

Direction de la Météorologie Nationale MOROCCO



Climate Products

Long Range Forecast 

- [Seasonal Outlook](#)
- [Model Prediction](#)
- [Statistical forecast](#)
- [Drought forecast](#)
- [Verification \(hindcast\)](#)



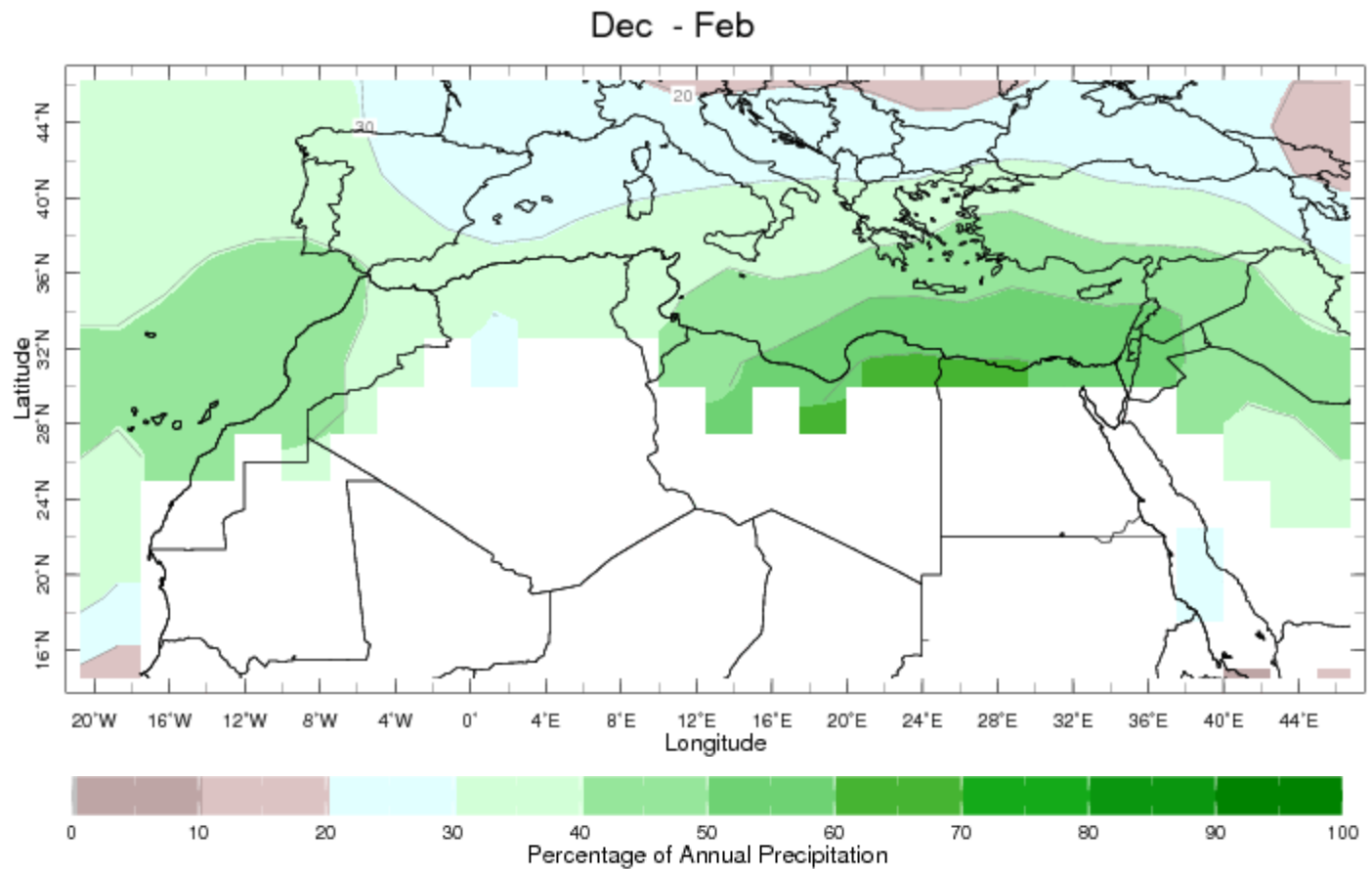
Seasonal forecast for DJF 2015/16 over North Africa

Fatima DRIOUECH, Atika KASMI

Centre National de Climat

MEDCOF5
23 Marrakech, Morocco

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

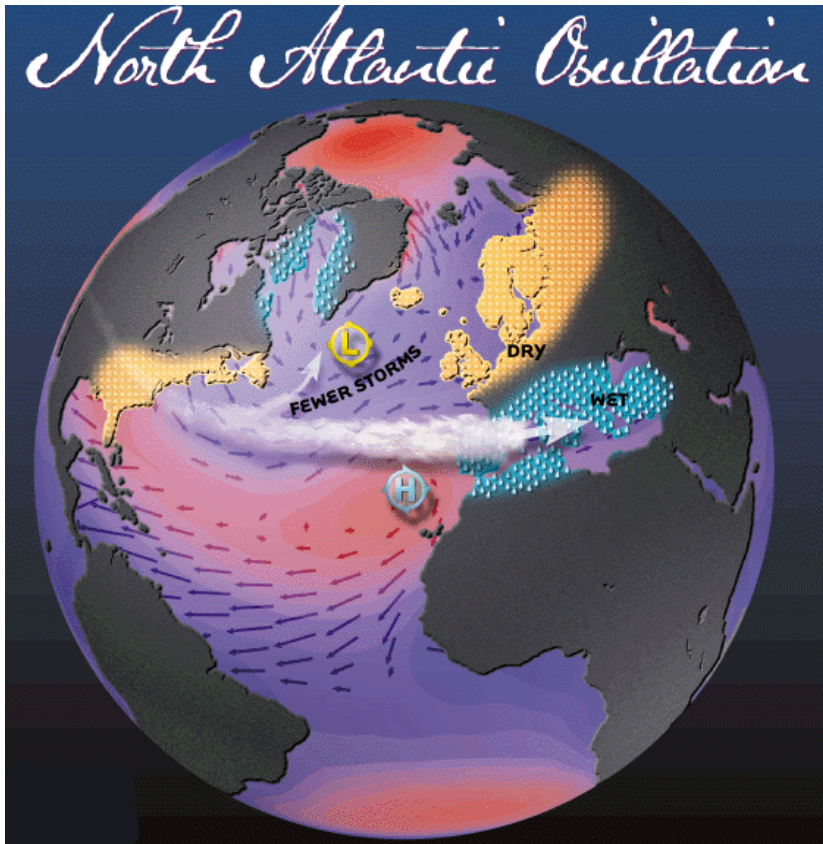


Sources of predictability DJF2015

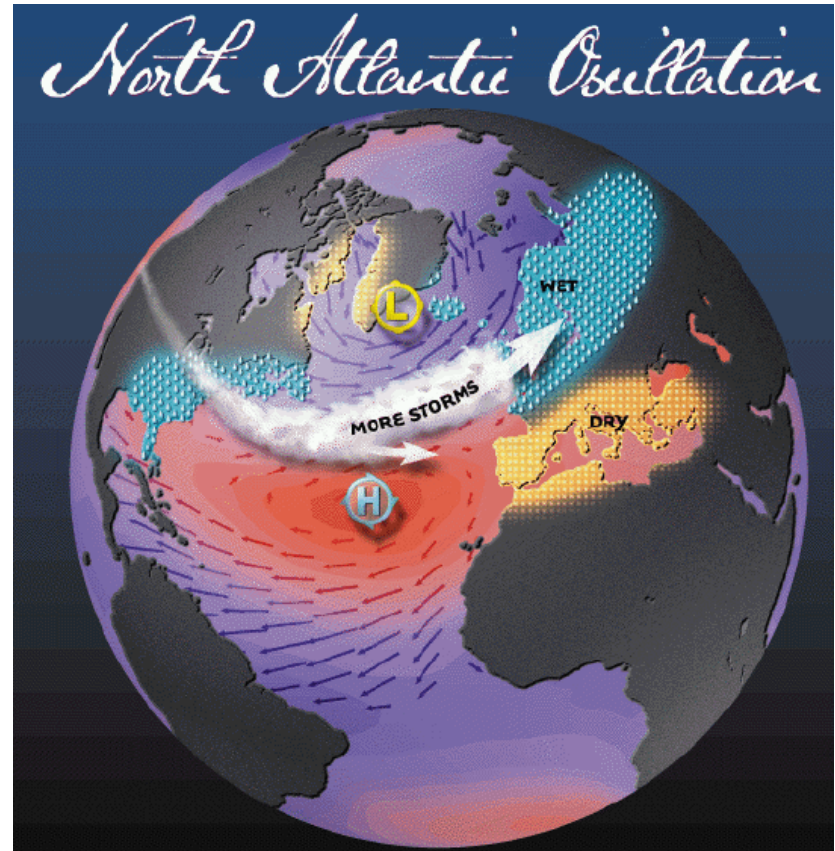
Drivers

- NAO
- QBO
- ENSO+PDO
- TNA

NAO impact



NAO-



NAO+

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

Structure of QBO

- alternating easterly and westerly wind regimes propagate downward with time;
- westerlies move down faster and more regularly than easterlies;
- the transition to easterlies is often delayed between 30 and 50 hPa;
- easterlies are generally stronger (30-35 m/s) than westerlies (15-20 m/s);
- maximum amplitudes of both phases typically occur near 20-hPa;
- the average period is about 27 months;
- both period and amplitude considerably vary from cycle to cycle.

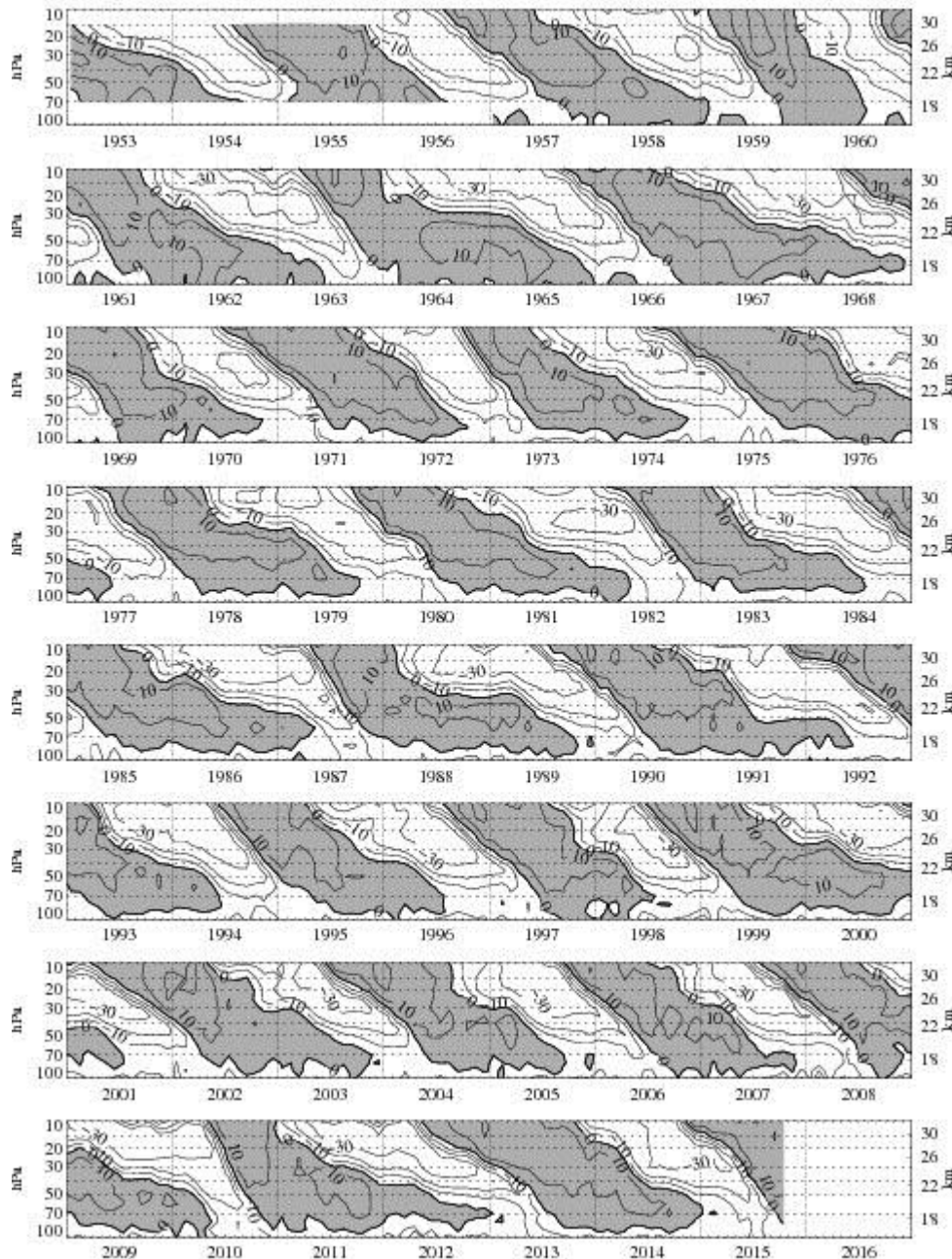


Figure 1: Time-height section of monthly mean zonal winds (m/s) at equatorial stations: Canton Island, 3°S/172°W (Jan 1953 - Aug 1967), Gan/Malediva Islands, 1°S/73°E (Sep 1967 - Dec 1975) and Singapore, 1°N/104°E (since Jan 1976). Isoleths are at 10 m/s intervals; westerlies are shaded (updated from Naujokat, 1986)

QBO Calculated at NOAA/ESRL PSD 30mb zonal wind at the equator, zonal average

- 2012 -16.07 -15.25 -16.74 -17.62 -22.04 -25.89 -27.82 -27.93 -26.60 -24.51 -18.95 -10.02
- 2013 -6.07 -1.23 2.85 8.39 12.64 13.38 14.27 14.66 13.12 11.69 12.45 12.55
- 2014 13.13 12.68 11.72 7.15 -2.81 -13.98 -19.29 -21.64 -23.24 -23.86 -23.65 -25.38
- 2015 -26.70 -28.62 -28.15 -24.38 -12.33 2.18 7.45 10.97 12.07 13.38 -999.00 -999.00

→ westerly

(<http://www.geo.fu-berlin.de/met/ag/strat/produkte/qbo/qbo.dat>)

QBO driving NAO

- West QBO → NAO + → No rain over NW part of Africa
- East QBO → NAO - → Rain over NW africa

Combined effects of the PDO and EL-NINO on Global Climate

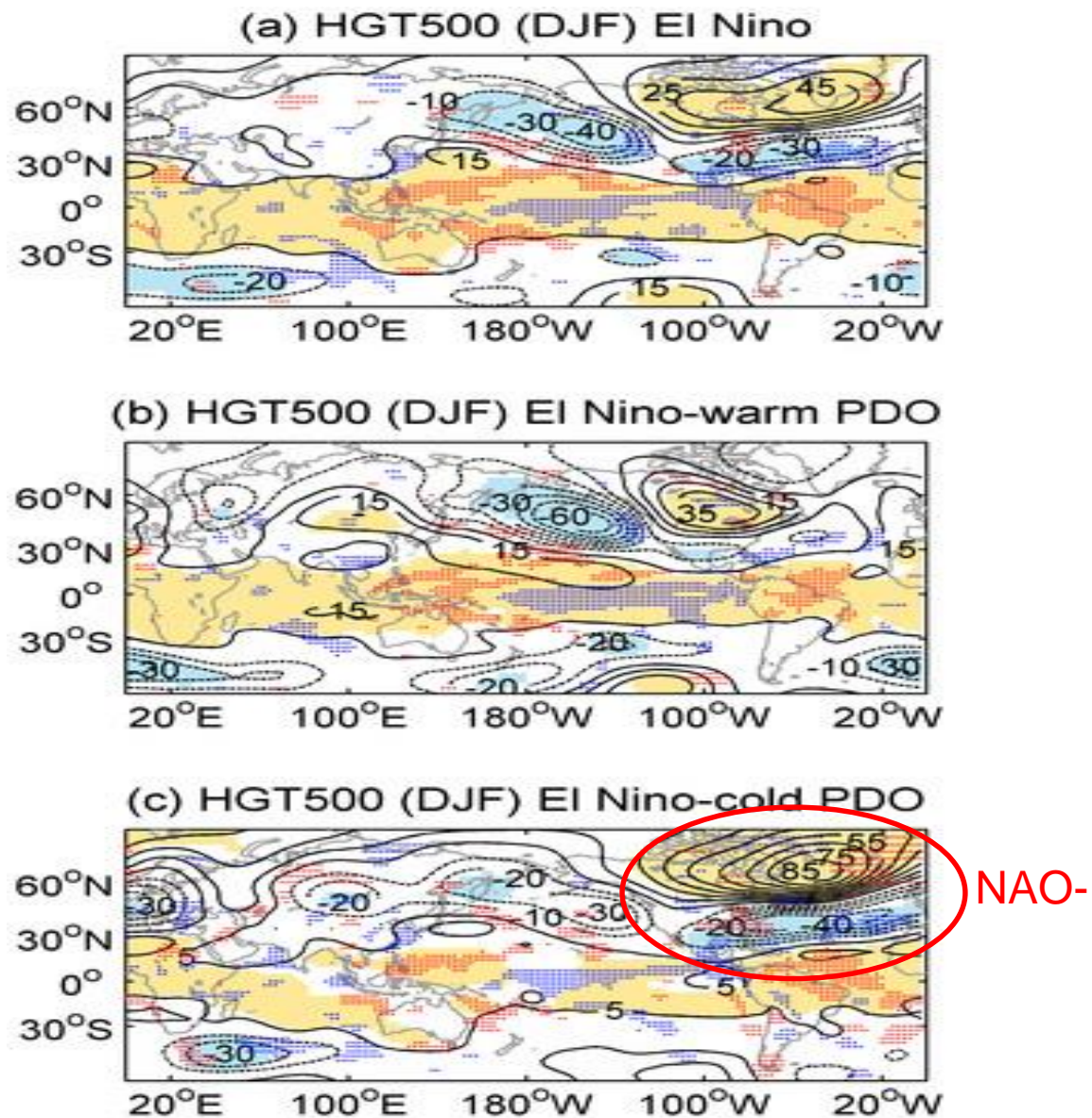


Figure: Composites of the DJF detrended 500 hPa HGT anomalies (contours, gpm, interval = 10 gpm) and winter vertical wind omega anomalies (the stippling, pascal/s) for the period 1950–2012.

EL-NINO-PDO(cold) driving NAO-

- EL-NINO-PDO(cold) → NAO - → Rain over NW africa
- EL-NINO-PDO(warm) *can* drive NAO +

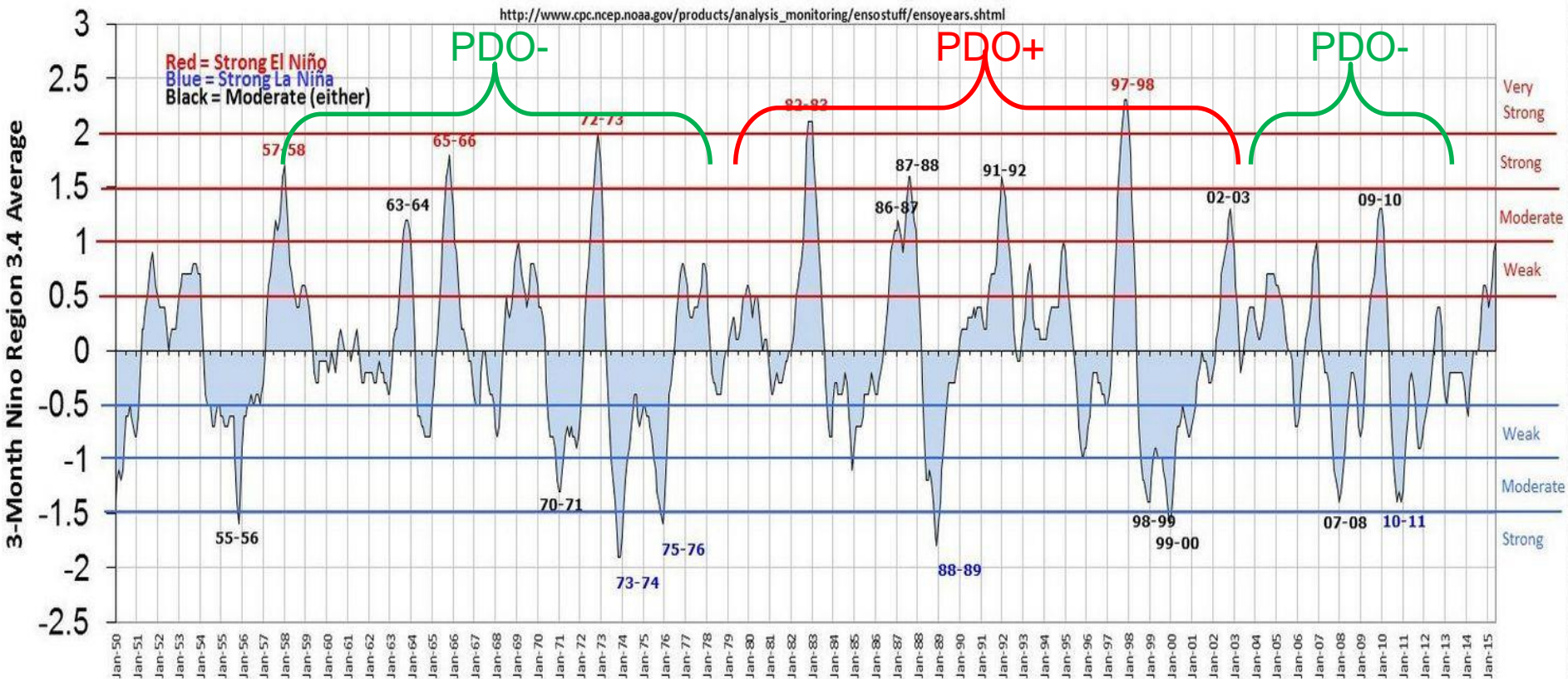
- 2013 -0.13 -0.43 -0.63 -0.16 0.08 -0.78 -1.25 -1.04 -0.48 -0.87 -0.11 -0.41
- 2014 0.30 0.38 0.97 1.13 1.80 0.82 0.70 0.67 1.08 1.49 1.72 2.51
- 2015 2.45 2.30 2.00 1.44 1.20 1.54 1.84 1.56 1.94

Warm PDO

- Data Derived from OI.v2 SST fields A graphic comparing monthly PDO values for 1982-2002 derived from the v1 and v2 sst products is available at <http://jisao.washington.edu/pdo/img/v1v2PDOComp.png>

Oceanic Niño Index (ONI)

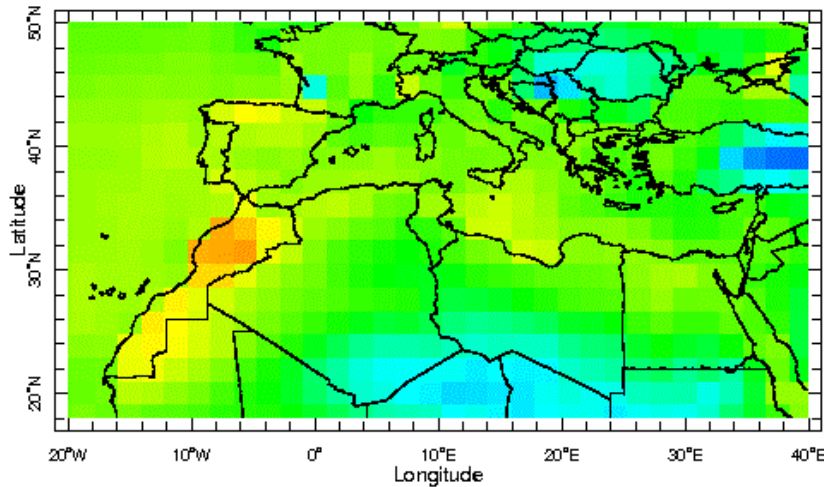
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ensoyears.shtml



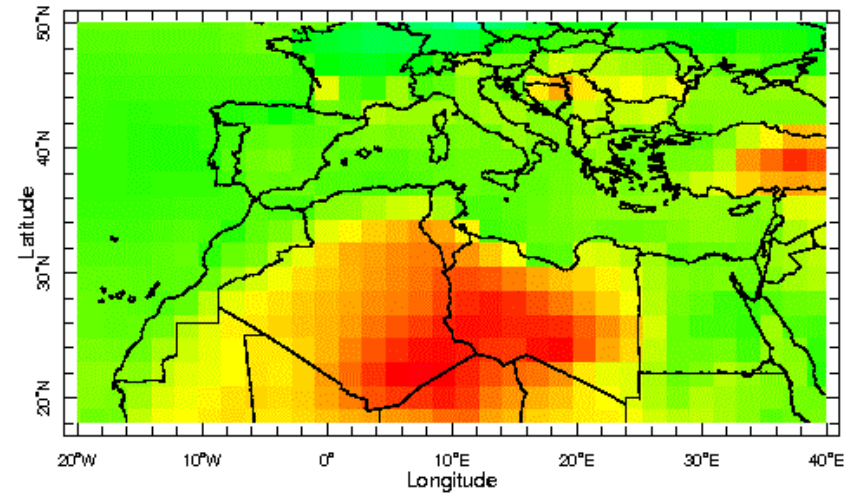
7 years of warm PDO
 10 years of cold PDO

Composite of DJF T2m anomalies for period 51-2014

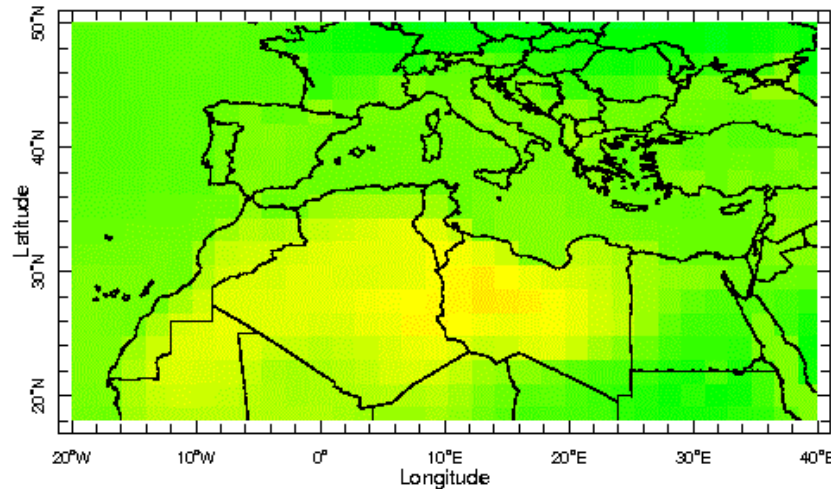
EL-NINO- Cold PDO



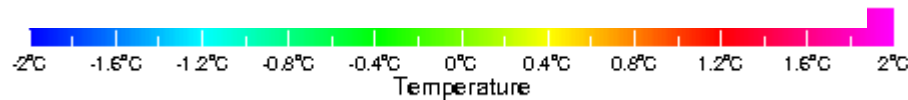
EL-NINO- Warm PDO



EL-NINO

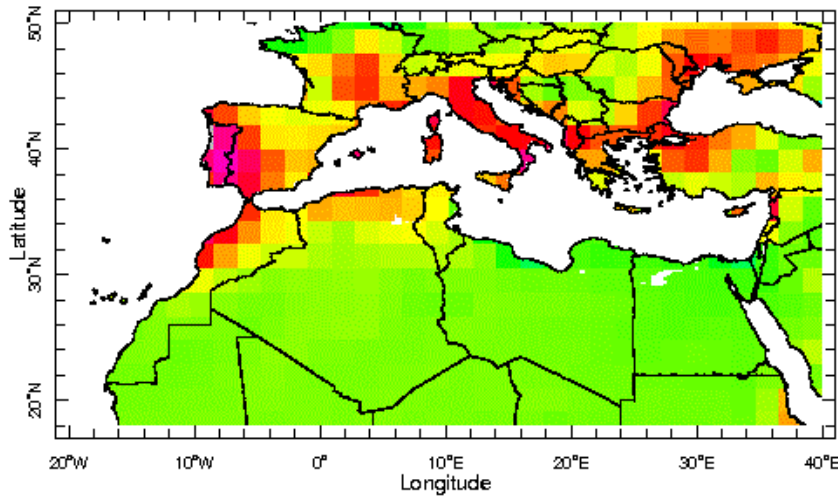


7 years ELNINO -warm PDO
10 years ELNINO- cold PDO

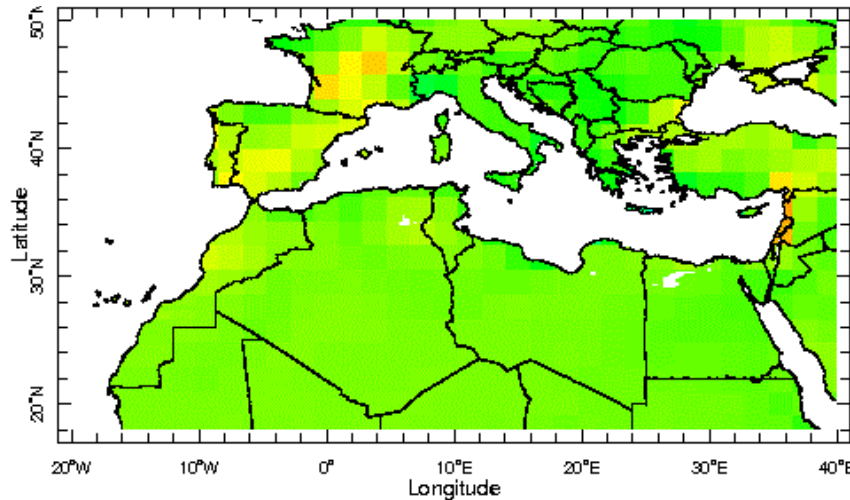
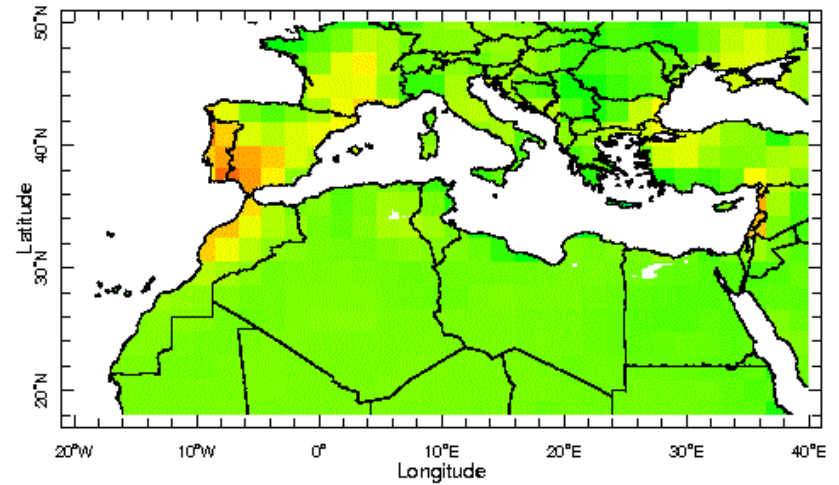


Composite of DJF Precipitation rate anomalies for period 1951-2014

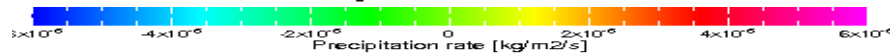
EL-NINO- Cold PDO



EL-NINO- Warm PDO



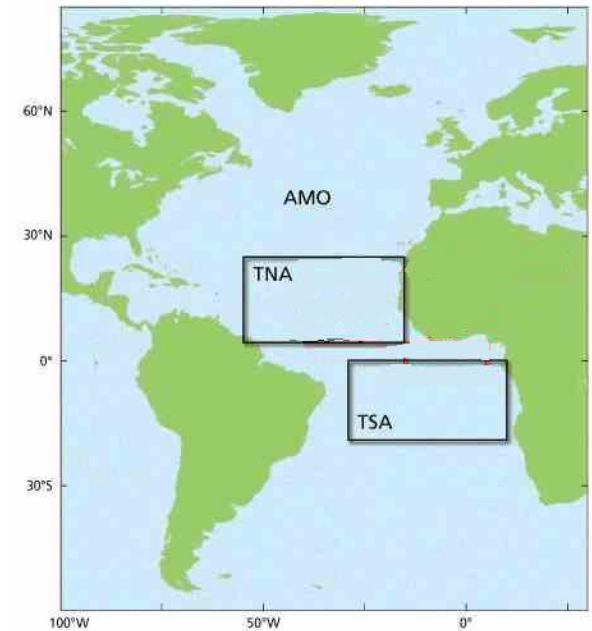
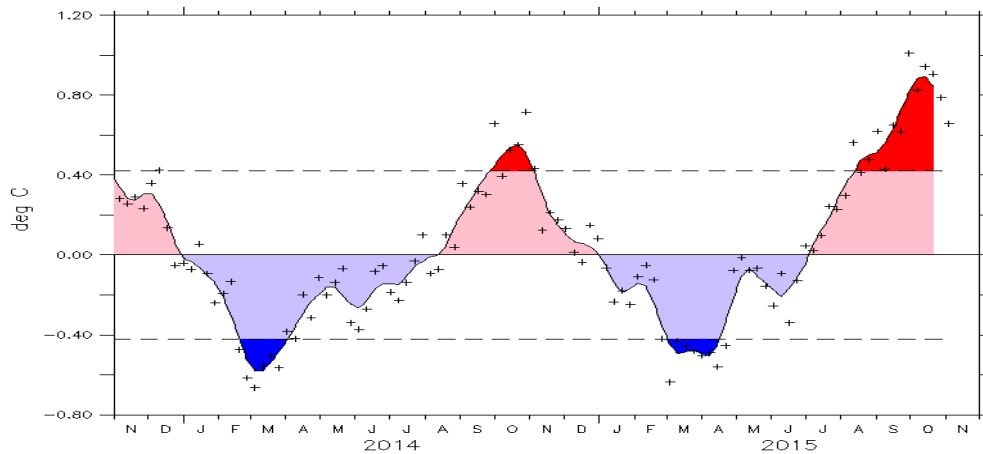
7 years ELNINO -warm PDO
10 years ELNINO- cold PDO



Impact of TNA

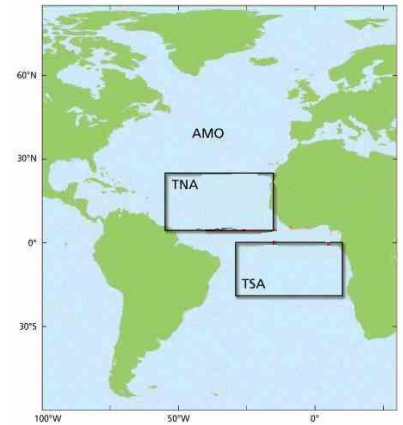
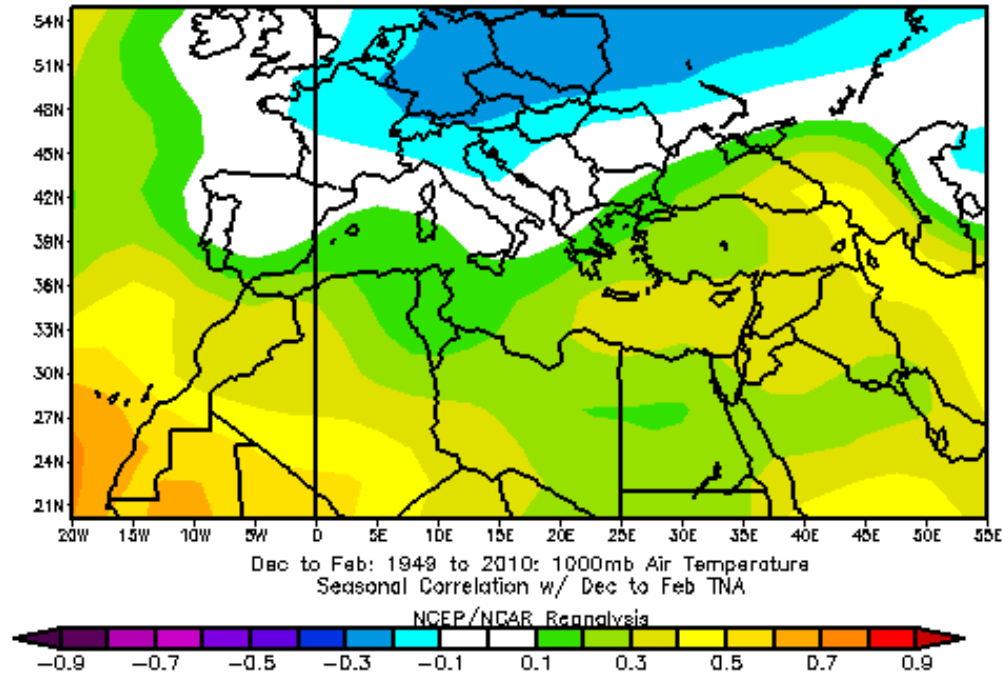
❖ Tropical Atlantic Variability (TAV)

❖ Tropical Northern Atlantic SST (TNA)



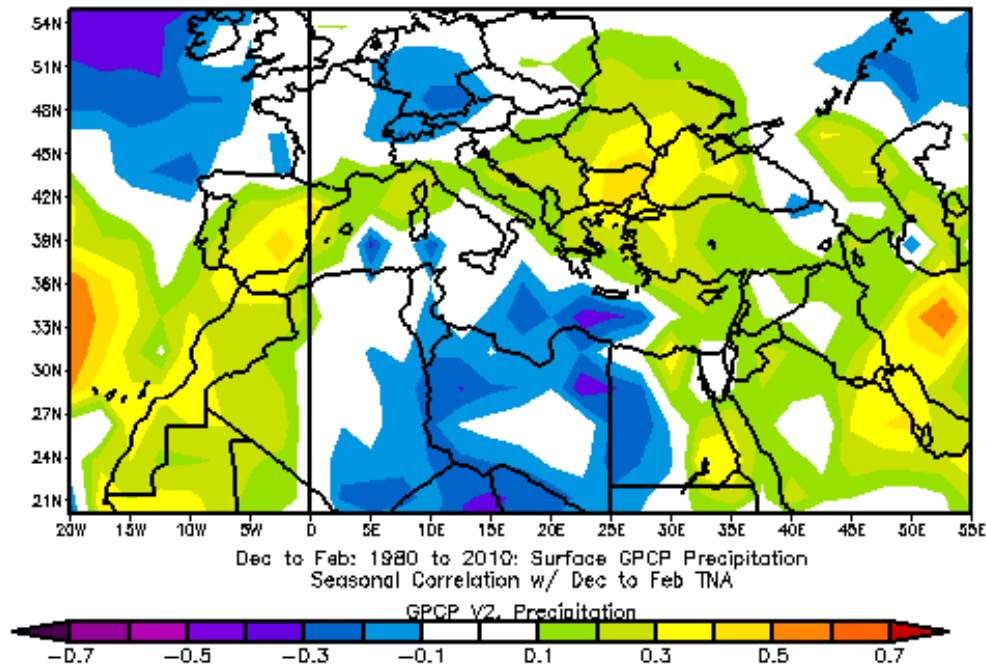
Impact of TNA

$\text{Cor}(\text{SST-TNA(DJF)}, \text{T2m(DJF)})$



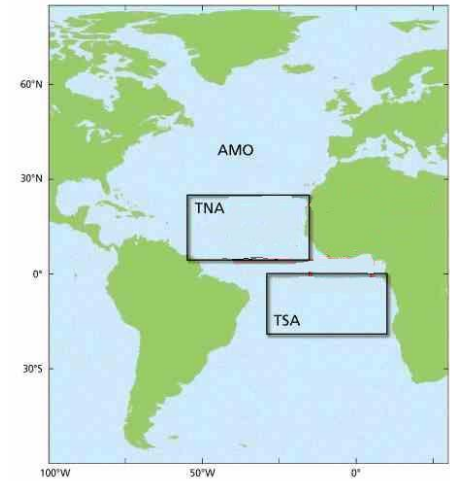
Impact of TNA

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

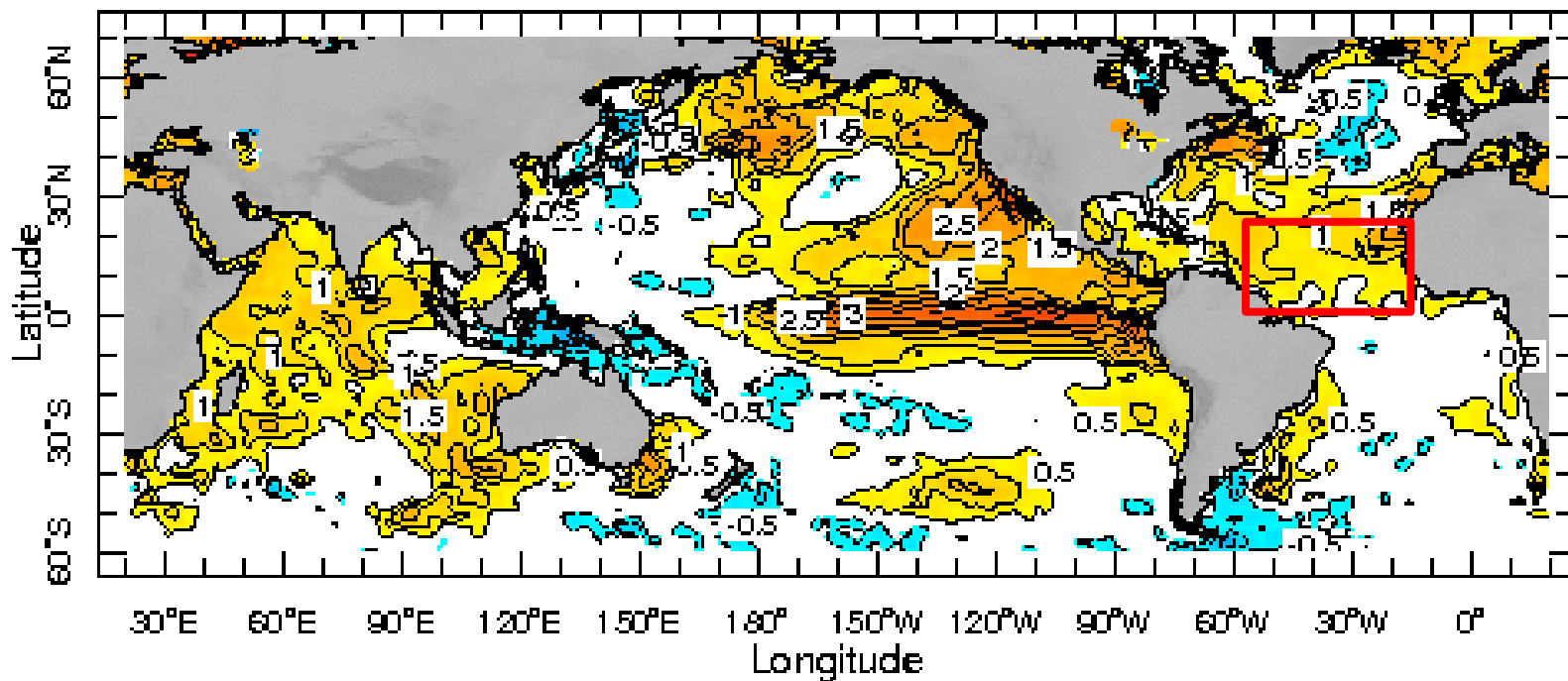


Dec to Feb: 1980 to 2010: Surface GPCP Precipitation
Seasonal Correlation w/ Dec to Feb TNA

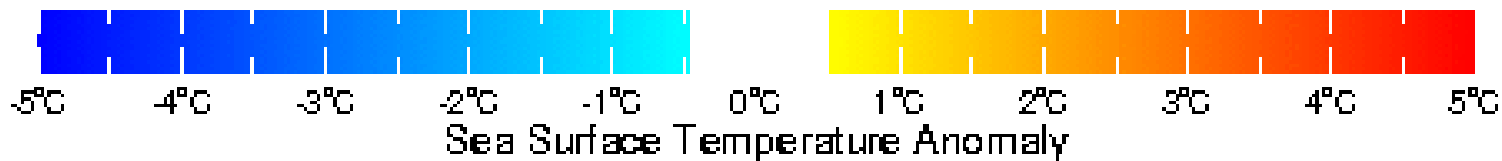
NOAA/ESRL Physical Sciences Division



OCT2015-SST



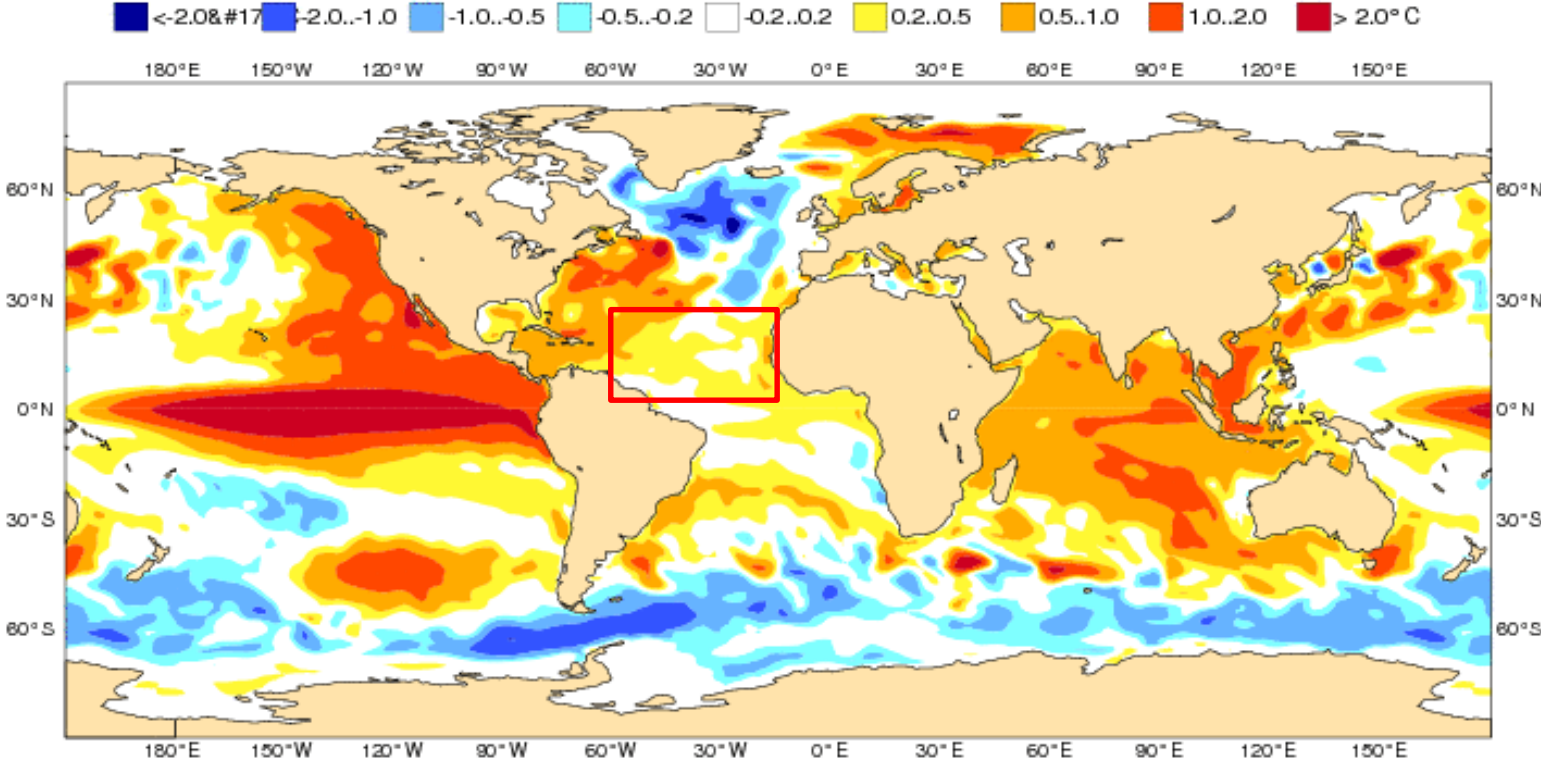
Oct 2015



ECMWF Seasonal Forecast
Mean forecast SST anomaly

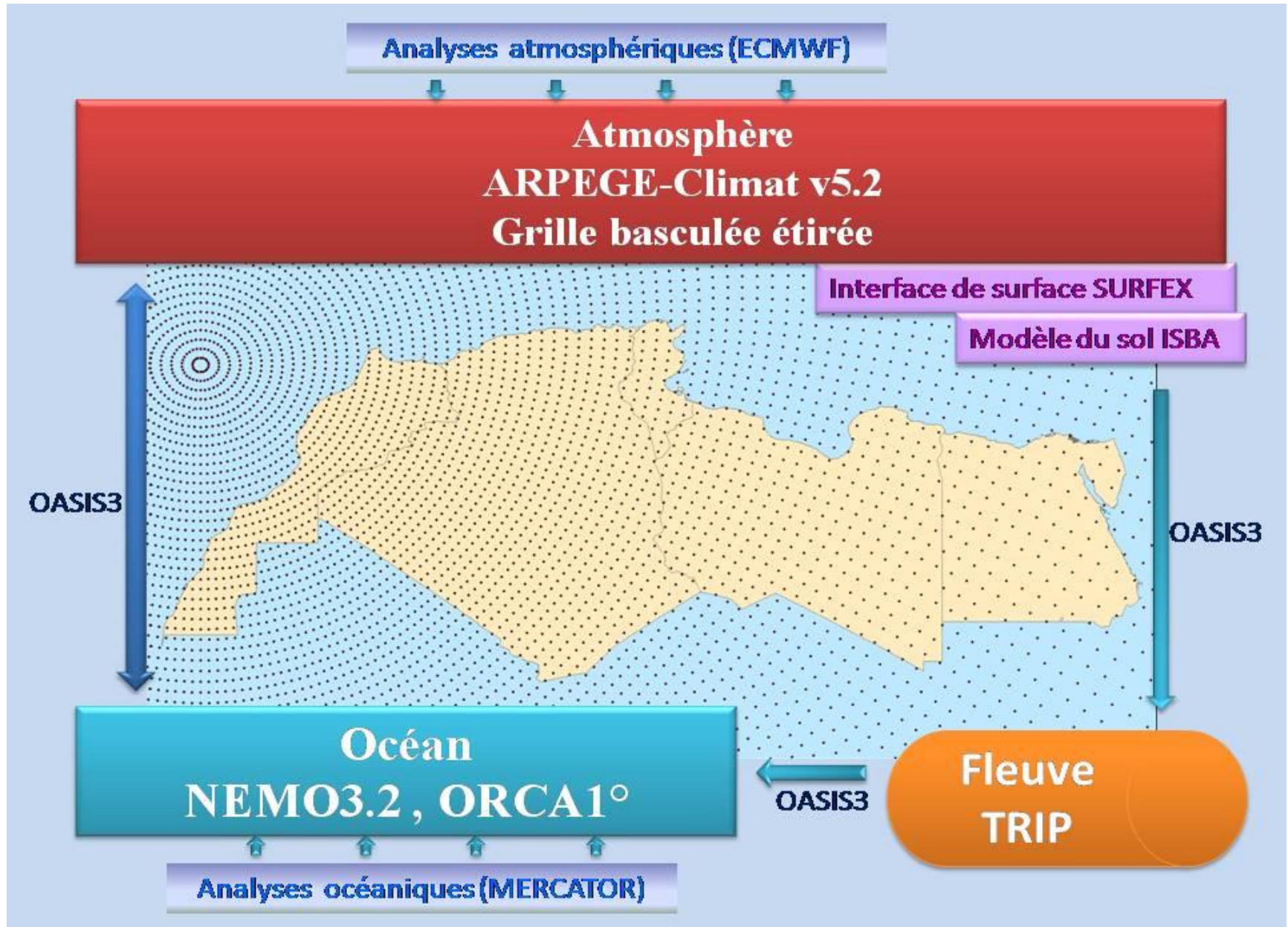
Forecast start reference is 01/11/15
Ensemble size = 51, climate size = 450

System 4
DJF 2015/16

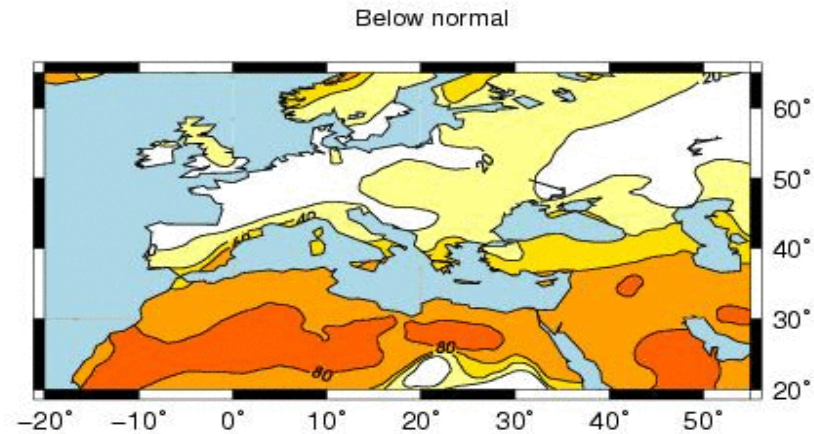
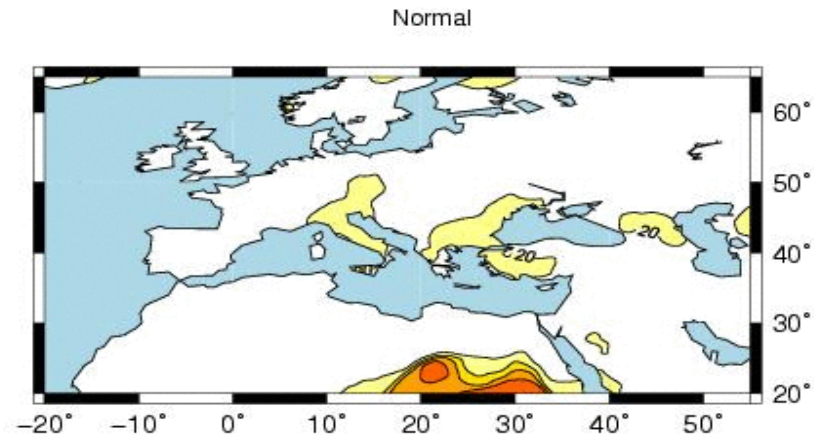
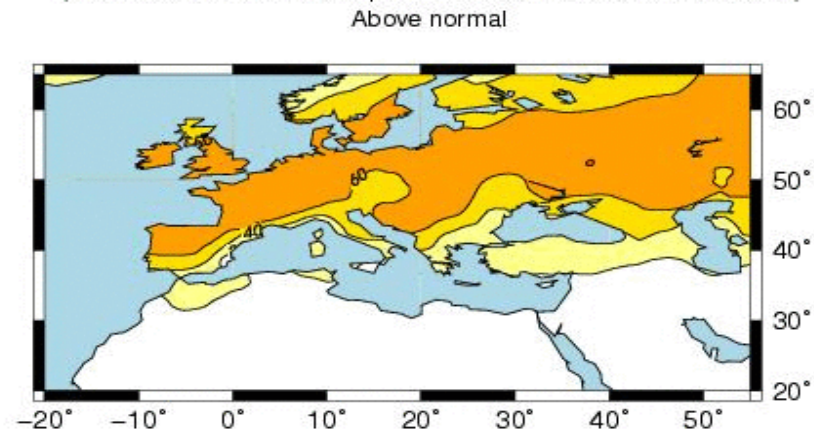


Dynamical forecast

Operational system of seasonal forecast at Maroc-Météo



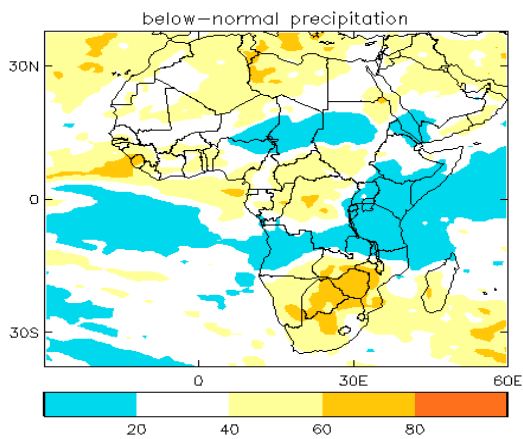
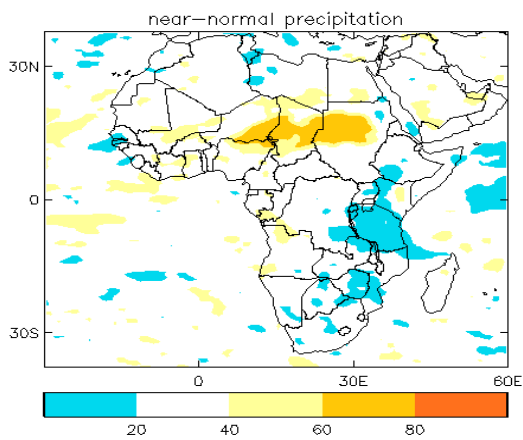
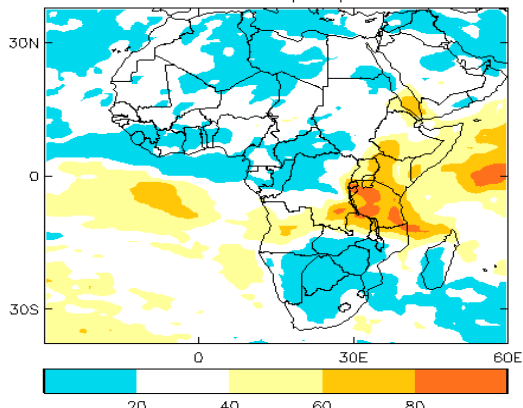
Probability
forecast of
Precipitation
tercile
categories
for DJF 2016



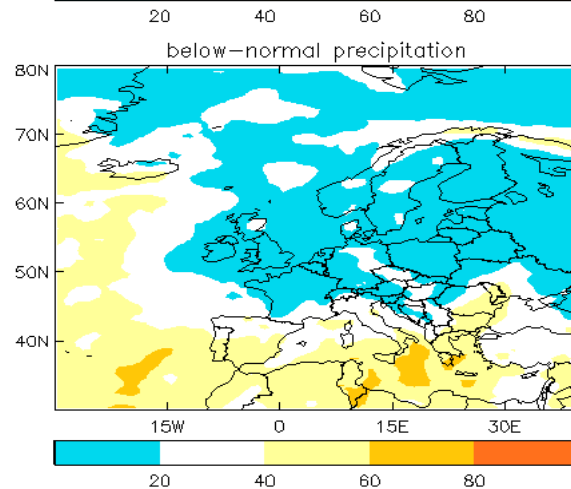
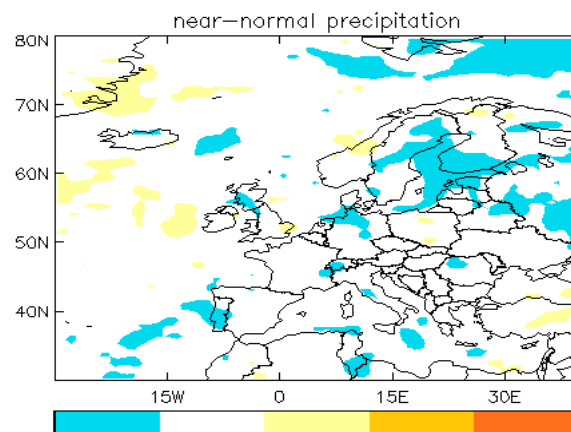
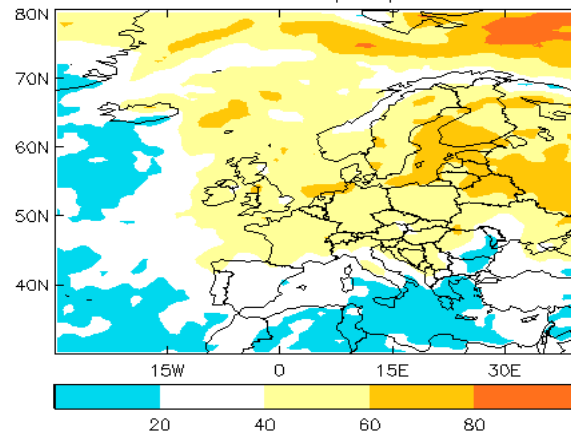
Model Outputs: ARPEGE-Climat

Probability
forecast of
Precipitation
tercile
categories
for DJF
2016

Probability of tercile categories Dec/Jan/Feb Issued Nov 2015
above-normal precipitation



Probability of tercile categories Dec/Jan/Feb Issued Nov 2015
above-normal precipitation



Model Outputs: UK Met Office

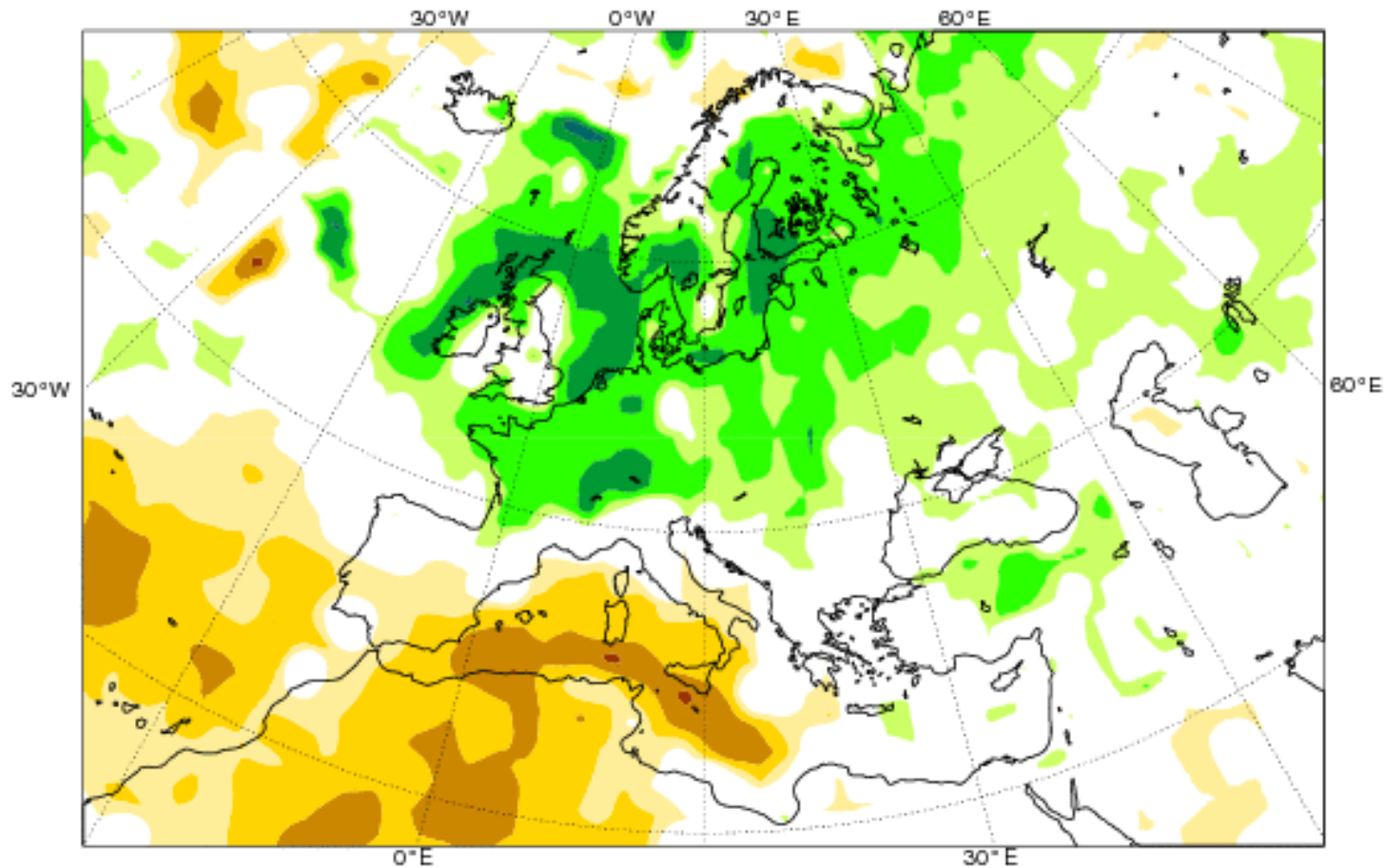
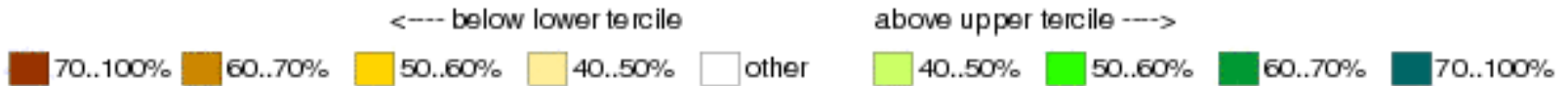
Model Outputs: ECMWF

ECMWF Seasonal Forecast
Prob(most likely category of precipitation)

Forecast start reference is 01/11/15

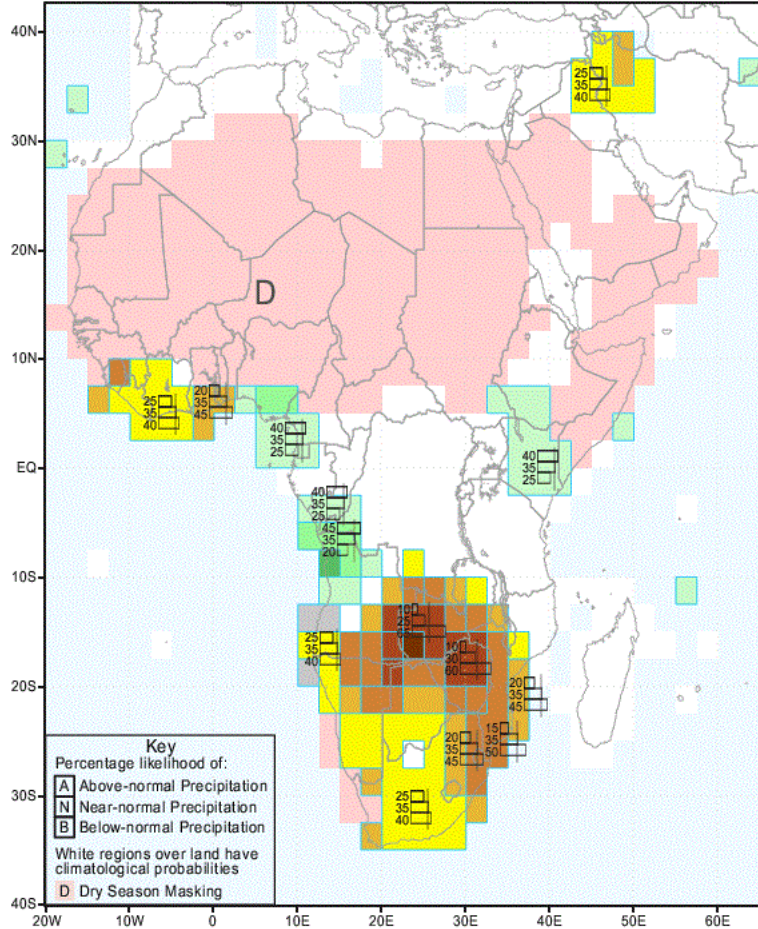
Ensemble size = 51, climate size = 450

System 4
DJF 2015/16

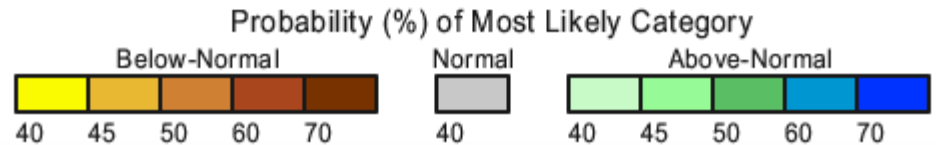
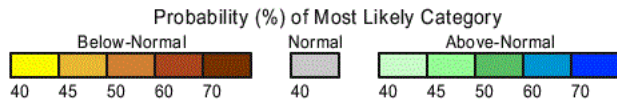
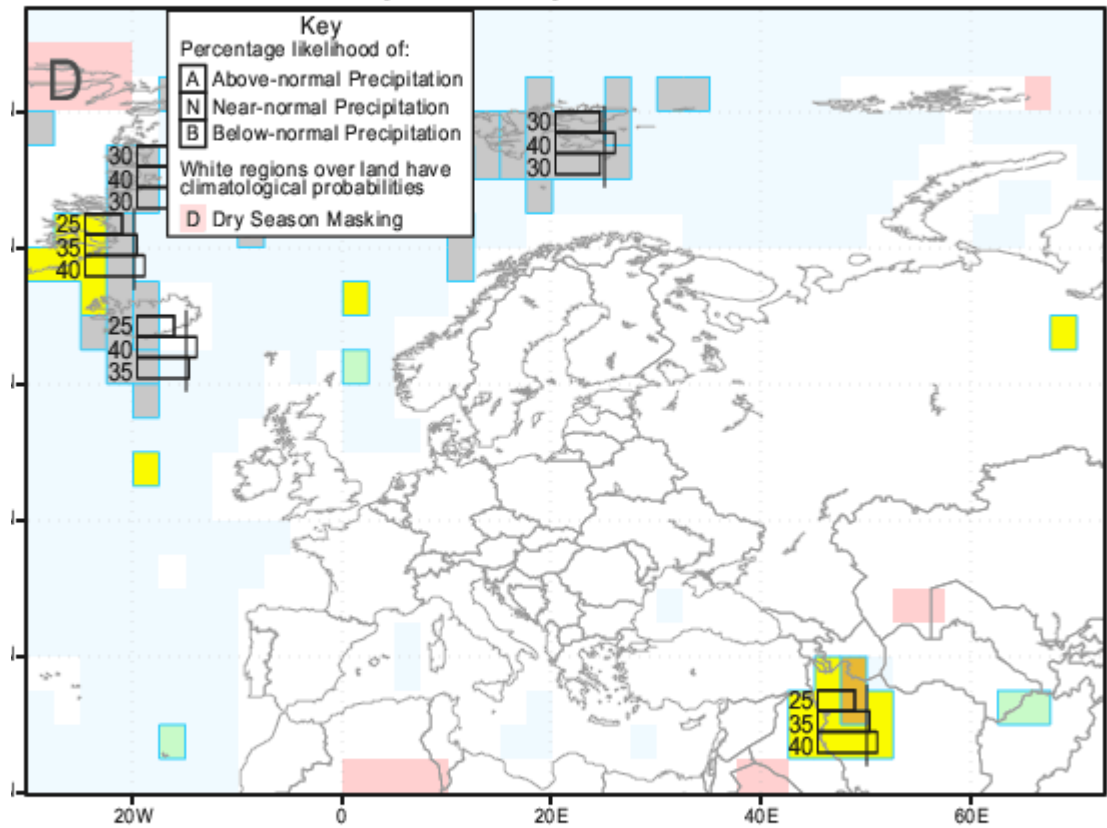


Model Outputs: IRI

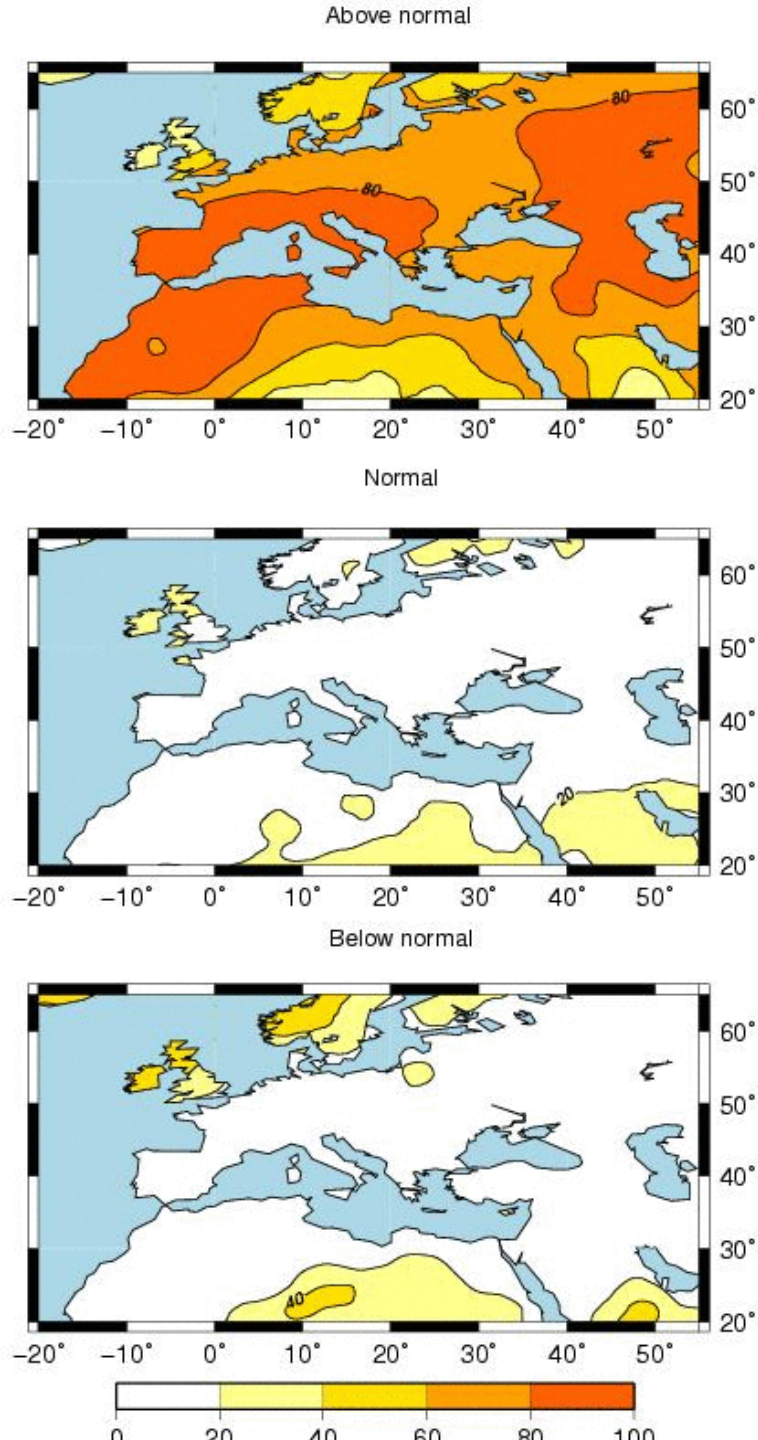
IRI Multi-Model Probability Forecast for Precipitation for December-January-February 2016, Issued November 2015



IRI Multi-Model Probability Forecast for Precipitation for December-January-February 2016, Issued November 2015



Probability
forecast of
Temperature
tercile
categories
for DJF
2016

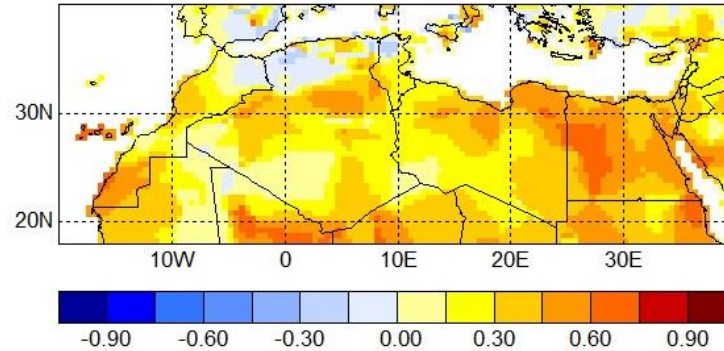


Model Outputs: ARPEGE-Climat

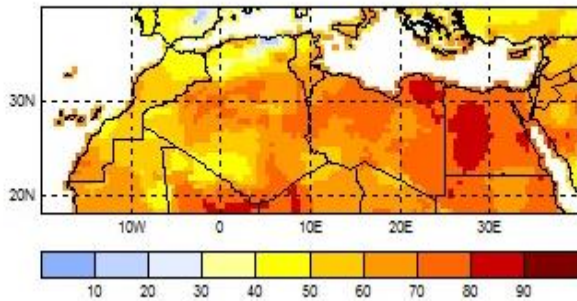
Statistical forecast (ACC) for 2m temperature– SST(predicteur)

SST(SO)-T2M(NORAF)

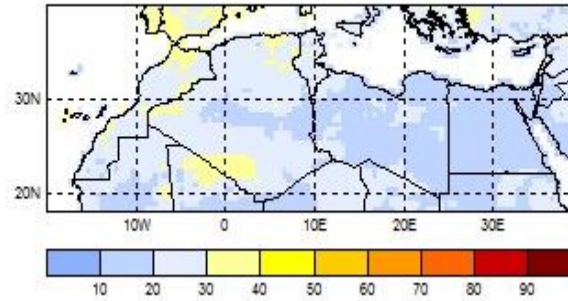
Pearson's Correlation



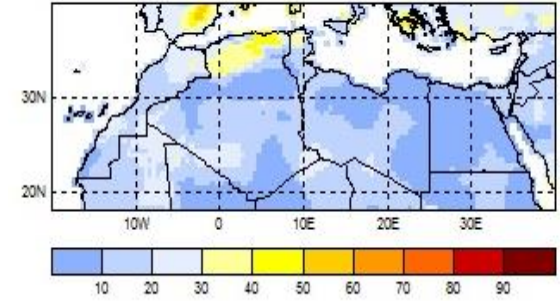
Above



Normal



Below



Above Normal



Summary from NA RCC-LRF

Precipitation:

- ❖ Probably normal to below normal over Morocco
- ❖ Probably below normal conditions over Algeria, Tunisia and Libya
- ❖ Probably normal conditions over Egypt
- ❖ Probably above normal conditions over European part excluding southern Spain

Temperature:

- ❖ Above normal conditions are most likely over the whole region

THANKS