

(Seasonal forecasts and) the Med Climate Outlook Forum (MedCOF)

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Improving access to Climate Change Information
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Outline

- 1) What seasonal forecasts are and how we make them**
- 2) Regional focus of seasonal forecasts: the RCOFs**
- 3) The most recently born in the Climate Outlook Forums community: MedCOF**



What are seasonal forecasts?

With a seasonal forecasts we predict the **probability** that a climate anomaly occurs in a season following the prediction date.

For example we may predict that **next summer will likely be warmer** than the reference period of the last 30 years.

First thing to know when we make a prediction is what the weather is doing right now. To do this, we receive observations from satellites, ships, buoys, weather stations that cover the whole world. This information is collected to make the initial conditions of our forecast.

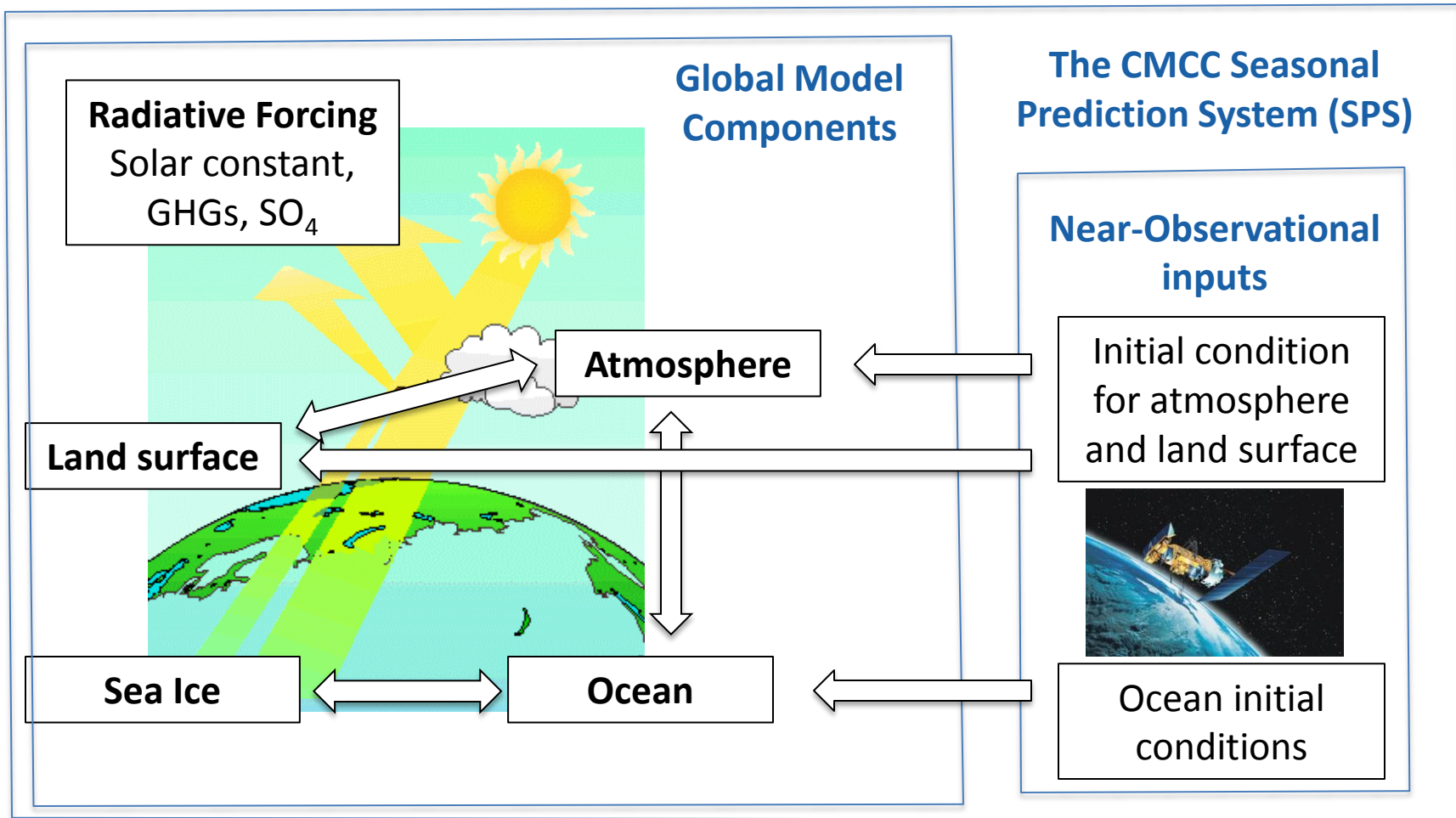
The forecast consists of an **ensemble of simulations** performed with a model that mirror the atmosphere and ocean dynamics.

After starting the model with the observed initial state, computers generate a climate prediction for the future.

Results are analyzed by scientists who combine the **model output** to their **experience**, so to obtain the most accurate **seasonal forecast**.



The CMCC Seasonal Predictions System

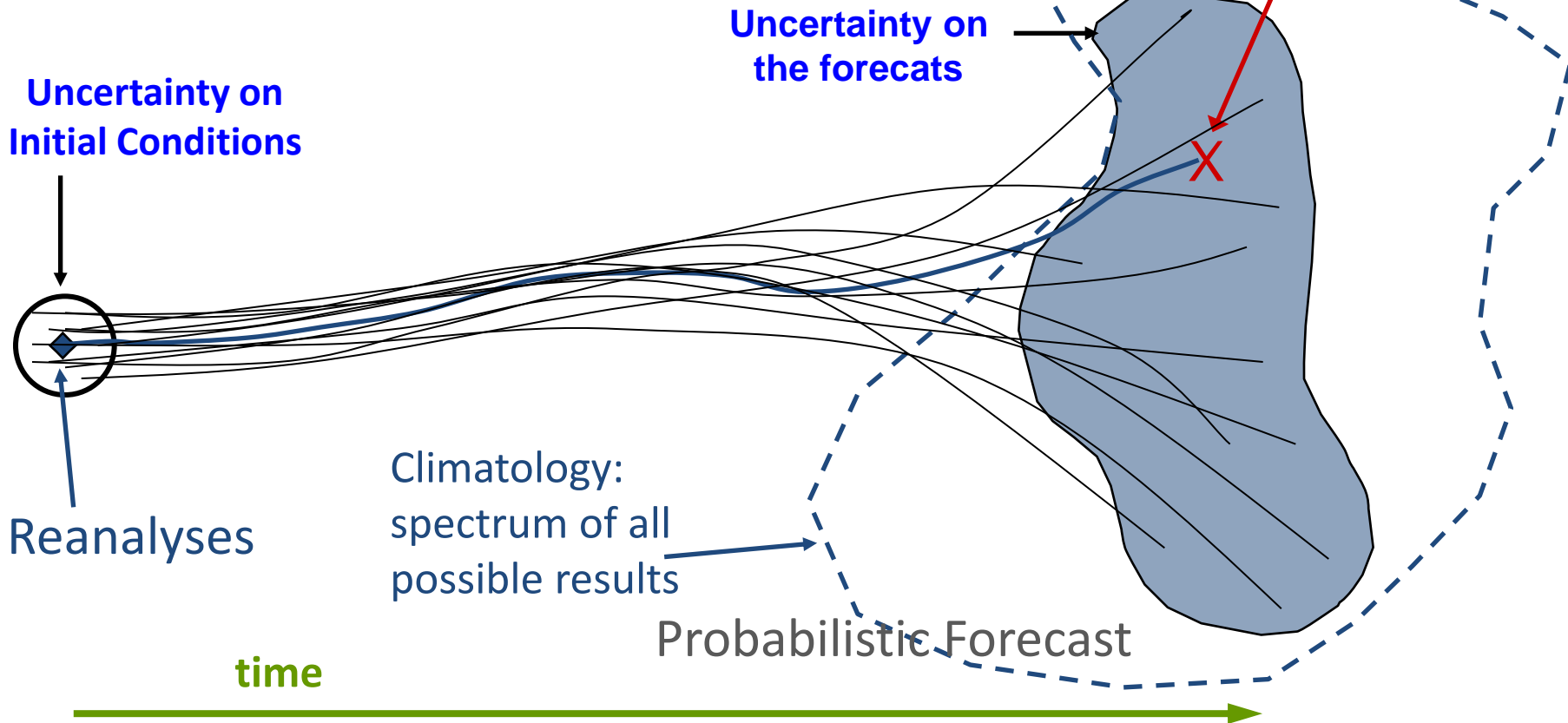


The GCM simulates the physics of the atmosphere, land surface and ocean, representing a world close to reality. The addition of realistic initial conditions allows the model to evolve towards the most likely future climate state.



How we make seasonal forecasts

Uncertainties on initial data could be large.
To supply for this issue: ensemble
technique with perturbed initial conditions.

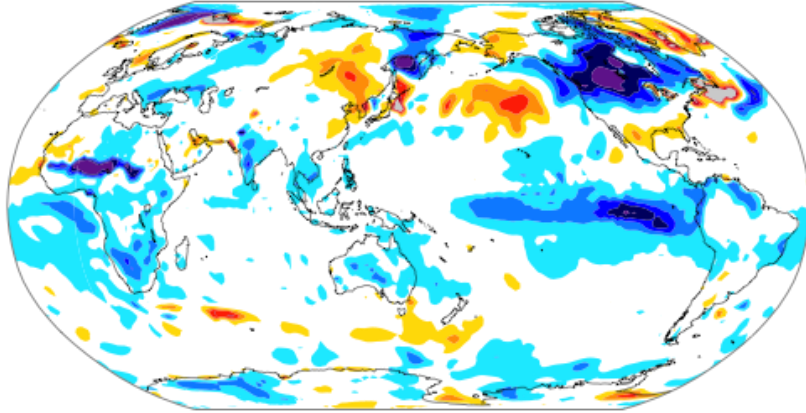


Readapted from Trzaska (<http://portal.iri.columbia.edu>)

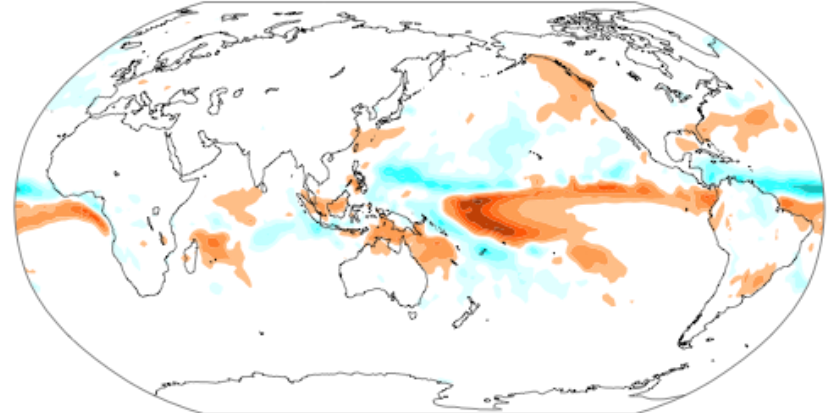


The output of a seasonal forecasts

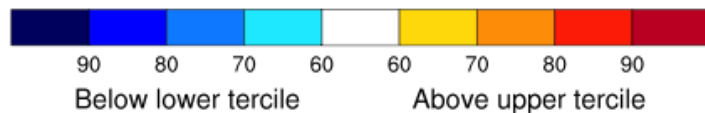
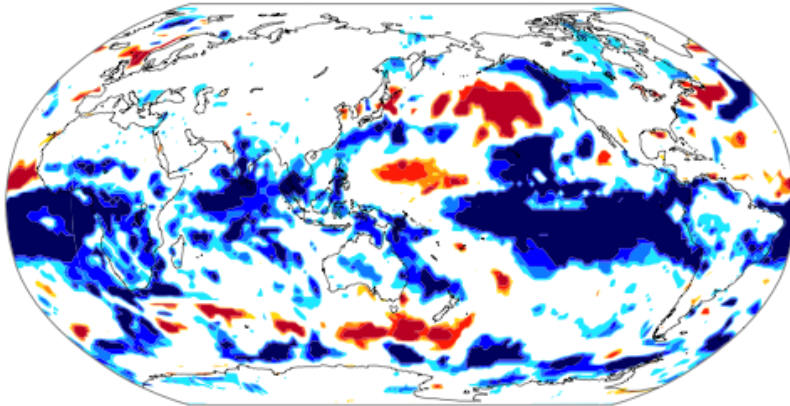
201311 djf surface Temperature anomalies (deg K)



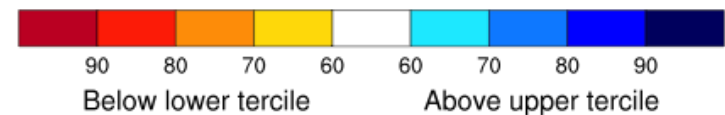
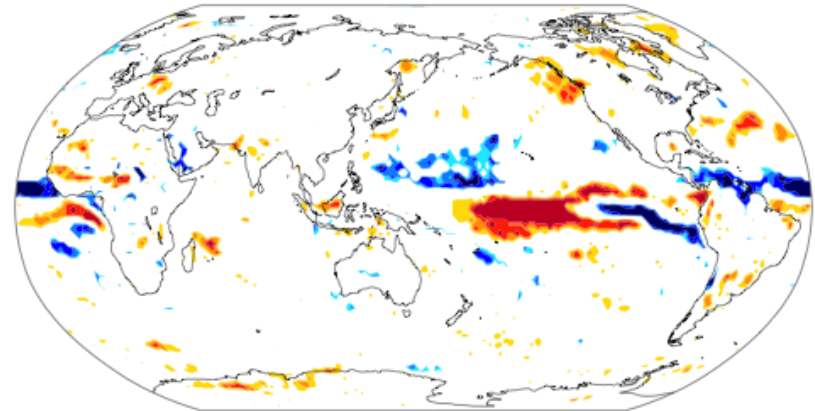
201311 djf Precipitation anomalies (mm/day)



201311 djf surface Temperature anomalies (%)



201311 djf Precipitation anomalies (%)

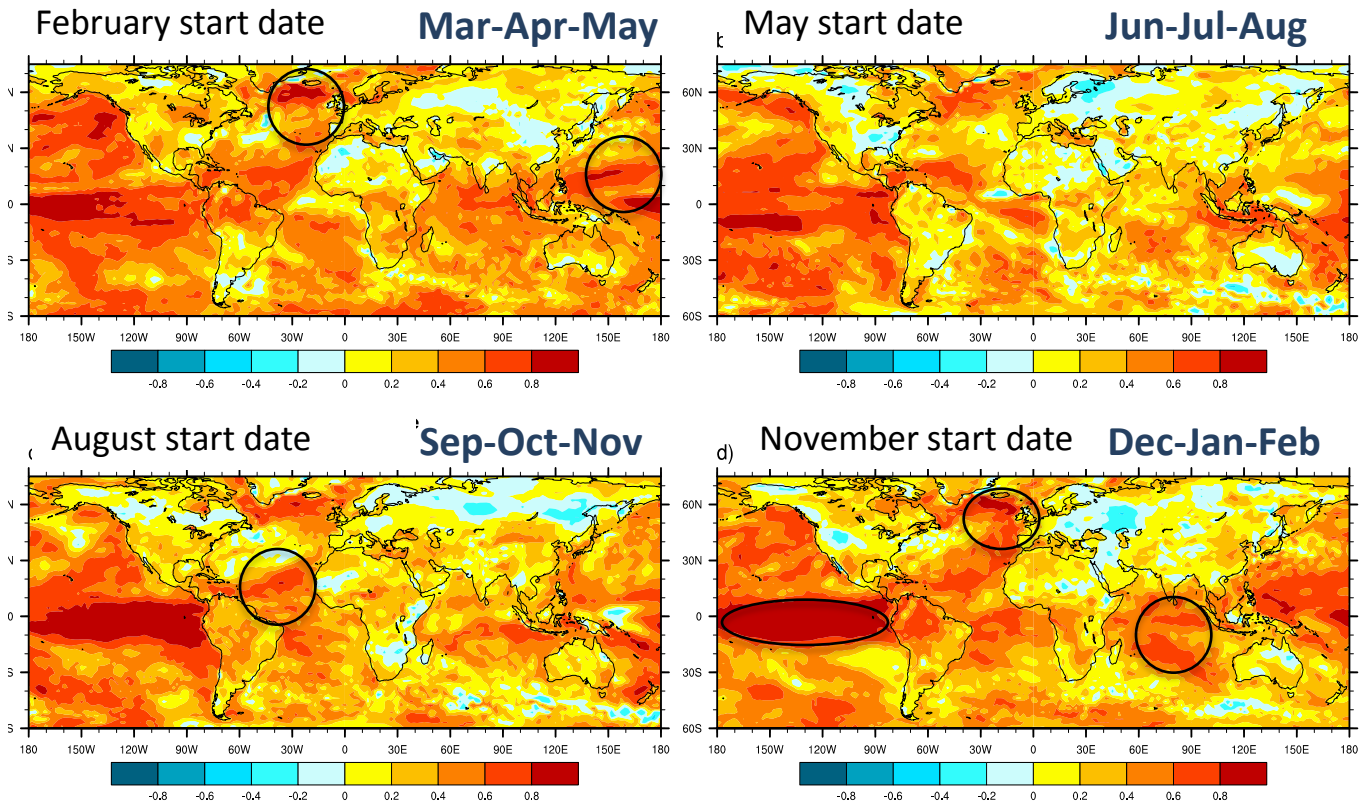


The skill of a seasonal forecasts

Tsurf Anomaly Correlation (ACC) - lead time 1

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

ACC is a measure of the skill, indicating the correlation between forecasts and ERA-Interim between 1989-2010.

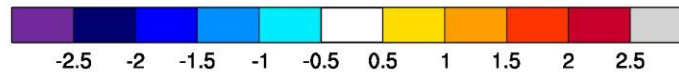
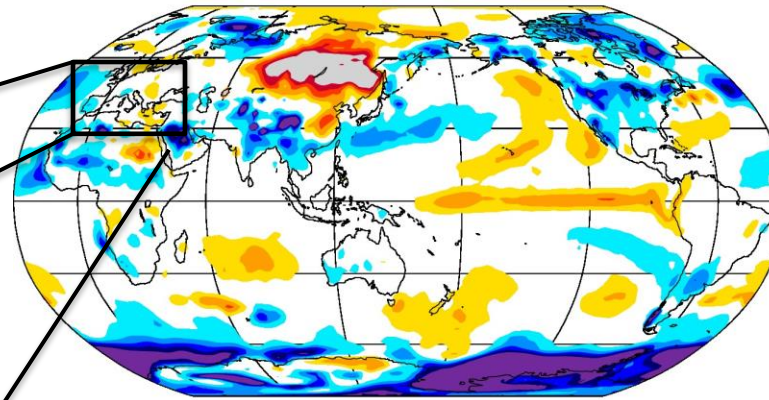


- Skill generally higher in the Tropics and in the oceans than on continents.
- High skill in the ENSO area and teleconnected regions.
- Good skill in the northern Atlantic region, particularly in the winter and the spring



Think global, act local

201404 amj 2 meter Temperature anomalies [°C]

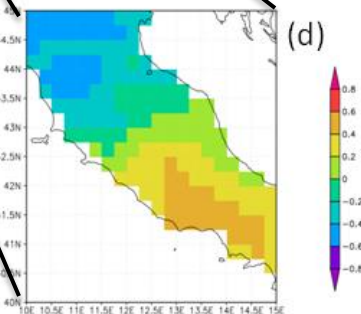
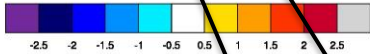
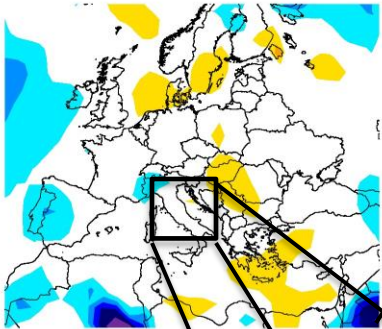


Global scale cannot be disregarded when we produce seasonal forecasts: through **teleconnections**, the climate of a region may be strongly influenced by anomalies occurring in distant areas of the world.

More and more often, stakeholders from different sectors (agriculture, tourism, energy) require **regional focus on the mid and small scales**.

To coordinate actions targeted on specific regions -> **Regional Climate Outlook Forums (RCOFs)**

201404 amj 2 meter Temperature anomalies [°C]



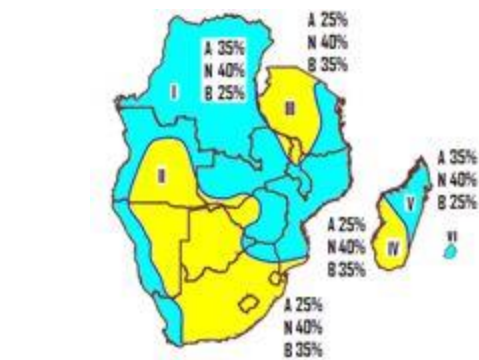
The role of RCOFs

Regional Climate Outlook Forums (RCOFs) is an innovative concept **conceived, developed and supported by WMO** in partnership with the National Meteorological and Hydrological Services (NMHSs), regional climate institutions (as CMCC) and other agencies.

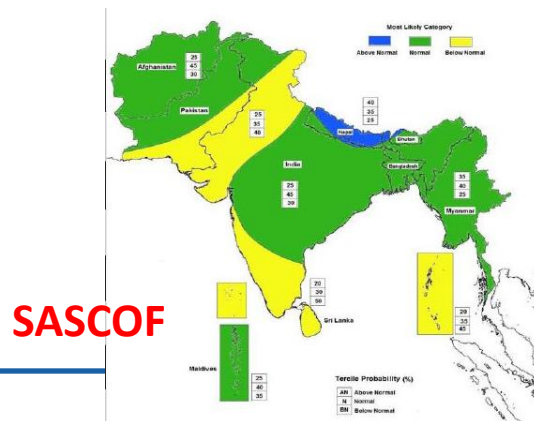
http://www.wmo.int/pages/prog/wcp/wcasp/clips/outlooks/climate_forecasts.html

Main objective of RCOFs is the development of **consensus-based climate prediction and information for the season which have critical socio-economic significance.**

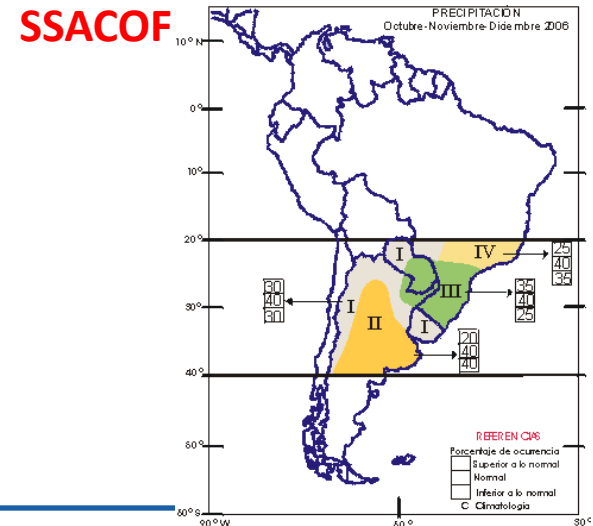
RCOFs in various forms and sizes are now in operation serving many regions in Africa, South America, Asia and recently Europe.



SARCOP



SASCOF



SSACOF



Motivations

Need of coordinated and agreed response from all involved centres to the increasing demand of seasonal information

- Seasonal forecast information is strongly requested (at regional-local scales) by decision makers for many economical sectors.
- Several seasonal forecast providers have developed their own tools to meet this demand with their own products.
- The release of non-coinciding seasonal forecasts – when not clearly contradictory – by different centres for the same region is damaging the credibility of the institutions issuing such forecasts and convey a negative message on the lack of usefulness of climate forecasts at such a time scale.



Motivations

Enhance cooperation for a task requiring resources which in many cases is beyond the capabilities of a single centre

- Seasonal forecast systems are frequently based on ensembles of individual forecasts requiring an enormous availability of computing power and modelling expertise.

Organize training activities to improve capabilities on seasonal forecasting.

- COFs facilitate the periodic organization of courses, workshops and other activities aiming to strength existing capabilities in seasonal forecasting and their applications.



MEDCOF: a new born forum

In Europe, 2 RCOFs are fully operational:

- the South-East European Climate Outlook Forum (SEECOF)
- the North EurAsian COF (NEACOF).

In the Mediterranean region (southern Europe, Middle East and North Africa):

- the North Africa COF (PRESANORD)
- the **MedCOF** (since June 2013): **overarching the Mediterranean region COFs**

Coordination team: African Centre of Meteorological Application for Development (ACMAD), AEMET (Spain), CMCC (Italy), Egyptian Meteorological Authority (EMA, Egypt), MeteoFRANCE (France), Météorologie nationale, (Morocco), NHMS (Serbia), WMO

Two Annual meetings: second half of November (winter forecast) and second half of May (summer forecast). The MedCOF meetings are held in correspondence of the SEECOF and/or PRESANORD

First MedCOF: Belgrade, 18-19/11/2013

- WMO RA VI RCC Network Nodes on long-range forecasting (**Meteo France**),
- WMO RA VI RCC Network Node on climate monitoring (**Deutscher Wetterdienst**)
- WMO RA I RCC Network Nodes on long-range forecasting (**ACMAD**)
- Global Producing Centre (**ECMWF, CMCC**)
- South East Europe Virtual Climate Change Centre (**SEEVCCC**)
- National Hydrometeorological Services of the Mediterranean and other European, African and Middle East regions.



Two days of analysis and discussion to find a consensus upon climate prediction for the following winter season

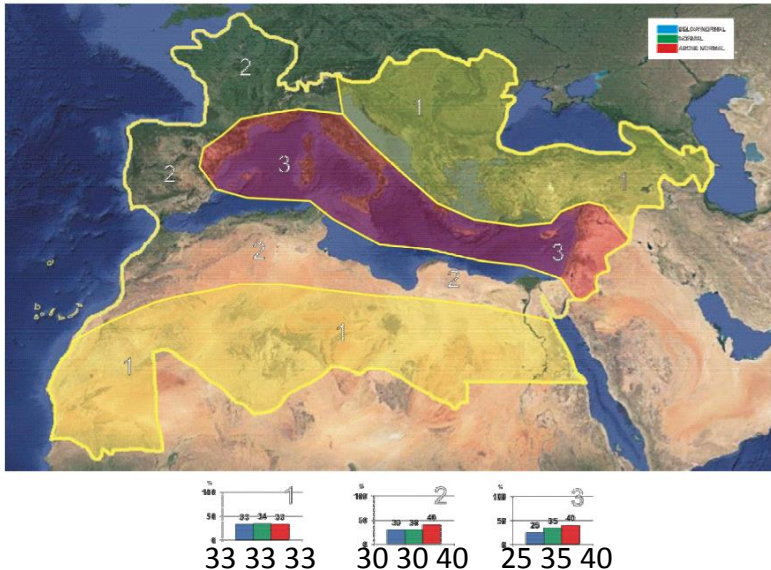


Temperature and precipitation forecast consensus

First MedCOF: Belgrade, 18-19/11/2013

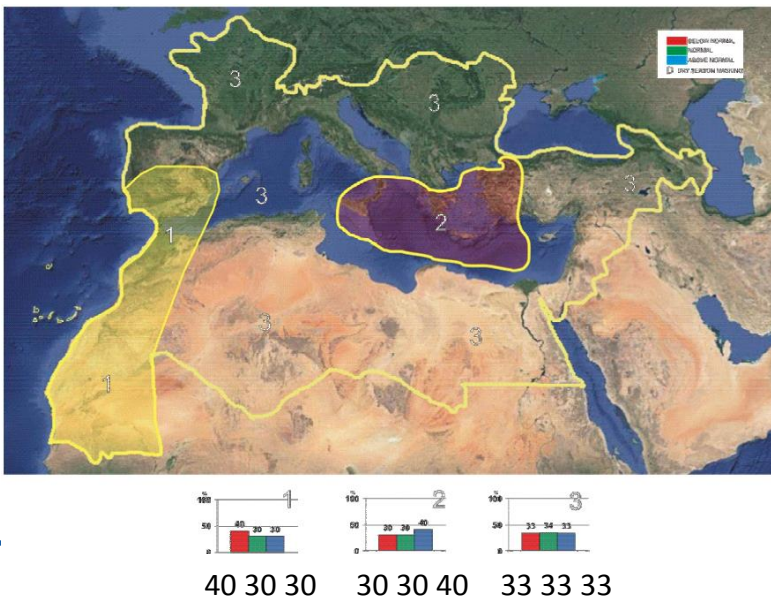
2m Temperature

- High uncertainty in the whole area.
- Weak tendency for the upper tercile (warmer) in the Western part of the domain and most of the Mediterranean Sea (regions 2 and 3).
- No signal for the Balkan Peninsula, Turkey, South Caucasus region and North Sahara



Precipitation

- Most of MedCOF region shows no indication for precipitation (region 3).
- Southern part of the Iberian Peninsula and the Atlantic coast of Africa show some slight tendency for the dry tercile (region 1)
- Central Mediterranean slightly points towards the wet tercile (region 2)

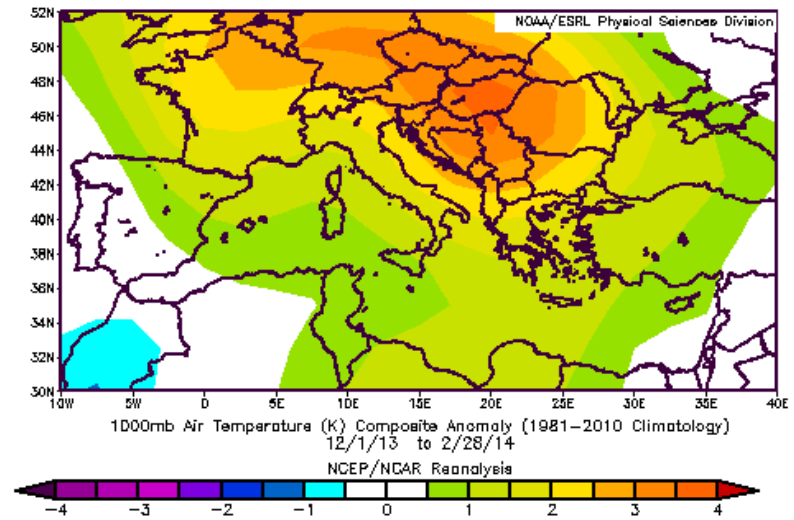
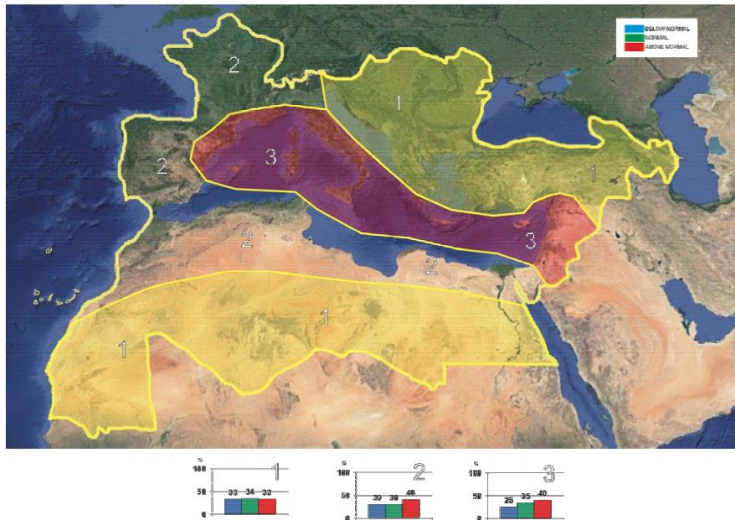


Verification of the forecasts

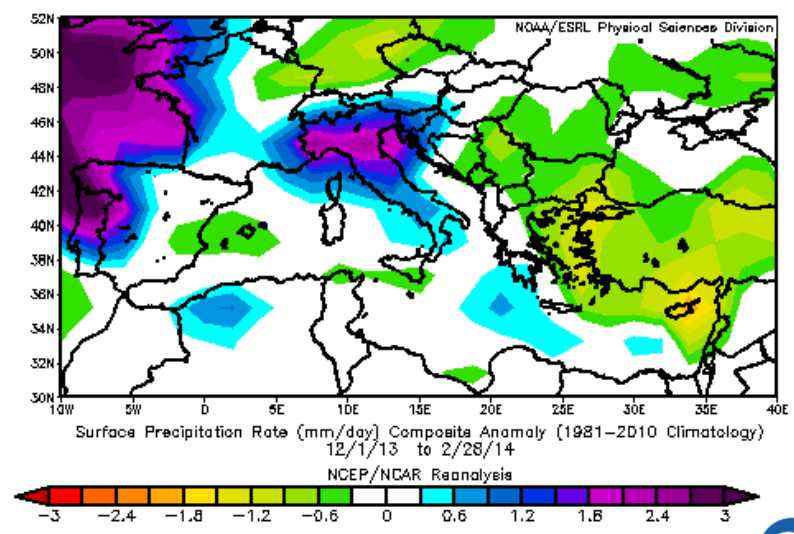
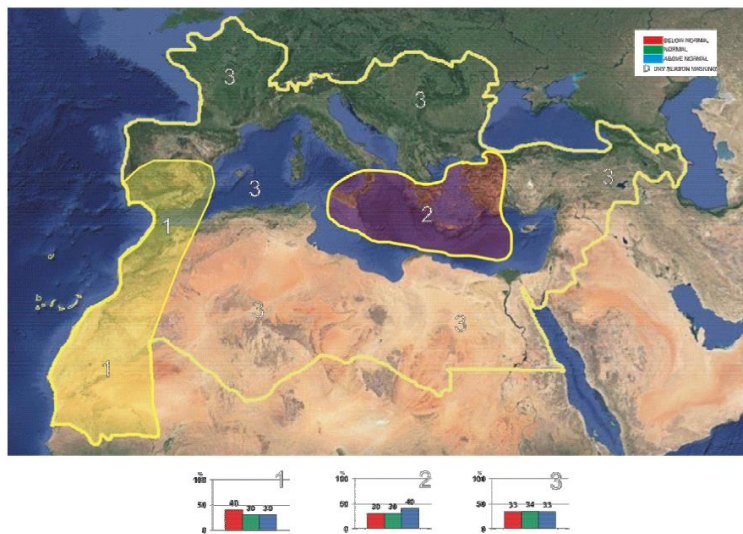
Forecast

Reanalysis

2m Temp.



Precip.



Conclusion

Next MedCOF: 18-25/05/2014

- Virtual meeting (teleconf, web-platform and email)

<http://medcof.aemet.es/Medcof/events/events.html>

MedCOF
Mediterranean Climate Outlook Forum



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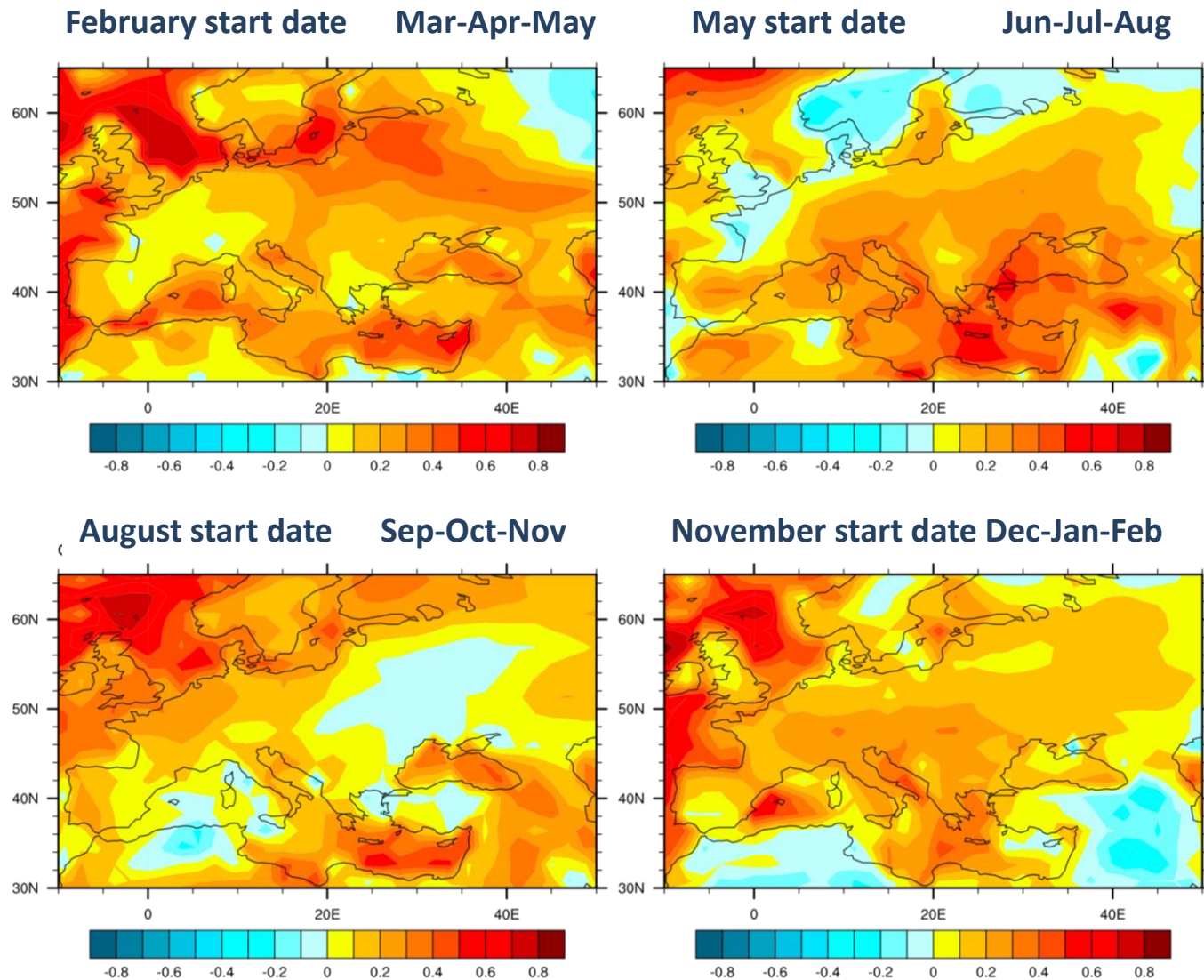
Thank you



cmcc
Centro Euro-Mediterraneo
sui Cambiamenti Climatici

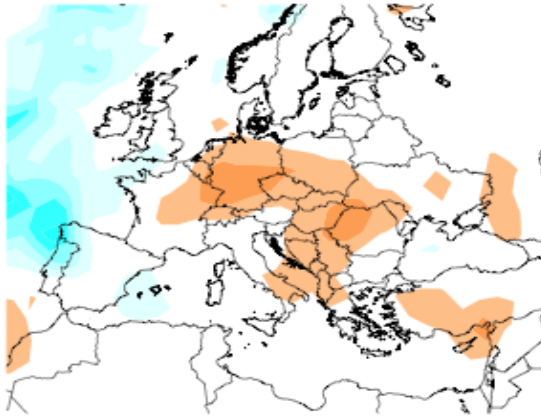
The skill of a seasonal forecasts

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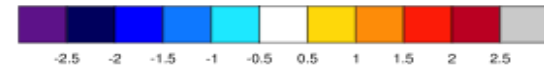
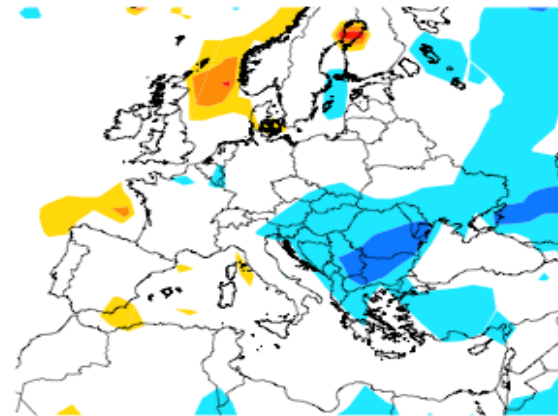


The output of a seasonal forecasts

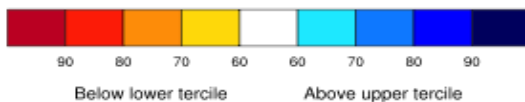
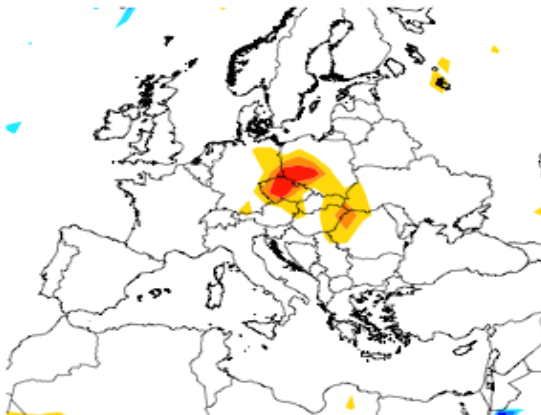
201311 djf Precipitation anomalies (mm/day)



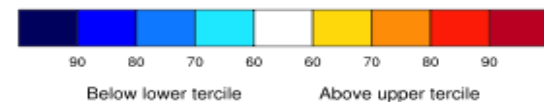
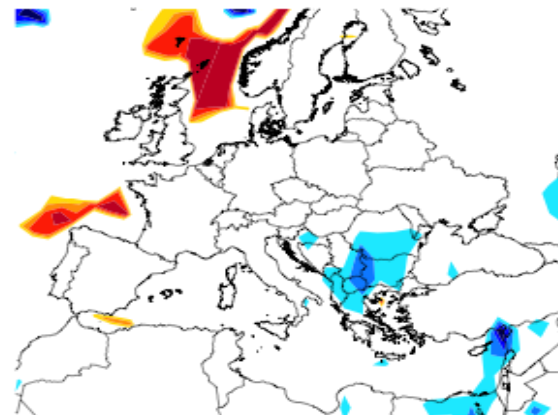
201311 djf surface Temperature anomalies (deg K)



201311 djf Precipitation anomalies (%)



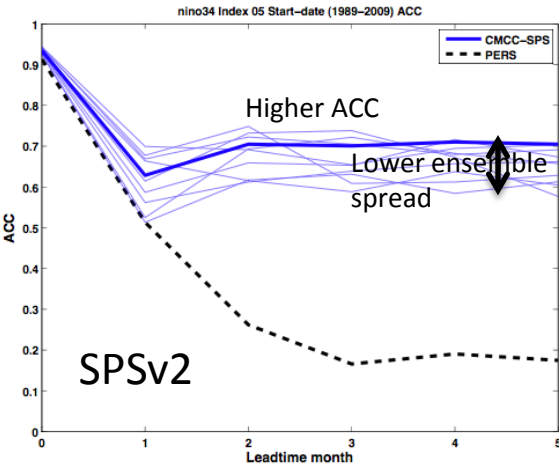
201311 djf surface Temperature anomalies (%)



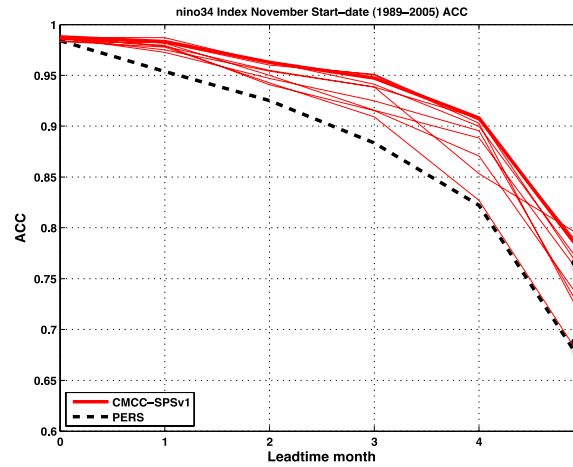
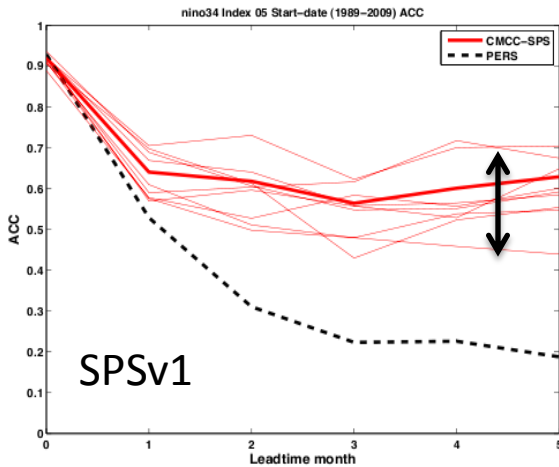
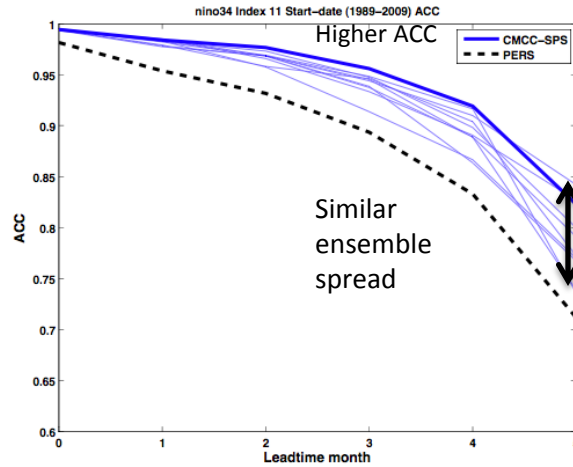
The CMCC Seasonal Prediction System

SST anomaly correlation - NINO3.4

May



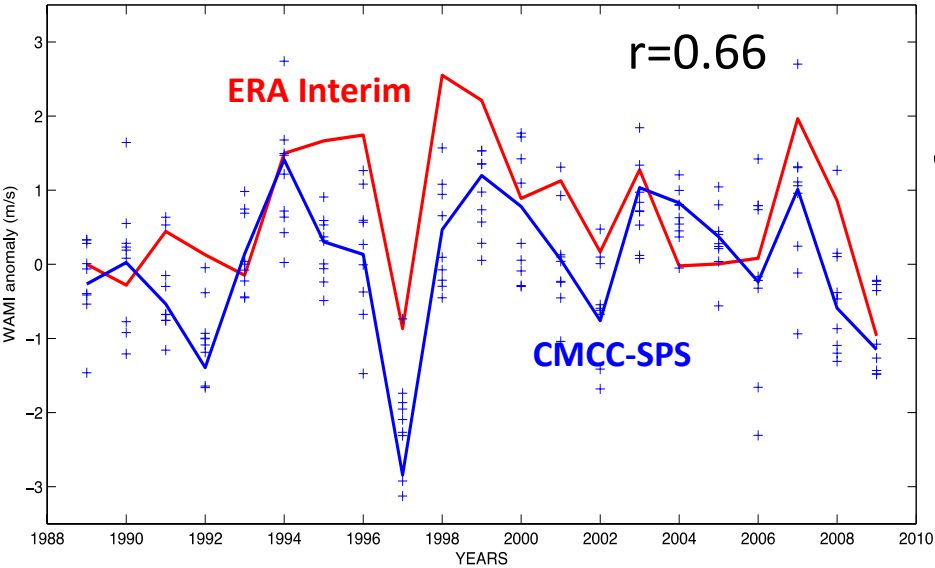
November



The introduction of land-atmosphere initial condition demonstrates an important and potentially predictable impact on the forecasts of equatorial Pacific SST (particularly in May), either as a result of the intra-seasonal stochastic component of the atmospheric initial state (Shi et al., 2011), or for the amplification of initial condition error in such a coupled system (Hudson et al., 2011).

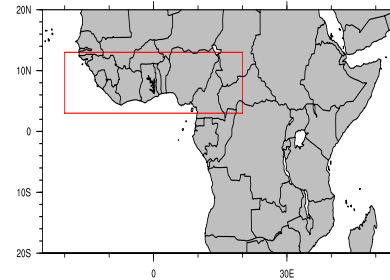
The CMCC Seasonal Prediction System

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



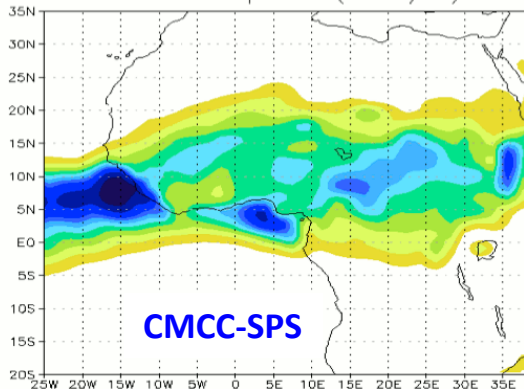
Predictions of the West African Monsoon

$$\text{WAMI} = u_{850\text{hPa}} - u_{200\text{hPa}} \quad (\text{Fontaine et al., 1995 J.Clim})$$

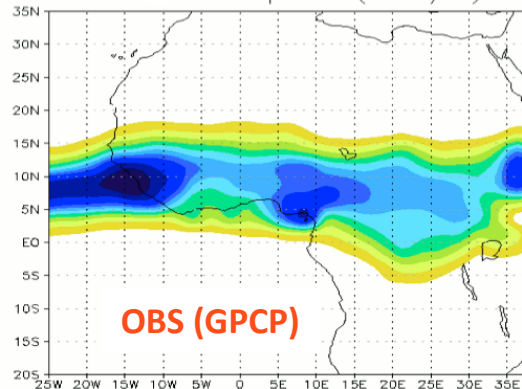


CMCC-SPS intercepts the interannual variability of Monsoon winds.

JJA prec (mm/d)



JJA prec (mm/d)

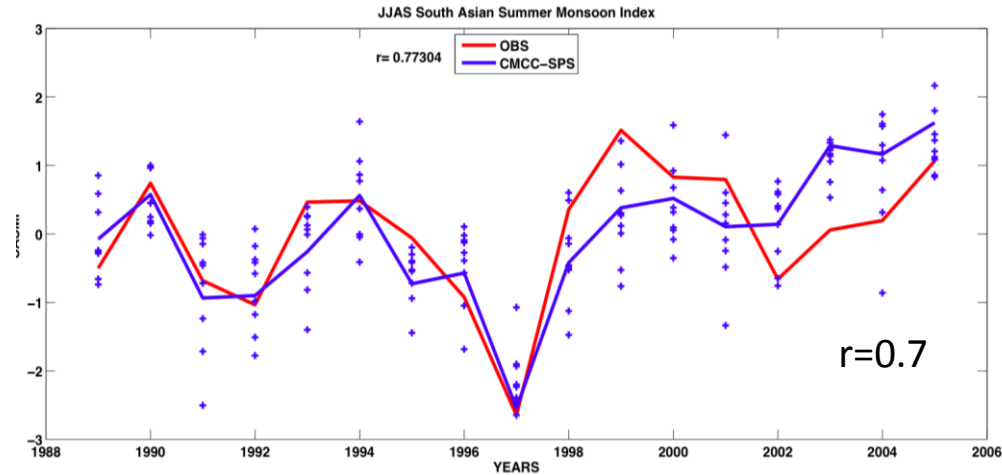
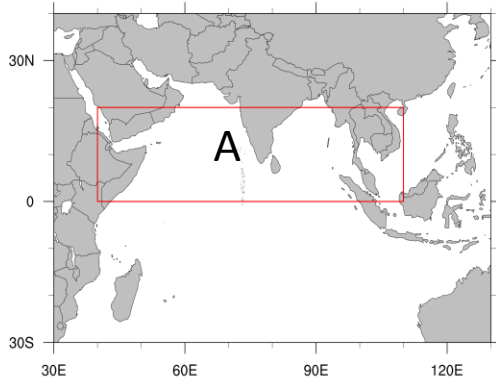


Nevertheless, precipitation during the summer, turns out to be too weak and to penetrate too much inland.

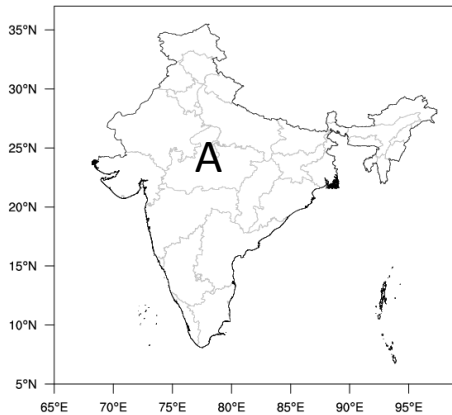
The CMCC Seasonal Prediction System

Predictions of the Indian Monsoon

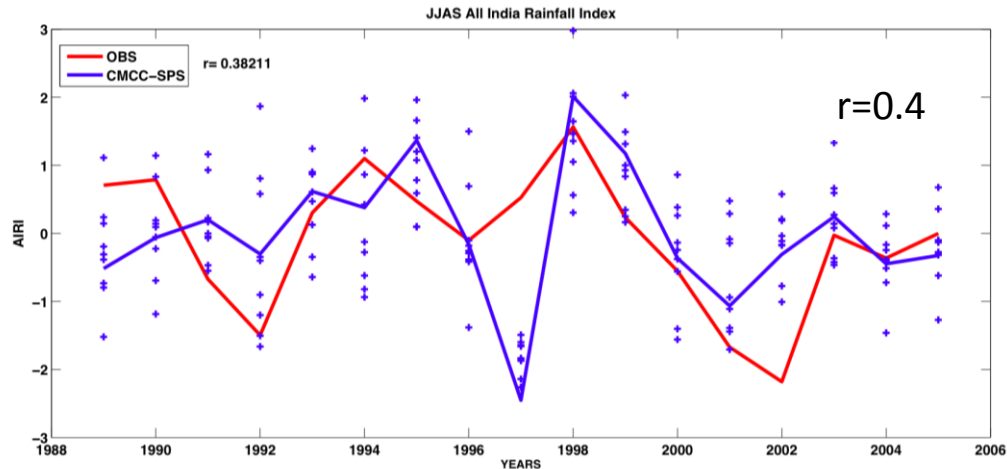
South Asian Summer Monsoon Index $\int_A U_{850} - U_{200} dA$
 (Webster and Yang, 1992)



All India Rainfall Index
 [e.g., Parthasarathy et al. (1995)]

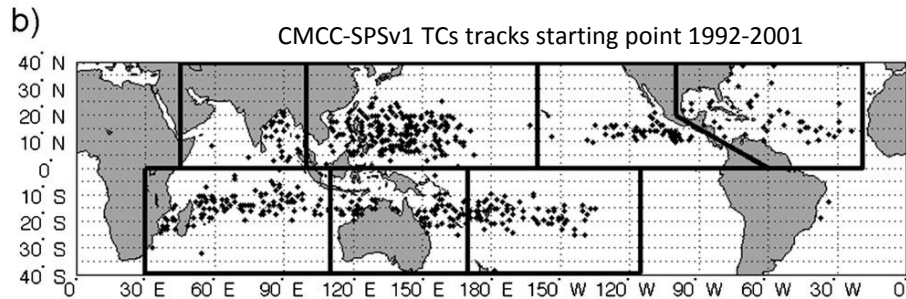
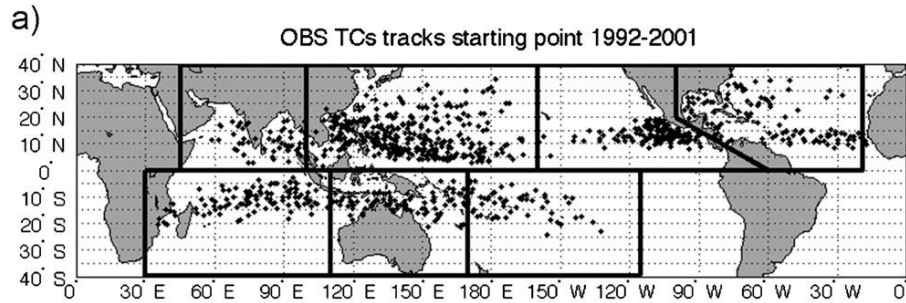


$$\int_A (prp - \overline{prp}) dA$$



The CMCC Seasonal Prediction System

Seasonal Predictions of Tropical Cyclone Activity



Number of TCs	OBS	DAS	NODAS
ToT	678	438	403
Mean	67.8	43.8	40.3
STD	7.0	4.9	4.8

Although CMCC-SPS underestimates the number of Tropical Cyclones, their location is well detected.

Correlation between predicted and observed number of TCs increases significantly when the ocean analyses are used to initialize the forecasts

Ocean Initialization vs. no Ocean Initialization

