Assessment of seasonal forecast skills of temperature and precipitation: a comparison of 5 different models over the Mediterranean region

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OBJECTIVE

Quantifying the added value of 5 different models in predicting seasonal and monthly temperature and precipitation anomalies over the Mediterranean region compared to a simple forecasting method based on the ERA5 climatology (CTRL) or the persistence of the ERA5 anomaly (PERS).

DATA

Models/systems considered:

- ECMWF
- MF
- UKMO
- DWD
- CMCC

- *MME (Multi-Model Ens)*
- *MMES (" –Small)*
- *PERS (Persistence)*

Skill scores refer to the climatology
ERA5 dataset as a reference
Winter and summer starting date

METHODS

For the evaluation process we used:

1.Anomaly Correlation Coefficient (**ACC**)
→ Association

2.Brier Skill Score (**BSS**)
→ resolution, reliability, accuracy

3. Fair Continuous Ranked Probability Score (**FCRPSS**)
→ accuracy, sharpness

4. Area Under the Receiver Operating Characteristic Curve (**AUCSS**)
→ discrimination

In Figs. 1-4 are presented some of the interesting features

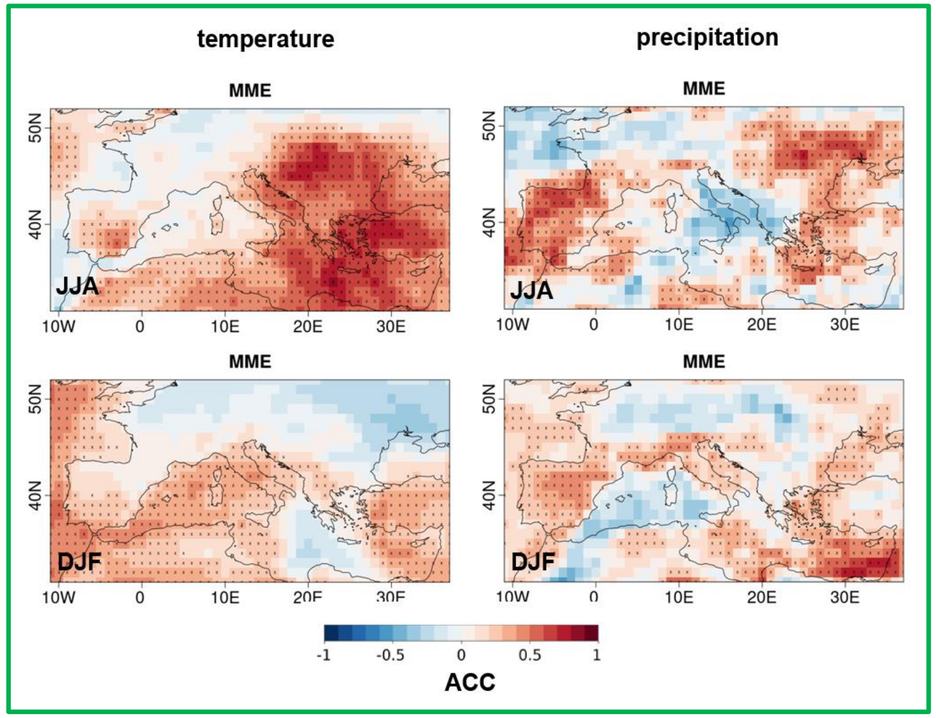

Fig. 1: *ACC for MME: temp and precipitation anomalies.*
Anomaly correlation patterns vary across different forecast systems (not shown); some frequently occurring features can be highlighted. Temperature correlations are higher than precipitation ones.

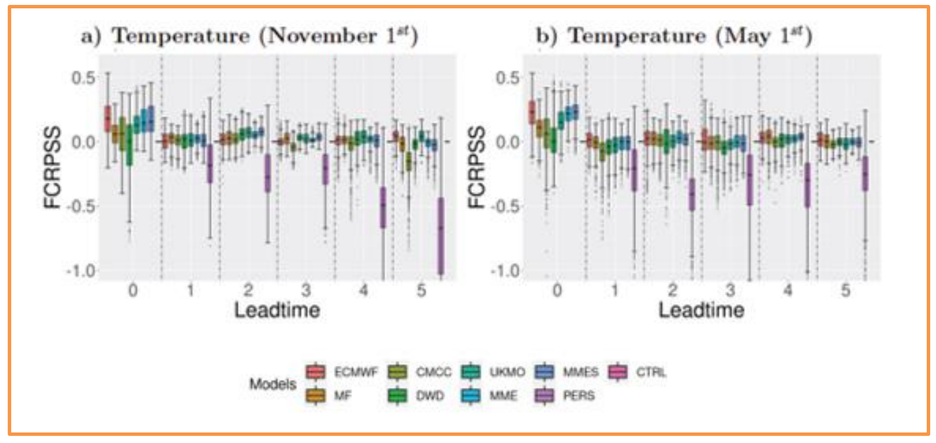

Fig. 2: *FCRPSS for winter and summer temp anomaly for every model/system. Boxplots summarize the statistics over the Med area.*
The Multi-Model Ensembles (MME and MMES) median FCRPSS show slightly better performances than the forecast systems in winter, with positive values up to lead time 4, and comparable performances in summer.

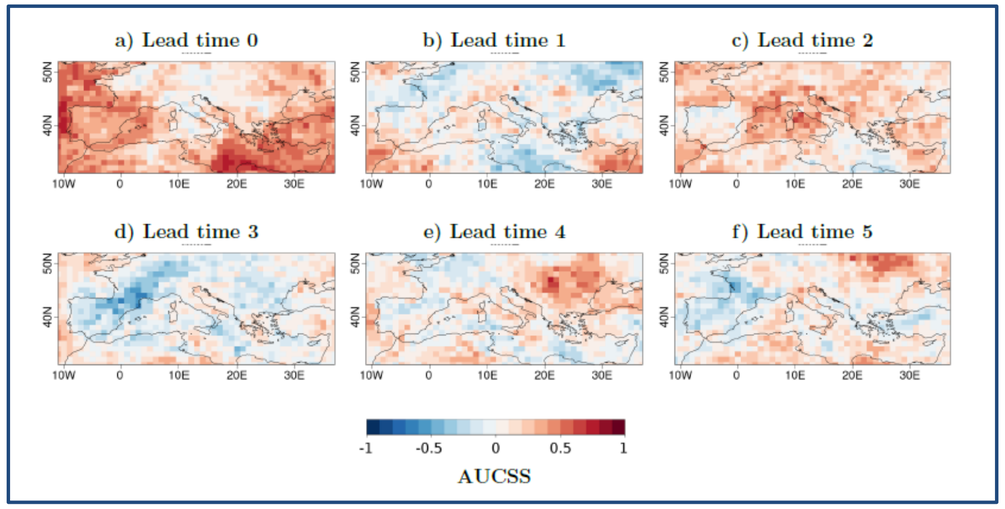

Fig. 3: *Spatial pattern of the AUCSS for the MME at increasing lead time.*
Positive AUCSS values are obtained at lead time 0 for 75% to 100% of the domain for each variable, each season and for almost all models. At longer lead times the median AUCSS decreases.

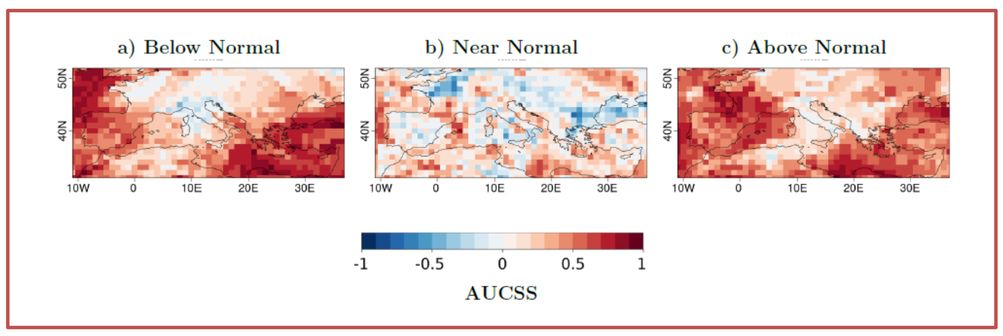

Fig. 4: *AUCSS maps for MME temp anomaly at lead time 0, starting date Nov. 1st, for three terciles.*
When the AUCSS is averaged over the lower and upper terciles only, the median AUCSS over the domain slightly increases.

CONCLUSIONS

- Temperature patterns and respective skill scores are better reproduced than those regarding precipitation.
- Different behaviors are found for the different skill scores; their high spatial variability suggests that smaller regions could perform better for a single variable or starting date.
- Sf systems show an added value with respect to simple forecast methods based on the climatology or the persistence, although the added value is not uniform over the Med area.