GLOBAL CLIMATE BULLETIN
n°168 - JUNE 2013

Table of Contents

I. DESCRIPTION OF THE CLIMATE SYSTEM (APRIL 2013) 3
I.1. OCEANIC ANALYSIS 3
I.1.a Global Analysis 3
I.1.b Pacific Basin (fig. 3, 4 and 5) 4
I.1.c Atlantic Basin 6
I.1.d Indian Basin 6
I.2. ATMOSPHERE 6
I.2.a Atmosphere : General Circulation 6
I.2.b Precipitation 8
I.2.c Temperature 9
I.2.d Sea Ice 9
II. SEASONAL FORECASTS FOR JJA FROM DYNAMICAL MODELS 11
II.1. OCEANIC FORECASTS 11
II.1.a Sea Surface Température (SST) 11
II.1.b ENSO Forecast : 13
II.1.c Atlantic Ocean forecasts : 15
II.1.d Indian Ocean forecasts : 16
II.2. GENERAL CIRCULATION FORECAST 17
II.2.a Global Forecast 17
II.2.b North hemisphere forecast and Europe 18
II.3. IMPACT : TEMPERATURE FORECASTS 19
II.3.a ECMWF 19
II.3.b Météo-France 19
II.3.c Met Office (UKMO) 20
II.3.d Climate Prediction Centre (CPC) 20
II.3.e Japan Meteorological Agency (JMA) 21
II.3.f Lead Centre on Multi Model Ensemble (LCMME) 22
II.3.g Euro-SIP 23
II.4. IMPACT : PRECIPITATION FORECAST 24
II.4.a ECMWF 24
II.4.b Météo-France 24
II.4.c Met office (UKMO) 25
II.4.d Climate Prediction Centre (CPC) 25
II.4.e Japan Meteorological Agency (JMA) 26
II.4.f Lead Centre on Multi Model Ensemble (LCMME) 27
II.4.g Euro-SIP 28
II.5. REGIONAL TEMPERATURES 29
REGIONAL PRECIPITATIONS 30
II.6. MODEL'S CONSISTENCY 31
II.6.a GPCs consistency maps 31
II.7. "EXTREME" SCENARIOS 32
II.8. DISCUSSION AND SUMMARY 34

Forecast over Europe 34
Tropical Cyclone activity 34
III. ANNEX 37
III.1. Seasonal Forecasts 37
III.2. « NINO », SOI indices and Oceanic boxes 37
III.3. Land Boxes 38

I. DESCRIPTION OF THE CLIMATE SYSTEM (APRIL 2013)

I.1. OCEANIC ANALYSIS

I.1.a Global Analysis

At the Surface (fig. 1) :
Generally speaking, little evolutions in the Tropics to the exception of the Eastern Pacific. More evolutions in the sub-tropics and mid-latitudes of both Hemipshere.
For the Pacific : In the equatorial wave close to neutral conditions excepted in the most western and most eastern part of the basin (respectively positive/negative anomalies) consistently with wave propagations under the surface. Strong cooling close to the South American continent. Some warming in the South-Eastern sub-tropics of the Southern hemisphere. In the mid-latitudes of Northern hemisphere cooling close to the dateline related to the Eastward shift of the positive anomaly.

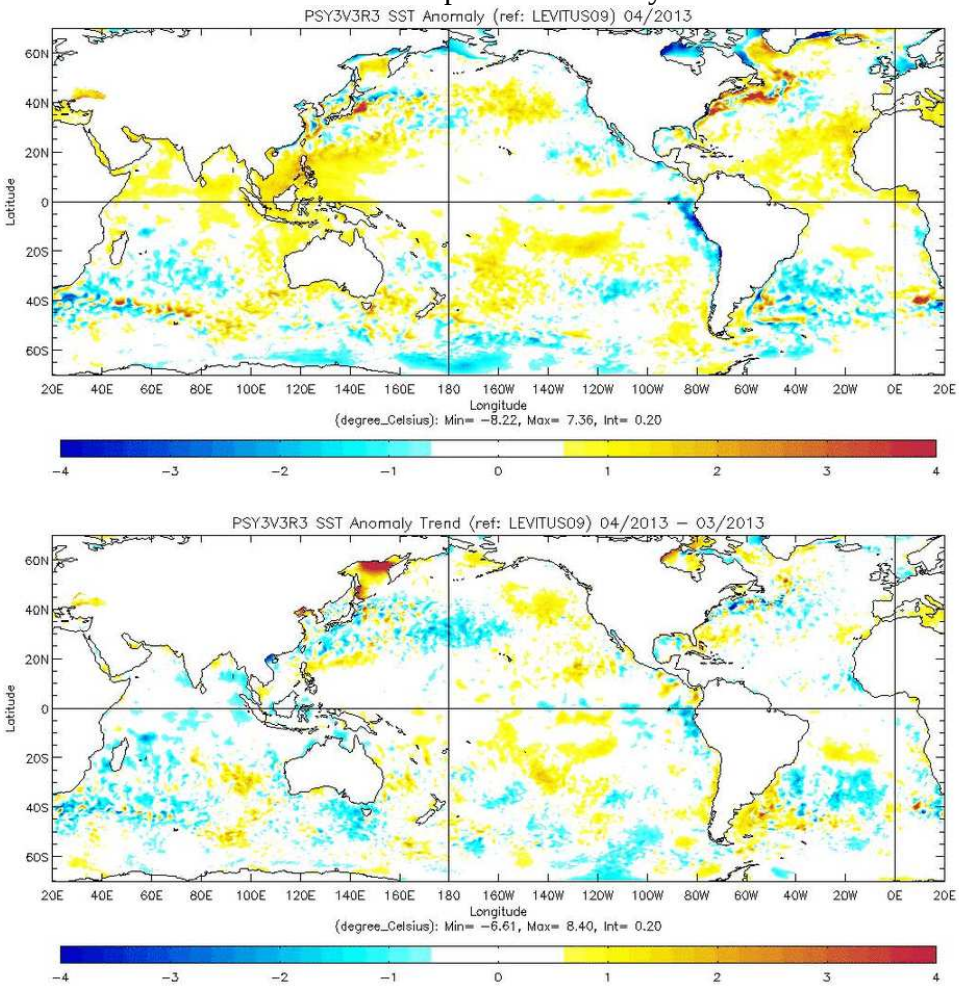


fig.1: top : SSTs Anomalies (°C) (reference 1950-2008); bottom : SST tendency (current – previous month) http://bcg.mercator-ocean.fr/

For the Atlantic : little evolution in the Tropics ; the North Tropical Atlantic remains warmer than normal while the Southern Tropical Atlantic is close to Normal. The Guinean Gulf faces some positive

anomaly. In the sub-tropics and mid-latitudes of Southern hemisphere cooling over the centre of the basin and warming close to Argentina. Some traces of cooling in the North Atlantic.

In the Indian Ocean : Little evolutions in the Northern hemisphere where SST are still mostly warmer than normal to the exception of the Bay of Bengal (cooling). In the Southern Hemisphere, to be quoted the cooling in the sub-tropics and the little evolution between Australia and the maritime continent. The DMI is close to neutral.

In subsurface (fig.2) :

Generally speaking the heat Content anomalies look very similar to the ones from the previous month to the exception of the Central Pacific equatorial waveguide.

In the Pacific : in the Tropics (including the equatorial waveguide), heat content anomalies mostly negative East to 160°W and positive West to this limit. Note the positive anomalies in the most Western part off equator (in the Northern hemisphere between 10°N and 20°N. In the SPCZ region positive anomaly extending South-East toward mid-latitudes. In the mid/high latitudes of the Northern hemisphere, great consistency with the surface signal (and similar pattern than for the Tropics).

In the Atlantic : in the equatorial waveguide and along the western coast of the African continent little anomalies. Persistence of the strong positive anomaly in the North-Eastern part of the basin (close to the mid-latitudes) up to the equatorial region. Over South Tropics anomalies are consistent with SST despite the patterns are quite fragmented.

In the Indian Ocean : heat content consistent with SST signal in the Northern hemisphere and Australia. In the equatorial waveguide the main evolution is related to the warming in the Western part of the basin.

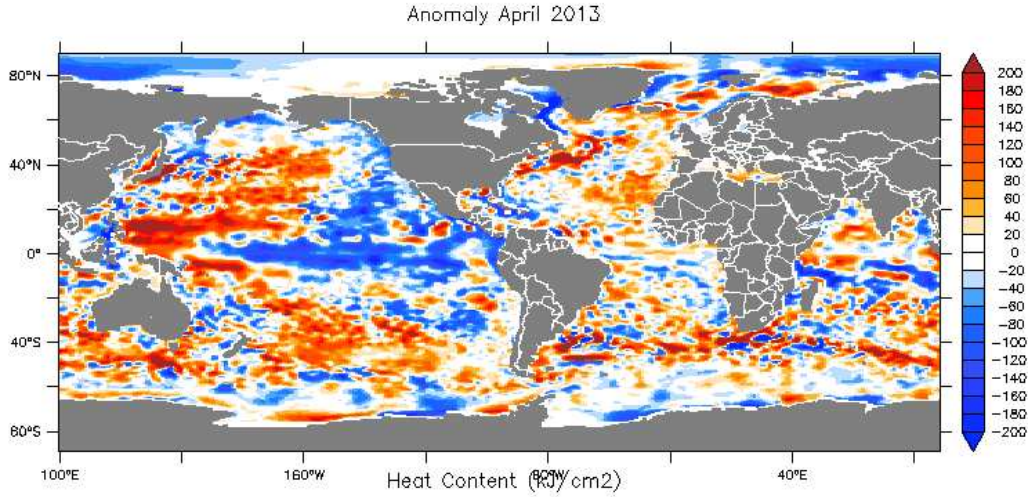


fig.2: map of Heat Content Anomalies (first 300m) (in kJ/cm²). (reference 1950-2008) http://bcg.mercator-ocean.fr/

I.1.b Pacific Basin (fig. 3, 4 and 5)

Despite the anomalies are relatively weak, a dipole pattern is visible with positive anomalies on the western and negative anomalies in the Central and Eastern part. Little trade wind anomalies over most of the basin. The SOI is close to neutral (+0.2) consistently with neutral SST conditions.

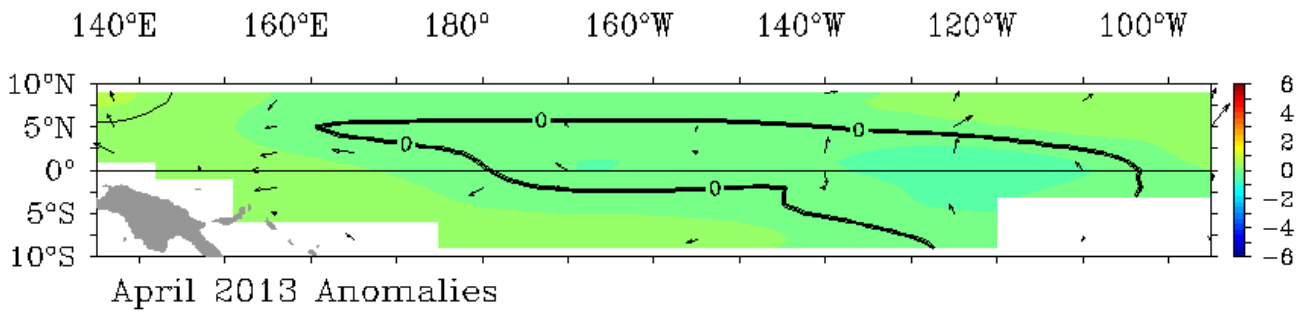


fig.3: SST Anomalies and Wind anomalies over the Equatorial Pacific from TAO/TRITON. http://www.pmel.noaa.gov/tao/jsdisplay/monthly-summary/monthly-summary.html

In the Niño boxes (4, 3.4, 3 et 1+2 ; see definition in Annex) the SST anomalies illustrate the netral conditions in the Pacific. The monthly averages are respectively 0,0°C, -0,1°C, -0,2°C and -0,9°C from West to East.

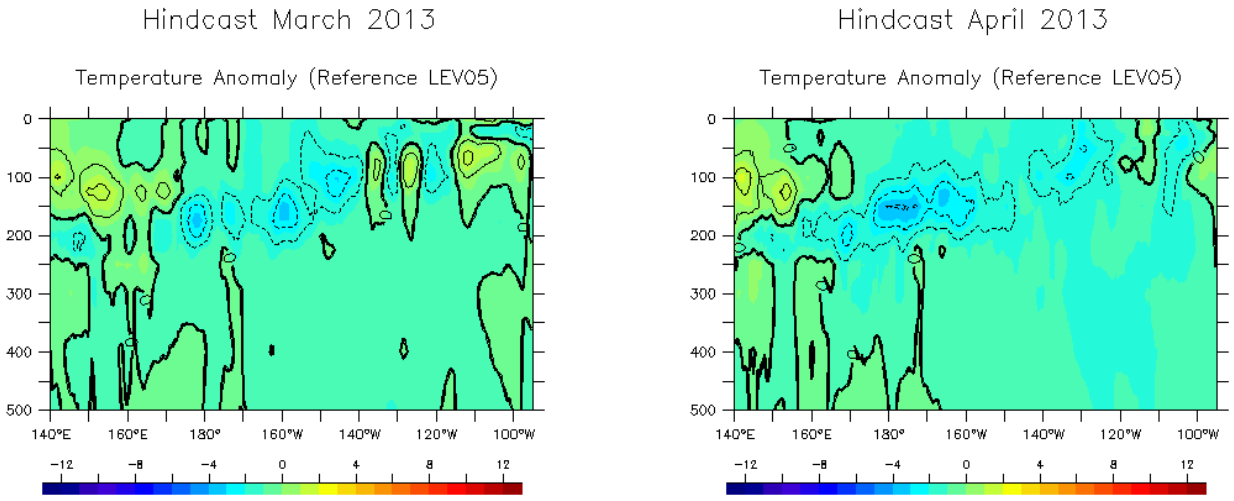


fig.4: Oceanic temperature anomaly in the first *500 metres* in the Equatorial Pacific, in previous month (left) and current month (right) http://bcg.mercator-ocean.fr/

In the equatorial waveguide (fig. 4) : still traces of propagation of Kelvin waves under the surface (colder than normal) in April from West to East. On the most Western part, the warm reservoir is still visible. This signal is to be carefully monitored with respect of next months and possible evolution for the end of this year.

The thermocline structure (fig. 5) : some traces of wave propagation signal of both anomalies as already pointed out in the previous comment. The deepening and strengthening of the warm reservoir on the most western side is visible at the end of the period.

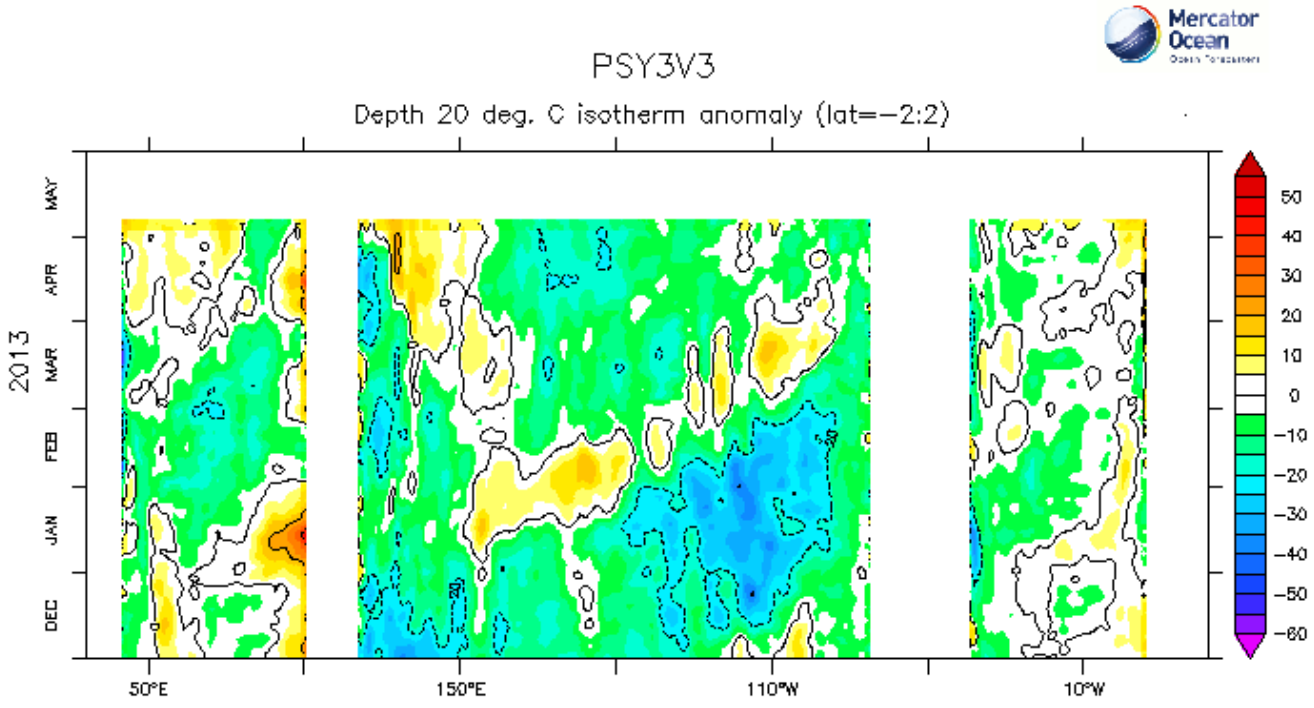


fig.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 6 month period. http://bcg.mercator-ocean.fr/

I.1.c Atlantic Basin

Northern Tropical Atlantic : mostly warmer than normal and little evolutions.
Equatorial waveguide : weak dipole structure (slightly cooler than normal on West and warmer than normal on East), with trace of wave propagation. Guinean Gulf slightly warmer than normal.
The Southern Tropical Atlantic : Close to normal. Some traces of warmer than normal conditions along the most Eastern part of the basin.

I.1.d Indian Basin

Southern Tropical Indian Ocean : mostly cooling on the Western side. Warmer than normal between Australia and the maritime continent.
Equatorial waveguide : the extension of the warm conditions on the western side is conspicuous while a strong positive anomaly is present close to the maritime continent. The DMI is close to normal.
Northern Tropical Indian Ocean : slightly warmer than normal more or less everywhere.

I.2. ATMOSPHERE

I.2.a Atmosphere : General Circulation

Velocity Potential Anomaly field in the high troposphere (fig. 6 – insight into Hadley-Walker circulation anomalies) : quite fragmented cells partly related to MJO activity (in the Tropics) as there is only little SST forcing and partly related to mid-latitude atmospheric activity.
On the Pacific : Divergent circulation anomaly (upward anomaly motion) on the Western equatorial region in the western side of the SPCZ. This signal is likely related to the MJO activity. Then more surprisingly on the Eastern part of the basin still a negative anomaly (upward anomaly motion). In addition, note the linkage to other patterns of the Northern sub-tropics (South-West US and Carribbean) and of South-America.
On the Atlantic : Strong Convergent circulation anomaly (downward anomaly motion) over the Southern Tropical Atlantic (likely in relationship with sub-regional dynamical forcing). In the Northern hemisphere, to be quoted the dipole structure positive/negative anomalies (downward/upward anomaly motion) between the Southern US and Eastern Atlantic (this later likely partly related to mid-latitude activity and partly to tropics). In the Southern hemisphere, to be quoted the negative anomaly over the sub-tropics.
On the Indian Ocean : Positive anomaly (convergent circulation anomaly - downward anomaly motion) over South-Africa and Madagascar.

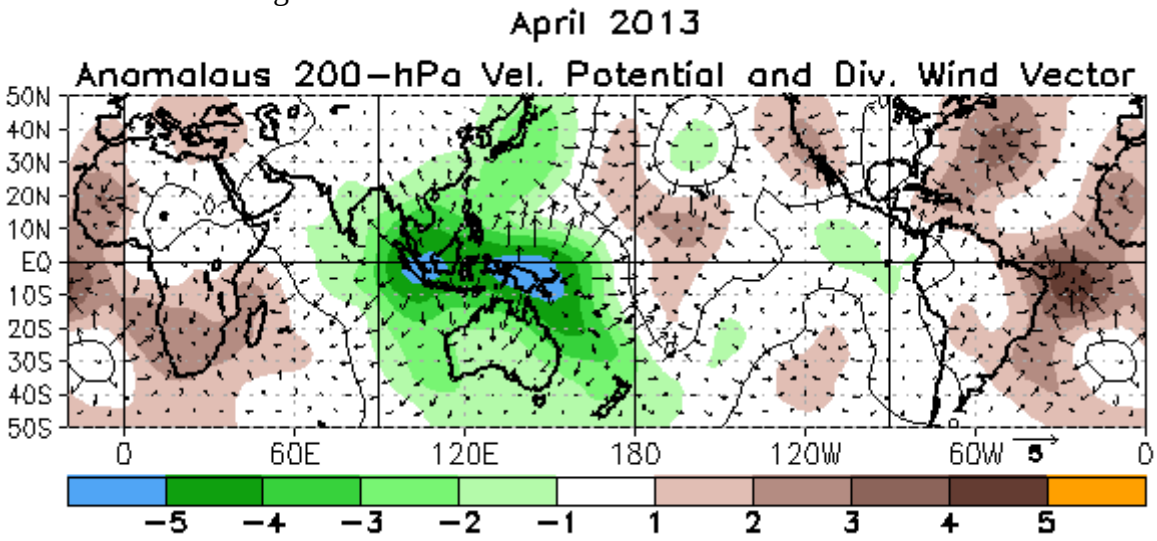


fig.6: Velocity Potential Anomalies at 200 hPa and associated divergent circulation. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly). http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

Stream Function anomalies in the high troposphere (fig. 7 – insight into teleconnection patterns tropically forced) : the strongest signal is likely related to mid-latitude activity. The Tropical Velocity Potential anomalies seem to have little impact onto the atmosphere.

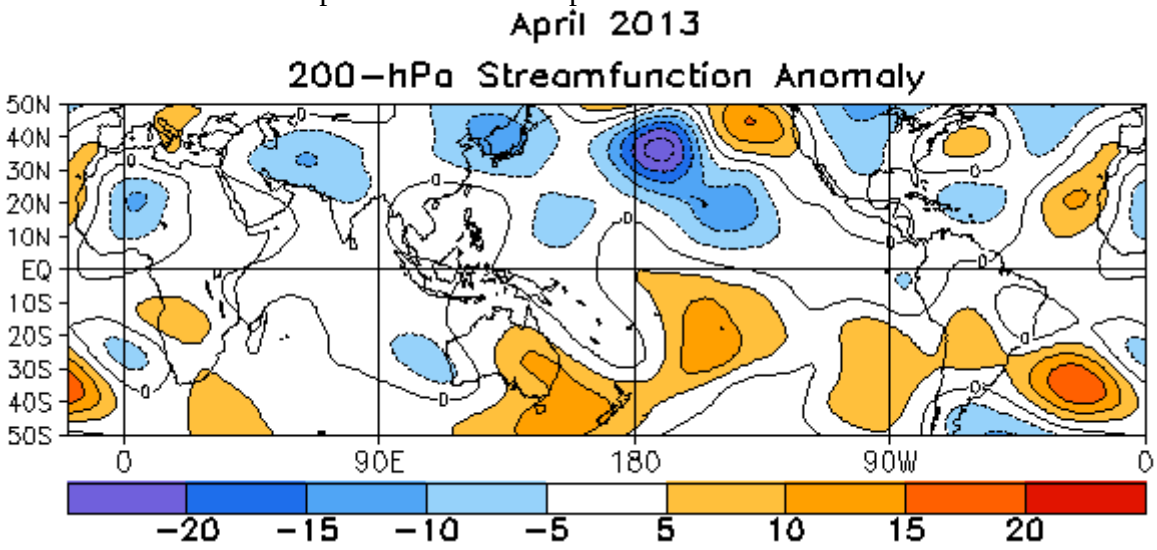


fig.7: Stream Function Anomalies at 200 hPa.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

Geopotential height at 500 hPa (fig. 8 – insight into mid-latitude general circulation) : The greatest anomaly is observed in the High and mid-latitudes of the Pacific. Over the Western façade of Europe the anomalies are weak. Consistently, the main active modes are the WP (-1.9) and the PNA (-1.8). The active mode over Europe are the Scandinavian (-1.1) and the East Atlantic modes (1.3).

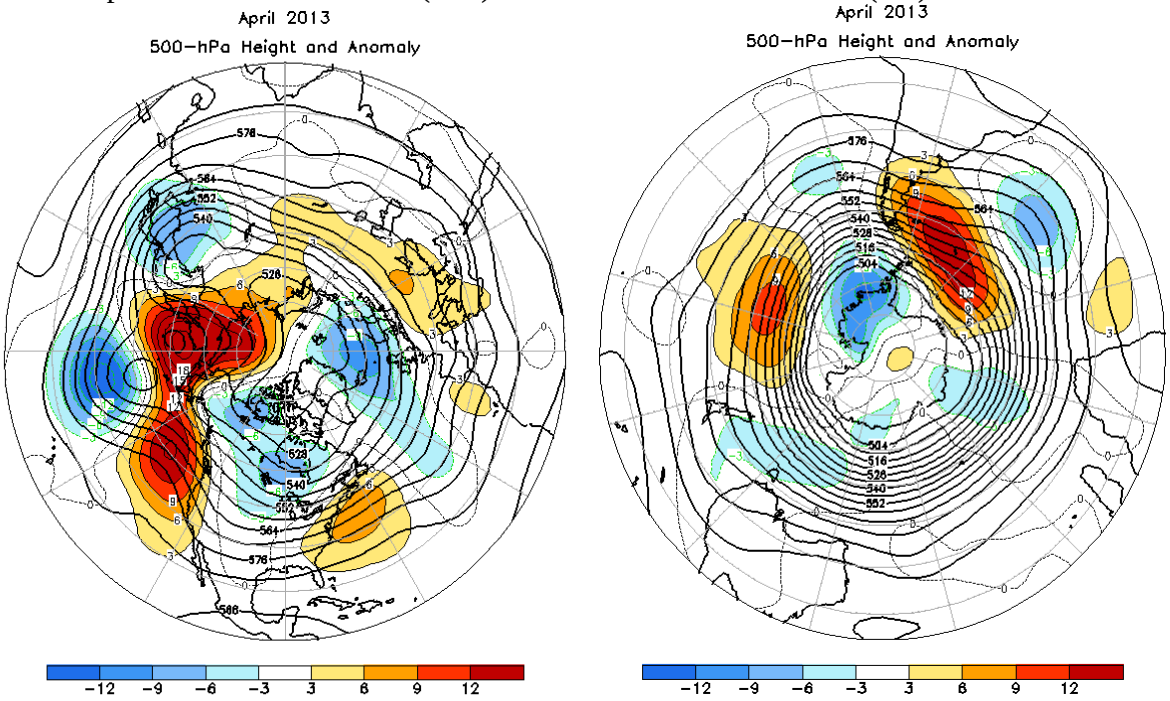


fig.8: Anomalies of Geopotential height at 500hPa (left North Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige9.shtml, and right South Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige15.shtml)

Evolution of the main atmospheric indices for the Northern Hemisphere for the last 6 months :

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
APR 13	**0.6**	**1.3**	**-1.9**	**1.2**	**-1.8**	**---**	**0.4**	**-1.1**	**-1.6**
MAR 13	-2.1	-0.2	0.6	0.7	-0.3	---	2.3	-0.6	-1.9
FEB 13	-1.0	0.1	1.5	-0.9	0.3	0.9	-1.3	1.0	0.3
JAN 13	-0.1	0.9	0.1	0.1	0.1	1.3	0.5	0.1	-1.9
DEC 12	0.1	0.7	-0.6	---	-1.3	-1.3	-0.9	2.0	0.4
NOV 12	-0.7	1.1	-2.0	0.1	-1.1	---	-0.6	0.7	-0.2

http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/table3.shtml

I.2.b Precipitation

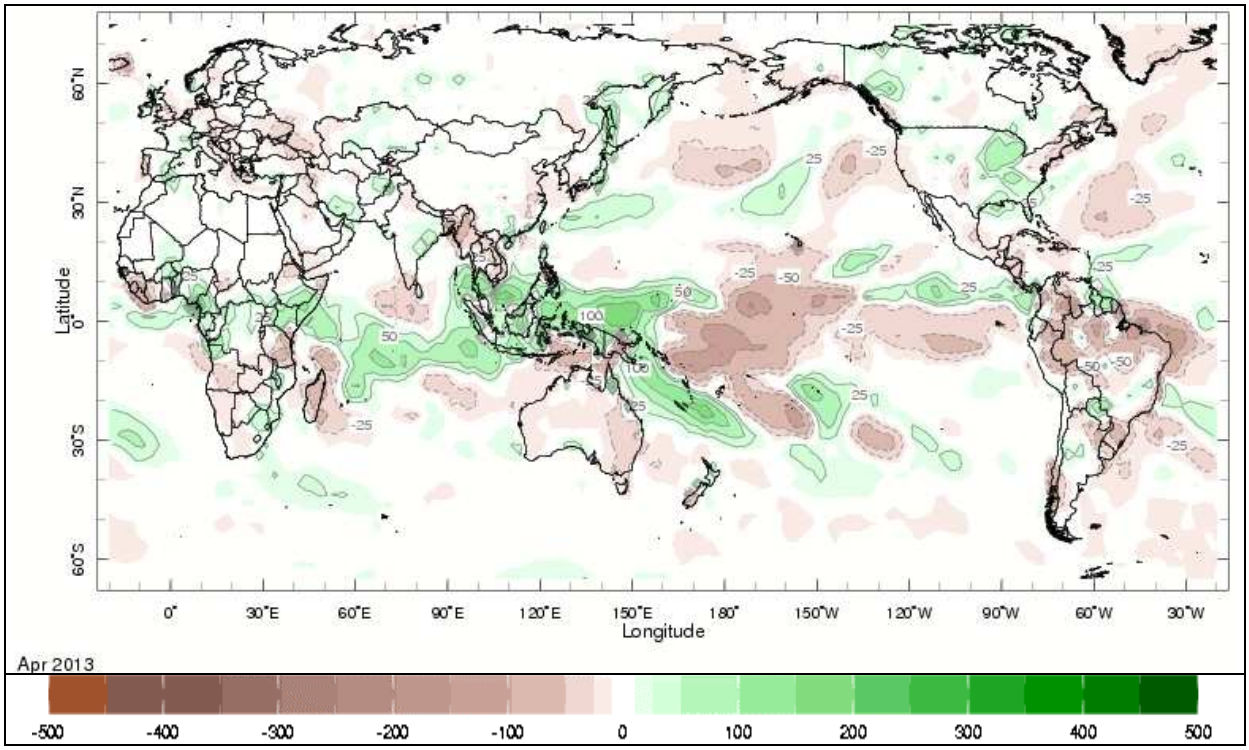


fig.9: Rainfall Anomalies (in mm) (departure to the 1979-2000 normal) – Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/

Most of the rainfall patterns in the Topics are consistent with the Velocity Potential anomaly field, to the exception of the central (in the Southern Hemisphere) and equatorial western part of the Indian Ocean.

Pacific : good consistency with the Divergent Circulation anomalies and the MJO activity; especially over the West Equatorial regions and the vicinity of the SPCZ region. In the sub-tropics of the Northern Hemisphere, good relationship between the rainfall anomaly and the velocity potential anomaly field (see coastal Western and Eastern Pacific regions).

Atlantic/Africa : Strong negative anomaly over the Northern Brazil and Amazonian regions and over the West-Southern part of Africa. The positive anomalies over Central Africa could be related to the warmer than normal SSTs (Guinean Gulf and West Indian Ocean) and a more active than normal ITCZ. Contrasted situation across West Africa.

Indian Ocean : Clear patterns of negative anomalies consistent with the velocity potential field. However, a large positive anomaly in the South-Central ocean is more difficult to interpret. To be quoted some positive anomaly over Eastern regions of India while dry conditions exist eastward and over the most southern part of India.

Australia : Dry conditions over the Eastern side and across the continent consistently with the velocity potential field anomalies.

North America : mostly dry over coastal area of West US (see Pacific) and close to the Gulf of Mexico. Some positive anomaly from Florida up to the Great Lake region.
Europe : Weak anomalies. But a clear tendency to dry conditions close to the eastern regions of the Mediterranean basin.

I.2.cTemperature

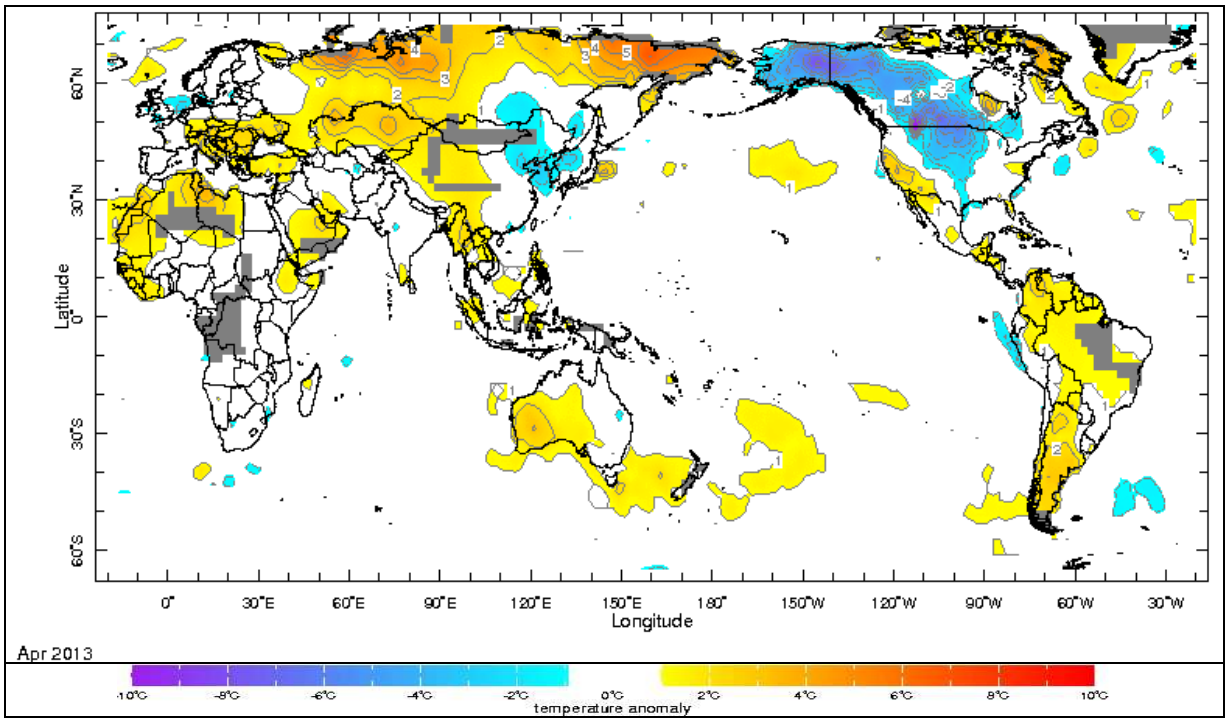


fig.10: Temperature Anomalies (in °C) (departure to the 1979-2000 normal)
http://iridl.ldeo.columbia.edu/maproom/.Global/.Atm_Temp/Anomaly.html

North-America : Strong anomalies ; Colder than normal conditions over most of Canada and North-Central US. Positive anomalies in the vicinity of California.
South-America : mostly Warmer than normal conditions everywhere (especially Argentina).
Australia : some traces of Warmer than normal conditions in the South-Western side.
Asia : Strong Warm anomaly over Kazakhstan and Siberia extending over Western China up to South-East Asia. Negative anomaly over North-East China and Korea.
Africa : Warmer than normal conditions over the Western part of the continent from the Guinean Gulf up to Algeria. Also some warmer than normal conditions over the Arabic Peninsula.
Europe : Above normal conditions over most of South-Eastern European regions (close to normal elsewhere).

I.2.d Sea Ice

In Arctic (fig. 11 - left) : well below normal sea-ice extension especially over the Atlantic side (negative anomaly below the value of last year).
In Antarctic (fig. 11 - right) : well above normal sea-ice extension anomaly with some large regional modulation.

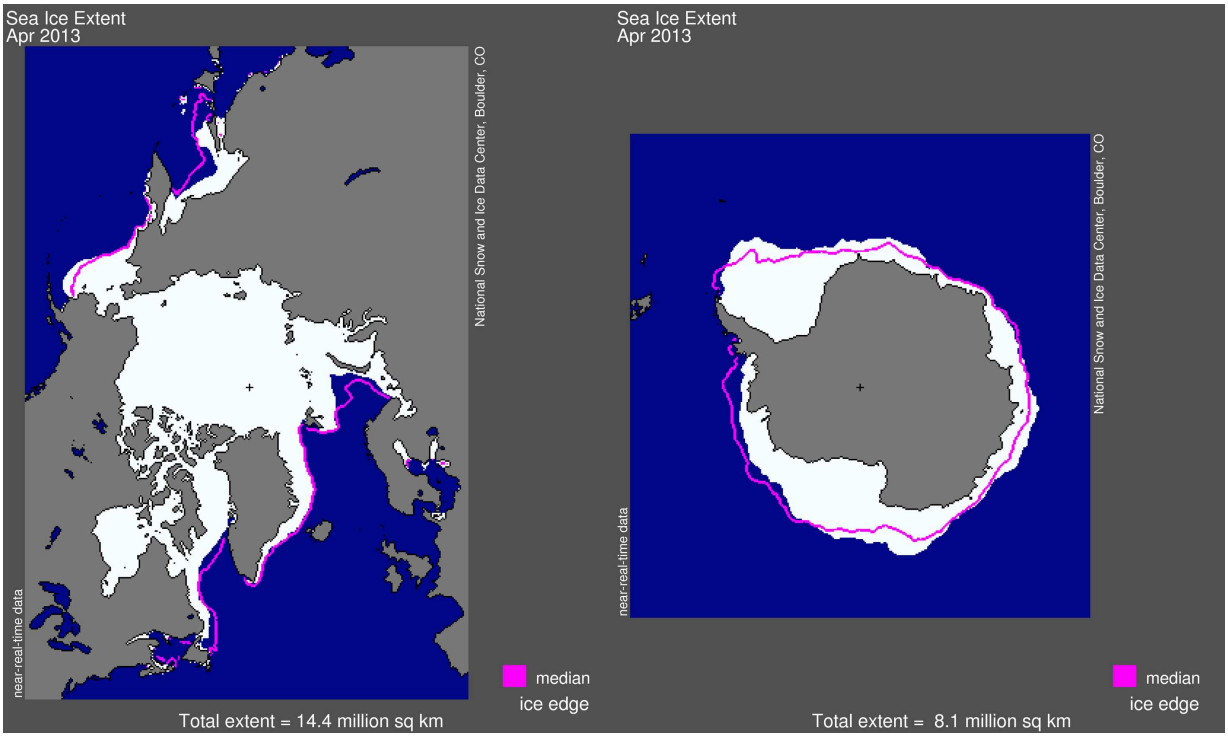


fig.11: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

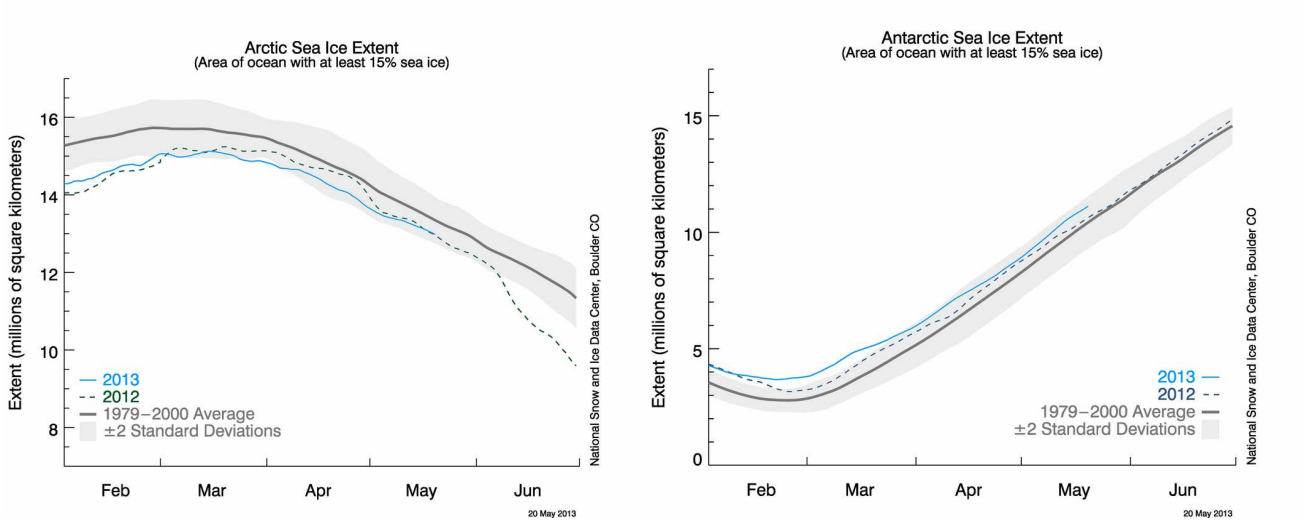


fig. 9bis : Sea-Ice extension evolution from NSIDC
http://nsidc.org/data/seaice_index/images/daily_images/N_stddev_timeseries.png

II.SEASONAL FORECASTS FOR JJA FROM DYNAMICAL MODELS

II.1. OCEANIC FORECASTS

II.1.a Sea Surface Température (SST)

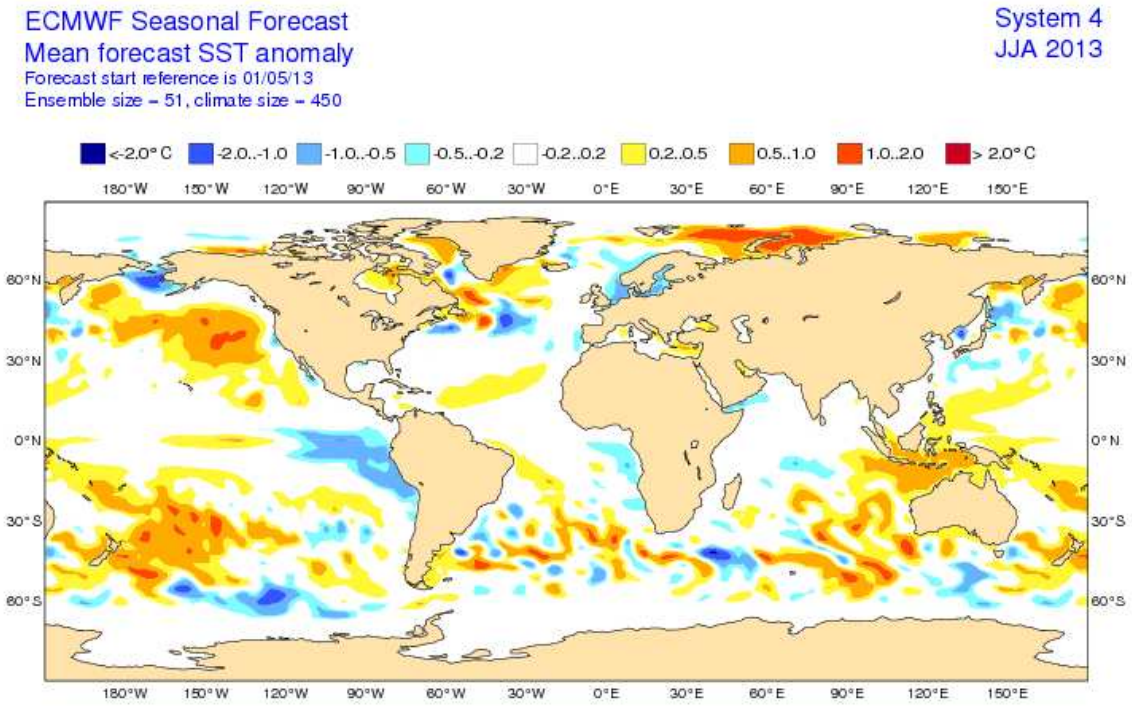


fig.12: SST anomaly forecast (in °C) from ECMWF for JJA, issued in May.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

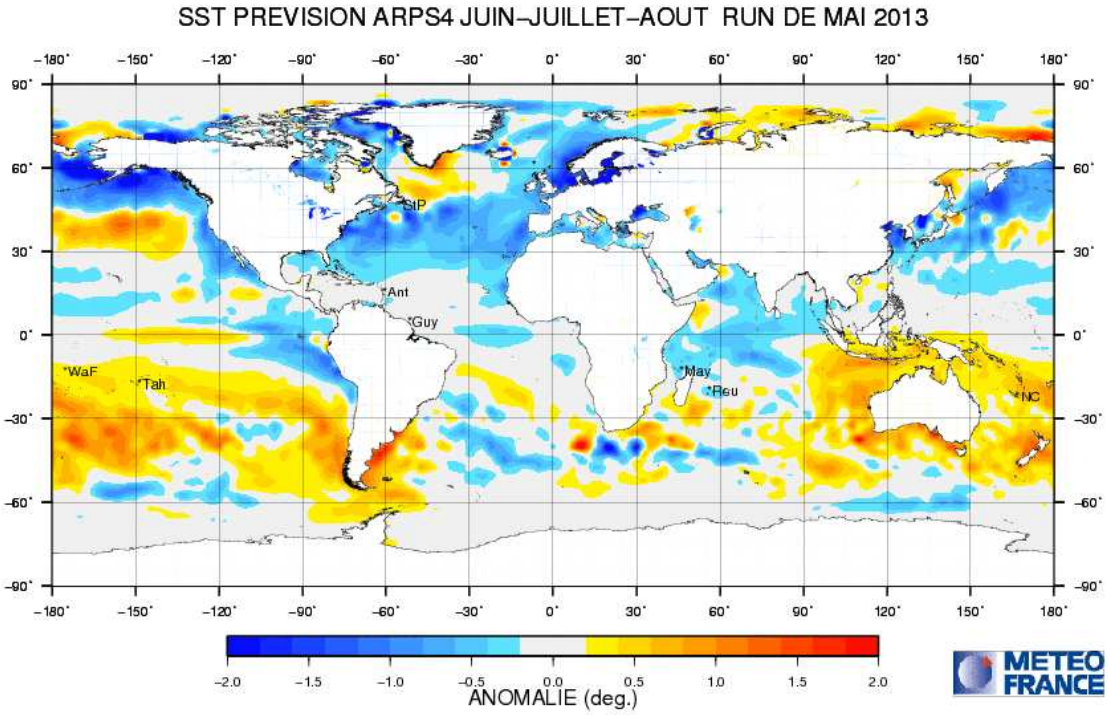


fig.13: SST Anomaly forecast (recalibrated with respect of observation) from Météo-France for JJA, issued in May. http://elaboration.seasonal.meteo.fr/

For the 2 individual models :
Even at large scale it appears some differences between the 2 models. The main differences are seen over the Tropical Atlantic and the Indian Ocean whatever the differences in the post-processing of the anomalies (including reference period for the hindcast ; 81-2010 for ECMWF and 91-2010 for MF system 4).
Pacific : along the equator the conditions are quite similar in both models with cold conditions on the most eastern side and a small cell of warmer than normal conditions in the eastern part of the basin (close to 150°W). Conversely to the previous forecast, there is no more development of warm conditions in the central and eastern pacific along the 7 months range. There is only a positive anomaly in the warm pool.
Atlantic : in both model consistency in Southern Tropical (and sub-tropical) Atlantic. There is more differences on the Northern Hemisphere starting in the equatorial waveguide (neutral in ECMWF and mostly colder than normal in MF) and following in the Sub-Tropics and mid-latitudes (Colder than normal scenario in MF while there is only little signal in ECMWF). In both models positive anomaly close to Greenland.
Indian Ocean : mostly consistent East to 90°E with warmer than normal conditions in the Southern Indian Ocean (close to normal or slightly colder than normal in the Northern part). Weak and consistent signal in the equatorial waveguide. Then West to 90°E, some large differences especially in the South-West Indian ocean from Comores up to Mauritius with colder than normal conditions in MF and close to normal in ECMWF and in the Northern hemisphere (mostly colder than normal in MF).
In Euro-SIP :
Some robust patterns appear in the tropics but not really in the equatorial waveguide.
Pacific : Equatorial waveguide : close to normal excepted over the most Western and most Eastern part of the basin (respectively weak positive and negative anomalies). Cold anomaly developing along the coast of South America. Quite consistent patterns in the mid-latitudes of both hemispheres (mostly warmer than normal).
Atlantic : Weak signal over the Tropics and sub-tropics (both South and North). Some little consistency over the mid and higher latitudes of the Northern and Southern Hemisphere.
Indian Ocean : weak signal over most of the basin to the exception of warmer than normal conditions on the South-Eastern part of the basin (close to Australia and the maritime continent).

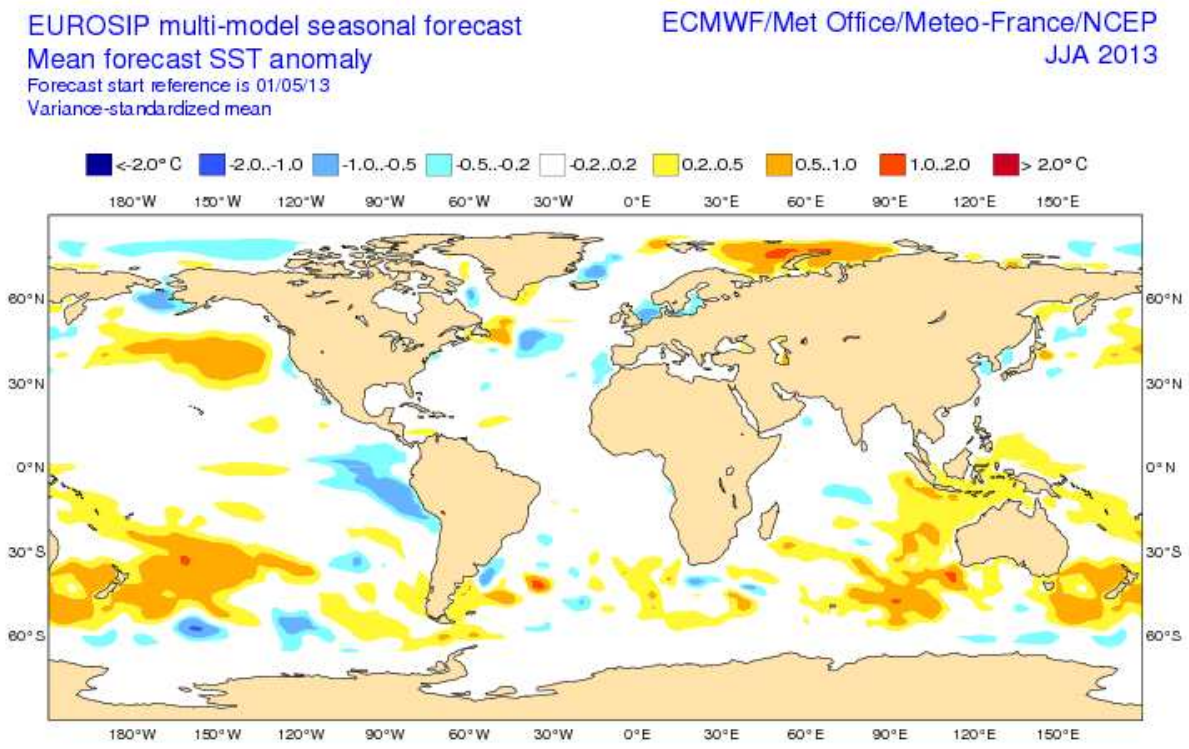


fig.14: SST Forecasted anomaly (in °C) from Euro-SIP for JJA, issued in May.

II.1.b ENSO Forecast :

Forecasted Phase for AMJ : neutral

For JJA : the majority of the models indicate close to neutral conditions for the targeted period. Most of the dynamical models show a tendency to a slight warming while most of the statistical models are indicating a cooling for the end of the year.

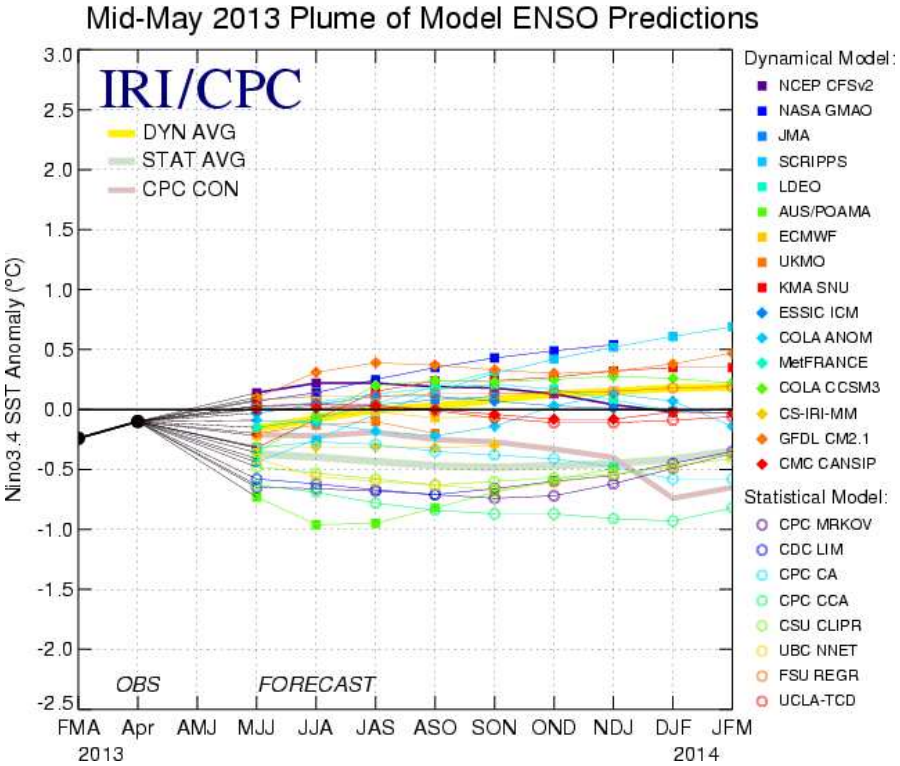


fig.15: Synthesis of Niño 3.4 forecasts (120° to 165°W) issued in May by IRI :
http://iri.columbia.edu/climate/ENSO/currentinfo/SST_table.html

Plumes from Météo-France and ECMWF for the 3 Niño boxes (see definition in Annex – fig. 16) :
In both models the ENSO thresholds are not reached on average for the JJA period ; both models are indicating a progressive warming. One can notice that also in both models the spread dramatically increases from the Centre up to the East of the basin and in time (very likely in relationship with the actual prevailing conditions). In EuroSIP Plumes, close to normal conditions on average and large spread indicating a large uncertainty.

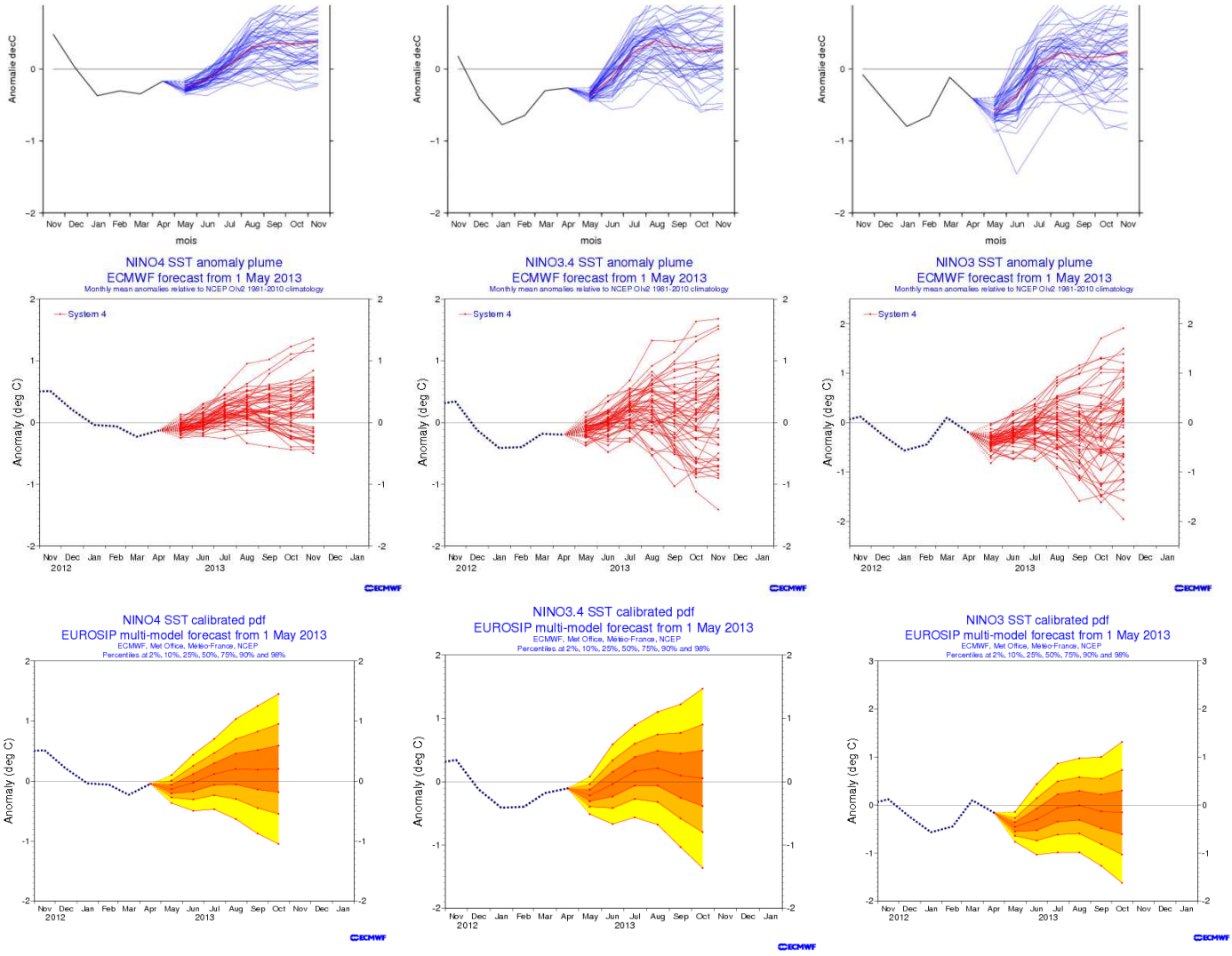


fig.16: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members - and EuroSIP (bottom) – recalibrated distributions - issued in May (http://www.ecmwf.int/)

II.1.c Atlantic Ocean forecasts :

Forecasted Phase: ***close to normal in both Tropics***

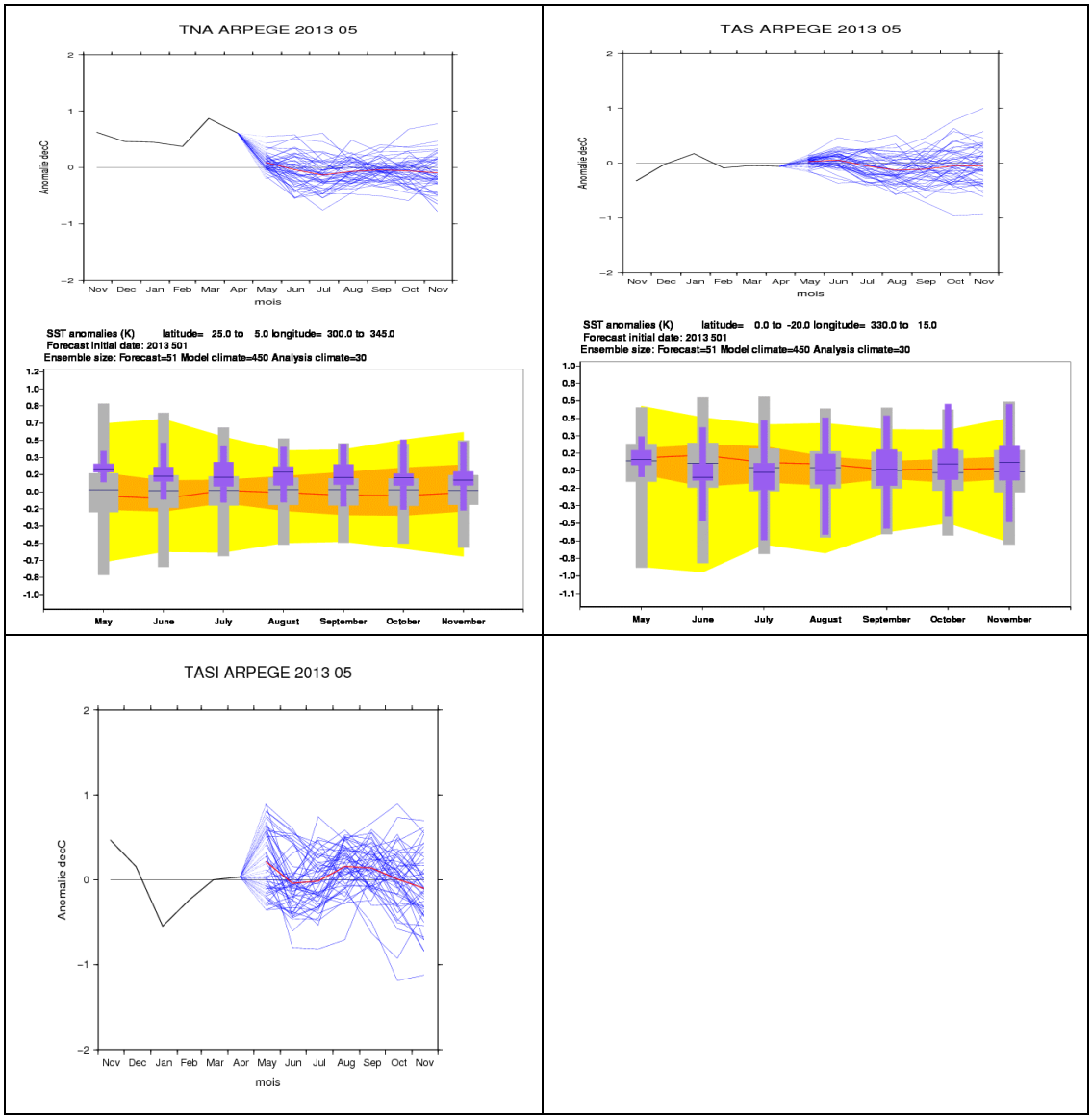


fig.17: SSTs anomaly forecasts in the Atlantic Ocean boxes from Météo-France and ECMWF, issued in May, plumes / climagrams correspond to 51 members and monthly means.

North Tropical Atlantic : slightly warmer than normal conditions in both models (taking into account the difference in hindcast periods) with a reasonable spread.
South Tropical Atlantic : in both models close to normal conditions.
The inter-hemispheric SST gradient should stay positive which is interesting to look at with respect of the monsoon behaviour in West Africa. However, the spread is quite large.
TASI : the TASI index is slightly positive in JJA. However the spread is large.

II.1.d Indian Ocean forecasts :

Forecasted Phase: *IOD on the negative side*

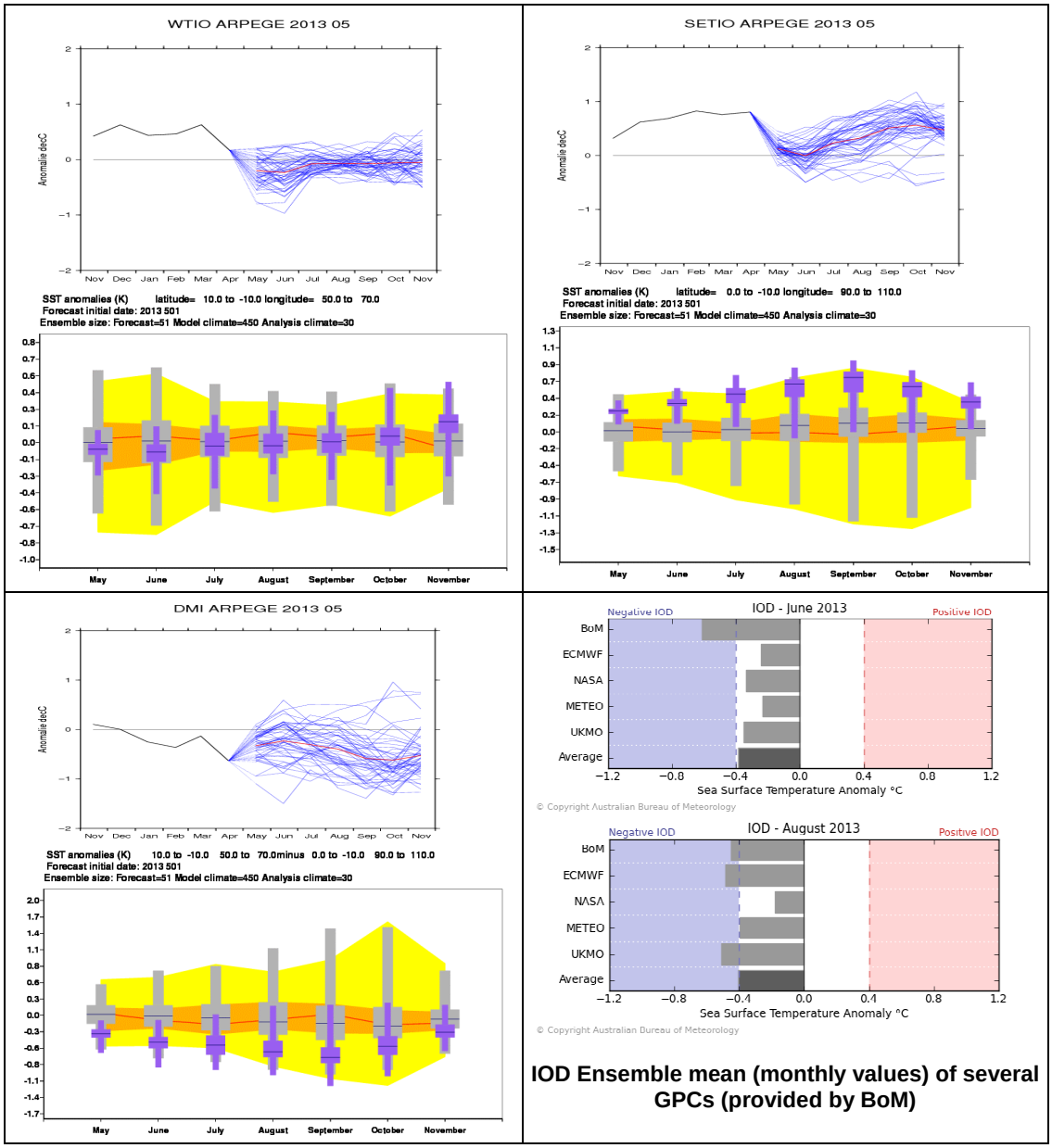


fig.18: SSTs anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, issued in May, plumes / climagrams correspond to 51 members and monthly means.

In WTIO : Consistent signal in both models. Slightly colder than normal conditions progressively moving to close to normal conditions; both models with reasonable spread and stable conditions along the whole period.

In SETIO : Close to normal in MF and then progressive warming; likely consistently with the Western Pacific SSTs behaviour. Consistent signal in ECMWF and reasonable spread in both models.

DMI (IOD) : Negative phase in both models becoming progressively (in relationship with SETIO evolutions) and little spread in ECMWF.

II.2. GENERAL CIRCULATION FORECAST

II.2.a Global Forecast

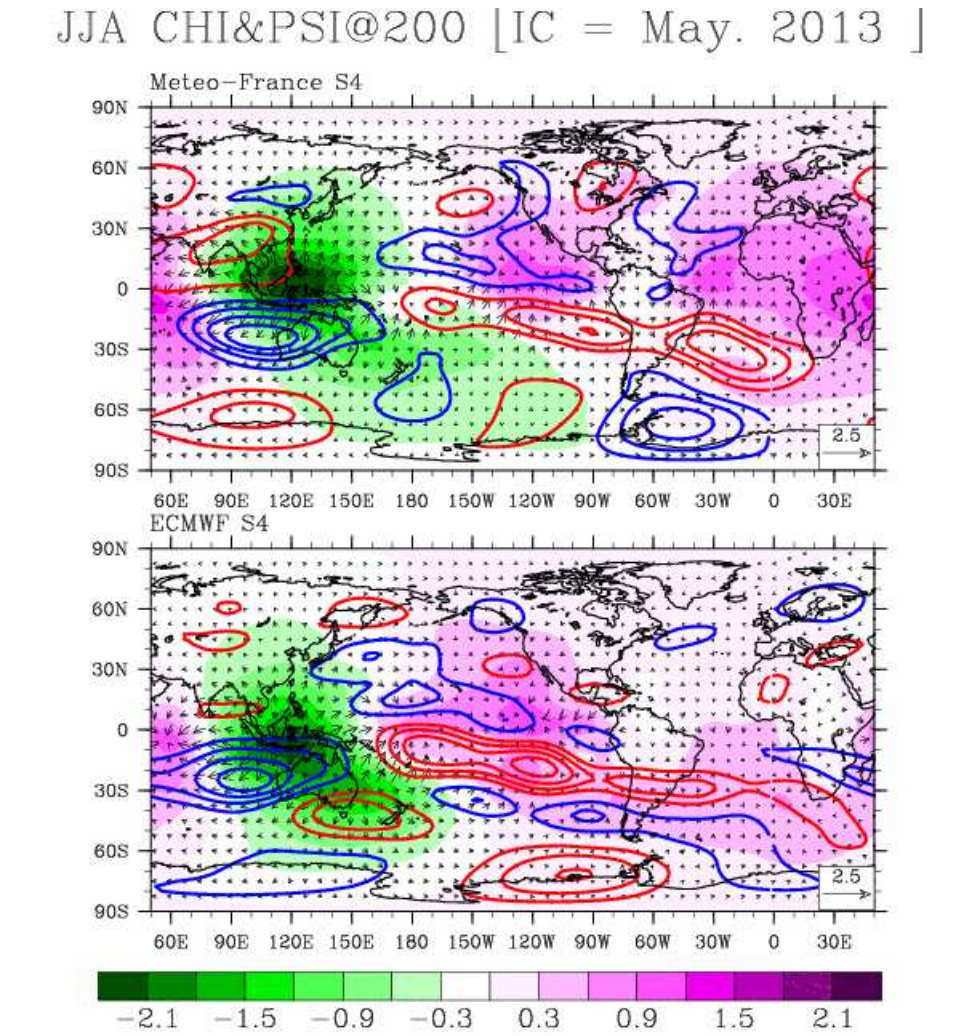


fig.19: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), associated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa for AMJ, issued in March by Météo-France (top) and ECMWF (bottom).

Velocity potential anomaly field (cf. fig. 19 – insight into Hadley-Walker circulation anomalies) :
in the Tropics : atmospheric response quite consistent but with very weak in the Northern Hemisphere likely in relationship with quasi neutral conditions in the Tropical Oceanic basins.
Over the Pacific : Good consistency between the 2 models on the Western part with negative anomaly over the maritime continent and the warm pool. Consequently Divergent circulation anomaly (upward motion) over the West Tropics but weak and with a limited meridional extension. Still a consistent pattern on the Eastern part of the basin (convergent circulation anomaly – downward anomaly motion).
Over Indian Ocean : Some traces of the Divergent anomaly from the Western Pacific and ; some enhanced Divergent circulation anomaly over South-West Indian Ocean in both models. However, this later cell is limited to the ocean in ECMWF while it extends widely over the African continent in MF.
Over Atlantic : little consistency between the 2 models. In ECMWF downward anomaly motion over South Atlantic while the positive anomaly in MF is North to the equator.
Stream Function anomaly field (cf. fig. 19 – insight into teleconnection patterns tropically forced) :
In both models, over the Pacific the atmospheric response is quite consistent in both models despite the weak signal. However, there is no propagation of the signal toward mid-latitudes. Over the Atlantic it's

difficult to infer any specific atmospheric response. As a conclusion the predictability is very limited over mid-latitudes regions everywhere in the Northern Hemisphere and especially over Europe. One can infer some predictability in the Tropics over the Pacific and Eastern Indian Ocean regions.

II.2.b North hemisphere forecast and Europe

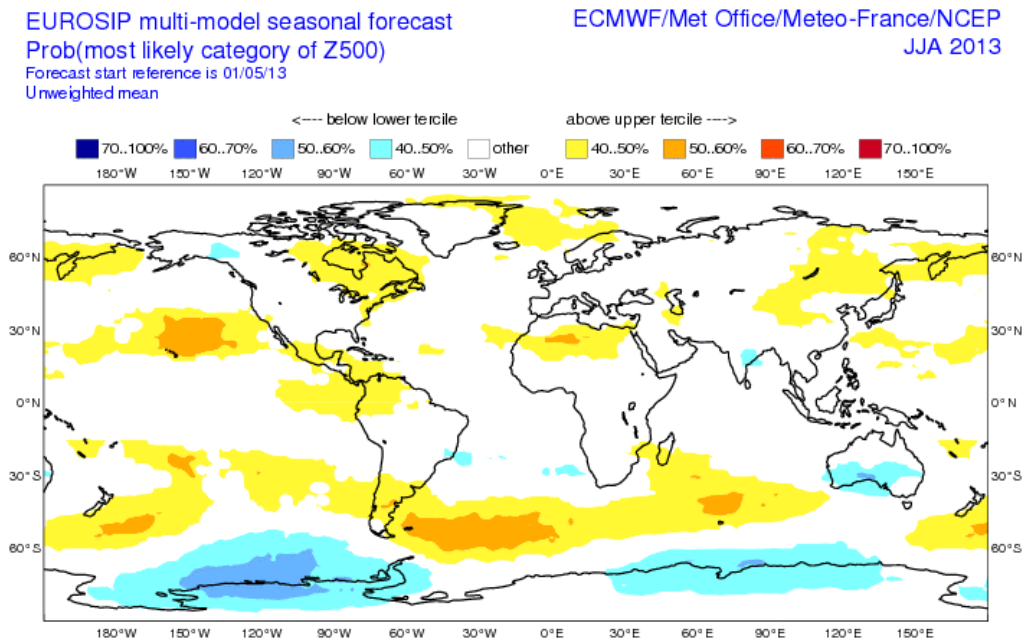


fig.20: Anomalies of Geopotential Height at 500 hPa for JJA, issued in May, from Euro-SIP. http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip

(Temporarily unvavailable)

fig.21: North Atlantic Regime occurrence anomalies from Météo-France and ECMWF : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

Geopotential height anomalies (fig. 20 – insight into mid-latitude general circulation anomalies) :
As seen on the Stream Function anomalies, there is a weak signal in both Velocity Potential anomalies and Stream Function Anomalies. So it's difficult to interpret these anomalies with respect of tropical forcing sources. The differences between the two models can likely be related to the model uncertainty.
North Atlantic Circulation Regimes (fig. 21) : As a consequence, there is only little signal in the mid-latitudes geopotential forecasts so no signal in the regimes forecast.
General atmospheric circulation in MF in the low troposphere (see fig. 22) : the zonal and meridionnal circulation over Europe don't show strong signal. In addition, due to the limited predictability, these patterns are not directly interpretable in term of teleconnection pattern.

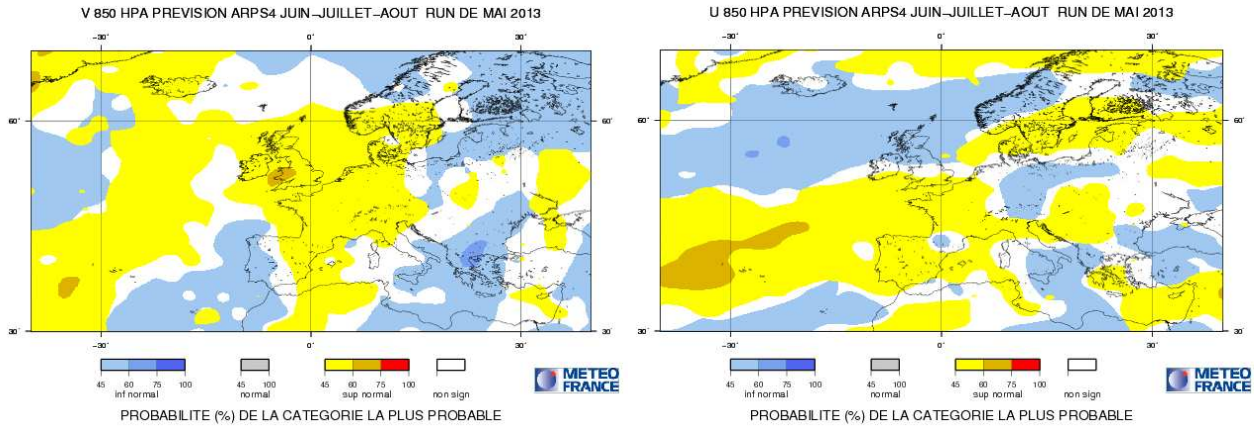


fig.22: Most likely category for the meridional (left) and zonal (right) wind at 850 hPa for JJA, issued in May from Météo-France.

II.3. IMPACT : TEMPERATURE FORECASTS

II.3.a ECMWF

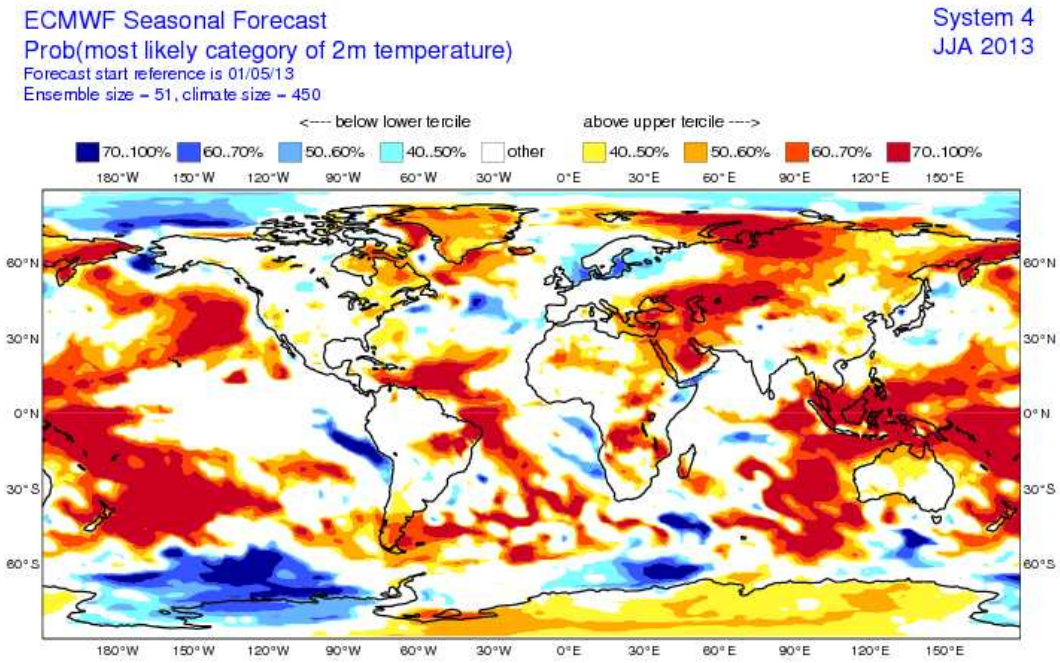


fig.23: Most likely category probability of T2m from ECMWF for JJA, issued in May. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.3.b Météo-France

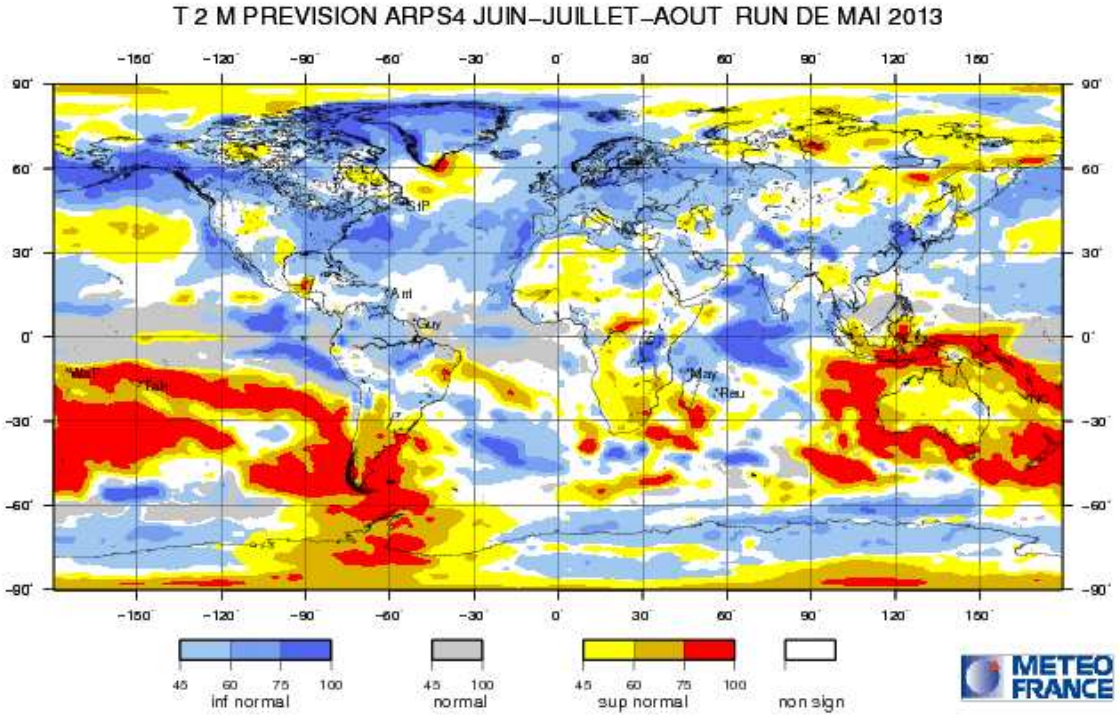


fig.24: Most likely category of T2m for JJA, issued in May. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.3.c Met Office (UKMO)

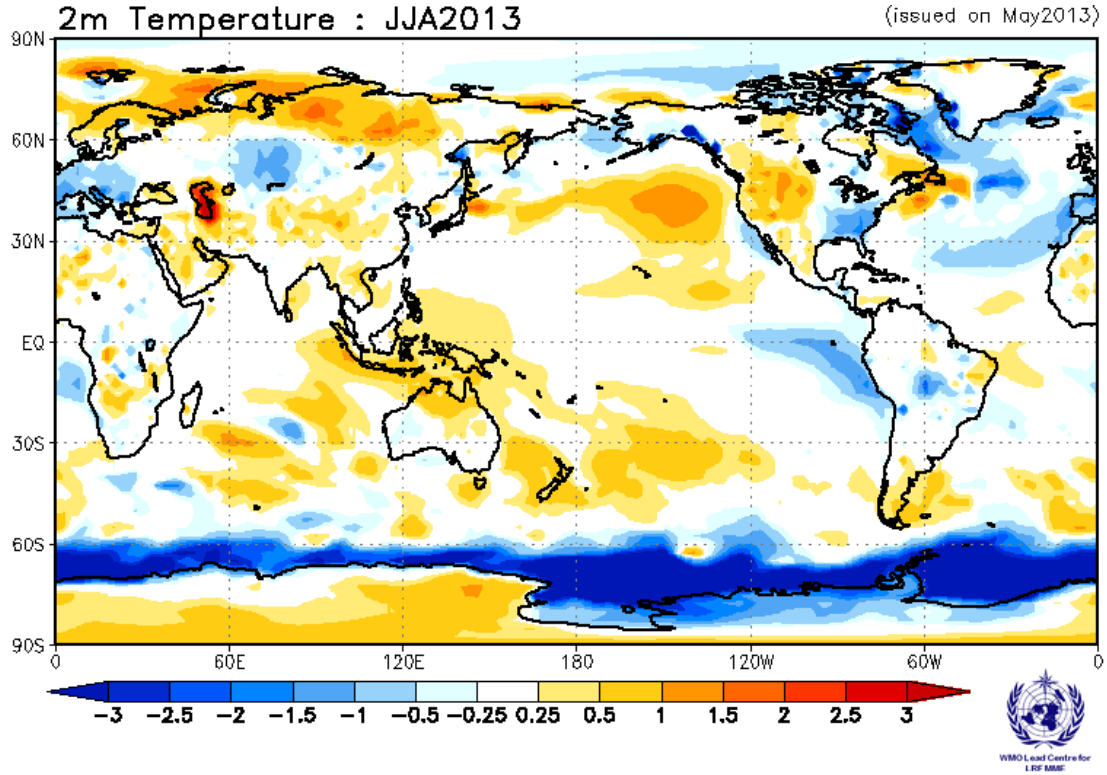


fig.25: **T2m anomaly for JJA, issued in May from UK Met Office.** https://www.wmolc.org/

II.3.d Climate Prediction Centre (CPC)

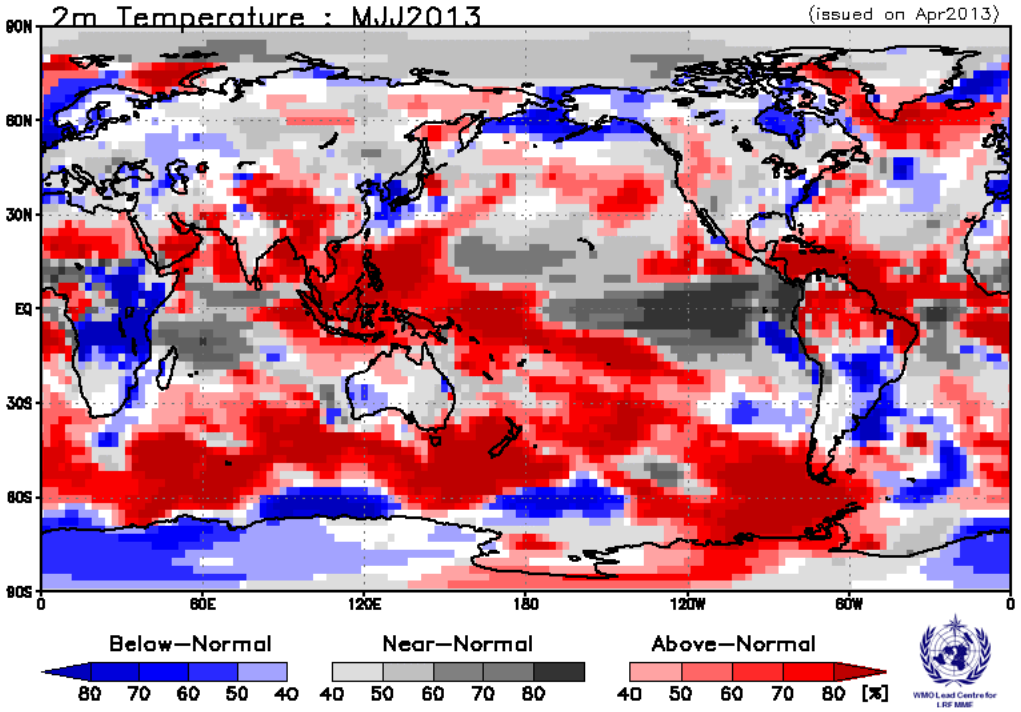


fig.26: **Most likely category of T2m Anomaly for JJA, issued in May from CPC.** https://www.wmolc.org/

II.3.e Japan Meteorological Agency (JMA)

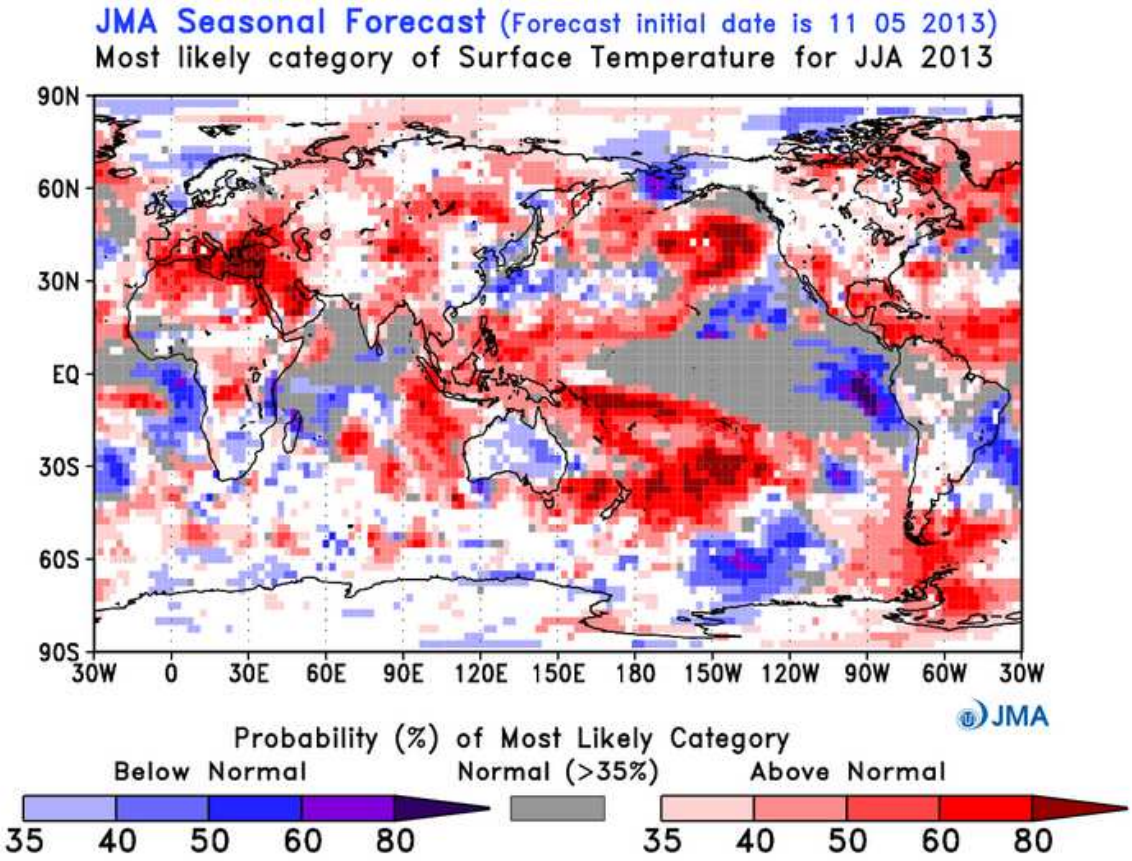


fig.27: Most likely category of T2m for JJA, issued in May. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/

II.3.f Lead Centre on Multi Model Ensemble (LCMME)

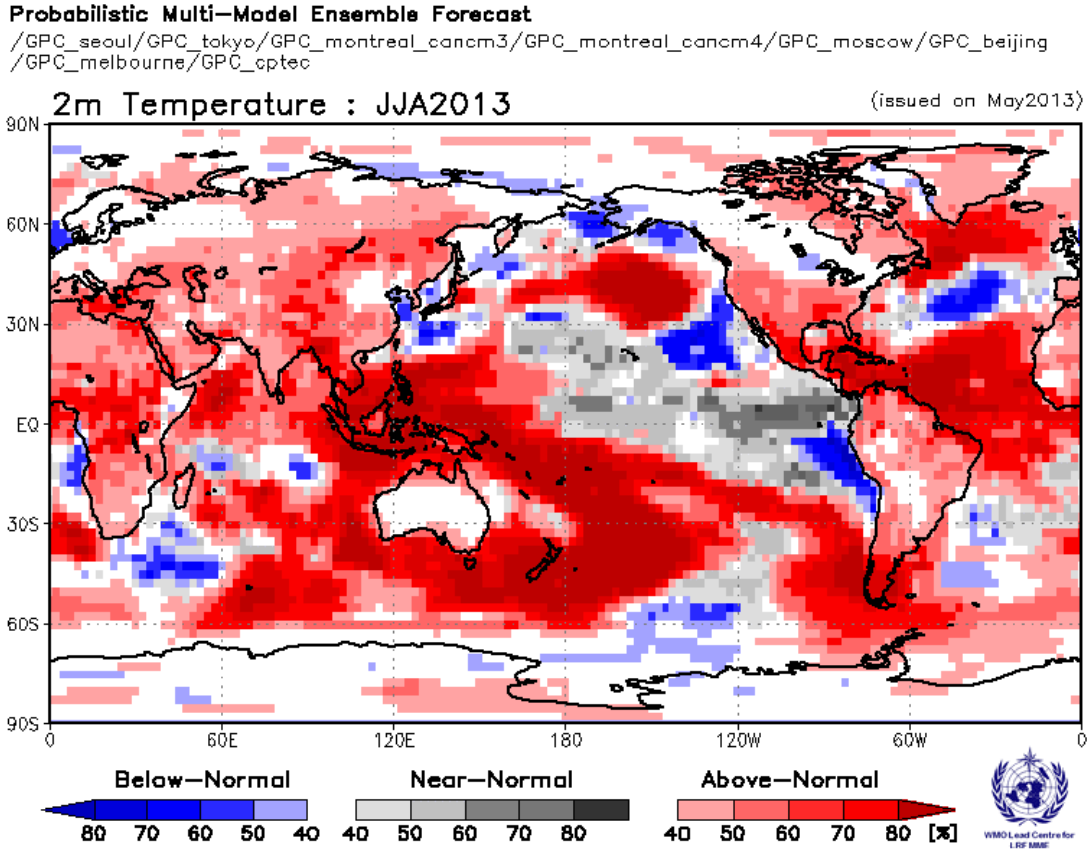


fig.28: T2m MME Anomaly for JJA, issued in May from LC-MME. The MME composition corresponds to the GPCs not used in EuroSIP https://www.wmolc.org/

II.3.g Euro-SIP

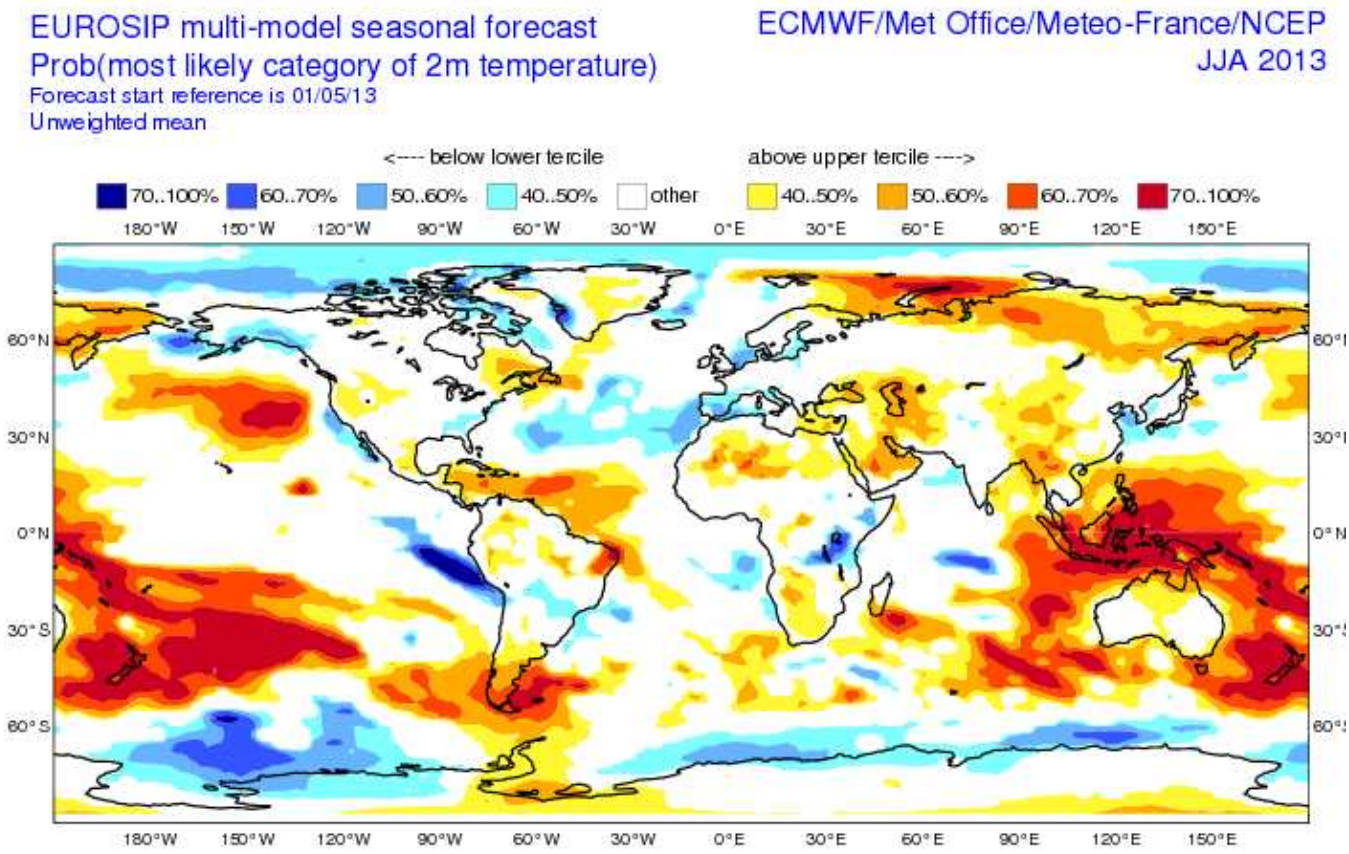


fig.29: Multi-Model Probabilistic forecasts for T2m from EuroSip for JJA, issued in May. (2 Categories, Below and Above normal – White zones correspond to No signal and Normal).

http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

North-America : Little signal across the North American continent. Colder than normal over the coastal area of Alaska and weak enhanced probability on the dipole West/East US.
South-America : Some limited signal over the Northern regions and the most southern part (warmer than normal).
Australia : Warmer than normal over the Northern part of the country.
Asia : Warmer than normal conditions over the maritime continent, from Bengla Desh up to Siberia and the Arabic Peninsula and regions close to the Caspian Sea.
Africa : Warmer than normal conditions over North and South Africa, colder than normal conditions in the vicinity of the Tanganyika Lake.
Europe : No signal over most of the continent to the exception of the Iberic peninsula (colder than normal) and the most eastern part of South Europe (warmer than normal).

II.4. IMPACT : PRECIPITATION FORECAST

II.4.a ECMWF

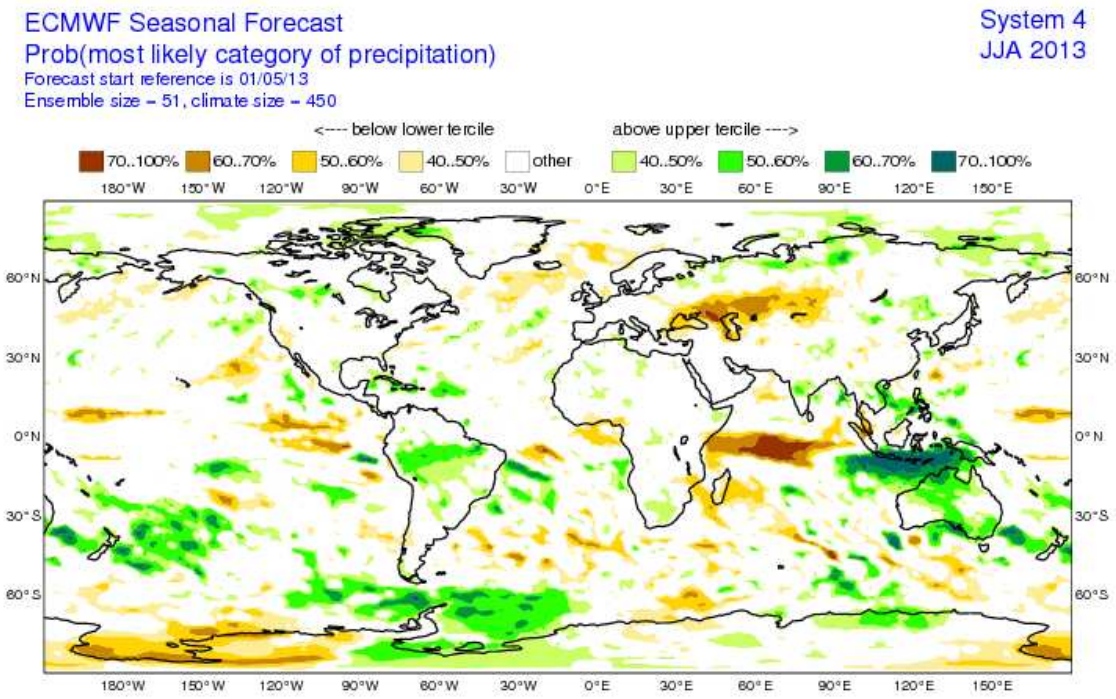


fig.30: Most likely category probability of rainfall from ECMWF for JJA, issued in May. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/charts/seasonal_charts_s2/

II.4.b Météo-France

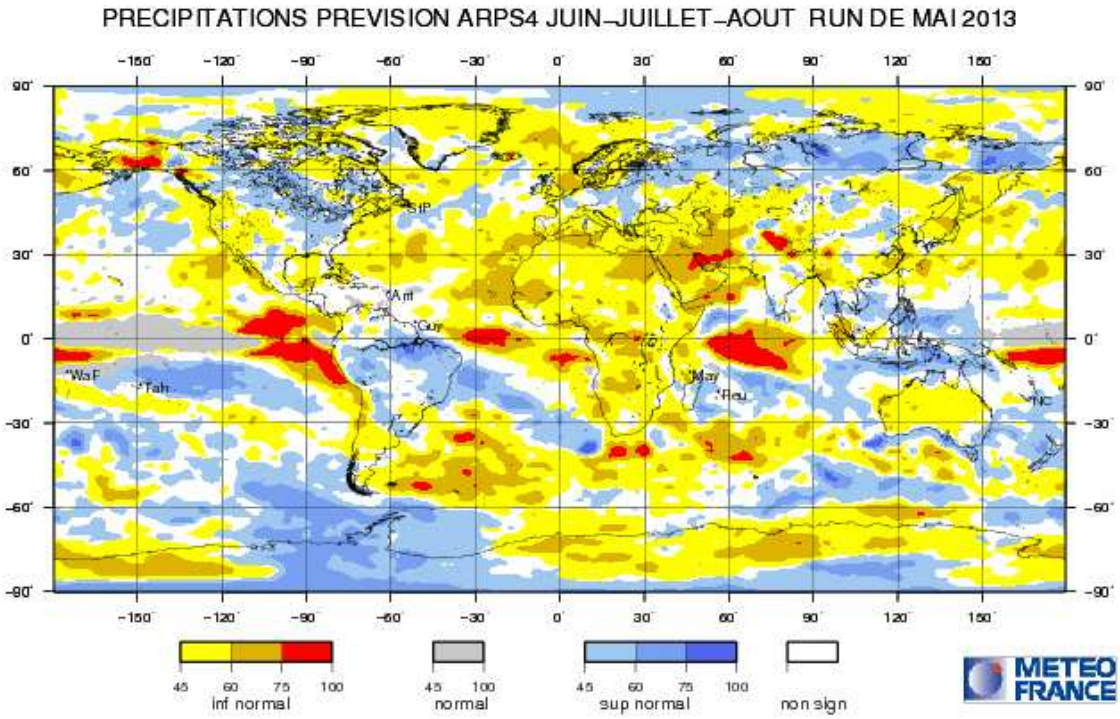


fig.31: Most likely category of Rainfall for JJA, issued in May. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.4.c Met office (UKMO)

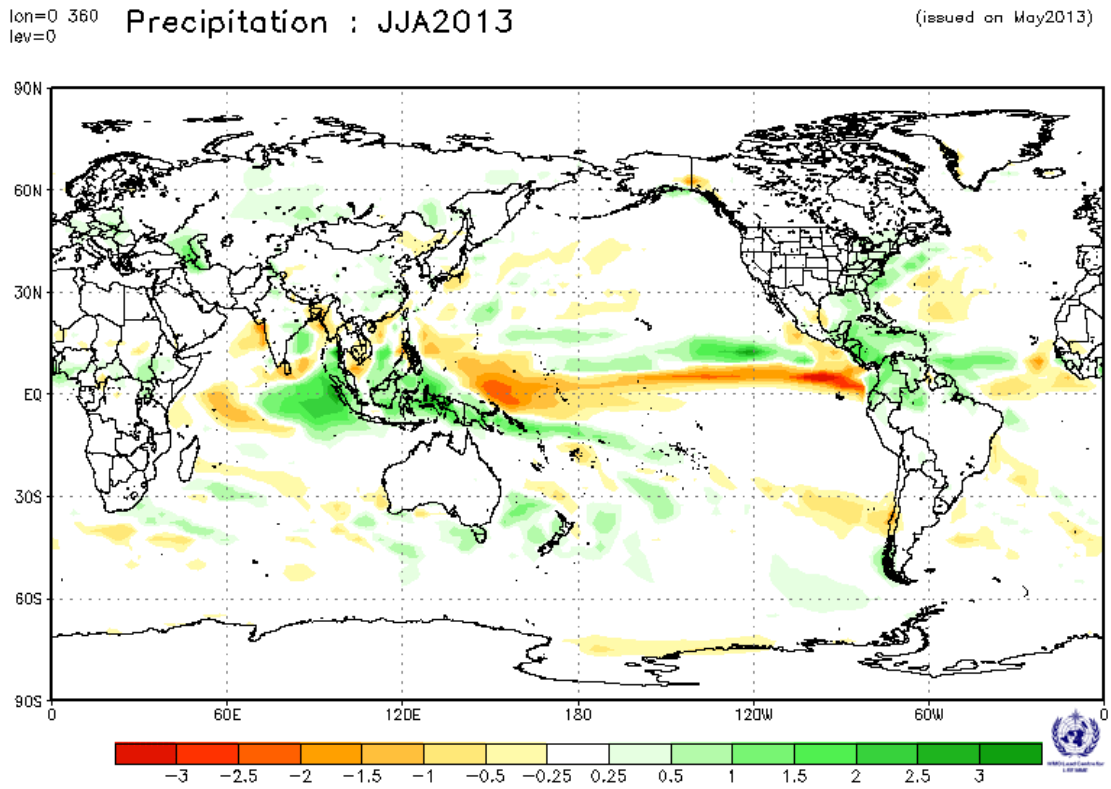


fig.32: Rainfall anomaly for JJA, issued in May from UK Met Office. https://www.wmolc.org/

II.4.dClimate Prediction Centre (CPC)

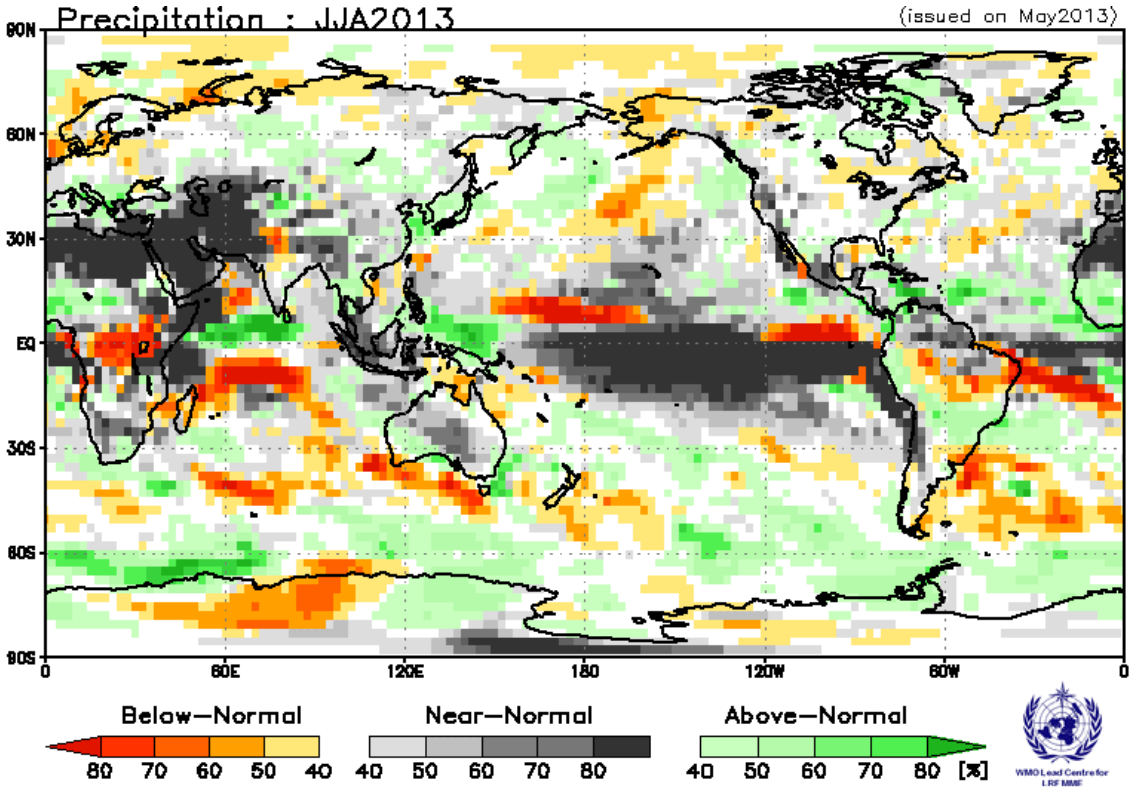


fig.33: Most likely category of Rainfall for JJA, issued in May from CPC. https://www.wmolc.org/

II.4.e Japan Meteorological Agency (JMA)

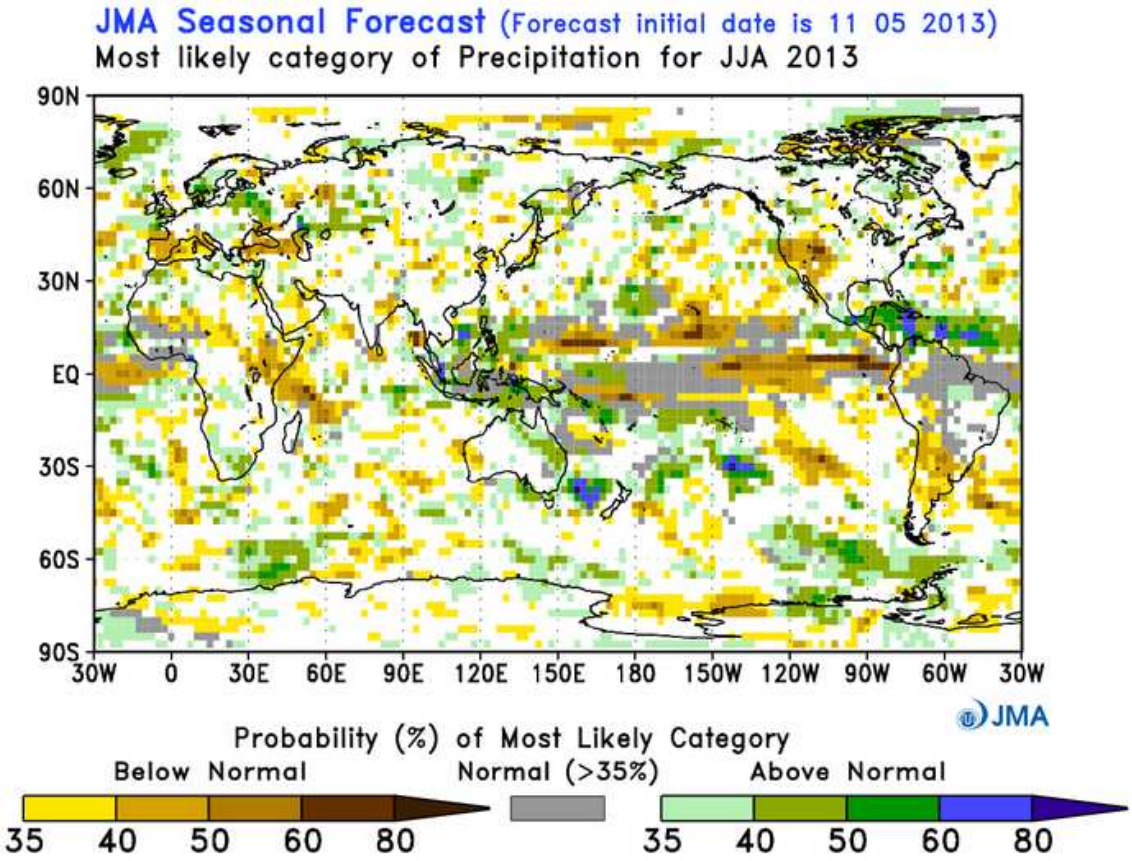


fig.34: Most likely category of Rainfall for JJA, issued in May from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/

II.4.f Lead Centre on Multi Model Ensemble (LCMME)

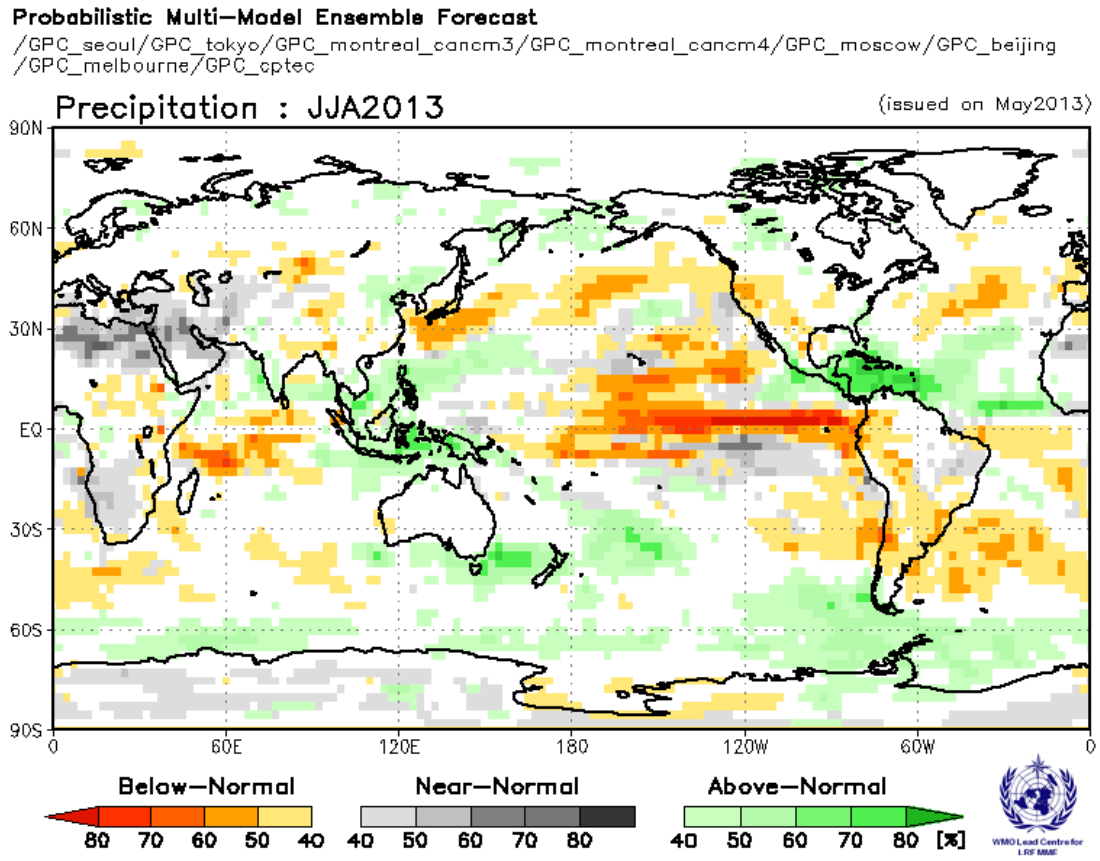


fig.35: **Rainfall MME anomaly for JJA, issued in May from LC-MME. The MME composition corresponds to the GPCs not used in EuroSIP.** **https://www.wmolc.org/**

II.4.g Euro-SIP

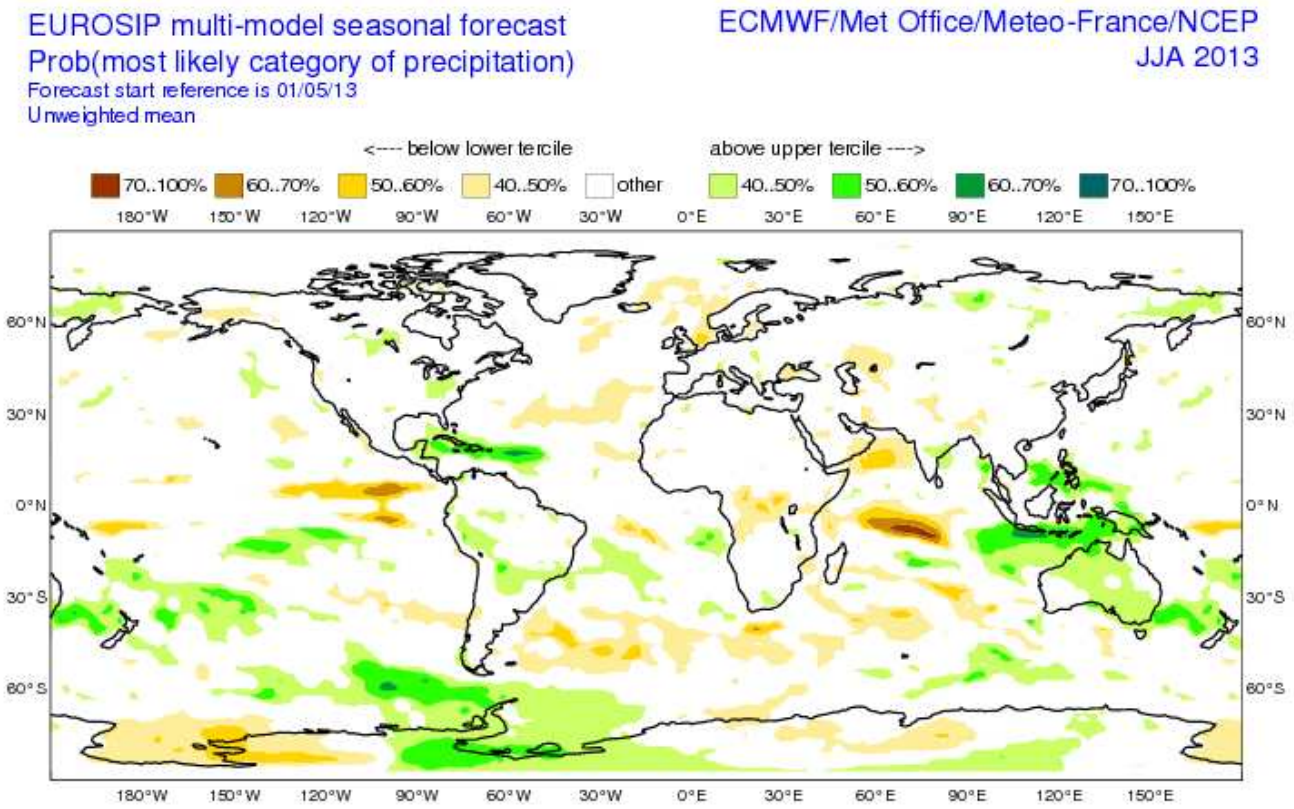


fig.36: Multi-Model Probabilistic forecasts for precipitation from EuroSip for JJA, issued in May. (2 Categories, Below and Above normal – White zones correspond to No signal).

http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

Some consistent signal in the Tropics and especially around the Pacific ; enhanced probabilities for wet scenarios over the maritime continent, Australia, The Caribbean and slightly enhanced probabilities for dry scenarios over the Equatorial Africa.

For Europe No signal everywhere and more generally for most of the mid latitude of Northern Hemisphere, consistently with discussion on predictability and teleconnections.

II.5. REGIONAL TEMPERATURES

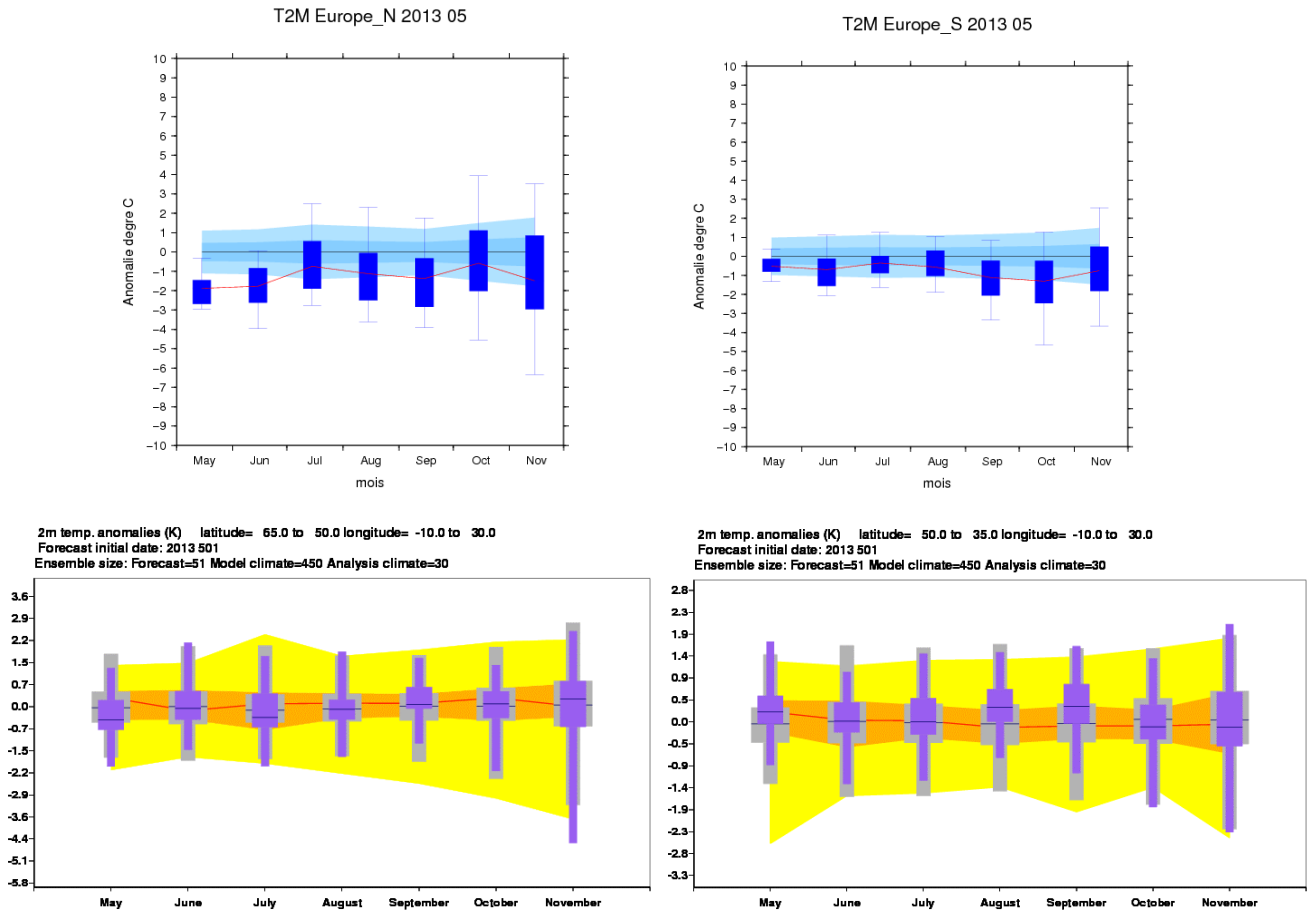


fig.37: Climagrams for T2m in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom) issued in May.

For both Northern and Southern Europe : large differences between the 2 models. Colder than normal conditions in MF while the cold signal is weak in ECMWF for Northern Europe and close to Normal for Southern Europe. Note the quite large spread (with respect of the climate reference).
Take care that due to the system change (from system 3 to system 4) the verification scores are not available yet.

In Météo-France climagrams, the distributions of area averages are displayed for the seasonal forecast (dark blue boxes and wiskers), and the climate reference on the 29-year hindcast period (blue and light blue bands). The limits of the boxes (ensemble forecast) and blue band (climate reference) correspond to the upper and lower terciles. The limits of the wiskers (ensemble forecast) and light blue band (climate reference) correspond to the mean + 1 standard deviation and the mean – 1 standard deviation. The red line corresponds to the ensemble mean.

REGIONAL PRECIPITATIONS

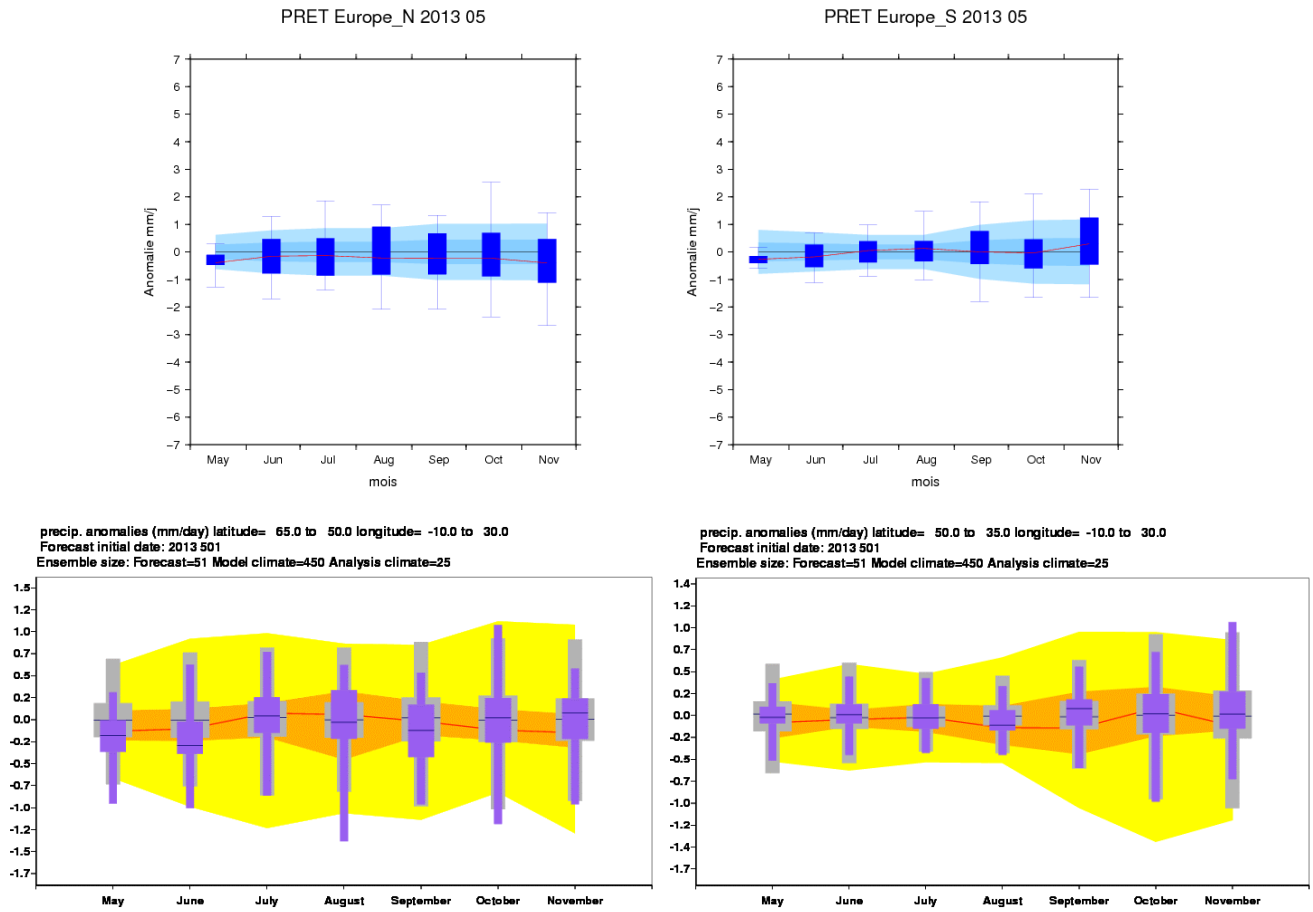


fig.38: Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom), issued in May.

For Northern Europe : Large spread in the evolution of the 2 models. Some consistency in the two models, starting with below normal and reaching close to normal conditions in July.
For Southern Europe : Here also the spread is large. Signal close to climatology in ECMWF and MF. Adding the low predictability consideration, these intraseasonal evolutions should be considered as indicating No Signal.
Take care that due to the system change (from system 3 to system 4) the verification scores are not available yet.

In Météo-France climagrams, the distributions of area averages are displayed for the seasonal forecast (dark blue boxes and wiskers), and the climate reference on the 29-year hindcast period (blue and light blue bands). The limits of the boxes (ensemble forecast) and blue band (climate reference) correspond to the upper and lower terciles. The limits of the wiskers (ensemble forecast) and light blue band (climate reference) correspond to the mean + 1 standard deviation and the mean – 1 standard deviation. The red line corresponds to the ensemble mean.

II.6. MODEL'S CONSISTENCY

II.6.a GPCs consistency maps

Not available this month

fig.39: ***GPCs Consistency maps from LC-MME*** *http://www.wmolc.org/*

For SST :
For Z500 :
For T2m :
For precipitation :

II.7. "EXTREME" SCENARIOS

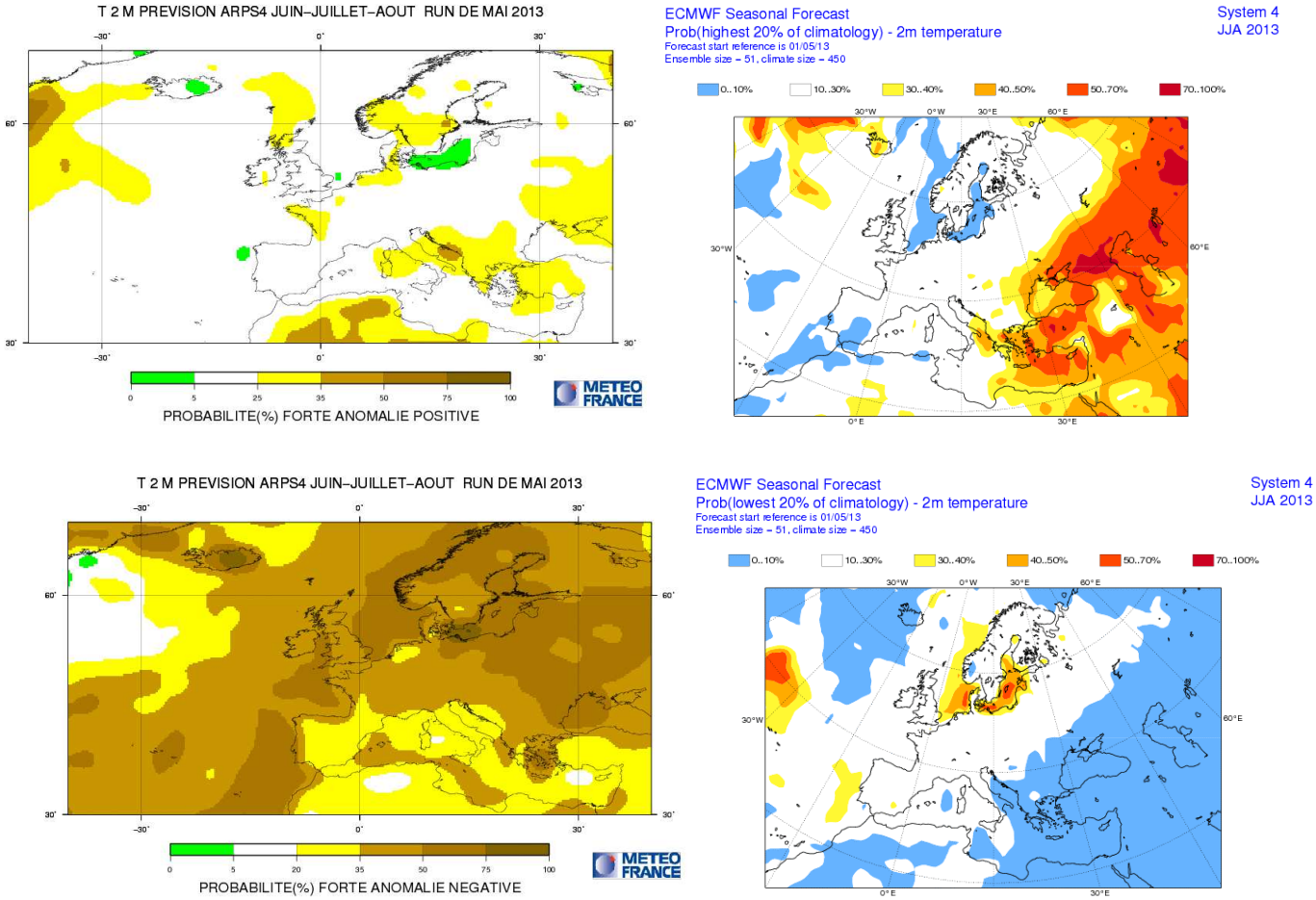


fig.40: Top : Probability of « extreme » above normal conditions for T2m for Meteo-France (left - highest ~15% of the distribution) and ECMWF (right - highest 20% of the distribution).
Bottom : Probability of « extreme » Below normal conditions for rainfall for Meteo-France (left - lowest ~15% of the distribution) and ECMWF (right – lowest 20% of the distribution).
For JJA, issued in May.

No consistency between the 2 models for the Very Below scenario.
Some consistency for very Above Normal scenario over some regions of South-East Europe. However, in relationship with the current predictability and the model uncertainties, it seems difficult to use these forecast.
Take care that due to the system change (from system 3 to system 4) the verification scores are not available yet.

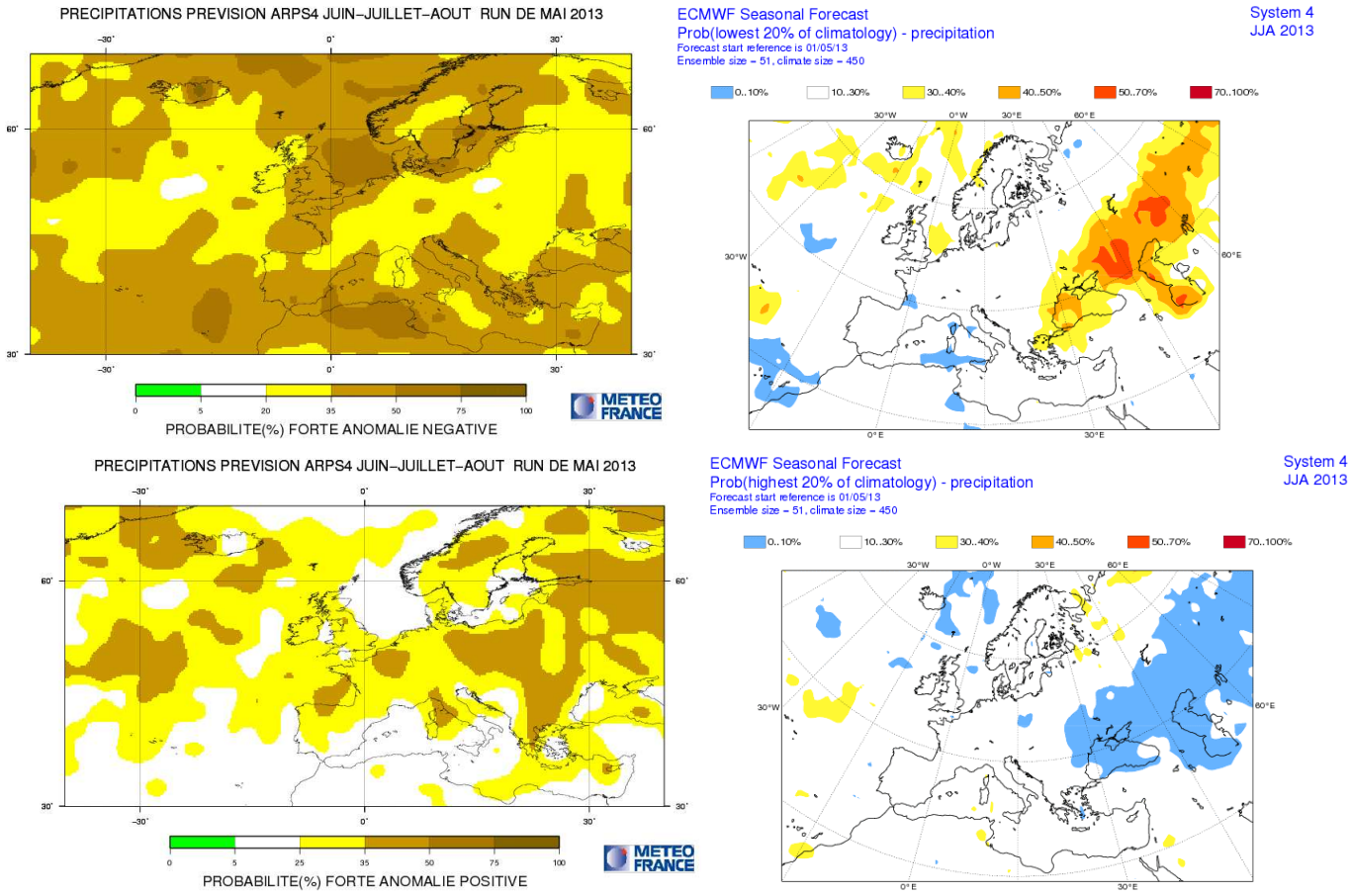


fig.41: Top : Probability of « extreme » Below normal conditions for rainfall for Meteo-France (left - lowest ~15% of the distribution) and ECMWF (right - lowest 20% of the distribution)
Bottom : Probability of « extreme » Above normal conditions for rainfall for Meteo-France (left - highest ~15% of the distribution) and ECMWF (right – highest 20% of the distribution).
For JJA, issued in May.

Mostly No signal in ECMWF (to the exception of the most Eastern regions for enhanced probabilities of very Below scenarios)) while there are traces of divergent scenarios in MF (enhanced probabilities for both extreme scenarios across the continent).
So in relationship with the current predictability and the model uncertainties, it seems difficult to use these forecast.
Take care that due to the system change (from system 3 to system 4) the verification scores are not available yet.

II.8. DISCUSSION AND SUMMARY

Forecast over Europe

For this forecast the first and main comment is about the predictability in the climate system. The oceanic forcing is low more or less everywhere and no teleconnection patterns seem to be present in the forecasts. As a consequence for Europe the predictability is very limited at seasonal scales.
So in such a context, the EuroSIP forecasts are likely a good synthesis of possible scenarios across the planet and more specifically over European regions.
For rainfall, “No Privileged Scenario” covers most of the European continent.
For temperature : Even for temperature, there is a large uncertainty over most of the European continent (No privileged scenario). However, the Above Normal scenario could prevail for the most South-Eastern Europe. Also to be quoted the below Normal scenario on the Iberic Peninsula which is consistent with the current monthly forecasts (Western Europe colder than normal).
Obviously, some downscaled information could detail these scenarios for specific countries or sub-regions.

Tropical Cyclone activity

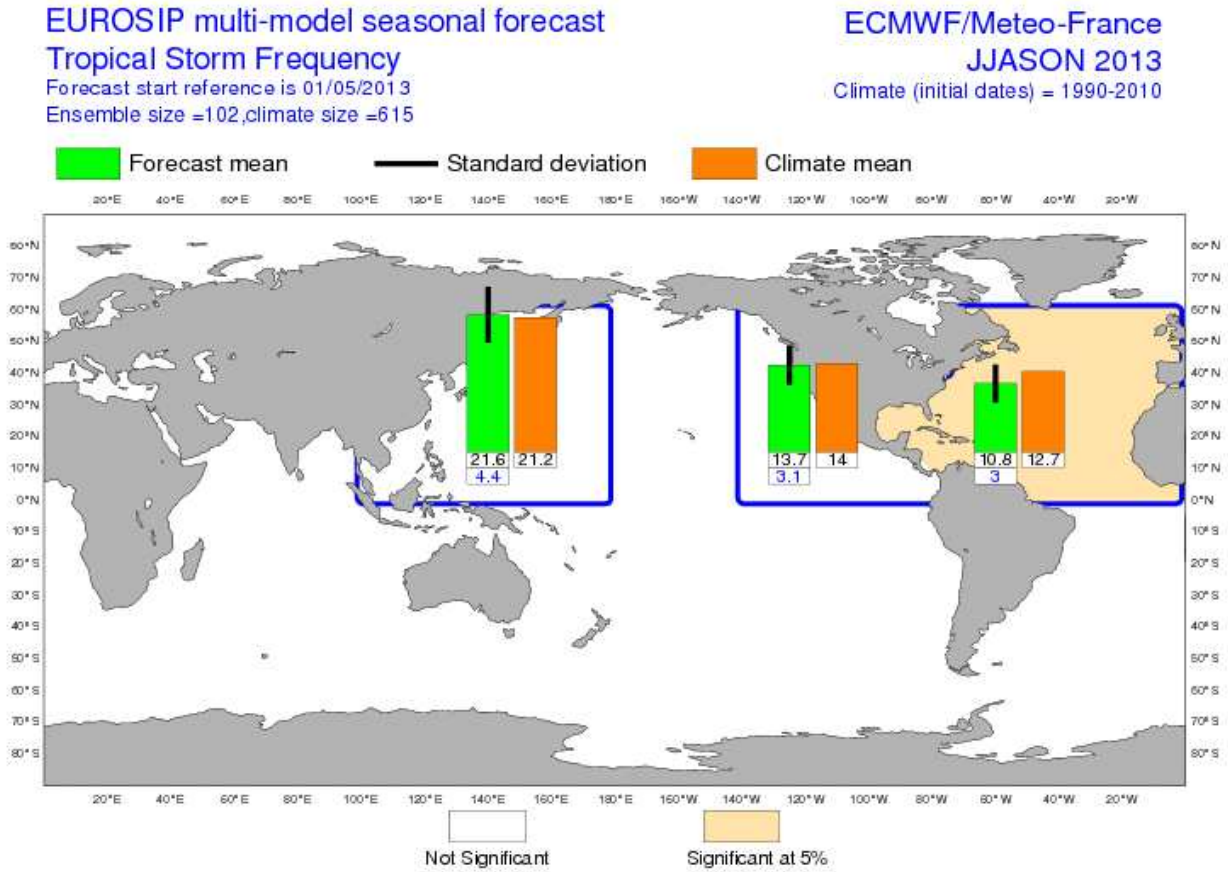


fig.42: Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF) for the JJASON period, issued in May.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro/eurosip_tropical_storm_frequency/

For the Tropical Cyclone season and in relationship with the low oceanic forcing, Euro-Sip forecasts indicate a close to normal condition over the Pacific and Below normal activity for the Tropical North Atlantic basin.

WMO RA VI
Pilot RCC-Network

Synthesis of Temperature forecasts for June-July-August 2013 for European regions

Results are expressed with respect of 3 possible scenarios : « Above normal », « close to normal » and « Below normal ». The limits between each category is given by the corresponding tercile such that each scenario have the same climatological probability of occurrence (33,3%). If the forecast shows no specific signal (because of low predictability and/or divergent scenarios between several models), the cell is filled in grey and “No privileged scenario” is indicated.

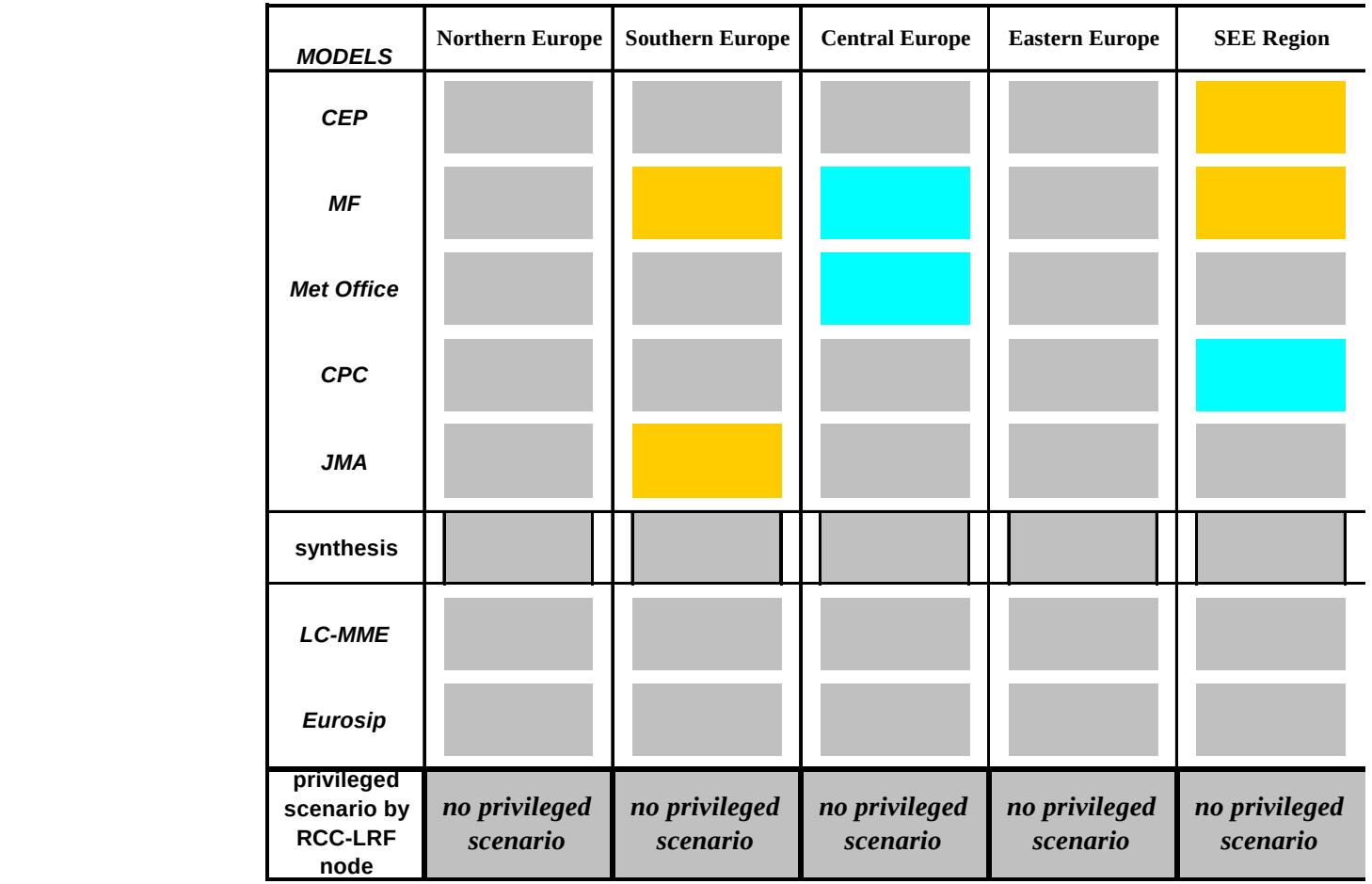
MODELS	Northern Europe	Southern Europe	Central Europe	Eastern Europe	SEE Region
CEP					
MF					
Met Office					
CPC					
JMA					
synthesis					
LC-MME					
Eurosip					
privileged scenario by RCC-LRF node	*no privileged scenario*	*no privileged scenario*	*no privileged scenario*	*no privileged scenario*	*above normal*

T Below normal (Cold) T close to normal T Above normal (Warm) No privileged scenario

WMO RA VI
Pilot RCC-Network

Synthesis of Rainfall forecasts for June-July-August 2013 for European regions

Results are expressed with respect of 3 possible scenarios : « Above normal », « close to normal » and « Below normal ». The limits between each category is given by the corresponding tercile such that each scenario have the same climatological probability of occurrence (33,3%). If the forecast shows no specific signal (because of low predictability and/or divergent scenarios between several models), the cell is filled in grey and “No privileged scenario” is indicated.



MODELS	Northern Europe	Southern Europe	Central Europe	Eastern Europe	SEE Region
CEP					
MF					
Met Office					
CPC					
JMA					
synthesis					
LC-MME					
Eurosip					
privileged scenario by RCC-LRF node	*no privileged scenario*	*no privileged scenario*	*no privileged scenario*	*no privileged scenario*	*no privileged scenario*

RR Below normal (Dry) RR close to normal RR Above normal (Wet) No privileged scenario

III. ANNEX

III.1. SEASONAL FORECASTS

Presently several centres provide seasonal forecasts, especially those designated as Global Producing Centres by WMO (see http://www.wmo.int/pages/prog/wcp/wcasp/clips/producers_forecasts.html).
■ BoM, CMA, CPTEC, ECMWF, JMA, KMA, Météo-France, NCEP and UK Met Office have ocean/atmosphere coupled models. The other centres have atmospheric models which are forced by a SST evolution which is prescribed for the entire period of forecast.
■ LC-MME and Euro-SIP provide multi-model forecasts. Euro-Sip is presently composed using 4 models (ECMWF, Météo-France, NCEP and UK Met Office). LC-MME uses information coming from most of the GPCs ; providing deterministic and probabilistic combinations of several coupled and forced models.

Seasonal forecasts use the ensemble technique to sample uncertainty sources inherent to these forecasts. Several Atmospheric and/or oceanic initial states are used to perform several forecasts with slightly different initial state in order to sample the uncertainty related to imperfect knowledge of the initial state of the climate system. When possible, the model uncertainty is sampled using several models or several version of the same model. The horizontal resolution of the Global models is currently between 100 and 300km. This mean that only Large Scale feature make sense in the interpretation of the issued forecasts. Generally speaking, the temperature forecasts show better skills than rainfall forecasts. Then, it exists a natural weakness of the seasonal predictability in Spring (ref to North Hemisphere).

In order to better interpretate the results, it is recommended to look to verification maps and graphs which give some insight into the expected level of skill for a specific parameter, region and period. A set of scores is presented on the web-site of the Lead-Centre for Verification (see http://www.bom.gov.au/wmo/lrfvs/) ; scores are also available at the specific web site of each centres.

This bulletin collects all the information available the 21st of the current month preceding the forecasted 3-month period.

III.2. « NINO », SOI INDICES AND OCEANIC BOXES

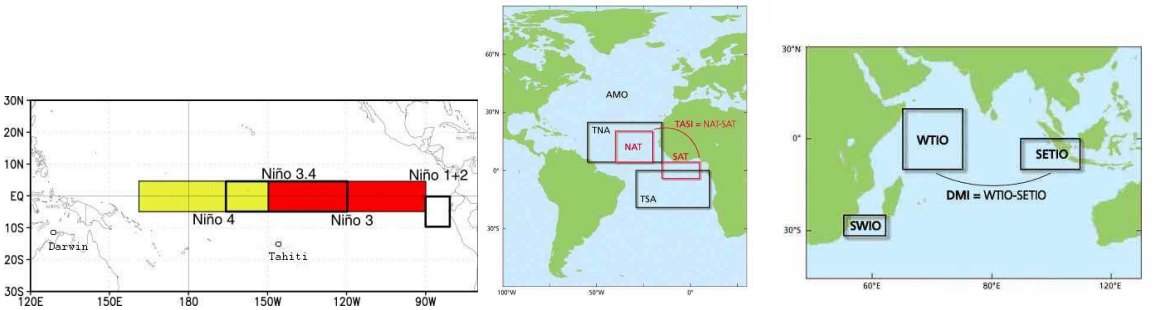
El Niño and La Niña events primarily affect tropical regions and are monitored by following the SST evolution in specific area of the equatorial Pacific.

- Niño 1+2 : 0°/10°S 80W-90W ; it is the region where the SST warming is developing first at the surface (especially for coastal events).
- Niño 3 : 5°S/5°N 90W-150W ; it is the region where the interanual variability of SST is the greatest.
- Niño 4 : 5°S/5°N 160E- 150 W ; it is the region where SST evolution have the strongest relationship with evolution of convection over the equatorial Pacific.
- Niño 3.4 : 5°S/5°N 120W-170W ; it is a compromise between Niño 3 and Niño 4 boxes (SST variability and Rainfall impact).

Associated to the oceanic « El Niño / La Niña » events, and taking into account the strong ocean/atmopshere coupling, the atmosphere shows also interanual variability associated to these events. It is monitored using the SOI (Southern Oscillation Index). This indice is calculated using standardized sea level pressure at Tahiti minus standardized sea level pressure at Darwin (see above

figure). It represents the Walker (zonal) circulation and its modifications. Its sign is opposite to the SST anomaly meaning that when the SST is warmer (respectively colder) than normal (Niño respectively Niña event), the zonal circulation is weakened (respectively strengthened).

Oceanic boxes used in this bulletin :



III.3.LAND BOXES

Some forecasts correspond to box averaged values for some specific area over continental regions. These boxes are described in the following map and are common to ECMWF and Météo-France.