GLOBAL CLIMATE BULLETIN
n°178 – APRIL 2014

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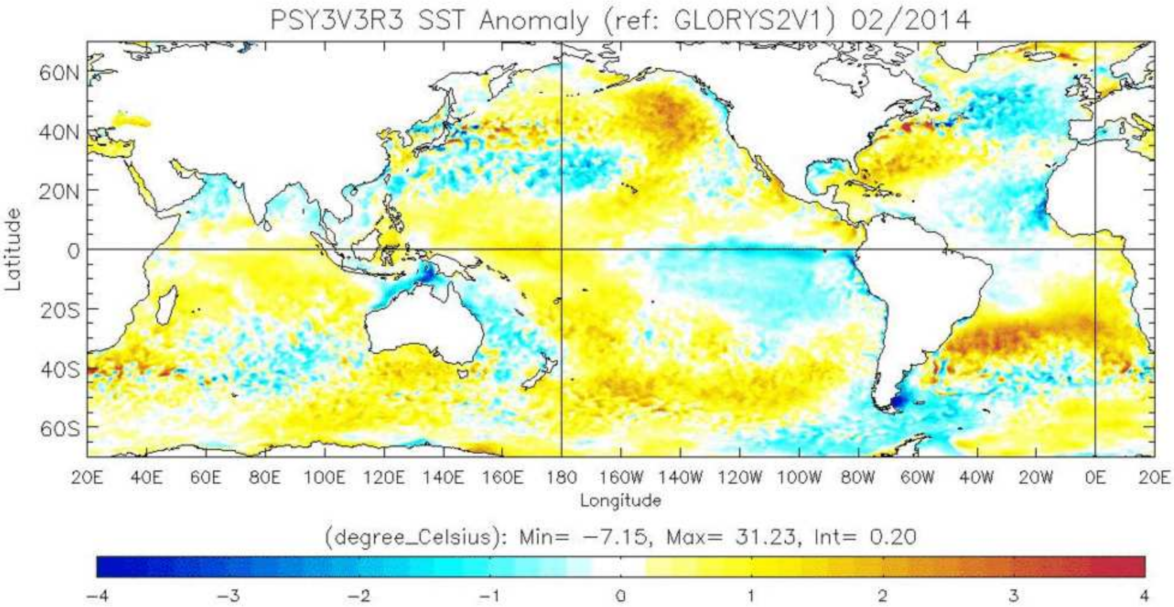
I. DESCRIPTION OF THE CLIMATE SYSTEM (FEBRUARY 2014)

I.1. Oceanic analysis

I.1.a Global analysis

Conspicuous evolutions in the Pacific equatorial waveguide ; a Dipole-like pattern with a strengthening of the Positive anomaly close to the dateline and the negative anomaly over the Eastern part. In the tropics, cooling over North Atlantic (mostly on the Eastern part - negative anomaly) and South Indian Ocean (still slightly positive anomaly).

In the mid latitudes of the Northern hemisphere still negative anomaly across the Atlantic and cooling over North Eastern Pacific (but persistent strong positive anomaly South of the Gulf of Alaska).



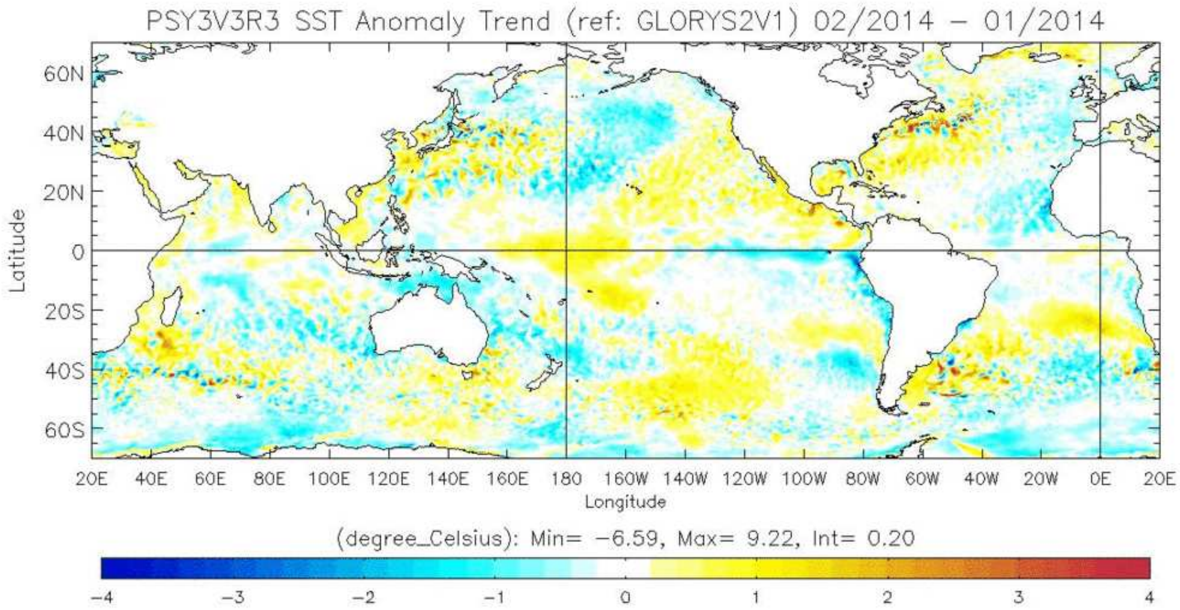


fig.I.1.1: top : SSTs Anomalies (°C) . Bottom: SST tendency (current – previous month), (reference Glorys 1992-2009). http://bcg.mercator-ocean.fr/

In subsurface :

In the Pacific : in the equatorial band (10°N-10°S), strengthening of the positive heat content anomalies and extension eastward to the dateline. Persistent strong positive anomalies in the Western part off equator (in the Northern hemisphere between 10°N and 20°N) consistently with the surface signal above the warm pool.

In the Atlantic : in the equatorial waveguide little anomalies to the exception of a positive anomaly in the Guinean Gulf. Persistence of slight and fragmented anomalies in the tropical part (Northern and Southern tropics).

In the Indian Ocean : Little anomalies in the equatorial waveguide signal. In most of the Southern Tropical part of the basin mostly warmer than normal conditions consistently with SSTs.

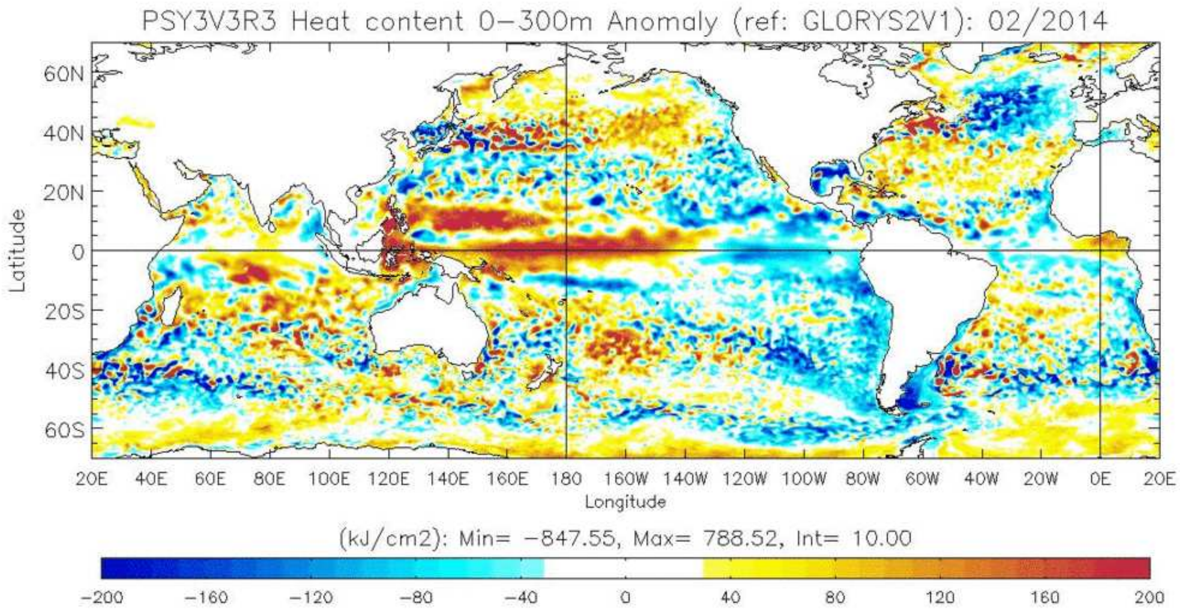


fig.I.1.2: map of Heat Content Anomalies (first 300m, kJ/cm2, reference Glorys 1992-2009)
http://bcg.mercator-ocean.fr/

I.1.b Pacific Basin

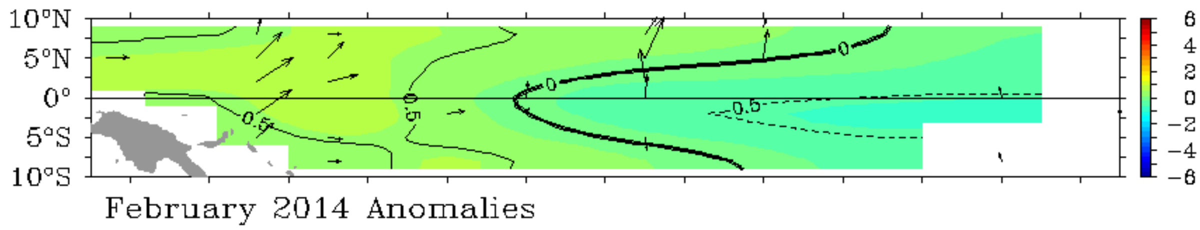


fig.I.1.3: SST Anomalies and Wind anomalies over the Equatorial Pacific from TAO/TRITON.
http://www.pmel.noaa.gov/tao/jsdisplay/monthly-summary/monthly-summary.html

A dipole like pattern between the Western and Eastern part of the basin consistently with the sub-surface signal. Note the trade wind anomalies in the western part of the basin which seems to be consistent with a Large Scale convection displacement Eastward and Northward. SOI is close to zero (+0.1) which is quite consistent with the little trade wind anomalies inthe equatorial wave guide

In the Niño boxes (4, 3.4, 3 et 1+2 ; see definition in Annex) the monthly averages are respectively +0.3°C, -0.6°C, -0.8°C to -0.8°C from West to East. It's very consistent with the recent SST evolution (see SST comment above).

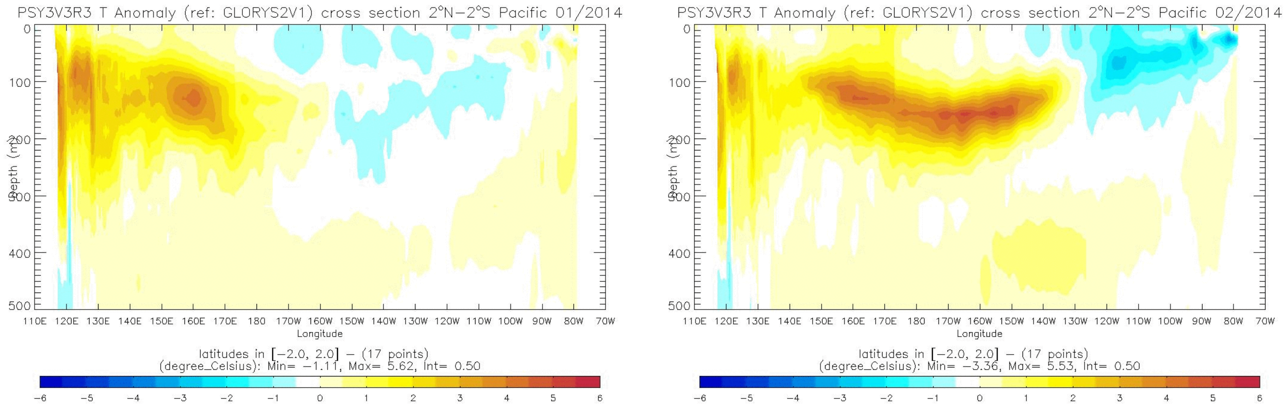


fig.I.1.4: Oceanic temperature anomaly in the first 500 meters in the Equatorial Pacific (previous and current month), http://bcg.mercator-ocean.fr

<u>In the equatorial waveguide (fig. 1.1.4 and 1.1.5)</u> : Clear traces of a Kelvin wave propagation under the surface (positive anomaly - fig.I.1.5). The warm reservoir dramatically increased and propagated in subsurface (Central part, around immersion 150m) and also the negative anomaly in the most Eastern part (fig.I.1.4).

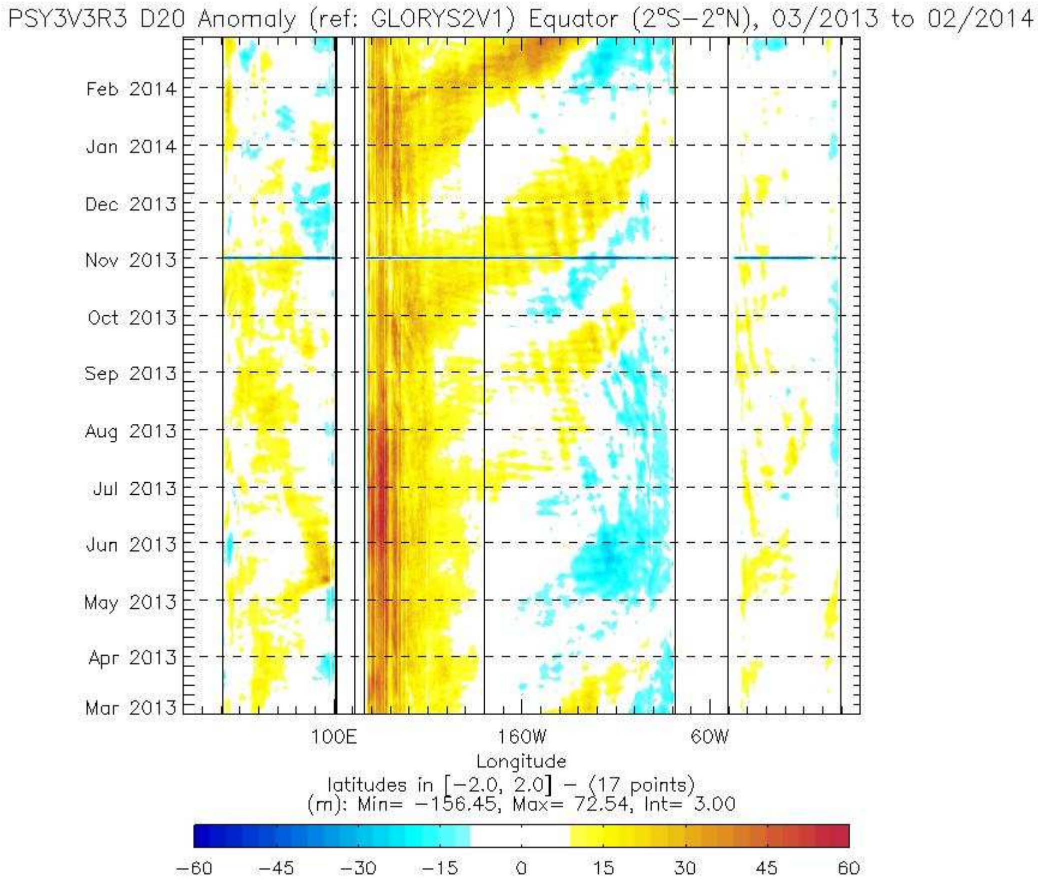


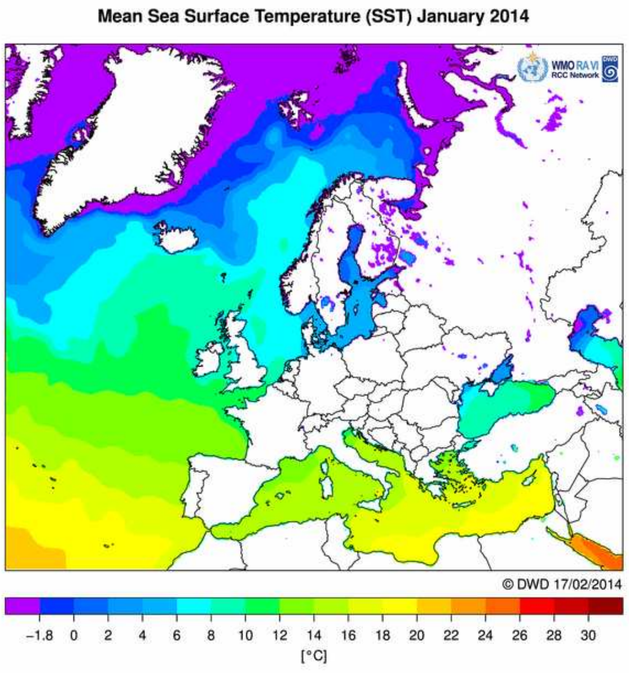
fig.I.1.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 6 month period http://bcg.mercator-ocean.fr/

I.1.c Atlantic Basin

Northern Tropical Atlantic : cooler than normal on the half Eastern part. The Western part is warmer than normal in the sub-tropical latitudes (with a warming tendency)
Equatorial waveguide : warmer than normal in the Guinean Gulf. Close to neutral elsewhere.
The Southern Tropical Atlantic : Close to normal to the exception of the regions closer to the African continent (around Greenwich Meridian regions).

Sea surface temperature near Europe :

Little evolution over the North Atlantic and the Arctic region. Arctic region and North Sea still warmer than normal, whereas the central and eastern Atlantic is mostly colder (consistently with an increased zonal circulation). Some cooling of the Baltic Sea from January to February. In the Mediterranean, some cooling advanced to southern and eastern parts, however, these areas are still 0.5-1°C warmer than normal (1981-2010 reference):



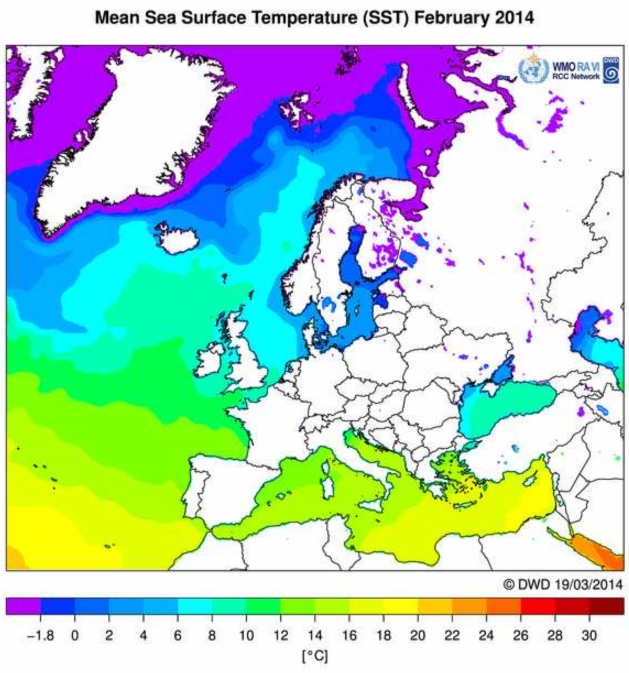


fig.I.1.6: Mean sea surface temperature in the RA VI Region (Europe) in the previous month (left) and the current month (right). http://www.dwd.de/rcc-cm

I.1.d Indian Basin

Southern Tropical Indian Ocean : warmer than normal over most of the basin.
Equatorial waveguide: close to normal conditions, the DMI is close to 0 (slightly negative).
Northern Tropical Indian Ocean : little anomalies, some traces of negative anomaly close to the coastal areas (especially the Arabic Peninsula).

I.2. ATMOSPHERE

I.2.a General Circulation

Velocity Potential Anomaly field in the high troposphere (fig. 1.2.1 – insight into Hadley-Walker circulation anomalies) : A lot of pattern along the equator and in the Tropics. The MJO was active over the Western Pacific in the second half of the month in relationship with a strong large scale convection over the Western Pacific.

On the Pacific : Divergent circulation anomaly (upward anomaly motion) just West to the dateline (consistent with persistence SST forcing over the warm pool) preceded westward (over the

Maritime continent) by a Convergent Circulation anomaly. Also to be quoted the strong divergent circulation anomaly in the North Central Tropical Pacific. Over the Central and Eastern Tropical Pacific some weak but discernable Convergent/Divergent cells linked with the sub-tropics (South/North) and the SPCZ.

On the Atlantic : Strong Convergent circulation anomaly (downward anomaly motion) over West Africa extending up to Morocco Northward and Southward over a large portion of the Southern Atlantic. Divergent circulation anomaly over the North-West of South America ; associated to these anomalies weak but existing convergent circulation anomaly over the Caribbean and Divergent circulation anomaly over the central Tropical North Atlantic likely dynamically forced.

On the Indian Ocean : Convergent circulation anomalies (downward anomaly motion) across the basin just North to the Equator. Also to be quoted the Divergent circulation anomaly in the vicinity of Pakistan (likely dynamically forced).

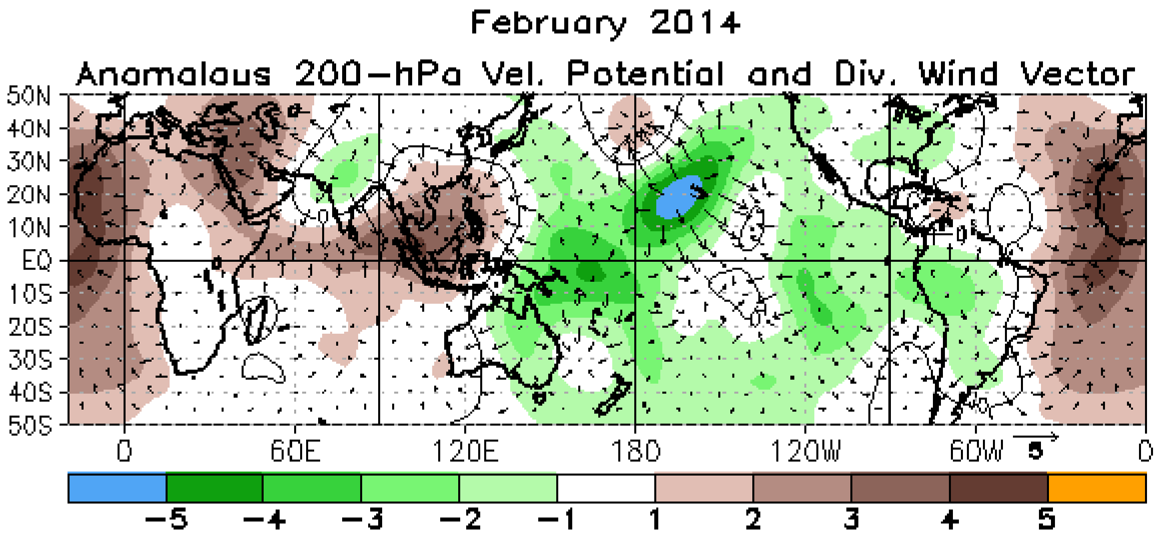


fig.I.2.1: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly). http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

Stream Function anomalies in the high troposphere (fig. 1.2.2 – insight into teleconnection patterns tropically forced) : on average weak signal close to Large Scale Convection sources to the exception of the Eastern Pacific. Most of the anomalies are located in the Northern Hemisphere and seem to be more related to Mid/High-Latitude activity extending up to the Topics rather than clearly influenced by the Tropics. Nevertheless, on the Eastern Pacific there is some indication of tropical influence.

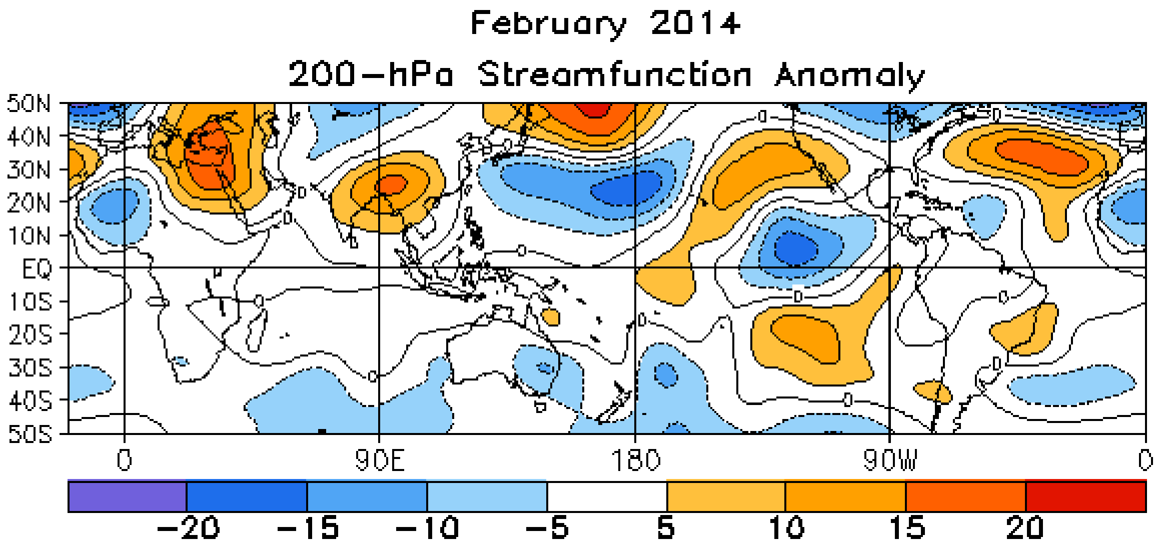


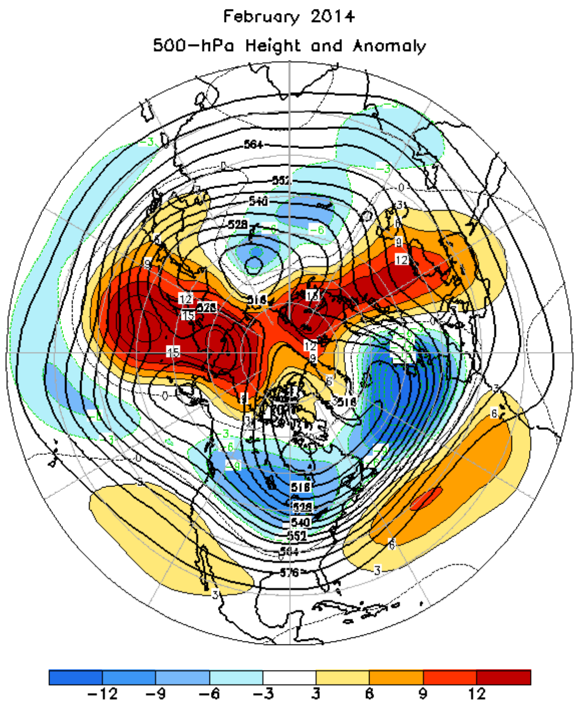
fig.I.2.2: Stream Function Anomalies at 200 hPa.

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, most of the strong anomalies seem to come from the mid/high latitudes of the Northern hemisphere. Strong positive anomalies over the North-Western Pacific, Eastern Europe (from North to South) and Negative anomalies especially over the North Atlantic sector indicating a strengthened zonal circulation across the Atlantic.

The atmospheric modes are quite active; main active modes are found everywhere; the Pacific with West Pacific (-1.4) and PNA (-1.6), the Atlantic with EA (+2.2) and NAO (+1.1) - very consistent with an increased zonal circulation - , over Europe with the Scandinavian mode (+1.1) and the EA/WR (-1.9) ; and the Polar-Eurasian mode (-1.9). These values support the hypothesis of a strengthened mid/high latitude activity.



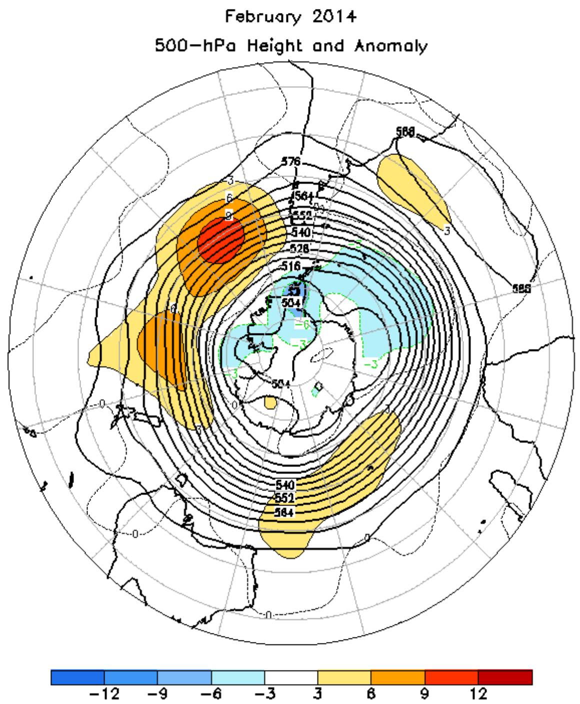


fig.I.2.3: Anomalies of Geopotential height at 500hPa (Anomalies of Geopotential height at 500hPa http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige9.shtml, right South Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige15.shtml)

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
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

Evolution of the main atmospheric indices for the Northern Hemisphere for the last 6 months : http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/table3.shtml

Sea level pressure and circulation types over Europe

Both the Icelandic Low and the Azores High were more intense than normal in February, but without clear relocation. This results in a positive NAO phase (+1). Since low pressure was much extended southeast of Iceland, the positive EA pattern intensified even more (+2.2). On the other hand, the blocking Russian High was more intense than normal especially in northern parts. For that reason mild Atlantic air was permanently advected to Europe, especially also the northern parts. Consequently the EA/WR pattern was highly negative (-1.9), indicating the southerly flow over Europe. The positive phase of the Scandinavia pattern (SCAND, +1.1) and the negative phase of the Polar-Eurasia pattern (POLEUR, -1.9) reflect the strong blocking over northeastern Europe.

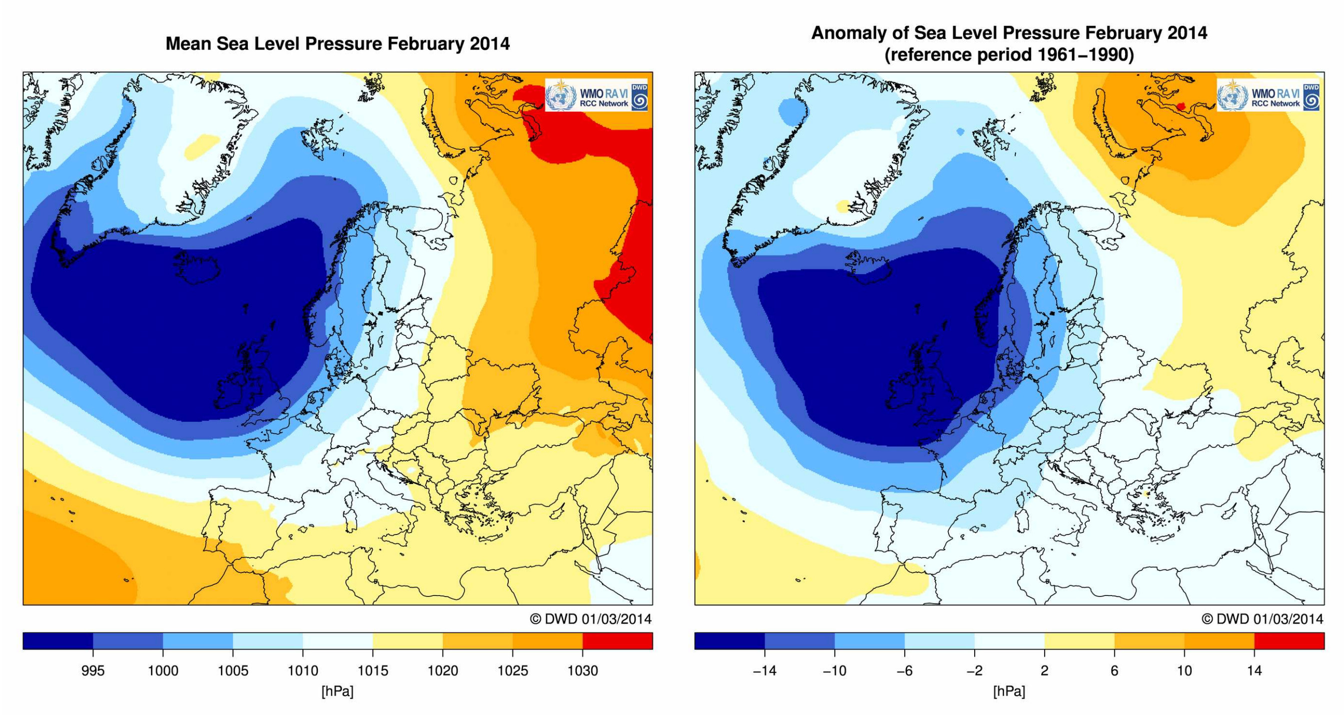


fig.I.2.4: Mean sea level pressure in the RA VI Region (Europe) (left) and 1961-1990 anomalies (right). http://www.dwd.de/rcc-cm

Circulation indices: NAO and AO

The NAO index was positive around +1 during the whole month, partly more than one standard deviation above normal. This indicates a permanent pattern throughout February. NAO contributed to the AO also. However, during most of the month, the AO index oscillated around zero within the standard deviation; at the end it was even negative. This means that the pattern over the North Atlantic was somewhat outstanding compared to the rest of the Northern Hemisphere.

In March 2014, the positive NAO phase continued, and also the AO became highly positive. This implies a relatively low air mass exchange between the Arctic and the northern mid-latitudes for the beginning of the spring season.

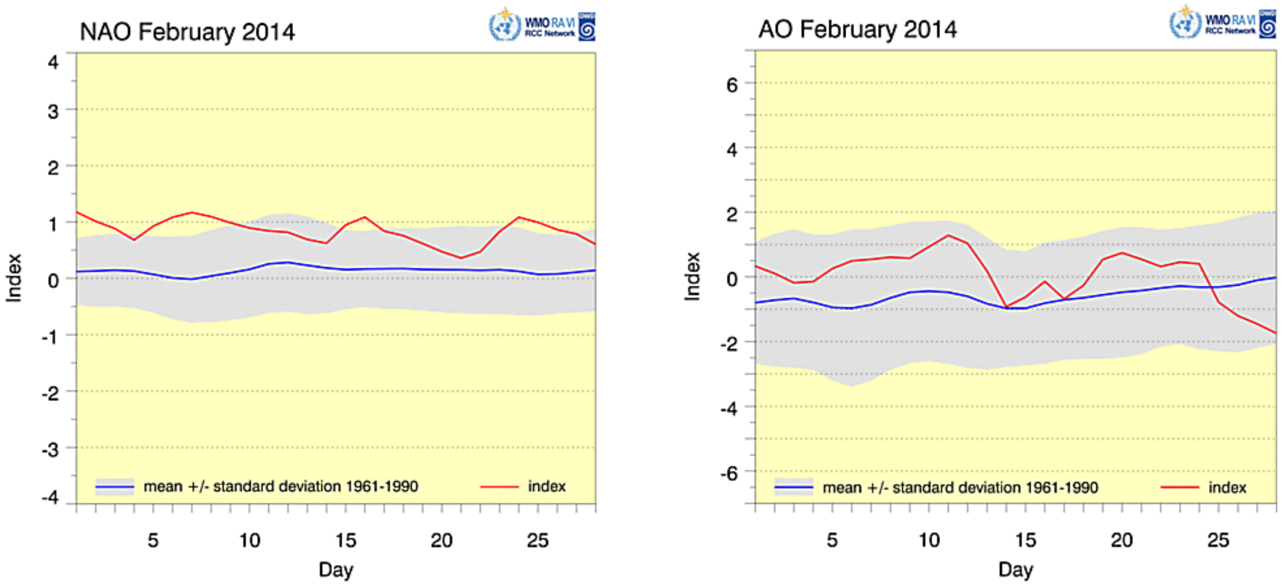


fig.I.2.5: North Atlantic Oscillation (NAO, upper graph) and Arctic Oscillation (AO, lower graph) indices with 1961-1990 mean standard deviation (shading). http://www.dwd.de/rcc-cm , data from NOAA CPC:
http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

I.2.b Precipitation

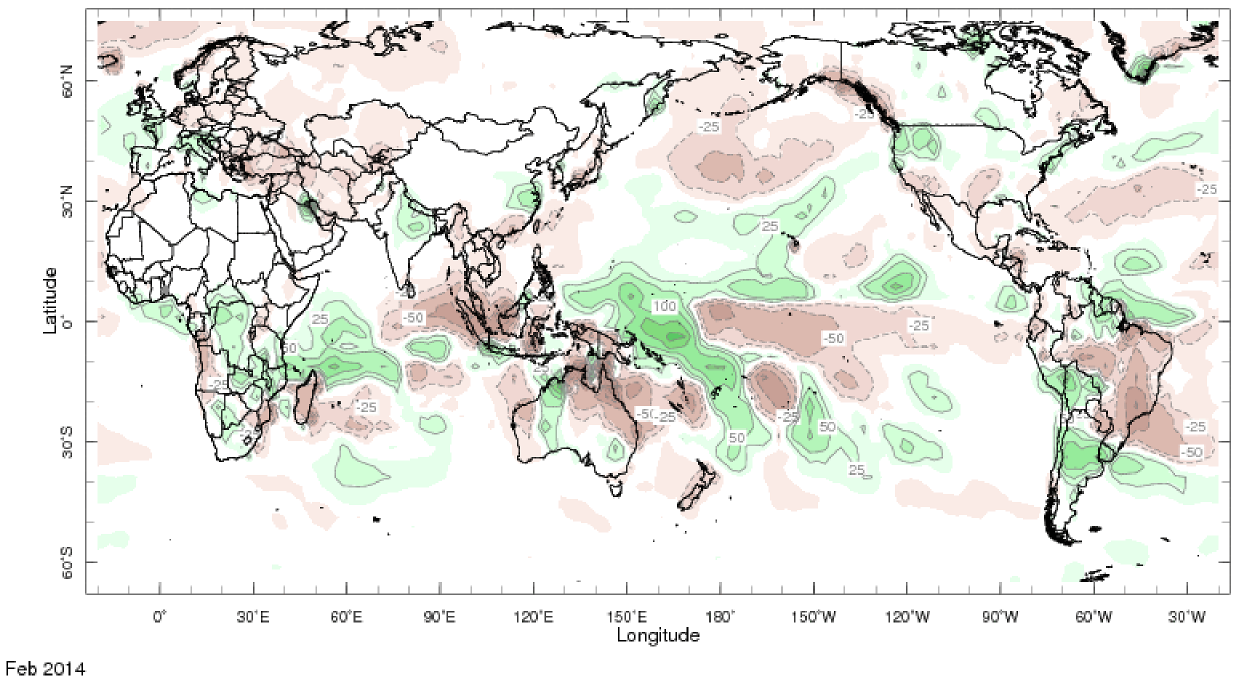


fig.I.2.4: Rainfall Anomalies (mm) (departure to the 1979-2000 normal) – Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/Anomaly.html

Intertropical zones (including sub-tropics) : some good consistency with the Velocity Potential anomalies, especialy in the vicinity of the Maritime continent (-), Western Pacific (+), Central Pacific (-). Also some good constistency on South America, with the East-West contrast in precipitation (between Brasil and Bolivia). The other patterns seem to be more related to sub-regional forcing ; especially the SST in the vicinity of the Gunіean Gulf.

Mid-latitudes : mostly drier than normal over Eastern Europe, Eurasia and Western Canada.

<u>Precipitation anomalies in Europe:</u>

It was extremely wet especially in western Europe due to permanent low pressure influence. Several Atlantic storms touched these areas and caused a lot of rain. Another region of much rain were the southern Alps, due to frequent cyclonic activity over the Mediterranean and orographic impact by the Alps. In middle and higher elevations of the southern Alps, the snow depth was more than twice as high as normal, on higher mountains, snow depth was more than 5m. On the other hand it was very dry in the Arctic region and in the high pressure zone in eastern and southeastern Europe.

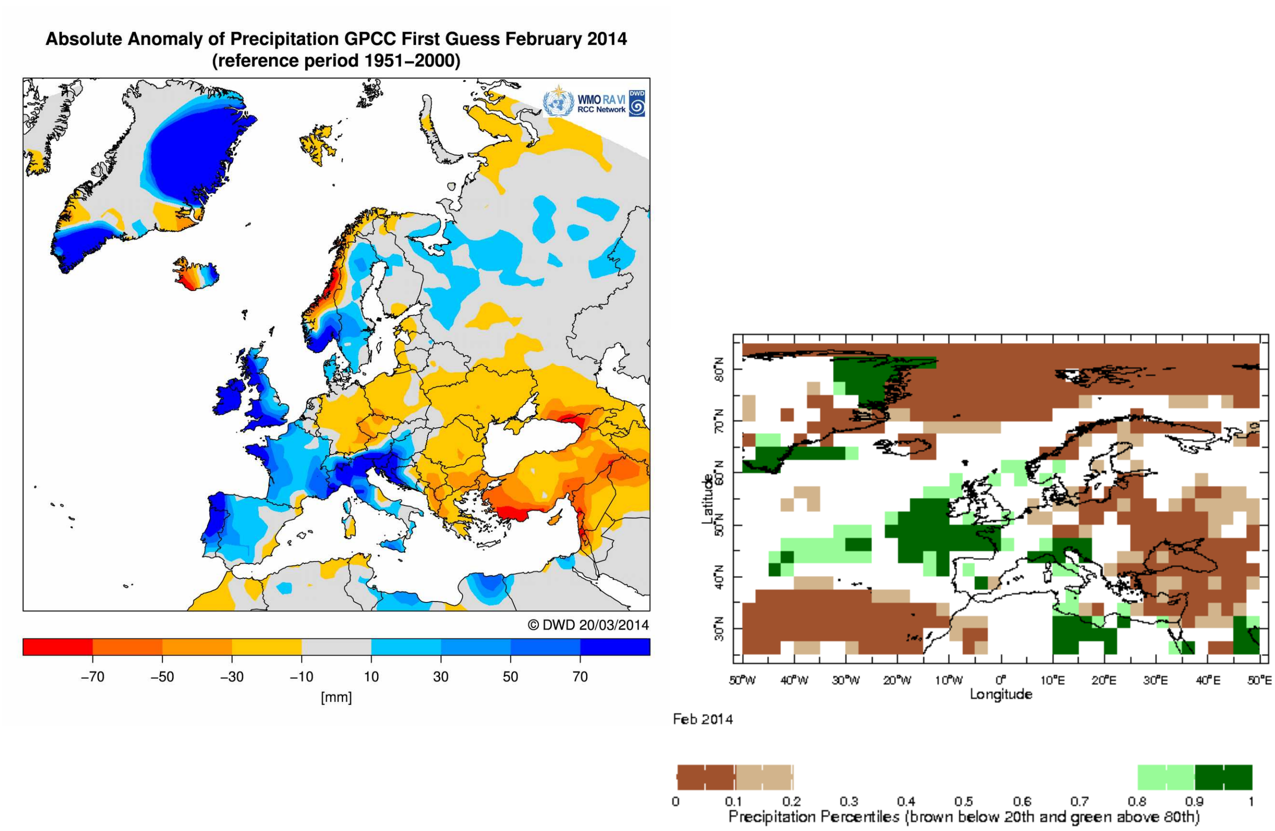


fig.I.2.5: Left: Absolute anomaly of precipitation in the RA VI Region (Europe), data from GPCC (Global Precipitation Climatology Centre), http://www.dwd.de/rcc-cm. Right: Percentiles of

precipitation. Data from NOAA Climate Prediction Center,
http://iridl.ldeo.columbia.edu/maproom/Global/Precipitation/Percentiles.html

Monthly mean precipitation anomalies in European subregions. Subregions refer to ECMWF land boxes defined in Annex III.3. Anomalies are based on gridded data from GPCC First Guess Product, ftp://ftp-anon.dwd.de/pub/data/gpcc/PDF/GPCC_intro_products_2008.pdf, 1951-2000 reference.

Subregion	Anomaly
Northern Europe	+13.9 mm
Southern Europe	+9.1 mm

I.2.c Temperature

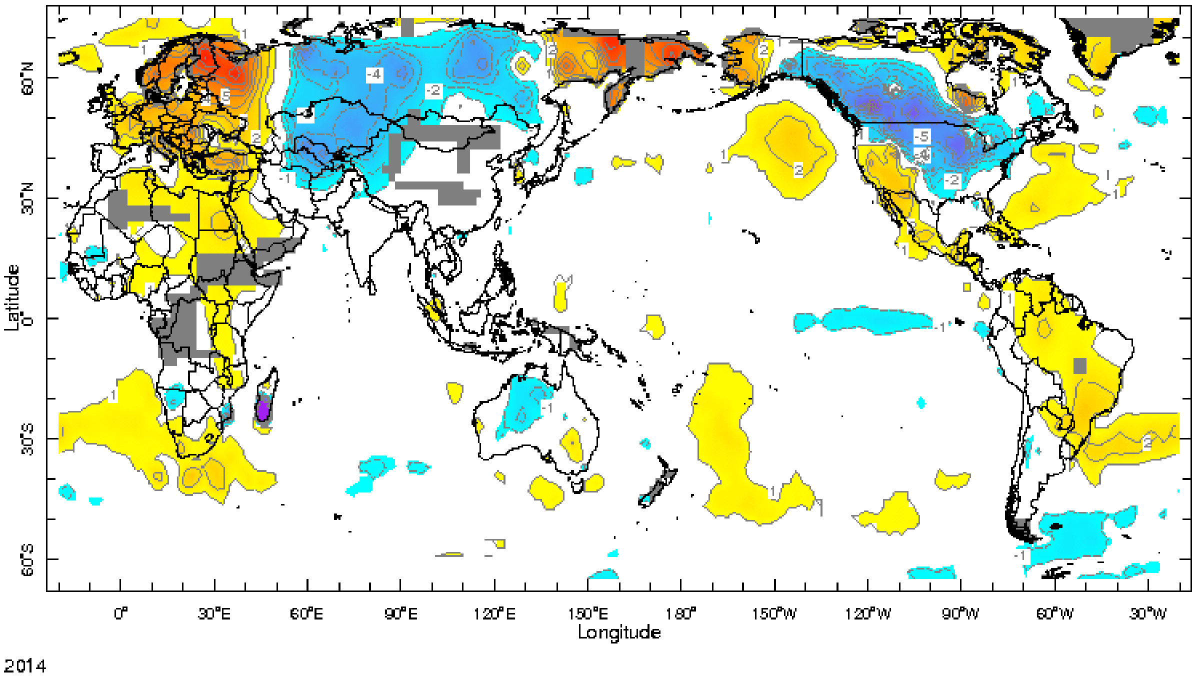


fig.I.2.6: Temperature Anomalies (°C) (departure to the 1979-2000 normal)
http://iridl.ldeo.columbia.edu/maproom/.Global/.Atm_Temp/Anomaly.html

Strong cold anomalies over a large portion of West Canada and Northern/Eastern USA consistently with the Z500 anomaly. The western part of USA (extending toward Mexico) is warmer than normal.

Mostly Warmer than normal conditions over Europe (consistent with positive EA indice). Colder than normal conditions over most of Erasia and Siberia (to the exception of the most Eastern part - positive anomaly).

Positive anomaly over Brasil.

Temperature anomalies in Europe:

Much warmer than normal over most of Europe including the European Arctic and the Mediterranean, very often exceeding the 80th of 90th percentile.

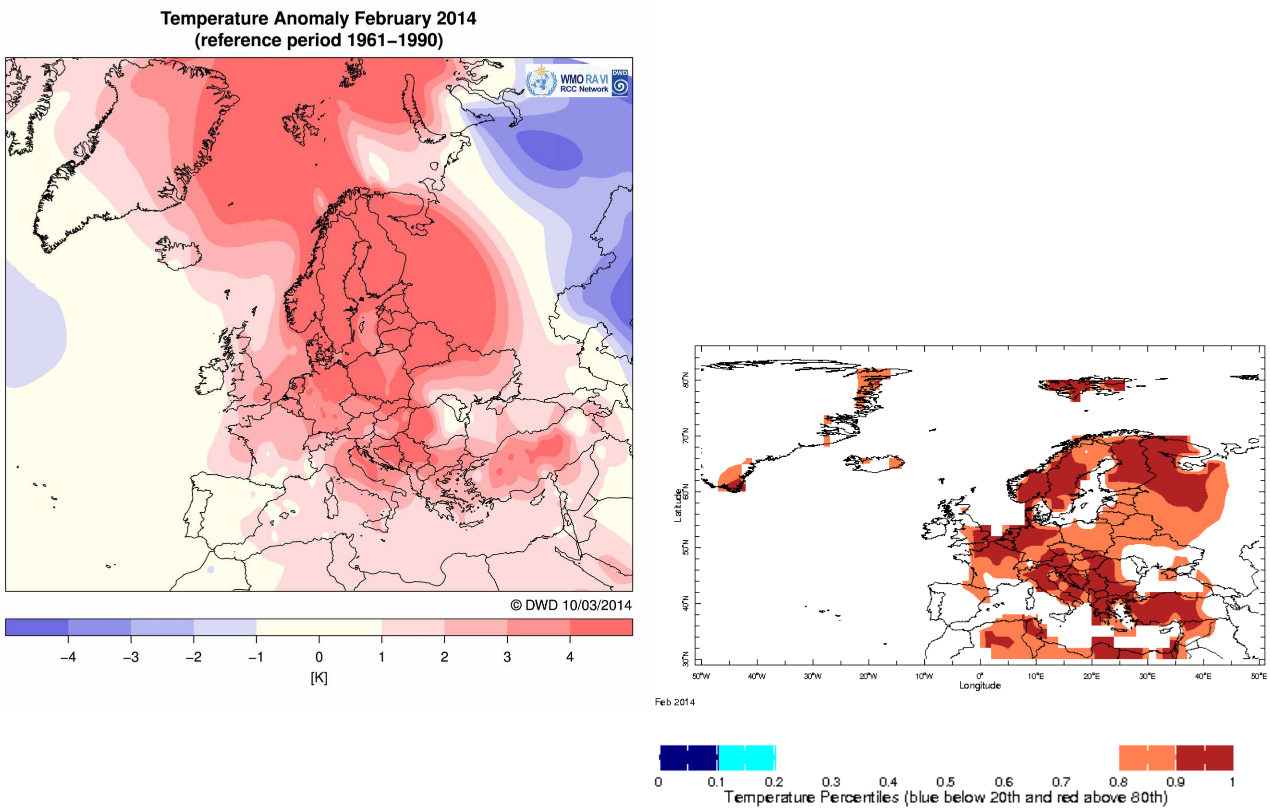


fig.I.2.7: Left: Absolute anomaly of temperature in the RA VI Region (Europe), data from Deutscher Wetterdienst (DWD); http://www.dwd.de/rcc-cm . Right: Percentiles of temperature. Data from NOAA Climate Prediction Center, http://iridl.ldeo.columbia.edu/maproom/Global/Atm_Temp/Percentiles.html .

Monthly mean temperature anomalies in European subregions: Subregions refer to ECMWF land boxes defined in Annex III.3. Anomalies are based on gridded CLIMAT data from DWD, http://www.dwd.de/rcc-cm, 1961-1990 reference.

Subregion	Anomaly
Northern Europe	+3.8°C
Southern Europe	+1.9°C

I.2.d Sea ice

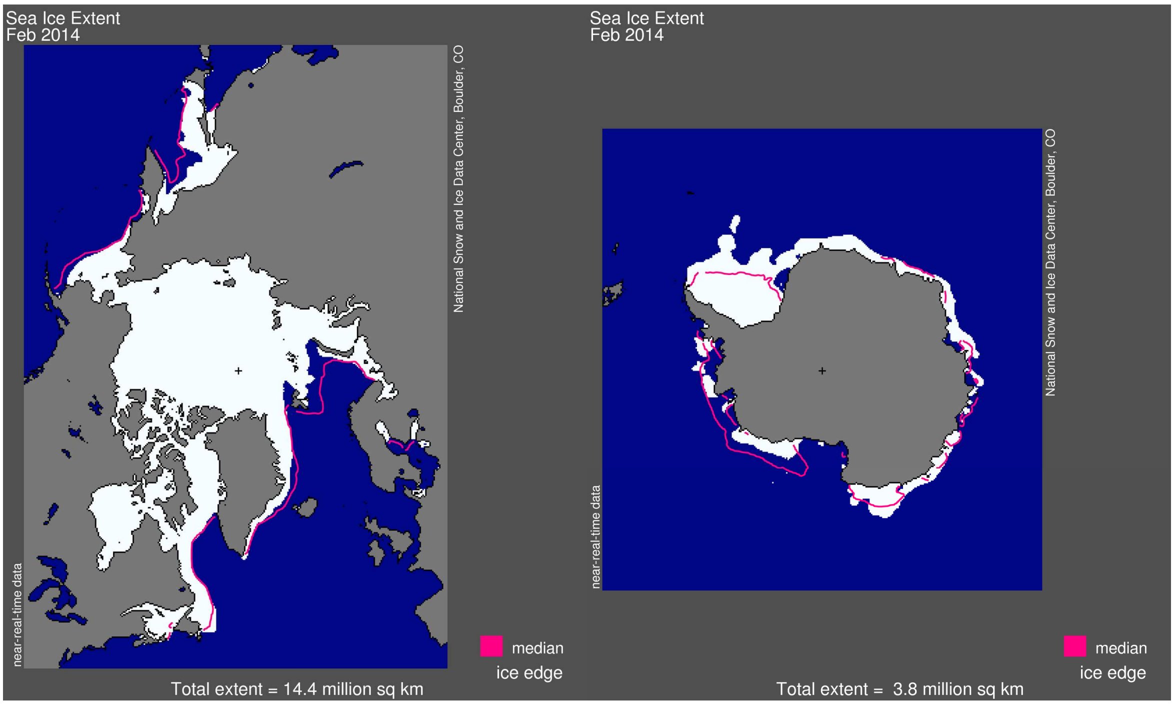


fig.I.2.6: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

In Arctic (fig. 1.2.6 and 1.2.7 - left) : well below normal sea-ice extension (negative anomaly close to 2 standard deviation - on the record).
In Antarctic (fig. 1.2.6 and 1.2.7 - right) : well above normal sea-ice extension anomaly (close to be on the record) with some large regional modulation.

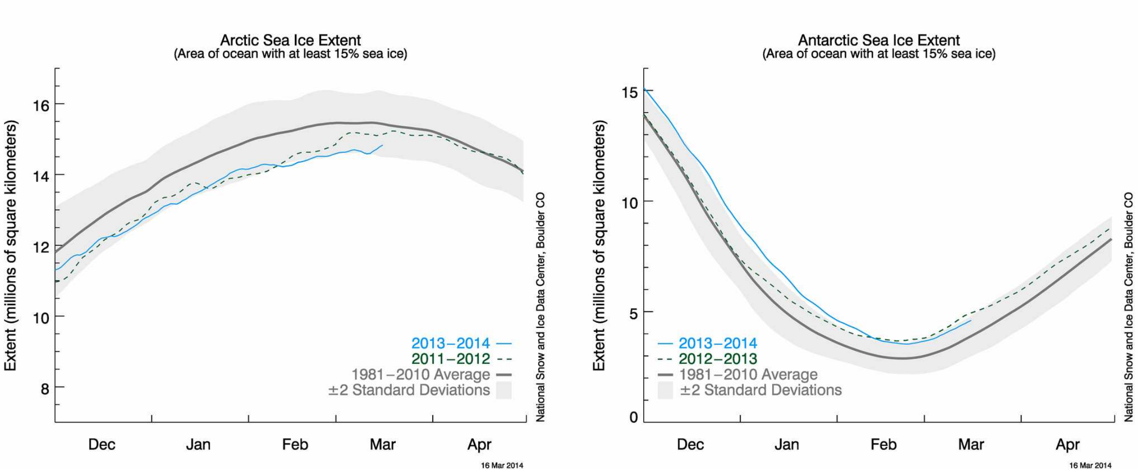


fig. I.2.7 : Sea-Ice extension evolution from NSIDC.

http://nsidc.org/data/seaice_index/images/daily_images/N_stddev_timeseries.png

II.SEASONAL FORECASTS FOR AMJ FROM DYNAMICAL MODELS

II.1. OCEANIC FORECASTS

II.1.a Sea surface temperature (SST)

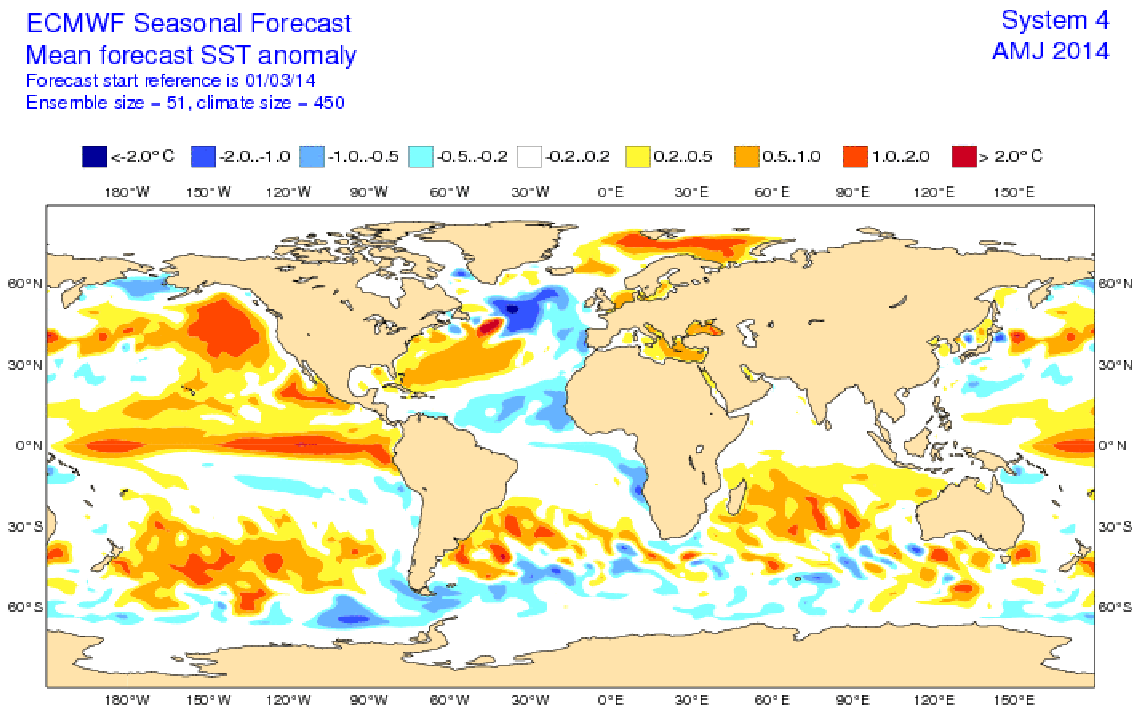


fig.II.1.1: SST anomaly forecast from ECMWF

http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

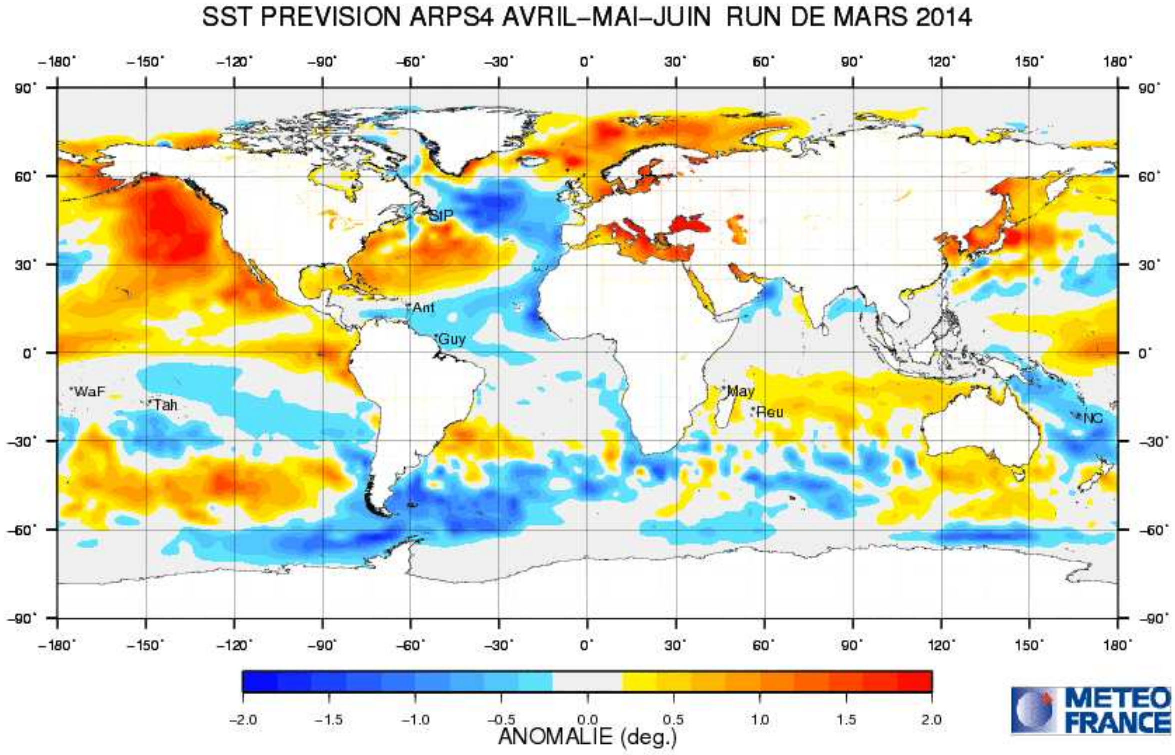


fig.II.1.2: SST Anomaly forecast from Meteo-France (recalibrated with respect of observation).
http://elaboration.seasonal.meteo.fr

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 consitent SST forecasts (taking into account the hindcast period differences), especially over the Northern Hemisphere and the Tropics.

Pacific : Still positive anomaly over warm pool extending eastward beyond the dateline up to the South American continent. Still negative anomalies in the South-Eastern Tropics. Beyond the Tropics, Eastern Pacific warmer than normal.

Atlantic : equatorial waveguide close to neutral in both models with some slight negative anomalies. Great consistency for negative anomalies in the North Tropical Atlantic (extending toward the Carribean). Still a dipole between Western sub-tropics and the Central/Eastern mid-latitudes of the Northern Hemisphere.

Indian Ocean : close to neutral in the Northern Hemipshere. Warmer than normal conditions in the Southern Tropics/Sub-Tropics. The IOD is close to neutral (slightly negative).

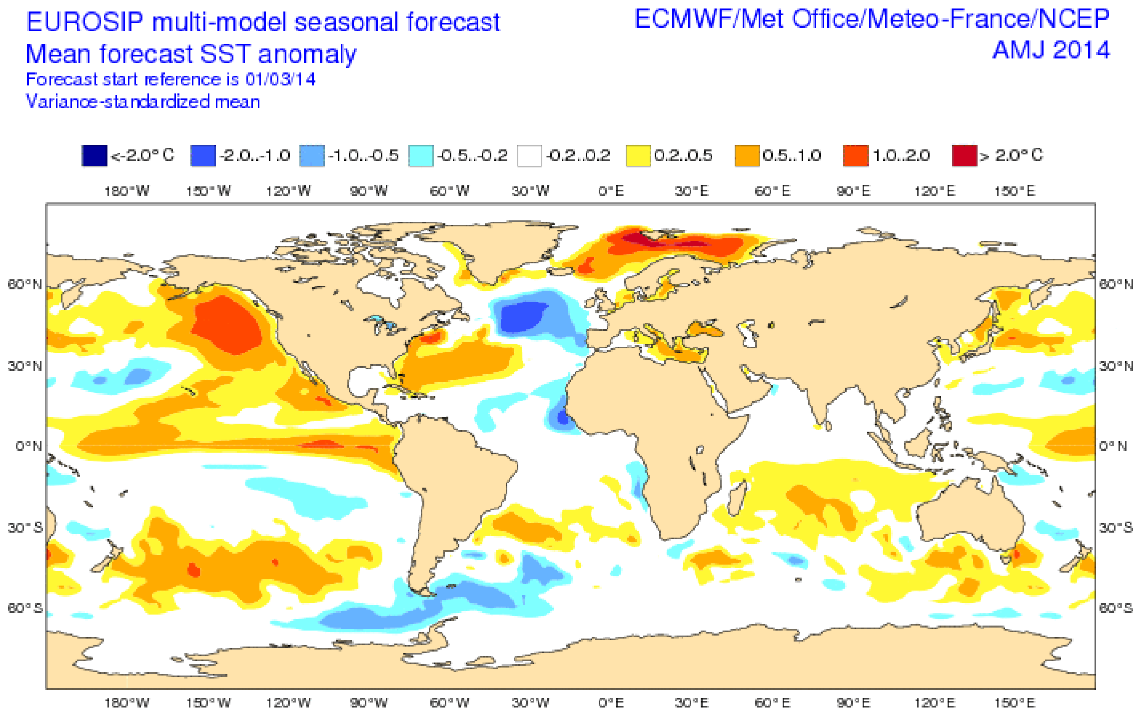


fig.II.1.3: SST Forecasted anomaly from Euro-SIP

<u>In Euro-SIP</u> :

Some robust patterns appear in the tropics everywhere to the exception of the Indian Ocean.

Pacific : The Western positive anomaly over equatorial waveguide region extending up to the South-American continent. Very consistent patterns in the subtropics and the mid-latitudes of the Northern hemispheres.

Atlantic : Weak signal over the Equatorial waveguide. Traces for colder than normal conditions in the North Tropical Atlantic. The West Southern sub-tropics are warmer than normal.

Indian Ocean : weak signal over a large portion of the basin close and North to the Equator. Warmer than normal conditions on the Southern Tropics/Sub-Tropics.

<u>II.1.b ENSO forecast :</u>

Forecasted phase : Neutral phase for AMJ - strong warming in summer

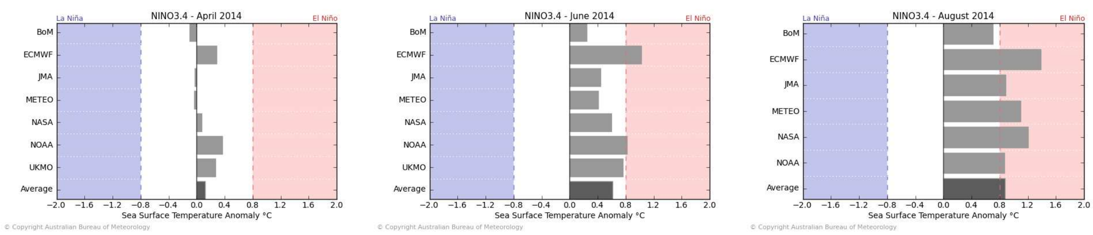


fig.II.1.4: Synthesis of Niño 3.4 forecasts (120° to 165°W) by IRI :
http://iri.columbia.edu/climate/ENSO/currentinfo/SST_table.html

For AMJ : the majority of the dynamical models stay in the range of neutral conditions for the targeted period. However, they are mostly indicating a strong warming on time in the Niño 3.4 area and reach the Niño threshold at Summer.

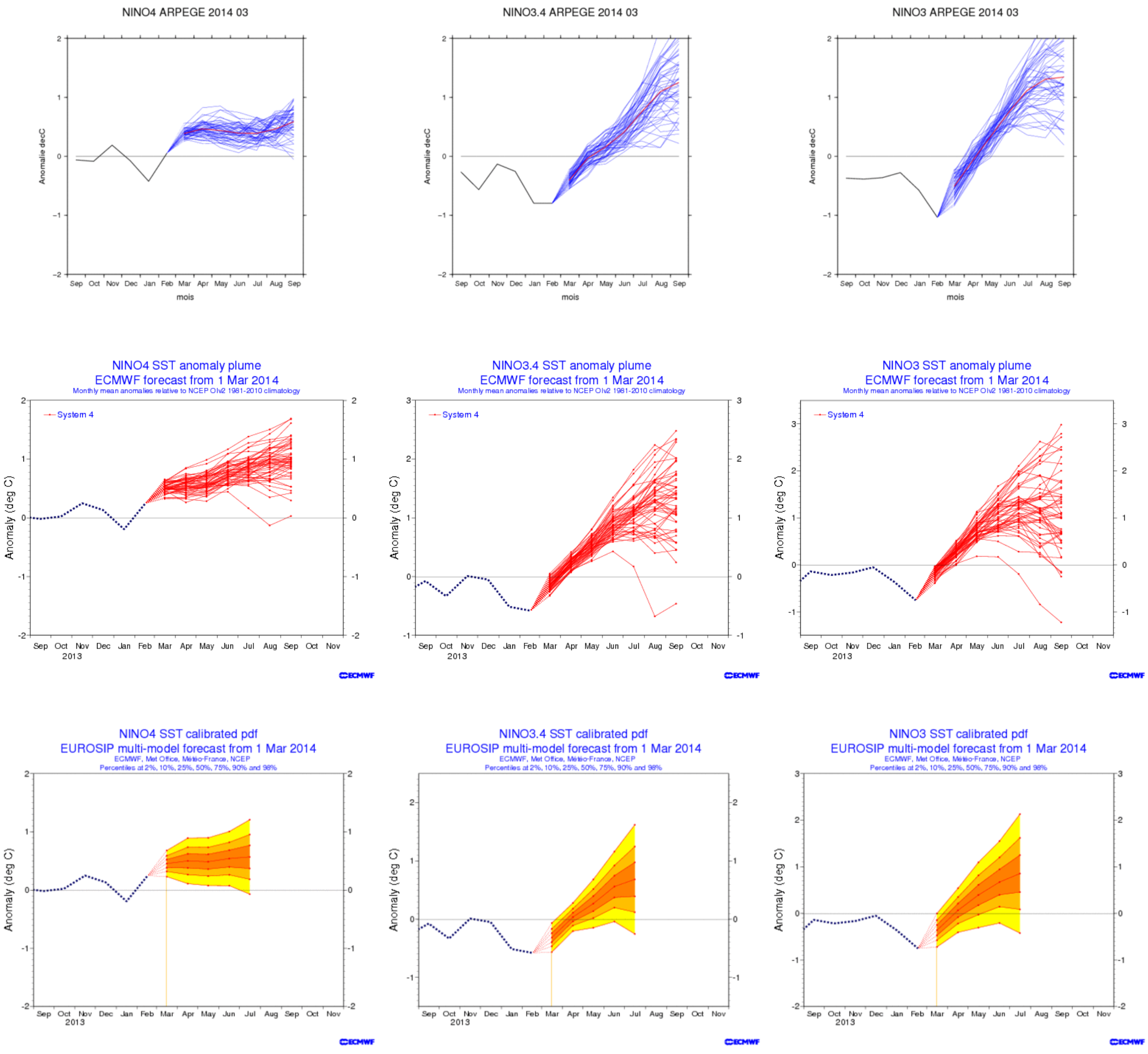


fig.II.1.5: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members - and EuroSIP (bottom) – recalibrated distributions - (http://elaboration.seasonal.meteo.fr , http://www.ecmwf.int/)

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 in the normal range for AMJ.

Nevertheless in both models the warming trend is spectacular and the uncertainty is especially weak even if it dramatically increases in summer. In EuroSIP Plumes, the plumes and main conclusion are very similar to the ones on individual models (even if the uncertainty is a bit larger).

I.1.c Atlantic ocean forecasts

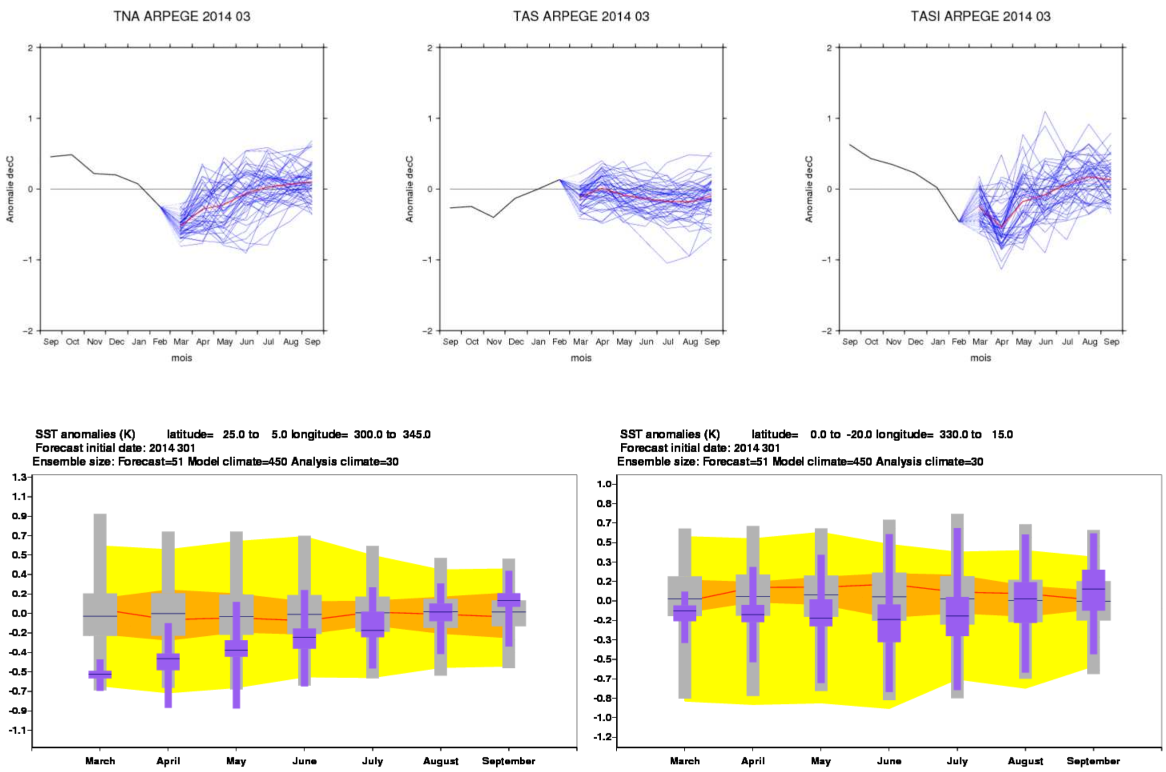


fig.II.1.6: SSTs anomaly forecasts in the Atlantic Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

Consistent behaviour between the 2 models.

North Tropical Atlantic : Colder than normal conditions in both models with a progressive warming to reach normal values at summer.
South Tropical Atlantic : moslty colder than normal conditions in both models.
TASI : the TASI index is close to negative for AMJ for MF. However the spread is large. To be quoted the progressive neutral conditions and then positive values during the West African monsoon.

I.1.d Indian ocean forecasts

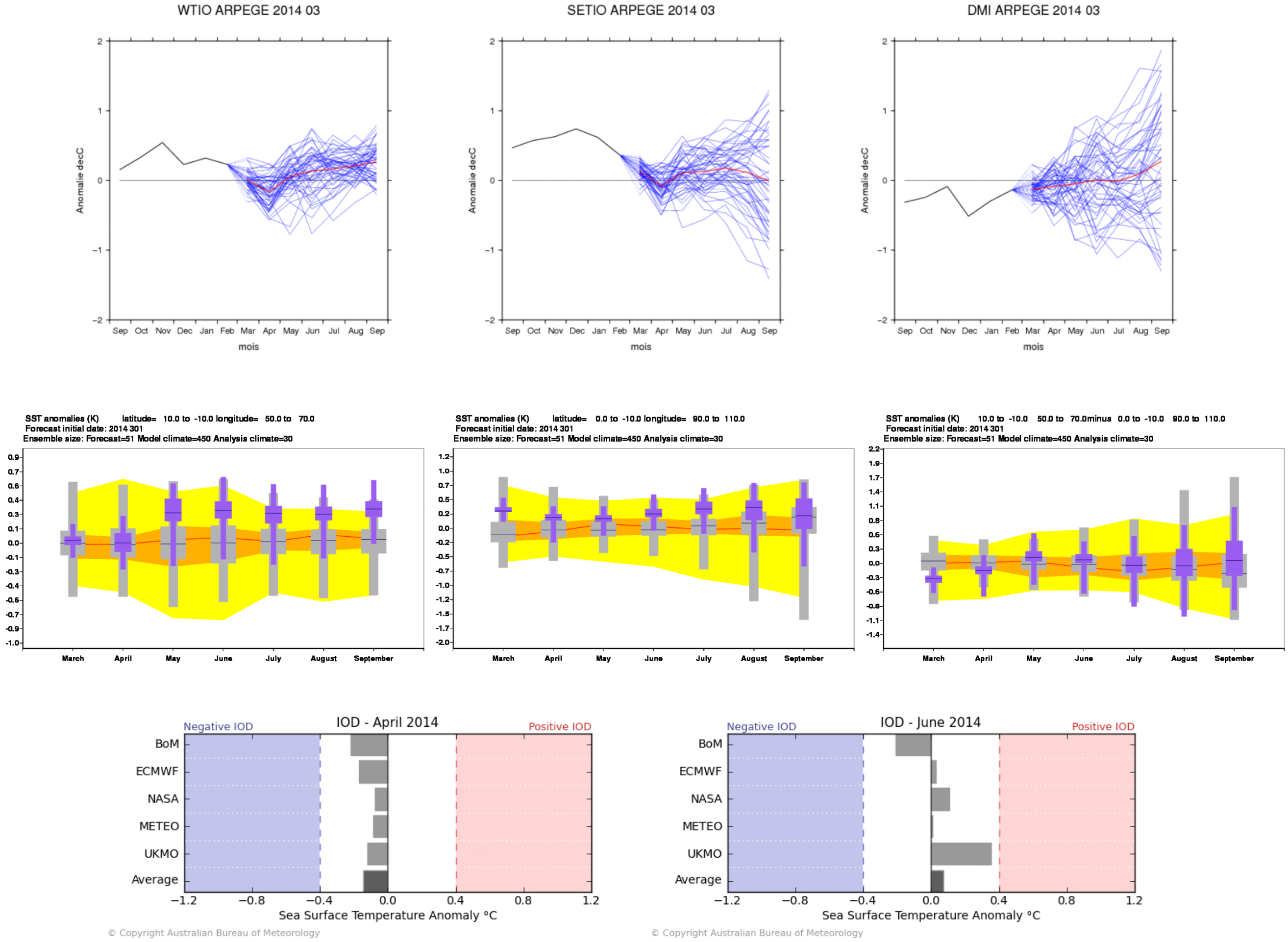


fig.II.1.7: SSTs anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

Quite consistent behaviour between the 2 models.

In WTIO : Mostly Warmer than normal conditions since May.

In SETIO : Mostly Above normal conditions. The spread increases in both models since Mayg.

DMI (IOD) : close to neutral in both models.

II.2. GENERAL CIRCULATION FORECAST

II.2.a Global forecast

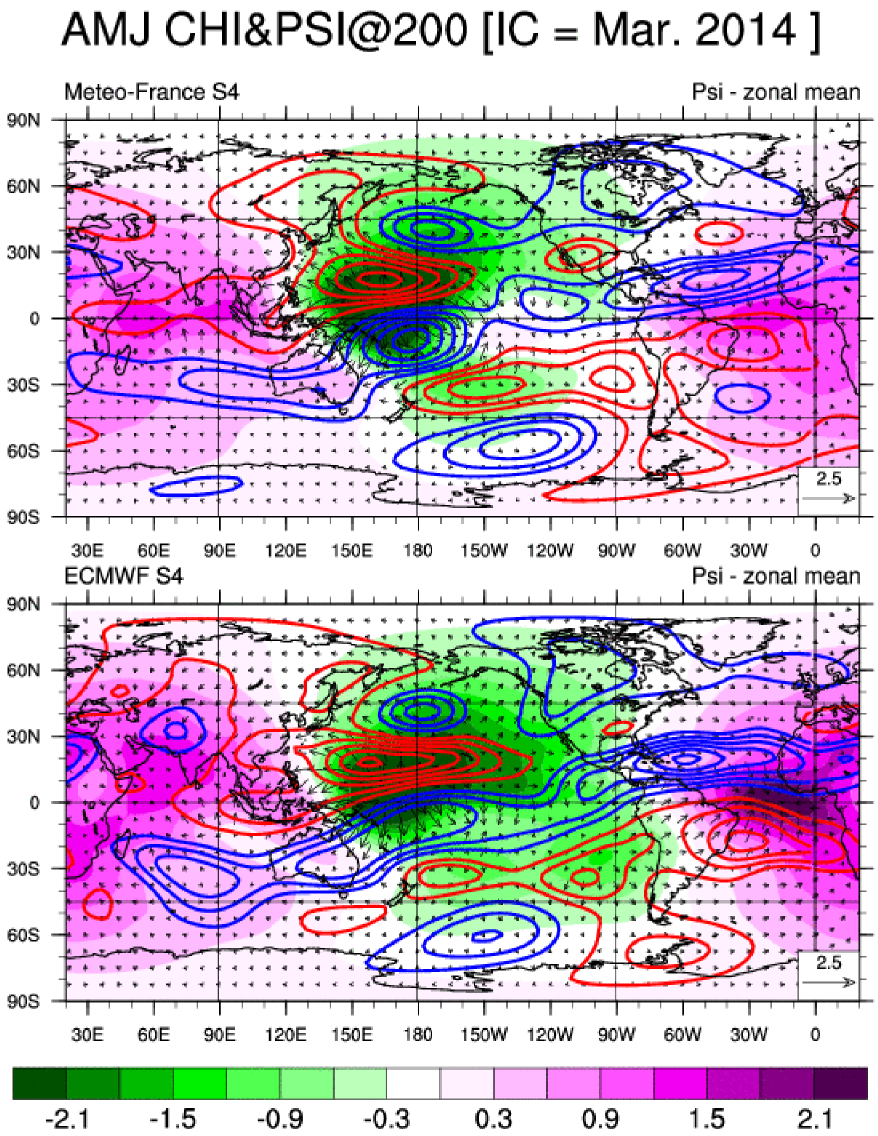


fig.II.2.1: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), associated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa by Météo-France (top) and ECMWF (bottom).

Velocity potential anomaly field (cf. fig. II.2.1 – insight into Hadley-Walker circulation anomalies) : in the Tropics, good consistency between the 2 models.

Over the Pacific, good consistency between the 2 models on warm pool, with a strong negative

anomaly just west to the dateline and its extension toward Hawaï and along the SCPZ ; The divergent circulation anomaly is quite consistent between the two models despite some differences in term of intensity (atmospheric response more intense in ECMWF). This response is consistent with SST forecast for its Pacific part.
Over Atlantic, still positive anomalies (Convergent circulation anomaly - downward anomaly motion) in the vicinity of the Equator and over the African continent (West Africa and the Western side of South Africa).

Over the Indian Ocean :a convergent circulation anomaly in ECMWf over the maritime continent and a divergent circulation anomaly over the South-Western part of the basin. Little signal in MF.

To be quoted that the JMA forecast is very similar to the ones discussed for the 2 models.

Stream Function anomaly field (cf. fig. II.2.1 – insight into teleconnection patterns tropically forced) : good consistency in the Tropics and the mid-latitudes despite the difference in term of intensity. The interpretation of these patterns could be related both to the mid-high latitude activity and to some influence of the Tropics onto the mid-latitude circulation. Nevertheless, the Tropics / Mid-Latitudes connection is not a canonical one likely related to the close to neutral conditions in the Pacific SSTs. The JMA forecast is also quite consistent with ECMWf and MF forecasts even if it seems more influenced by the Mid-Latitude activity.

As a conclusion the predictability exists in the vicinity of the Pacific basin. More generally over mid-latitudes regions of the Northern Hemisphere, one could consider that the signal is mostly related to the high/mid latitudes activity but with some influence coming from the Tropics, even over the Atlantic sector. One can infer only some predictability for the mid-latitude general circulation over the Atlantic.

II.2.b North hemisphere forecast and Europe

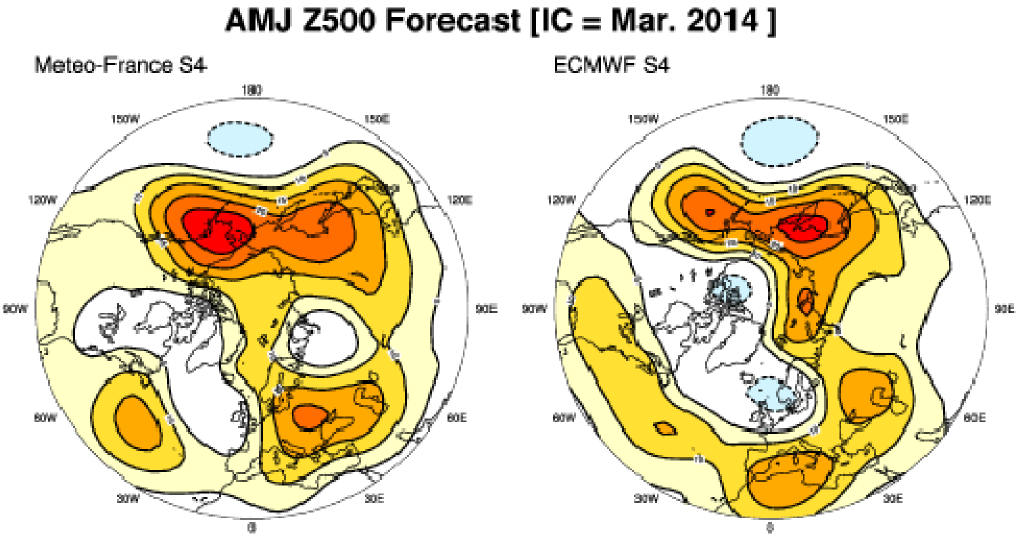


fig.II.2.2: Anomalies of Geopotential Height at 500 hPa from Météo-France (left) and ECMWF (right). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip

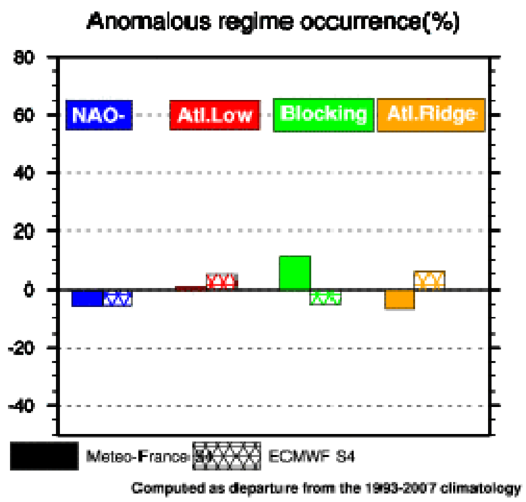


fig.II.2.3: North Atlantic Regime occurrence anomalies from Meteo-France and ECMWF : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

Geopotential height anomalies (fig. 20 – insight into mid-latitude general circulation anomalies) :

Over Pacific, good consistency over most of the basin including the North-American continent. There is clear traces of the mid/high latitudes activity strengthenned by the Tropics (especially the strong positive anomaly in the vicinity of the Bering Sea).

Over atlantic : less consistency betwenn the 2 models. The only consistency is about the positive anomaly across the Atlantic ; however with some location differences. So models could give different signals in terms of temperature and precipitation.

North Atlantic Circulation Regimes (fig. 21) :

As a consequence, little consistency in the regimes forecast and the anomalies are weak. The only interpretable signal is the deficit of NAO - regimes.

II.3. IMPACT: TEMPERATURE FORECASTS

II.3.a ECMWF

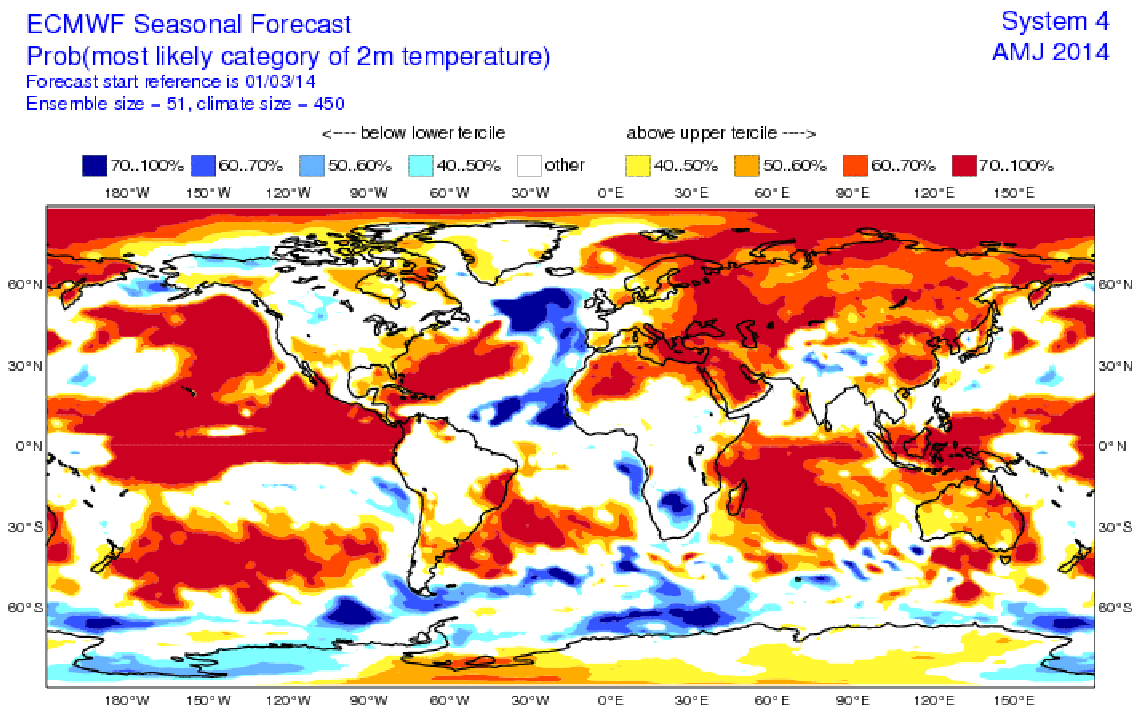


fig.II.3.1: Most likely category probability of T2m from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).

http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seaso...

II.3.b Météo-France

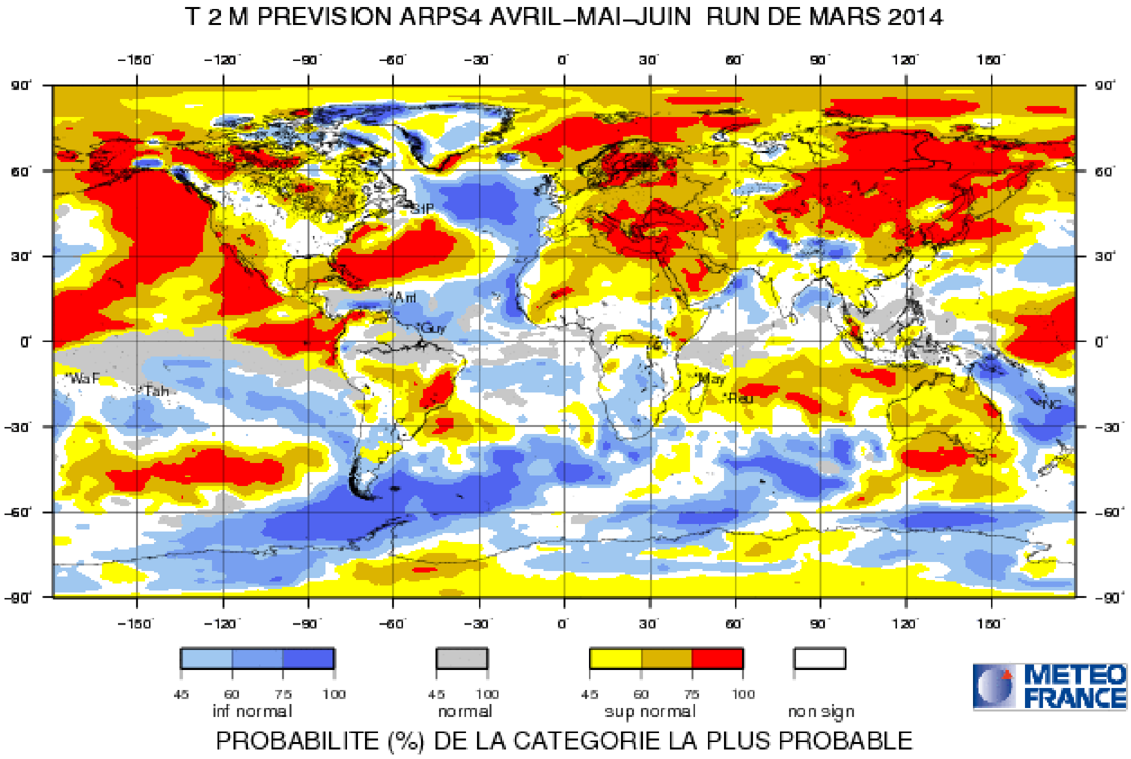


fig.II.3.2: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.3.c Met Office (UKMO)

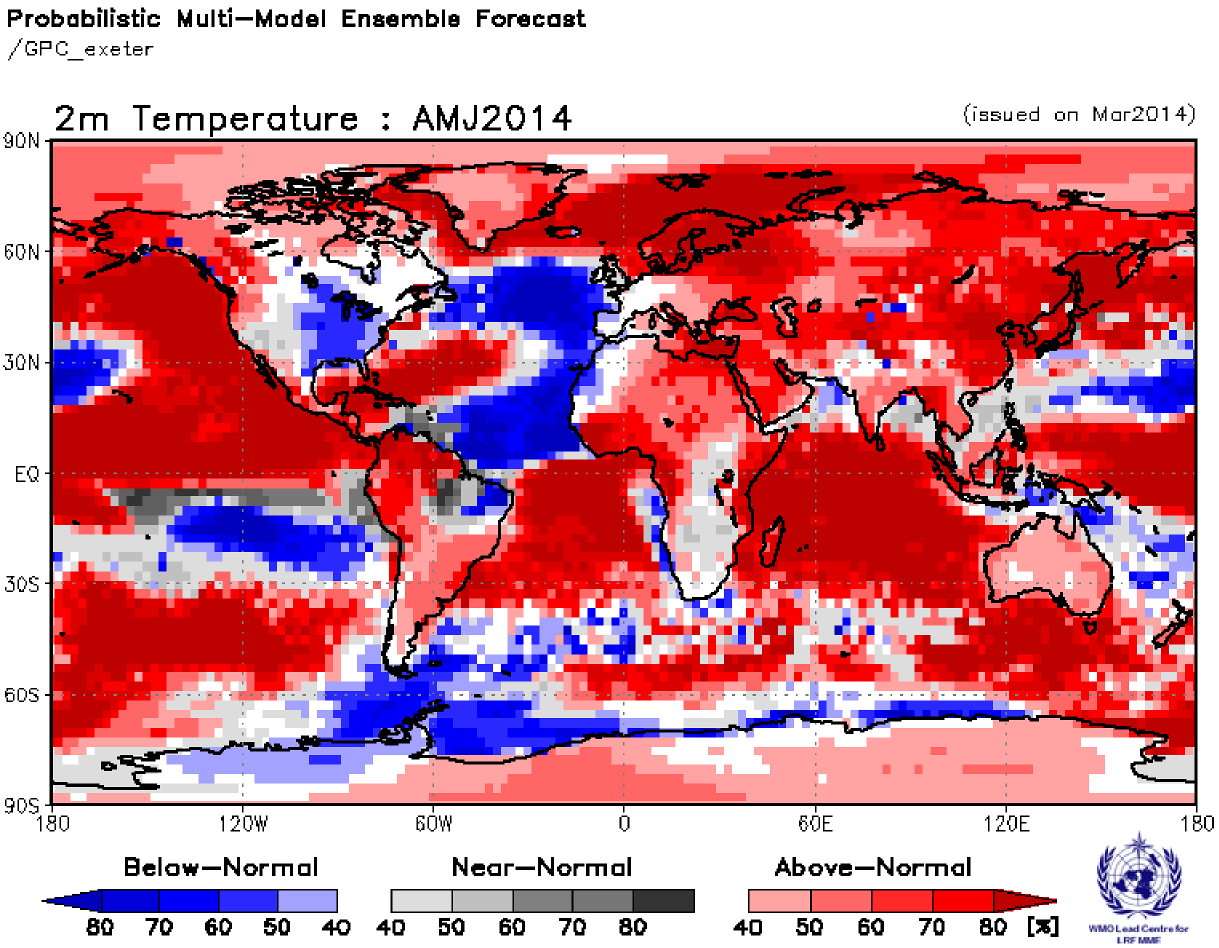


fig.II.3.3 : Most likely category of T2m from UK Met Office. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. https://www.wmolc.org/

II.3.c Climate Prediction Centre (CPC)

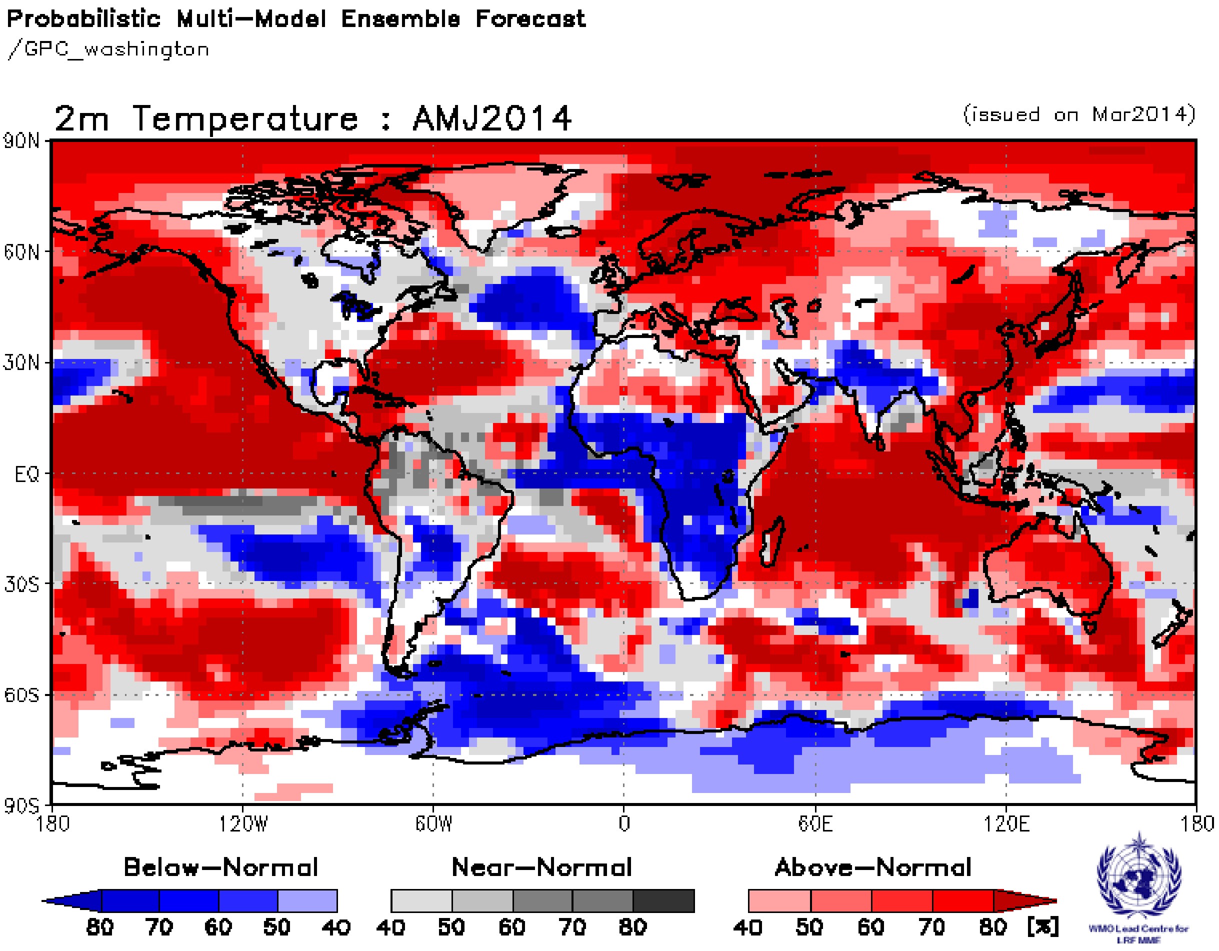


fig.II.3.4 : Most likely category of T2m from NCEP. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. https://www.wmolc.org/

II.3.e Japan Meteorological Agency (JMA)

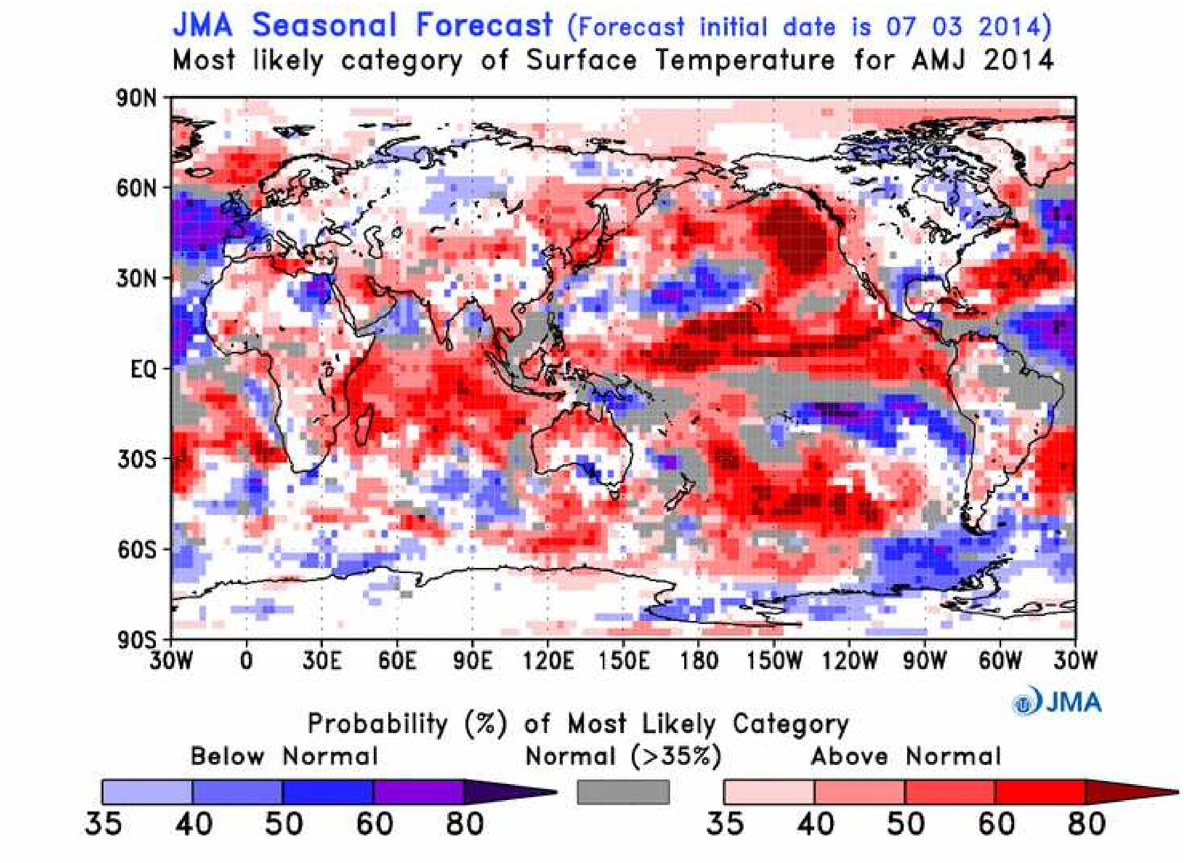


fig.II.3.5: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.

http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/4mE/fcst/fcst_gl.php

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

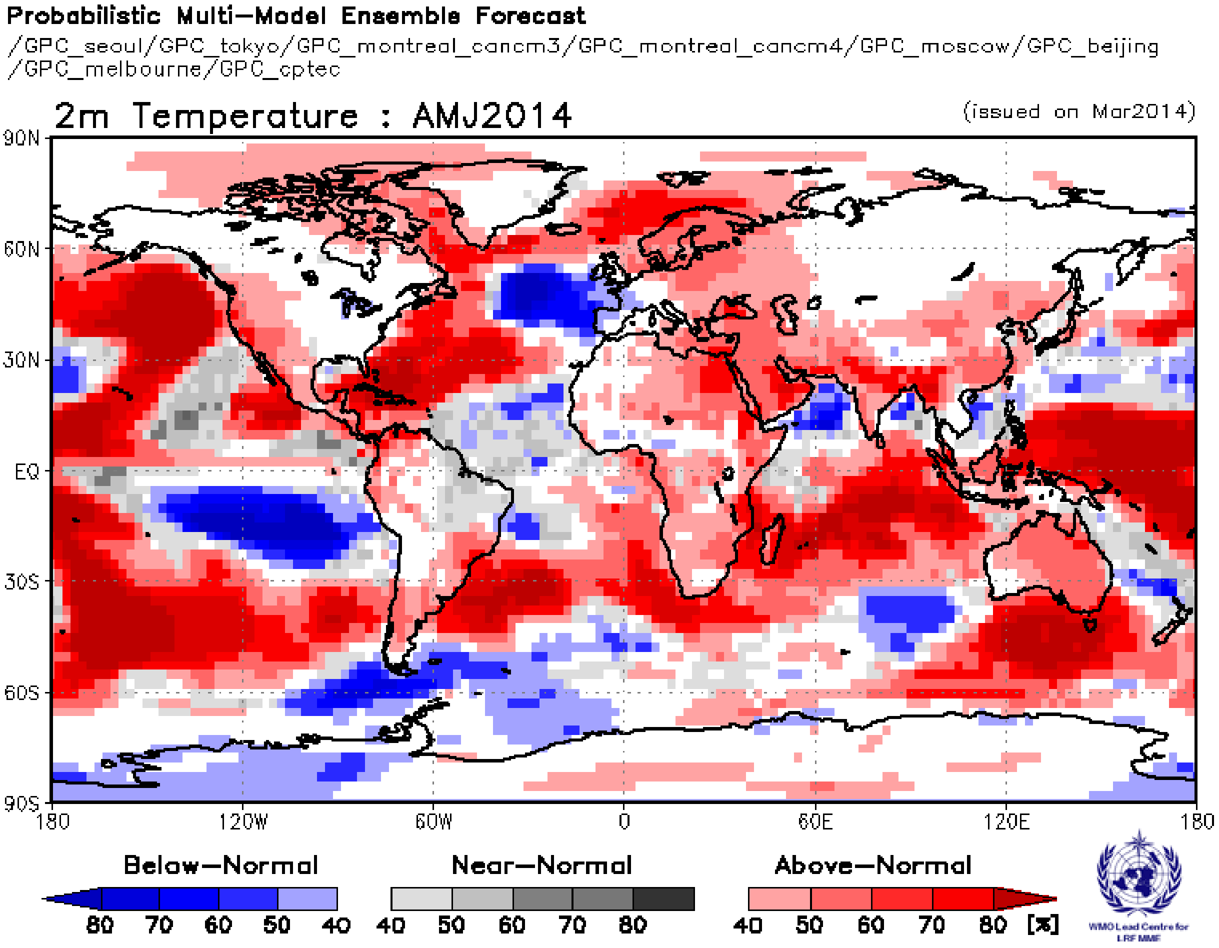


fig.II.3.6 : Most likely category of T2m from LC-MME. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. https://www.wmolc.org/

II.3.g Euro-SIP

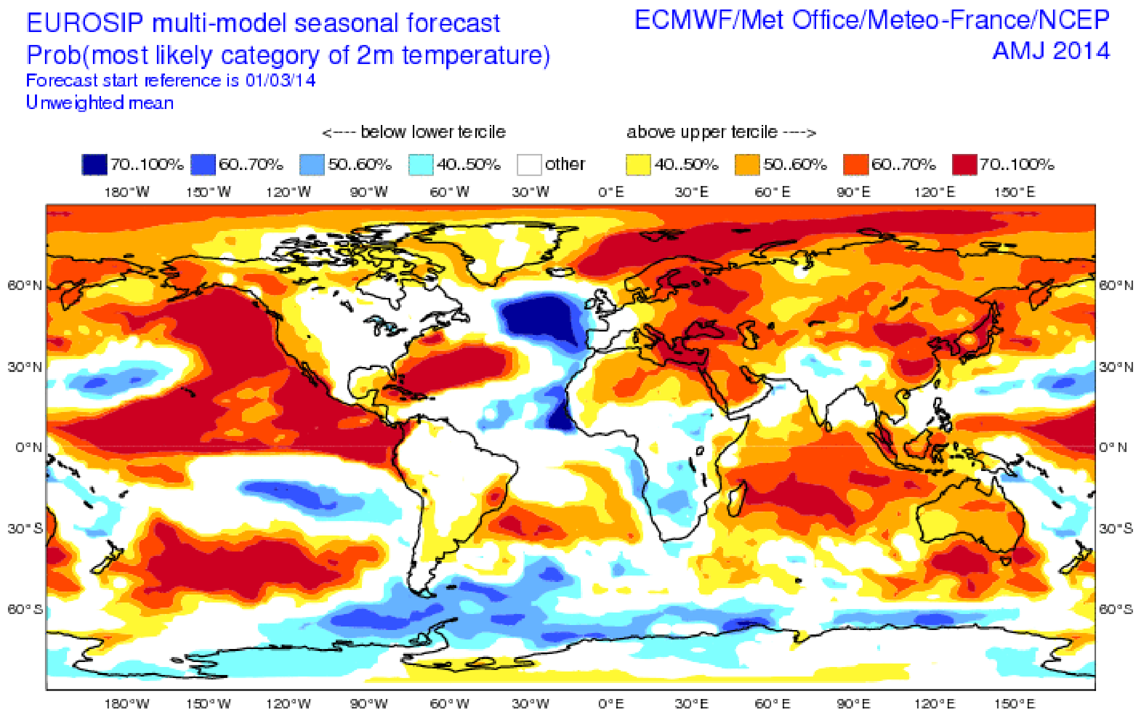


fig.II.3.7: Multi-Model Probabilistic forecasts for T2m from EuroSip (2 Categories, Below and Above normal – White zones correspond to No signal and Normal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

North-America : enhanced probabilities for warm anomalies along the Pacific coast; no clear signal elswhere.
Central-America : globally warmer than normal extending toward the North Caribbean.

South-America : Some consistent signal over the South-Eastern part of the continent along the coastal areas (warmer than normal).
Australia : warmer than normal
Asia : Mostly Warmer than normal conditions in the Eastern and Northern parts, with the strongest probability on the Eastward side.
Africa : Mostly warmer than normal North over the Maghreb area.
Europe : Warmer than normal conditions over of Eastern part of the continent, no signal over the Western countries.

II.4. IMPACT : PRECIPITATION FORECAST

II.4.a ECMWF

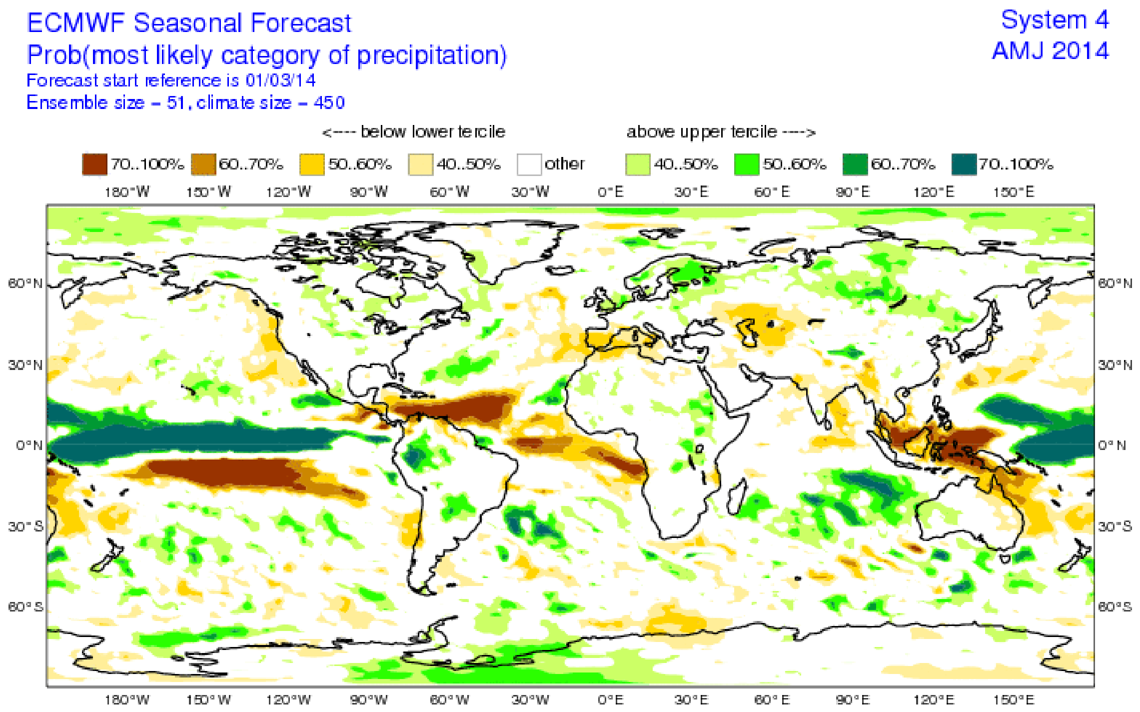


fig.II.4.1: Most likely category probability of rainfall from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).

http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.4.b Météo-France

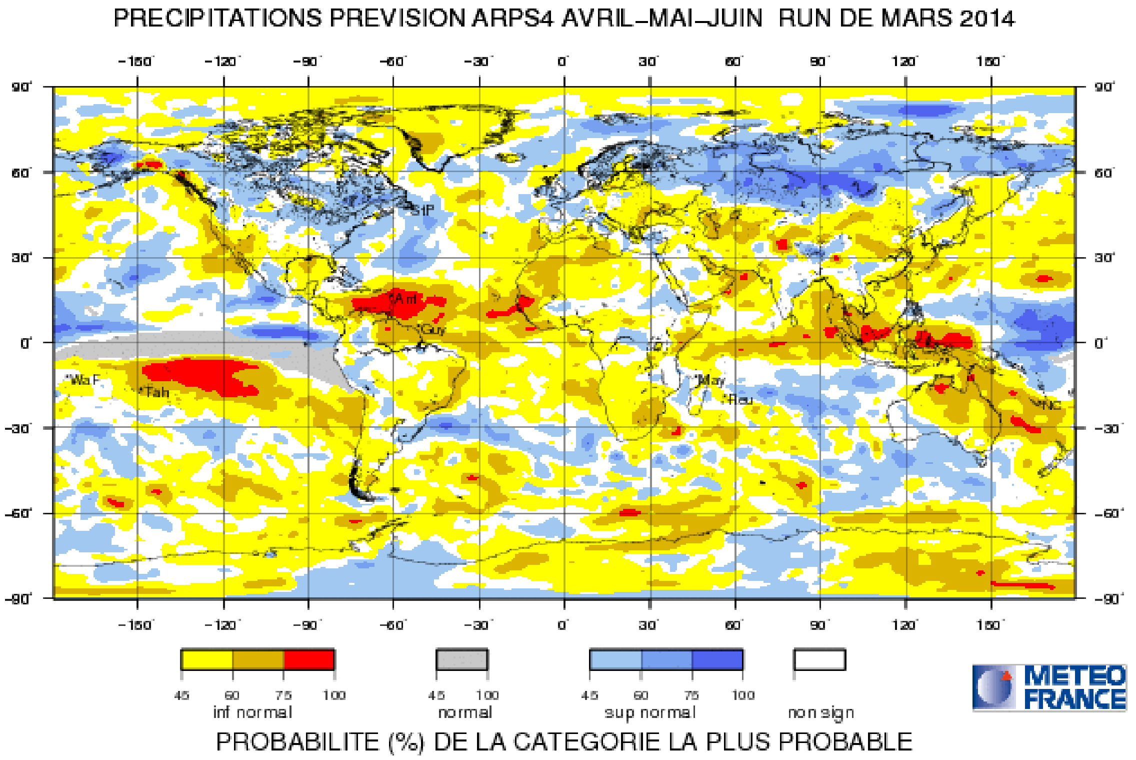


fig.II.4.2: Most likely category of Rainfall. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.4.c Met office (UKMO)

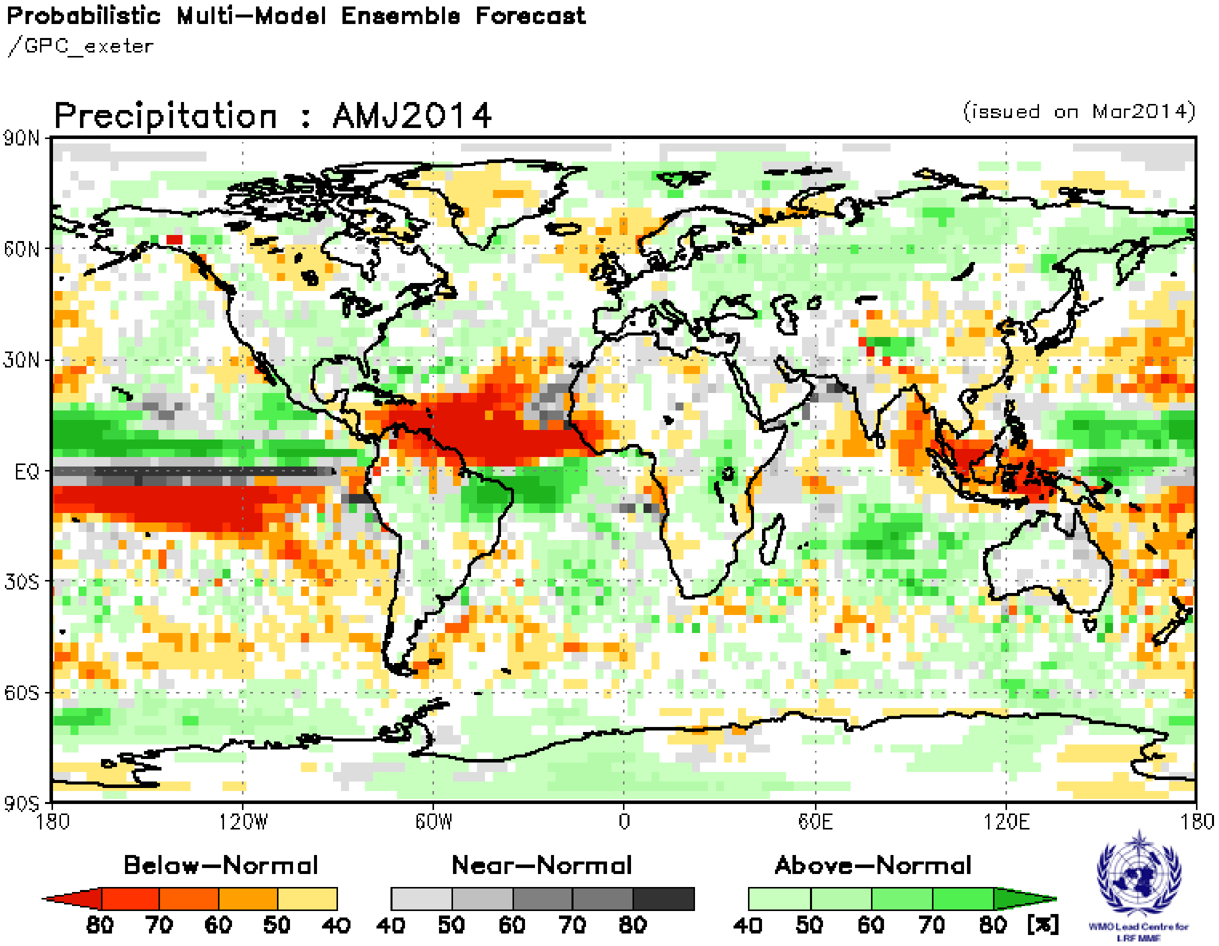


fig.II.4.3: Most likely category of Rainfall from UK Met Office. Categories are Above, Below and Close to Normal. White zones correspond to No Signal

II.4.d Climate Prediction Centre (CPC)

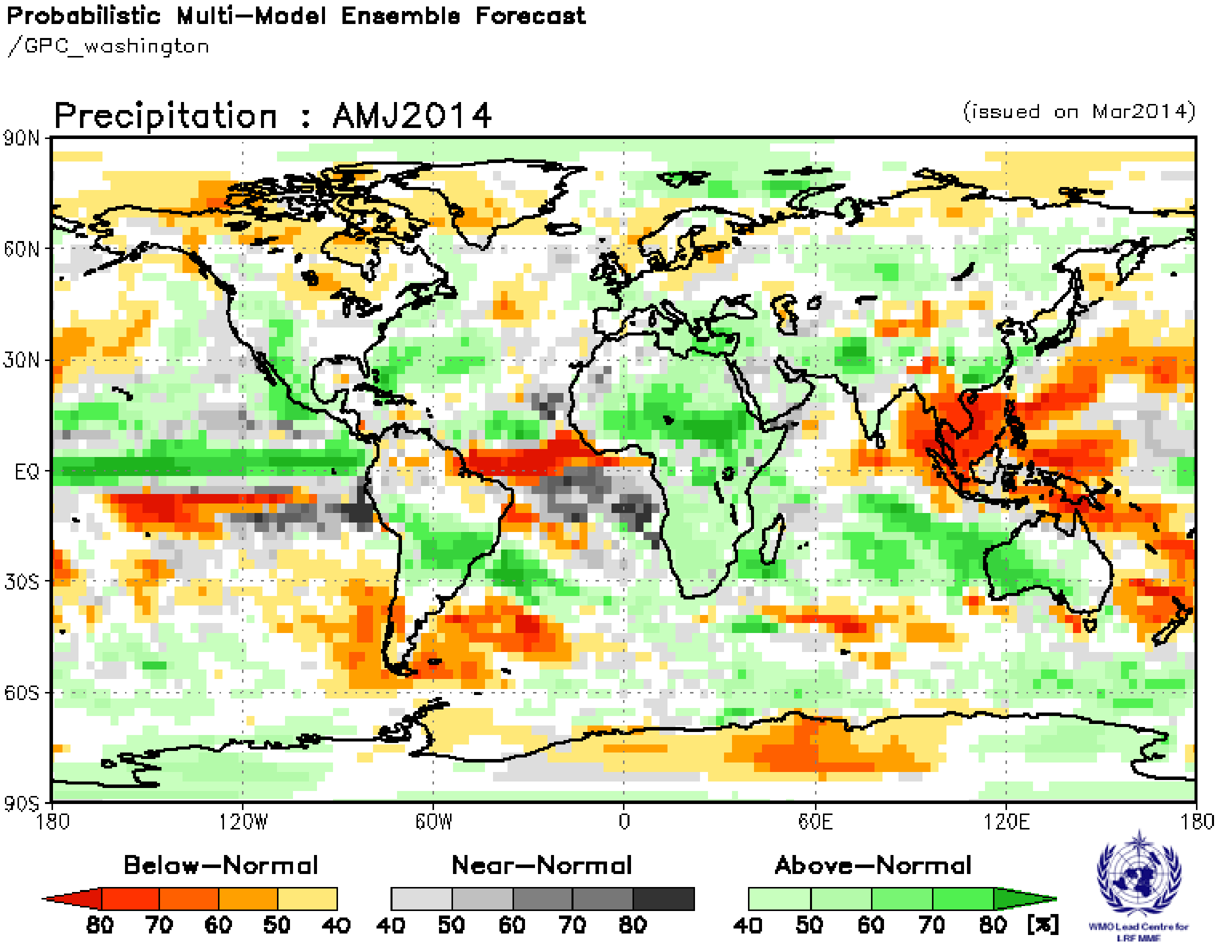


fig.II.4.4 : Most likely category of Rainfall from NCEP. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. https://www.wmolc.org/

II.4.e Japan Meteorological Agency (JMA)

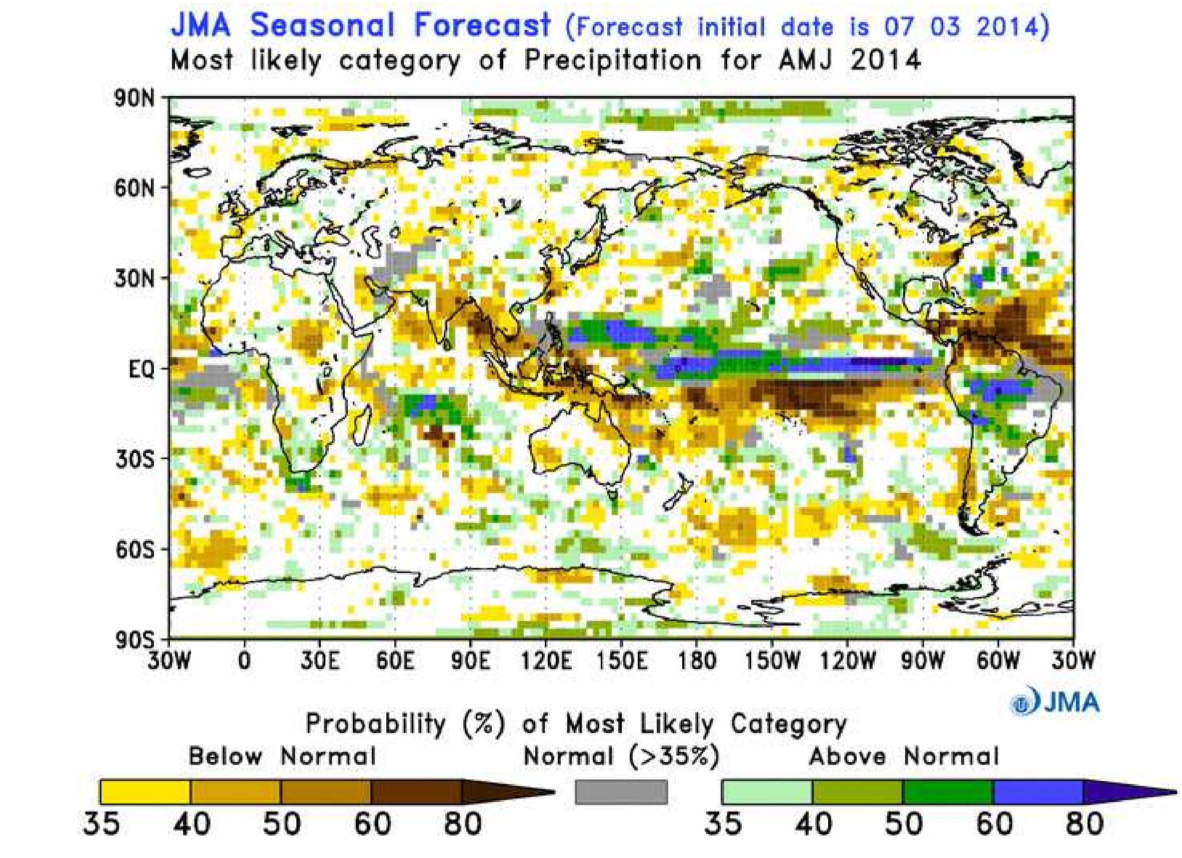


fig.II.4.5: Most likely category of Rainfall from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.

http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/4mE/fcst/fcst_gl.php

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

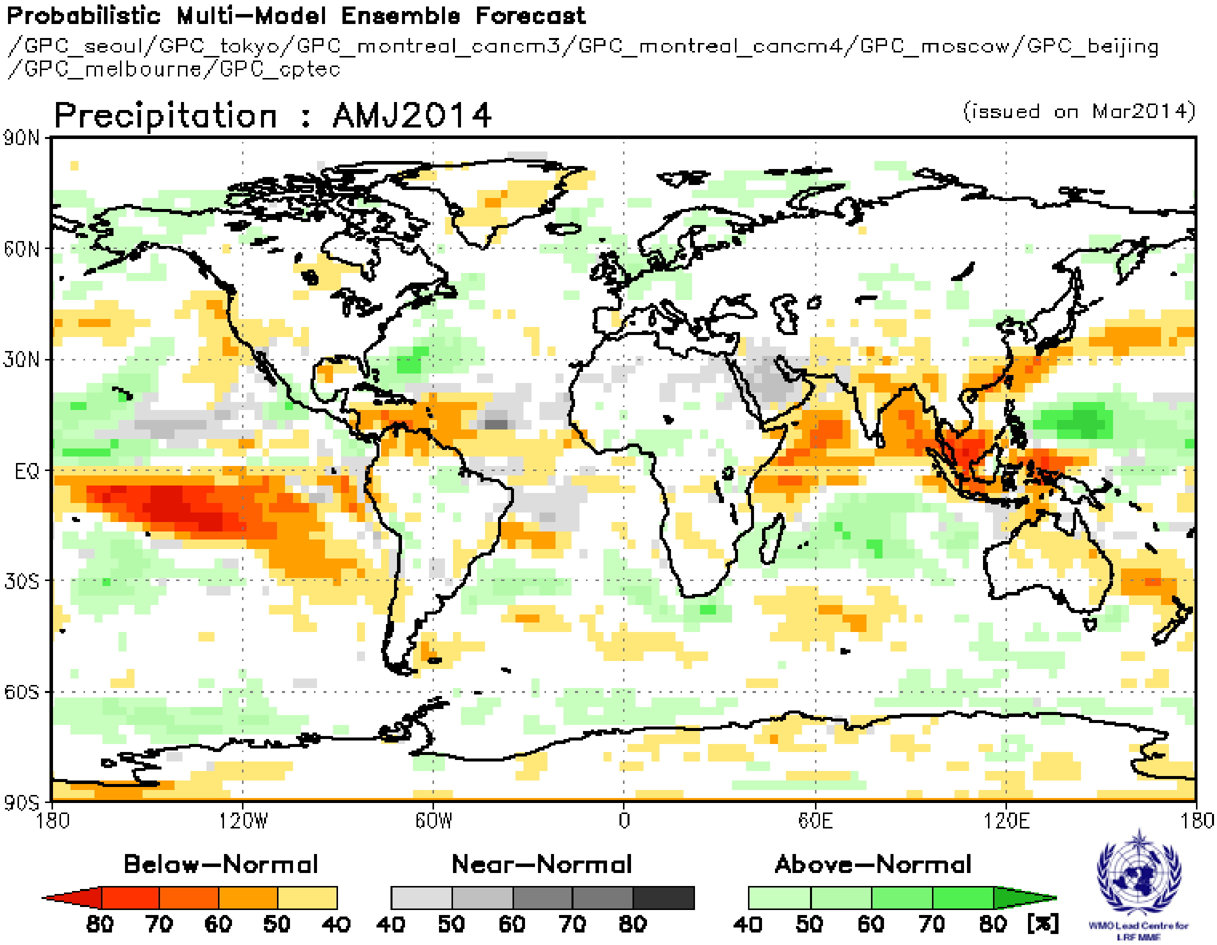


fig.II.4.6 : Most likely category of Rainfall from LC-MME. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. https://www.wmolc.org/

II.4.g Euro-SIP

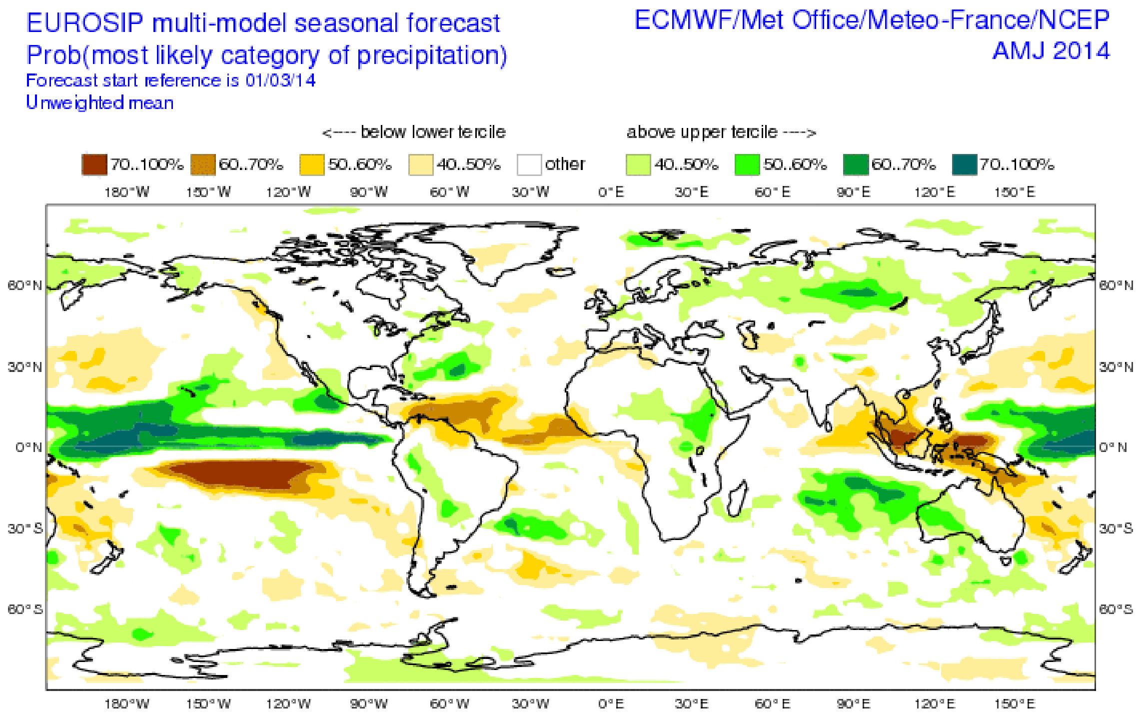


fig.II.4.7: Multi-Model Probabilistic forecasts for precipitation from EuroSip (2 Categories, Below and Above normal – White zones correspond to No signal).

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 in the vicinity of the warm pool extending toward Hawaï, and extending along the Equator up to the Eastern part of the basin. Enhanced probabilities for dry scenario over the Northern coastal areas of South America and Southern Caribbean, over the Maritime continent and the most South-Western part of West Africa.

For Europe : No signal more or less everywhere.

II.5. REGIONAL TEMPERATURES and PRECIPITATIONS

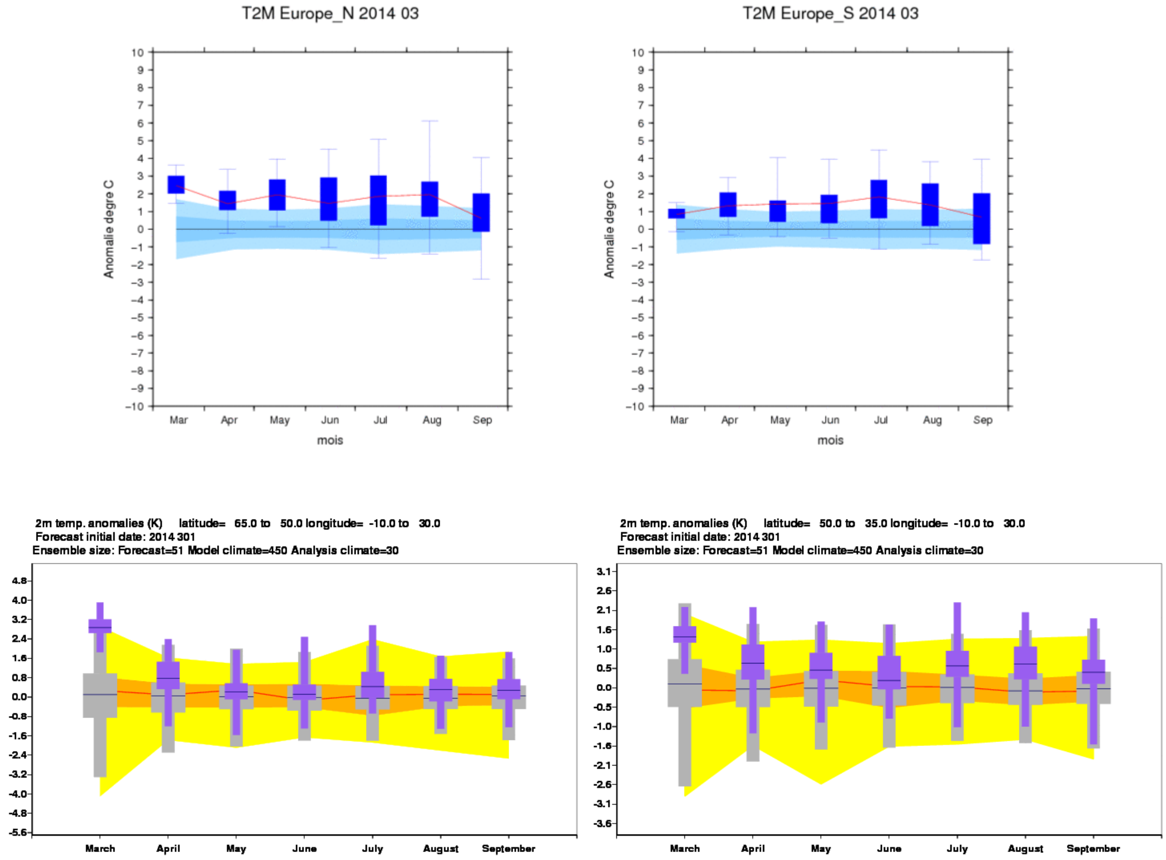


fig.II.5.1 : Climagrams for Temperaturel in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

For Northern Europe: little consistency between the 2 models.

For Southern Europe: the warmer than normal scenario is privileged in both models.

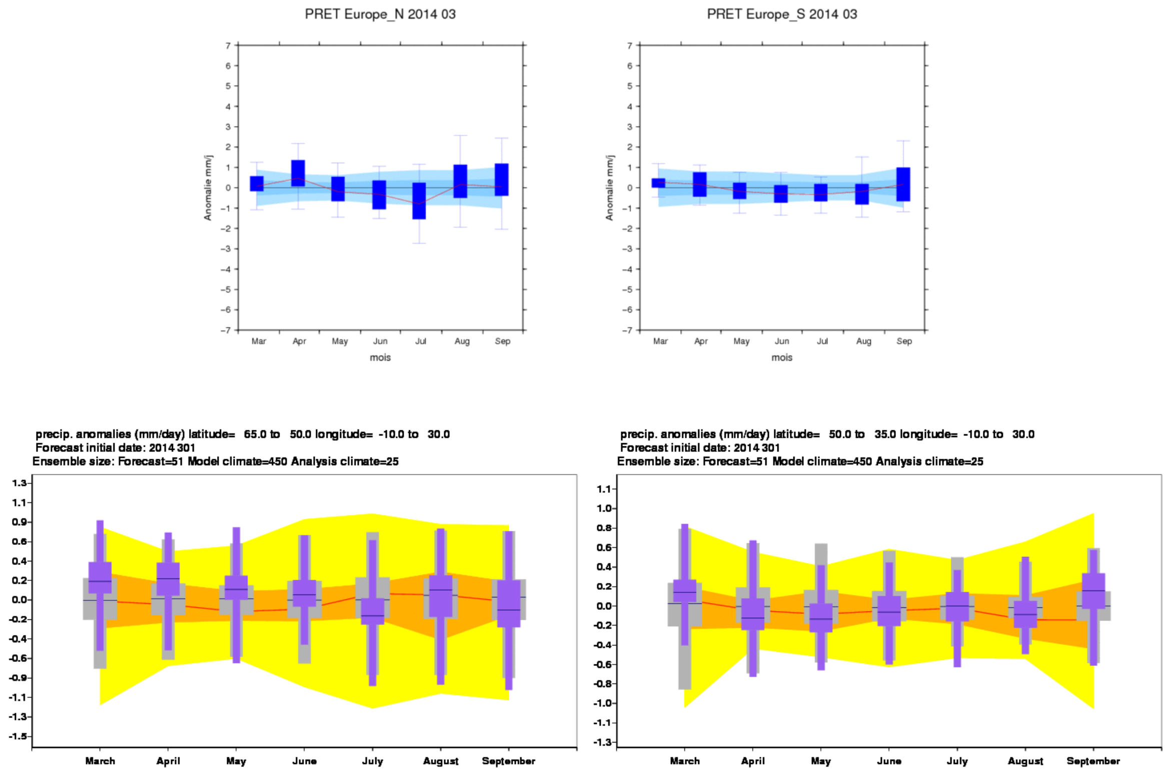


fig.II.5.2 : Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

No consistency between the 2 models.

II.6. MODEL'S CONSISTENCY

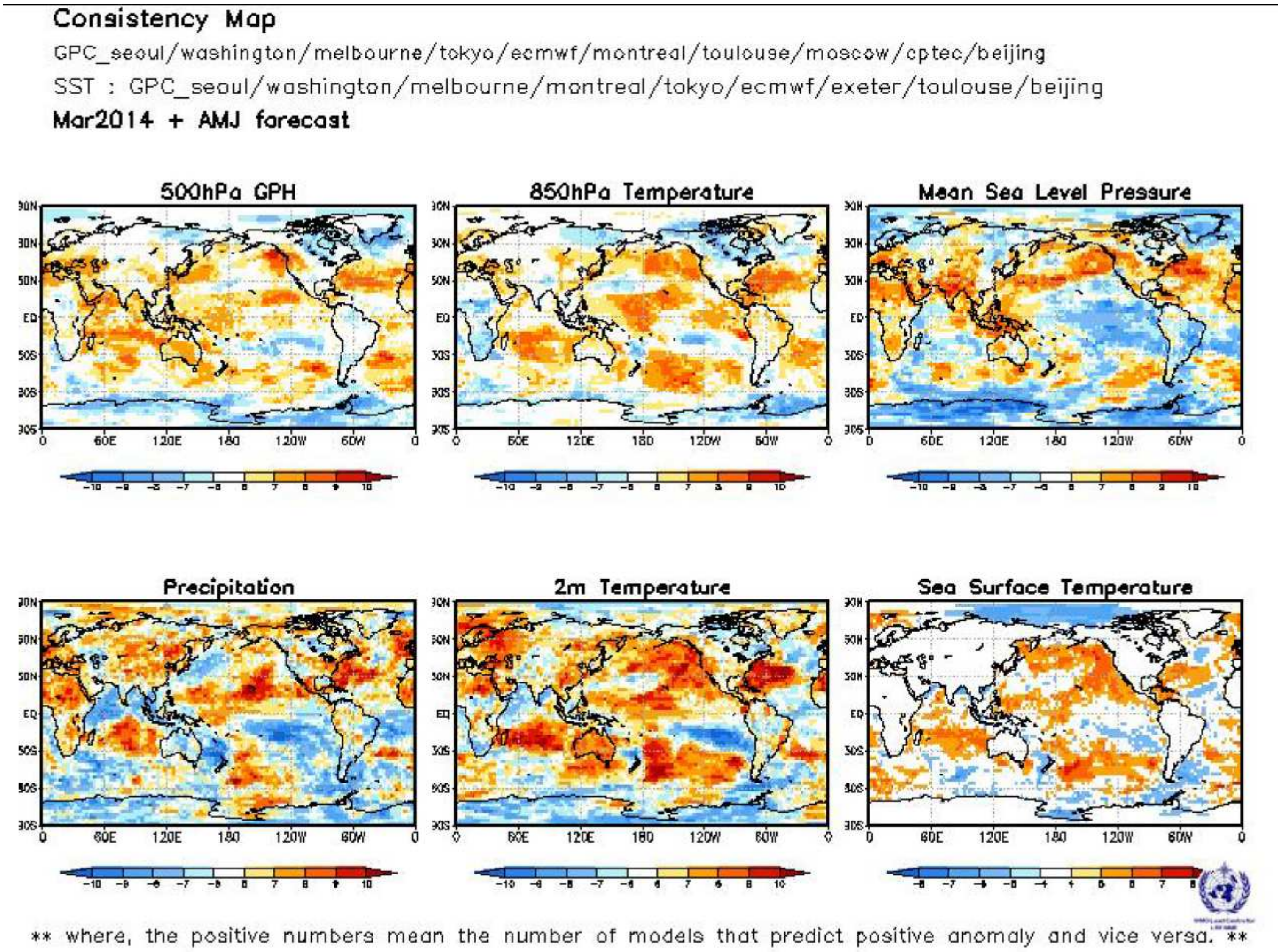


fig.II.6.1 : GPCs Consistency maps from LC-MME http://www.wmolc.org/

For SST : Consistency over the Western Pacific (Warmer than normal). The slight warm conditions in the central equatorial wave guide is also present, but nothing clear in the eastern part. In the Indian ocean, large convergence for Above normal conditions in the Eastern part and over the Southern sub-Tropics. The negative or neutral IOD is also conspicuous. For the Atlantic, consistency in the Northern Tropics.

For Z500 : In the Northern Atlantic and northern Pacific, quite good consistency.

For T2m : globally little consistency over the continental regions, to the exception of Australia (+), Eastern Asia (+), Eastern Europe (+), Northern Africa (+).

For precipitation : For Above normal conditions, some consistency in the vicinity of the warm pool and the SPCZ, over Africa, Central Europe and Central America. For the Below normal scenario, some consistency exists over part of South-Asia, Australia, Middle-East, Brazil and US.

II.7. "EXTREME" SCENARIOS

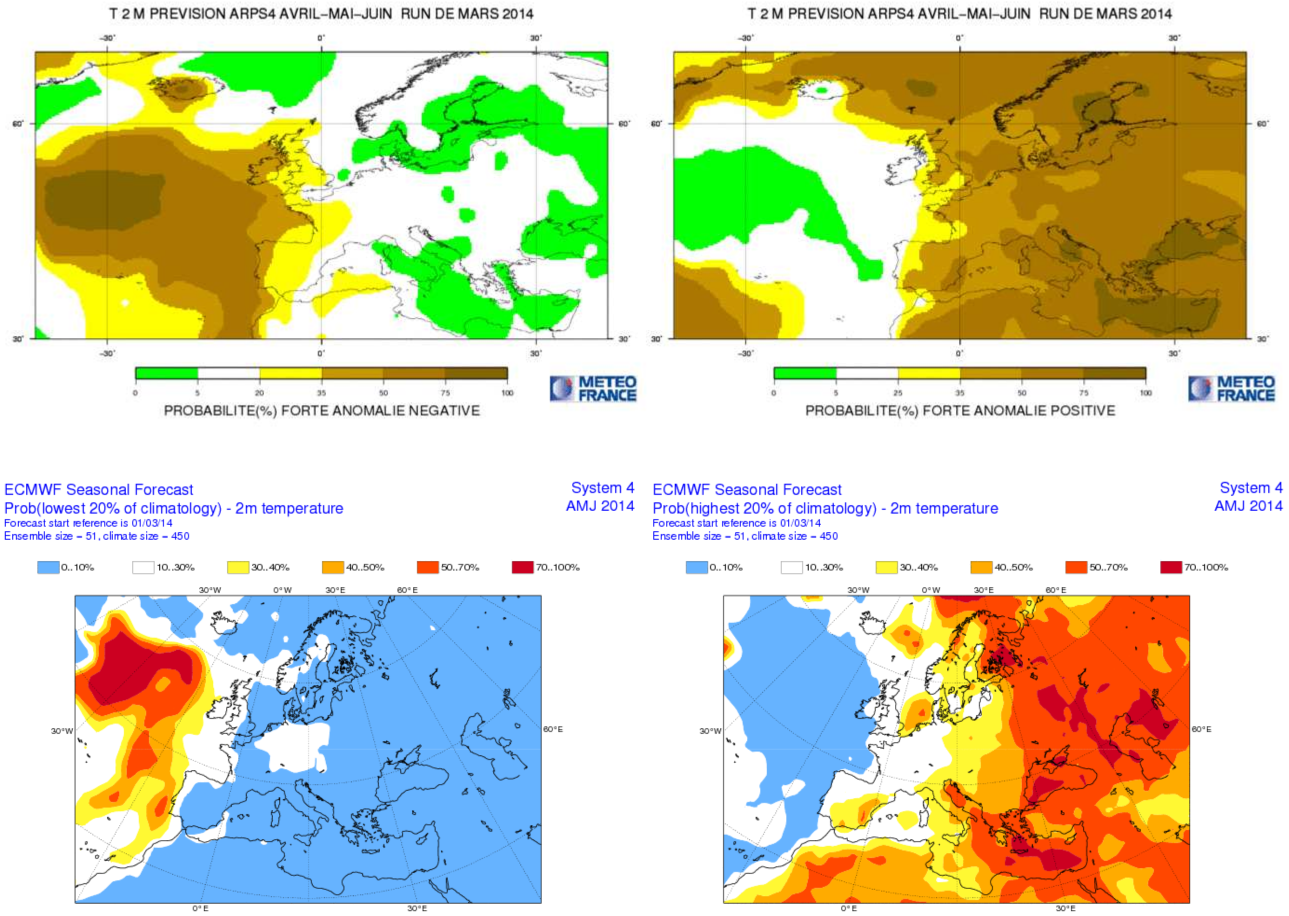


fig.II.7.1 : Top : Meteo-France T2m probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution). Bottom : ECMWF T2m probability of « extreme » below normal conditions (left - lowest ~20% of the distribution) and "extreme" above normal conditions (right – highest ~20% of the distribution).

Partial consistent signal between the 2 models (it concerns Eastern Atlantic and Central and Eastern Europe).

The Very below scenario over the Eastern Atlantic is likely related to the increased zonal circulation. Enhanced probabilities over most of the European continent for the Very Above normal scenario, especcially the Central and Eastern part. In MF, the ROC scores are between 0.55 and 0.75 over a large portion of the Mediterranean basin and Central Europe (up to Scandinavia). So some information could be infered from these forecasts over the region with a significant score.

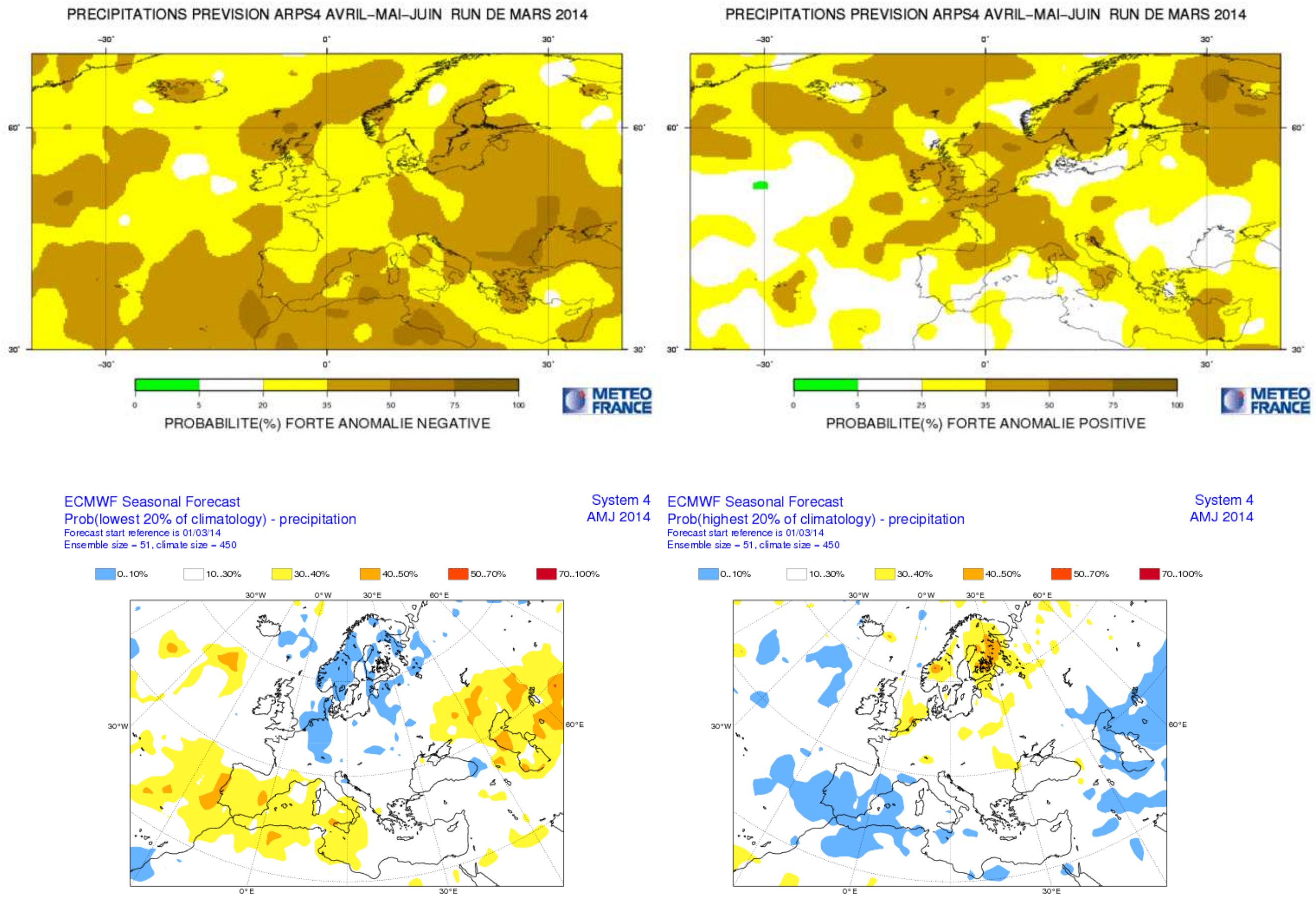


fig.II.7.2 : Top : Meteo-France rainfall probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution).
Bottom : ECMWF rainfall probability of « extreme » below normal conditions (left - lowest ~20% of the distribution) and "extreme" above normal conditions (right – highest ~20% of the distribution).

Mostly No signal in ECMWF while there are a signal for extreme scenarios in MF. In MF Very Below scenarios possible over the South-West of Europe (with some similar -even weak- indication in ECMWF) and Very Above scenario possible over Scandinavia. To be quoted the divergent scenarios over Central and Eastern Europe. The ROC scores in MF are only better than climatology (0.55 to 0.7) over the South-West part of Europe for the Very Above normal scenario.
So in relationship with the current predictability and the model uncertainties, it seems difficult to use these precipitation forecast.

II.8. DISCUSSION AND SUMMARY

II.8.a Forecast over Europe

For this forecast the major comment is about the current predictability in the climate system. The oceanic forcing remains quite low to the exception of the vicinity of the warm pool. The current predictability seems to exist in the Tropics in the vicinity of the Pacific basin but also to some extent in the mid-latitudes due to the influence of the Tropics onto the mid-latitude activity which nevertheless should prevail. 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: despite the weak predictability the Above normal scenario could be privileged for the most of Southern Europe and Central and Eastern Europe (including South-East Europe). For the Western façade, there is uncertainty and so "No Privileged" scenario is chosen. Obviously, some downscaled information could detail these scenarios for specific countries or subregions.

II.8.b Tropical cyclone activity

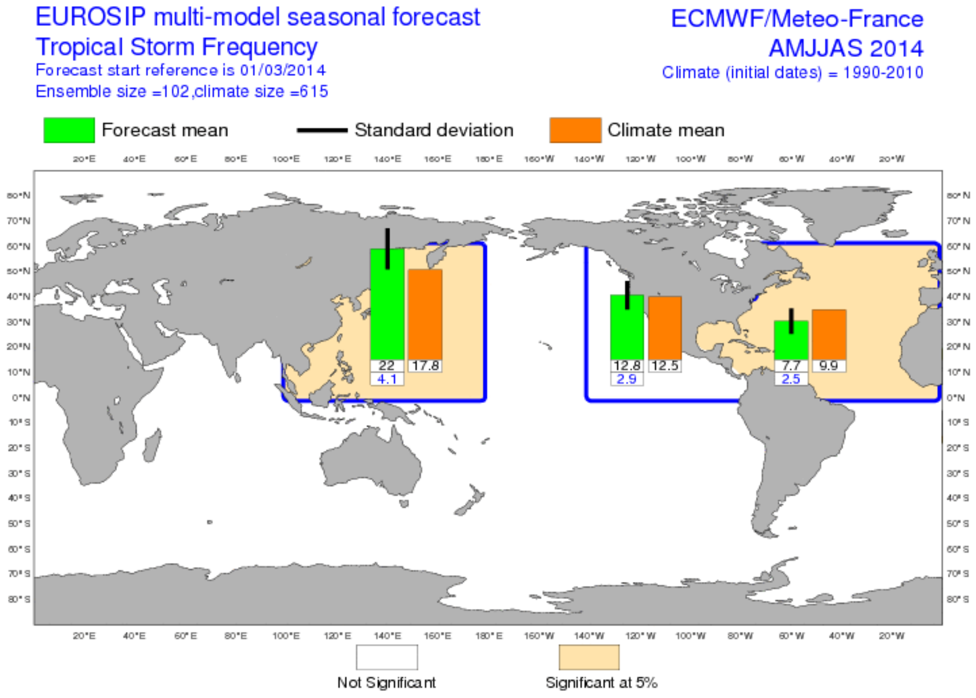


fig.II.8.1: Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro/eurosip_tropical_storm_frequency/

For the Tropical Cyclone season, Euro-Sip forecasts indicate higher than Normal Topical Cyclone activity in the North-western Pacific and lower than normal in the Northern Atlantic.

WMO RA VI
Pilot RCC-Network

Synthesis of Temperature forecasts for April-May-June 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***	***above normal***	***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 April-May-June 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.

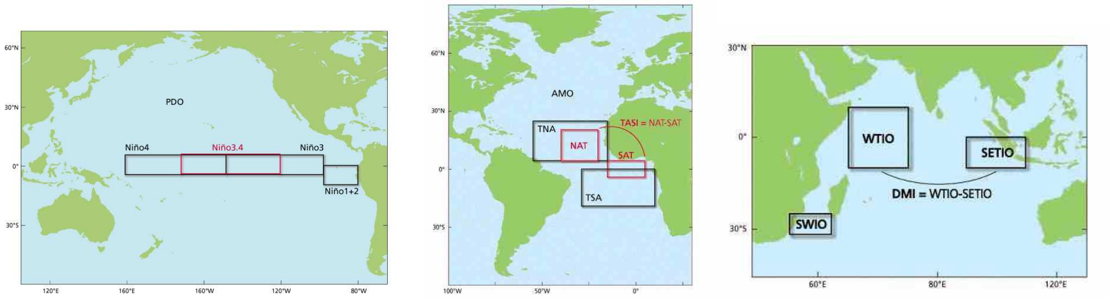
III.2. « NINO », SOI INDICES AND OCEANIC BOXES

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.