



Climate Change

Forecast  
December 2017 – February 2018  
MedCOF November 2017





Climate  
Change

## Sources of information

- Copernicus Climate Change Service (C3S) seasonal forecasts (individual systems – ECMWF, UK Met Office, Météo-France – and combination)
- GPC Exeter and GPC ECMWF
- The WMO Global Seasonal Climate Update (GSCU): experimental product, based on forecasts from LC-LRFMME, designed to be produced and issued four times a year

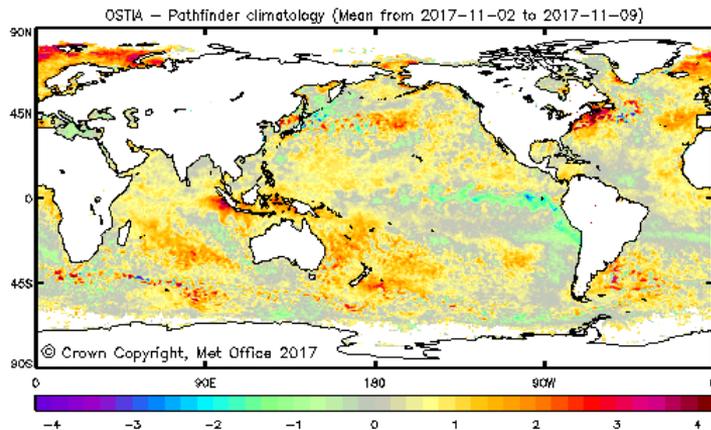


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# Observations

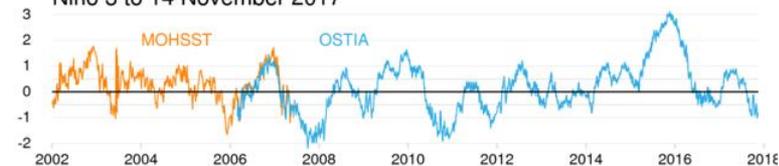
2-9 Nov

SOI to  
19 Nov  
*BoM*

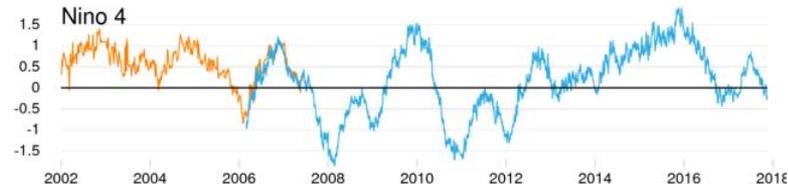


## ENSO up to 14 Nov

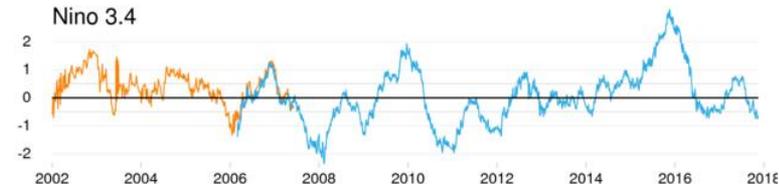
Nino 3 to 14 November 2017



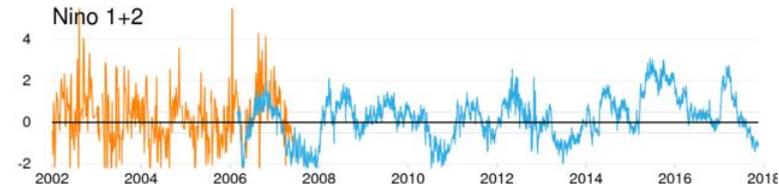
Nino 4



Nino 3.4



Nino 1+2

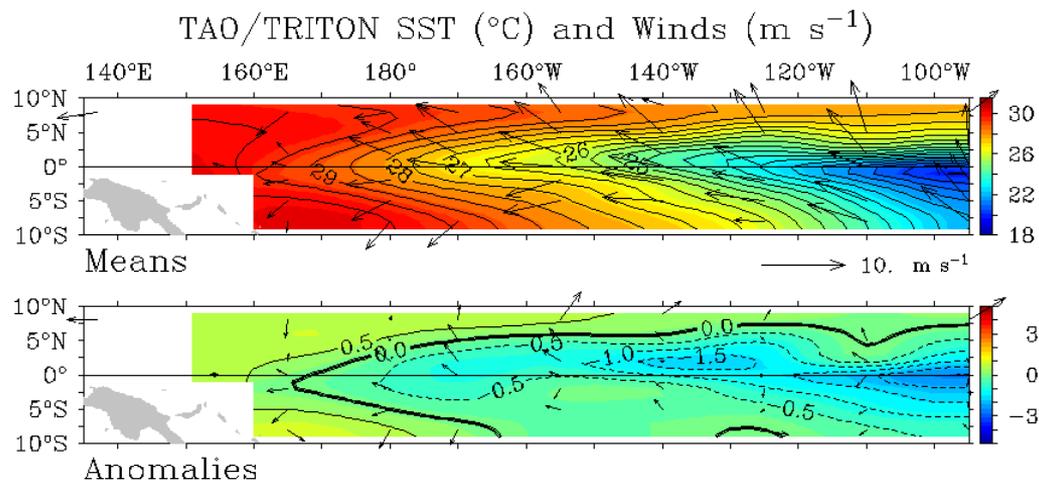
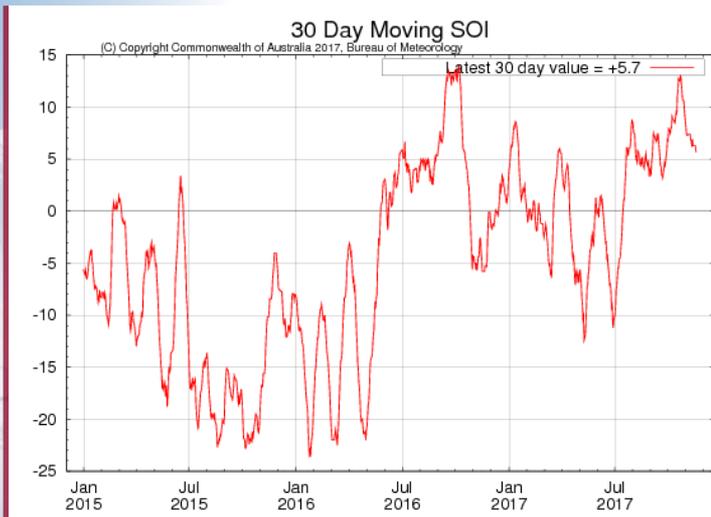




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# SOI, SST and wind to 19 Nov

from Bureau of Meteorology (BoM),  
Australia



Five-Day Mean Ending on November 19 2017



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# Tropical Pacific sub-surface: 11 - 15 Nov

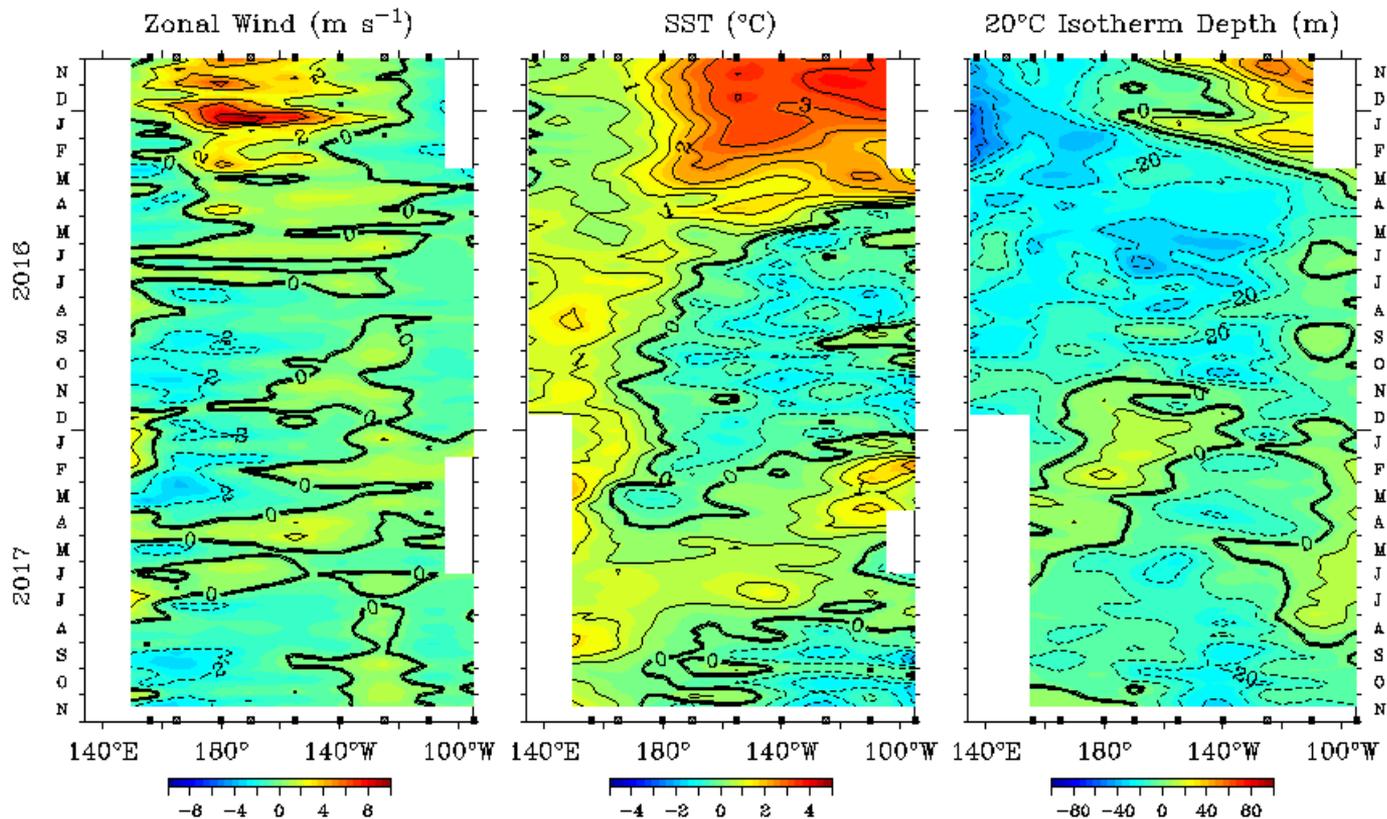
## U wind

## SST

## 20 deg isotherm depth anom

Five Day Zonal Wind, SST, and 20°C Isotherm Depth Anom

Time

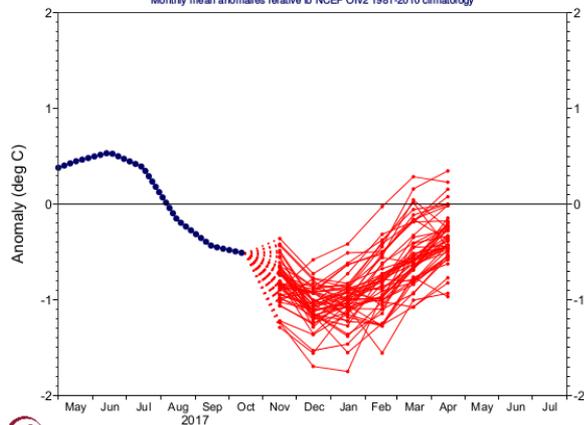




Climate Change

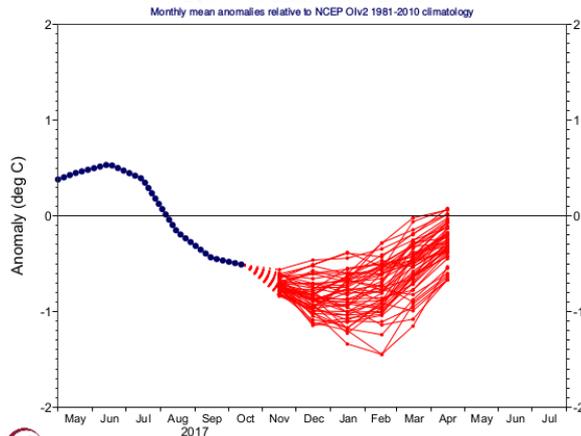
# NINO 3.4 - from November 2017

NINO3.4 SST anomaly plume  
C3S: Met Office contribution from 1 Nov 2017  
Monthly mean anomalies relative to NCEP OIv2 1981-2010 climatology



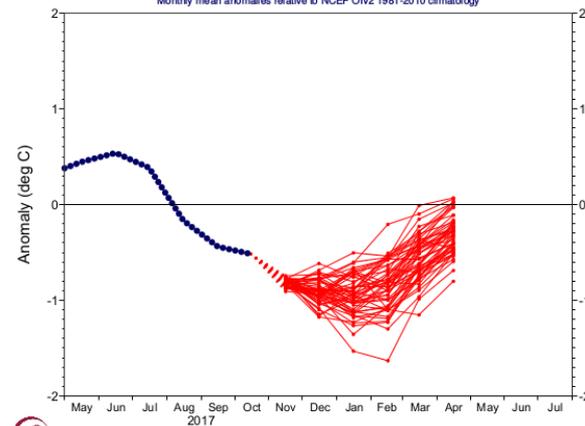
UKMO

NINO3.4 SST anomaly plume  
ECMWF forecast from 1 Nov 2017  
Monthly mean anomalies relative to NCEP OIv2 1981-2010 climatology



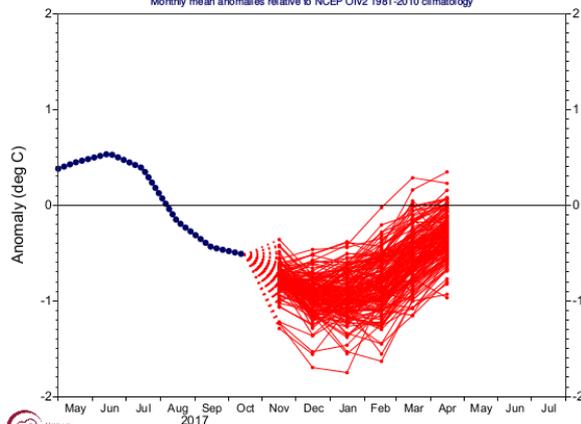
ECMWF

NINO3.4 SST anomaly plume  
C3S: Météo-France contribution from 1 Nov 2017  
Monthly mean anomalies relative to NCEP OIv2 1981-2010 climatology



MF

ECMWF, Met Office, Météo-France  
Monthly mean anomalies relative to NCEP OIv2 1981-2010 climatology



C3S

UKMO: Met Office  
MF: Météo-France  
C3S: combination



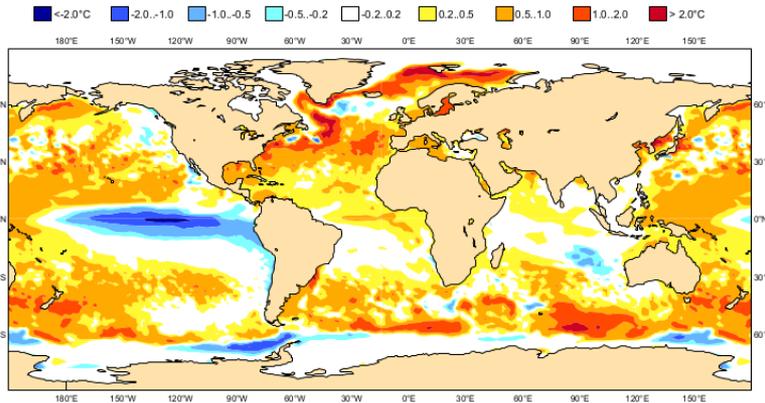


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# SST-DJF from November 2017

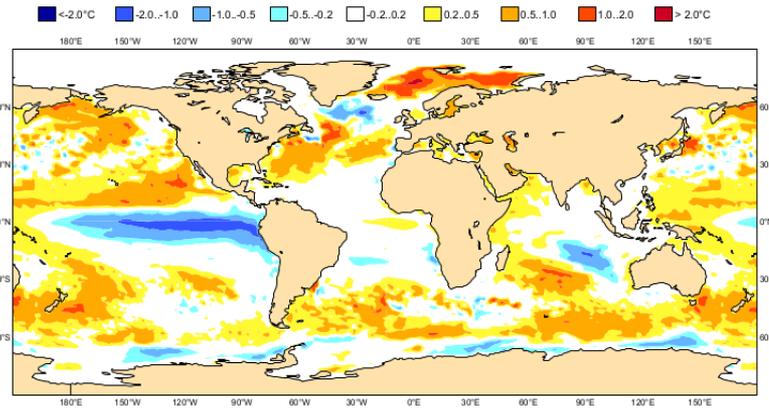
C3S: Met Office contribution  
Mean forecast SST anomaly  
Nominal forecast start 01/11/17  
Ensemble size = 50, climate size = 644

DJF 2017/18



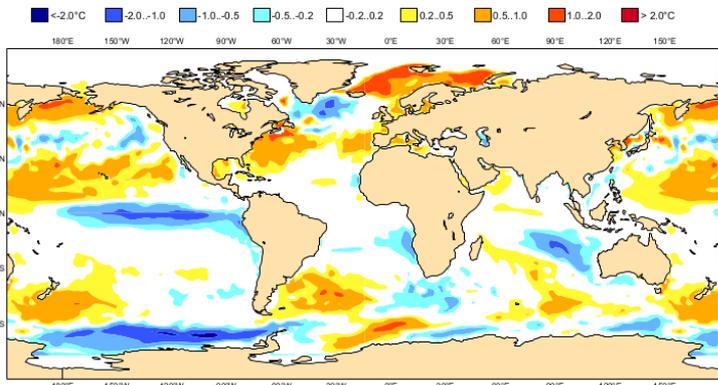
C3S: ECMWF contribution  
Mean forecast SST anomaly  
Nominal forecast start 01/11/17  
Ensemble size = 51, climate size = 575

DJF 2017/18



C3S: Météo-France contribution  
Mean forecast SST anomaly  
Nominal forecast start 01/11/17  
Ensemble size = 51, climate size = 330

DJF 2017/18



UKMO

ECMWF

MF

UKMO: Met Office  
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# Large-scale SST indices

## GSCU November 2017

Month	Niño 1+2	Niño 3	Niño 4	Niño3.4	IOD	NTA	STA
December 2017	-0.82±0.45	-1.09±0.35	-0.31±0.17	-0.94±0.24	0.04±0.17	0.18±0.20	0.08±0.19
January 2018	-0.89±0.43	-1.01±0.27	-0.28±0.22	-0.88±0.26	0.08±0.13	0.19±0.19	0.05±0.19
February 2018	-0.74±0.37	-0.80±0.28	-0.26±0.23	-0.81±0.26	0.06±0.15	0.18±0.19	0.06±0.18
December 2017- February 2018	-0.82±0.41	-0.97±0.28	-0.28±0.20	-0.88±0.25	0.06±0.13	0.18±0.19	0.06±0.18

Table 2: Multi-model forecasts for oceanic indices (°C), with standard deviation. Values are the equal-member-weighting average of those derived, using each GPC models own hindcast climate mean, from the 11 GPCs supplying SST forecasts (GPC Beijing, ECMWF, Exeter, Melbourne, Montreal, Moscow, Offenbach, Seoul, Tokyo, Toulouse, Washington). The standard deviation is calculated on all ensemble members, except for GPC Toulouse (GPC Toulouse provides only ensemble mean anomaly). The latitude/longitude bounds of the regions are given in the supplementary information section.

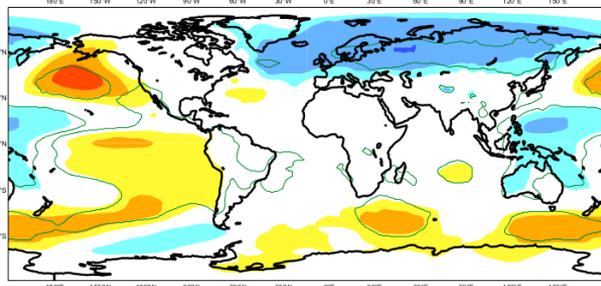


# MSLP - DJF from November 2017

C3S: Met Office contribution  
Mean MSLP anomaly  
Nominal forecast start 01/11/17  
Ensemble size = 50, climate size = 644

## UKMO

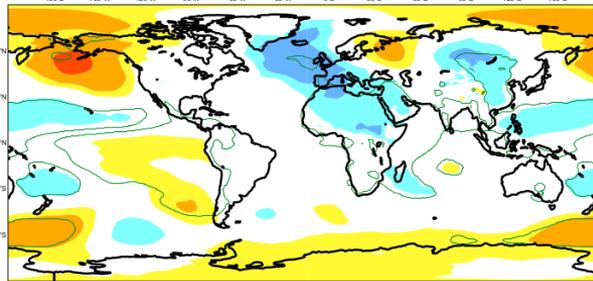
DJF 2017/18  
Solid contour at 1% significance level



C3S: ECMWF contribution  
Mean MSLP anomaly  
Nominal forecast start 01/11/17  
Ensemble size = 51, climate size = 575

## ECMWF

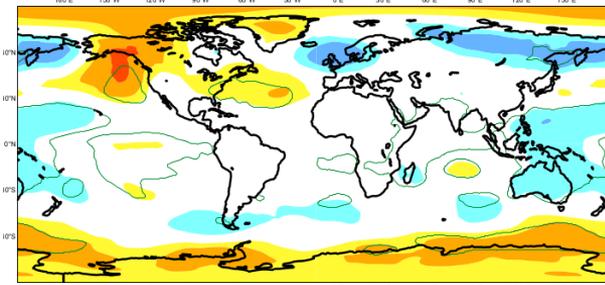
DJF 2017/18  
Solid contour at 1% significance level



C3S: Météo-France contribution  
Mean MSLP anomaly  
Nominal forecast start 01/11/17  
Ensemble size = 51, climate size = 330

## MF

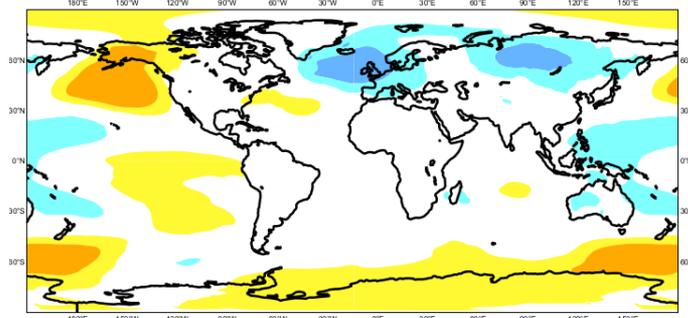
DJF 2017/18  
Solid contour at 1% significance level



C3S multi-system seasonal forecast  
Mean MSLP anomaly  
Nominal forecast start 01/11/17  
Variance-standardized mean

## C3S

ECMWF/Met Office/Météo-France  
DJF 2017/18



UKMO: Met Office  
MF: Météo-France  
C3S: combination



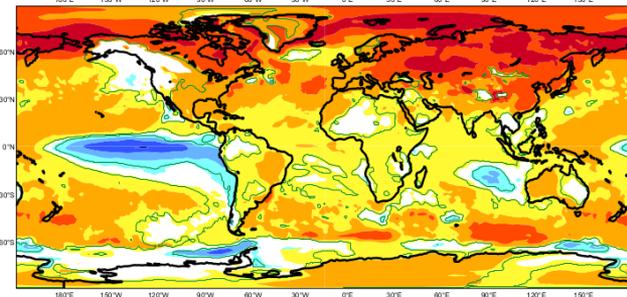
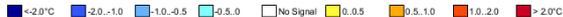
# T2m - DJF from November 2017

Climate

C3S: Met Office contribution  
Mean 2m temperature anomaly  
Nominal forecast start 01/11/17  
Ensemble size = 50, climate size = 644

## UKMO

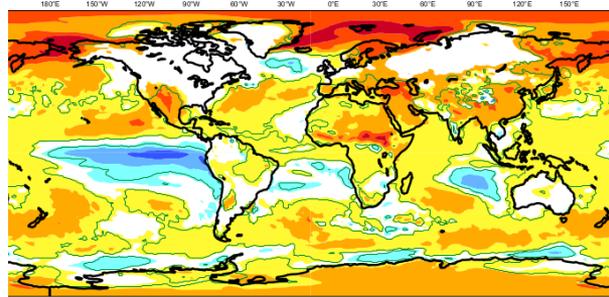
DJF 2017/18  
Shaded areas significant at 10% level  
Solid contour at 1% level



S: ECMWF contribution  
an 2m temperature anomaly  
Nominal forecast start 01/11/17  
ensemble size = 51, climate size = 575

## ECMWF

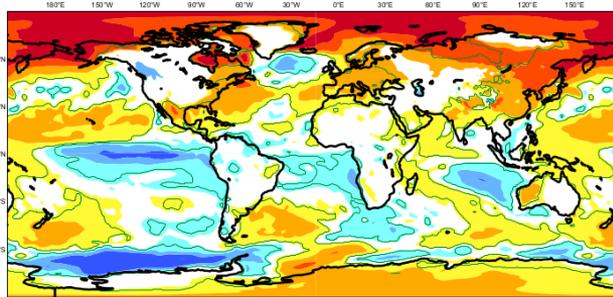
DJF 2017/18  
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Solid contour at 1% level



C3S: Météo-France contribution  
Mean 2m temperature anomaly  
Nominal forecast start 01/11/17  
ensemble size = 51, climate size = 330

## MF

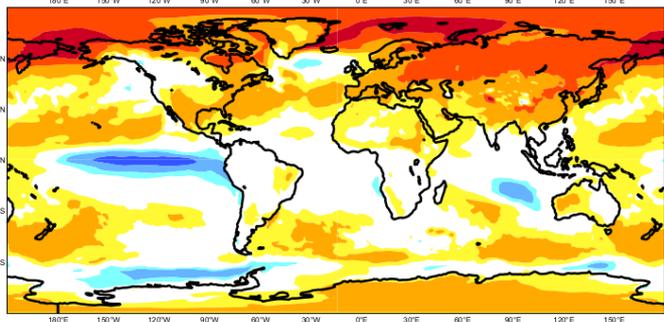
DJF 2017/18  
Shaded areas significant at 10% level  
Solid contour at 1% level



C3S multi-system seasonal forecast  
Mean 2m temperature anomaly  
Nominal forecast start 01/11/17  
Variance-standardized mean

## C3S

ECMWF/Met Office/Météo-France  
DJF 2017/18

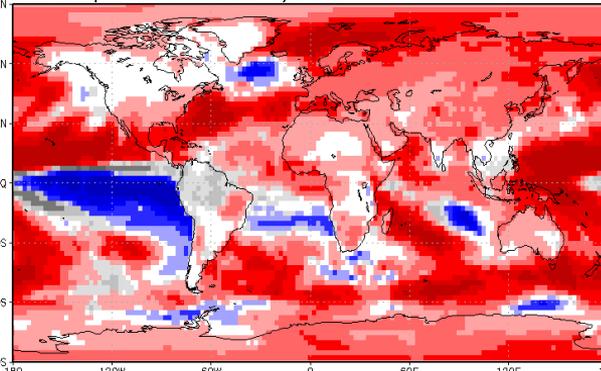


Probabilistic Multi-Model Ensemble Forecast  
GPC\_Beijing/CPTCE/ECMWF/Exeter/Melbourne/Montreal/Moscow/Offenbach/Seoul/Tokyo/Washington

## 2m Temperature : DJF2017/2018

(issued on Nov2017)

## GSCU





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# T 2 m - ECMWF

## Ensemble mean - DJF from November 2017

C3S: ECMWF contribution

Mean 2m temperature anomaly

Nominal forecast start: 01/11/17

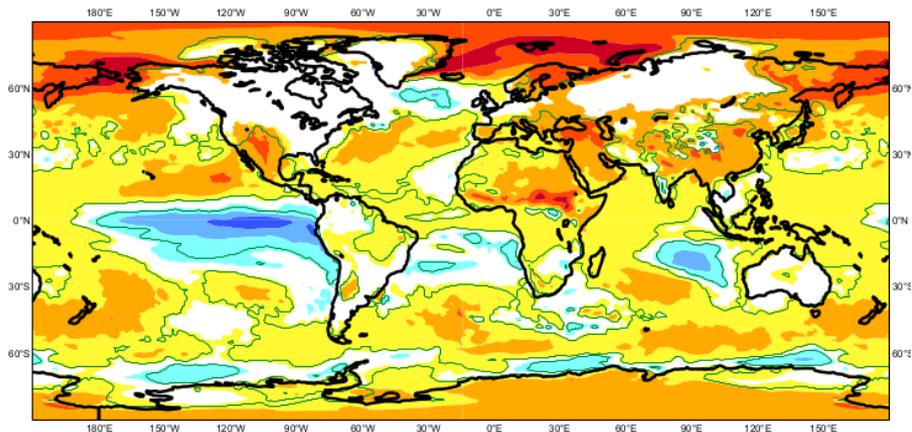
Ensemble size = 51, climate size = 575

DJF 2017/18

Shaded areas significant at 10% level

Solid contour at 1% level

■ <-2.0°C ■ -2.0..-1.0 ■ -1.0..-0.5 ■ -0.5..0 ■ No Signal ■ 0..0.5 ■ 0.5..1.0 ■ 1.0..2.0 ■ > 2.0°C



## Anomaly correlation - DJF from November

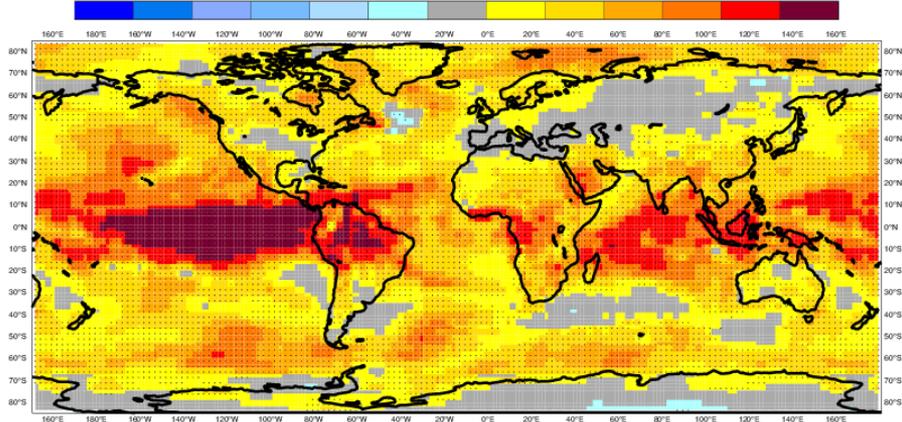
Anomaly Correlation Coefficient for 0001 with 25 ensemble members

Near-surface air temperature

Hindcast period 1981-2016 with start in November average over months 2 to 4

Black dots for values significantly different from zero with 95% confidence ( 1000 samples)

-1 -0.9 -0.8 -0.7 -0.6 -0.4 -0.2 0.2 0.4 0.6 0.7 0.8 0.9 1





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# T 2 m - U K M O

## ROC area DJF from November

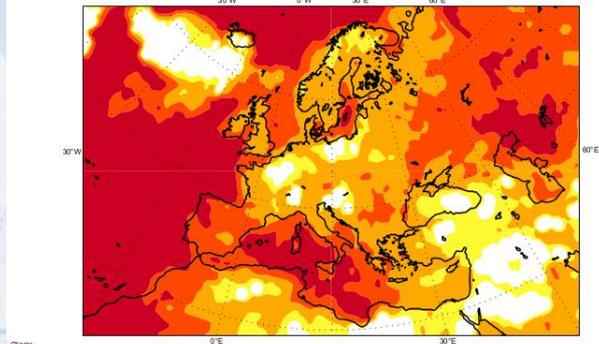
C3S: Met Office contribution

Prob(most likely category of 2m temperature)

Nominal forecast start 01/11/17

Ensemble size = 50, climate size = 644

DJF 2017/18



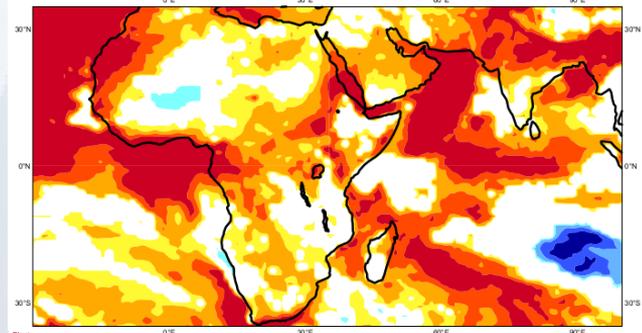
C3S: Met Office contribution

Prob(most likely category of 2m temperature)

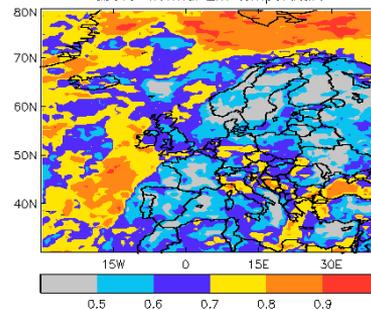
Nominal forecast start 01/11/17

Ensemble size = 50, climate size = 644

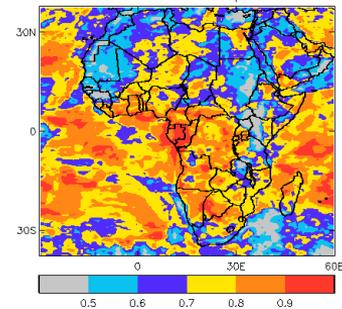
DJF 2017/18



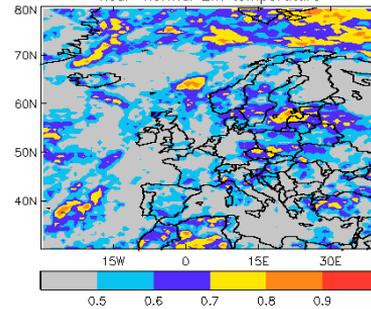
ROC scores for tercile categories Dec/Jan/Feb/: Issued November  
above-normal 2m temperature



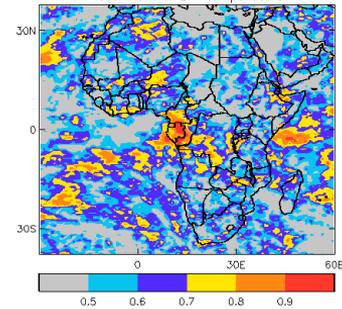
ROC scores for tercile categories Dec/Jan/Feb/: Issued November  
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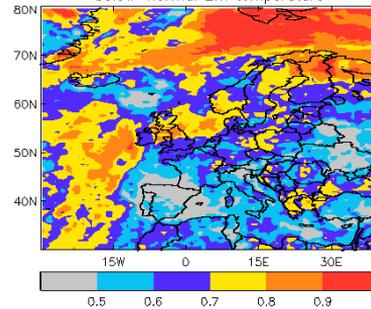
near-normal 2m temperature



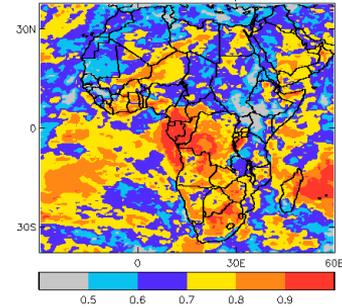
near-normal 2m temperature



below-normal 2m temperature



below-normal 2m temperature

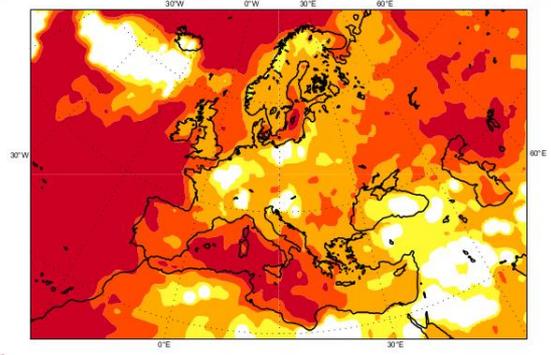




# Precipitation - DJF from November 2017

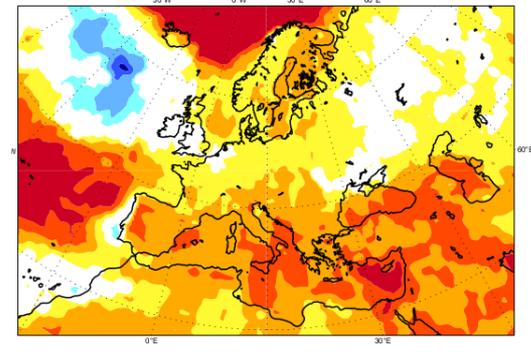
C3S: Met Office contribution  
Prob(most likely category of 2m temperature)  
Nominal forecast start 01/11/17  
Ensemble size = 50, climate size = 644

## UKMO



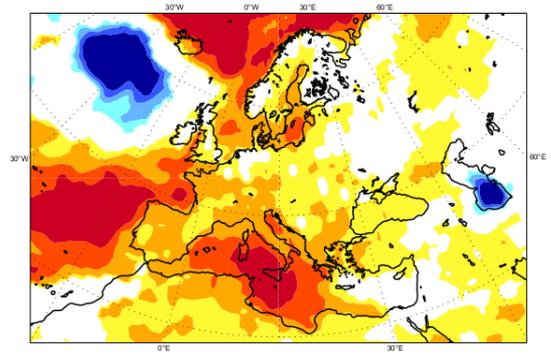
DJF 2017/18  
WF contribution  
Most likely category of 2m temperature)  
Nominal forecast start 01/11/17  
Ensemble size = 51, climate size = 575

## ECMWF



DJF 2017/18  
Météo-France contribution  
Most likely category of 2m temperature)  
Nominal forecast start 01/11/17  
Ensemble size = 51, climate size = 330

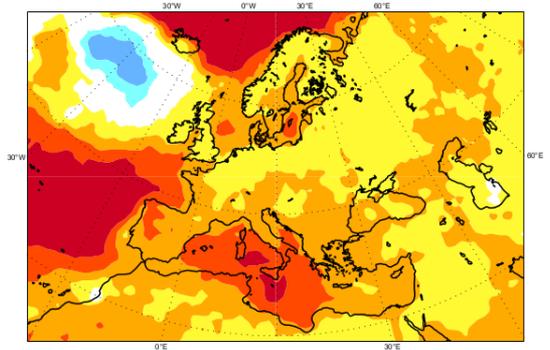
## MF



C3S multi-system seasonal forecast  
Prob(most likely category of 2m temperature)  
Nominal forecast start 01/11/17  
Unweighted mean

## C3S

ECMWF/Met Office/Météo-France  
DJF 2017/18



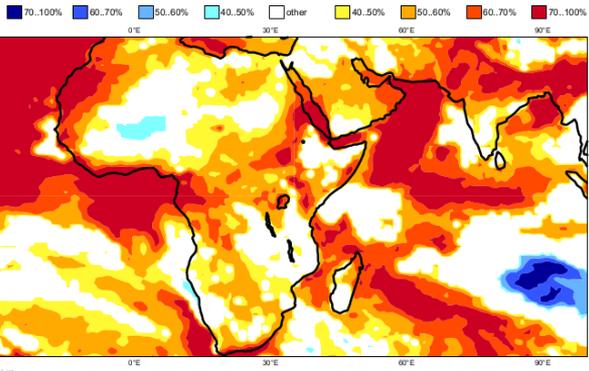
UKMO: Met Office  
MF: Météo-France  
C3S: combination



# Precipitation - DJF from November 2017

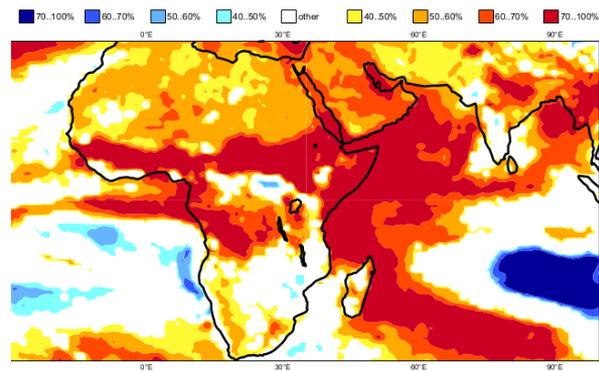
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Nominal forecast start: 01/11/17  
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## UKMO



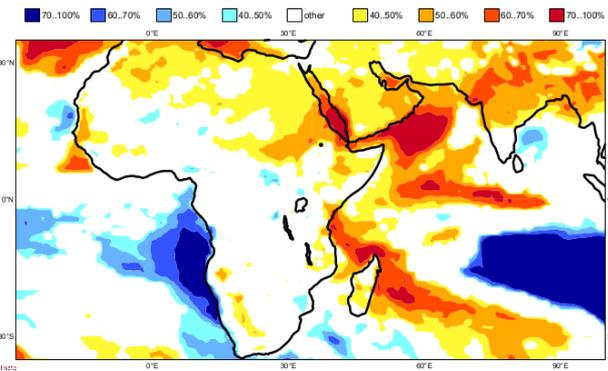
DJF 2017/18  
ECMWF contribution  
Prob(most likely category of 2m temperature)  
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DJF 2017/18  
C3S: Météo-France contribution  
Prob(most likely category of 2m temperature)  
Nominal forecast start: 01/11/17  
Ensemble size = 51, climate size = 330

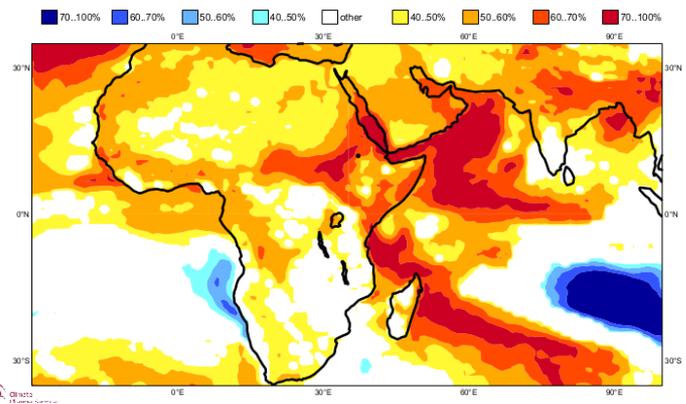
## MF



C3S multi-system seasonal forecast  
Prob(most likely category of 2m temperature)  
Nominal forecast start: 01/11/17  
Unweighted mean

## C3S

ECMWF/Met Office/Météo-France  
DJF 2017/18



- UKMO: Met Office
- MF: Météo-France
- C3S: combination

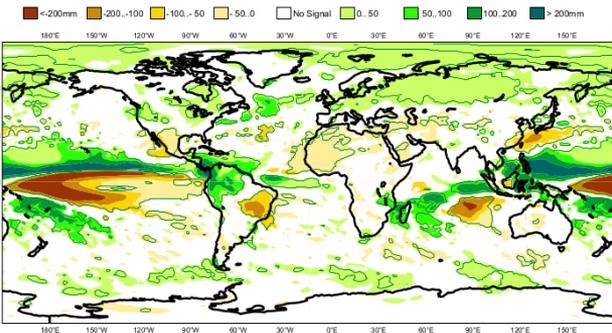


# Precipitation-DJF from November 2017

**C3S: Met Office contribution**  
Mean precipitation anomaly  
Nominal forecast start 01/11/17  
Ensemble size = 50, climate size = 644

## UKMO

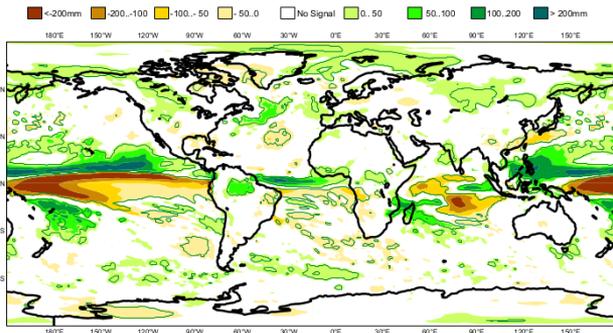
**DJF 2017/18**  
Shaded areas significant at 10% level  
Solid contour at 1% level



**C3S: ECMWF contribution**  
Mean precipitation anomaly  
Nominal forecast start 01/11/17  
Ensemble size = 51, climate size = 675

## ECMWF

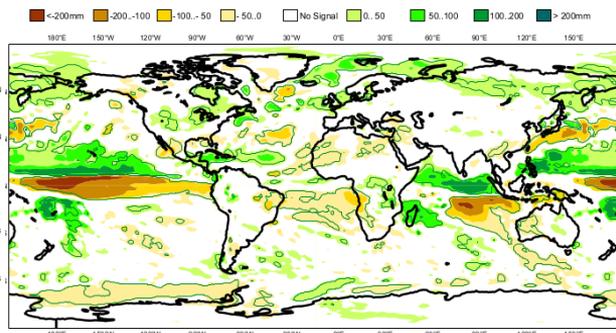
**DJF 2017/18**  
Shaded areas significant at 10% level  
Solid contour at 1% level



**C3S: Météo-France contribution**  
Mean precipitation anomaly  
Nominal forecast start 01/11/17  
Ensemble size = 51, climate size = 330

## MF

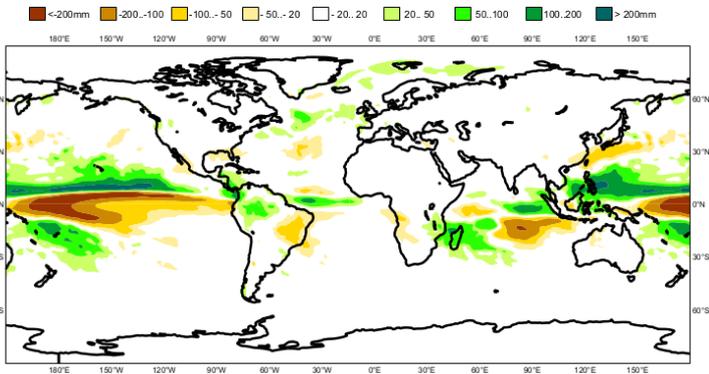
**DJF 2017/18**  
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Solid contour at 1% level



**C3S multi-system seasonal forecast**  
Mean precipitation anomaly  
Nominal forecast start 01/11/17  
Variance-standardized mean

## C3S

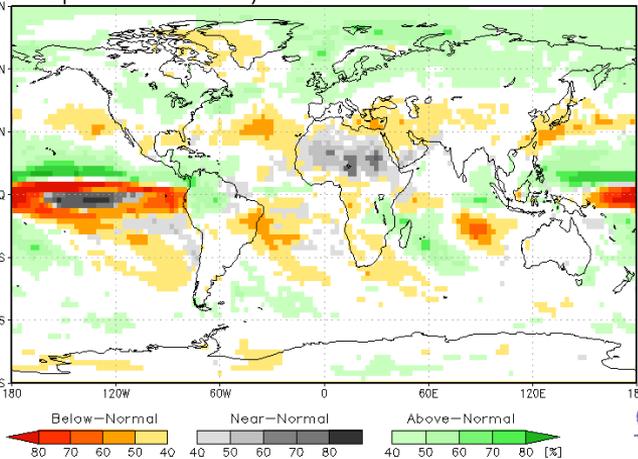
**ECMWF/Met Office/Météo-France**  
DJF 2017/18



**Probabilistic Multi-Model Ensemble Forecast**  
GPC\_Beijing/CPIEC/ECMWF/Exeter/Melbourne/Montreal/Moscow/Offenbach/Seoul/Tokyo/Washington

**Precipitation : DJF2017/2018** (issued on Nov2017)

## GSCU



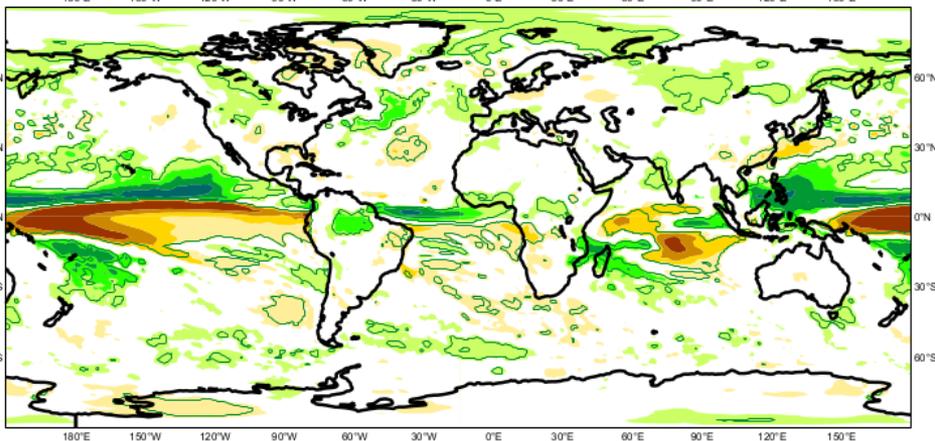


## Ensemble mean - DJF from November 2017

C3S: ECMWF contribution  
Mean precipitation anomaly  
Nominal forecast start: 01/11/17  
Ensemble size = 51, climate size = 575

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Shaded areas significant at 10% level  
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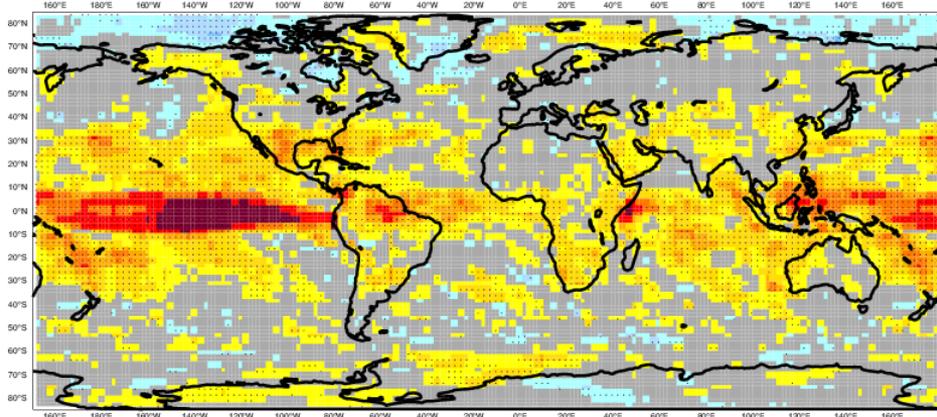
Legend for precipitation anomaly (mm):  
-200mm, -200...-100, -100...-50, -50..0, No Signal, 0..50, 50..100, 100..200, > 200mm



## Anomaly correlation - DJF from November

Anomaly Correlation Coefficient for 0001 with 25 ensemble members  
Precipitation  
Hindcast period 1981-2014 with start in November average over months 2 to 4  
Black dots for values significantly different from zero with 95% confidence ( 1000 samples)

Legend for Anomaly Correlation Coefficient (ACC):  
-1, -0.9, -0.8, -0.7, -0.6, -0.4, -0.2, 0.2, 0.4, 0.6, 0.7, 0.8, 0.9, 1





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# Precipitation - UKMO

## ROC area DJF from November

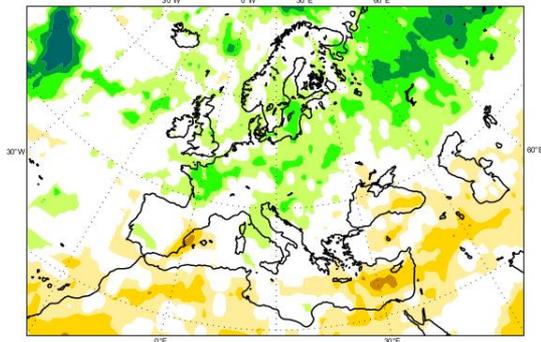
C3S: Met Office contribution

Prob(most likely category of precipitation)

Nominal forecast start: 01/11/17

Ensemble size = 50, climate size = 644

DJF 2017/18



© Met Office

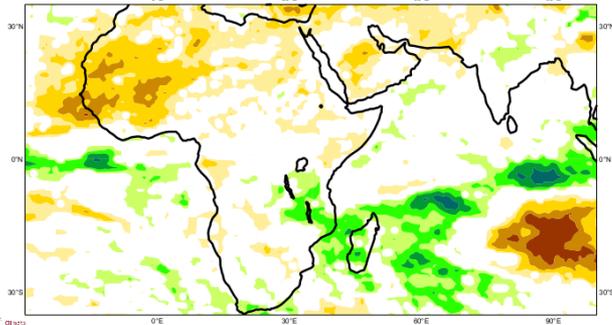
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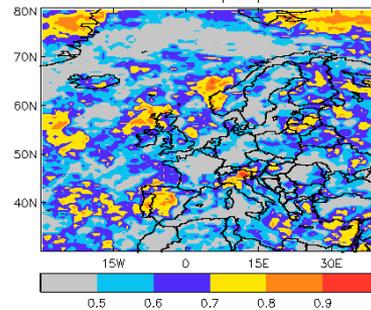
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DJF 2017/18

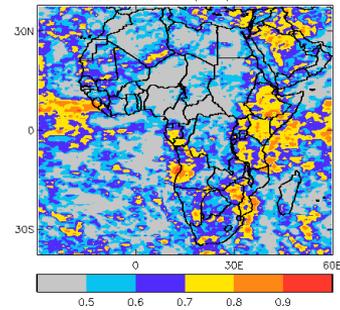


© Met Office

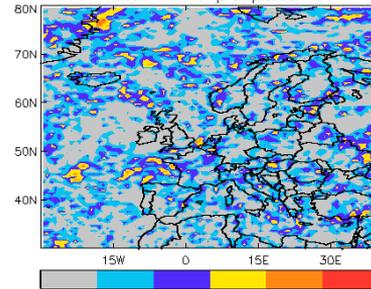
ROC scores for tercile categories Dec/Jan/Feb/: Issued November  
above-normal precipitation



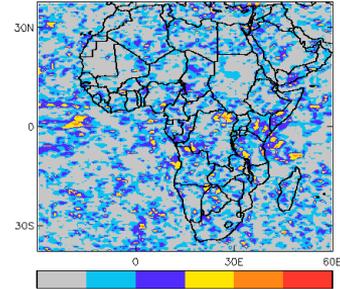
ROC scores for tercile categories Dec/Jan/Feb/: Issued November  
above-normal precipitation



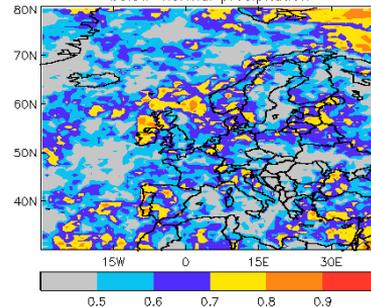
near-normal precipitation



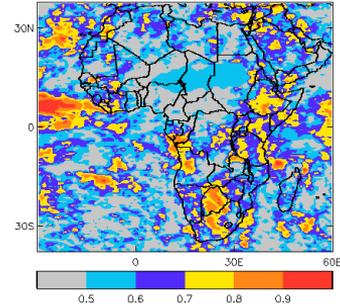
near-normal precipitation



below-normal precipitation



below-normal precipitation

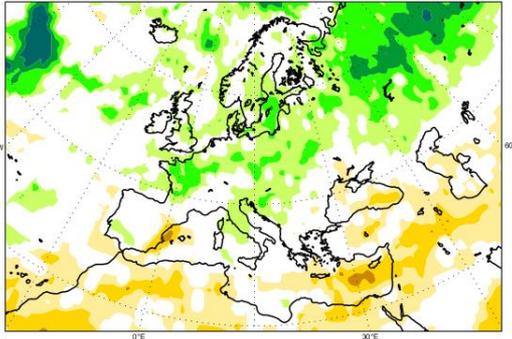




# Precipitation-DJF from November 2017

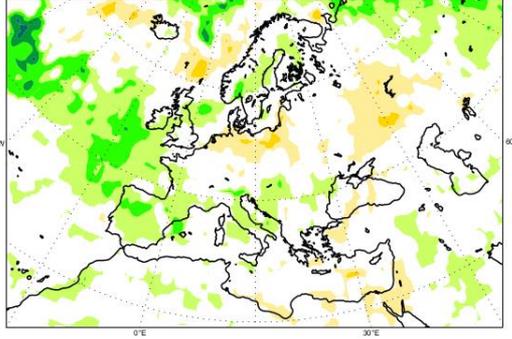
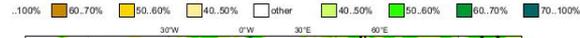
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Nominal forecast start: 01/11/17  
Ensemble size = 50, climate size = 644

## UKMO



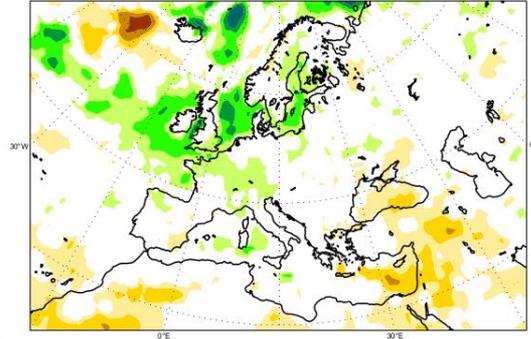
AWF contribution  
DJF 2017/18  
most likely category of precipitation  
start: 01/11/17  
size = 51, climate size = 575

## ECMWF



Météo-France contribution  
DJF 2017/18  
most likely category of precipitation  
forecast start: 01/11/17  
size = 51, climate size = 330

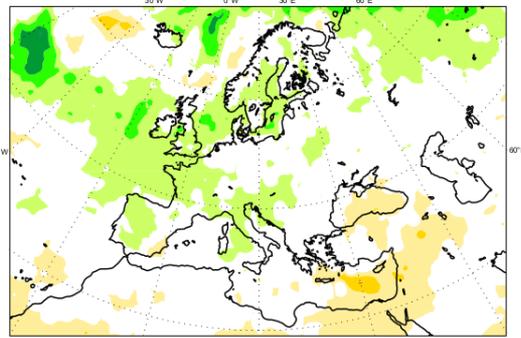
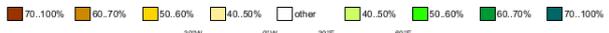
## MF



C3S multi-system seasonal forecast  
Prob(most likely category of precipitation)  
Nominal forecast start: 01/11/17  
Unweighted mean

## C3S

ECMWF/Met Office/Météo-France  
DJF 2017/18



UKMO: Met Office  
MF: Météo-France  
C3S: combination



# Precipitation - DJF from November 2017

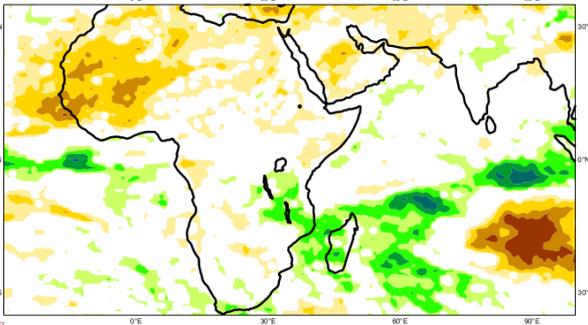
C3S: Met Office contribution

Prob(most likely category of precipitation)

Nominal forecast start 01/11/17

Ensemble size = 50, climate size = 644

## UKMO



C3S: ECMWF contribution

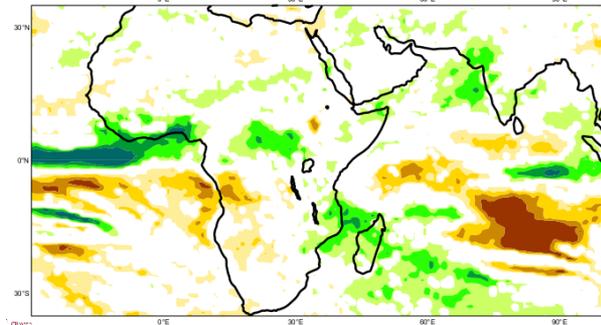
DJF 2017/18

Prob(most likely category of precipitation)

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## ECMWF



C3S: Météo-France contribution

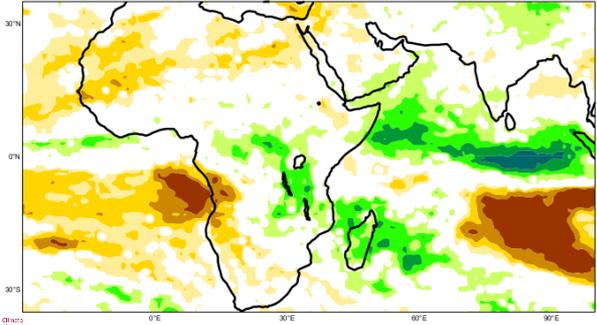
DJF 2017/18

Prob(most likely category of precipitation)

Nominal forecast start 01/11/17

Ensemble size = 51, climate size = 330

## MF



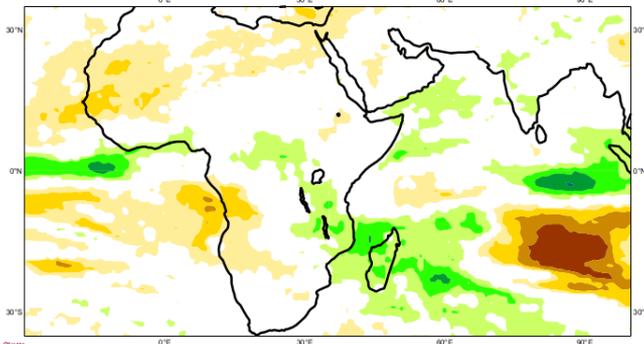
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## C3S



ECMWF/Met Office/Météo-France

DJF 2017/18

UKMO: Met Office  
MF: Météo-France  
C3S: combination



Climate  
Change



Thank you



Climate  
Change

M S L P - E C M W F

## Anomaly correlation - DJF from November

Anomaly Correlation Coefficient for 0001 with 25 ensemble members

Mean sea level pressure

Hindcast period 1981-2016 with start in November average over months 2 to 4

Black dots for values significantly different from zero with 95% confidence ( 1000 samples)

