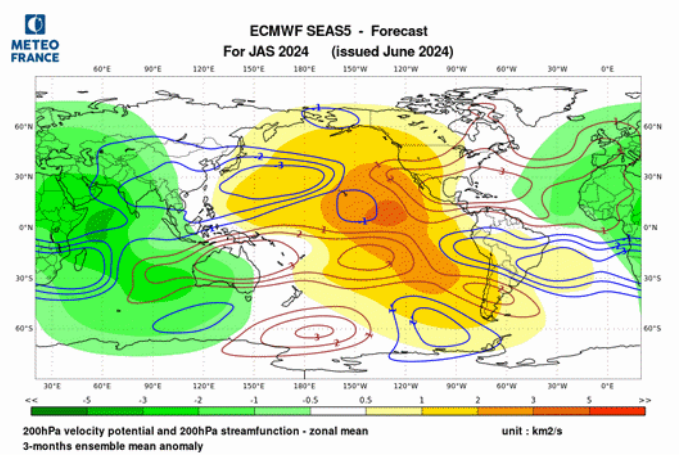
Réussite : 65 %
(clim. : 33%)

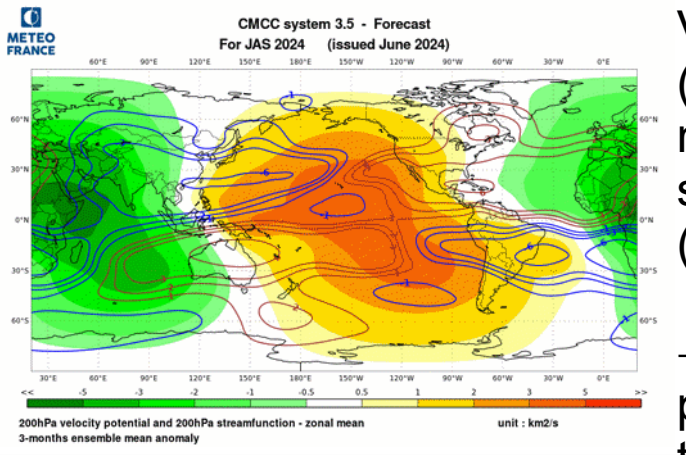
Précipitations

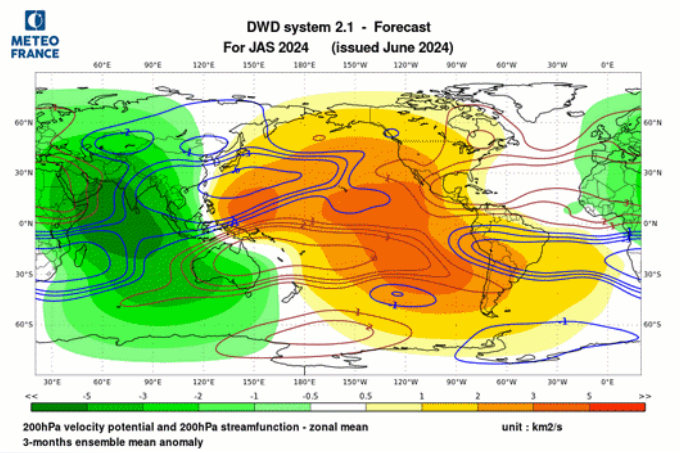


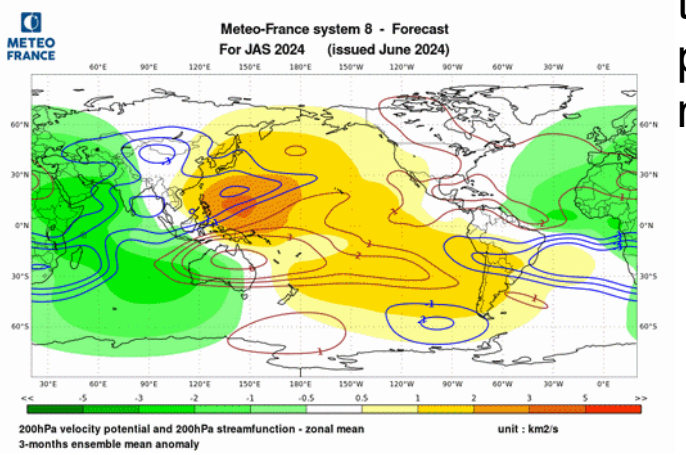
Réussite : 55 %
(clim. : 33%)

Current products: 200 hPa atmospheric circulation fields









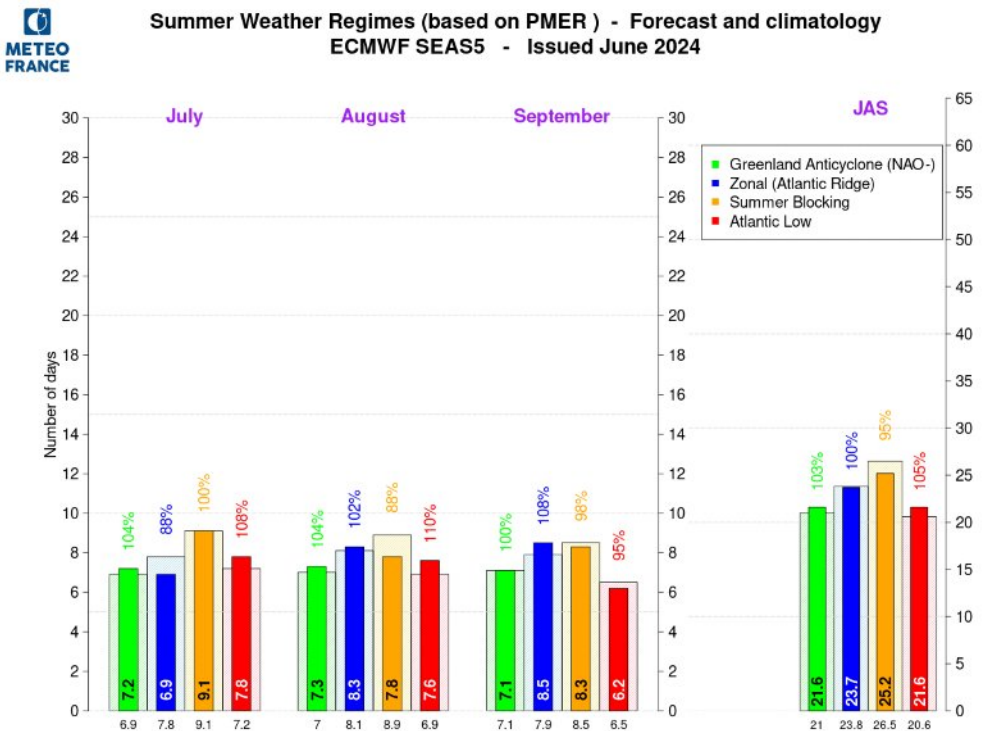
Velocity potential (colors) and zonal mean of streamfunction (contours)

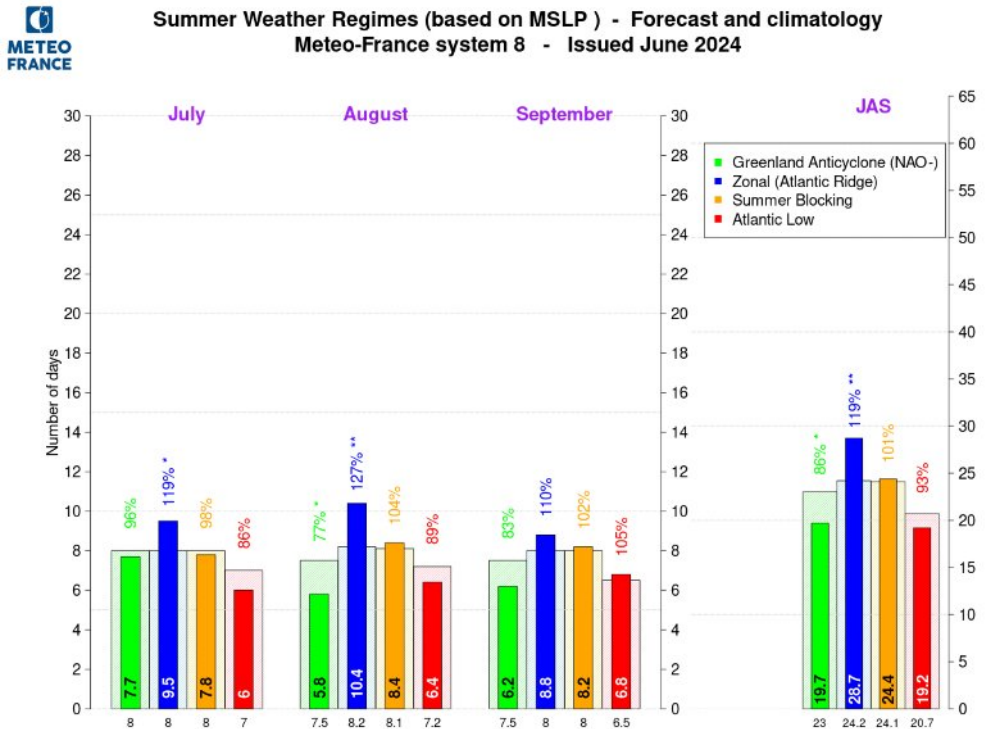
→ Consistency in possible teleconnection patterns to midlatitudes

Current products: weather regime decomposition

Based on Z500 & MSLP daily fields (winter & summer)

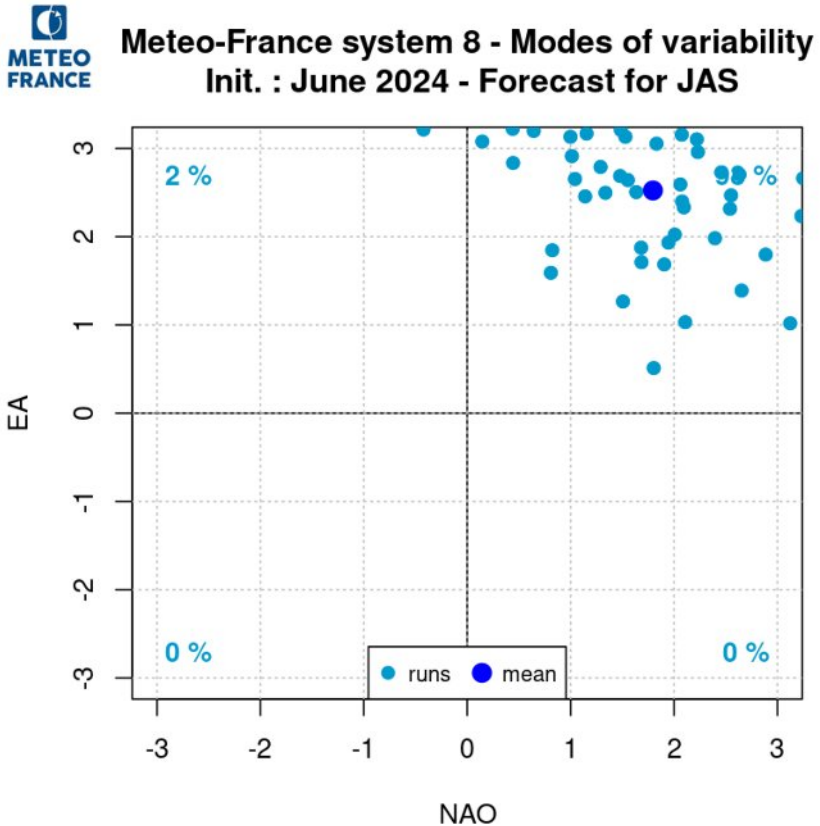
Computed for ECMWF SEAS5 and MF Sys8

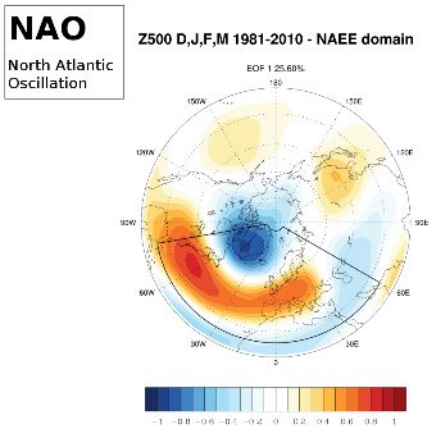


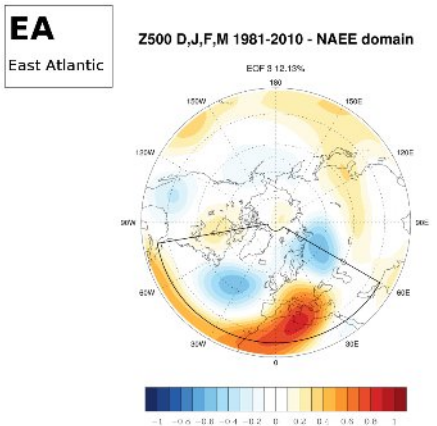


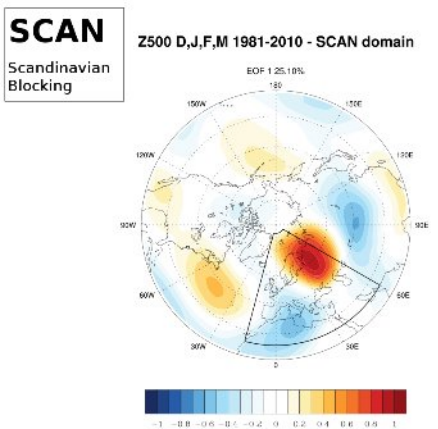
Current products: modes of variability

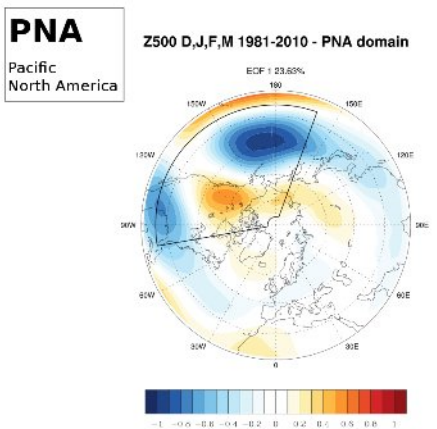
Based on Z500 monthly anomaly fields (winter)



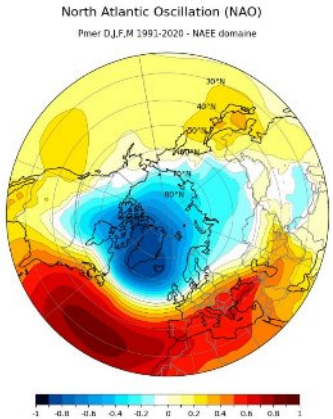


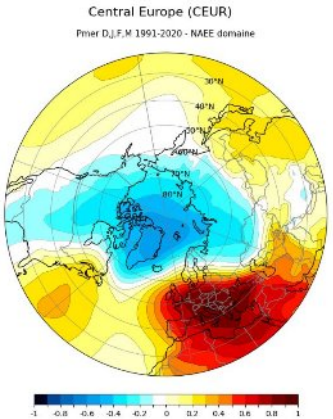


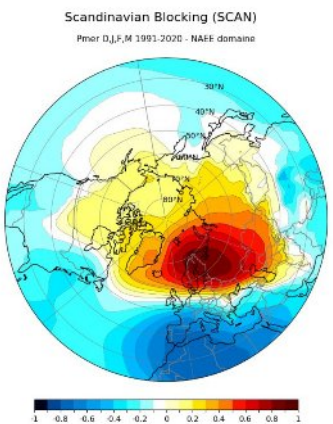


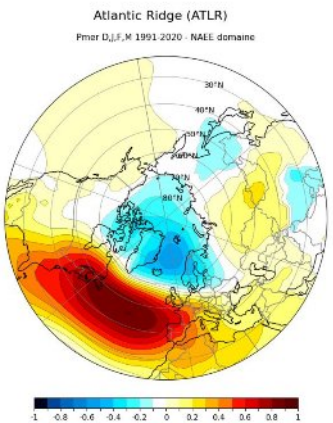


Current products: recent evolution



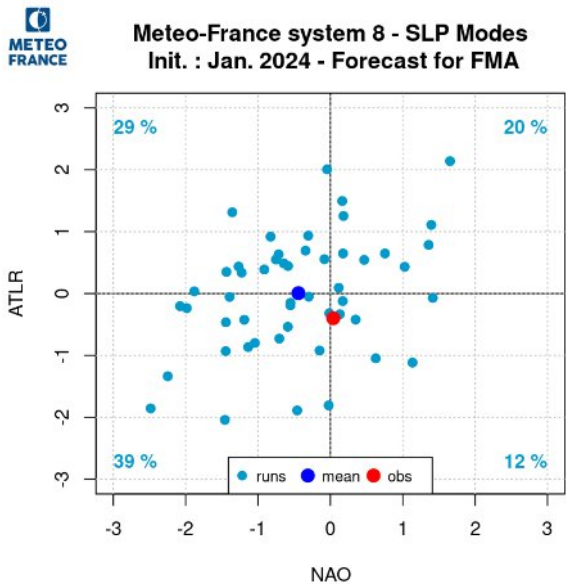


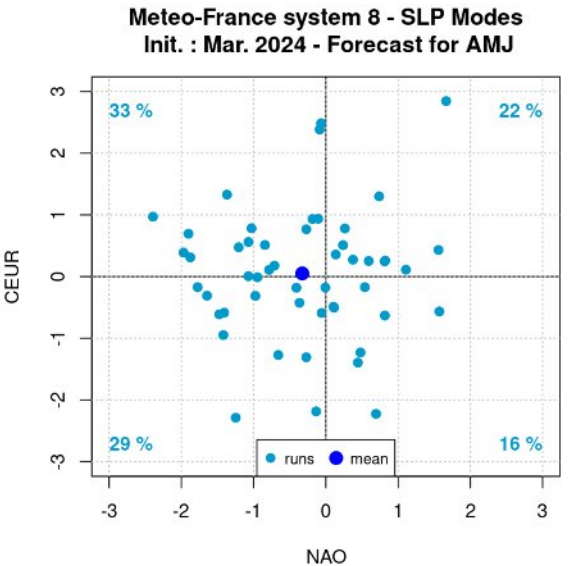




East Atlantic pattern is strongly linked to climate change signal over North Atlantic

New modes computed on MSLP to (partially) address this issue.

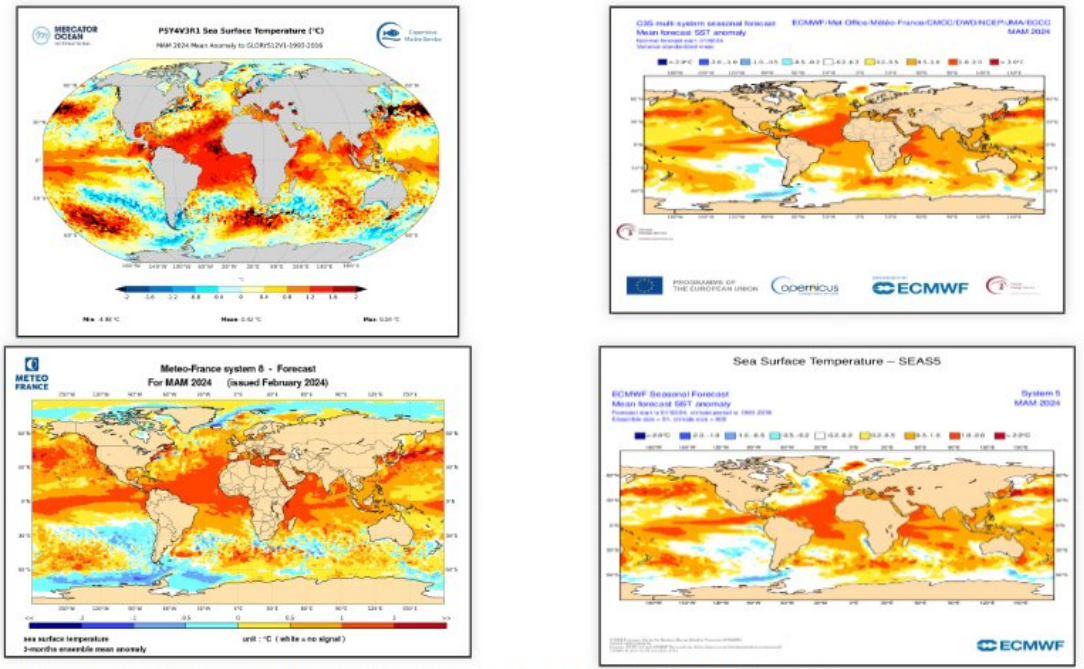




Verification bulletins

Oceans : surface temperature anomalies

In the Pacific Ocean, the main anomalies were well predicted by both models: residual warm anomaly in the equatorial zone (El Niño), PDO- pattern in the Northern Hemisphere and cold anomaly in the Southern Hemisphere.
In the Indian Ocean, the predicted patterns and the reanalysis are very close (warm anomaly more marked in the west of basin)
In the Atlantic Ocean the extent of warm anomaly is weel forecasted by models but the intensity is underestimated particularily in south Atlantic.



SST anomalies in the analysis from Mercator (top left), C3S multi-models (top right), MF-S8 (bottom left) and SEAS5 (bottom right)

Bulletins produced at the end of each 3-month season

Analysis of forecast outputs vs analysis / reanalysis data

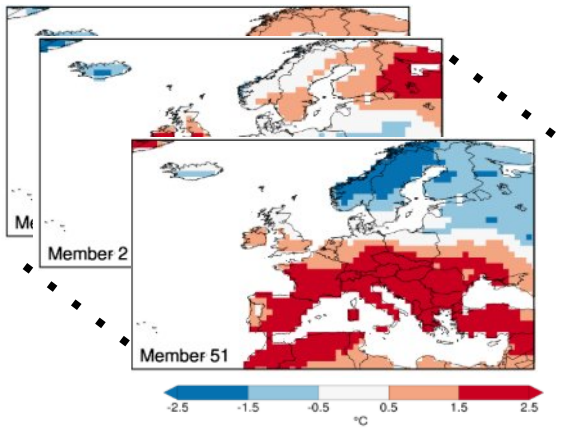
Comparison between synthesis maps and observed anomalies

→ Improvements to this approach would be numerical scores (pattern correlation?)

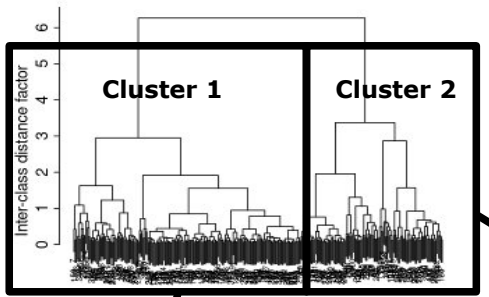
Future products

Possible future products: development of an objective clustering methodology

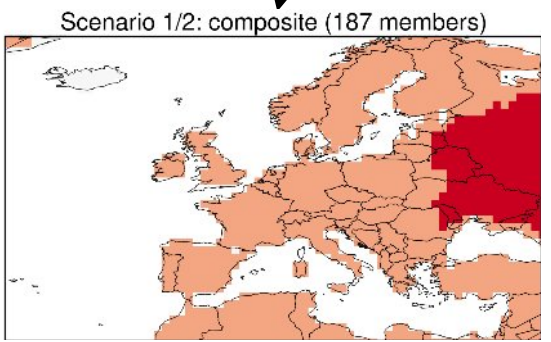
Goal : inform on diversity of scenarios for the upcoming season in seasonal forecasts over Europe ; operational implementation target : 2025

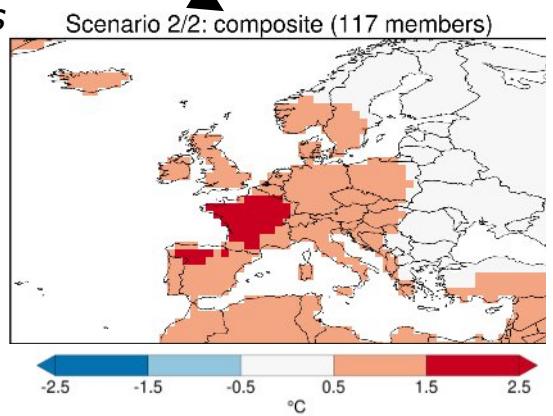


Hierarchical clustering



Scenarios

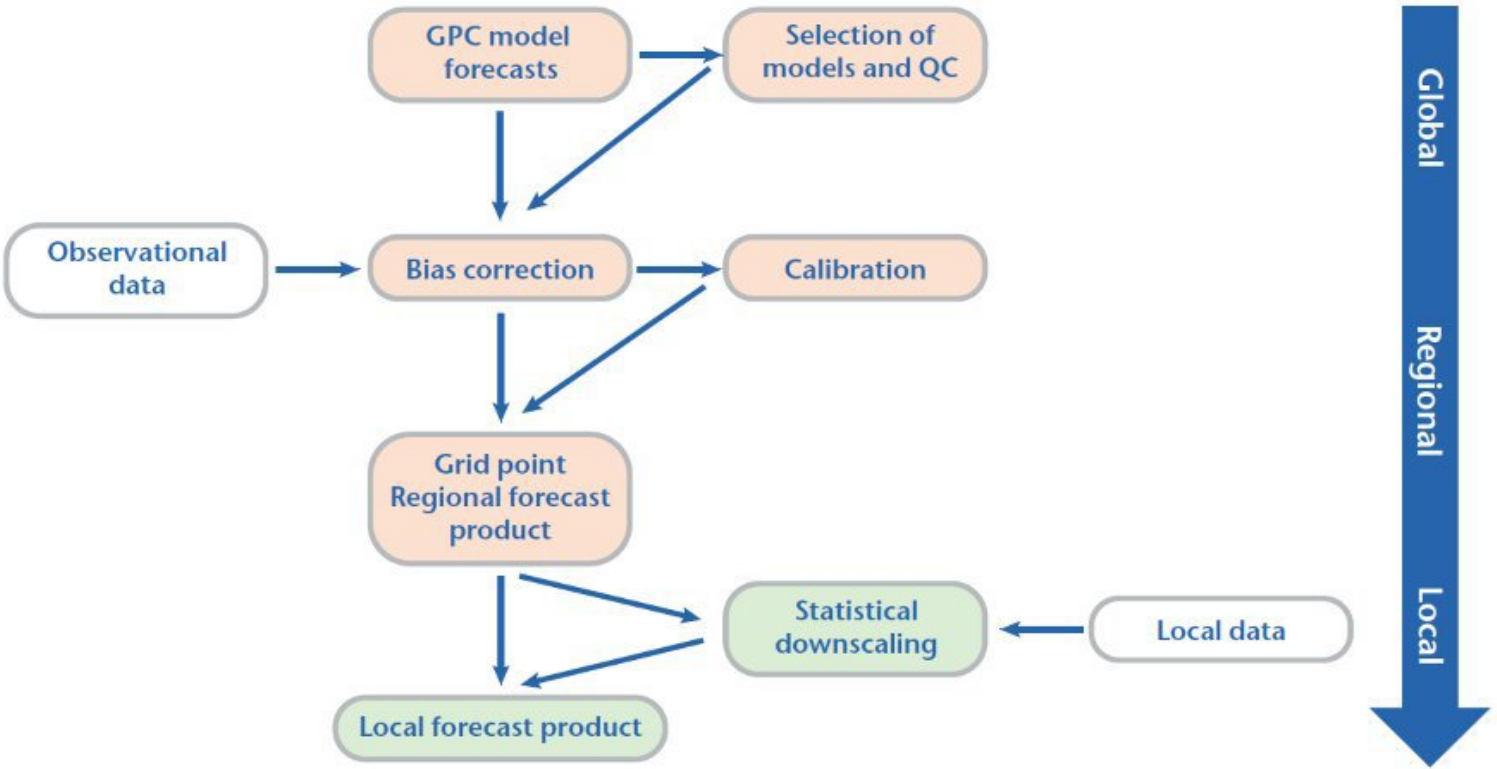




See Damien's talk later today!

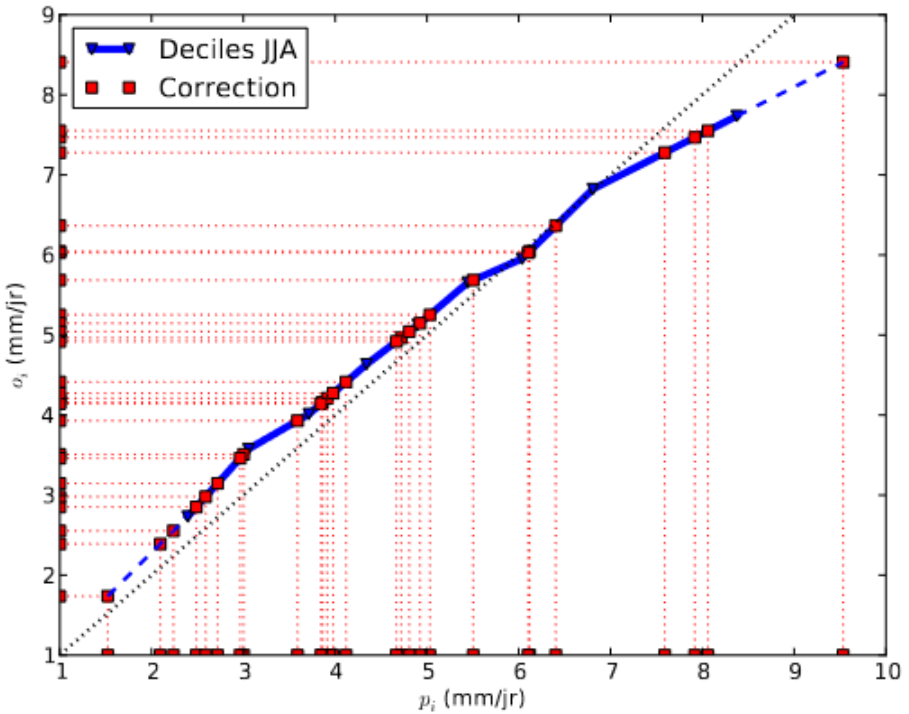
This work is funded by the C3S2-370-MF contract (Operational Seasonal Predictions).

Towards an objective process, in an area with limited SNR



Downscaling methods at Météo-France: quantile mapping

Operational approach for hydrology applications (France) : Quantile mapping

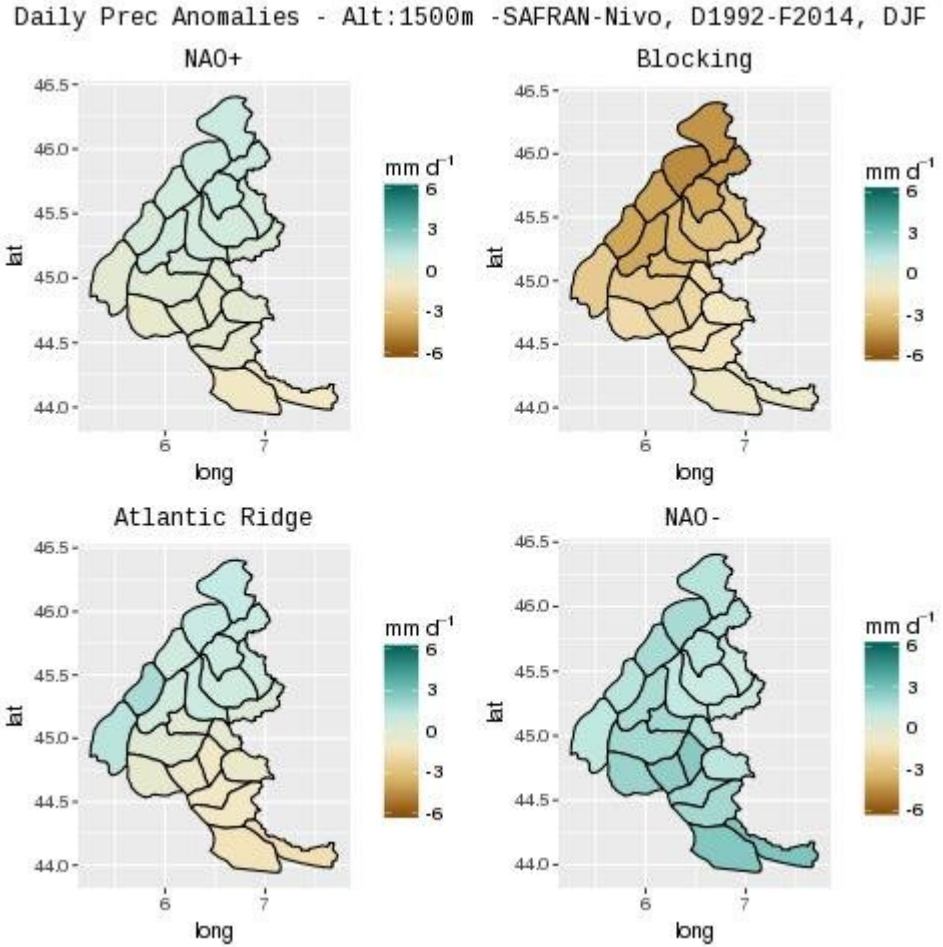


Use of high-resolution (8 km) precipitation and temperature reanalysis data (SAFRAN chain)

Mapping of daily precipitation and temperature fields to SAFRAN values with random sub-daily disaggregation of precipitation and mean temperature diurnal cycle

Input for offline hydrological forecasts using the ISBA model

Downscaling methods at Météo-France: ADAMONT (Verfaillie et al. 2017)



Quantile mapping may not be the most adequate method for bias-adjusting seasonal forecast data

The ADAMONT approach uses weather regimes : takes into account possible differences in distributions and diurnal cycles of variables in different synoptic situations.

ADAMONT adjusts the distribution of daily values (accumulated or mean) using quantile mapping, and then computes daily disaggregated data based on an analogous day in the reference dataset.

DJF mean daily precipitation anomalies in SAFRAN-Nivo data at 1500m according to the 4 North Atlantic Europe weather regimes (credits : P. Marson, PROSNOW project)

Lessons learned from sectoral applications using downscaled SF

1) **Forecast quality** is essential

Sometimes best to use a well-designed (recent) climatology than unreliable SF outputs

Expert judgment can help direct the user towards one or another method

2) Most products are **tailored** to the users' needs

Given limitations in skill, dialog with the users is essential

3) **Simple is beautiful**

Elaborate methods often fall short of (significantly) beating less elaborate, robust benchmarks

4) **High quality data** for calibration is of paramount importance

5) Beware of **overfitting**! → Need for large enough learning datasets + CC problem!

Thank you for your attention!