GLOBAL CLIMATE BULLETIN
n°179 - MAY 2014

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I. DESCRIPTION OF THE CLIMATE SYSTEM (MARCH 2014)

I.1. OCEANIC ANALYSIS

I.1.a Global Analysis

<u>At the Surface (fig. 1)</u> :
Significant evolutions in the equatorial waveguide ; especially a conspicuous warming in the Eastern Pacific. In the tropics, some cooling in Tropical North Atlantic (especially in the vicinity of West Africa) and South-Western Pacific.
In the mid latitudes of the Northern hemisphere some evolution across the Pacific and the Atlantic.

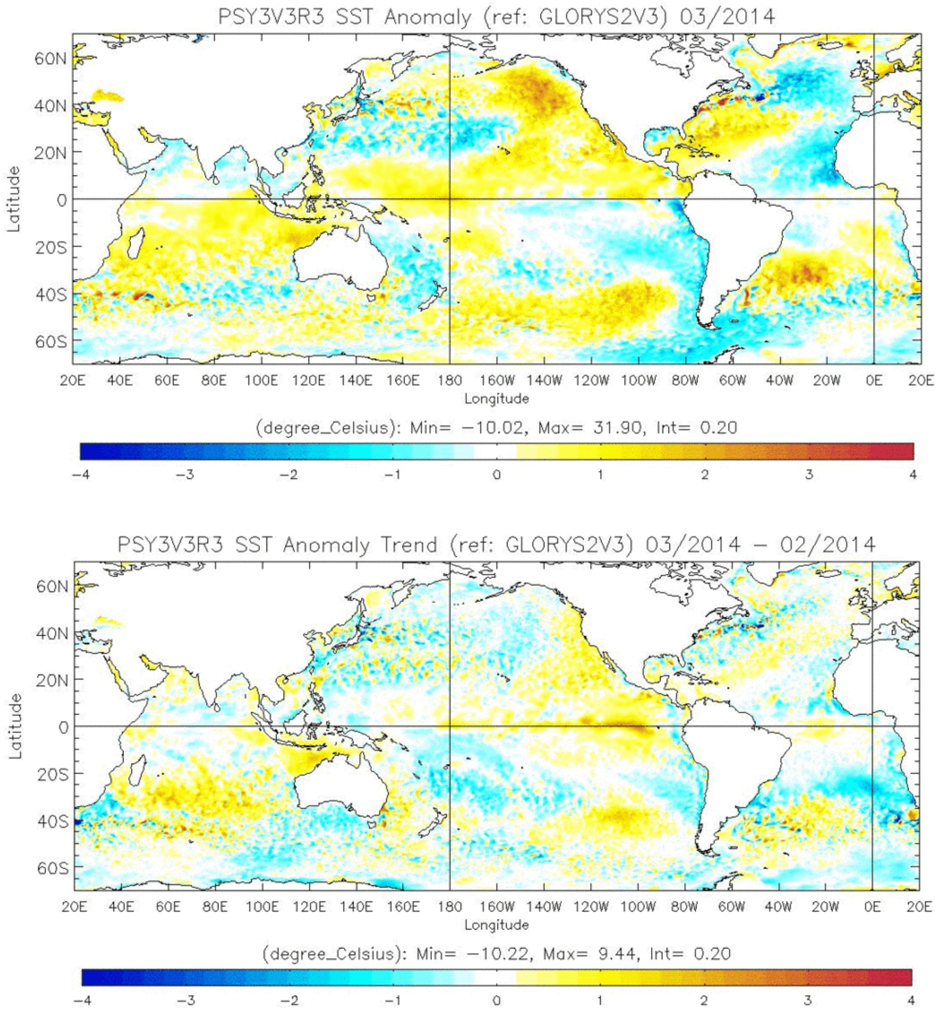


fig.1: top : SSTs Anomalies (°C) (reference Glorys 1993-2009); bottom : SST tendency (current – previous month) http://bcg.mercator-ocean.fr/

<u>In subsurface (fig.2)</u> :

In the Pacific : in the equatorial band (10°N-10°S), strong positive heat content anomalies in the Central Pacific along the Equator and negative anomaly in the most western part. The persistent strong positive anomalies in the Western part off equator (in the Northern hemisphere between 10°N and 20°N) disappeared consistently with the surface signal evolution. In the SPCZ region a negative anomaly extends South-East in the Tropics.
In the Atlantic : in the equatorial waveguide mostly negative anomalies to the exception of a weak positive anomaly in the Guinean Gulf. In the Topical North Atlantic, negative anomaly from West Africa to the Northern coast of South America.
In the Indian Ocean : development of negative anomalies in the Tropical most Eastern part (especially Northern Hemisphere) and positive anomalies off equator (especially in the Northern hemisphere). In the Tropical Southern part of the basin mostly warmer than normal conditions consistently with SSTs.

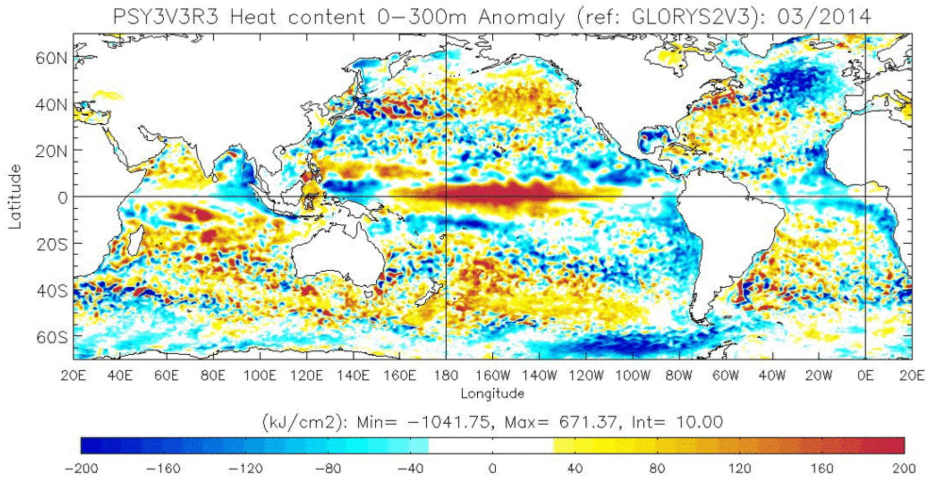


fig.2: map of Heat Content Anomalies (first 300m) (in kJ/cm²). (reference Glorys 1992-2009)
http://bcg.mercator-ocean.fr/

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

Most of the Northern Hemisphere shows a positive anomaly a negative one is visible in the Eastern Southern part. The trade wind anomalies in the western part of the basin which seems to be consistent with a Large Scale convection displacement beyond the dateline and a weakening of the trade wind over the western regions. This is quite consistent with the observation of a negative SOI (-0.9)
In the Niño boxes (4, 3.4, 3 et 1+2 ; see definition in Annex) the monthly averages are respectively 0.5°C, -0.2°C, -0.2°C to -0.8°C from West to East.

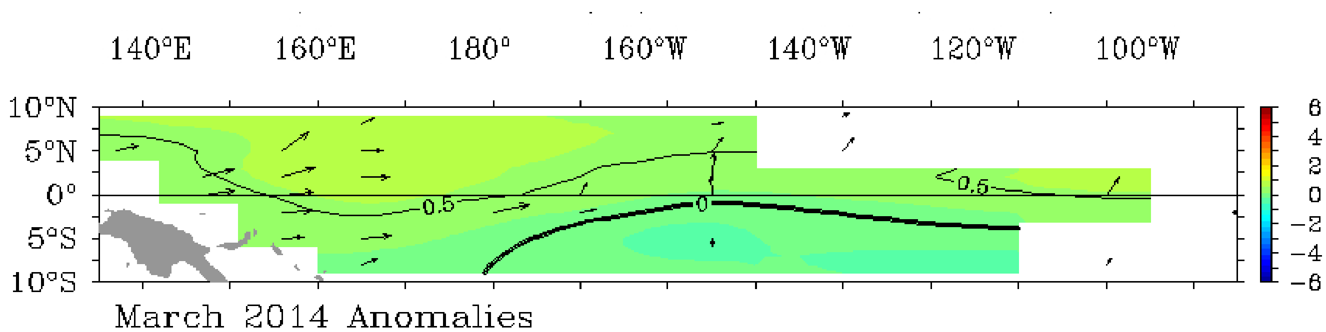


fig.3: SST and Wind anomalies over the Equatorial Pacific from TAO/TRITON.
http://www.pmel.noaa.gov/tao/jsdisplay/monthly-summary/monthly-summary.html

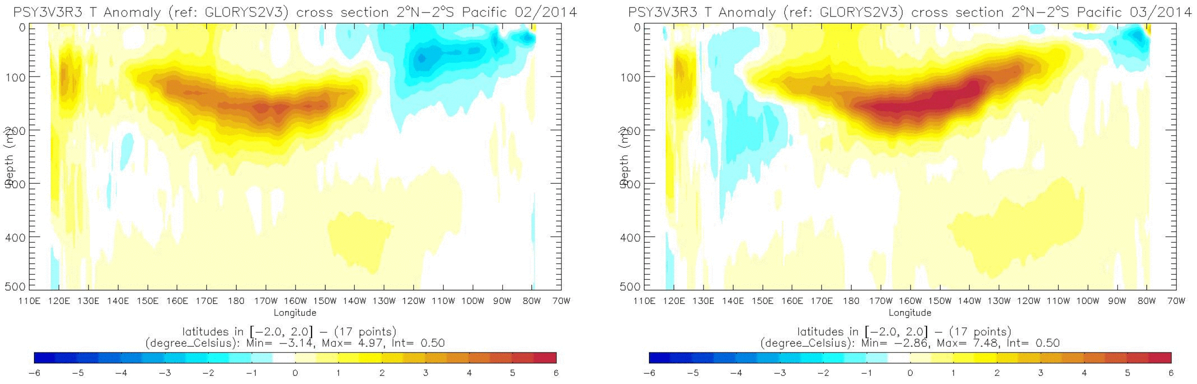


fig.4: Oceanic temperature anomaly in the first *500 metres* in the Equatorial Pacific, in previous month (left) and current month (right) http://bcg.mercator-ocean.fr/

In the equatorial waveguide (fig. 4) : A very clear propagation of a Kelvin wave (positive anomaly) under the surface (close to immersion 150m). The warm reservoir dramatically increased in subsurface (Central and Eastern part, around immersion 150m) and the negative anomaly decreased in the Eastern part in relation with the eastward propagation of the warm sub-surface signal. The ocean/atmosphere coupling processes seem to be active.

The thermocline structure (fig. 5) : Traces of the deepening of the thermocline (related to the warm reservoir) and of the Kelvin wave propagation (positive anomaly) East to the dateline.

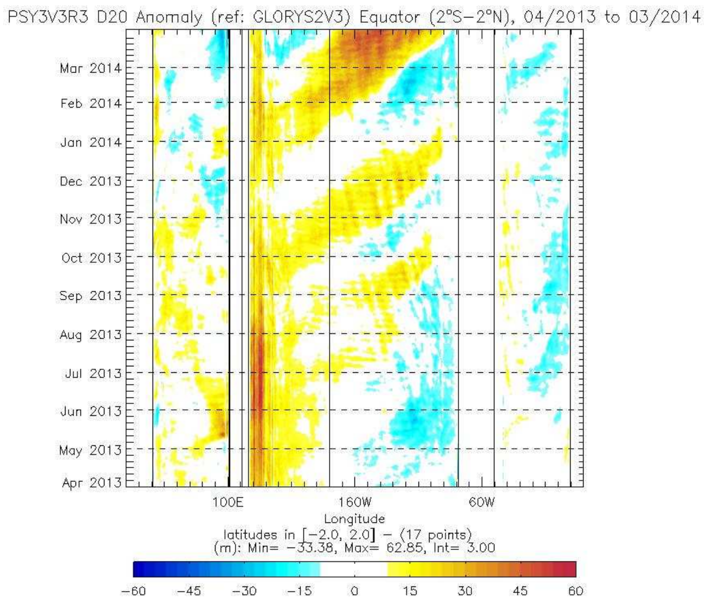


fig.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 24 month period. http://bcg.mercator-ocean.fr/

I.1.c Atlantic Basin

Northern Tropical Atlantic : cooler than normal with a negative tendency.

Equatorial waveguide : Close to neutral to the exception of a weak positive anomaly in the Guinean Gulf where the SAT index is positive.

The Southern Tropical Atlantic : Close to normal to the exception of the regions close to the African continent (close to Namibia/Angola).

The TASI index is now in a negative phase.

Sea Surface Temperature near Europe :

Generally very little change of SST from February to March 2014.
The North Sea, which normally has its lowest temperatures in March, has not cooled this year; consequently anomalies increased this March to more than +1°C near the coasts of Central Europe. Also the Norwegian Sea remained relatively warm. The water temperature observed at the station Ekofisk in the Norwegian Sea was the warmest (together with March 1990) since the start of measurements in 1980. On the other hand, anomalies of the central Mediterranean and the Adriatic Sea decreased because spring warming of these areas was missing. It remained also cooler than normal in the East Atlantic west of Iberia.

I.1.d Indian Basin

Southern Tropical Indian Ocean : warmer than normal conditions over most of the basin with a warming close to Australia.
Equatorial waveguide : close to normal conditions, the DMI is negative in relationship with the SETIO box (warmer than normal) ; the WTIO being close to 0.
Northern Tropical Indian Ocean : little anomalies, some traces of negative anomaly close to the Arabic Peninsula.

I.2. ATMOSPHERE

I.2.a Atmosphere : General Circulation

<u>Velocity Potential Anomaly field in the high troposphere</u> (fig. 6 – insight into Hadley-Walker circulation anomalies) : A quasi 3 wavenumber pattern on the Equator. The MJO Index is significant and the phase is over the Western Hemisphere and the Indian Ocean. This could explain the relative fragmented patterns.

On the Pacific : Strong Divergent circulation anomaly (upward anomaly motion) close to the dateline (in relationship with the SST evolution in the equatorial waveguide). Over the maritime continent, the counterpart of the previous pattern ; strong convergent circulation anomaly (downward anomaly motion) which extends along the Eastern coast of Asia. Over the Eastern Pacific some weak but discernable Convergent/Divergent cells also likely linked with the sub-tropics (South/North).
On the Atlantic : Convergent circulation anomaly (downward anomaly motion) close to the Equator with some extension along the Northern coast of South-America and toward mid-latitudes of South Atlantic. A weak Divergent circulation anomaly over the North-Western Tropical Atlantic.
On the Indian Ocean : Divergent circulation anomalies (upward anomaly motion) over most of the North-Western part of the basin. Convergent circulation anomaly over most of the Eastern part of the basin and in the vicinity of Madagascar.

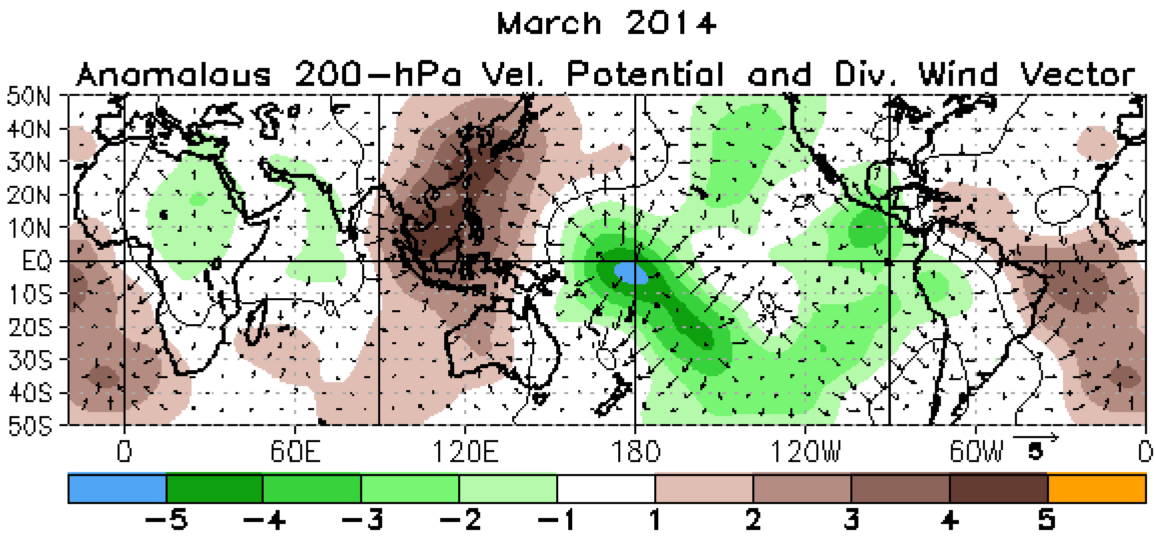


fig.6: Velocity Potential Anomalies at 200 hPa and associated divergent circulation.
Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly).
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

Stream Function anomalies in the high troposphere (fig. 7 – insight into teleconnection patterns tropically forced) : on average weak signal in the inter-tropical band to the exception of the Central and Eastern Pacific. The cells seem to be more related to the local/regional signal rather than to some possible teleconnection. The remaining anomalies are linked to mid-high latitude activity.

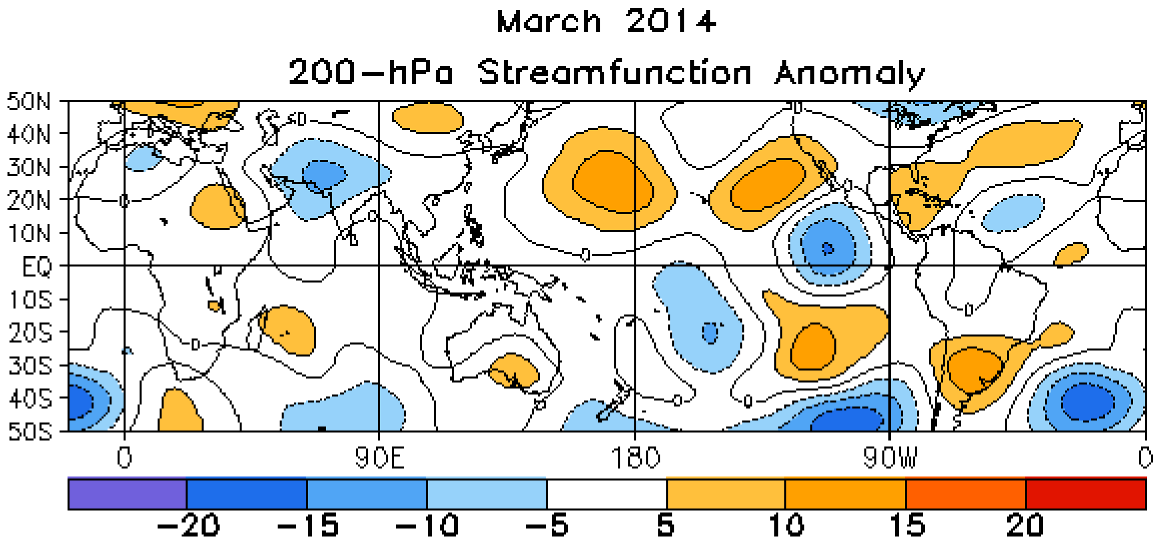


fig.7: Stream Function Anomalies at 200 hPa.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

Geopotential height at 500 hPa (fig. 8 – insight into mid-latitude general circulation) : Consistently with the previous analysis, little anomalies coming from the Tropics and weak anomalies in the Northern Hemisphere. Some anomalies observed in the high latitudes of Asia, North America and North-Western Europe.

The atmospheric modes are not too much quite active ; nevertheless one can quote ; the Pacific with East-North Pacific (1.2) and the East Atlantic (+0.9) over Europe.

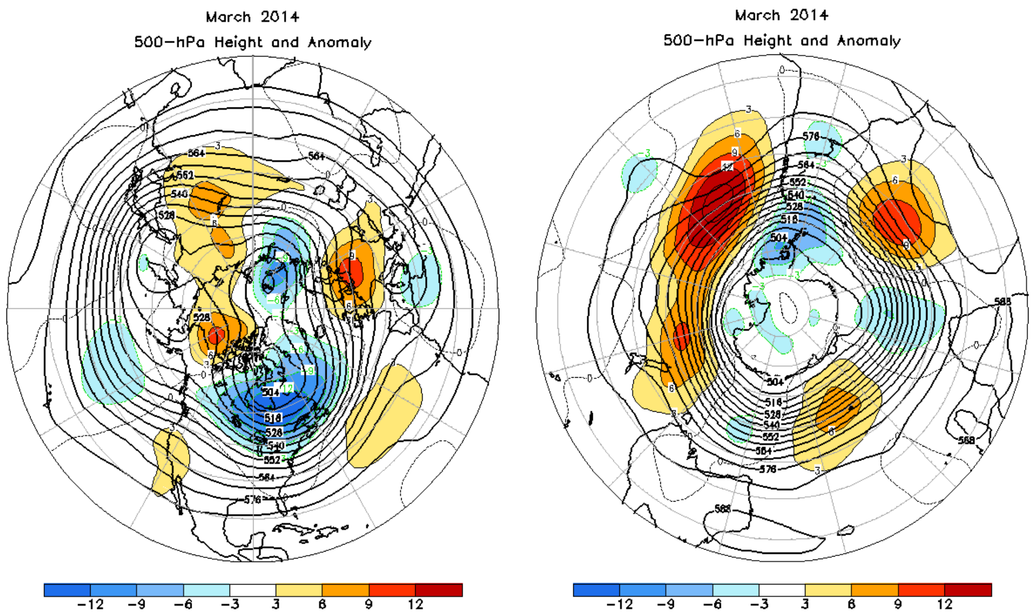


fig.8: Anomalies of Geopotential height at 500hPa (left North Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige9.shtml, and right South Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige15.shtml)

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
MAR 14	**0.4**	**0.9**	**-0.4**	**1.2**	**0.5**	**---**	**-0.1**	**-0.5**	**0.0**
FEB 14	1.1	2.2	-1.4	0.3	-1.6	0.3	-1.9	1.1	-1.9
JAN 14	-0.2	1.4	0.5	1.1	0.6	1.6	-1.3	1.7	-0.8
DEC 13	0.8	1.2	-2.0	---	-1.2	1.8	-0.4	-0.7	-0.8
NOV 13	0.8	0.1	0.0	1.2	-1.1	---	-0.9	-0.7	2.6
OCT 13	-0.9	1.4	-0.1	1.0	-0.2	---	0.6	0.7	0.8

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

Sea level pressure and circulation over Europe

Both the Icelandic Low and the Azores High had very typical positions for March. However, both pressure centres were more intense than usual; particularly the Icelandic Low was much deeper. This implies a stronger-than-normal zonal flow over the North Atlantic to northern Europe, which is in line to the 500 hPa pattern and to the still active EA mode (and NAO to some extent though weaker than in February). A second northern low pressure centre near Nowaja Semlja Island, too, was much stronger than normal, causing a continuation of the strong zonal flow also to the eastern parts of northern Europe. The influence of the Russian High was relatively weak in eastern Europe.

High pressure influence from the Azores High extended to large parts of the European continent except the north, but this is not unusual for the season.

I.2.b Precipitation

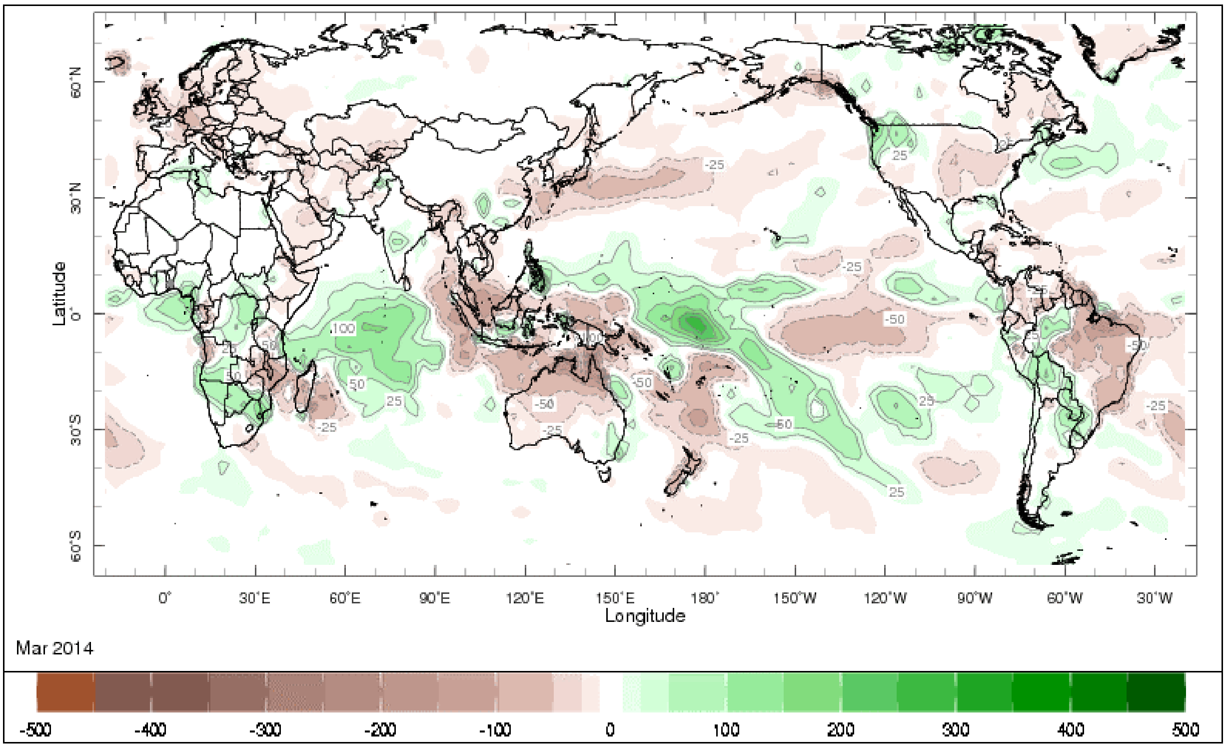


fig.9: Rainfall Anomalies (in mm) (departure to the 1979-2000 normal) – Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/

Intertropical zones (including sub-tropics) : good consistency with the Velocity Potential anomalies, especially over the Indian Ocean (globally +), the maritime continent and Australia (-), Central (+) and Eastern (-) Pacific. Good consistency on South America, with the East-West (-/+) contrast in precipitation and in velocity potential. (between Brazil and Bolivia). Also over the South-African regions, especially in the vicinity of Madagascar
Mid-latitudes : mostly drier than normal over the Eastern part of the North-American continent
Rainfall anomalies in Europe:

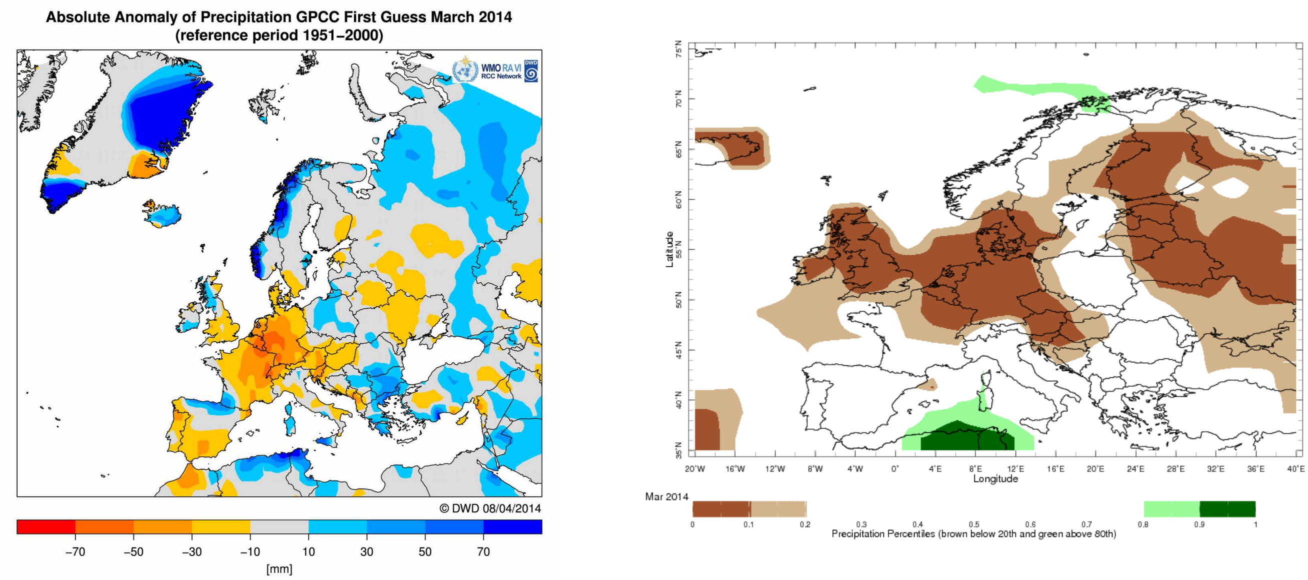


fig.10: Left: Absolute anomaly of precipitation in the RA VI Region (Europe), data from GPCC (Global Precipitation Climatology Centre – reference 1951-2000), http://www.dwd.de/rcc-cm. Right: Percentiles of precipitation. Data from NOAA Climate Prediction Center, http://iridl.ldeo.columbia.edu/maproom/Global/Precipitation/Percentiles.html

March was very dry in western and central Europe, the northern Balkan Peninsula, most of the Iberian Peninsula and eastern Europe and western Russia. In France, the Netherlands and Germany precipitation was below 40 percent of the normal, partly in Germany and France even below 20 percent or the 10th percentile.
For the Northern and Southern Europe boxes (see definition in annex), anomalies were very close to normal, just very little below, which shows that drought conditions were restricted to a relatively small area in Europe.

I.2.cTemperature

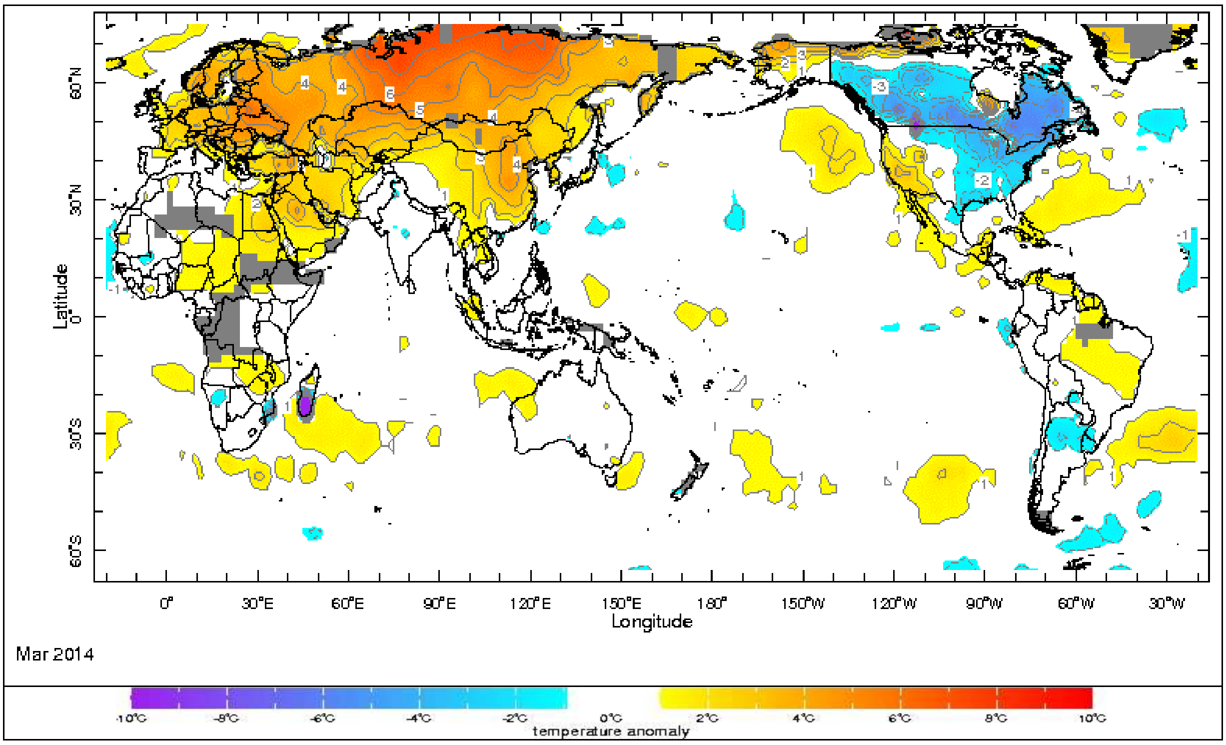


fig.11: Temperature Anomalies (in °C) (departure to the 1979-2000 normal)
http://iridl.ldeo.columbia.edu/maproom/.Global/.Atm_Temp/Anomaly.html

Strong warm anomalies from the Western façade of Europe up to the most North Eastern regions of Siberia. Strong negative anomaly covering most of the Canada and extending over the Eastern part of US. To be quoted the positive anomaly in the most Western part of US. Some positive anomaly over Brazil consistent with the rainfall anomaly.

Temperature anomalies in Europe:
March 2014 was much warmer than normal in Europe. The mean monthly anomalies exceeded +4°C in the Arctic and the Norwegian Sea, in northern and north-eastern Europe except the Atlantic coastal region and in eastern and south-eastern central Europe and in eastern Turkey. In much of that area monthly means were above the 90th percentile for March.
For the Northern and Southern Europe boxes (see definition in annex), monthly mean temperature anomalies were respectively +3°4C and +1°7C (1961-1990 reference).

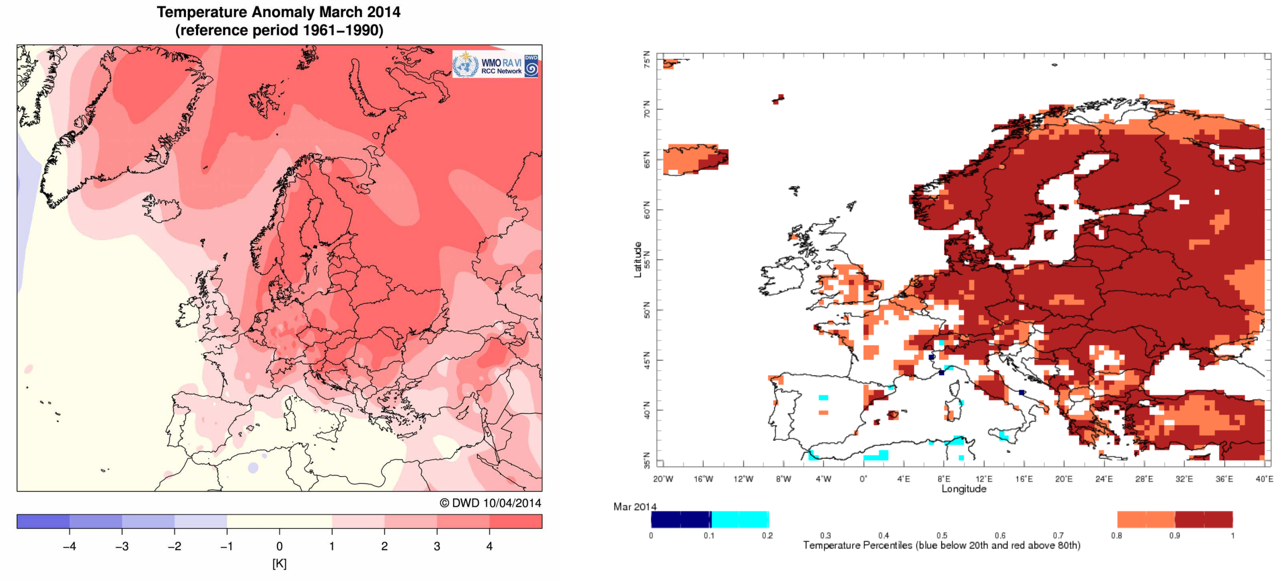


fig.12: left : Absolute anomaly of temperature in the RA VI Region (Europe), data from Deutscher Wetterdienst (DWD); http://www.dwd.de/rcc-cm . Right : Percentiles of temperature. Data from NOAA Climate Prediction Center, http://iridl.ldeo.columbia.edu/maproom/Global/Atm_Temp/Percentiles.html .

I.2.d Sea Ice

In Arctic (fig. 11 - left) : well below normal sea-ice extension (negative anomaly close to 2 standard deviation).
In Antarctic (fig. 11 - right) : well above normal sea-ice extension anomaly (on record) with some large regional modulation.

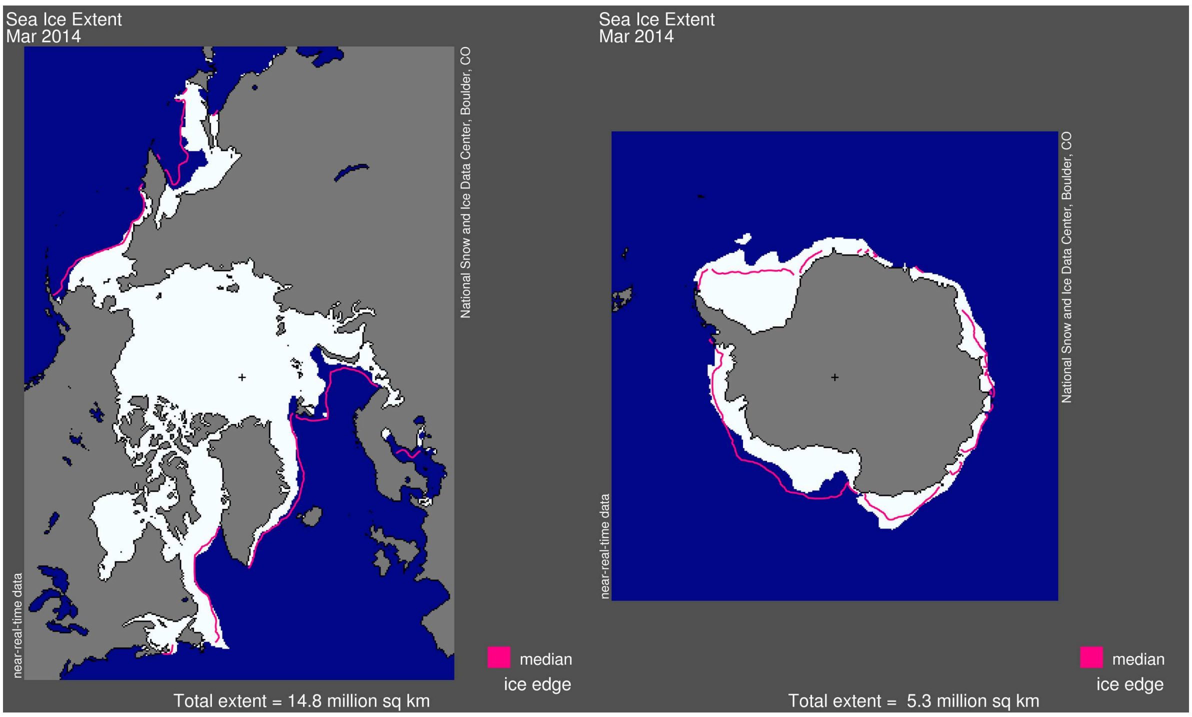


fig.13: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period). **http://nsidc.org/data/seaice_index/**

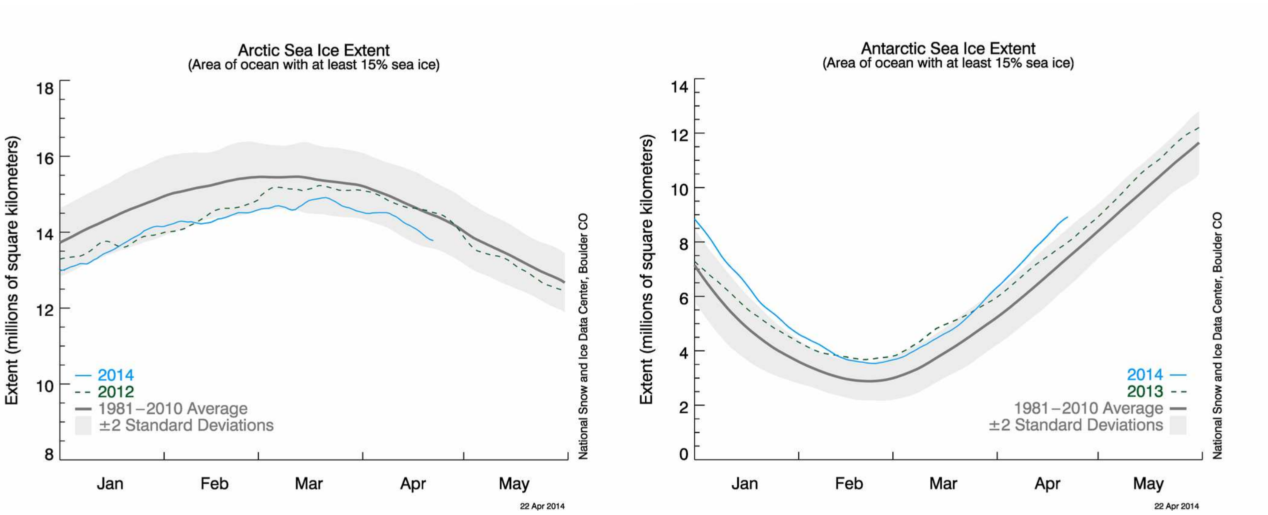


fig. 9bis : Sea-Ice extension evolution from NSIDC
http://nsidc.org/data/seaice_index/images/daily_images/N_stddev_timeseries.png

II. SEASONAL FORECASTS FOR MJJ FROM DYNAMICAL MODELS

II.1. OCEANIC FORECASTS

II.1.a Sea Surface Temperature (SST)

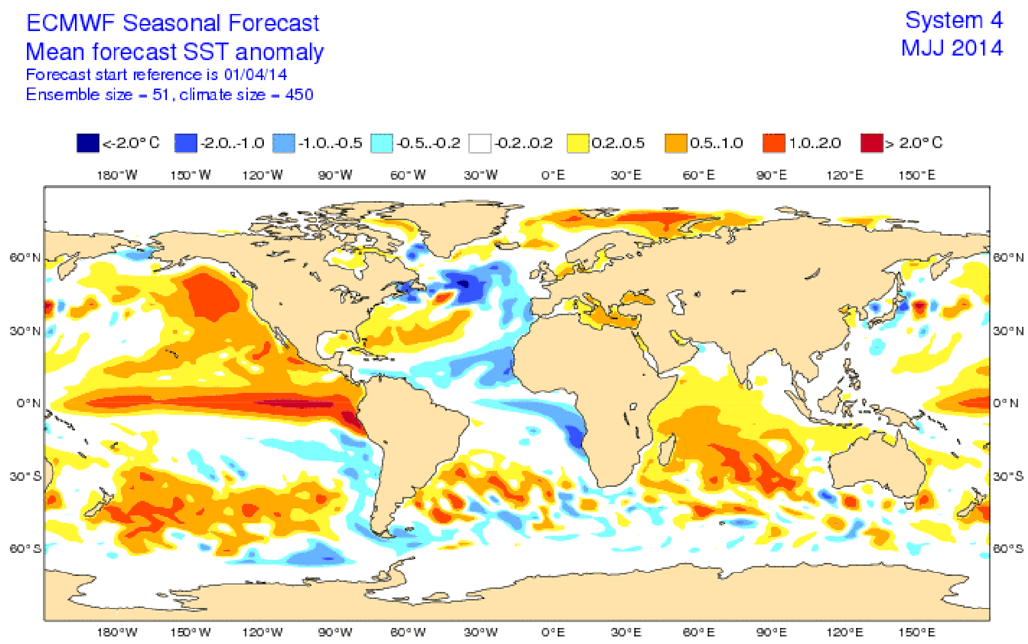


fig.14: SST anomaly forecast (in °C) from ECMWF.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

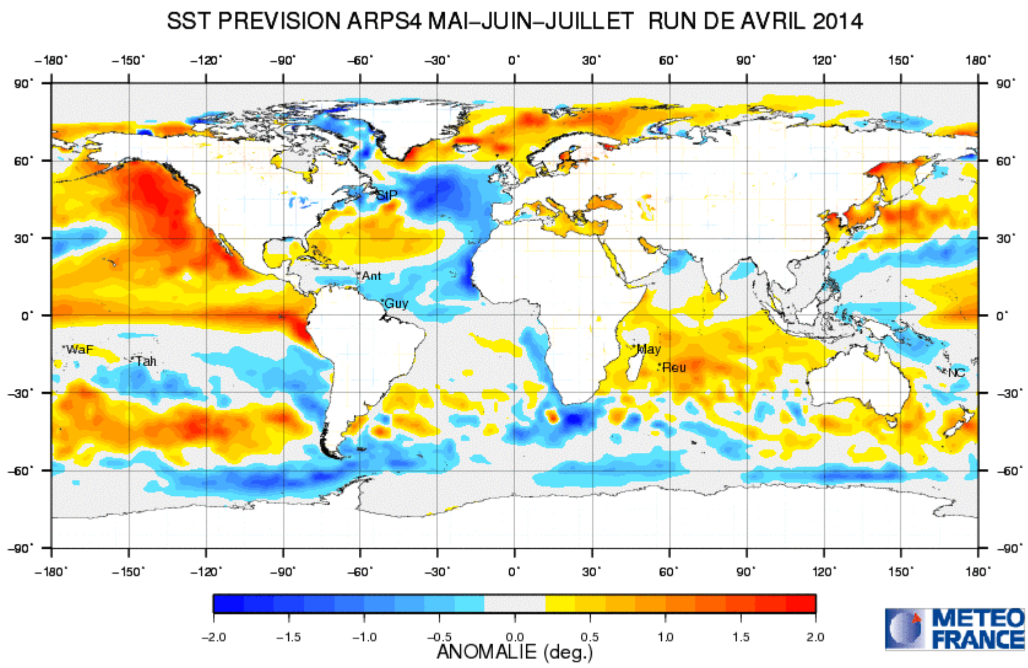


fig.15: SST Anomaly forecast (in°C - recalibrated with respect of observation) from Météo-France.
http://elaboration.seasonal.meteo.fr/

For the 2 individual models :
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), very consistent SST forecasts (taking into account the hindcast period differences), over both Hemispheres.
Pacific : Clear warming in the equatorial waveguide in the most Eastern part of the basin. The positive anomaly extends up to the dateline (and beyond). Positive anomalies over the Half Eastern North Pacific. Negative anomalies in the South-Eastern Tropics and Sub-Tropics.
Atlantic : equatorial waveguide close to neutral in both models. Great consistency for negative anomalies in the Northern hemisphere on the eastern side extending to East (up to Caribbean region) and on the western sub-tropical side (warmer than normal SSTs). Colder than normal conditions in the mid-latitudes likely related to a strengthened zonal circulation.
Indian Ocean : Warmer than normal conditions in the Southern part of the basin (persistent signal) in both models. IOD on the positive side.

In Euro-SIP :
Some robust patterns appear in the tropics everywhere on more or less the same comments than for the individual models.
Pacific : The positive anomaly in the equatorial waveguide region from the most Eastern part up to the dateline. Quite consistent patterns in the subtropics and the mid-latitudes of both hemispheres.
Atlantic : Slightly negative anomaly over the Equatorial waveguide. Colder than normal conditions in the North-West Tropical Atlantic. The Southern Tropics are close to neutral to the exception of the coastal African regions.
Indian Ocean : Warmer than normal conditions over a large portion of the Tropical and Southern sub-tropical basin.

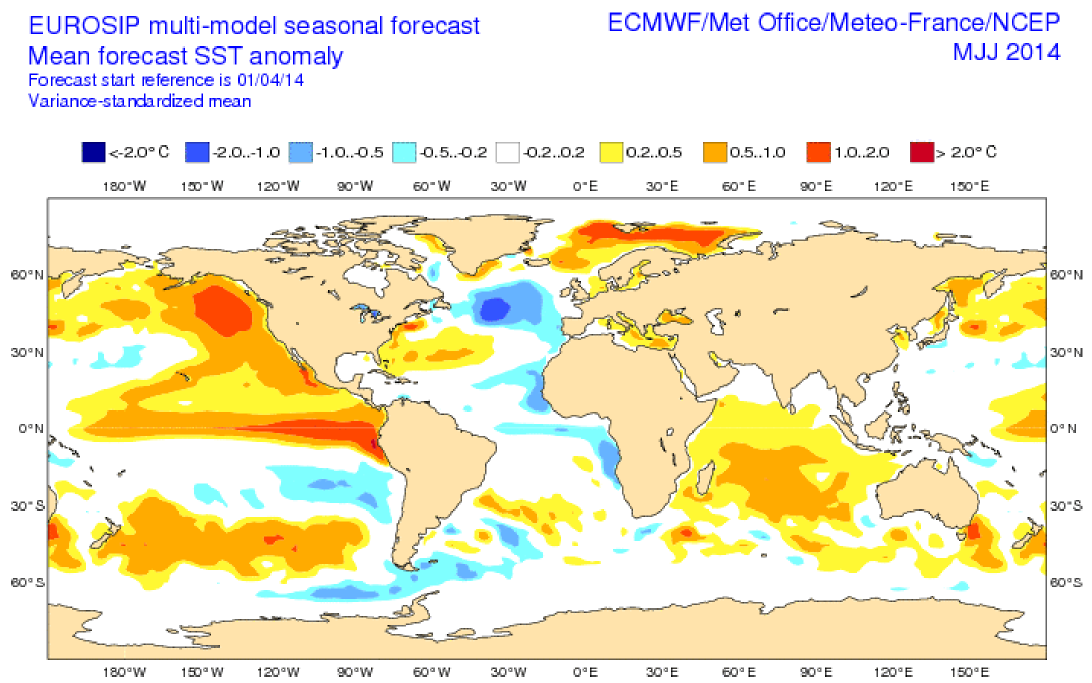


fig.16: SST Forecasted anomaly (in °C) from Euro-SIP. http://www.ecmwf.int/

II.1.b ENSO Forecast :

Forecasted Phase : Neutral on average but close to Niño threshold

For MJJ : the majority of the dynamical models stay in the range of neutral conditions at the beginning of the targeted period. However, they are indicating a warming on time in the Niño 3.4 area. Most of them are reaching the Niño threshold at the end of the period and go beyond after.

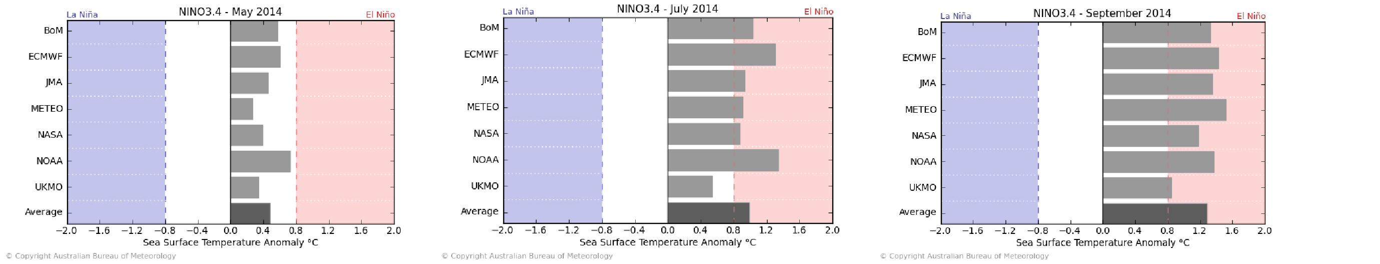
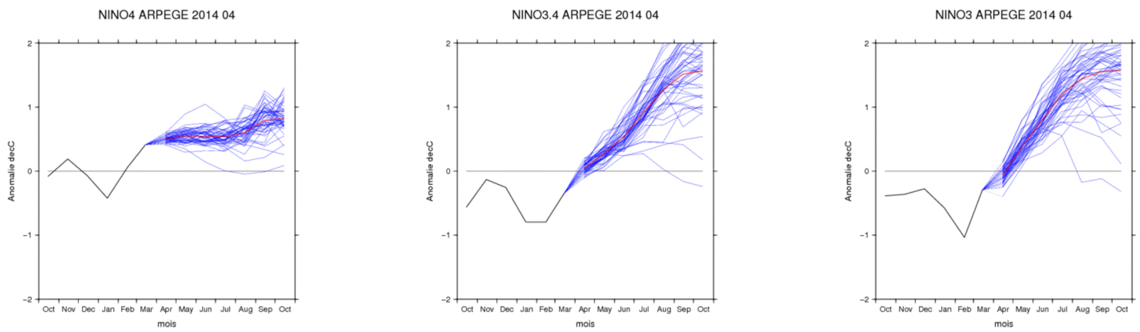
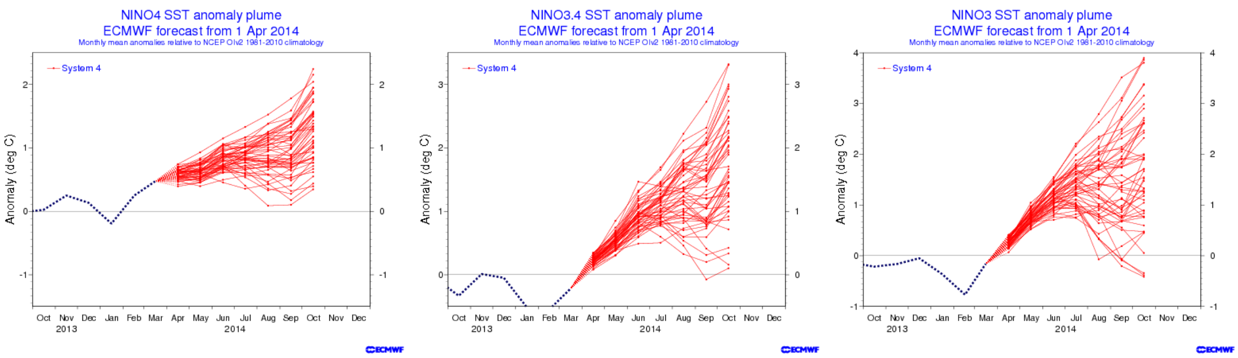


fig.17: Synthesis of Niño 3.4 forecasts from several GPC by BoM :
http://www.bom.gov.au/climate/ahead/model-summary.shtml#tabs=Pacific-Ocean

Plumes from Météo-France and ECMWF for the 3 Niño boxes (see definition in Annex – fig. II.1.5) : In both models and on average, prevailing conditions close to Niño threshold for MJJ. In both models the warming trend is conspicuous and the uncertainty is not too much despite some more uncertainty beginning of Summer. In EuroSIP Plumes, close to Niño threshold on average and continuous warming on time. The spread indicates a larger uncertainty at Summer.





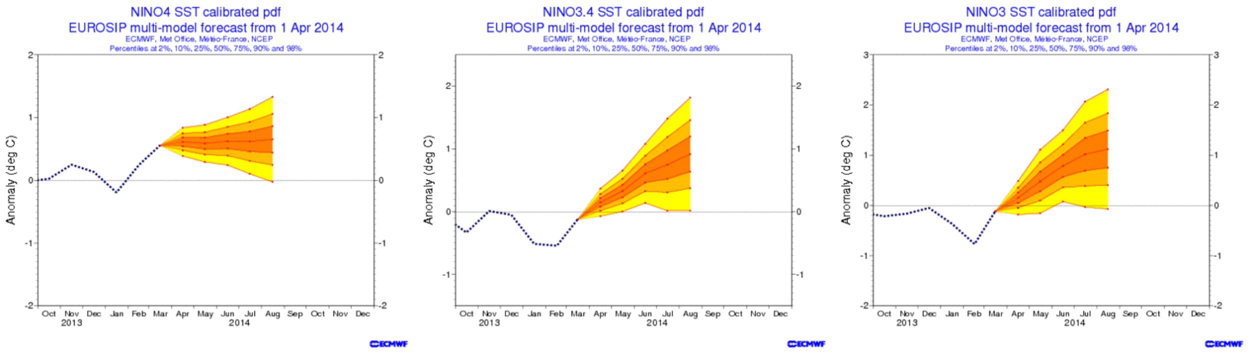


fig.18: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members - and EuroSIP (bottom) – recalibrated distributions.
(http://www.ecmwf.int/)

II.1.c Atlantic Ocean forecasts :

Forecasted Phase: Below Normal in the Northern and Southern Tropics - TASI on the negative side returning to neutral

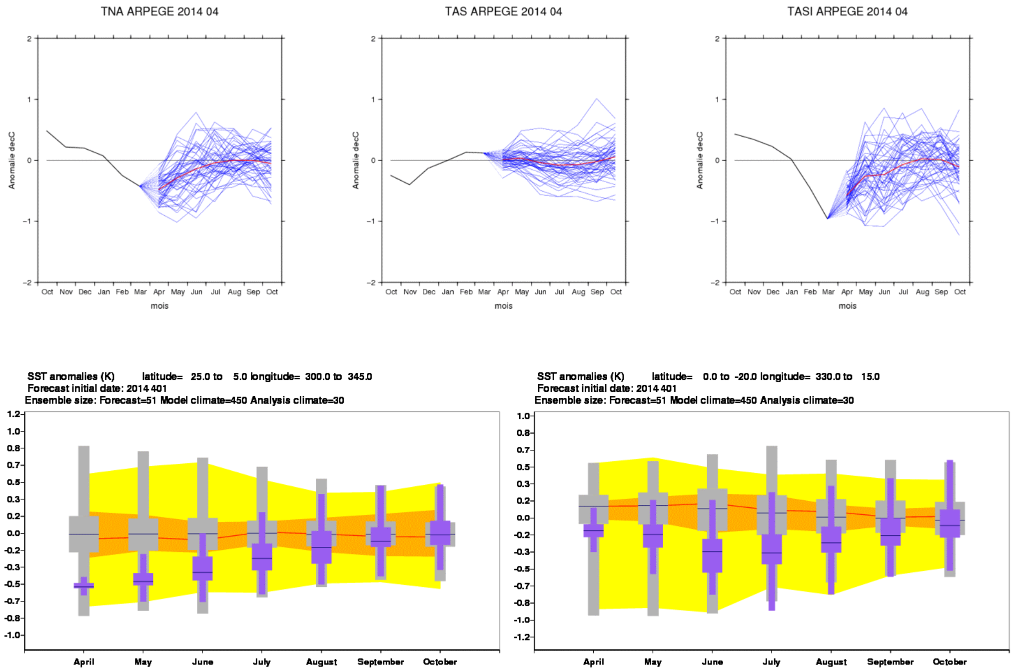


fig.19: SSTs anomaly forecasts in the Atlantic Ocean boxes from Météo-France (top) and ECMWF (bottom), plumes / climagrams correspond to 51 members and monthly means.

Consistent behaviour between the 2 models over the North Atlantic ; the difference over the Southern Atlantic could be partly related to the hindcast issue.
North Tropical Atlantic : Colder than normal conditions in both models with a progressive (weak) warming.
South Tropical Atlantic : Close to neutral conditions in both models with some cooling up to July.
TASI : in MF, the TASI index is slightly negative for MJJ with a tendency to return to neutral conditions at the end of the period. However the spread is large.
Guinean Gulf : close to neutral in MF.

II.1.d Indian Ocean forecasts :

Forecasted Phase: West (warming) and East positive IOD on the positive side

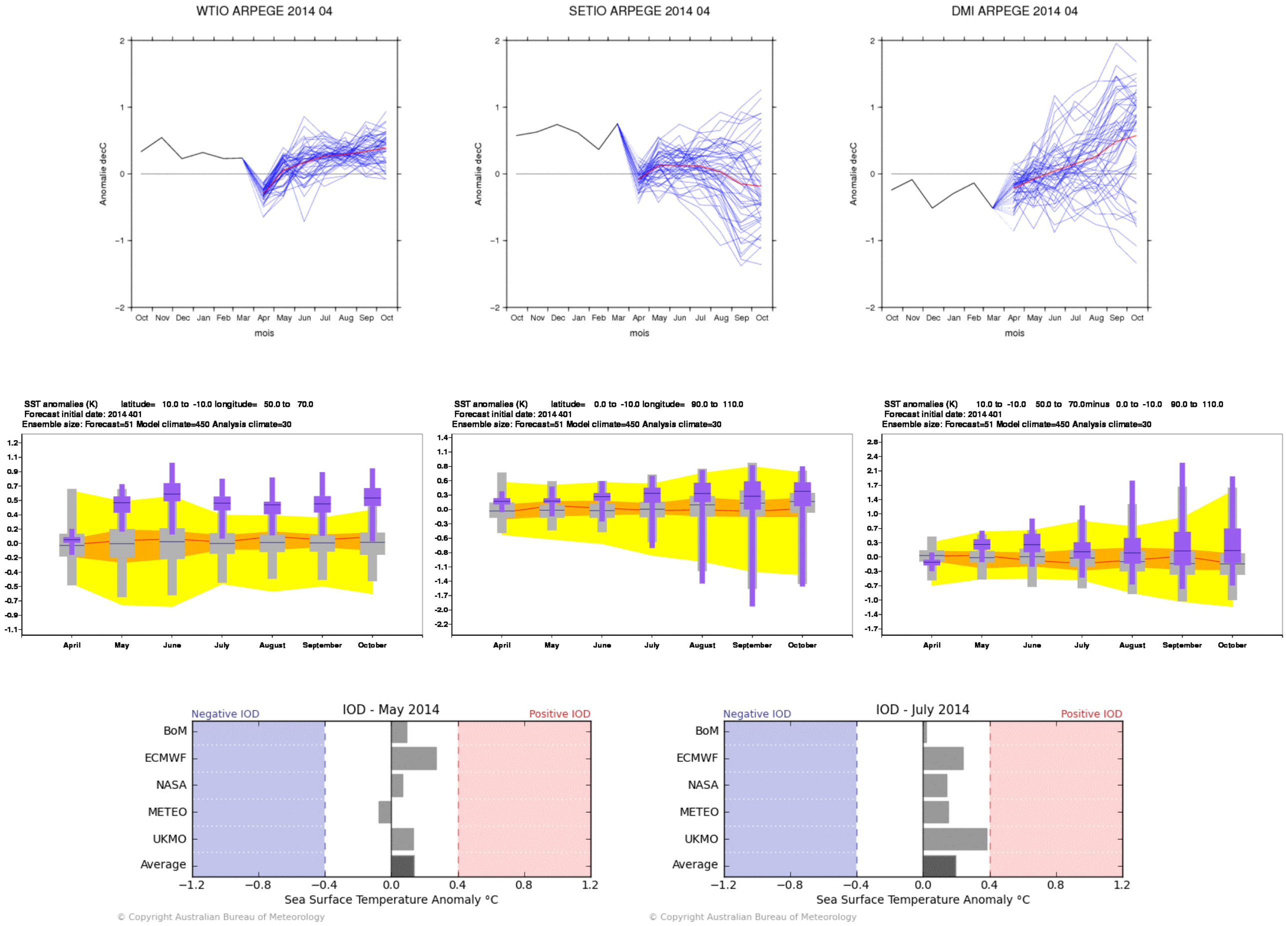


fig.20: SSTs anomaly forecasts in the Indian Ocean boxes from Météo-France (top), ECMWF (middle), plumes / climagrams correspond to 51 members and monthly means. Synthesis for IOD (bottom) for several GPCs from BoM http://www.bom.gov.au/climate/ahead/model-summary.shtml#tabs=Indian-Ocean

Quite consistent behaviour between the 2 models.
In WTIO : warmer than normal with a warming on time in MF (more stable in ECMWF). Not too much uncertainty in both models.
In SETIO : Slightly Above normal conditions. Quite large spread (biased toward negative side).
DMI (IOD) : on the positive side in both models ; the spread is large and biased toward positive value (see SETIO behaviour).

II.2. GENERAL CIRCULATION FORECAST

II.2.a Global Forecast

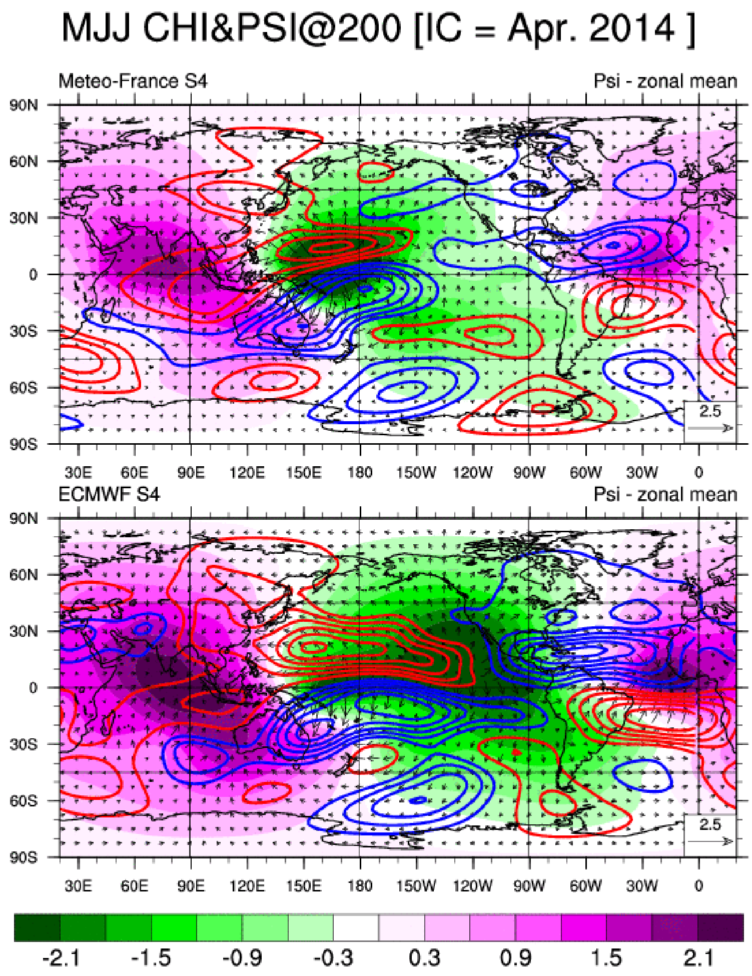


fig.21: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), associated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa by Météo-France (top) and ECMWF (bottom).

Velocity potential anomaly field (cf. fig. 19 – insight into Hadley-Walker circulation anomalies) : in the Tropics, some consistency between the 2 models but also some large differences.
Over the Pacific, The divergent circulation anomaly is not very consistent between the two models. The strongest Large Scale Convection response stays close to the dateline in MF while it is moving far on the Eastern side in ECMWF. ECMWF response seems to be more consistent with the development of the Pacific warm event from the eastern part of the basin ; in addition the JMA forecast is more similar to ECMWF ones. So we could give more weight to ECMWF solution with respect of MF forecast.
Over the Atlantic, quite consistent response (Convergent circulation anomaly - downward anomaly motion) in the vicinity of the Equator and Tropical North Atlantic with some extension over the African continent (West Africa). In JMA, the positive anomaly exists but weaker and closer to West Africa.
Over the Indian Ocean : A convergent circulation anomaly in both models over most of the Equatorial and Northern part of the basin. ECMWF response is stronger likely in relationship with the differences in the Pacific response (also stronger in ECMWF) and the relationship between the Pacific and the monsoon circulation across the Indian regions. These responses are very consistent with the one from JMA.

Stream Function anomaly field (cf. fig. 19 – insight into teleconnection patterns tropically forced) : good consistency in the Tropical Atlantic and over the Indian Ocean and Western Pacific (between 90°E and the dateline). The interpretation of these patterns could not be directly related to teleconnection patterns even if some of them seem to be linked to velocity potential field anomalies. The JMA forecast is more similar to ECMWF rather than MF in relationship with the differences into the atmospheric response over the Pacific (see Velocity Potential field discussion).

As a conclusion **the predictability** exists in the vicinity of the Pacific basin, over the Indian Ocean (especially the Northern Hemisphere) and in the Tropics in the vicinity of the Atlantic sector. Over mid-latitudes regions of the Northern Hemisphere, one could consider that the signal is poorly influenced by the Tropics to the exception of the USA. One can infer only little predictability for the mid-latitude general circulation over the Atlantic ; the predictability increasing on time.

II.2.b North hemisphere forecast and Europe

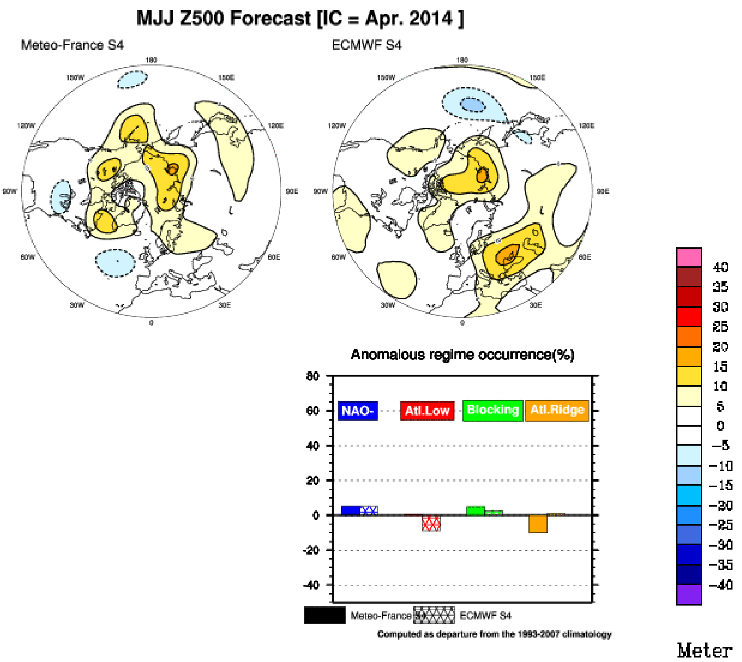


fig.22: Anomalies of Geopotential Height (top) at 500 hPa from Meteo-France (left) and ECMWF (right). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip and North Atlantic Regime occurrence anomalies (bottom) from Météo-France and ECMWF : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

Geopotential height anomalies (fig. 20 – insight into mid-latitude general circulation anomalies) : Consistently with the previous discussion, there is only little Geopotential Height anomalies and they correspond mostly to mid-high latitude signal.
Over the Pacific : some consistency over the North-Eastern Pacific and North Canada.
Over the Atlantic : Little consistency across the Atlantic and over Europe.

North Atlantic Circulation Regimes (fig. 20) : As a consequence, weak signal in the regimes forecast.

II.3. IMPACT : TEMPERATURE FORECASTS

II.3.a ECMWF

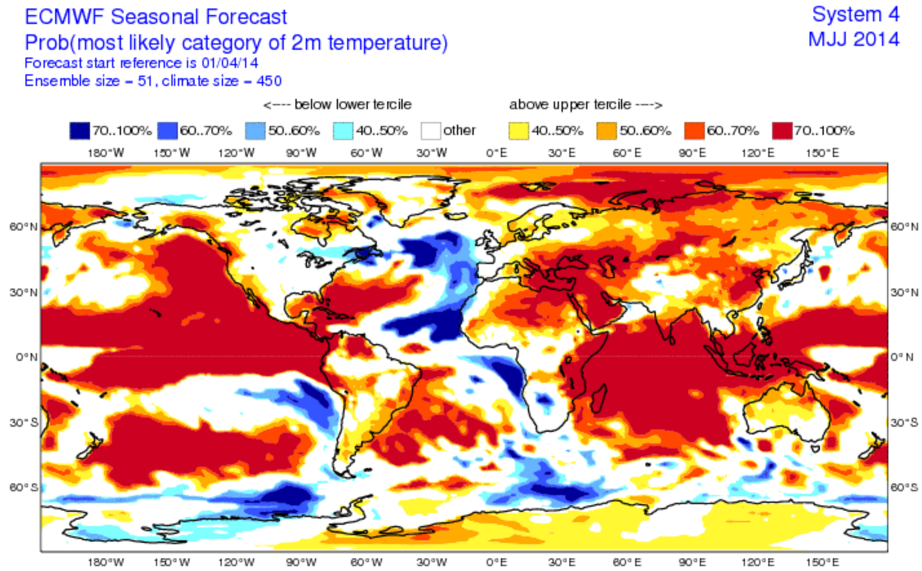


fig.23: Most likely category probability of T2m from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.3.b Météo-France

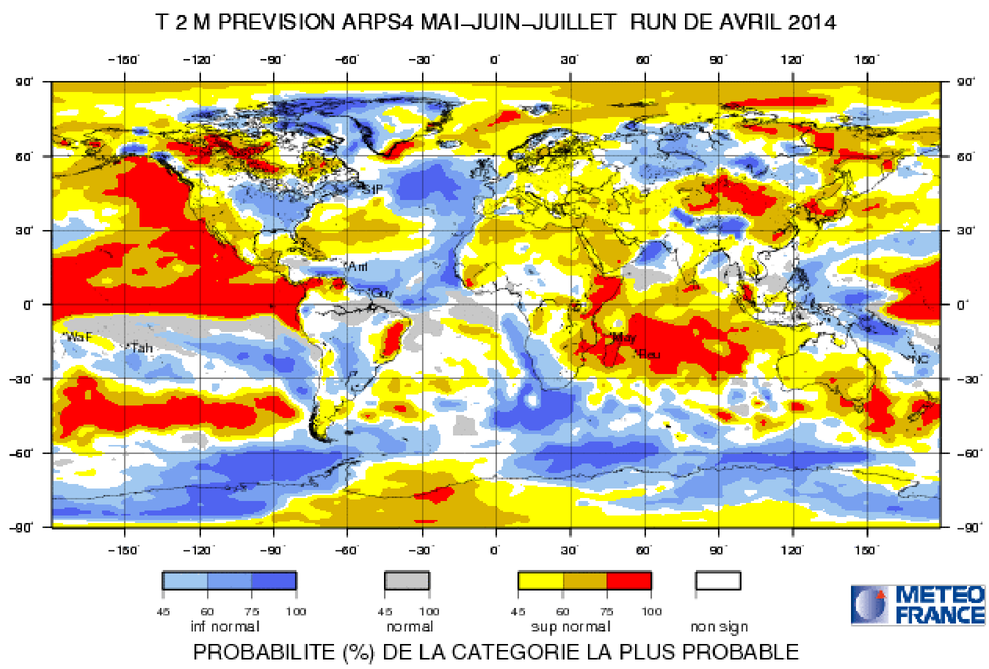


fig.24: Most likely category of T2m from Meteo-France. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. **http://elaboration.seasonal.meteo.fr/**

II.3.c Met Office (UKMO)

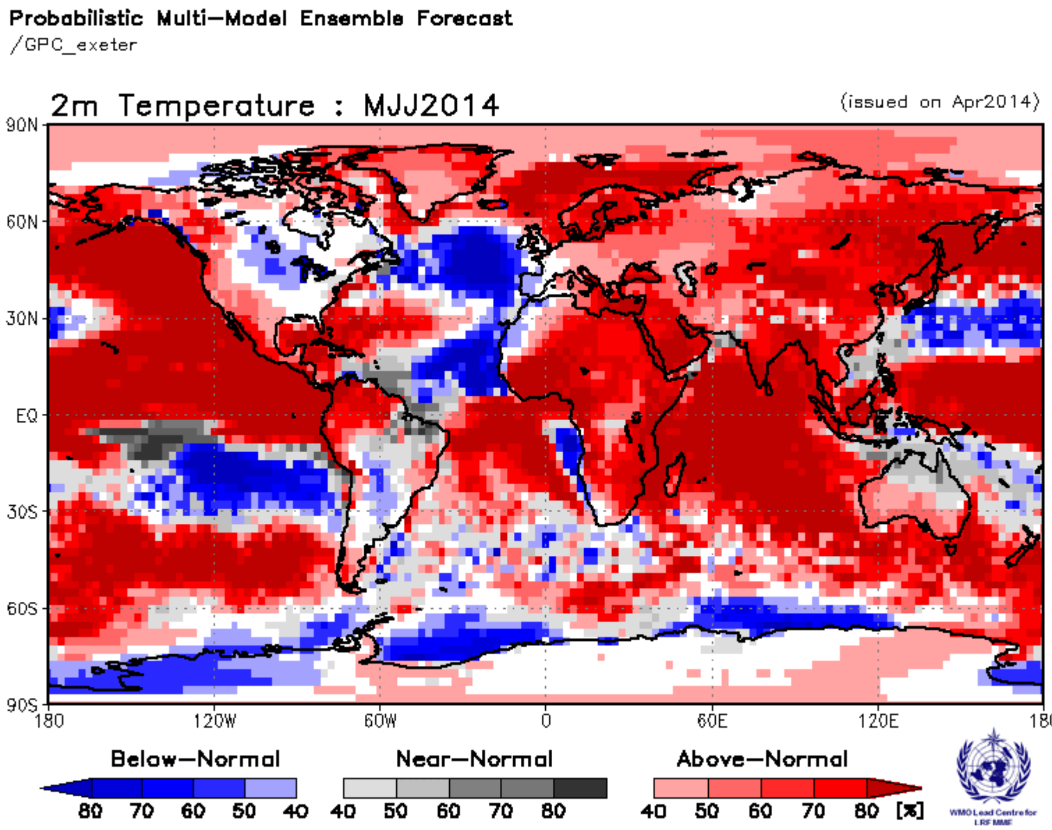


fig.25: **Most likely category of T2m Anomaly from UK Met Office. https://www.wmolc.org/**

II.3.d Climate Prediction Centre (CPC)

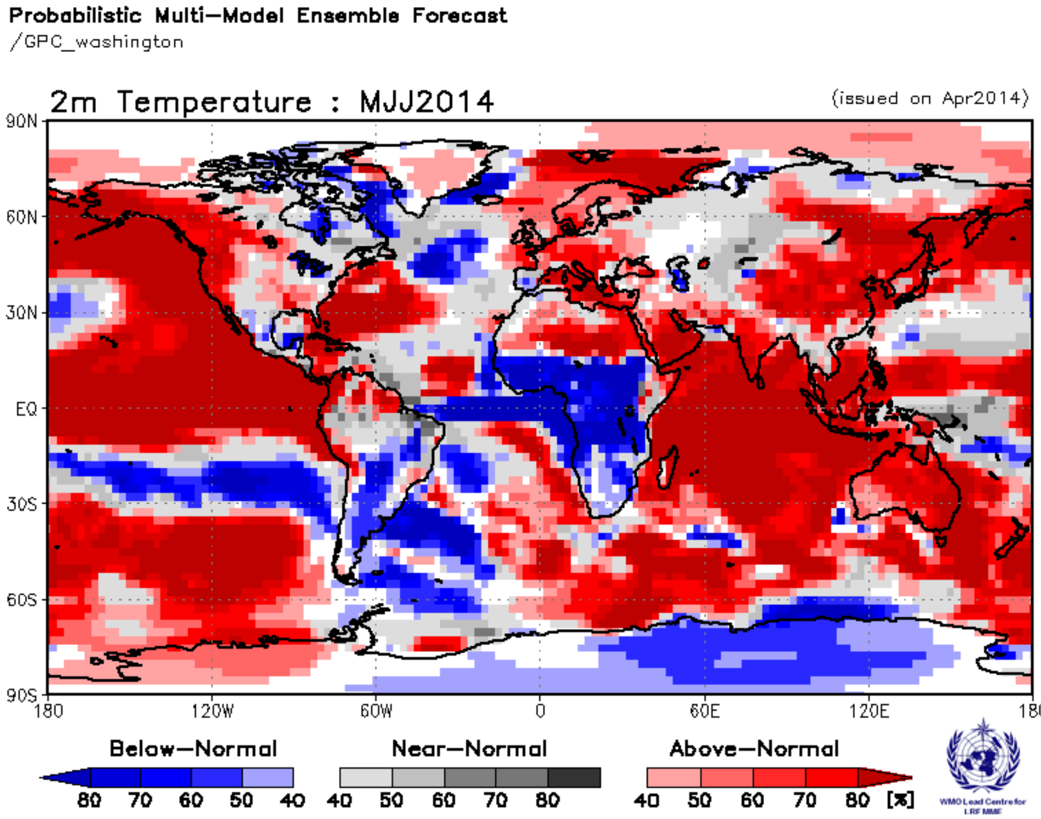


fig.26: **Most likely category of T2m Anomaly from CPC. https://www.wmolc.org/**

II.3.e Japan Meteorological Agency (JMA)

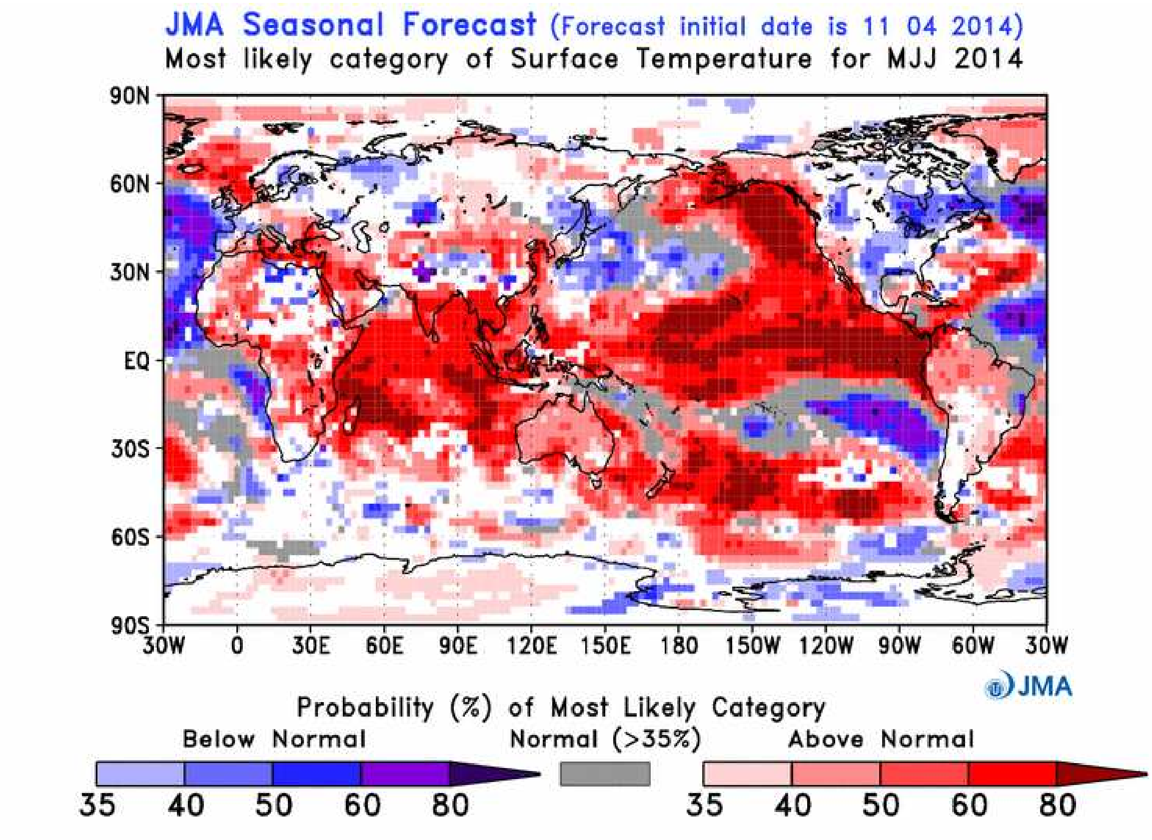


fig.27: Most likely category of T2m from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/

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

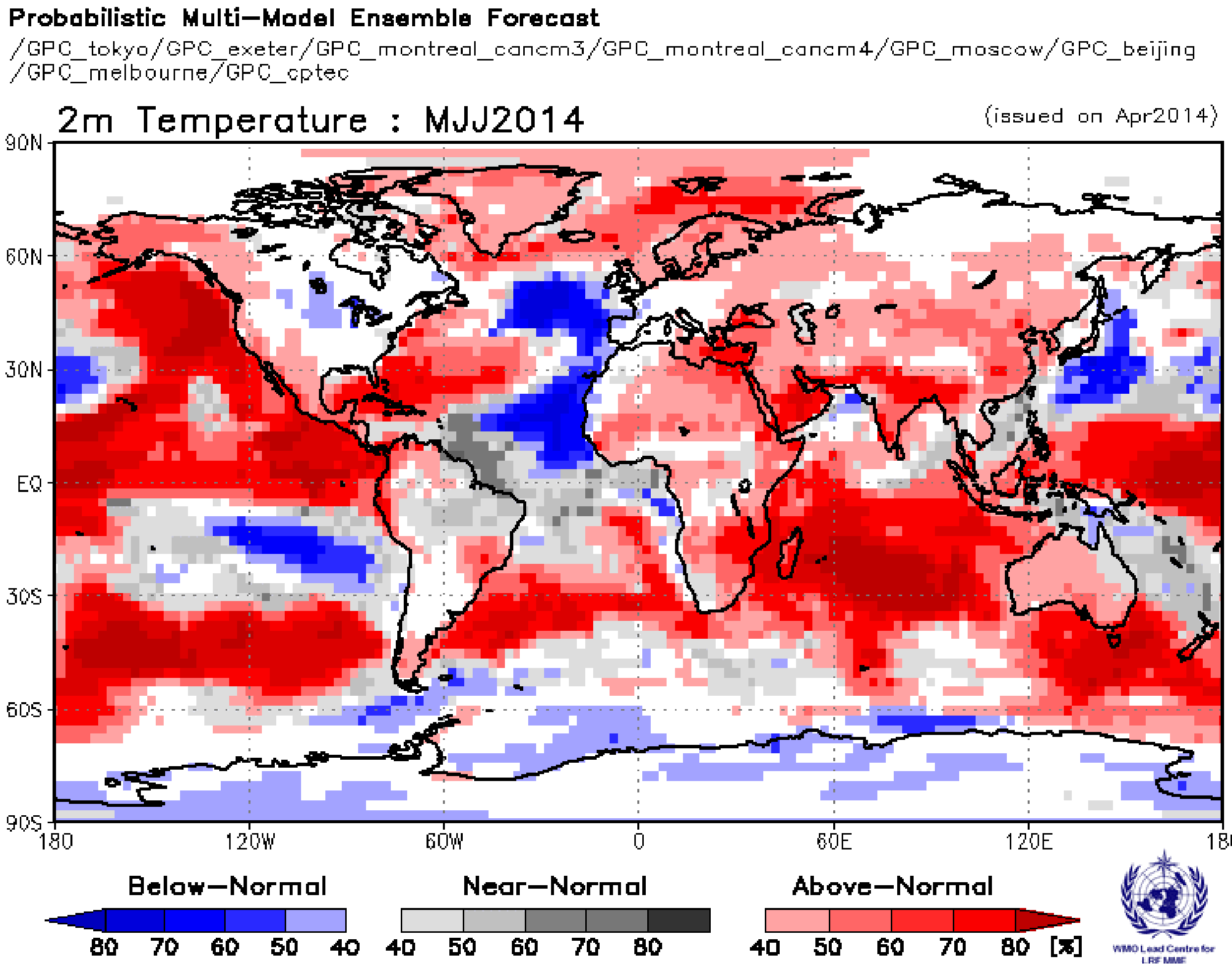


fig.28: MME most likely category of T2m from LC-MME. The MME composition corresponds to the GPCs not used in EuroSIP https://www.wmolc.org/

II.3.g Euro-SIP

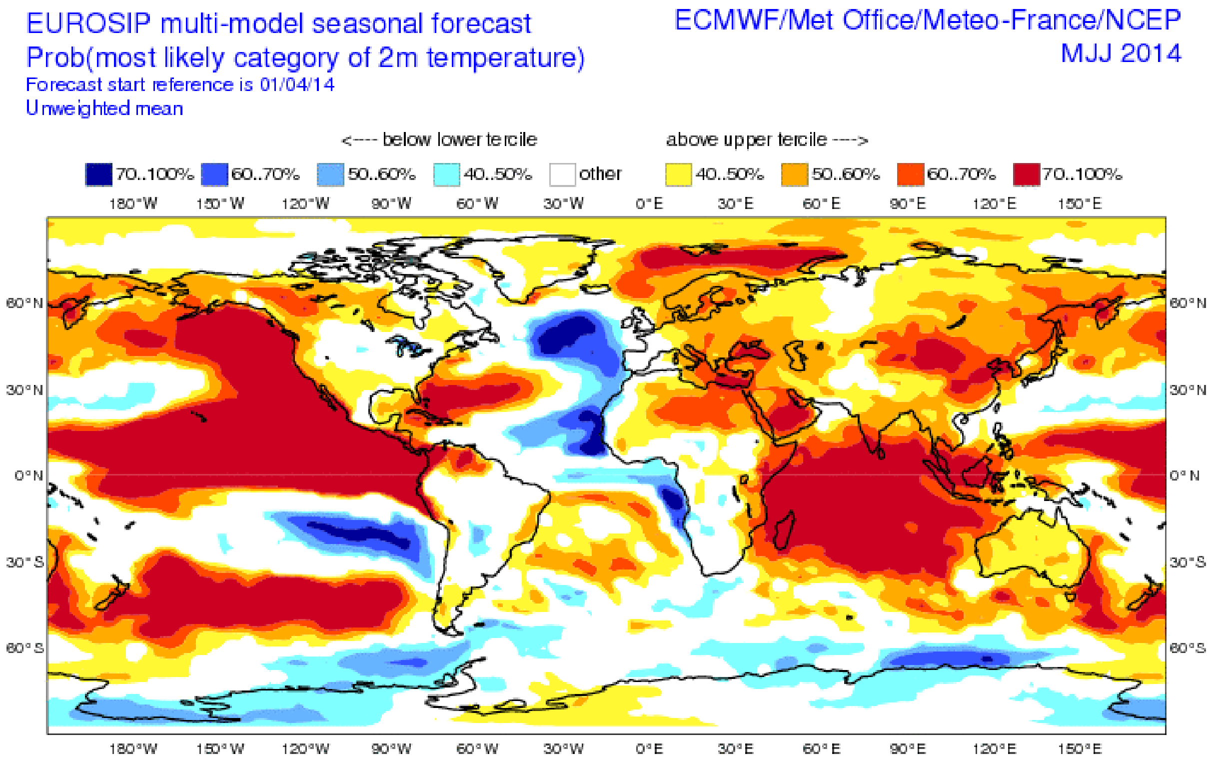


fig.29: Multi-Model Probabilistic forecasts for T2m from EuroSip.
(2 Categories, Below and Above normal – White zones correspond to No signal and Normal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

North-America : enhanced probabilities for warm anomalies over a large portion of Canada and the Western coast of USA.
Central-America : globally warmer than normal extending toward the North Caribbean.
South-America : Some consistent signal over the North-Western coastal part of the continent (warmer than normal) and the Northern regions (on the Atlantic).
Australia : warmer than normal especially over most of the continent.
Asia : Mostly Warmer than normal conditions everywhere, with the strongest probability on the Eastward side. Warmer than normal conditions over most of the Indian sub-continent (possibly in relationship with a weak monsoon).
Africa : Mostly warmer than normal over the Northern part of the continent and along the Eastern coast.
Europe : Warmer than normal conditions over most of the continent to the exception of the Western facade (No Signal).

II.4. IMPACT : PRECIPITATION FORECAST

II.4.a ECMWF

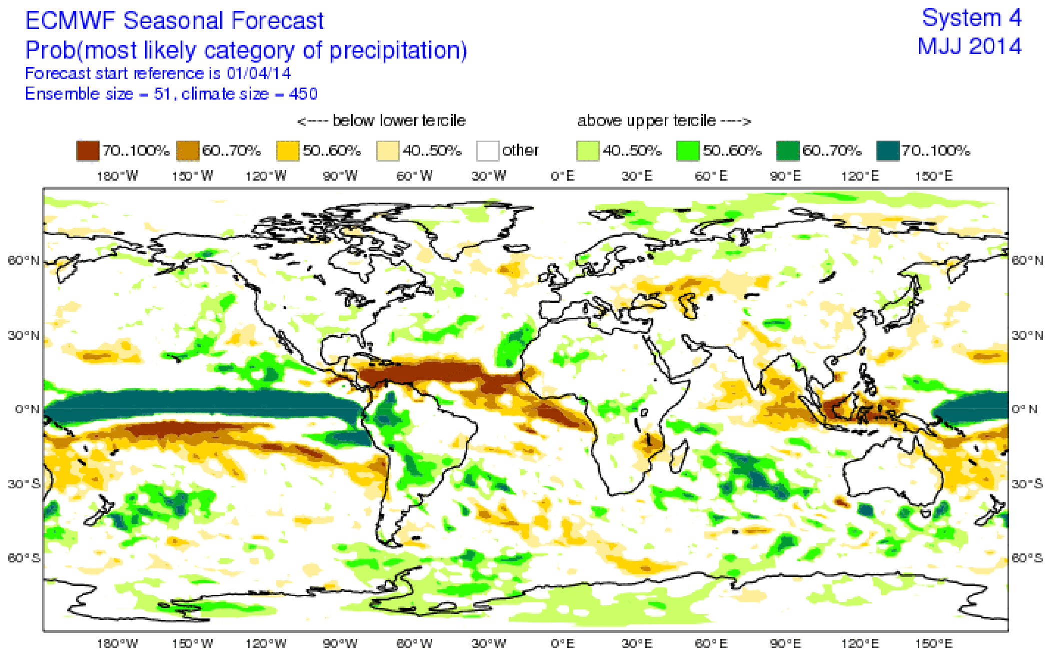


fig.30: Most likely category probability of rainfall from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/charts/seasonal_charts_s2/

II.4.b Météo-France

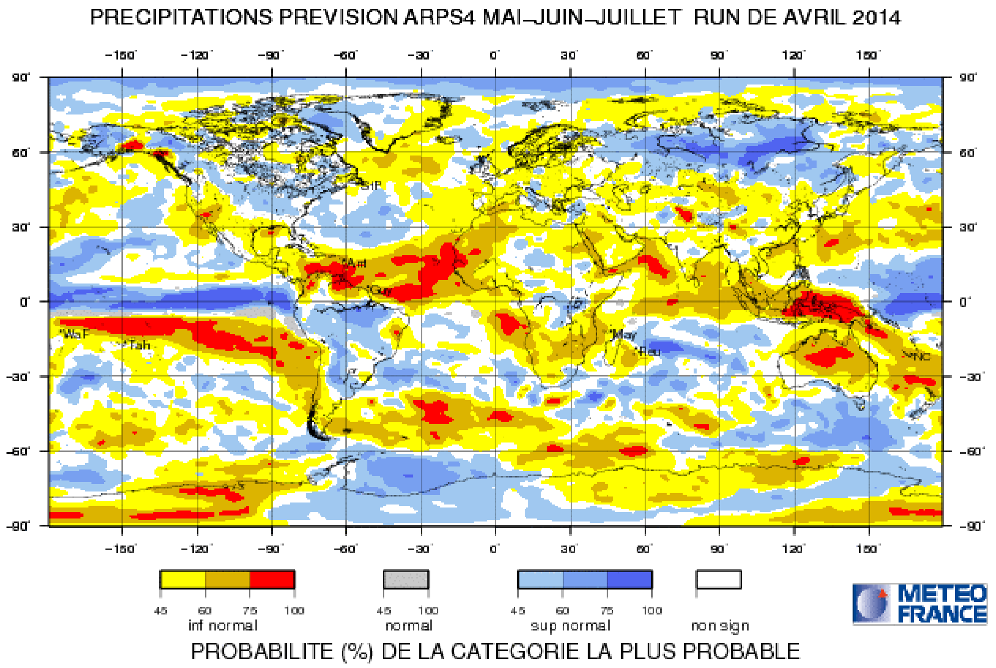


fig.31: Most likely category of Rainfall from Meteo-France. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.4.c Met office (UKMO)

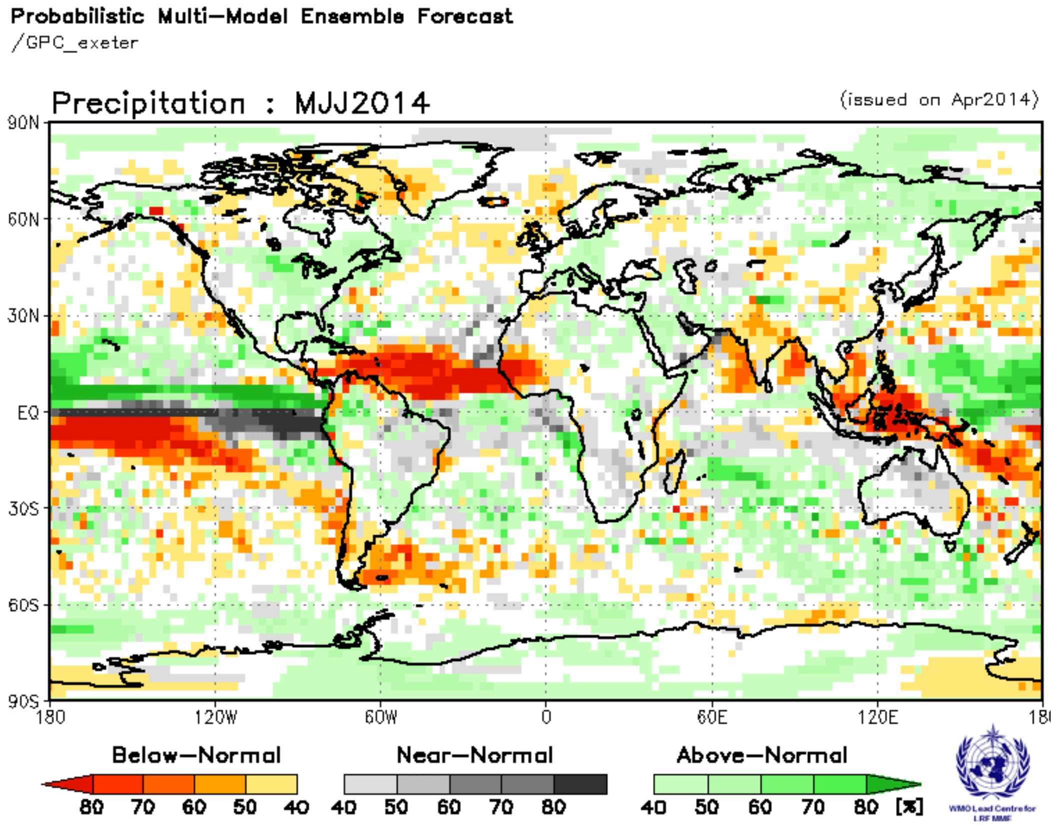


fig.32: **Category probabilities of Rainfall from UK Met Office.** **https://www.wmolc.org/**

II.4.d Climate Prediction Centre (CPC)

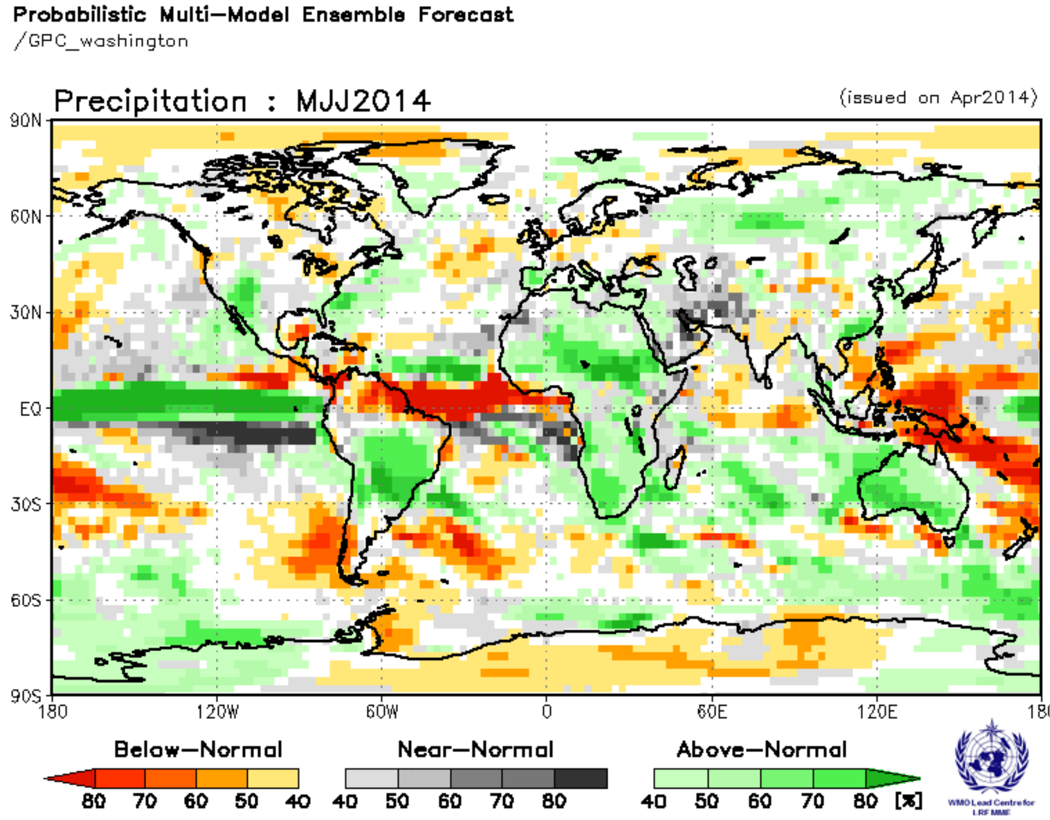


fig.33: **Most likely category of Rainfall from CPC.** **https://www.wmolc.org/**

II.4.e Japan Meteorological Agency (JMA)

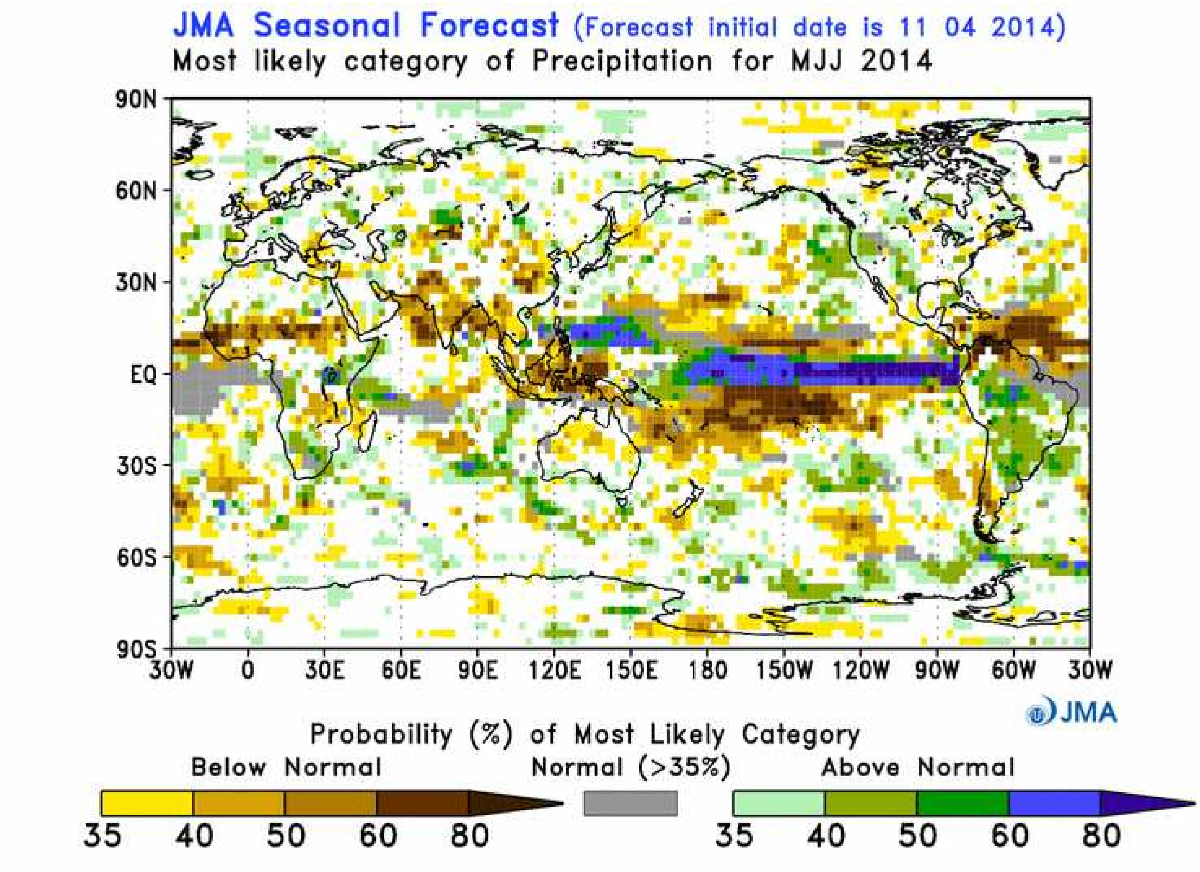


fig.34: Most likely category of Rainfall from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/

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

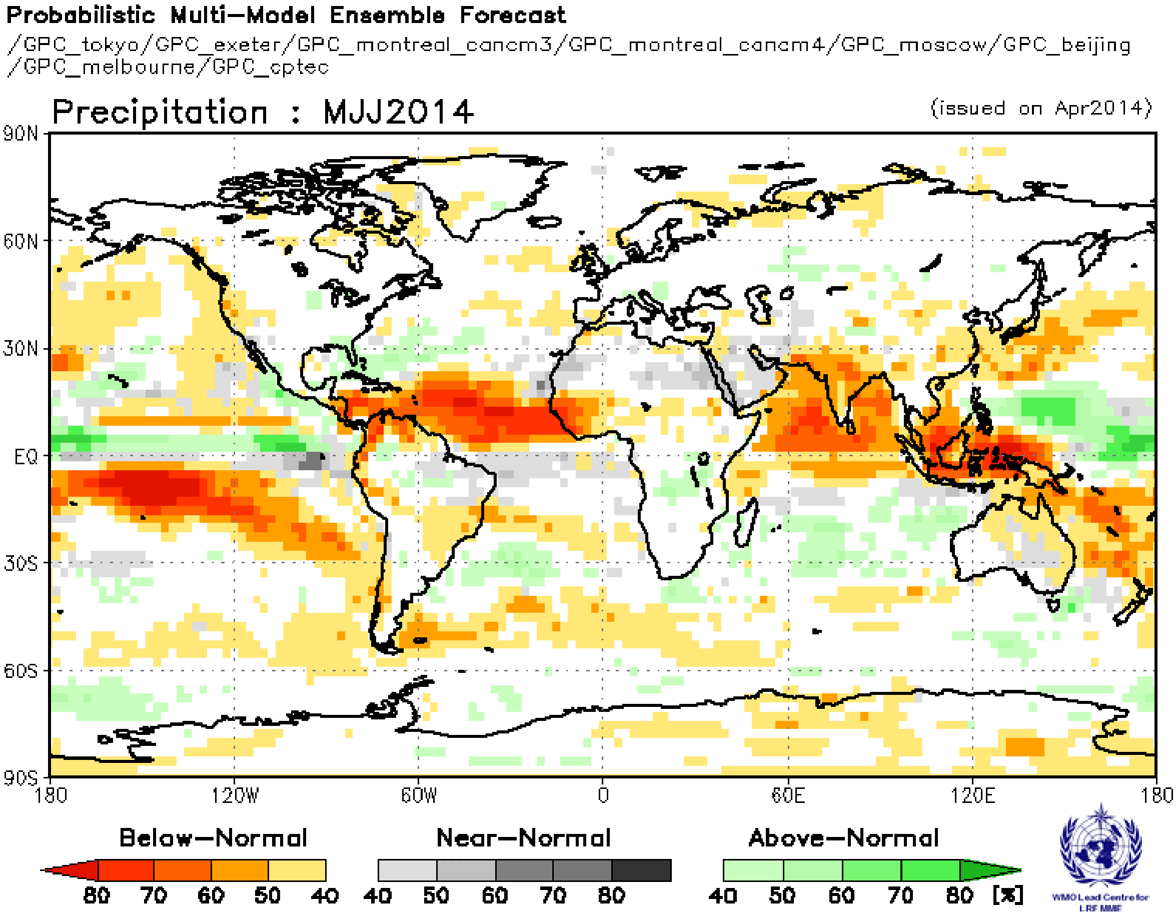


fig.35: **MME most likely category of Rainfall from LC-MME. The MME composition corresponds to the GPCs not used in EuroSIP. https://www.wmolc.org/**

II.4.g Euro-SIP

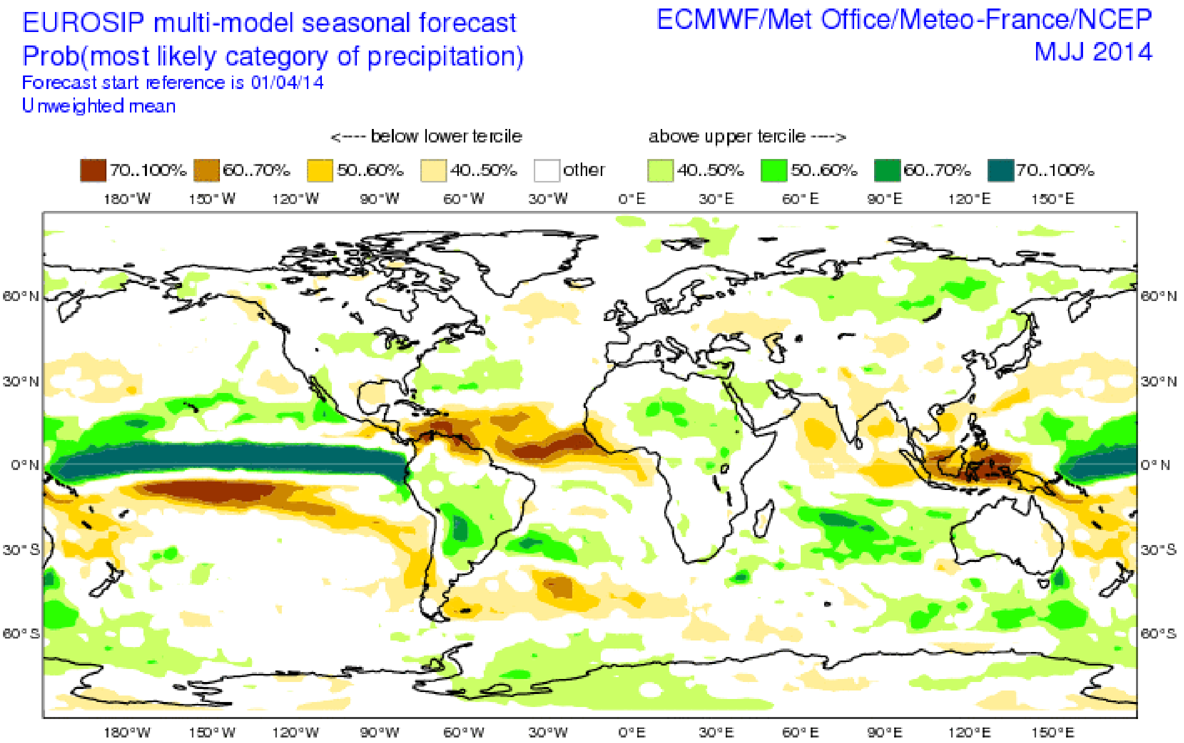


fig.36: Multi-Model Probabilistic forecasts for precipitation from EuroSip. (2 Categories, Below and Above normal – White zones correspond to No signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

In the Tropics : some consistent signal. Enhanced probabilities for wet scenarios across the Equatorial Pacific extending up to the dateline (see previous discussions), also over a large portion of Africa North to the Equator (especially Central and Eastern Sahel)and over a large portion of South-America (Brazil, Argentina, Bolivia, …). Enhanced probabilities for dry scenario over the Northern coastal areas of South America (and the Southern Caribbean), over most of the Maritime continent and the most South-Western part of West Africa, including the coastal regions of the Guinean Gulf. Also to be quoted Dry scenarios over part of the Indian sub-continent consistently with the development of the Pacific warm event and the atmospheric response of the models over the Indian Ocean (weakened monsoon circulation).
For Europe : No signal more or less everywhere to the exception of little traces of enhanced probabilities of Dry scenario over the most South-Eastern regions.

II.5. REGIONAL TEMPERATURES

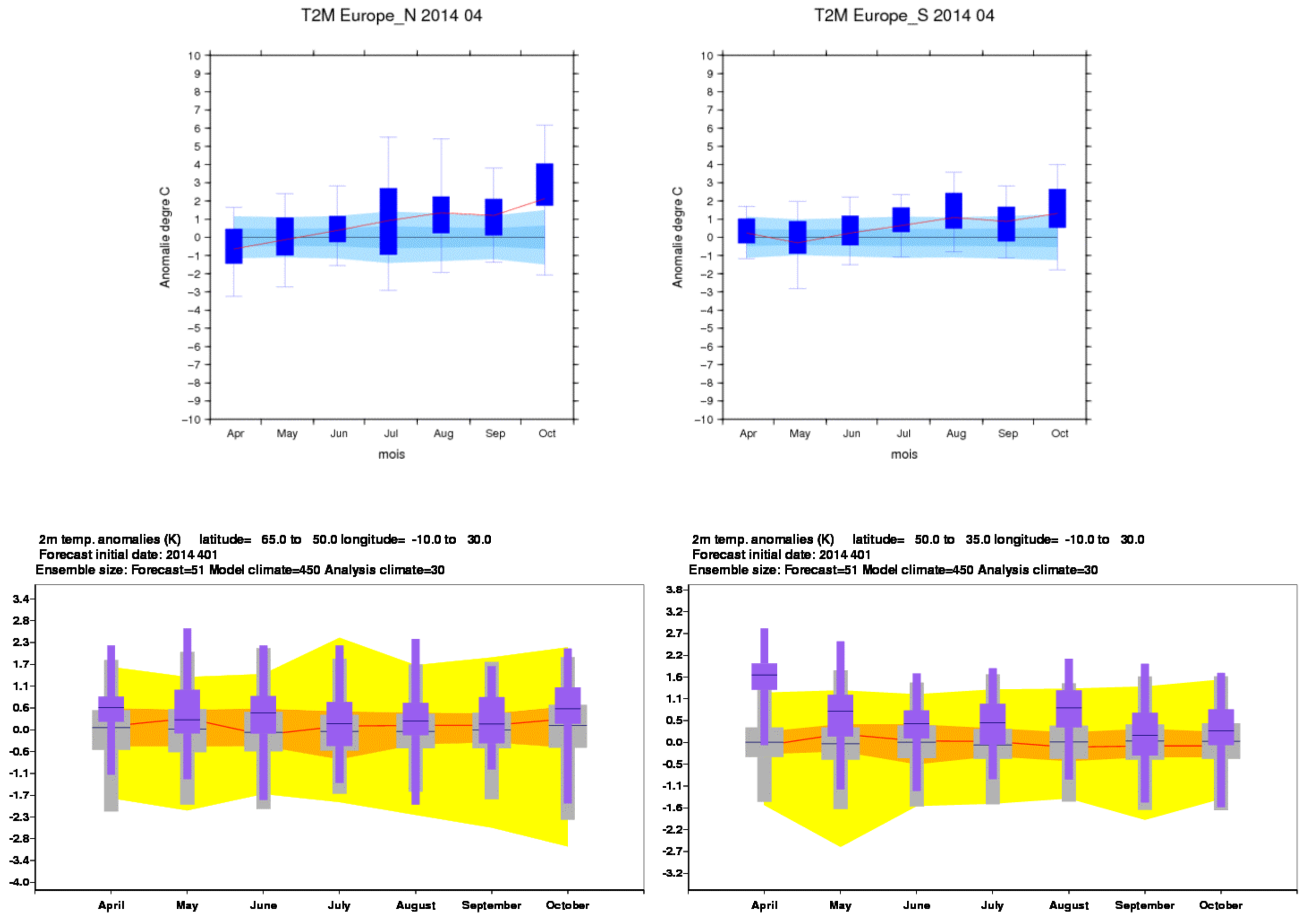


fig.37: Climagrams for T2m in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom - idem).

Little consistency between the two models (see discussion on Geopotential Height)

For Northern Europe : Continuous warming in MF and large spread in July and beyond. Slightly warmer than normal conditions in ECMWF and return to close to normal conditions at fall. Also large spread (with respect of the climate reference).

For Southern Europe : Continuous warming in MF and large spread in May. In ECMWF, well above normal conditions first and progressive cooling but keeping warmer than normal conditions along the entire period. Also large spread (with respect of the climate reference)..

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

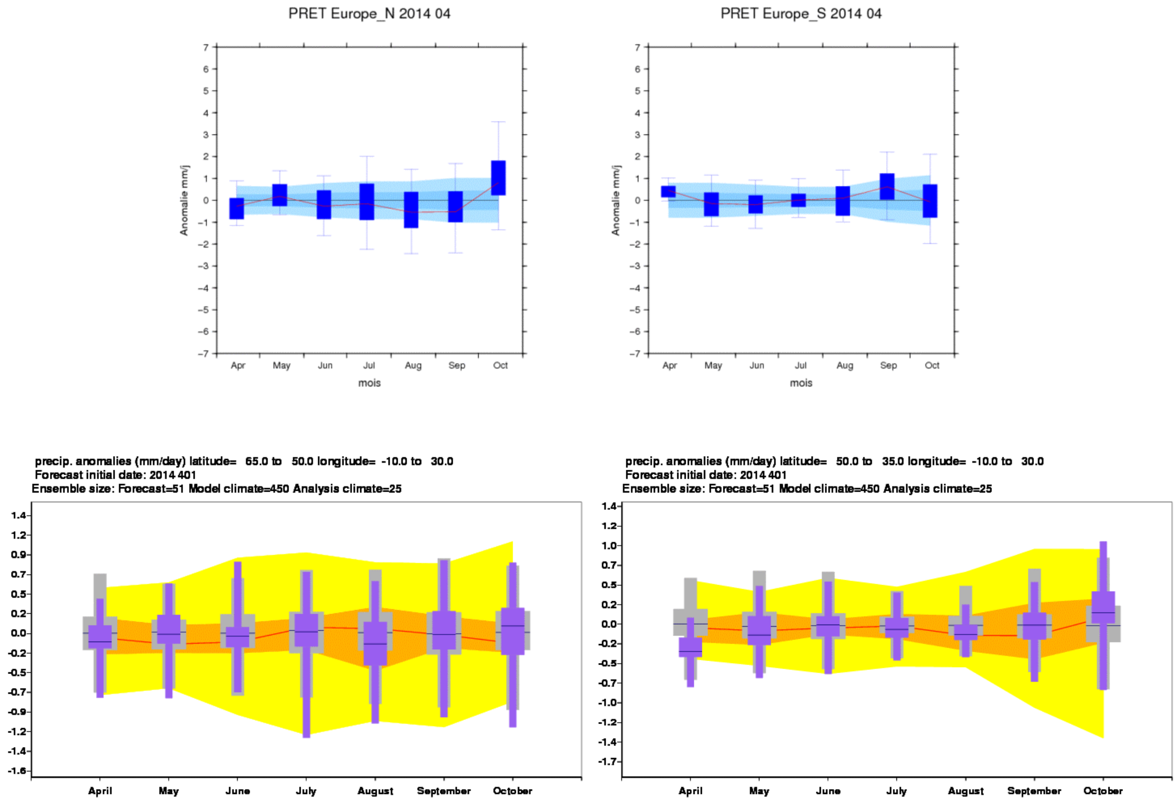


fig.38: Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom - idem).

Some consistency between the 2 models.

For Northern Europe : the signal move in time toward below normal conditions in MF while it is mostly Above normal in ECMWF. The spread is large.

For Southern Europe : on average close to normal conditions. The spread is quite large.

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

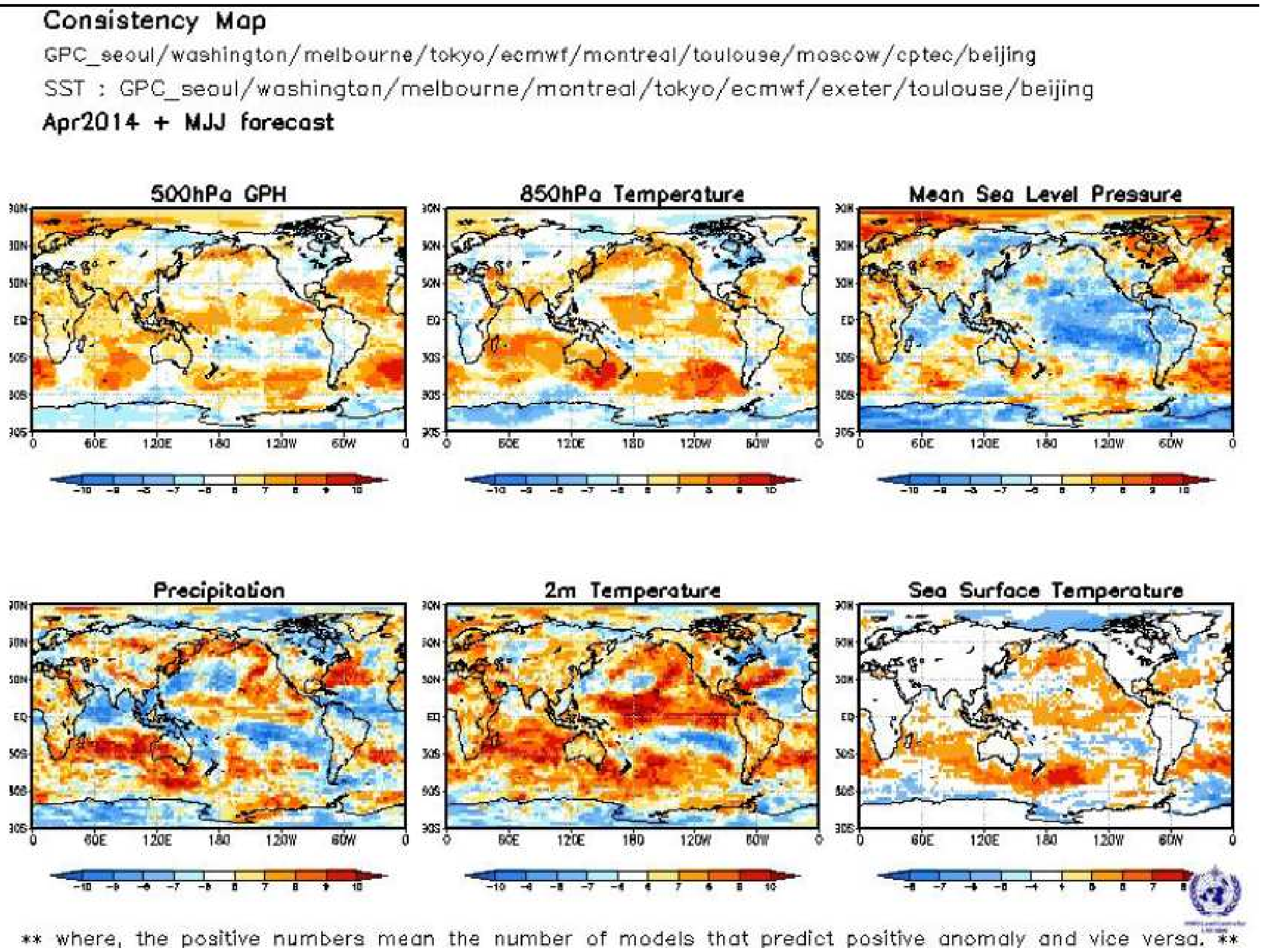


fig.39: ***GPCs Consistency maps from LC-MME*** http://www.wmolc.org/

For SST : Surprisingly, not too much consistency in the SST forecasts and the Tropical regions, especially over the Pacific but also over the Indian Ocean and the Atlantic. The greatest consistency is in the sub-tropics and mid-latitudes of the Southern Hemisphere.

For Z500 : Mostly Above normal consistent signal in the Tropics. In the Northern Hemisphere, consistency for a positive anomaly in the sub-tropics (EA mode positive) and also close to West Africa (see General Circulation discussion – consistent with the velocity potential anomaly already discussed).

For T2m : Some very consistent signal (warmer than normal) ; especially a large portion of Central and Eastern Europe, part of North Africa, most of the Eastern coast of Africa and the Indian Ocean South to the Equator, The Northern part of South-America, Central America and the Northern Caribbean and the Western coast of USA.

For Precipitation : Some consistent signal for drier conditions over the maritime continent extending up to New-Zealand, Southern part of the Caribbean and Northern part of South-America, the coastal area of West Africa and some areas of the Indian sub-continent. Wetter than normal conditions in the Southern part of Australia, on the Southern part of Brazil, along the Eastern coasts of Asia and USA. SPCZ. Little consistency over most of the European continent.

II.7. “EXTREME” SCENARIOS

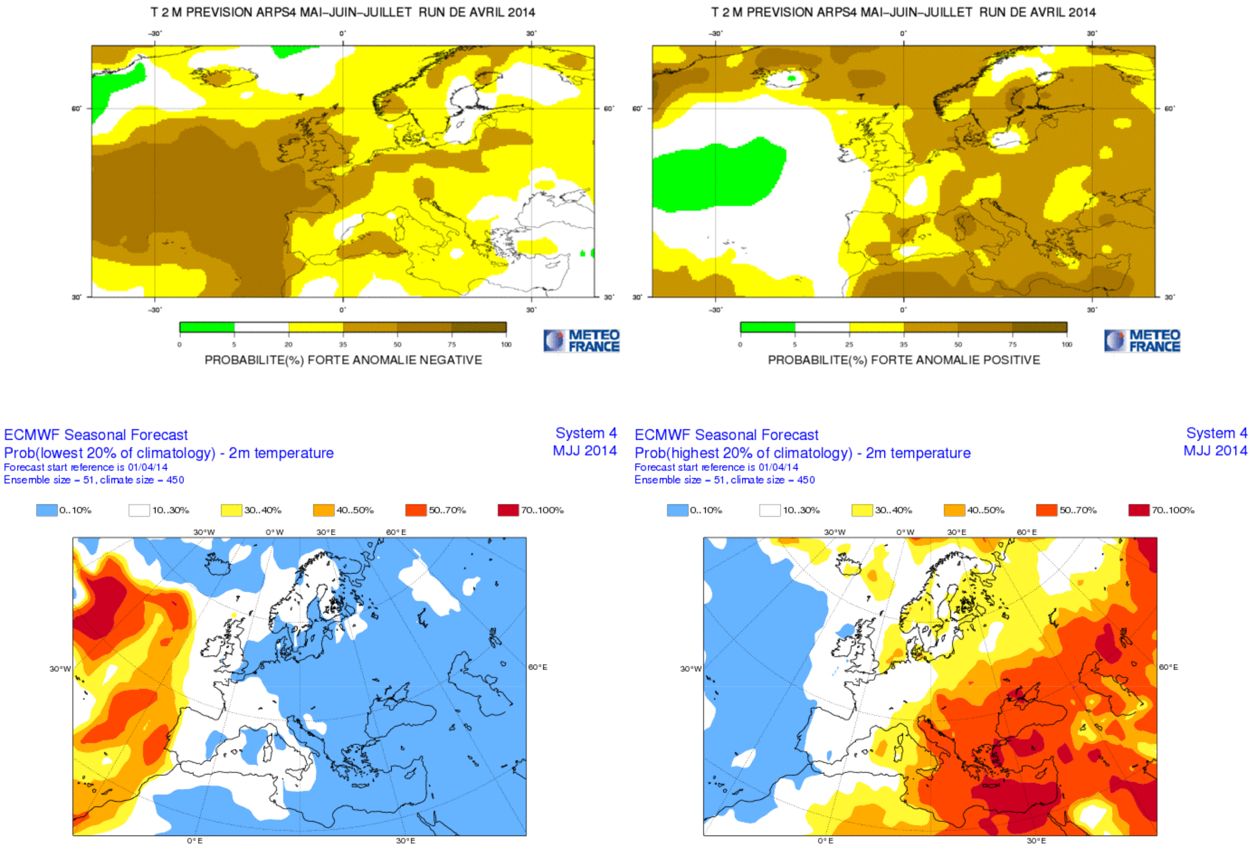


fig.40: Top : Probability of « extreme » above normal conditions from T2m for Meteo-France (left - highest ~15% of the distribution and right lowest ~15% of the distribution)
Bottom : idem from ECMWF (left - highest 20% of the distribution and right lowest 20% of the distribution).

Some consistent signal between the 2 models.
The **Very below scenario** over the Eastern Atlantic, Enhanced probabilities over most of the South–Eastern part of Europe for the **Very Above normal** scenario (especially the SEECOF region and the Eastern part of the Mediterranean basin). In MF, the ROC scores are between 0.55 and 0.8 over a large portion of Europe (up to Scandinavia) and around the Mediterranean basin. So some information could be inferred from these forecasts especially over the SEECOF region (with a significant score).

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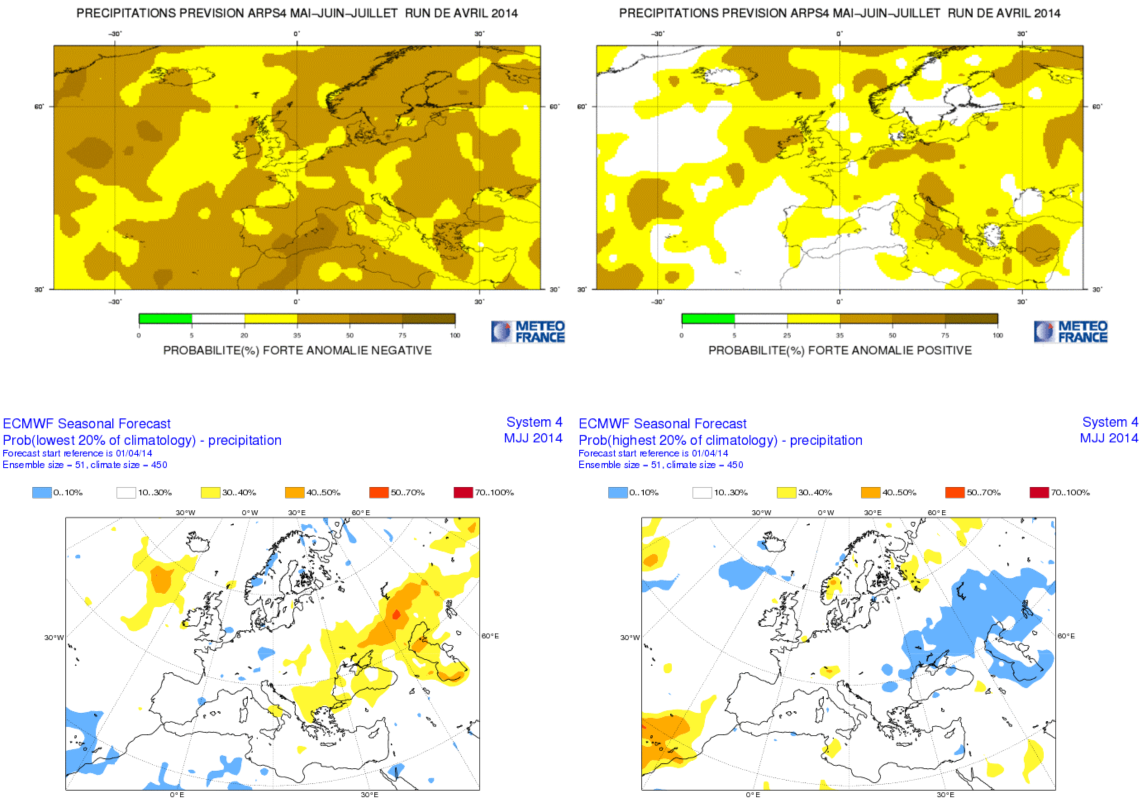


fig.41: Top : Probability of « extreme » above normal conditions for rainfall from Meteo-France (left - highest ~15% of the distribution and right lowest ~15% of the distribution)
Bottom : idem from ECMWF (left - highest 20% of the distribution and right lowest 20% of the distribution).).

Mostly No signal in ECMWF to the exception of regions between the Black Sea and the Caspian Sea (enhanced probabilities for Well Below scenario). In MF there are divergent signal for extreme scenarios (enhanced probabilities for both extreme categories). To be quoted the divergent scenarios over Central and Eastern Europe. The ROC scores in MF are only worst than climatology over most of Europe for the Very Below category.
So in relationship with the current predictability and the model uncertainties, it seems **difficult to use these extreme precipitation forecasts**.

II.8. DISCUSSION AND SUMMARY

Forecast over Europe

For this forecast the major comment is about the **current predictability** in the climate system. The development of a warm event in the Pacific suggest some possible predictability, but mostly located in the Tropics at this stage (Pacific, Indian Ocean and Atlantic).
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, at the exception of the most South-Eastern part of Europe with a slight enhanced probability for drier than normal scenario.
For temperature : the Above normal scenario could be privileged for the most of Central and Eastern Europe and especially the South-East European region where Very Above normal conditions could occurred. For the Western façade, there is more uncertainty and so "No Privileged" scenario should be privileged.
Obviously, some downscaled information could detail these scenarios for specific countries or sub-regions.

Tropical Cyclone activity

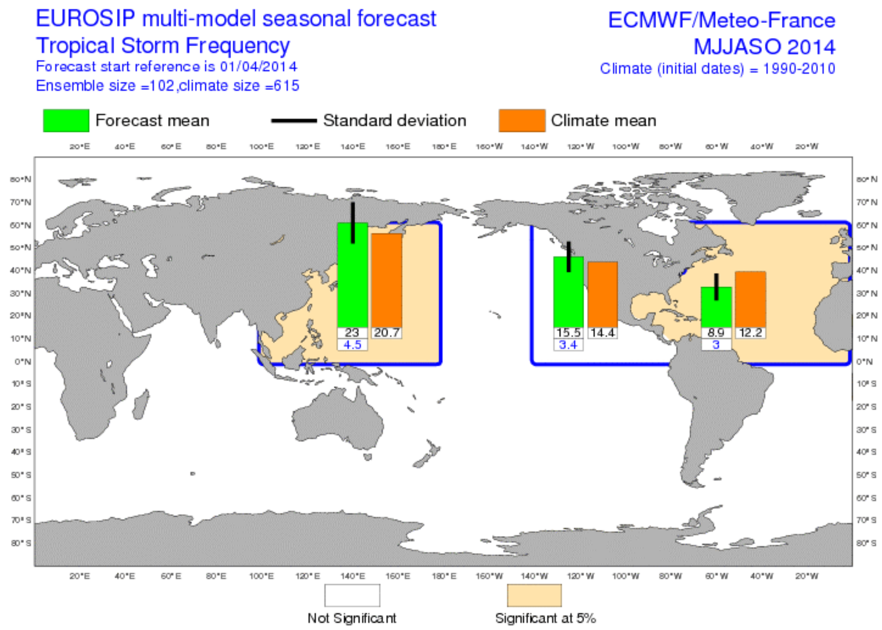


fig.42: Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro/eurosip_tropical_storm_frequency/

For the Tropical Cyclone season and in relationship with the SSTs scenarios, Euro-Sip forecasts indicate Below Normal Topical Cyclone activity over the Tropical North Atlantic (consistently with the development of the Pacific warm event) and Above normal Tropical Cyclone activity over the North Western Pacific. The Tropical Cyclone activity should be close to normal in the North eastern Pacific.

WMO RA VI
Pilot RCC-Network

Synthesis of Temperature forecasts for May-June-July 2014 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	*above normal*	*no privileged scenario*	*above normal*	*above normal*	*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 May-June-July 2014 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.

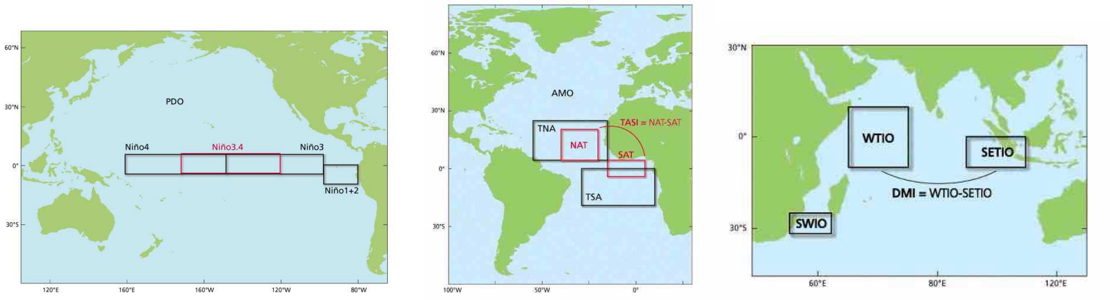
III.2. « NINO », SOI INDICES AND OCEANIC BOXES

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.