Seasonal forecast from CMCC

Climate outlook for winter 2014-15

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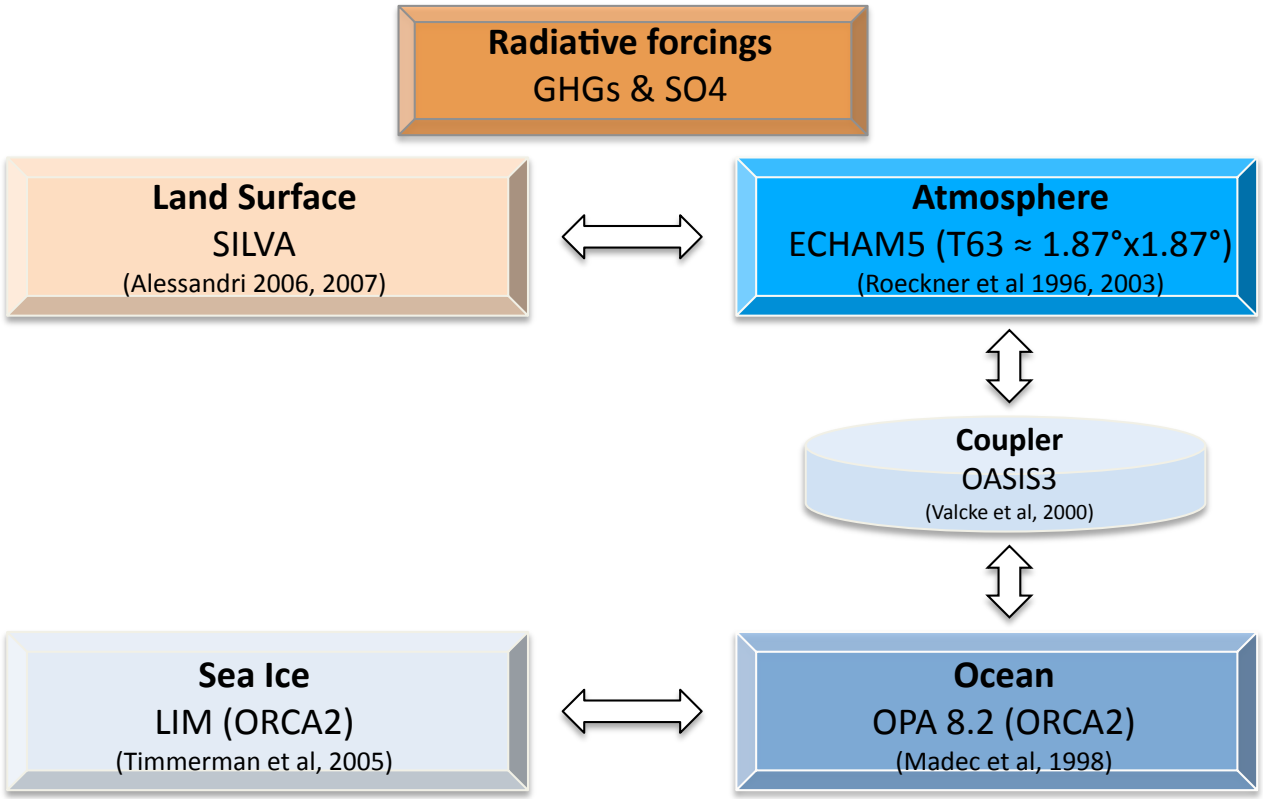
17-18 November 2014
Antalya, Turkey

cmcc
Centro Euro-Mediterraneo
sui Cambiamenti Climatici

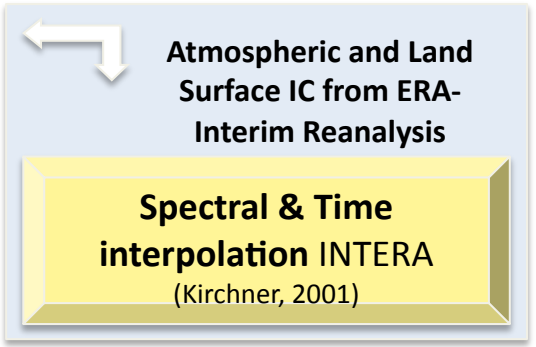
The CMCC Seasonal Prediction System

Coupled Model component

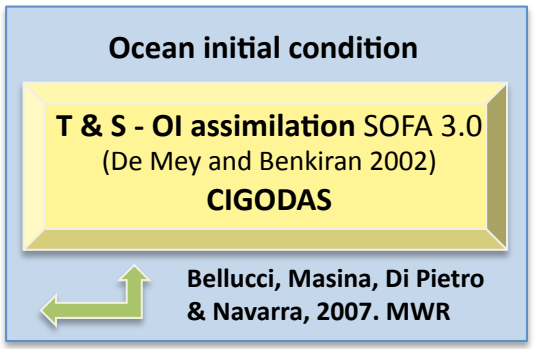


Coupling Daily No flux adjustment

Off line Initialization Tools



SPSv2



SPSv1

Initialization of other components:

Sea ice: distribution is given by the ocean analysis on the basis of SST. Thickness is climatological

Aerosol and GHGs: observation up to 2005, afterwards RCP8.5 scenario values are used

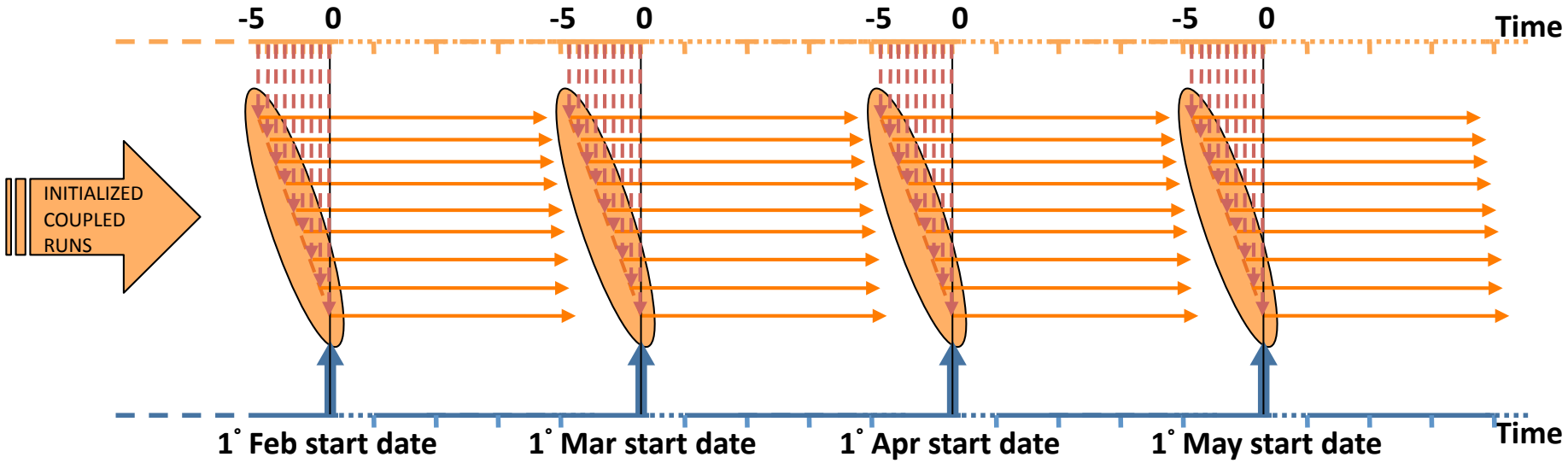
Ozone: climatological

The experimental setup

Retrospective forecasts (hindcasts) for validation

OFF LINE interpolated
Land-Atmosphere IC from
Operational analysis

Day lag every 12 hours



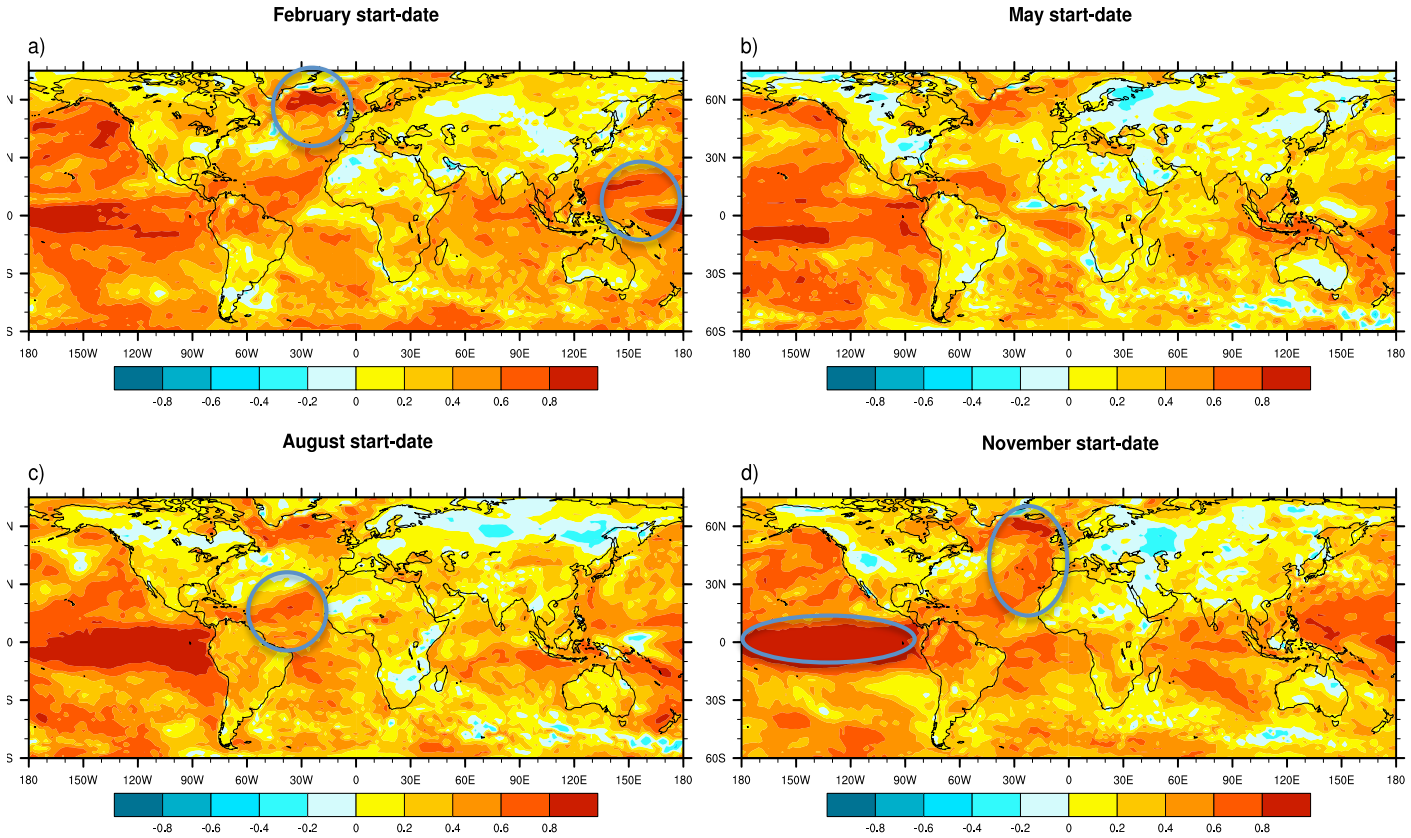
OFF LINE assimilated
OCEAN ANALYSIS

- start date every month
- 7-month-integration for the period 1989-2010
- 12 start dates per year (once a month)
- 9 ensemble members for each start date

Validation of the CMCC-SPS

Surface Temperature ACC between forecast (Lead 1) and ERA-Interim reanalyses, for the 1989-2010 period (re-forecasts)

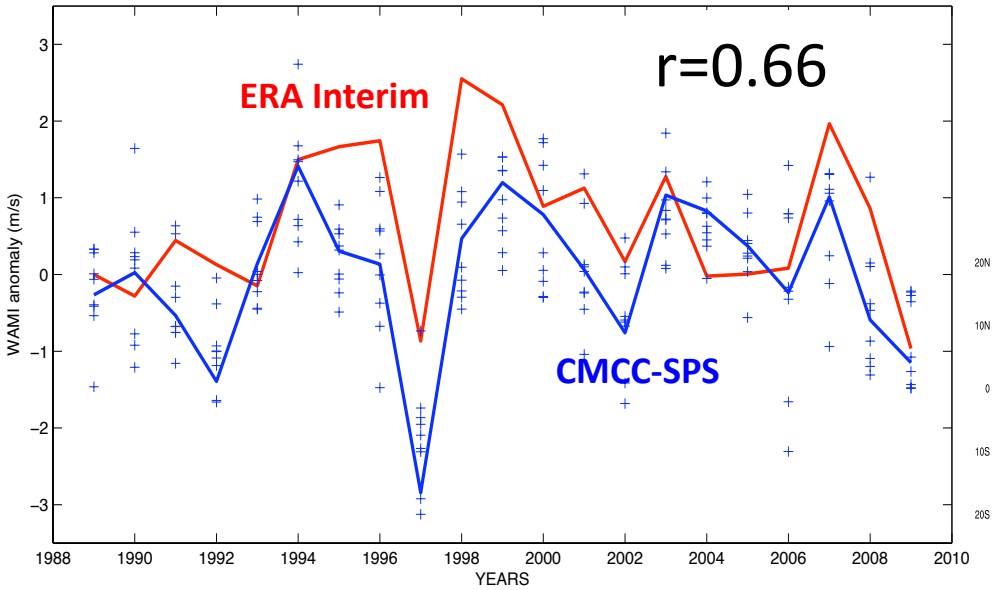
Lead time 1 refers to the season starting one month after the start date (e.g. Feb lead 1 = MAM)



- Skill is higher in the Tropical oceans (ENSO and teleconnections)
- Good skill in the northern Atlantic region, particularly in the winter and the spring

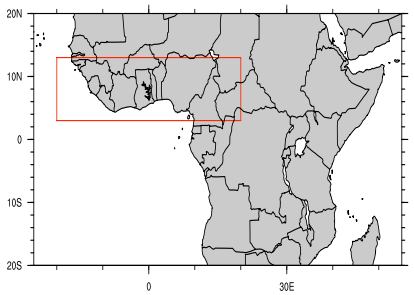
Validation of the CMCC-SPS

WAMI anomaly (m/s) May start date, lead 1 (JJA)



West African Monsoon

$$WAMI = u_{850hPa} - u_{200hPa}$$



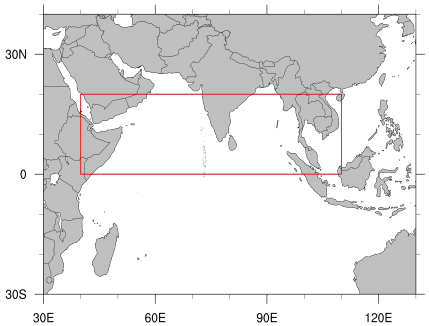
CMCC-SPS intercepts the interannual variability of Monsoon winds.

South East Asia Monsoon

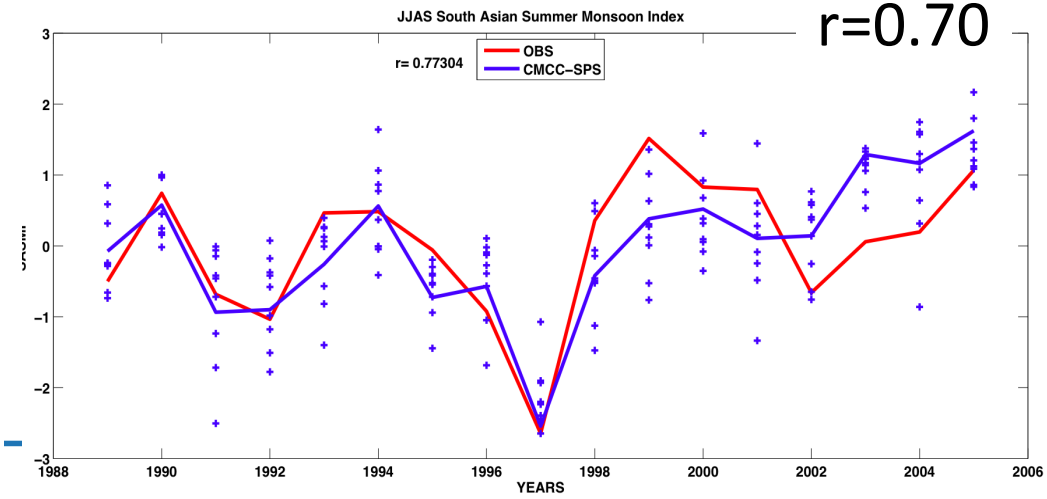
South Asian Summer Monsoon Index

$$\int_A U_{850} - U_{200}\, dA$$

(Webster and Yang, 1992)



r=0.70

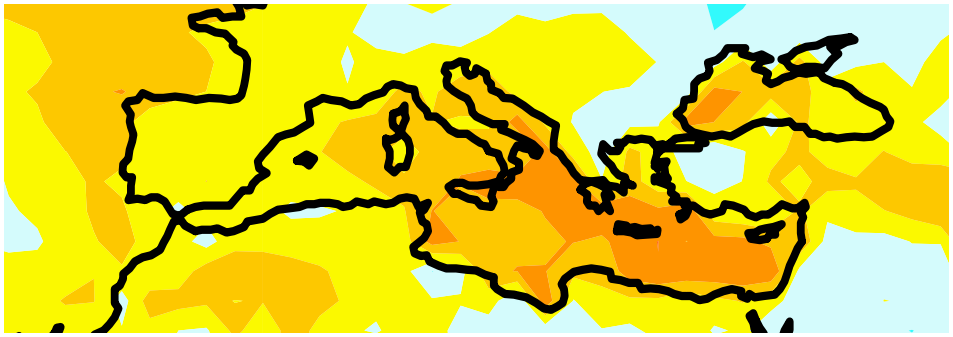


Validation of the CMCC-SPS

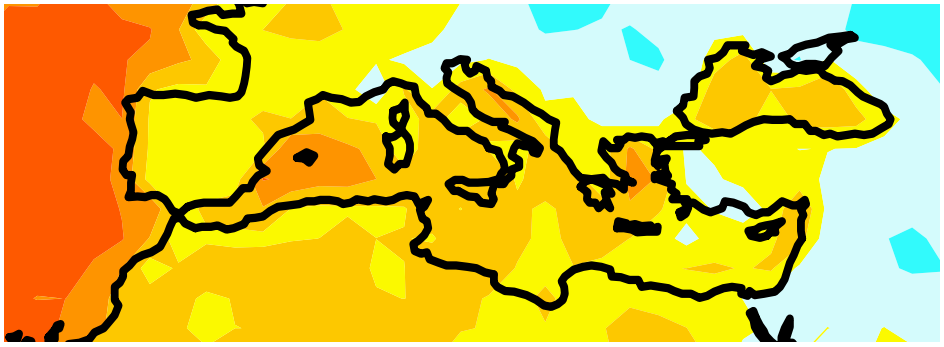
Focus on the Mediterranean area

Tsurf Anomaly Correlation (ACC) lead time 1

May



November



Skill is higher in the eastern basin during the summer, while in the winter the good skill over North Atlantic favors good quality of the forecast over the western basin.

Verification of the summer forecast

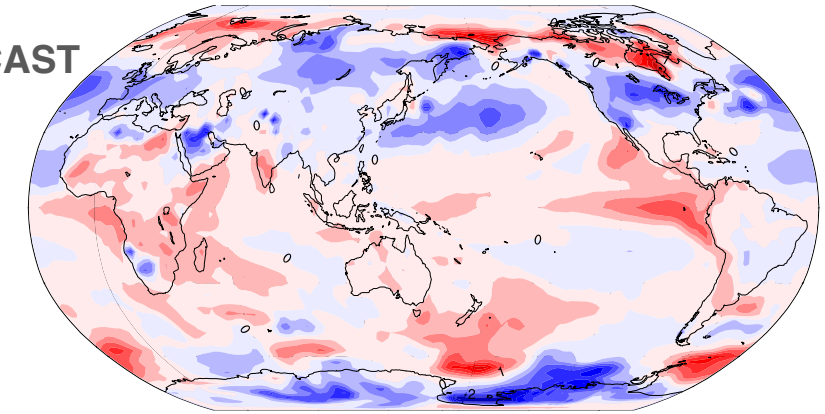
2-m Air Temperature

May start date - Lead 1 (JJA)

June-to-August 2014 [ini: 1st May 2014]

CMCC — 2 meter Temperature [°C]

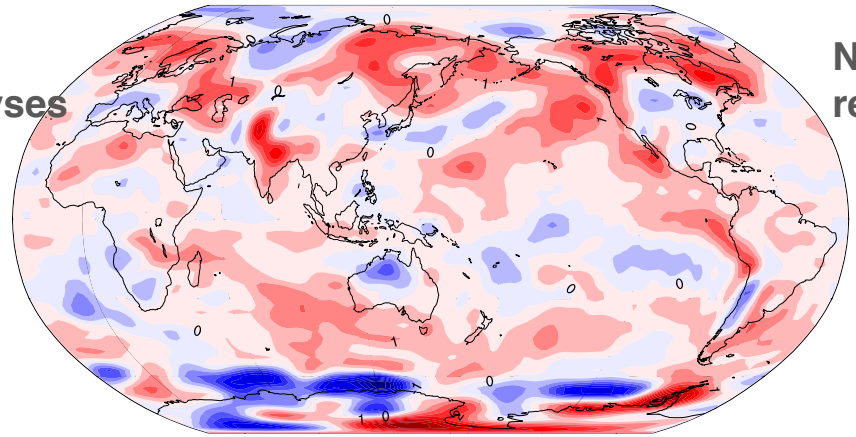
FORECAST

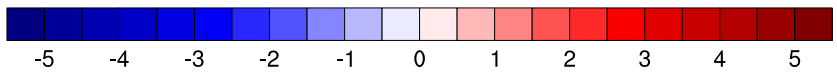


June-to-August 2014

NCEP — 2 meter Temperature [°C]

NCEP reanalyses



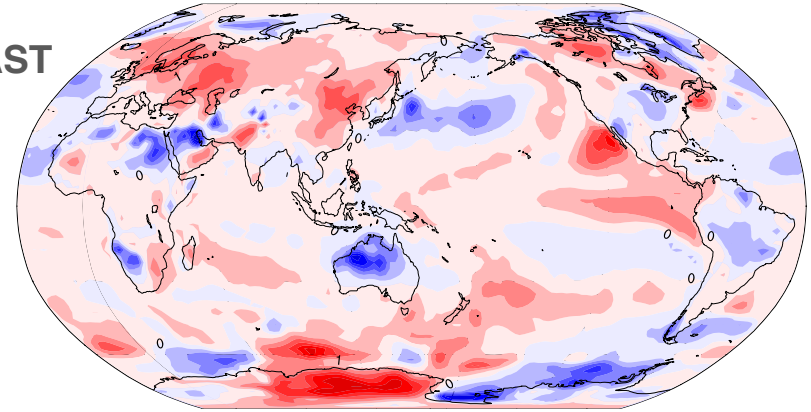


May start date – Lead 2 (JAS)

July-to-September 2014 [ini: 1st June 2014]

CMCC — 2 meter Temperature [°C]

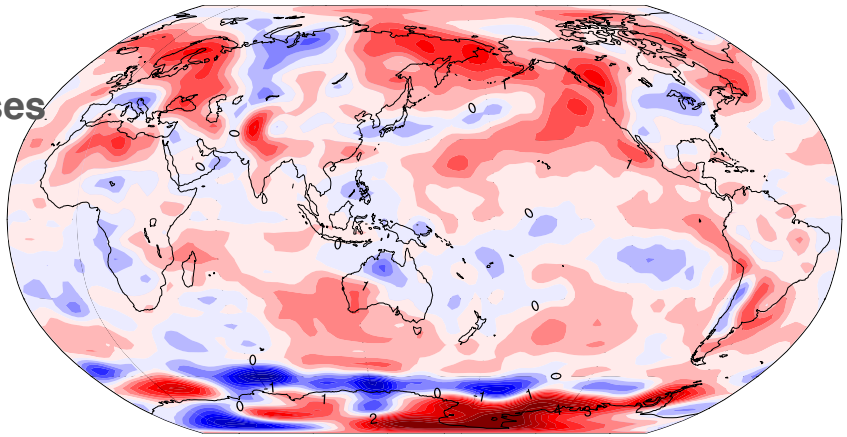
FORECAST

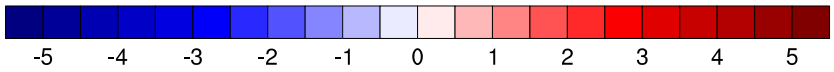


July-to-September 2014

NCEP — 2 meter Temperature [°C]

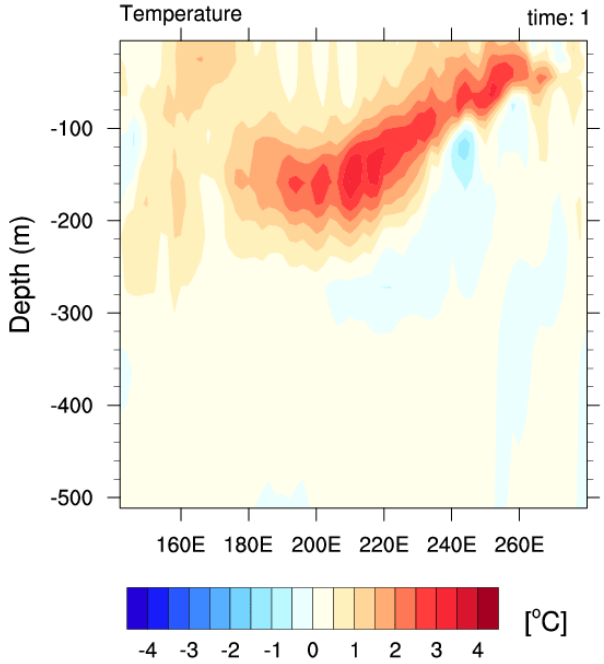
NCEP reanalyses



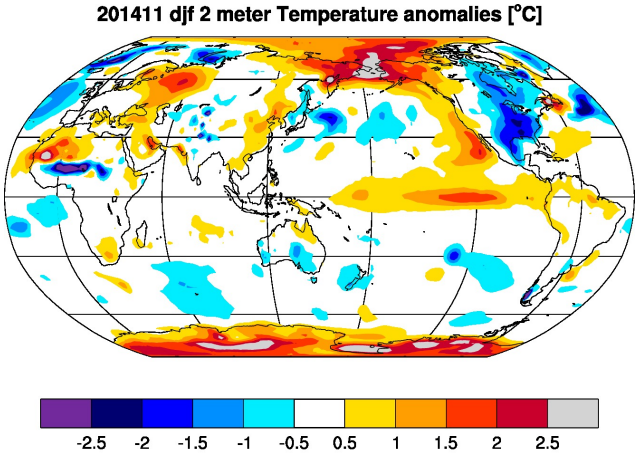


Forecast next winter

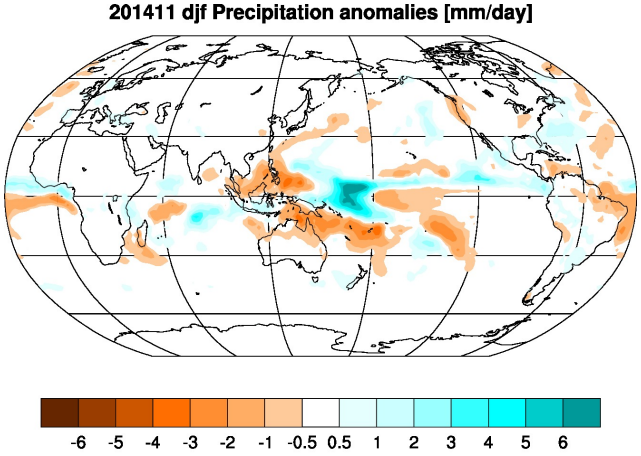
November start date - Lead 1 (DJF)

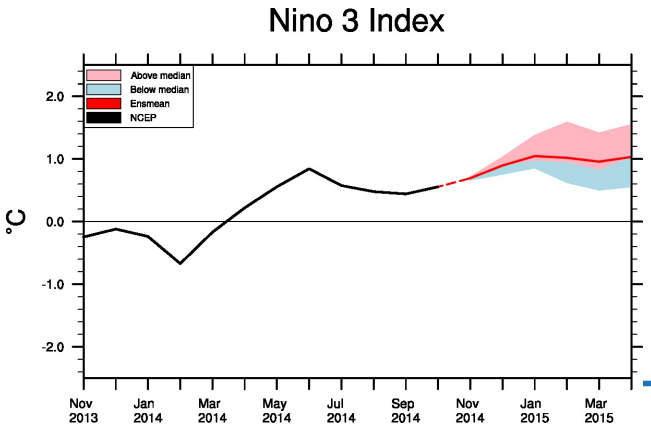


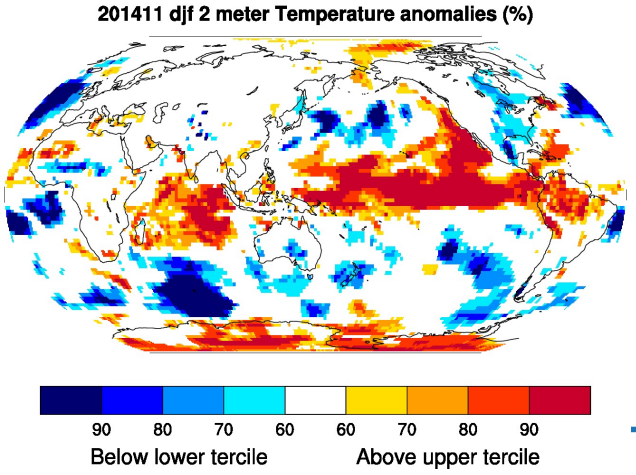
2-m Temperature

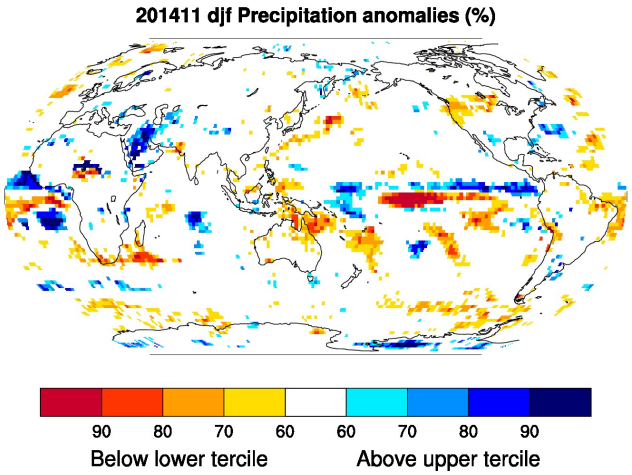


Precipitation







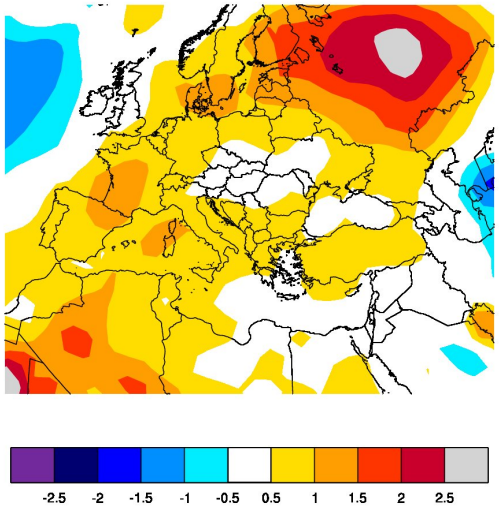


Forecast next winter

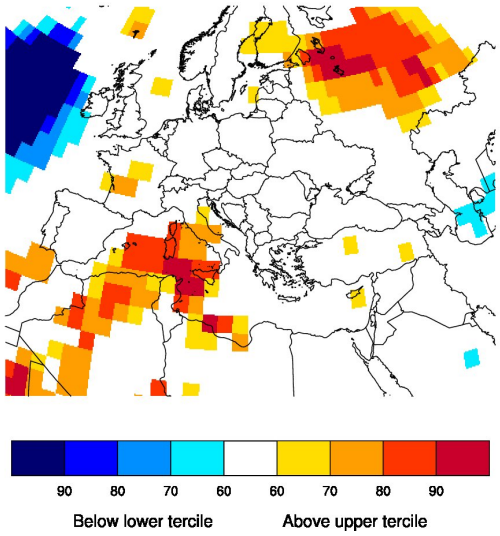
2-meter Temperature – start date 1 November

Lead 0

201411 ndj 2 meter Temperature anomalies [°C]

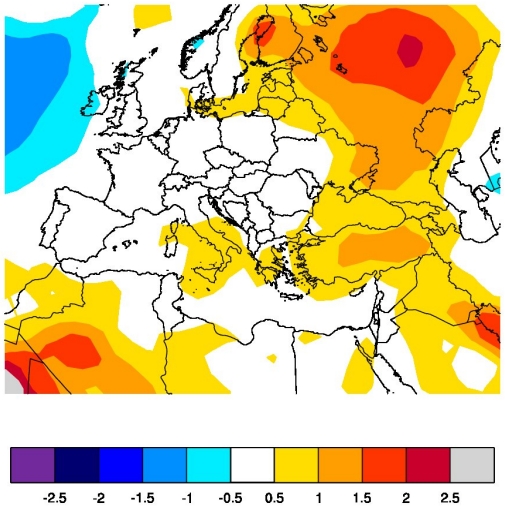


201411 ndj 2 meter Temperature anomalies (%)

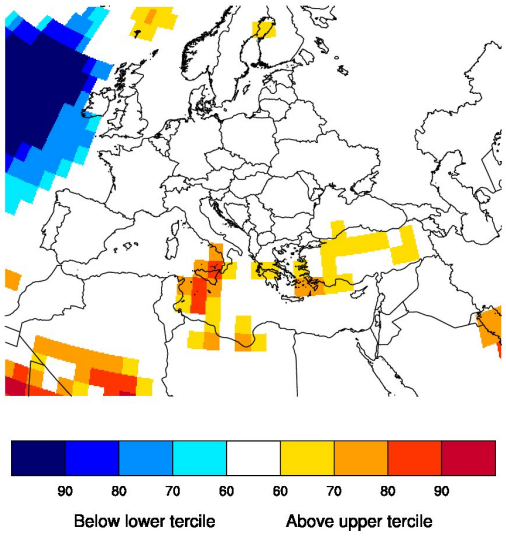


Lead 1

201411 djf 2 meter Temperature anomalies [°C]

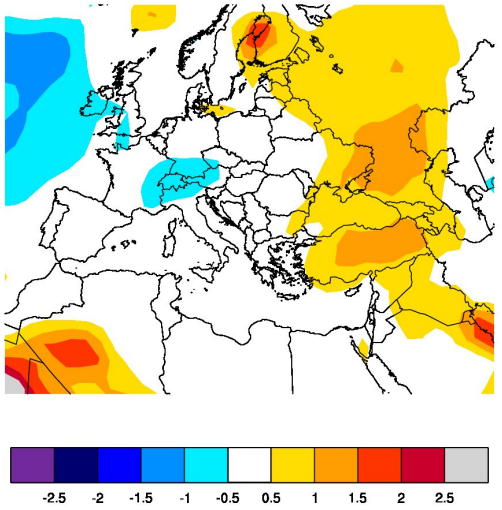


201411 djf 2 meter Temperature anomalies (%)

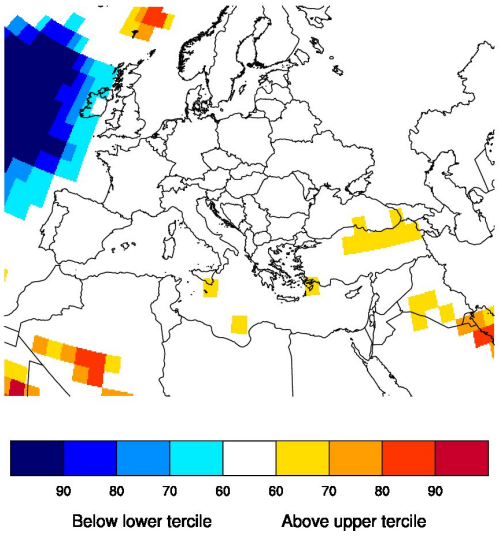


Lead 2

201411 jfm 2 meter Temperature anomalies [°C]



201411 jfm 2 meter Temperature anomalies (%)

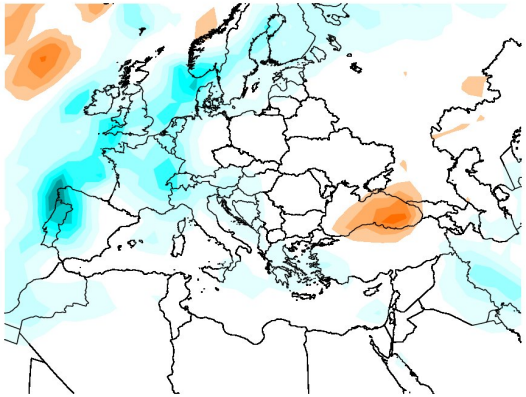


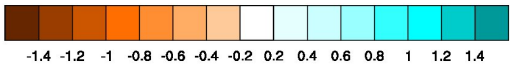
Forecast next winter

Precipitation – start date 1 November

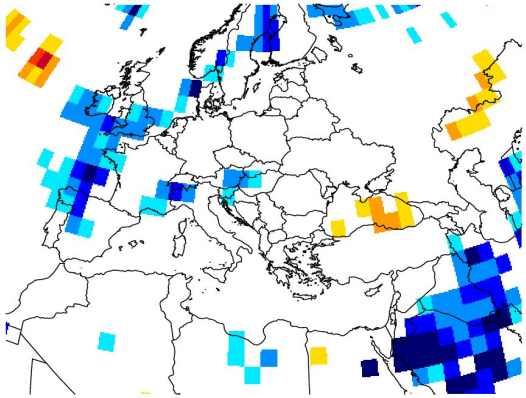
Lead 0

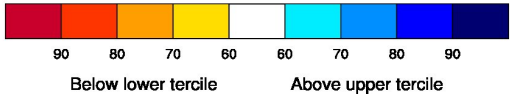
201411 ndj Precipitation anomalies [mm/day]





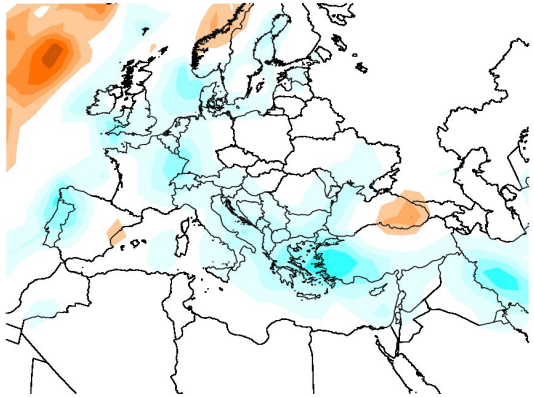
201411 ndj Precipitation anomalies (%)

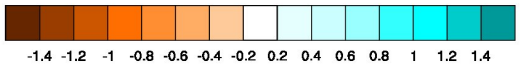




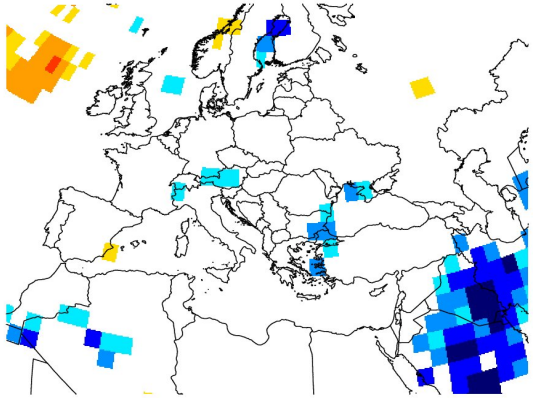
Lead 1

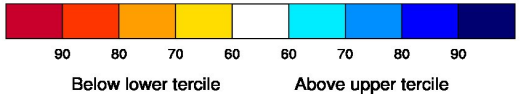
201411 djf Precipitation anomalies [mm/day]





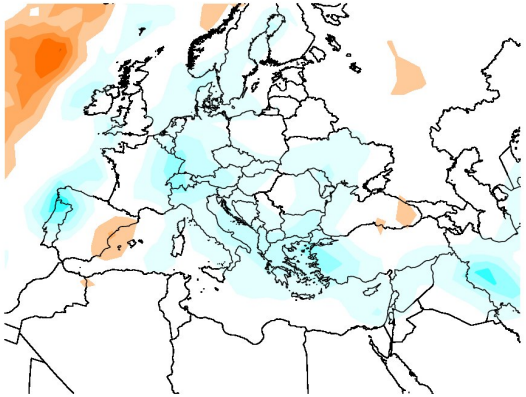
201411 djf Precipitation anomalies (%)

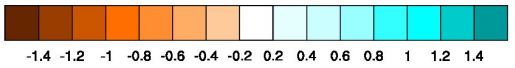




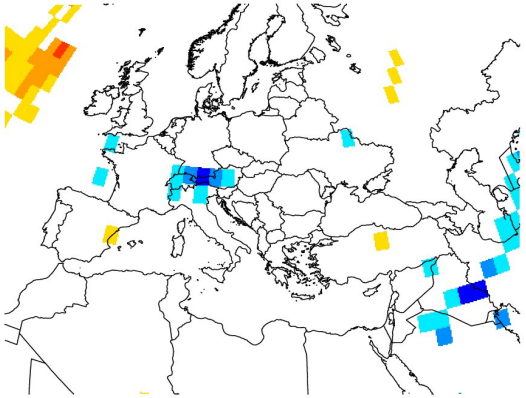
Lead 2

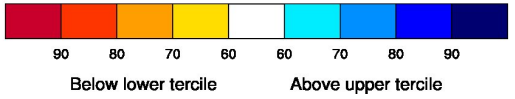
201411 jfm Precipitation anomalies [mm/day]



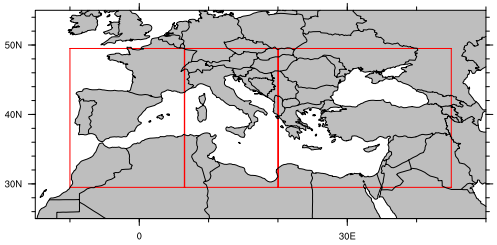


201411 jfm Precipitation anomalies (%)



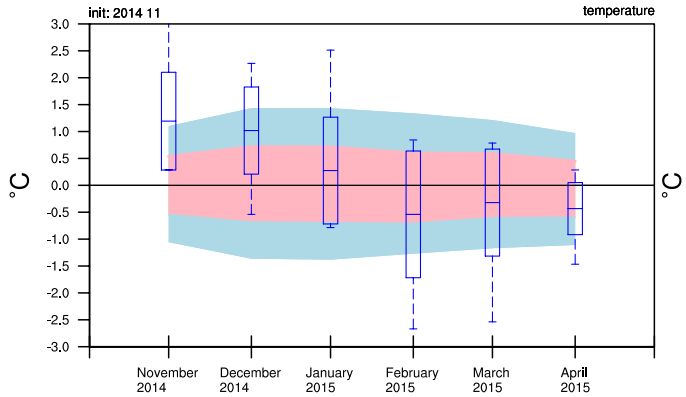


Forecast next winter

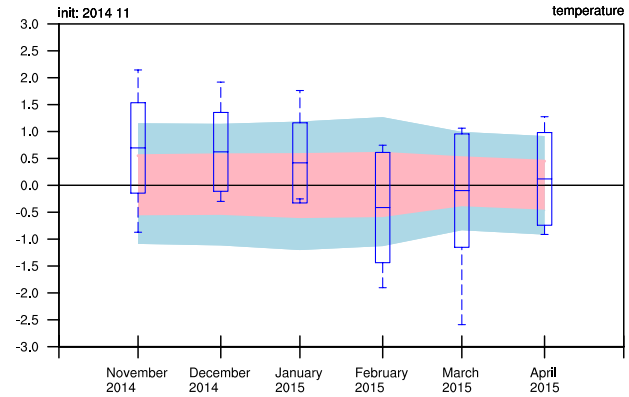


2-m Temperature

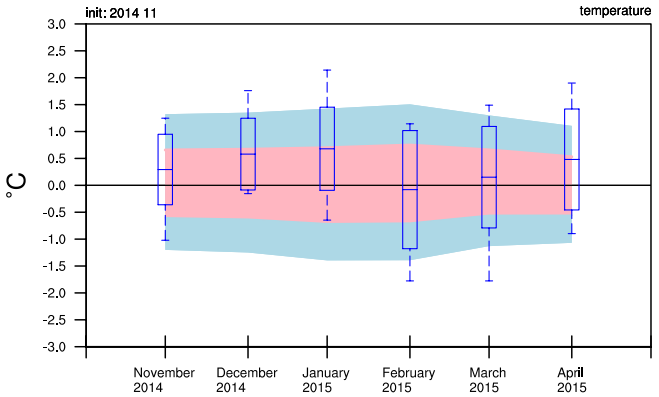
Western Mediterranean



Central Mediterranean

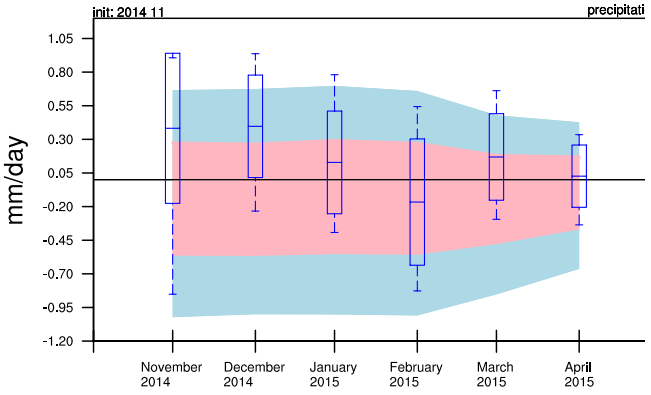


Eastern Mediterranean

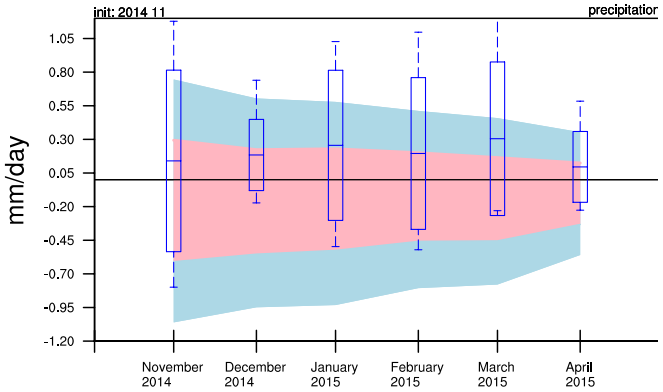


Precipitation

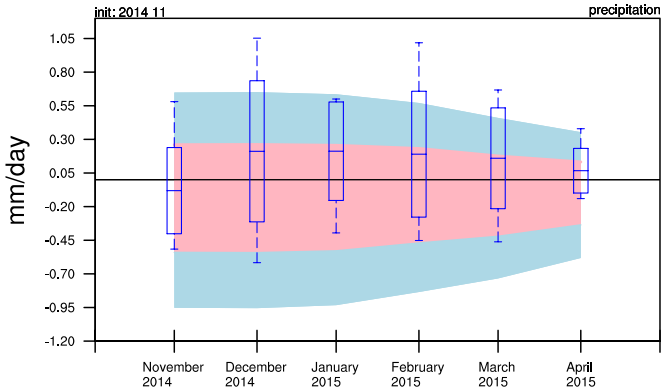
Western Mediterranean



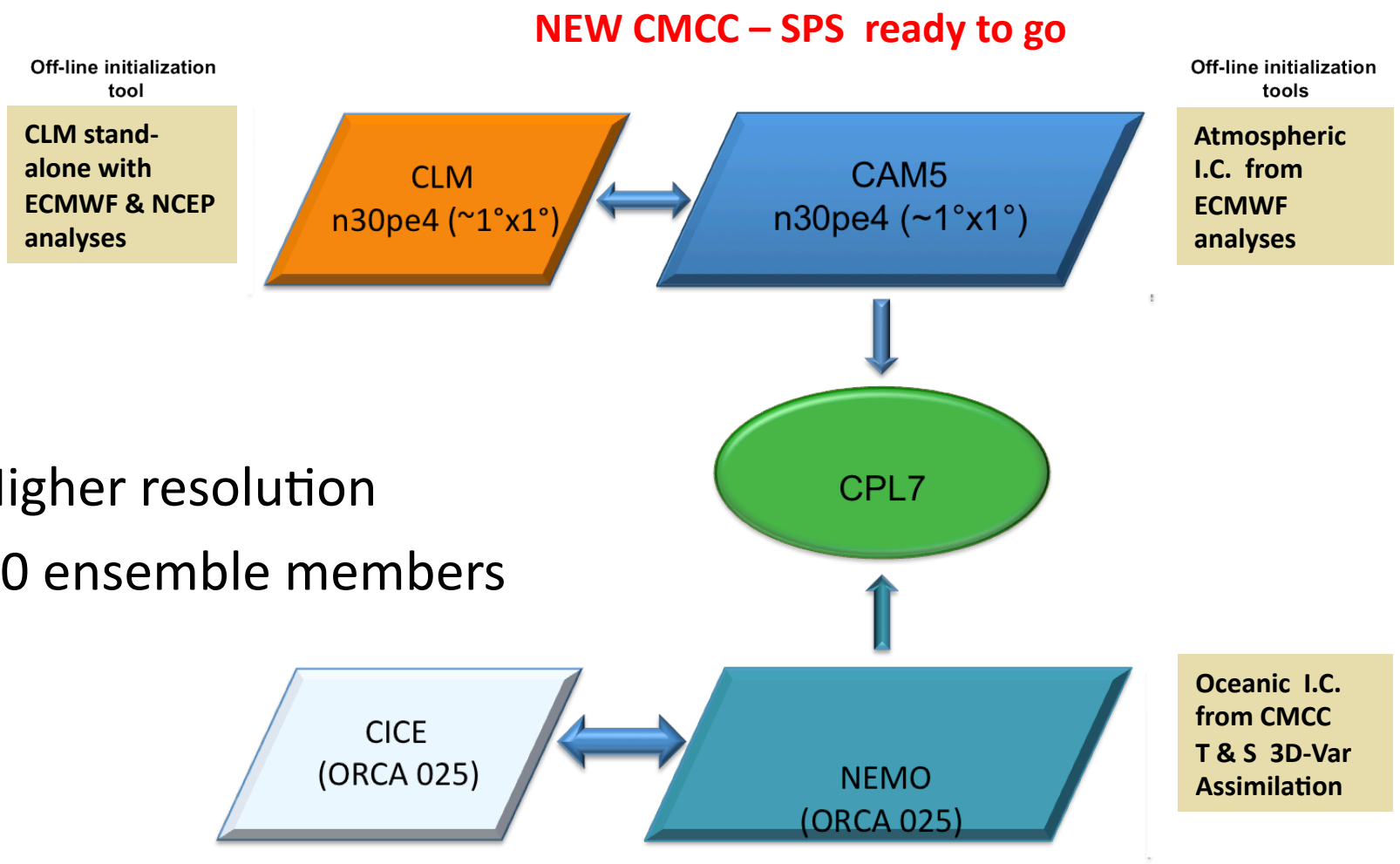
Central Mediterranean



Eastern Mediterranean



The new seasonal prediction system: CMCC-SPS.v3



- Higher resolution
- 20 ensemble members

Main novelties with respect to the previous seasonal prediction system:

- New model
- More realistic initialization land surface;
- Increased resolution for both the atmosphere and ocean;
- Increased number of ensemble members, through two perturbations for the land surface and 10 for the atmosphere;

Thank you

Some references of the CMCC Seasonal Prediction System:

• Athanasiadis P. J.,et al. , 2014: The representation of atmospheric blocking and the associated low-frequency variability in two seasonal prediction systems (CMCC, Met-Office). *J. Climate*, in press.

• Materia S., et al. , 2014: Impact of atmosphere and land surface initial conditions on seasonal forecast of global surface temperature. *J. Climate*, in press.

• Alessandri A., et al., 2011: Tropical cyclone count forecasting using a dynamical Seasonal Prediction System: sensitivity to improved ocean initialization. *J. Climate*, 24, 2963-2982.

• Alessandri, A, et al., 2011: Evaluation of Probabilistic Quality and Value of the ENSEMBLES Multimodel Seasonal Forecasts: Comparison with DEMETER. *Mon. Weath. Rev*., **139**, 581-607, DOI: 10.1175/2010MWR3417.1

• Alessandri A. et al., 2010: The INGV-CMCC Seasonal Prediction System: improved ocean initial conditions. *Mon. Weath. Rev*., **138**, 2930-2952.

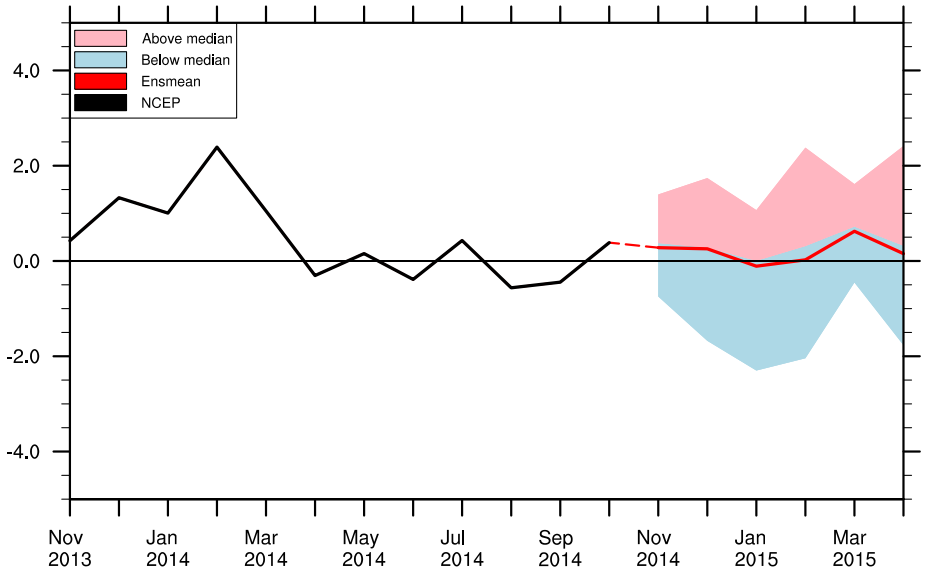
• Weisheimer A, et al., 2009: ENSEMBLES: A new multi-model ensemble for seasonal-to-annual predictions-Skill and progress beyond DEMETER in forecasting tropical Pacific SSTs. *Geophys. Res. Lett.*, **36**, L21711, DOI: 10.1029/2009GL040896

• Gualdi S., 2005: Impact of atmospheric horizontal resolution on ENSO forecasts. *Tellus*, **57A**, 357-374

• Palmer T.N., et al., 2004: Development of a European Multi-Model Ensemble System for Seasonal to Inter-Annual Prediction (DEMETER). *Bull Amer Meteo Soc*, **85**, 853-872.

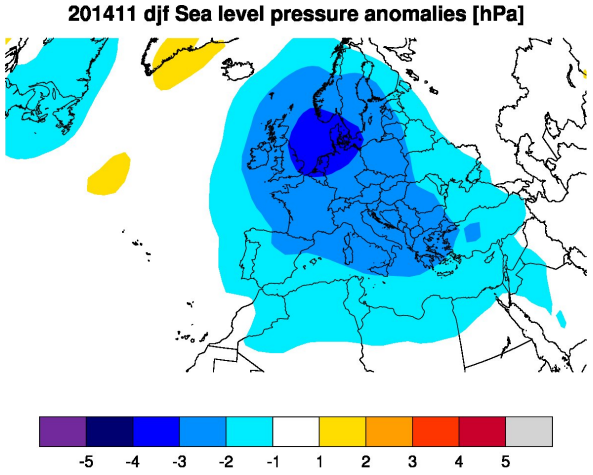
Forecast next winter

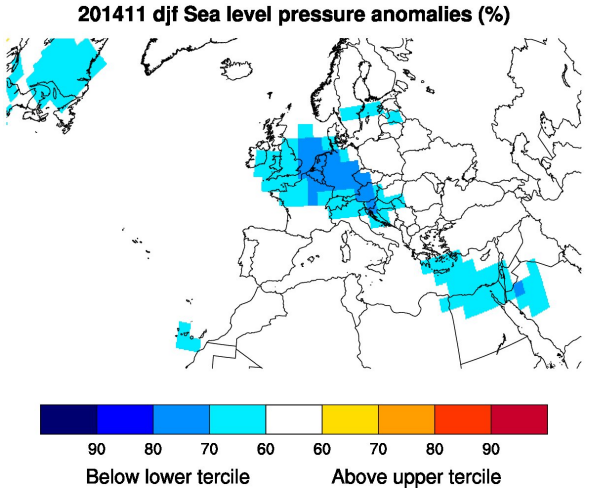
NAO station Index



SLP anomalies – start date November

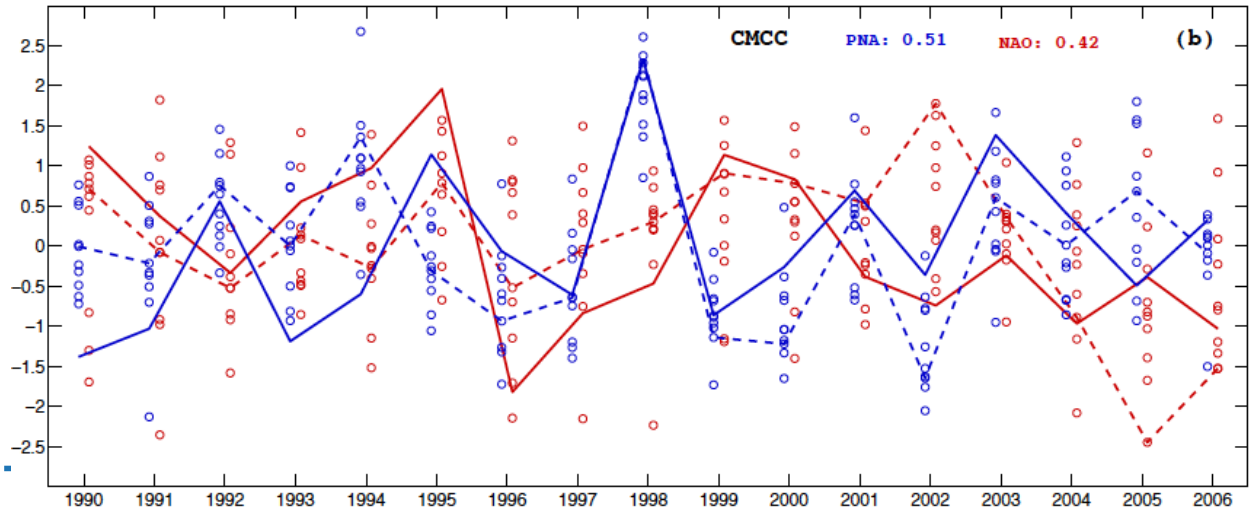
Lead 1





PNA = 0.51

NAO = 0.42



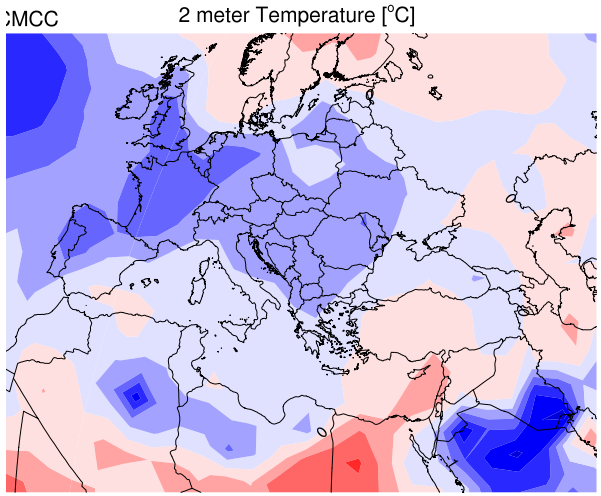
Verification of the summer forecast

2-m Air Temperature

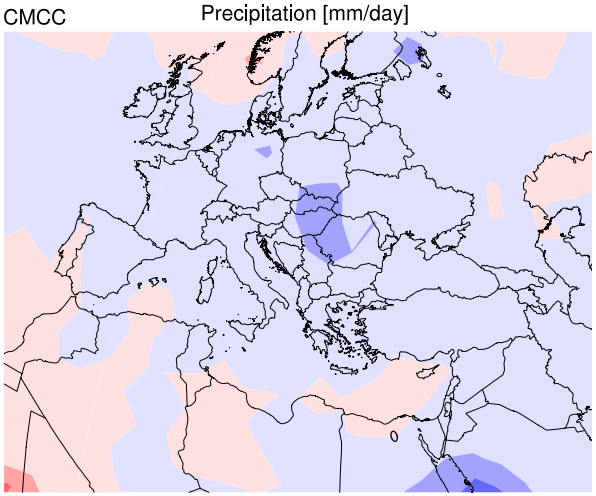
Precipitation

FORECAST Lead 1

June-to-August 2014 [ini: 1st May 2014]

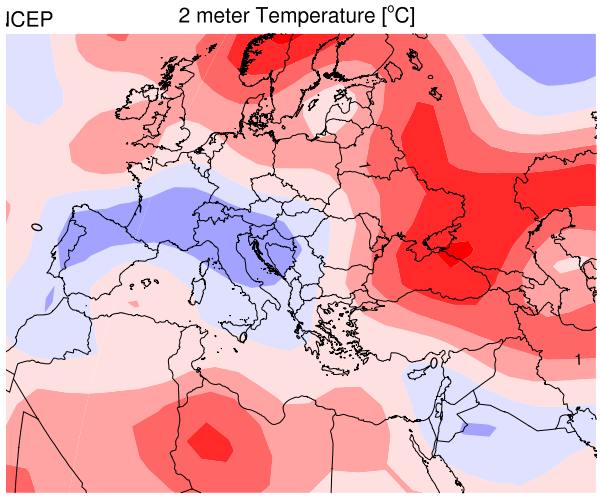


June-to-August 2014 [ini: 1st May 2014]

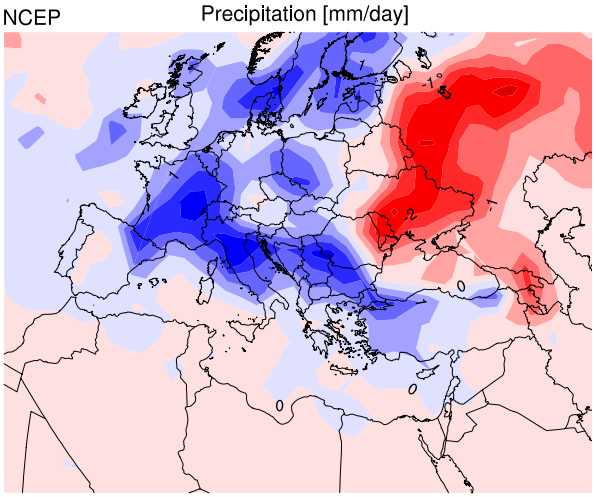


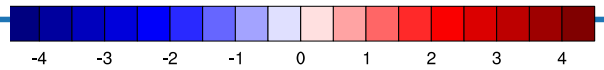
NCEP reanalyses

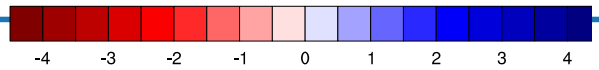
June-to-August 2014 [ini: 1st May 2014]



June-to-August 2014 [ini: 1st May 2014]





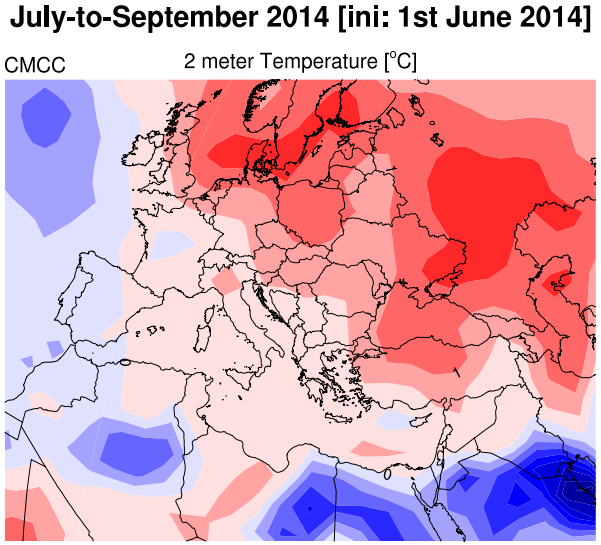


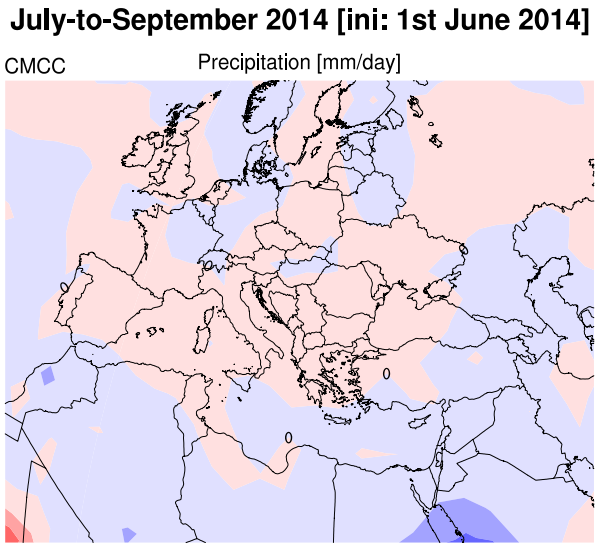
Verification of the summer forecast

2-m Air Temperature

Precipitation

FORECAST
Lead 2





NCEP
reanalyses