Sources of climate variability and predictability in the Mediterranean regions

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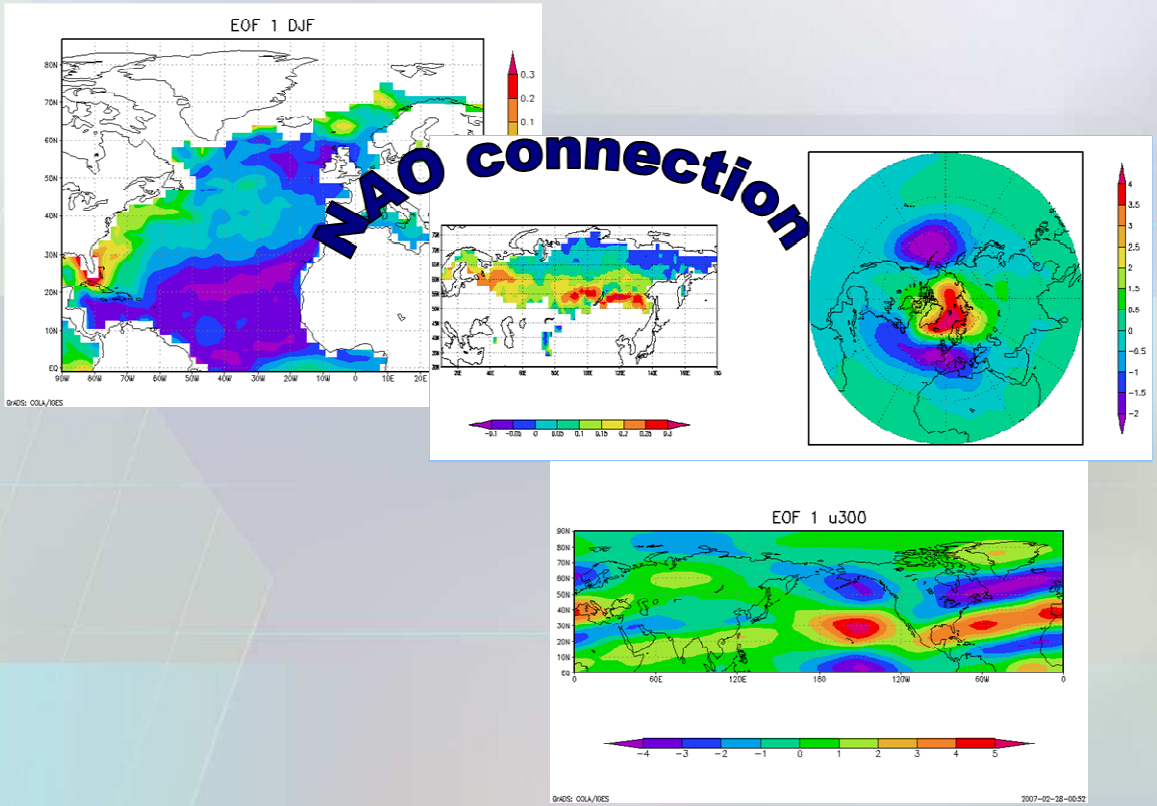
Overview

- **Recurrent climate patterns in Mediterranean regions**
- **Predictive methodologies**
- **Preliminary conclusions**

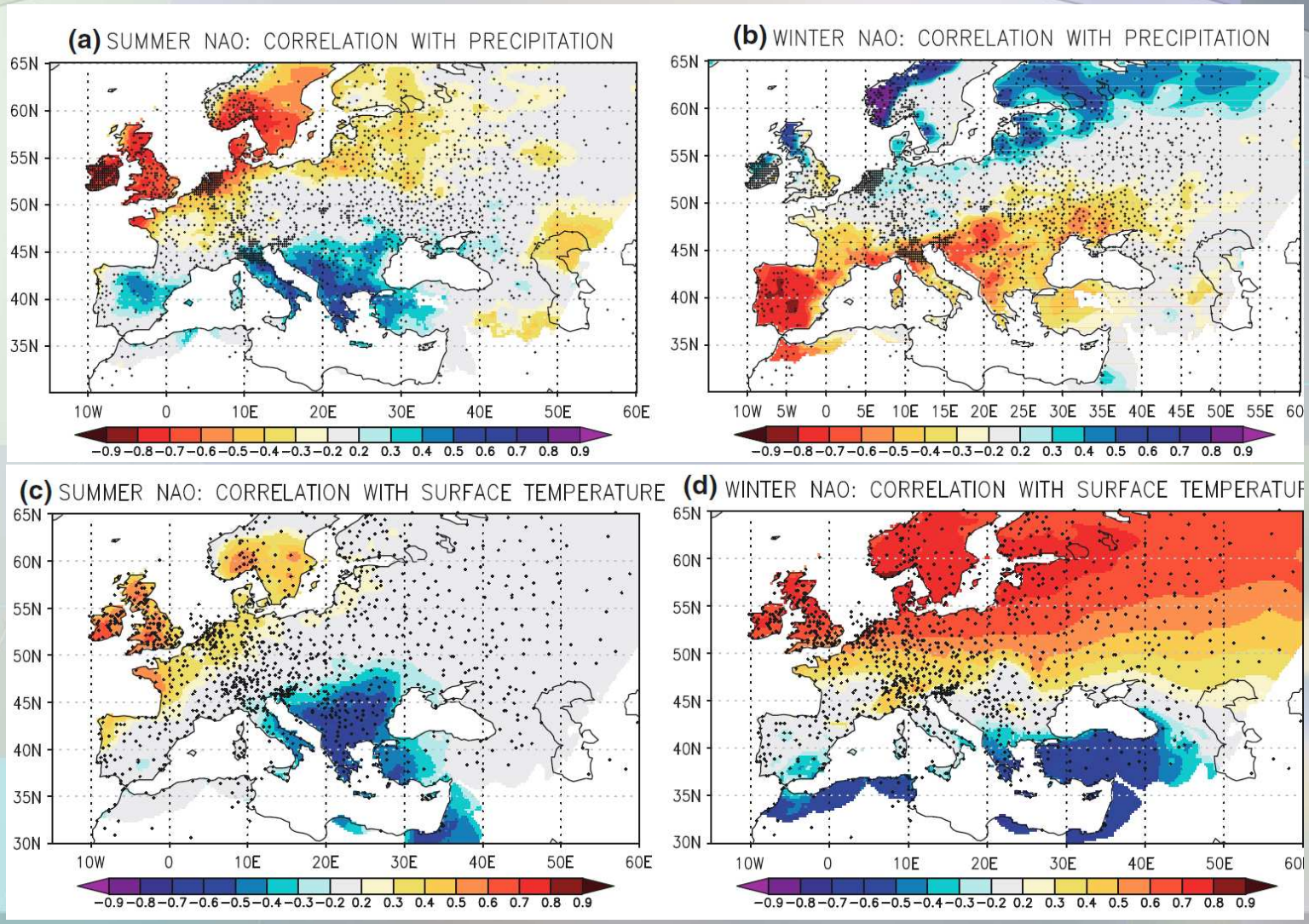
Recurrent climate patterns in Mediterranean regions

- teleconnections: NAO/AO, ENSO, AMO
- local mechanisms: soil moisture
- climate change projection on regional scale



North Atlantic/Arctic Oscillation

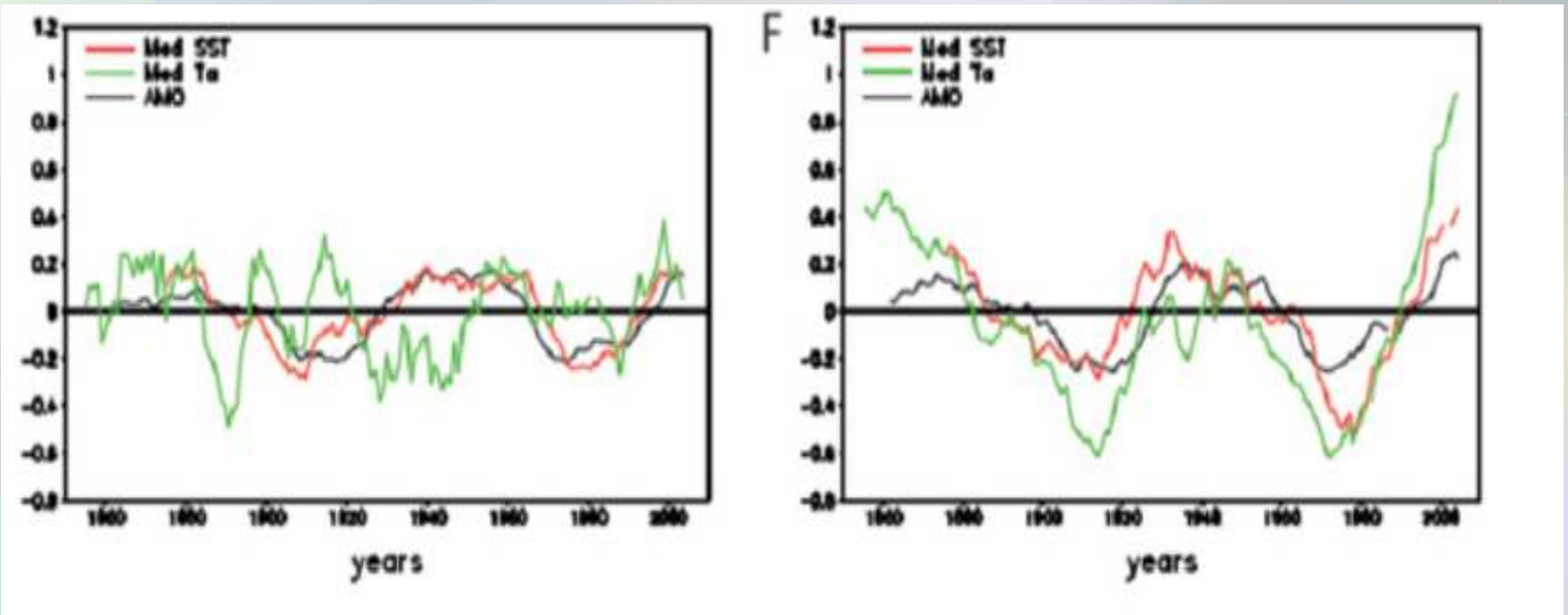
Blade et al., (2012)



Multidecadal Atlantic Oscillation

METEO ROMANIA

Mariotti and Dell'Aquila (2011)



Local Mechanisms: soil moisture

Wang et al. (2011)

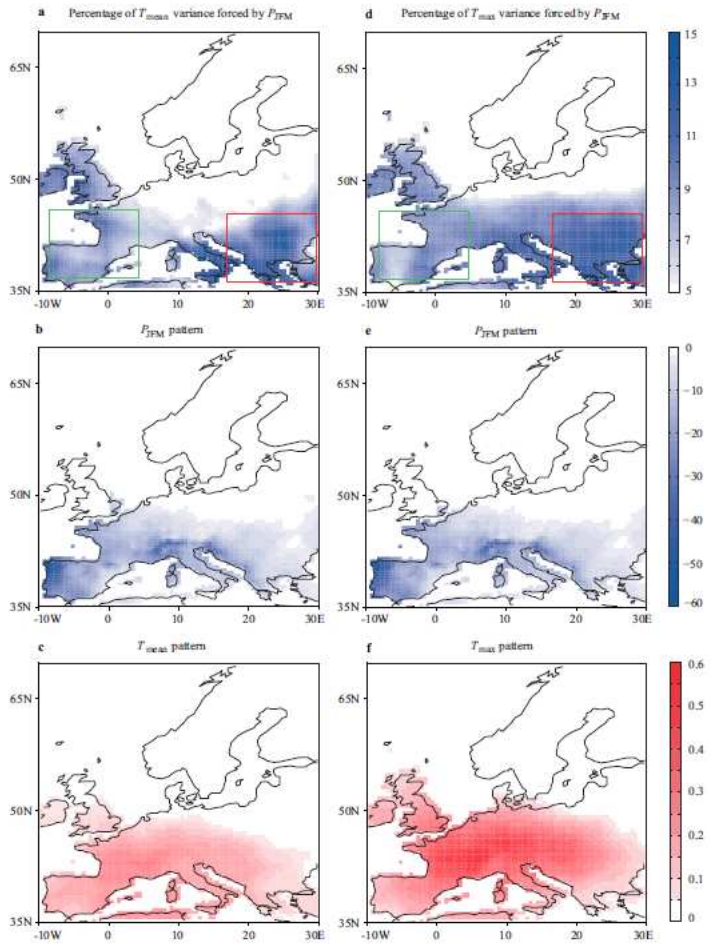


Fig. 1. T_{mean} as well as T_{max} variability forced by P_{JFM}. **(a)** Percentage of T_{mean} variance forced by P_{JFM} (sig = 0.10 in the red rectangle). The spatial patterns of **(b)** P_{JFM} and **(c)** its T_{mean} response. **(d)** Percentage of T_{max} variance forced by P_{JFM} (sig = 0.10 in the red rectangle). The spatial patterns of **(e)** P_{JFM} and **(f)** its T_{max} response for the 1st MCA mode. All the relevant time coefficient series mutually exhibit unit correlation ($r > 0.99$), shown in Fig 3. Units are K for T_{mean} as well as T_{max} and mm for P_{JFM}.

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Mariotti et al. (2002)

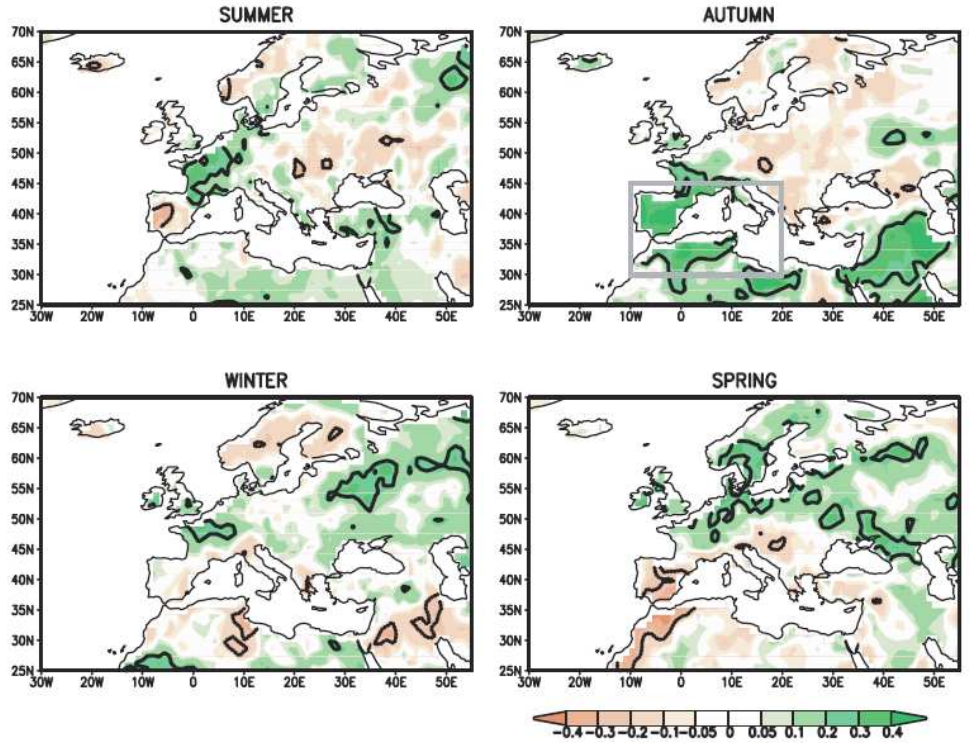


Figure 1. Seasonal correlation of rainfall in the Euro-Mediterranean region and the Nino3.4 index for the period 1948–1996. Rainfall data is from CRU. Correlation coefficients enclosed by contours are statistically significant at the 95% level. The grey box defines the region considered to compute western Mediterranean area-averages.

Climate change projection on Mediterranean area

Giorgi and Lionello (2008)

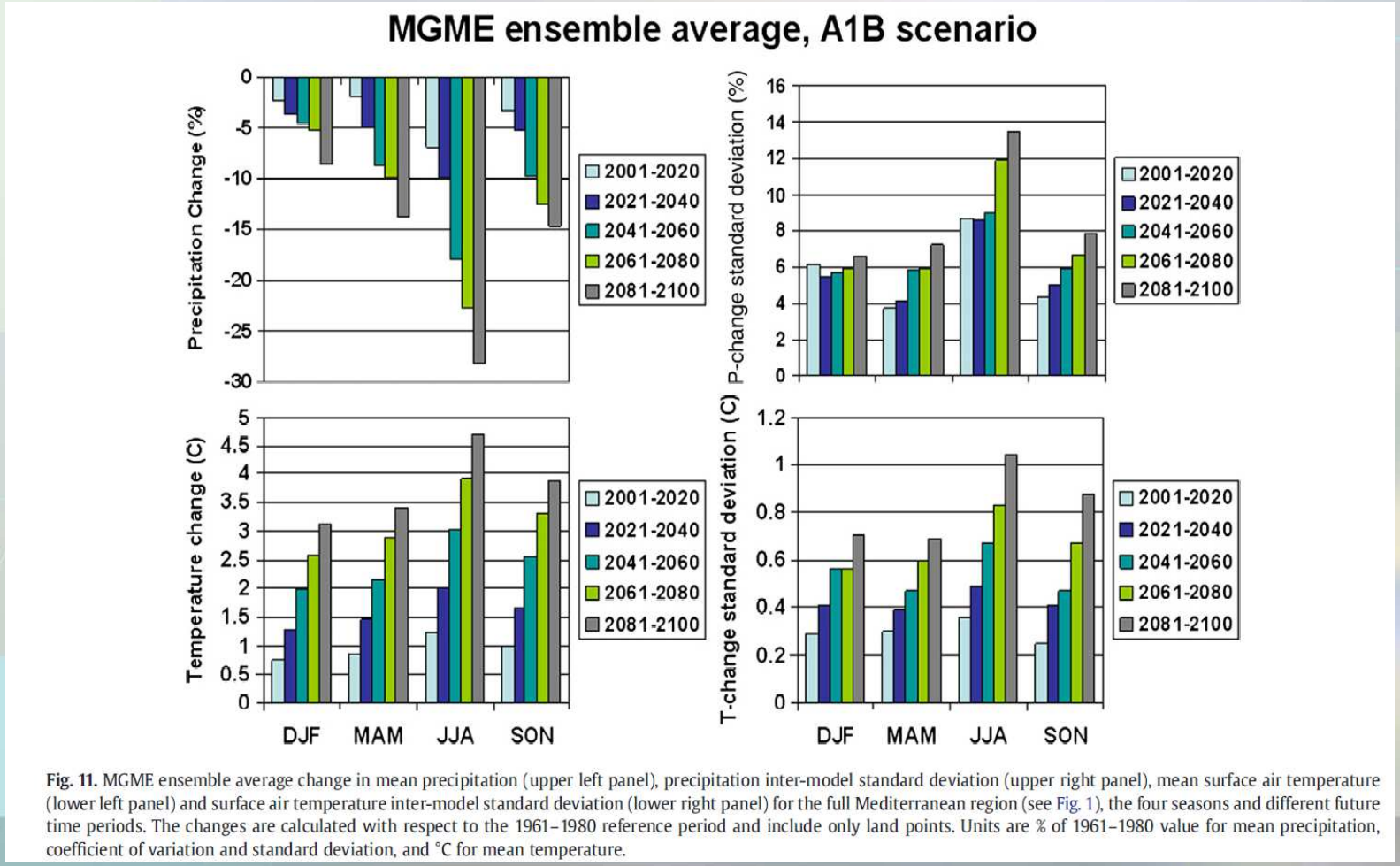
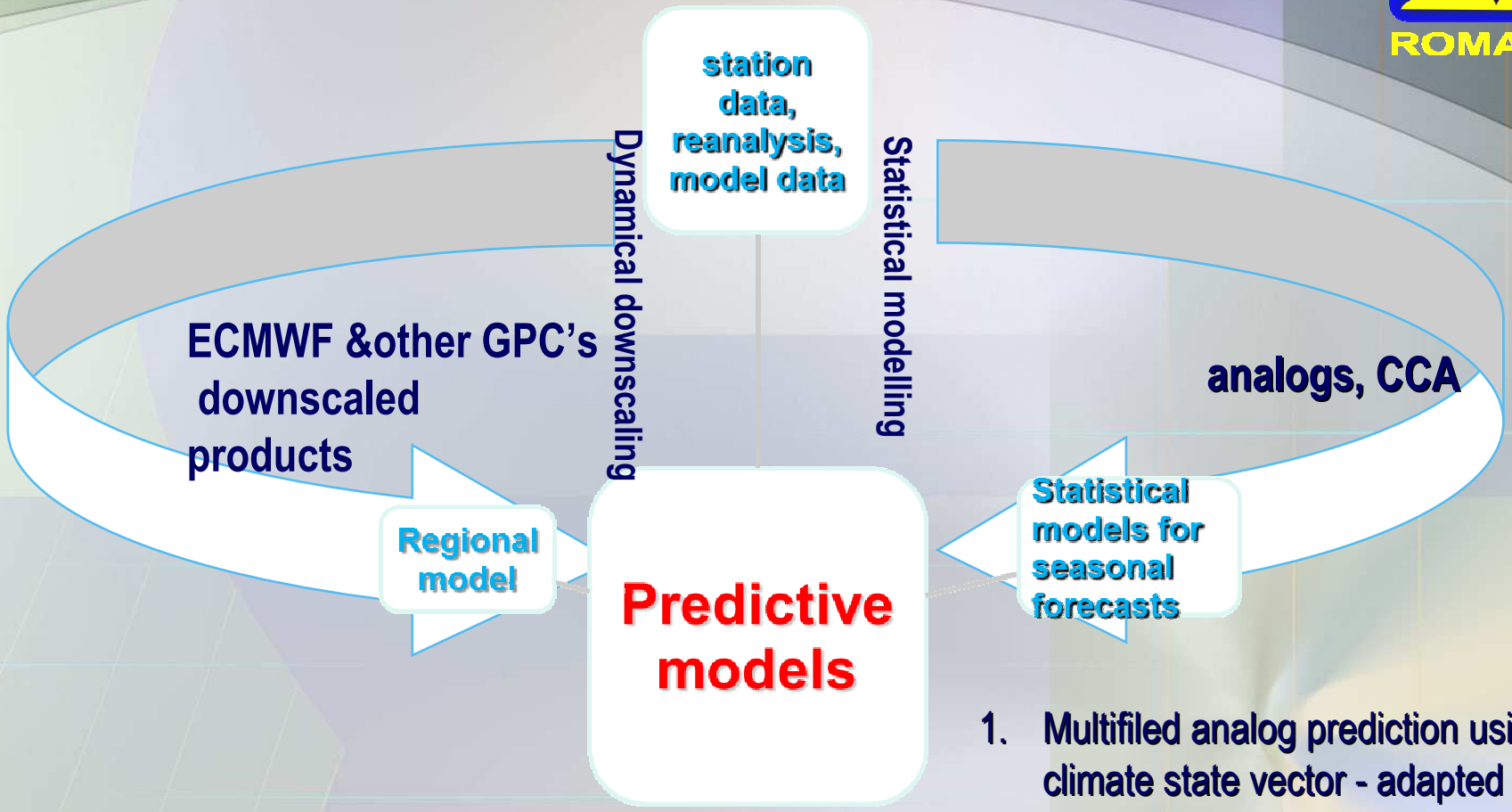


Fig. 11. MGME ensemble average change in mean precipitation (upper left panel), precipitation inter-model standard deviation (upper right panel), mean surface air temperature (lower left panel) and surface air temperature inter-model standard deviation (lower right panel) for the full Mediterranean region (see Fig. 1), the four seasons and different future time periods. The changes are calculated with respect to the 1961–1980 reference period and include only land points. Units are % of 1961–1980 value for mean precipitation, coefficient of variation and standard deviation, and °C for mean temperature.

Other factors which influence Mediterranean climate (Alpert et al., 2006):

- tropical hurricanes
- South Asian Monsoon
- Saharan dust

Predictive methodologies



1. Multifiled analog prediction using a climate state vector - adapted for Romania;
2. NAO index prediction using May SSTs
3. NAO index prediction using April-October snow cover

Beyond NAO statistics: predictive signals in SST, snowcover, etc.

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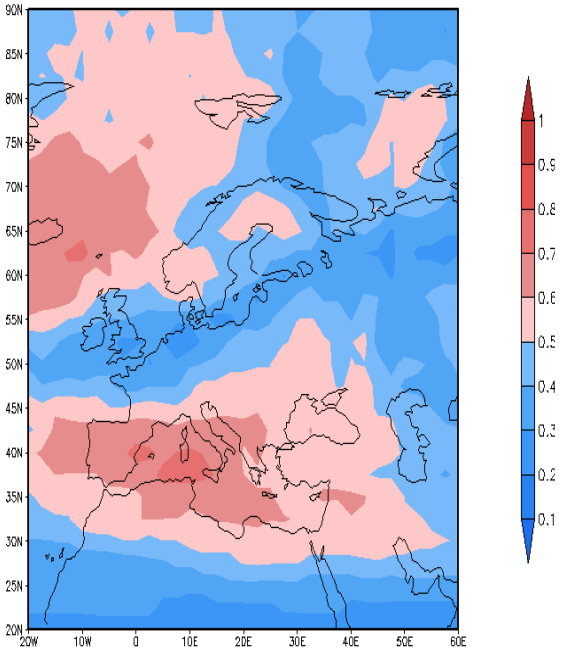
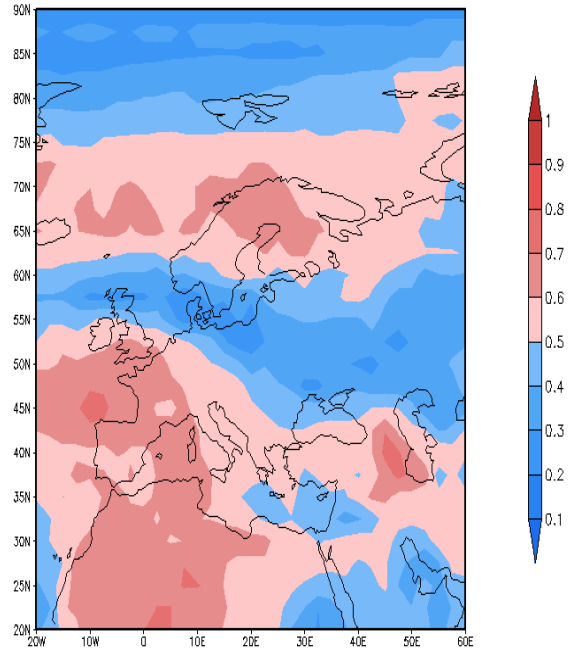
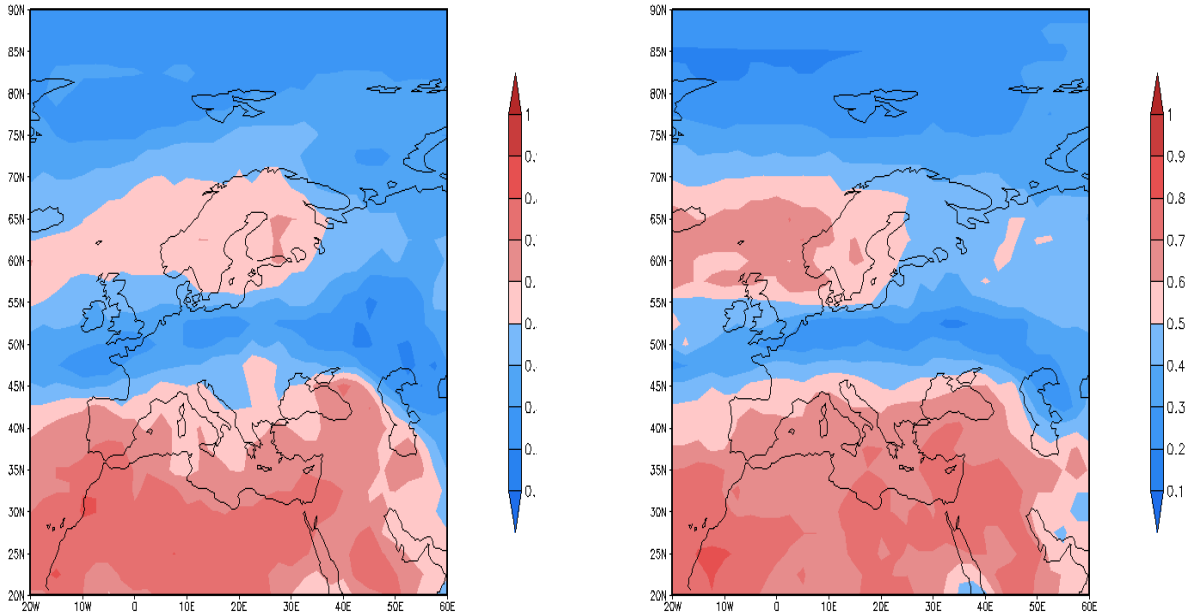
ROC maps for above (left) and below (right) normal predicted anomalies of DJF SLP using the CCA-based model. The model uses the October signal in zonal wind anomalies over Eurasia and was cross-validated for the period 1962-2011.





ROC maps for above (left) and below (right) normal predicted anomalies of DJF SLP using the CCA-based model. The model uses the May signal in SST anomalies over North Atlantic and was cross-validated for the period 1962-2011.



Preliminary conclusions

- **Climate predictability is regionally and temporally dependent; climate prediction strategy has to be regionally-orientated;**
- **Existence of scientific significance of climate prediction results does not guarantee socio-economic; significance (cost/benefit ratio);**
- **IPCC AR5/CMIP 5 – new and updated information on decadal climate predictability**
- **There are deontological and ethical implications of climate prediction which should be taken into account.**

References

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