

Direction de la Météorologie Nationale  
MOROCCO

**Summary for seasonal forecast for DJF 2014/2015  
from North Africa RCC-LRF**

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**Service Études Climatiques**

**Centre National de Recherches Météorologiques**

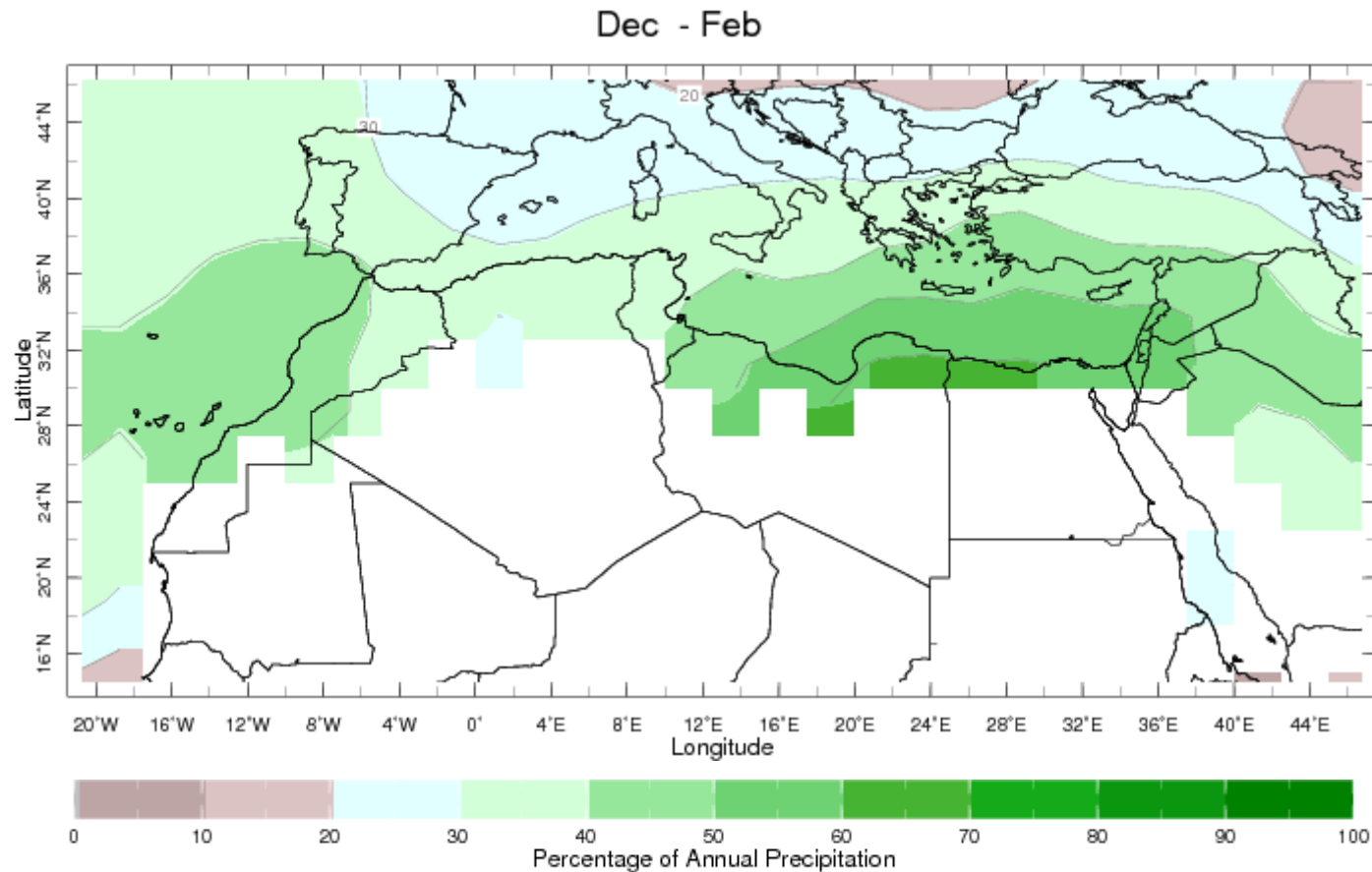
**MEDCOF3**

**17-18/11/2014, Antalya, Turquie**

# Outline

1. Predictability sources for DJF in North Africa
2. Dynamical forecasts for DJF in North Africa
3. Statistical forecasts for DJF in North Africa
4. Drought forecast(SPI) for DJF in North Africa

# Most of annual rainfall is received on DJF over many places on North Africa



IRI maproom

Climatology data from CPC/CMAP, 1981-2010,

# Sources of predictability

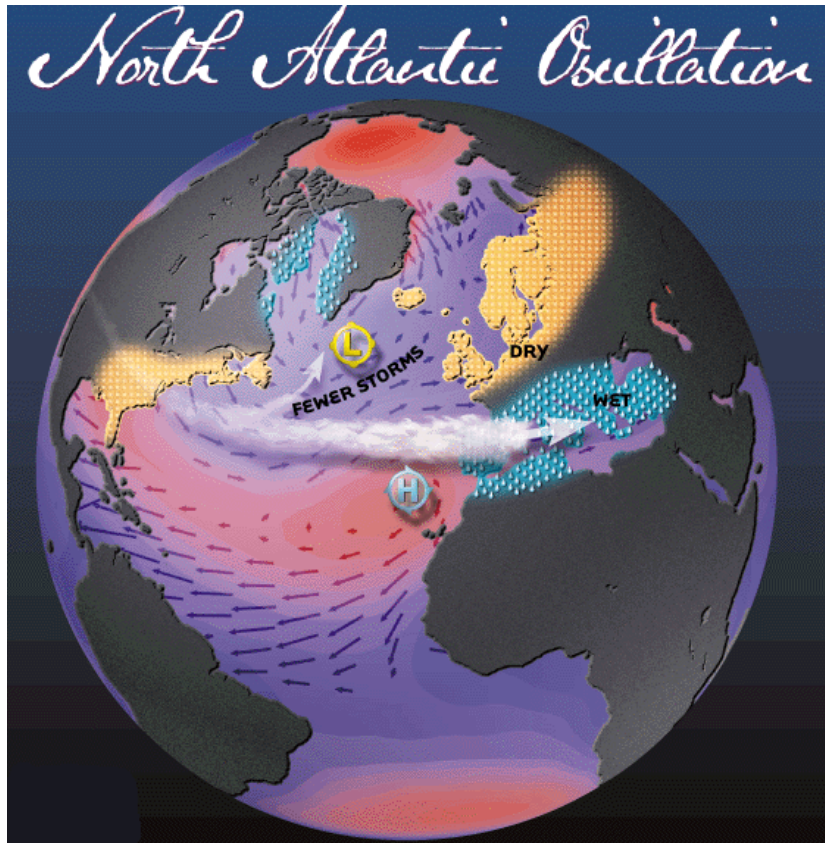
## Atmospheric pattern

- NAO
- EA
- SCAN

## Oceanic pattern

- TNA
- ENSO
- AMO+PDO

## Atmospheric pattern



NAO-



NAO+

NAO have impact with opposite sign on precipitation over north west Africa in **DJF**

Ward et al, 1999 ,Marshall et al,2001 ,  
Trigo et al, 2002 , Driouech 2009,  
many studies in DMN ....

# Impact of Atmospheric pattern

## Winter precipitation

NHTP

ONA

SCA

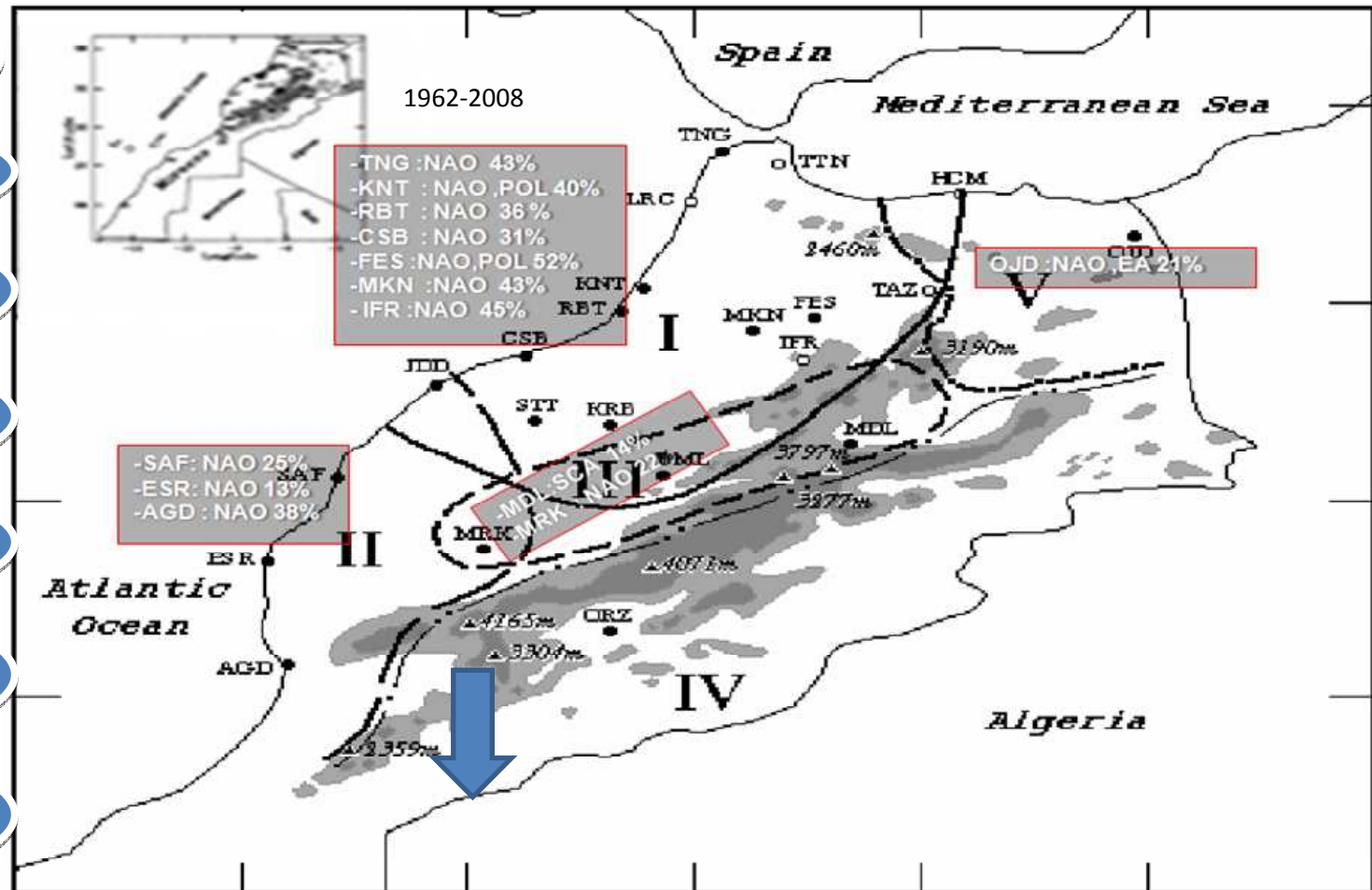
EA

POL

EA/WR

EP/NP

WP

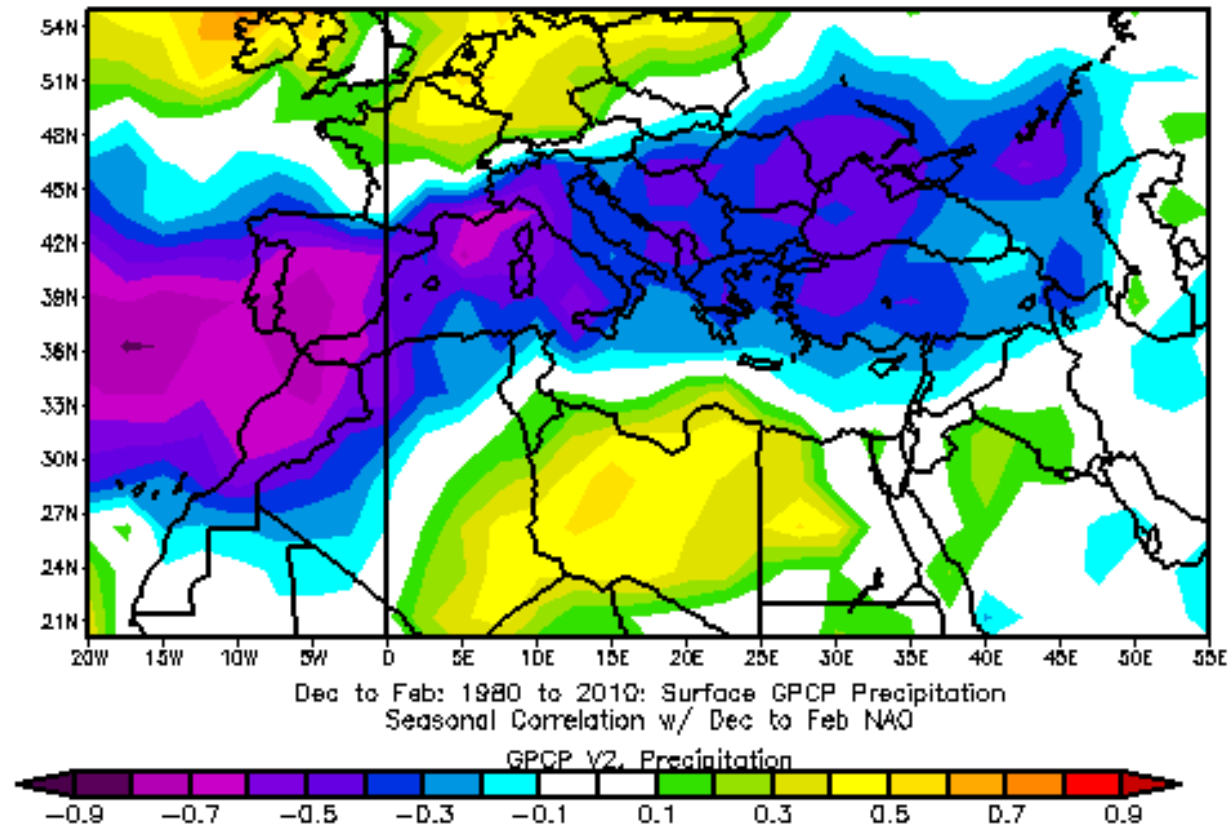


RLM(NHTP, Precip) → NAO the most dominant 13% à 45%

Thanks to W. BADI & F. DRIOUECH

# Impact of NAO

Corr (RR(DJF)-NAO(DJF))

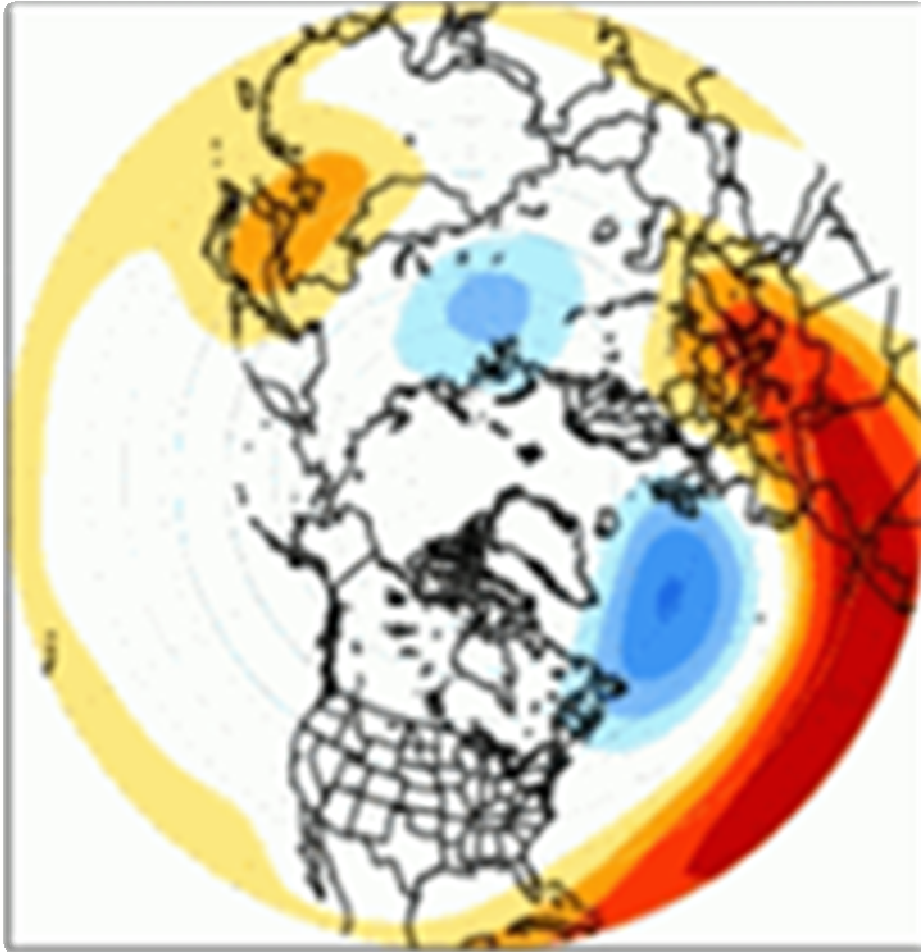


NOAA/ESRL Physical Sciences Division

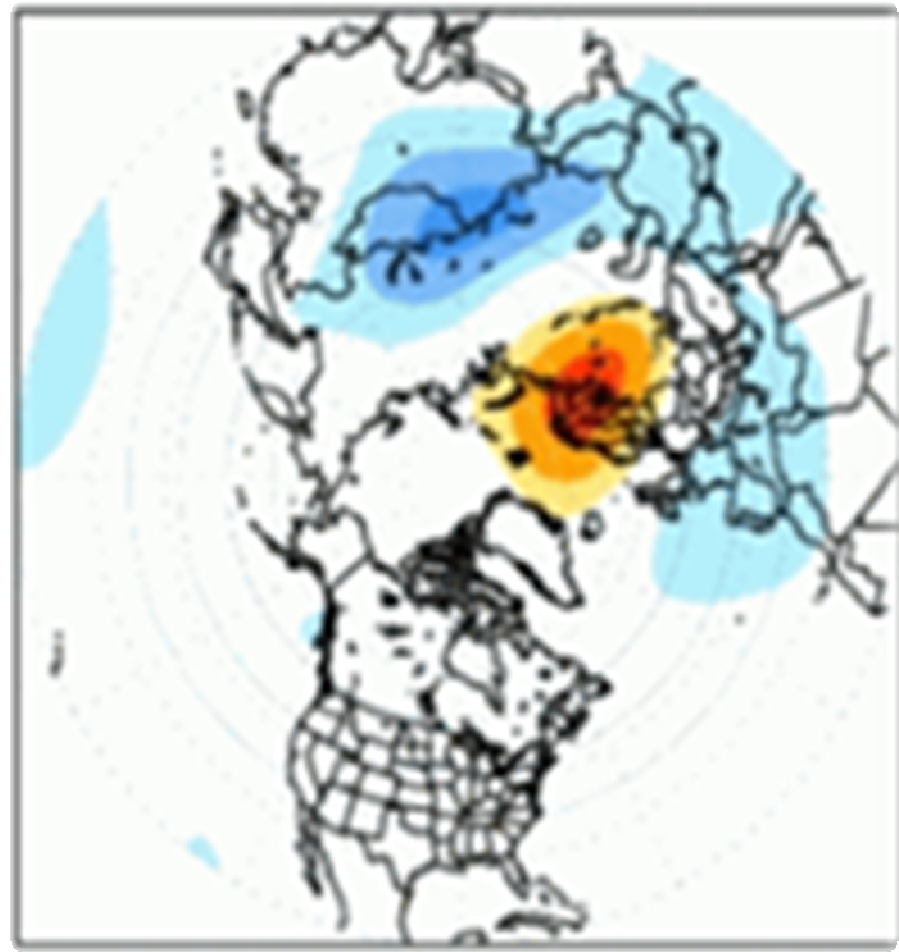


# Atmospheric pattern

East Atlantic(jan)



Scandinavian(jan)

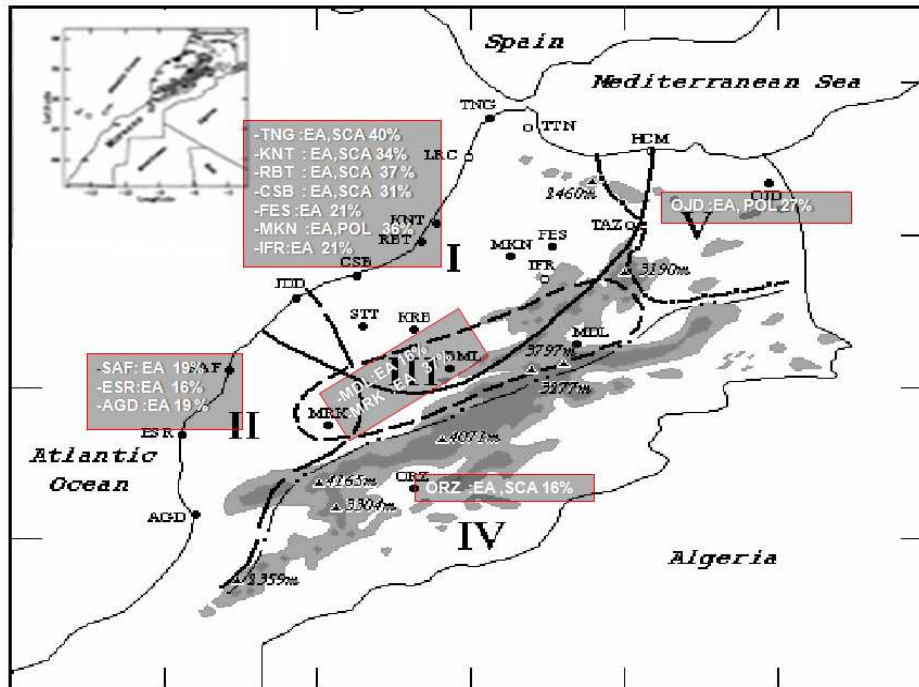


Climate Prediction Center

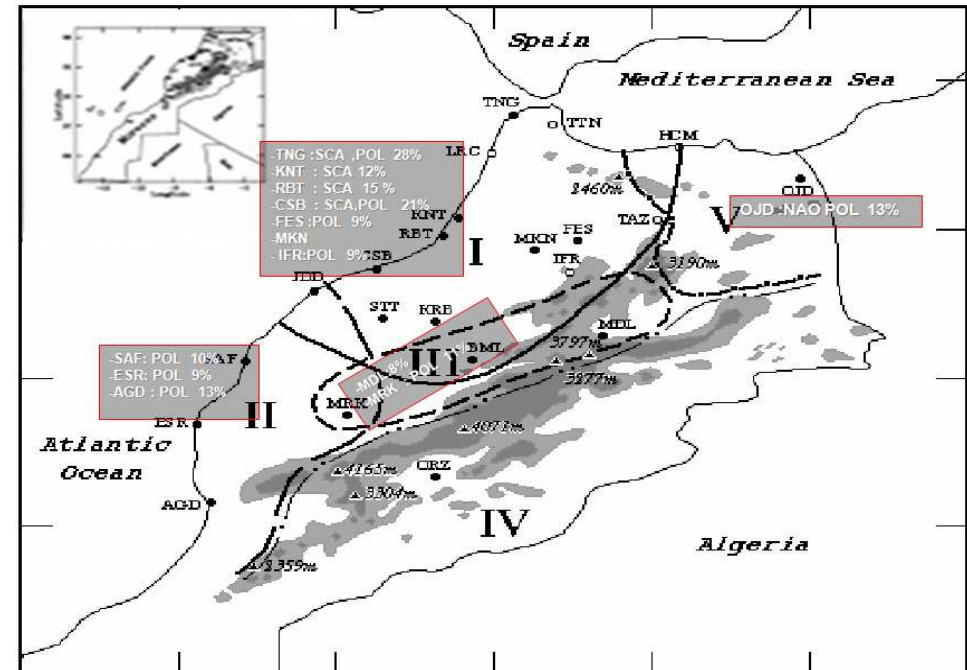


# Impact of Atmospheric pattern

## Spring precipitation



## Autumn precipitation



**EA: le plus importants de 16% à 36%**

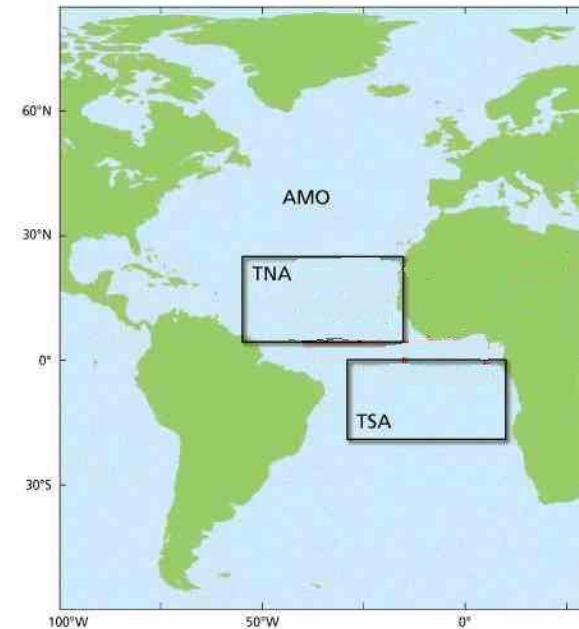
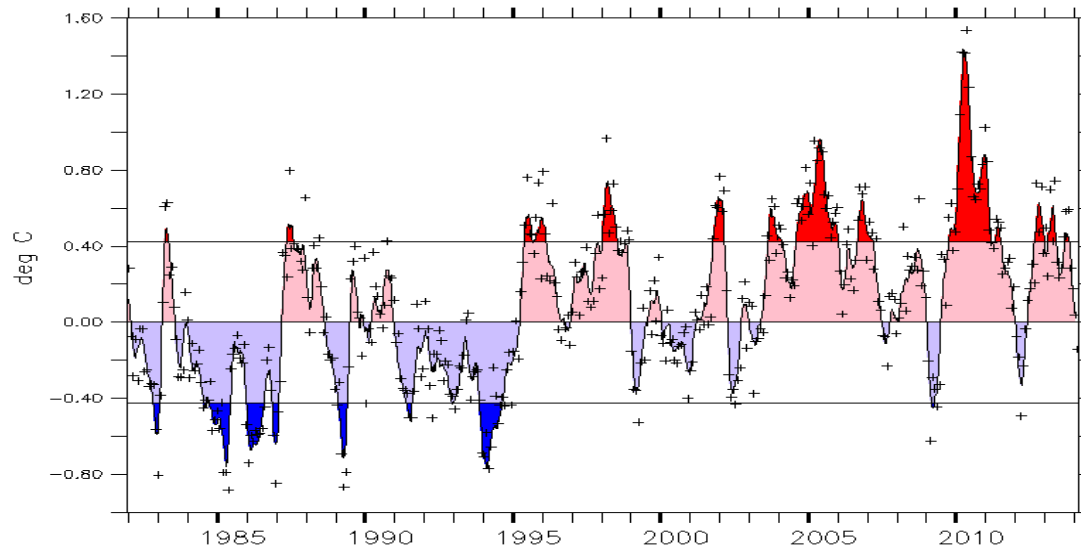
**SCA: le plus importants de 10% à 28%**

Thanks to W. BADI&F. DRIOUECH

# Oceanic pattern

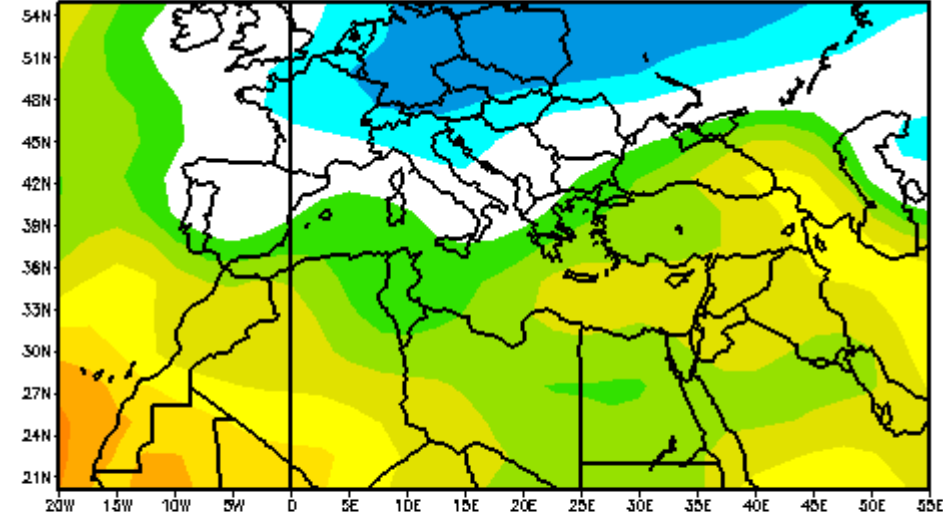
❖ Tropical Atlantic Variability (TAV)

❖ Tropical Northern Atlantic SST (TNA)

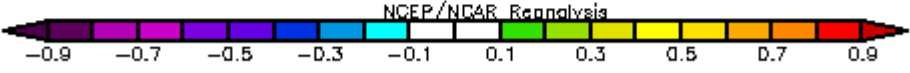


# Impact of TNA

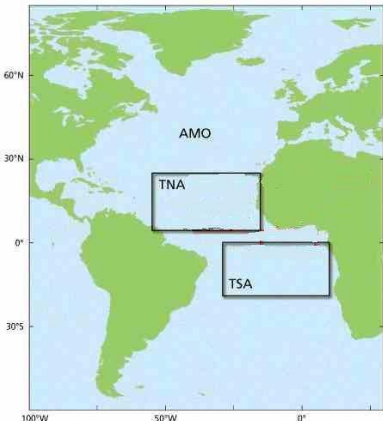
Cor(SST-TNA(DJF),T2m(DJF))



Dec to Feb: 1949 to 2010: 1000mb Air Temperature  
Seasonal Correlation w/ Dec to Feb TNA



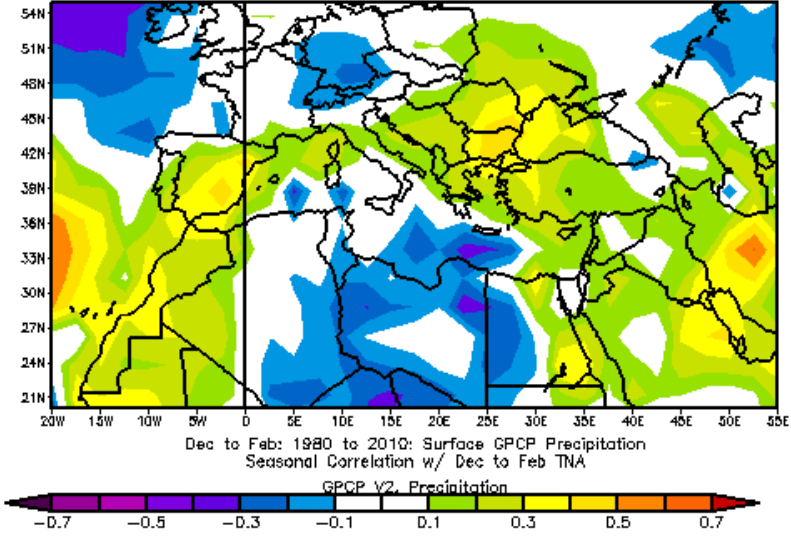
NOAA/ES&I Physical Sciences Division



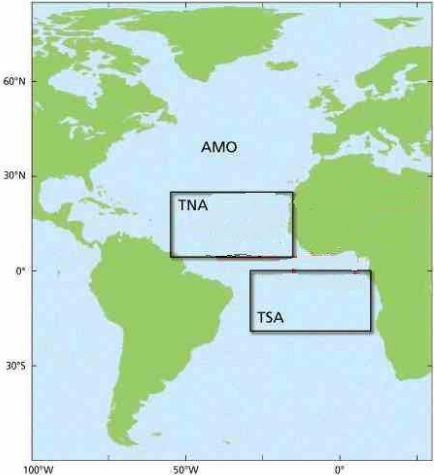
Cor(SST-TNA(SON),T2m(DJF))

# Impact of TNA

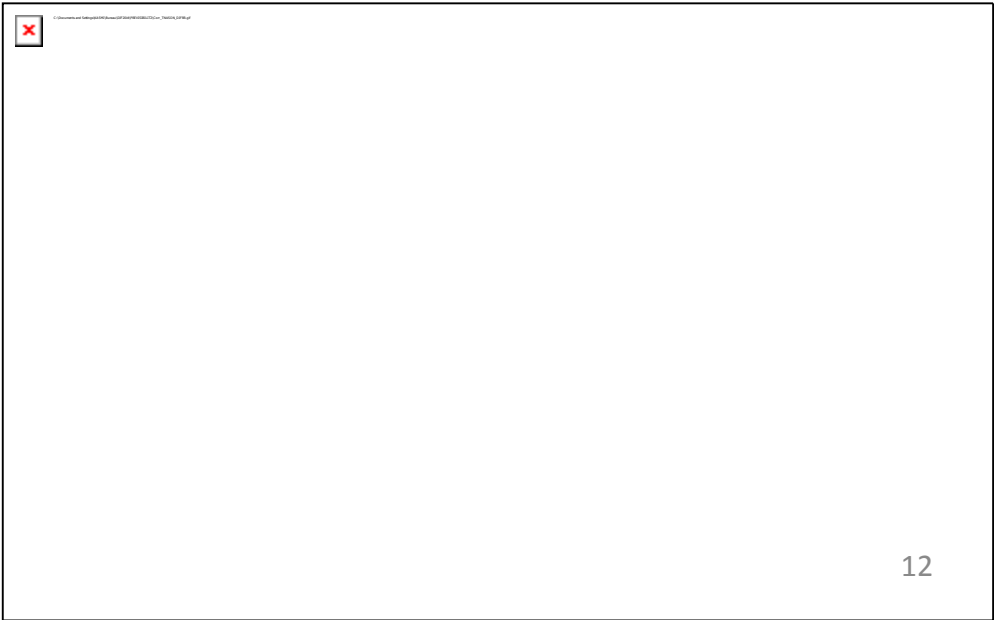
Cor(TNA(DJF),Precip(DJF))



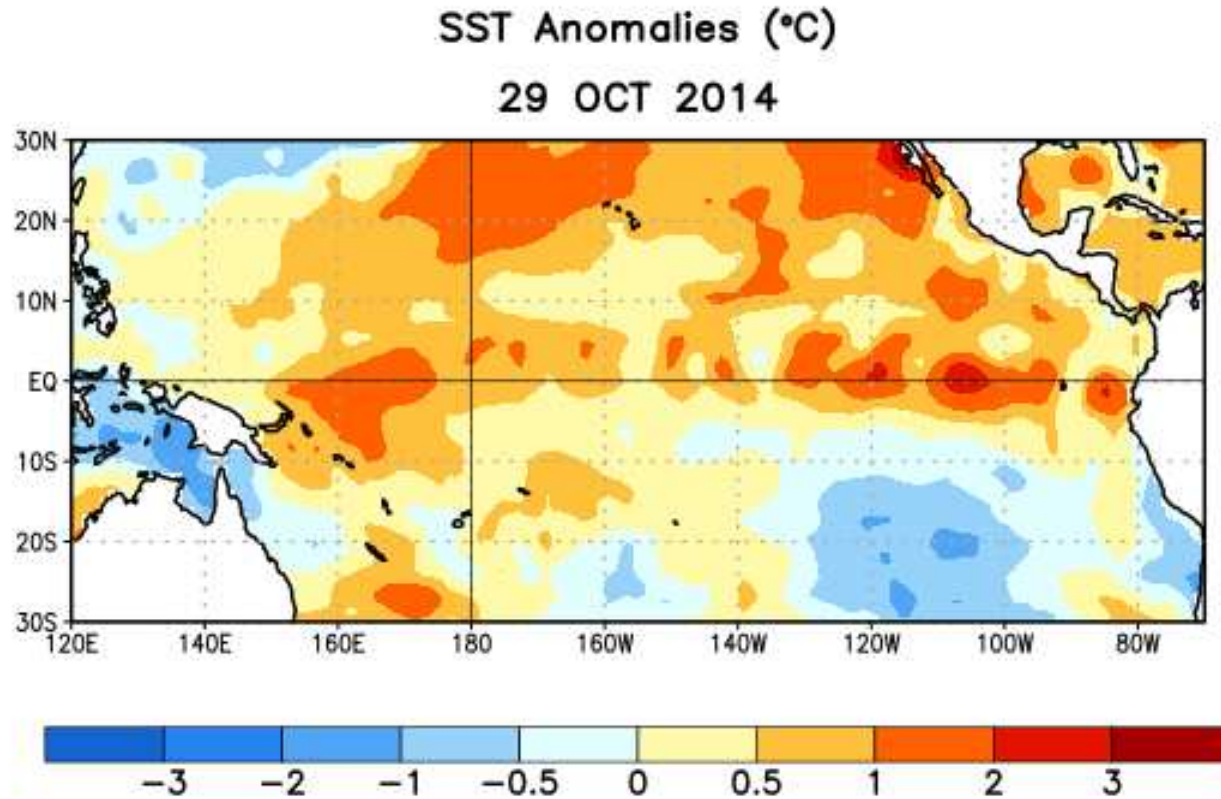
NOAA/ESRL Physical Sciences Division



Cor(TNA(SON),Precip(DJF))



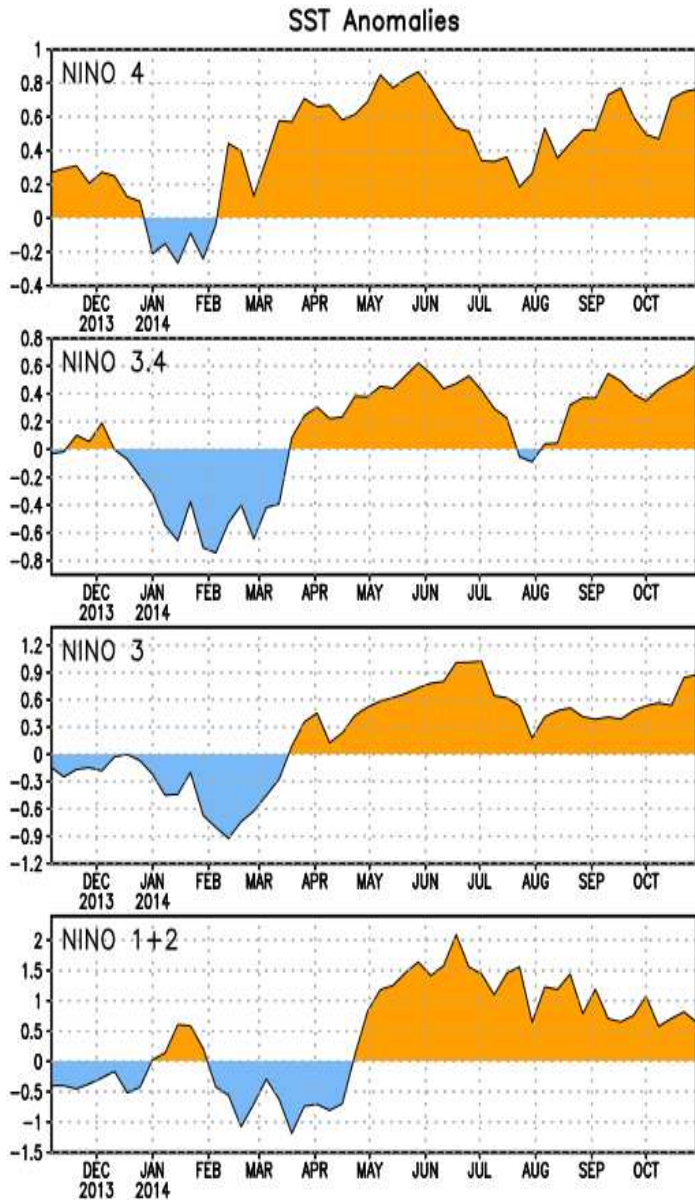
# Current ENSO status



Average sea surface temperature (SST) anomalies (°C) for the week centered on 29 October 2014.  
Anomalies are computed with respect to the 1981-2010 base period weekly means. (CPC/NCEP/NWS - IRI )

During October 2014, above-average (SST) increased slightly across the eastern half of the equatorial Pacific

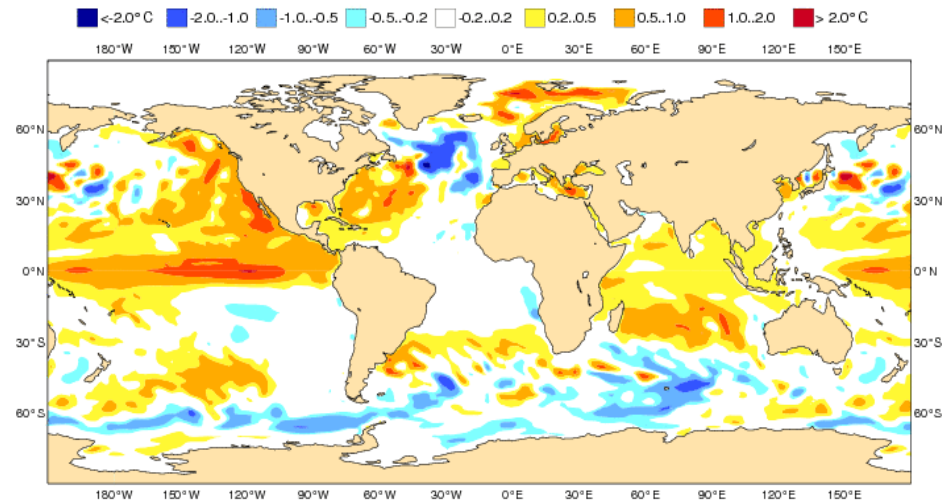




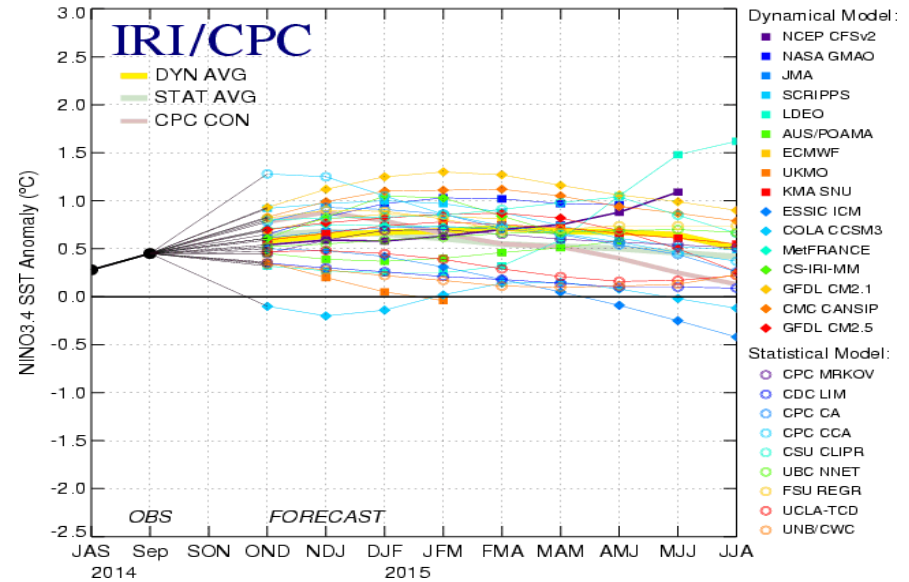
The weekly Niño indices were between +0.6°C (Niño-3.4 and Niño-1+2) and +0.9°C (Niño-3) at the end of the month

ECMWF Seasonal Forecast  
 Mean forecast SST anomaly  
 Forecast start reference is 01/11/14  
 Ensemble size - 51, climate size - 450

System 4  
 DJF 2014/15



Mid-Oct 2014 Plume of Model ENSO Predictions

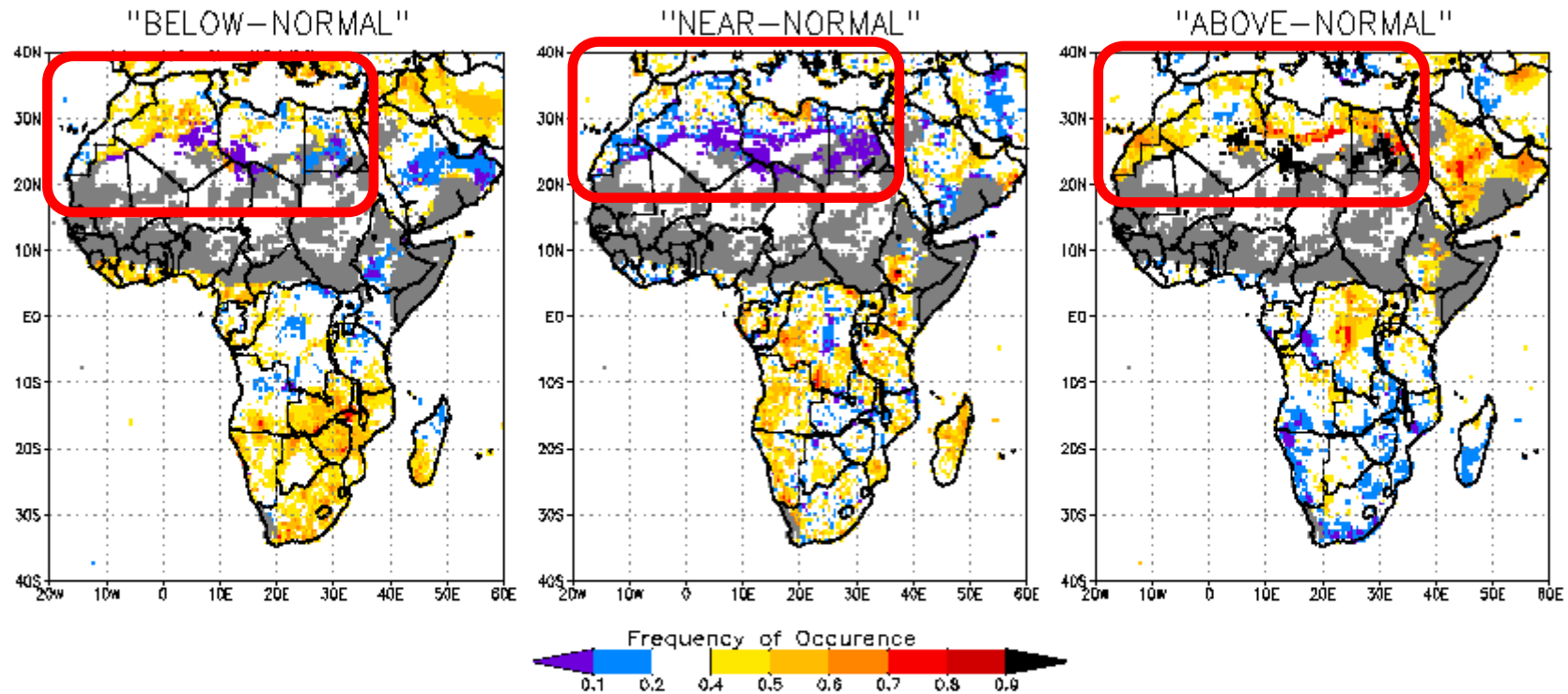


most models predict El Niño to develop during October-December 2014 and to continue into early 2015



*“There is a 58% chance of El Niño during the Northern Hemisphere winter, which is favored to last into the Northern Hemisphere spring 2015” (CPC/NCEP/NWS & IRI)*

# Precipitation Probabilities for DJF associated with El Nino (Max. 10 NINO3.4 SSTa DJF 1950-1995)

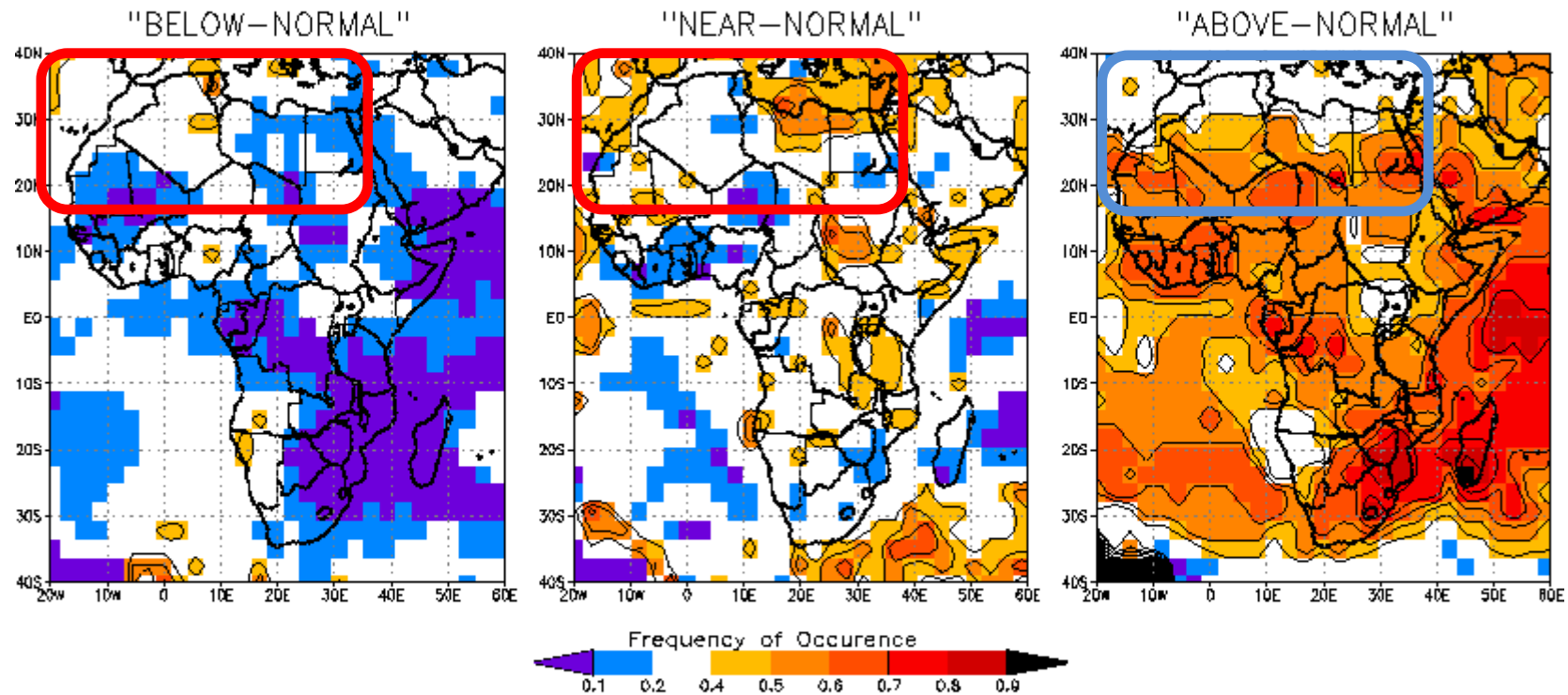


GREY areas indicate dry season (seasonal avg. < 5cm and < 15% annual avg.)

Warm NINO3.4 Yrs (incr. magnitude): 1991 1988 1969 1967 1995 1966 1992 1973 1958 1983

**IRI** International Research Institute  
for climate prediction

## Temperature Probabilities for DJF associated with El Nino (Max. 10 NINO3.4 SSTa DJF 1950-1995)

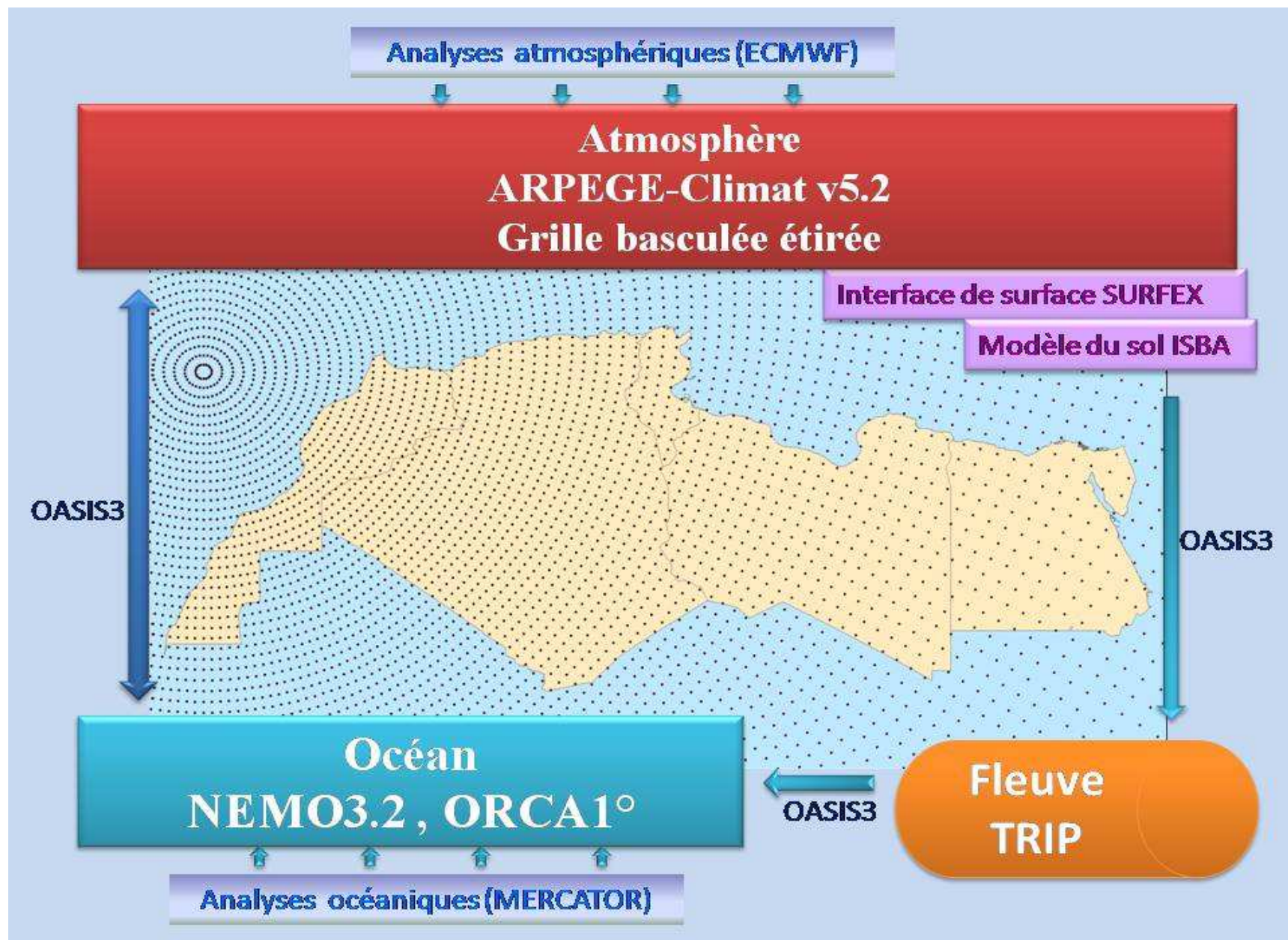


**Warm NINO3.4 Yrs (incr. magnitude): 1970 1991 1988 1969 1987 1966 1992 1973 1958 1983**

**IRI** International Research Institute for climate prediction  
NOAA/OGP, Columbia U./LDEO, U.California/SIO

# Dynamical forecast

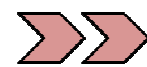
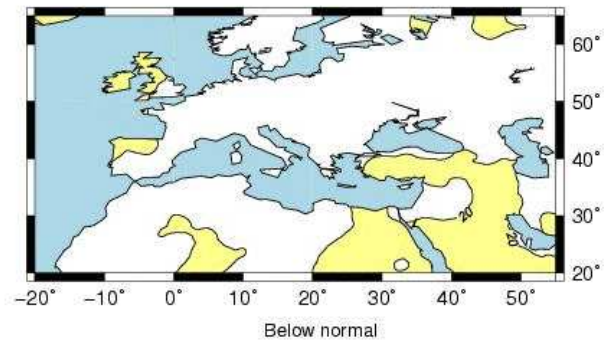
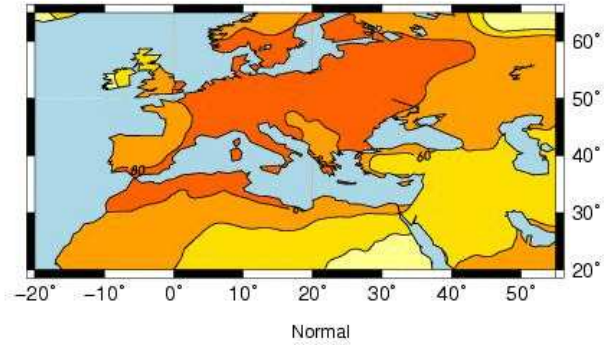
*Operational system of seasonal forecast at Maroc-Météo*



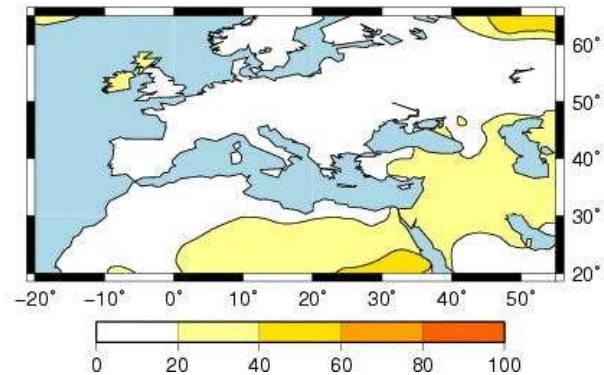


# Temperature forecast for DJF2014/2015 : ARPEGE-Climat

Probability of tercile category of 2m temperature for DJF 2014 over MEDCOF region  
(ARPEGE-Climat V5.2 coupled model, issued November 2014)  
Above normal



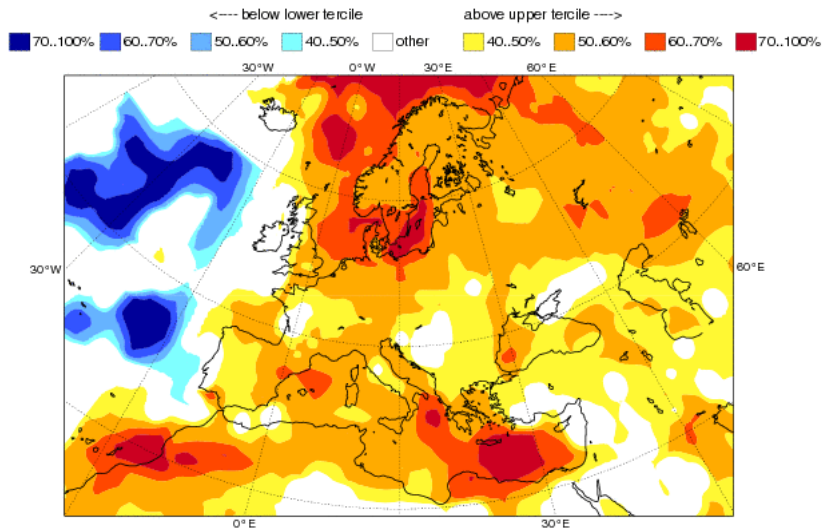
Above normal over north Africa with des probabilités  
40 à 80%



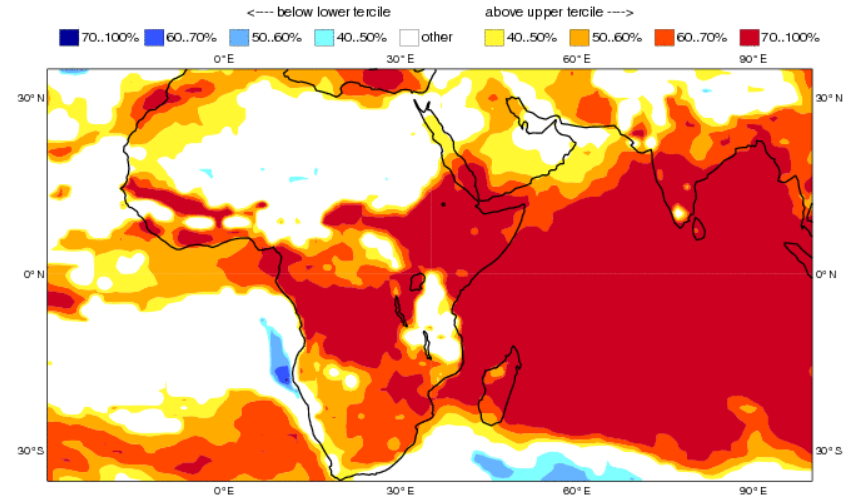


# Temperature forecast for DJF2014/2015 : CEPMMT

ECMWF Seasonal Forecast  
 Prob(most likely category of 2m temperature)  
 Forecast start reference is 01/11/14  
 Ensemble size = 51, climate size = 450



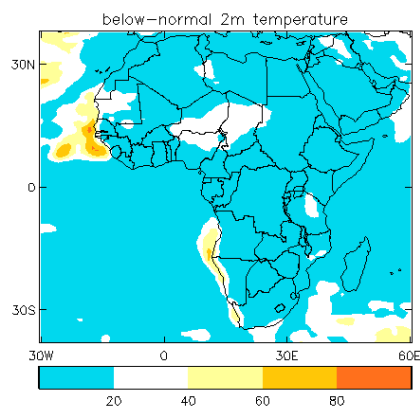
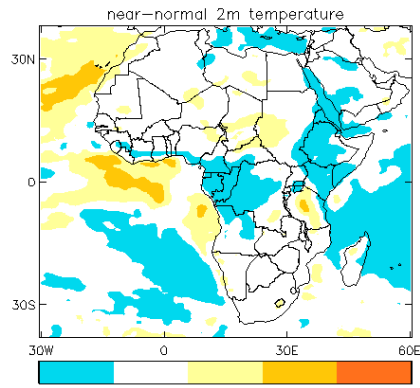
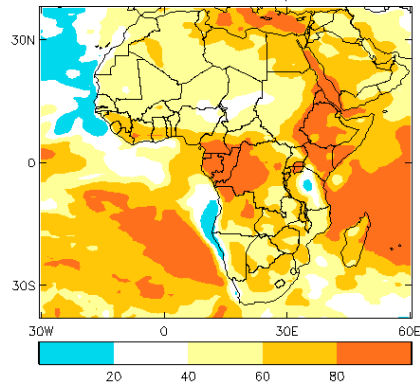
System 4  
 DJF 2014/15 ECMWF Seasonal Forecast  
 Prob(most likely category of 2m temperature)  
 Forecast start reference is 01/11/14  
 Ensemble size = 51, climate size = 450



Above normal over Morocco, north of Algeria, Tunis and north-west part of Egypt

# Temperature forecast for DJF2014/2015 : UK-Metoffice

Probability of tercile categories Dec/Jan/Feb Issued Nov 2014  
above-normal 2m temperature

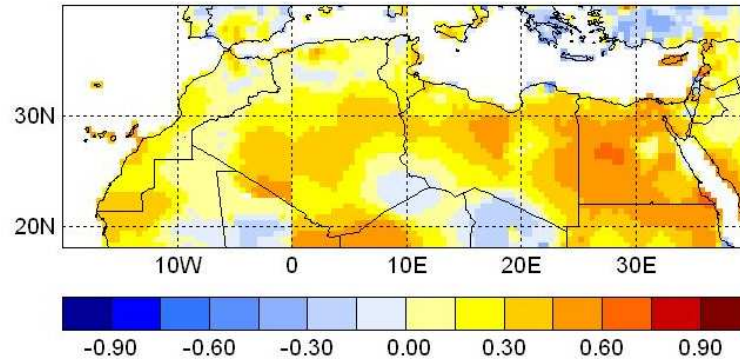


Above normal

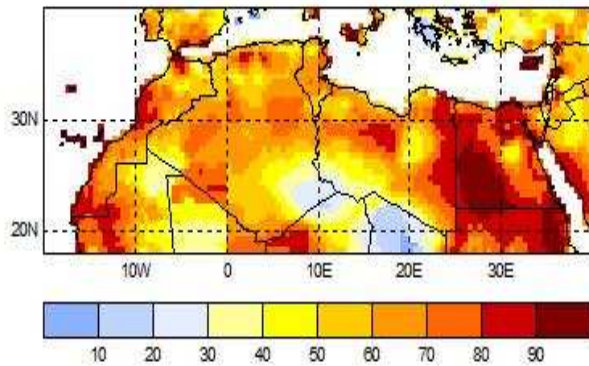
# Statistical forecast (ACC) for temperature– SST(predicteur)

SST(SO)-T2M(NORAF)

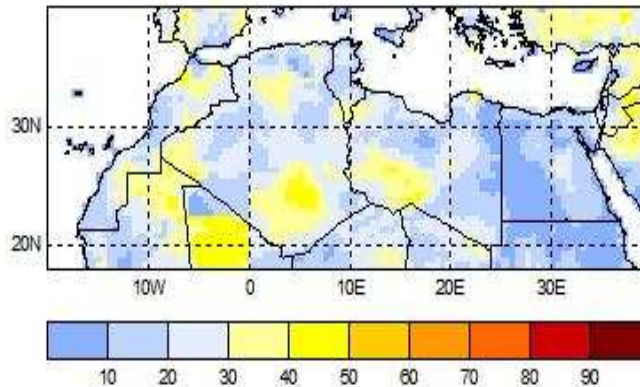
Pearson's Correlation



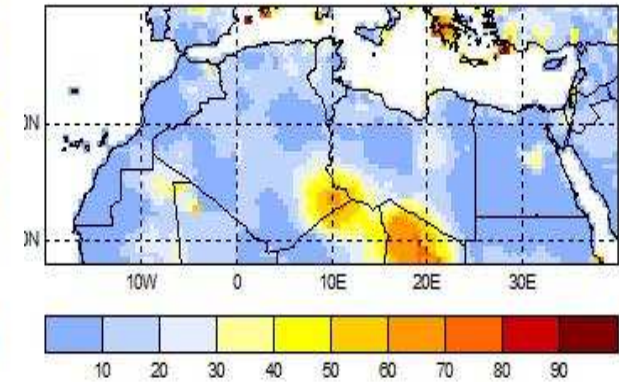
Above



Normal



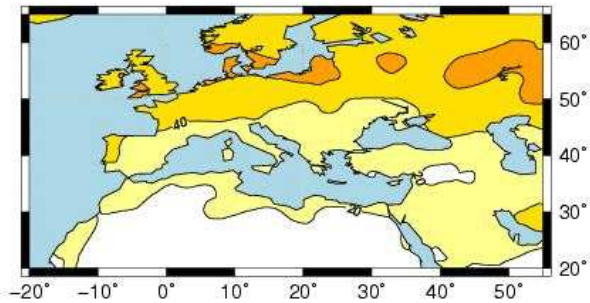
Below



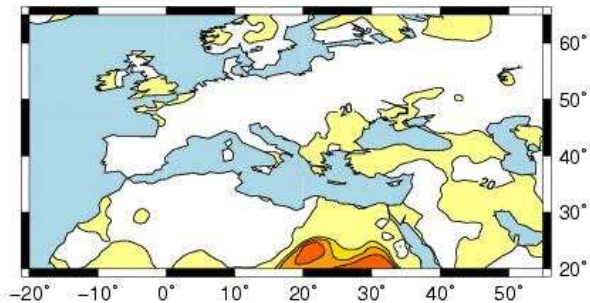
⇓  
⇓  
Above Normal

# Precipitation forecast for DJF2014/2015: ARPEGE-Climat

Probability of tercile category of precipitation for DJF 2014 over MEDCOF region  
(ARPEGE-Climat V5.2 coupled model, issued NOVEMBER 2014)  
Above normal



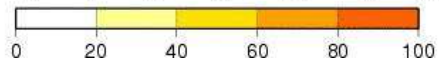
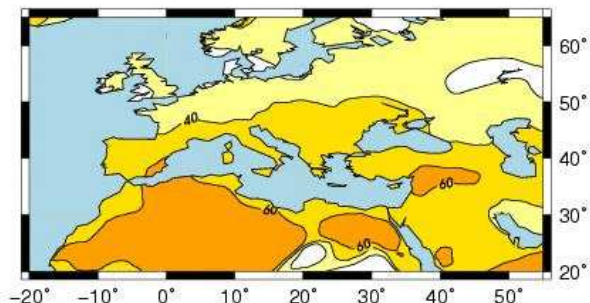
Normal



Below normal



Below normal



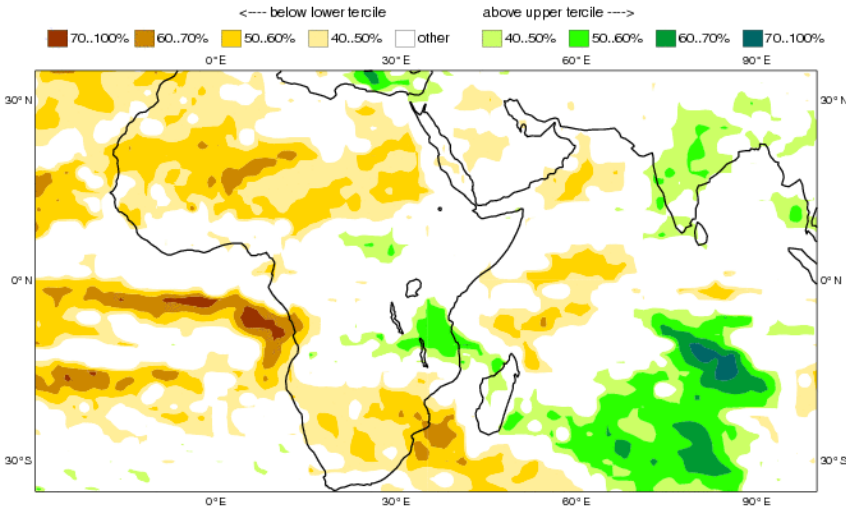
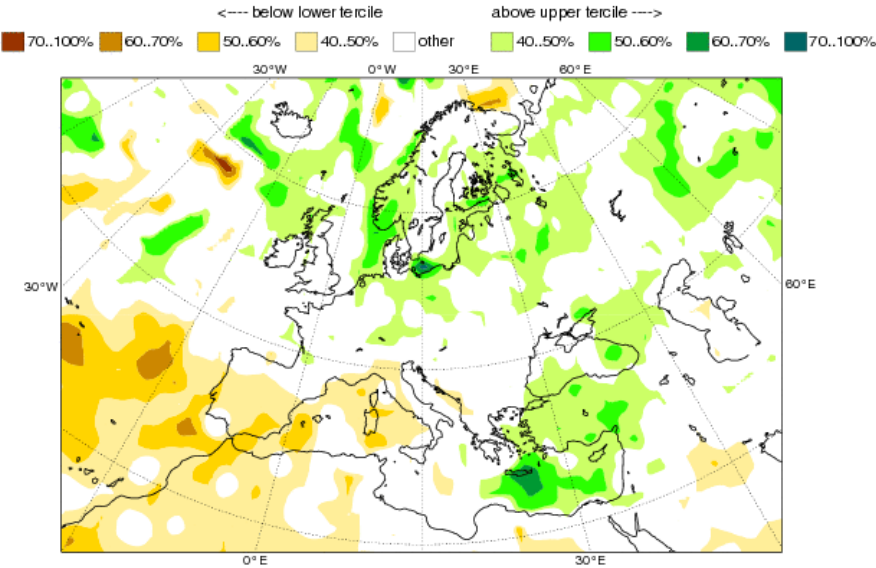
# Precipitation forecast for DJF2014/2015 : ECPMMT

ECMWF Seasonal Forecast  
 Prob(most likely category of precipitation)  
 Forecast start reference is 01/11/14  
 Ensemble size = 51, climate size = 450

System 4  
 DJF 2014/15

ECMWF Seasonal Forecast  
 Prob(most likely category of precipitation)  
 Forecast start reference is 01/11/14  
 Ensemble size = 51, climate size = 450

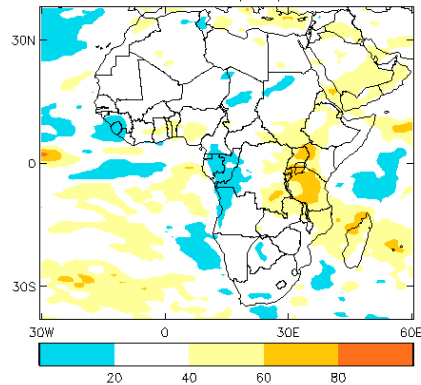
System 4  
 DJF 2014/15



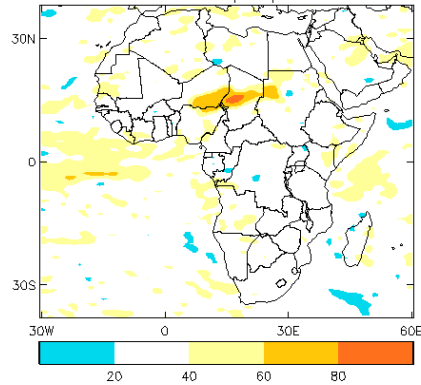
Below normal over Morocco, most part of Algeria and Egypt,

# Precipitation forecast for DJF : UK-Metoffice

Probability of tercile categories Dec/Jan/Feb Issued Nov 2014  
above-normal precipitation

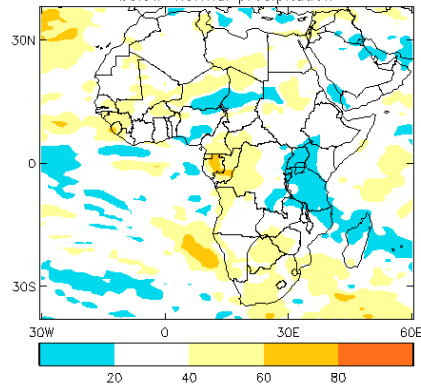


near-normal precipitation



Above normal on the north of Morocco  
Below normal over Tunis  
Equiprobability Elsewhere

below-normal precipitation

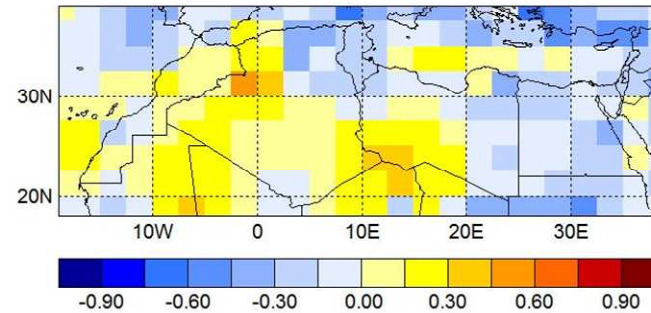




# Statistical forecast ACC for Precip for DJF2015– SST(predicteur)

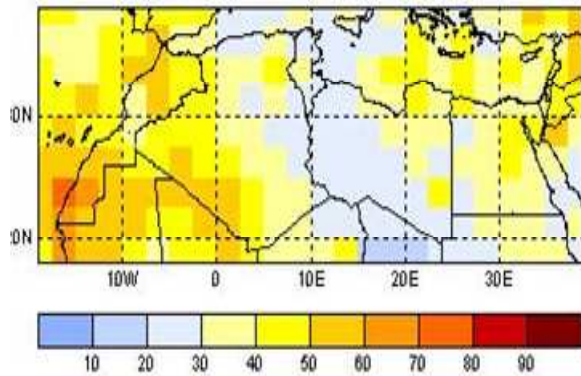
SST(TNA(SO)),Precip(DJF)

Pearson's Correlation

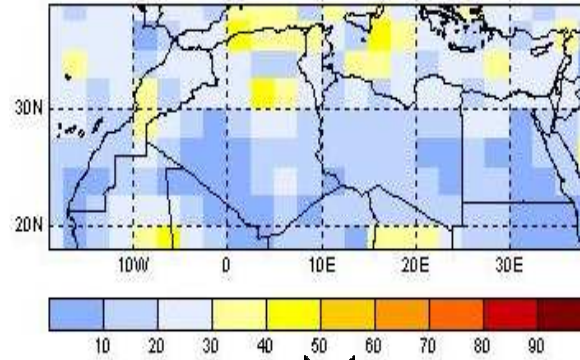


Correlation between observed and predicted (ACC) Precip based on SST (TNA region)

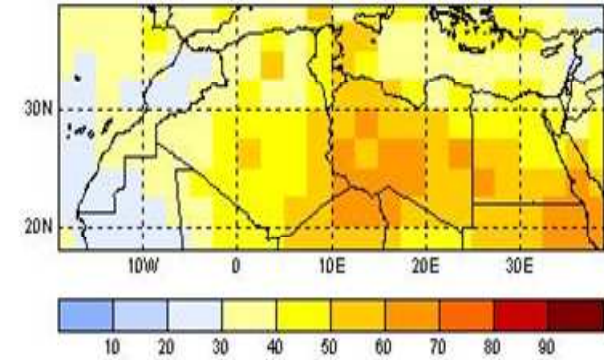
Au-dessus



Normale



Au-dessous

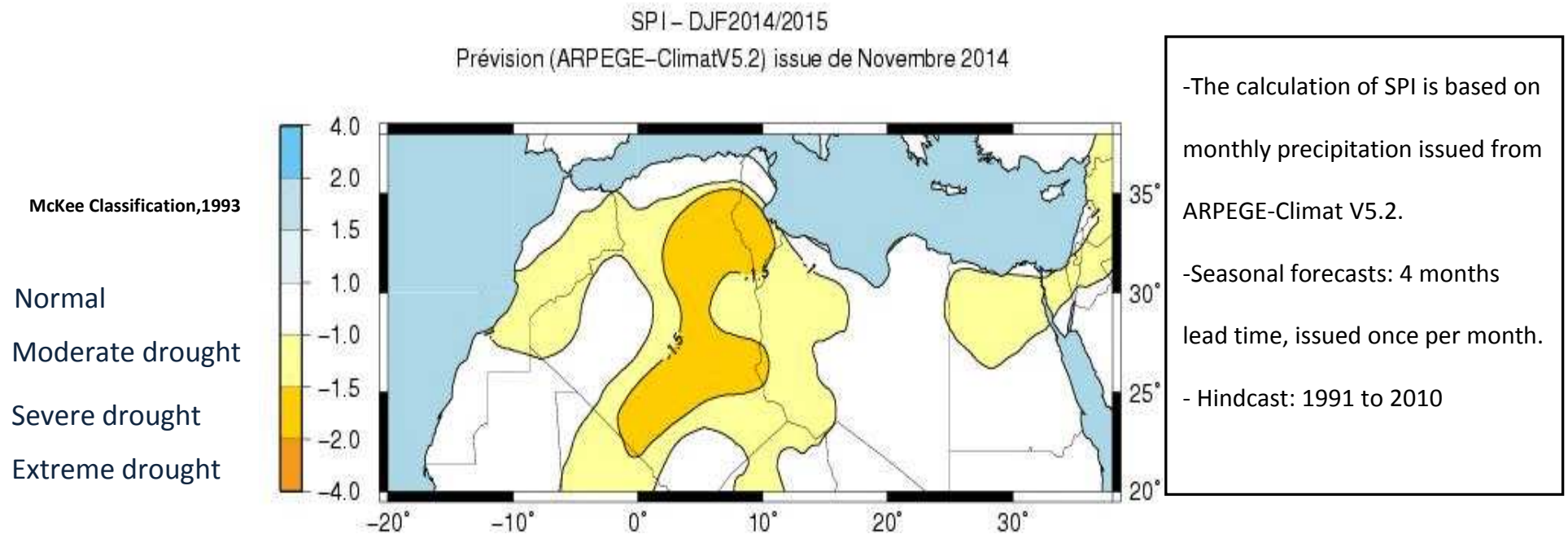


Above normal over Morocco, western part of Algeria ,  
below normal on the Est

# Drought Forecasting : SPI Index

## Why the SPI ?

- Recommended by WMO for meteorological drought
- Many weather services and stakeholders know about the SPI.
- Only based on monthly precipitation (model / observations);
- Can be calculated for different accumulation periods(3, 6 or 12)



With thanks to **E.DUTRA(ECMWF)**, **W.BADI(DMN)**&**F.DRIOUECH(DMN)**

**THANKS**