WMO RA VI Pilot RCC-Network

METEO FRANCE Toujours un temps d'avance

GLOBAL CLIMATE BULLETIN n°166 - AVRIL 2013

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I. DESCRIPTION OF THE CLIMATE SYSTEM (FEBRUARY 2013)

I.1. OCEANIC ANALYSIS

I.1.a Global Analysis

At the Surface (fig. 1) :
Generally speaking, little evolutions in the Tropics to the notable exception of the most Eastern part of the Pacific basin.
For the Pacific : In the equatorial wave guide still some colder than normal SST anomalies (in relationship with a wave propagation under the surface) in the Central/Eastern part and positive anomalies over the Warm pool despite the anomalies seems to retract. Over the most South-Eastern part of the basin, strong warming close to the South American continent. A colder than normal pattern exists in the Southern mid-latitudes extending up to the central Tropics. In the Northern hemisphere little evolutions.

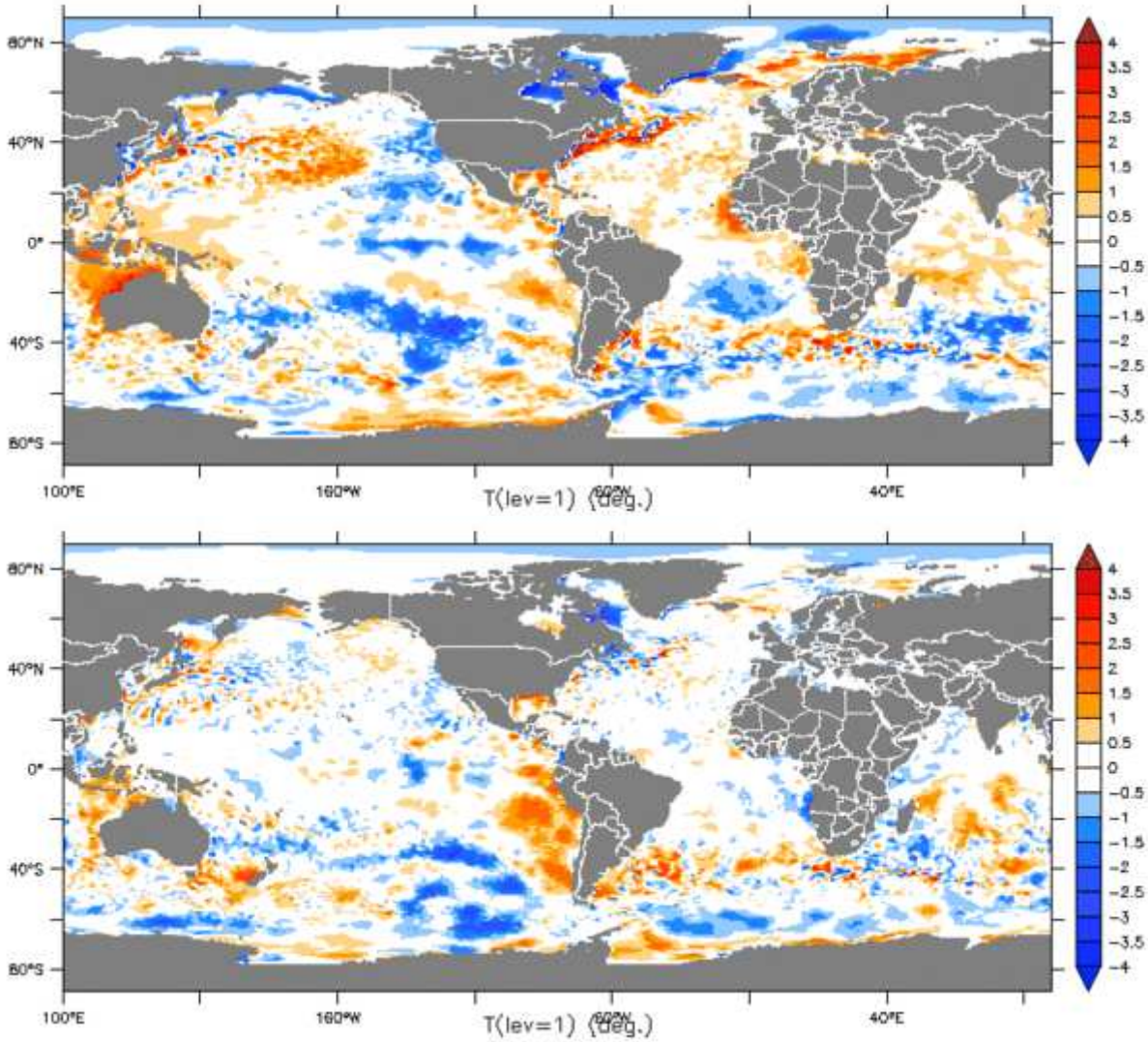


fig.1: **top : SSTs Anomalies in February (°C) (reference 1950-2008)**
bottom : SST tendency (current – previous month) http://bcg.mercator-ocean.fr/

For the Atlantic : little evolution everywhere to the exception of the mid-latitudes in the Southern hemisphere. Still some positive anomaly along the western coast of the African continent from Mauritania up to Angola. The positive anomaly is decreasing along the South-Western coast of Africa. Over the Northern Atlantic, positive anomaly on the Western Tropics and over the NW basin in the mid-latitudes. In the Southern Tropics, still a negative anomaly.
In the Indian Ocean : Little evolutions in the Northern hemisphere where SST are still mostly warmer than normal. Some SST warming between Australia and Madagascar and still positive anomaly close to Australia. In the mid-latitudes, the southern part is colder than normal in the centre of the basin. The DMI is close to neutral but slightly negative.
In subsurface (fig.2) :
Generally speaking the heat Content anomalies look very similar to the ones from the previous month to the exception of the Central Pacific equatorial waveguide.
In the Pacific : in the Tropics (including the equatorial waveguide), heat content anomalies mostly negative East to 160°W and positive West to this limit. Note the positive anomalies in the most Western part off equator (in the Northern hemisphere between 10°N and 20°N. In the SPCZ region this positive anomaly decreased while some cooling is visible East to the SPCZ. In the mid/high latitudes of the Northern hemisphere, great consistency with the surface signal (and same pattern than for the Tropics).
In the Atlantic : weakening of the dipole structure in the equatorial waveguide (positive/negative anomaly in the Eastern/Western sides). Positive heat content anomalies along the western coast of the African continent (see SST). Persistence of the strong positive anomaly in the North-Western part of the basin (close to the mid-latitudes). Over South Tropics anomalies are consistent with SST despite the patterns are quite fragmented.
In the Indian Ocean : heat content consistent with SST signal in the Northern hemisphere and Australia. In the equatorial waveguide note the extension of the negative anomaly and the signal mostly consistent with the DMI.

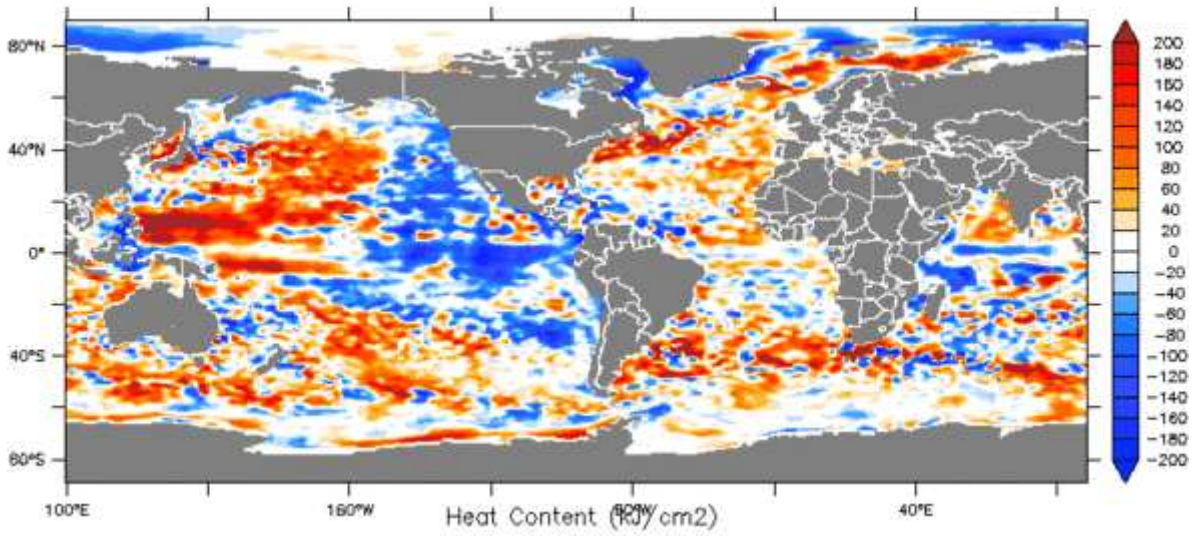


fig.2: map of Heat Content Anomalies (first 300m) in February (kJ/cm²). (reference 1950-2008)
http://bcg.mercator-ocean.fr/

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

Despite the anomalies are relatively weak, a dipole pattern is still visible with positive anomalies on the western side and negative anomalies in the Eastern side. The warmer than normal conditions seem to decrease in relationship with a wave propagation under the surface (see fig. 4&5). Not too much trade wind anomalies over most of the basin. However there is some trace of an increased zonal circulation on the western part. The SOI is near average (-0,2).

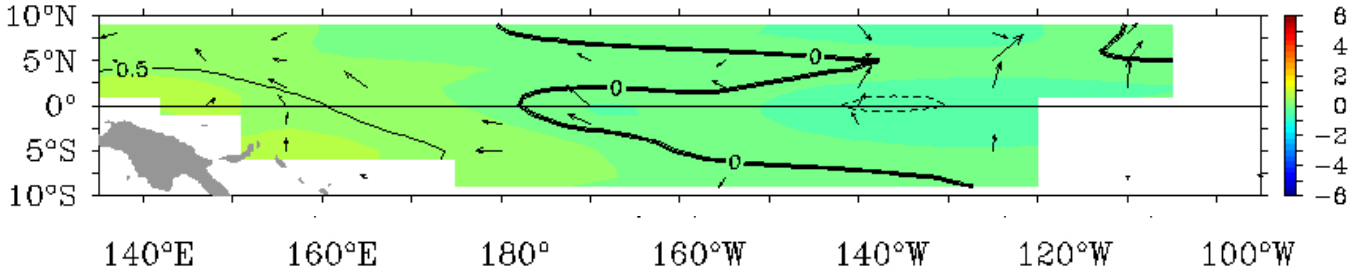


fig.3: SST Anomalies and Wind anomalies in February over the Equatorial Pacific from TAO/TRITON. http://www.pmel.noaa.gov/tao/jsdisplay/monthly-summary/monthly-summary.html

In the Niño boxes (4, 3.4, 3 et 1+2 ; see definition in Annex) the SST anomalies illustrate the little SST evolution. The monthly averages are respectively 0,0°C, -0,4°C, -0,5°C and -0,4°C from West to East.

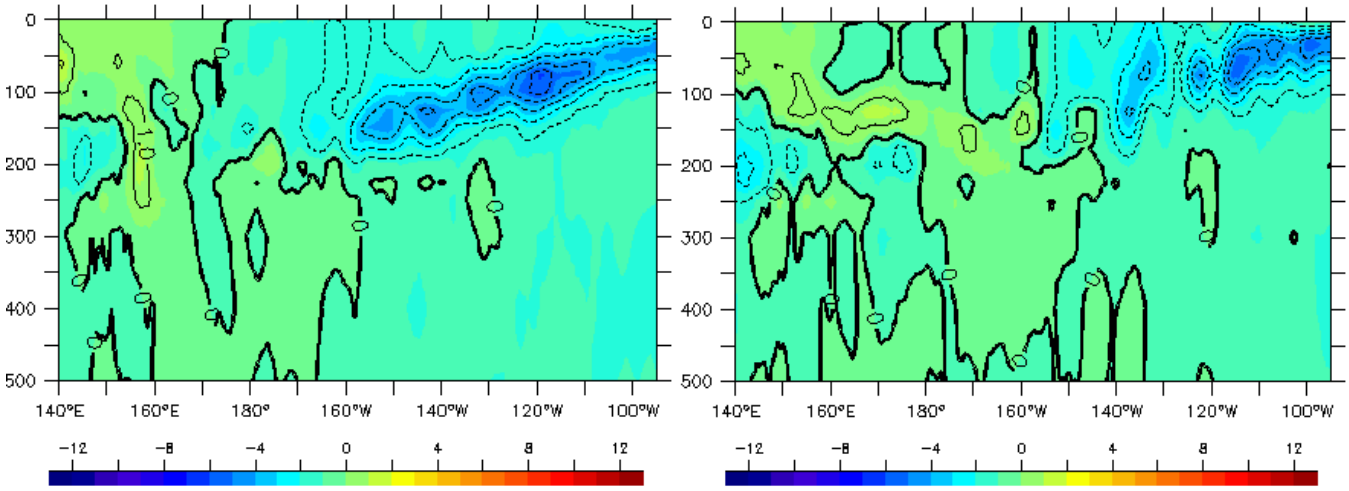


fig.4: Oceanic temperature anomaly in the first *500 metres* in the Equatorial Pacific, in previous month (left) and current month – February (right) http://bcg.mercator-ocean.fr/

In the equatorial waveguide (fig. 4) : traces of propagation of the Kelvin waves (both warmer and colder than normal) in February under the surface from the most western part (warm signal) and from the eastern part (cold signal). The evolution of the warm reservoir in the Western part is to be carefully monitored with respect of next months and possible evolution for the end of this year.

The thermocline structure (fig. 5) : Clear wave propagation signal of both anomalies as already pointed out in the previous comment. Some trace of positive anomaly are visible at the end of March.

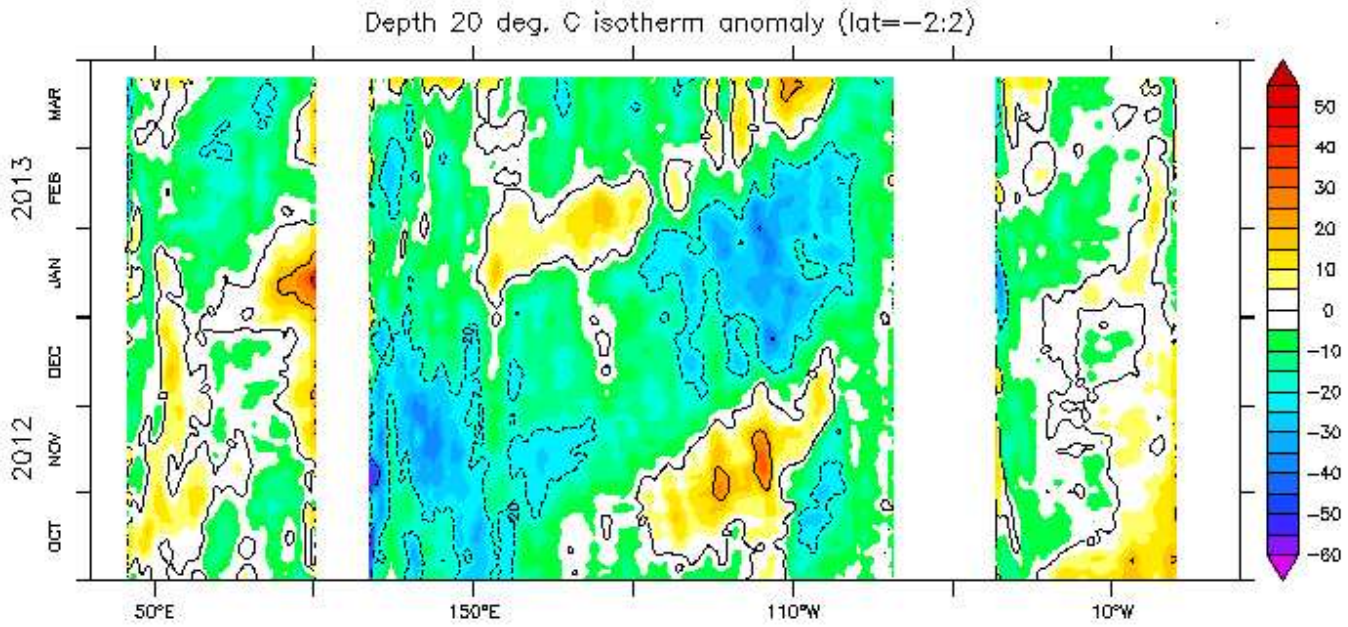


fig.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 6 month period. http://bcg.mercator-ocean.fr/

I.1.c Atlantic Basin

Northern Tropical Atlantic : slightly warmer than normal, with little evolution since the last month.
Equatorial waveguide : on average close to normal conditions for the thermocline/SST in the equatorial waveguide but some trace of wave propagation. Note that there is warmer than normal conditions along the coastal areas. A warmer than normal signal appears on the Western side at the end of the period.
The Southern Tropical Atlantic : Still cooler than normal. Some traces of warmer than normal conditions along the most Eastern part of the basin.

I.1.d Indian Basin

Southern Tropical Indian Ocean : warmer than normal close to West Australia.
Equatorial waveguide : close to normal conditions. However, a negative anomaly develops along the coast of Africa. The IOD is close to normal and slightly negative.
Northern Tropical Indian Ocean : slightly warmer than normal.

I.2. ATMOSPHERE

I.2.a Atmosphere : General Circulation

Velocity Potential Anomaly field in the high troposphere (fig. 6 – insight into Hadley-Walker circulation anomalies) : quite a lot of sub-regional patterns. The biggest positive anomaly is in the sub-tropics while the negative is in the Tropics (in between the Indian and Pacific oceans).
On the Pacific : Divergent circulation anomaly (upward anomaly motion) on the Western equatorial region which extends in the region of the SPCZ beyond the dateline. This signal could be partly related to the MJO activity while the extension is related to the SSTs. Additional sub-regional circulation anomaly in both hemispheres across the Pacific. In the sub-tropics, the strong positive anomaly corresponds to the descending branch of the Hadley circulation and is consistent with SST evolution below.
On the Atlantic : Strong Convergent circulation anomaly (downward anomaly motion) over the Southern Tropical Atlantic (consistent with SST) which extends along the Eastern coast of South America up to the Caribbean (likely in relationship with sub-regional dynamical forcing). In the Northern hemisphere, to be quoted the dipole structure positive/negative anomalies (downward/upward anomaly motion) between the

Caribbean and coast of West Africa Also to be notice the relatively strong negative anomaly (upward anomaly motion) over the Eastern part of Mediterranean regions extending up to Chad. Convergent circulation anomaly over most of Southern Africa.

On the Indian Ocean : Strong negative anomaly (divergent circulation anomaly - upward anomaly motion) on the equatorial eastern side up to the Bay of Bengal. To be quoted that this anomaly is extending far in the North with respect of the climatology of the ITCZ. The equatorial pattern could also to be likely related to the MJO activity. Associated to this strong anomaly, on the eastern coast of Africa, Convergent circulation anomaly (downward anomaly motion) which could partly explain the SST evolution already pointed out.

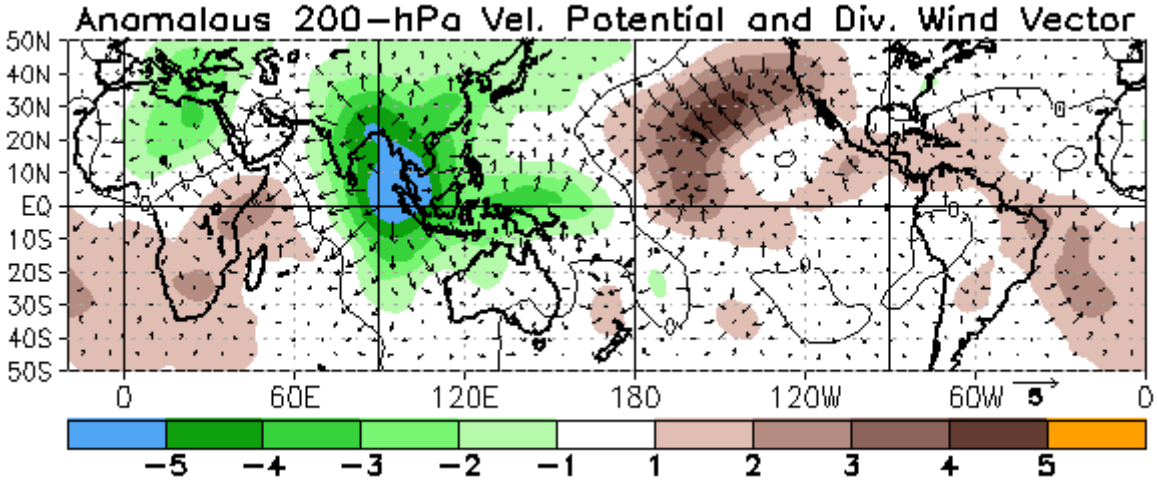


fig.6: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly in February. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly).
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

Stream Function anomalies in the high troposphere (fig. 7 – insight into teleconnection patterns tropically forced) : little signal starting from the Tropics. Limited teleconnection starting from the 2 convection anomalies (East Indian and West Pacific oceans) over China and over Australia (same source). No trace of teleconnection over the Atlantic sector and Europe.

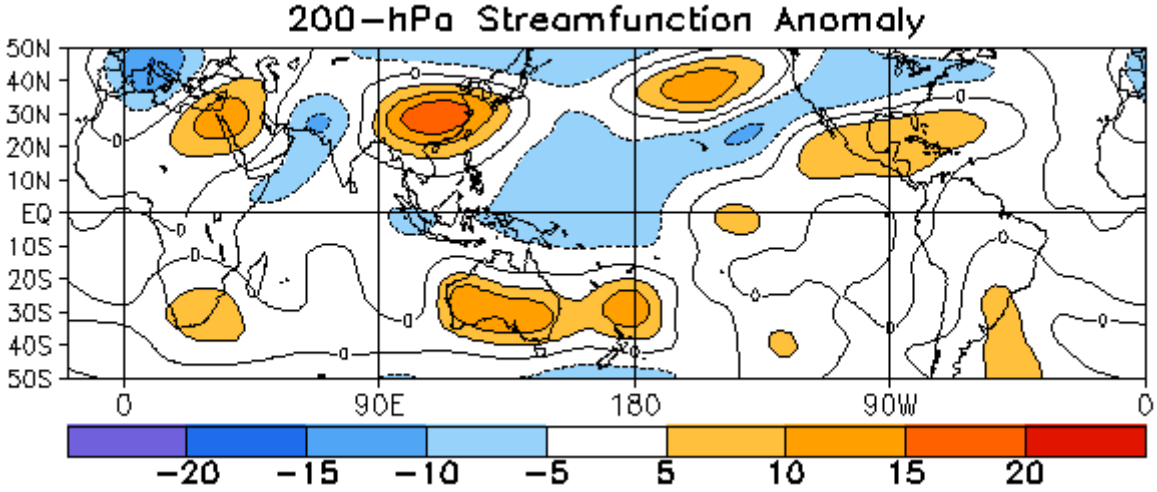


fig.7: Stream Function Anomalies at 200 hPa in February.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

Geopotential height at 500 hPa (fig. 8 – insight into mid-latitude general circulation) : In relationship with previous discussion, the main anomalies in the mid/high latitudes are mostly related to mid-latitude dynamic to the possible exception of the strong positive anomaly over the mid-latitudes of northern Pacific. Over Europe, the anomalies are the traces of the mid-latitude dynamic. The main active modes are the WP (+1.5 – consistent with the previous discussion fig 5 & 6), the East Atlantic/West Russia (-1.3) and the Scandinavian mode (+1.0) and important for Europe the NAO mode (-1.0).

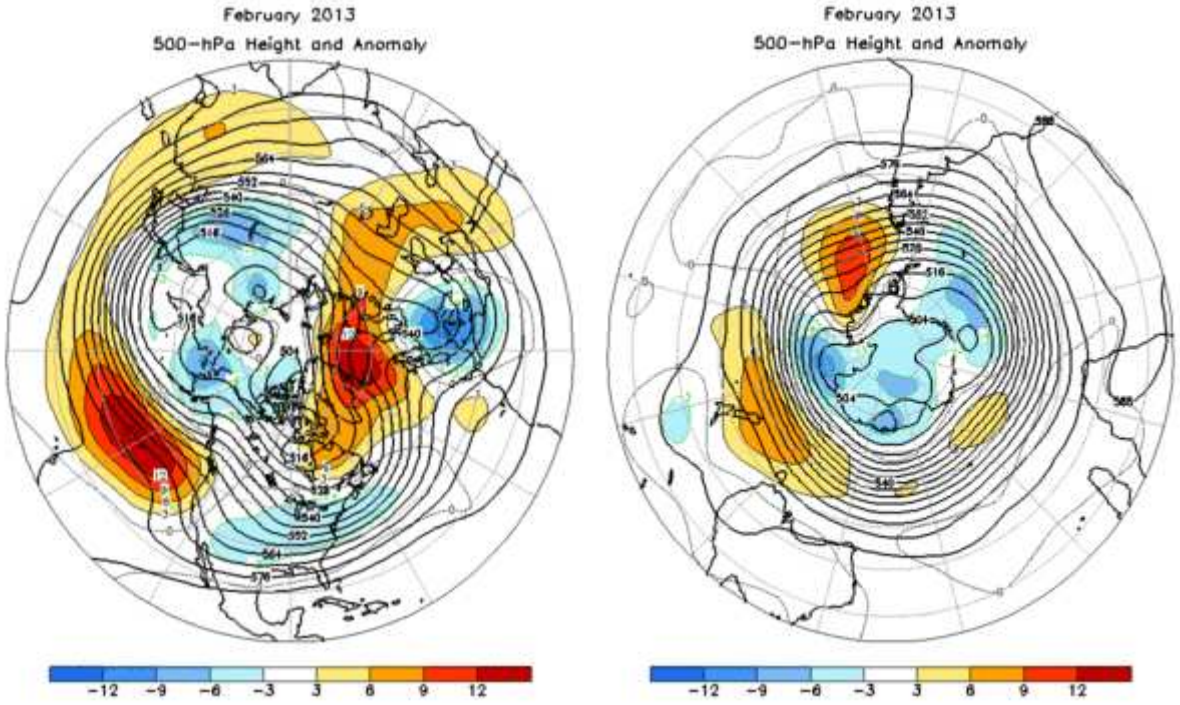


fig.8: Anomalies of Geopotential height at 500hPa in February (left North Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige9.shtml, and right South Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige15.shtml)

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
FEB 13	**-1.0**	**0.1**	**1.5**	**-0.9**	**0.3**	**0.9**	**-1.3**	**1.0**	**0.3**
JAN 13	-0.1	0.9	0.1	0.1	0.1	1.3	0.5	0.1	-1.9
DEC 12	0.1	0.7	-0.6	---	-1.3	-1.3	-0.9	2.0	0.4
NOV 12	-0.7	1.1	-2.0	0.1	-1.1	---	-0.6	0.7	-0.2
OCT 12	-1.7	-0.3	-2.5	0.6	-1.1	---	-1.0	-0.3	-0.2
SEP 12	-0.4	0.4	0.7	0.2	-0.4	---	-0.5	-0.9	-0.7

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

I.2.b Precipitation

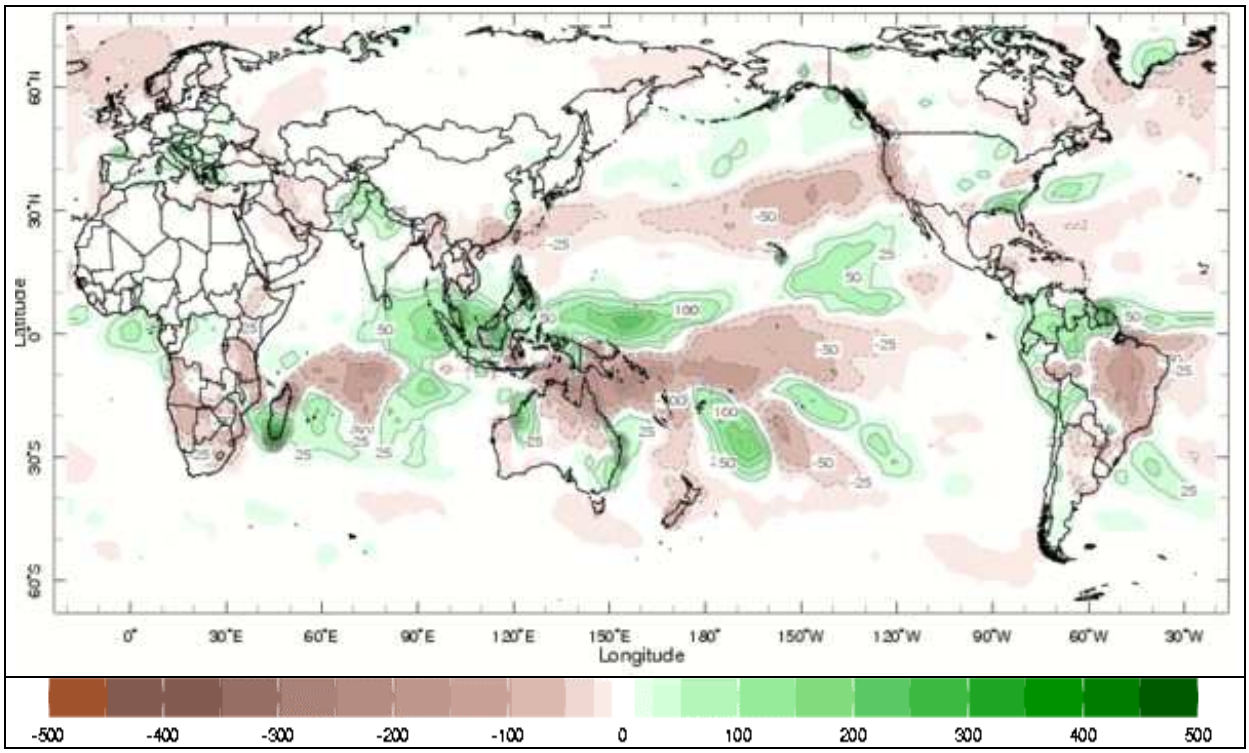


fig.9: Rainfall Anomalies (mm) in February (departure to the 1979-2000 normal) – Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/

The rainfall patterns are quite consistent with the Velocity Potential anomaly field, especially referring to sub-regional cells :

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

Atlantic/Africa : Strong negative anomaly over the Northern Brasil and over most of Southern Africa. The positive anomalies over the most Northern regions of Southern America seem to be related to sub-regional cells and their influence onto the ITCZ. To be quoted some trace of wet conditions in the vicinity of the Guinean Gulf.

Indian Ocean : strong positive anomaly over most of the maritime continent. Strong dipole anomaly over Madagascar. To be quoted some positive anomaly in the most Northern region of India.

Australia : great spatial variability in relationship with sub-regional patterns. But strong negative anomaly over Northern regions.

North America : mostly dry over coastal area of West Canada and US (see Pacific). Still a wet band from Texas up to the Great Lake region. Mostly dry over the Caribbean.

Europe : to be quoted the negative anomalies over North-Western and most Eastern regions. Some locally wet conditions close to the Eastern Mediterranean basin.

I.2.cTemperature

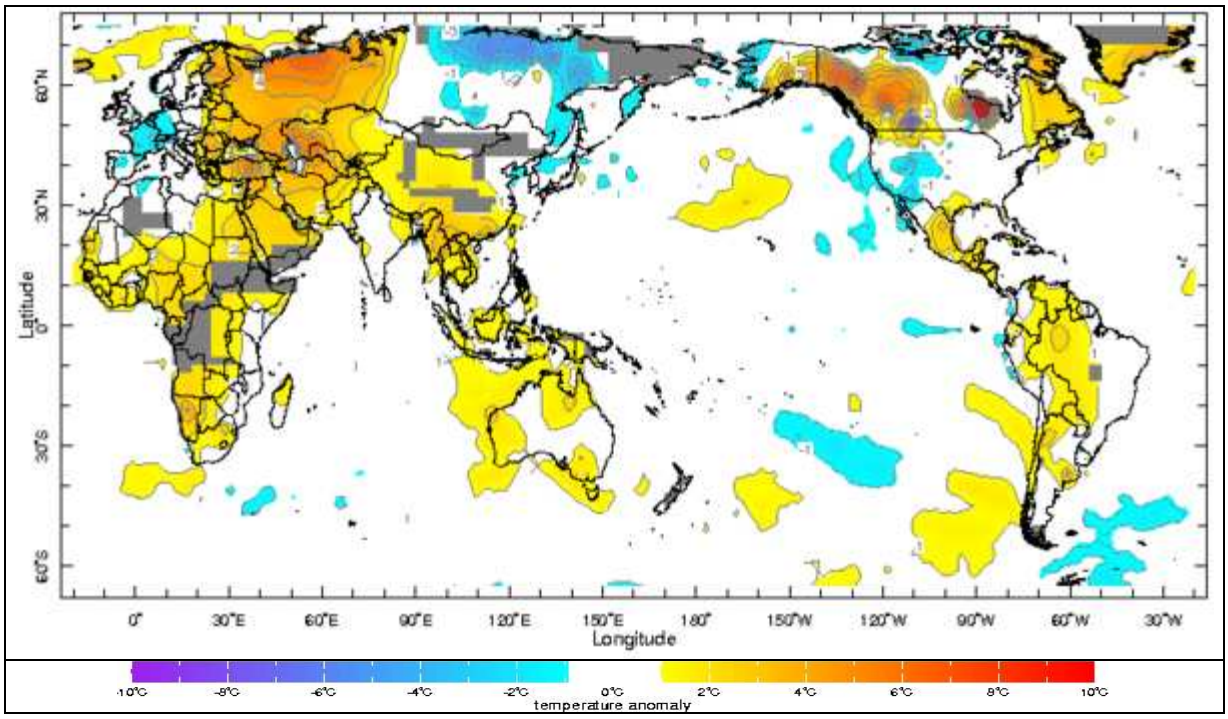


fig.10: Temperature Anomalies (°C) in February (departure to the 1979-2000 normal) http://iridl.ldeo.columbia.edu/maproom/.Global/.Atm_Temp/Anomaly.html

North-America : Strong anomalies ; Warmer than normal conditions over most of Western Canada and also East Canada.
South-America : mostly Warmer than normal conditions to the exception of Eastern regions (close to normal).
Australia : some traces of Warmer than normal conditions.
Asia : Warmer than normal over South-East Asia and a large portion of China. Colder than normal over Eastern Siberia.
Africa : Mostly Warmer than normal conditions everywhere (including the Arabic Peninsula) to the exception of Northern African regions (mostly on the western side).
Europe : Above normal conditions over Central and Eastern Europe including the Eastern Mediterranean regions. Colder than normal conditions over France.

I.2.d Sea Ice

In Arctic (fig. 11 - left) : still the sea-ice extension reached its minimum value and record (negative anomaly close to 2011-2012 value).
In Antarctic (fig. 11 - right) : well above normal sea-ice extension anomaly with some large regional modulation.

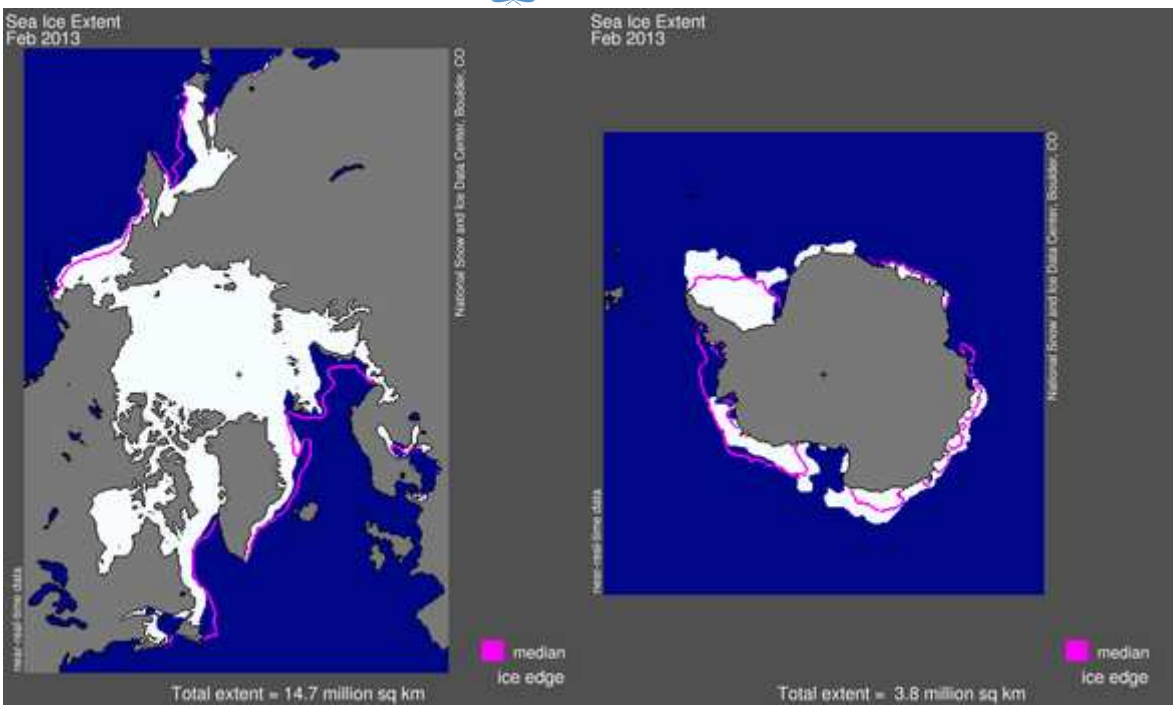


fig.11: Sea-Ice extension in Arctic (left), and in Antarctic (right) in February. The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

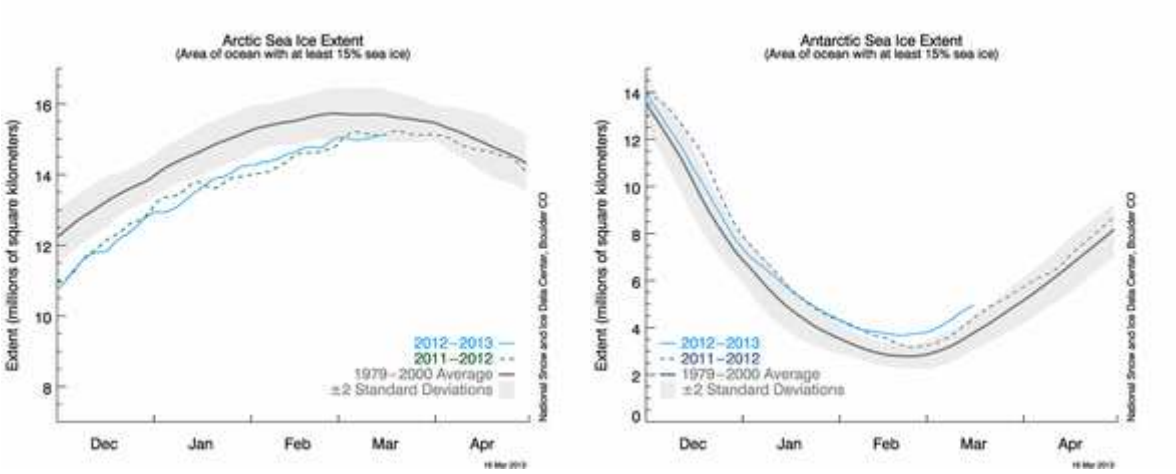


fig. 9bis : Sea-Ice extension evolution from NSIDC
http://nsidc.org/data/seaice_index/images/daily_images/N_stddev_timeseries.png

II.SEASONAL FORECASTS FOR AMJ FROM DYNAMICAL MODELS

II.1. OCEANIC FORECASTS

II.1.a Sea Surface Température (SST)

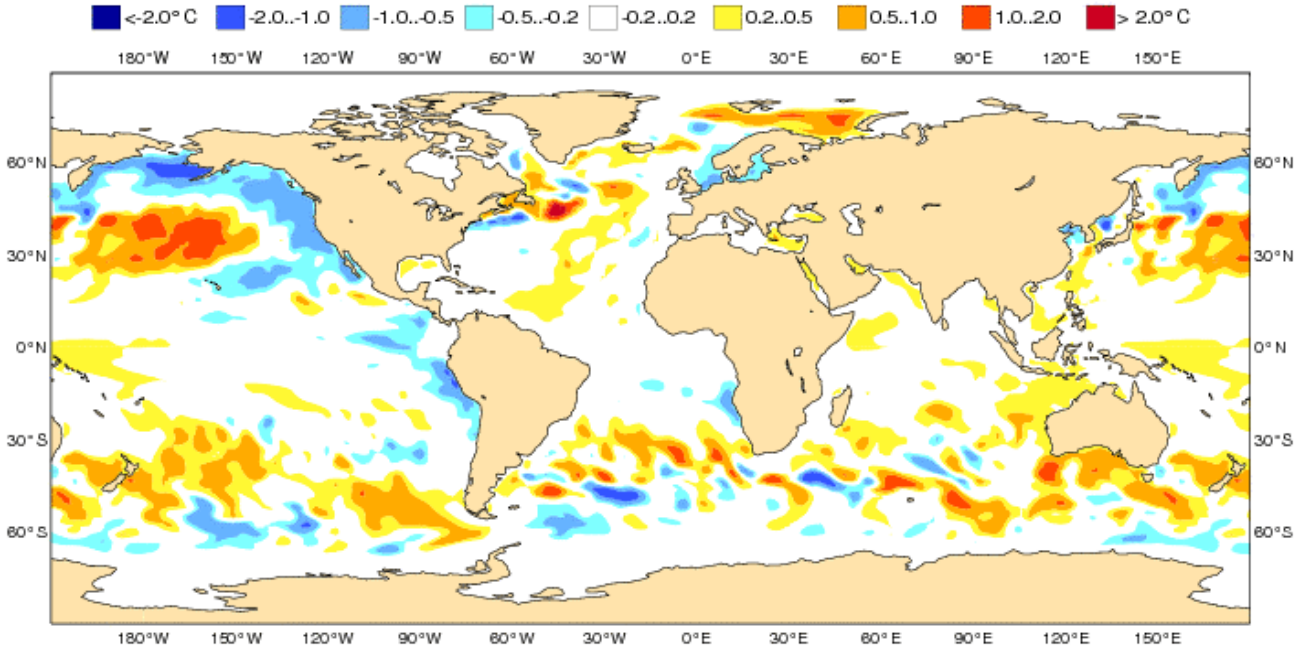


fig.12: SST anomaly forecast (in °C) from ECMWF for AMJ, issued in March.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

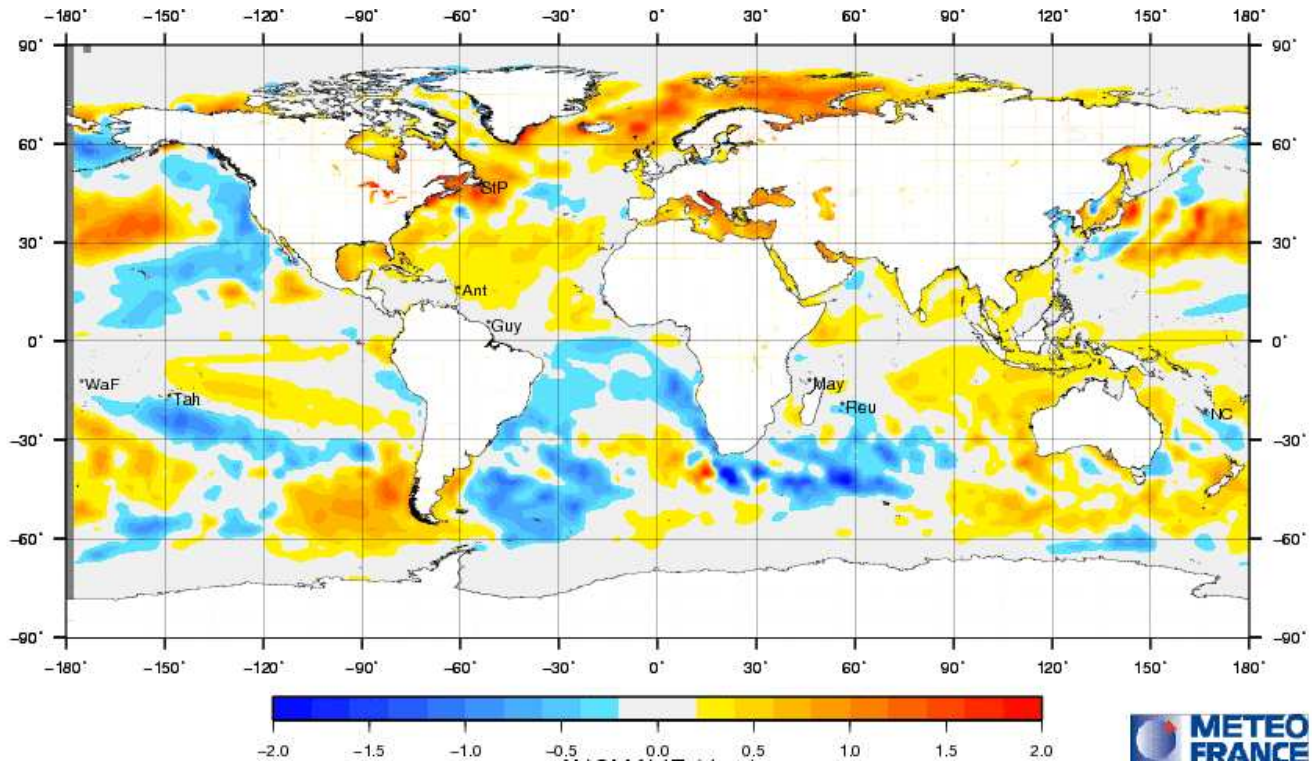


fig.13: SST Anomaly forecast (recalibrated with respect of observation) from Météo-France for AMJ, issued in March. http://elaboration.seasonal.meteo.fr/

For the 2 individual models :

At large scale there is some consistence over most of the Tropics and the mid-latitudes despite some sub-regional differences and some differences in the post-processing of the namolies (including reference period for the hindcast ; 81-2010 for ECMWF and 91-2010 for MF system 4). The main difference are in the Southern hemisphere.

Pacific : along the equator the conditions are close to normal everywhere to the exception of the most western part (West to the dateline). Some colder than normal conditions are still visible in the most Eastern Tropics (along the coast of Peru). In the Northern hemisphere very consistent forecasts with warmer than normal conditions in the Western and Central part and colder than normal conditions close to the Western coast of North American continent. Some differences in the sub-topics of the Southern hemisphere with colder than normal conditions in MF (Central and Eastern part) while the signal is very weak in ECMWF.

Atlantic : in both model consistency in Tropical and mid-latitudes of North Atlantic (mostly warmer than normal conditions) even if anomalies are not too strong. There is more differences in the Southern Hemisphere starting in the equatorial waveguide (neutral in ECMWF and contrasted signal in MF) and following in the Tropics (Colder than normal scenario in MF while there is only little cold signal in ECMWF).

Indian Ocean : mostly consistent from the Northern Indian Ocean up to 20°S. Weak signal in the equatorial waveguide. Then in the Southern Indian ocean some large differences over the central and Western part of the basin. Warm anomalies in both models close to Australia, extending westward in the Tropics.

In Euro-SIP :

Main patterns very similar to the one already presented on individual models in relationship with the consistency of forecasts of individual models at large scales.

Pacific : Equatorial waveguide : close to normal excepted West to the dateline. In the mid-latitudes of the Northern hemisphere dipole pattern Warmer/Colder than normal in the Western-Central/Eastern part of the basin. Mostly warmer than normal conditions in the Southern mid-latitudes.

Atlantic : Weak signal over the Tropics (both South and North). Some consistency over the mid and higher latitudes of the Northern and Southern Hemisphere.

Indian Ocean : weak signal over most of the basin to the exception of warmer than normal conditions close to Australia.

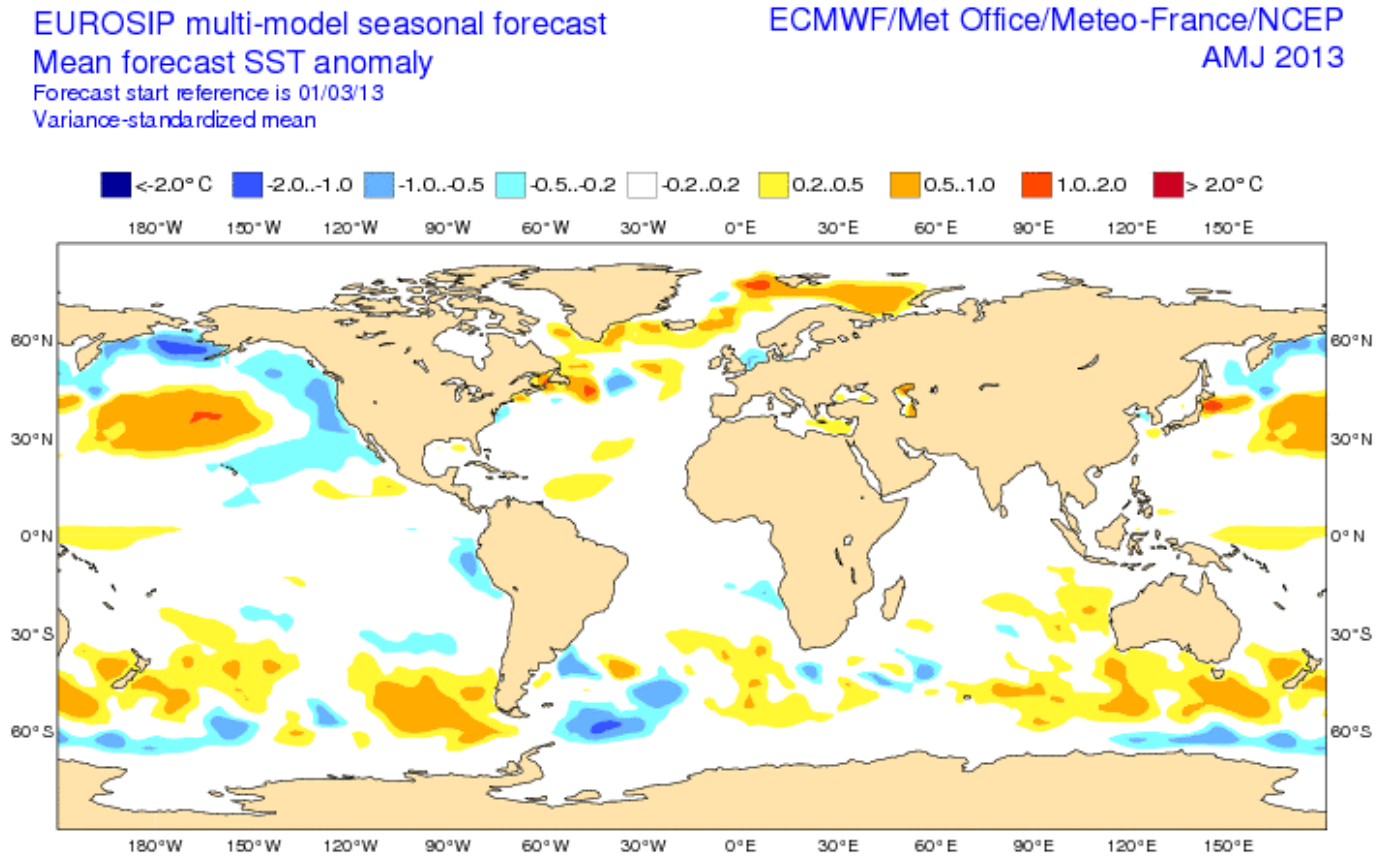


fig.14: SST Forecasted anomaly (in °C) from Euro-SIP valid for AMJ, issued in March.

II.1.b ENSO Forecast :

Forecasted Phase for AMJ : neutral

For AMJ : the majority of the models indicate a slightly cold central Pacific but still within the Neutral boundary condition. Note that because of the Spring predictability barrier, it's difficult to infer longer time evolutions.

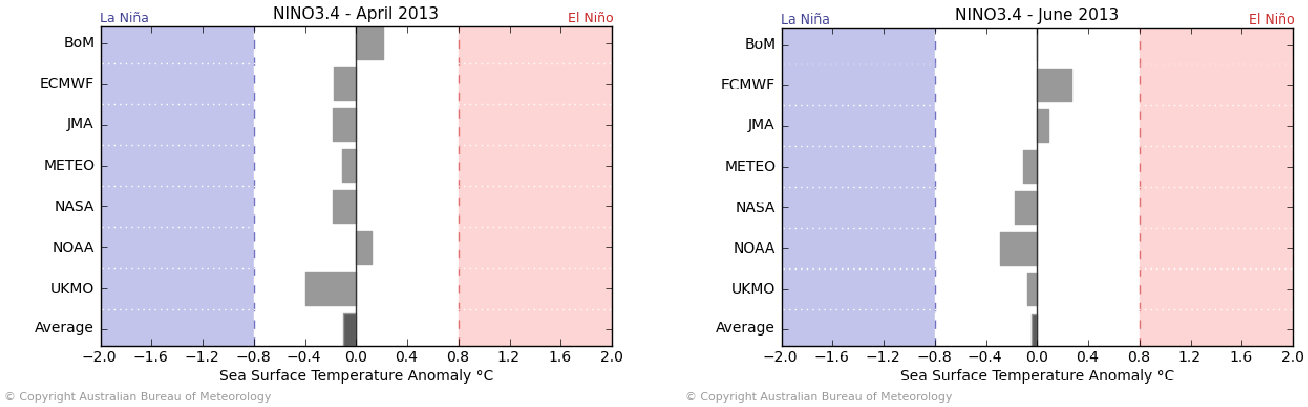


fig.15: Synthesis of Niño 3.4 forecasts (120° to 165°W) issued in March by BoM :
http://iri.columbia.edu/climate/ENSO/currentinfo/SST_table.html

Plumes from Météo-France and ECMWF for the 3 Niño boxes (see definition in Annex – fig. 16) :

In both models the ENSO thresholds are not reached on average for the AMJ period ; both models are indicating a progressive warming. One can notice that also in both models the spread dramatically increase from the Centre up to the East of the basin and in time (very likely in relationship with the Spring barrier of predictability and actual prevailing conditions).

NIÑO 4 NIÑO 3.4 NIÑO 3

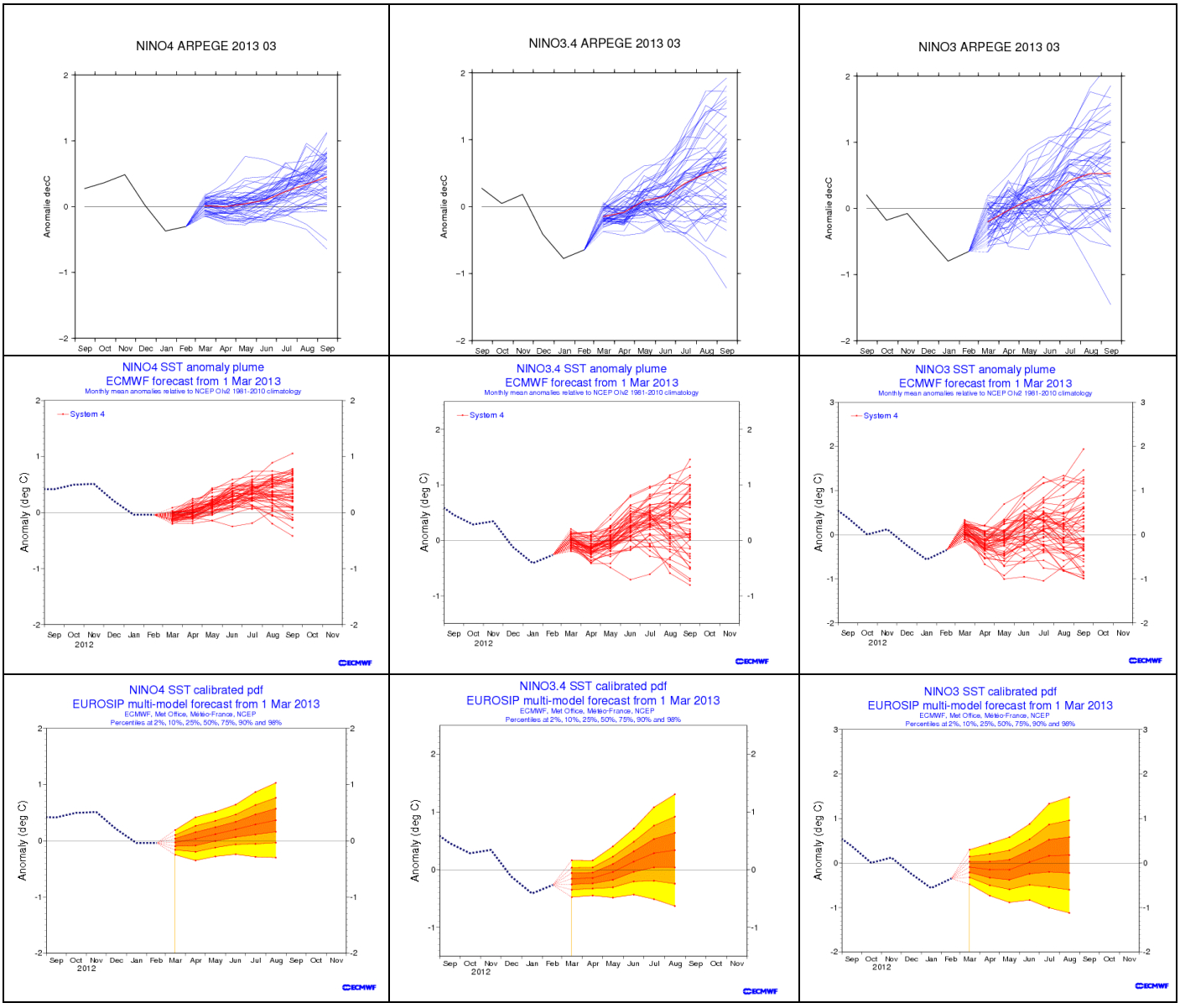


fig.16: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members - and EuroSIP (bottom) – recalibrated distributions - issued in March
(http://www.ecmwf.int/)

II.1.c Atlantic Ocean forecasts :

Forecasted Phase: slightly *warmer than normal in the Northern, slightly colder than normal in Southern Tropics*

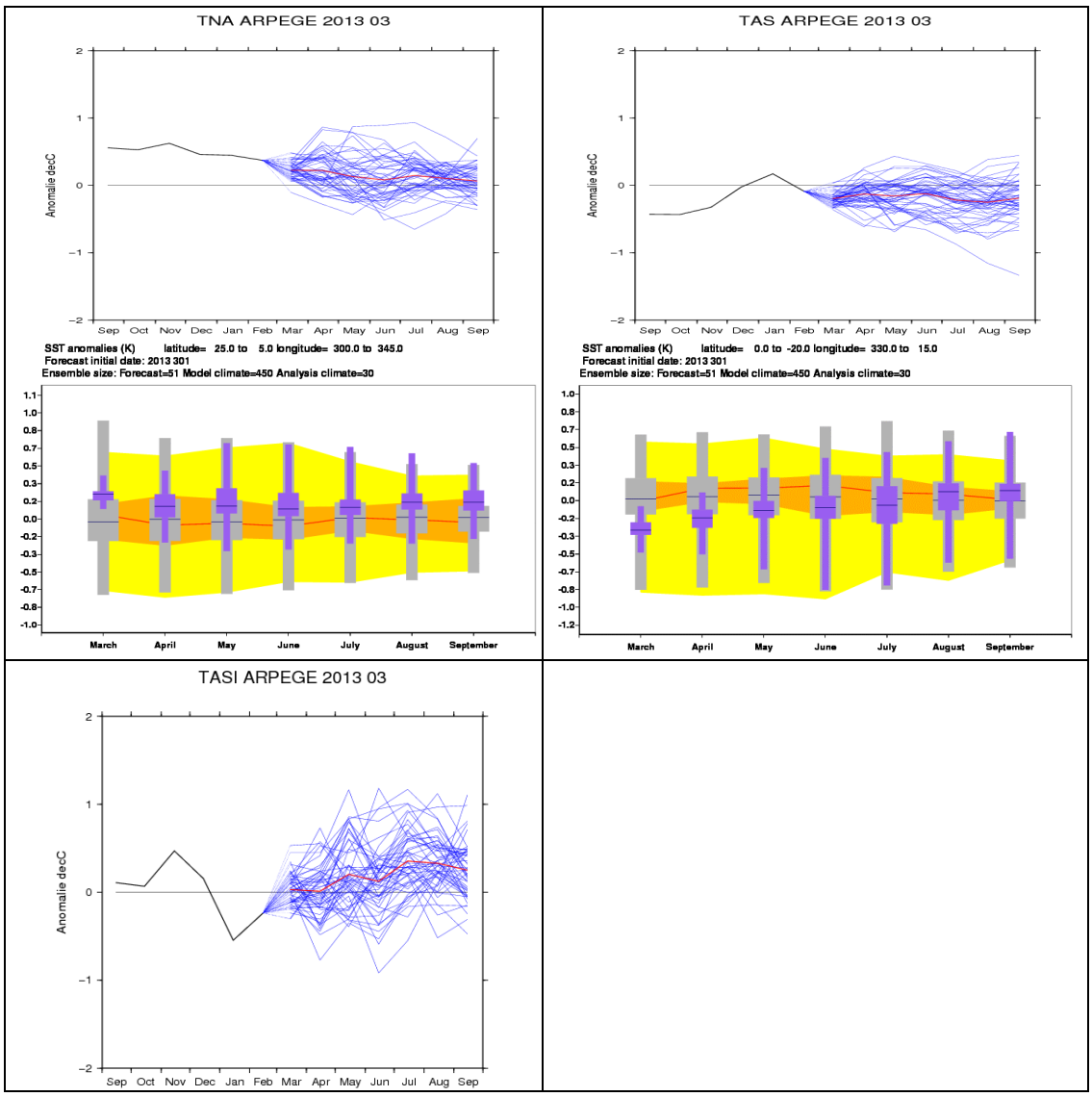
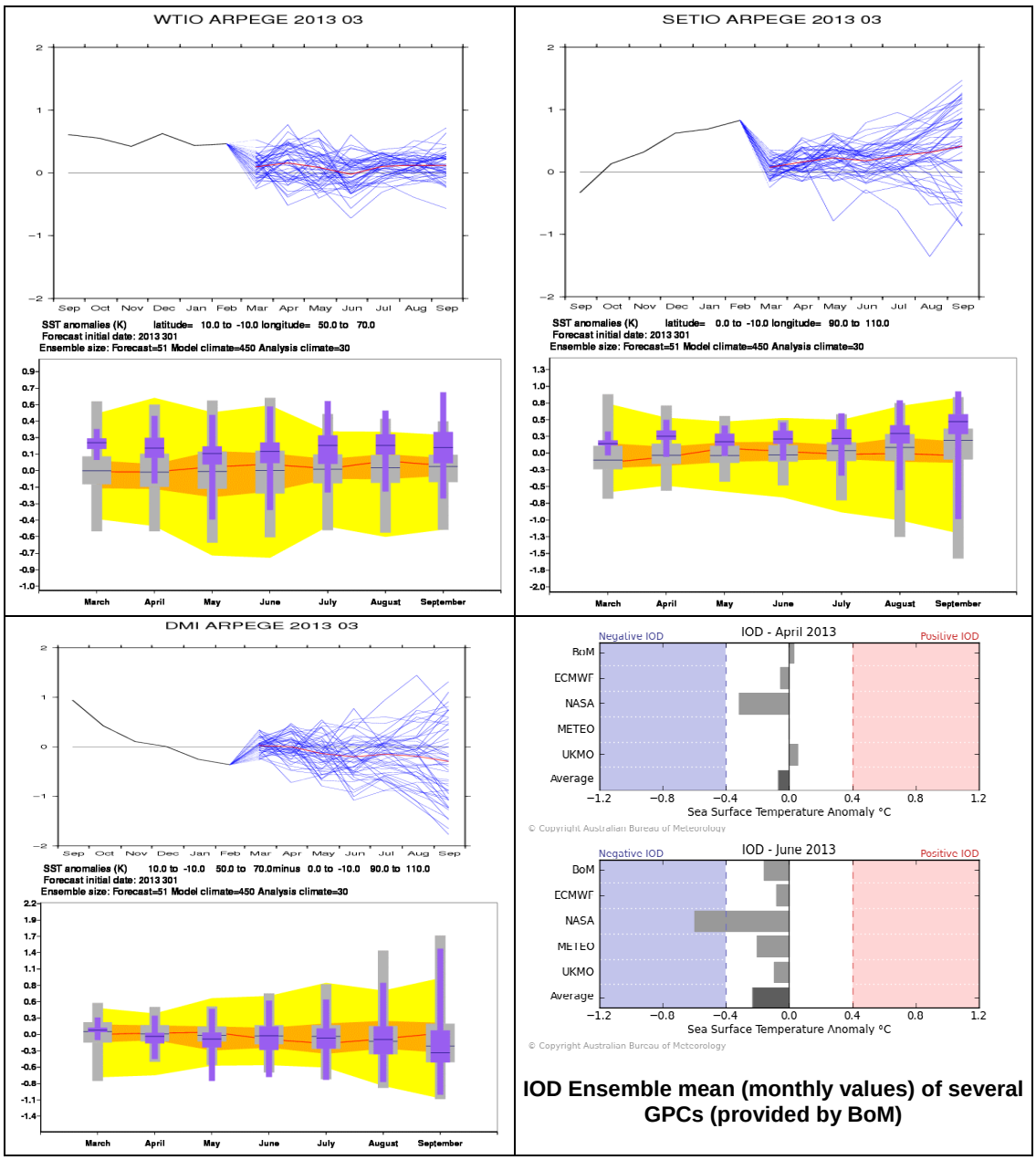


fig.17: SSTs anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, issued in March, plumes / climagrams correspond to 51 members and monthly means.

North Tropical Atlantic : slightly warmer than normal conditions in both models with a reasonable spread.
South Tropical Atlantic : in both models slightly colder than normal conditions.
The inter-hemispheric SST gradient should stay positive which is interesting to look at with respect of the monsoon onset in West Africa (possibly an early onset).
TASI : the TASI index is progressively becoming positive. And despite the large spread, there is a good consistency between the two models and this is consistent with the expected behaviour of the inter-hemispheric gradient.

II.1.d Indian Ocean forecasts :

Forecasted Phase: *IOD close to neutral (slightly negative)*



IOD Ensemble mean (monthly values) of several GPCs (provided by BoM)

fig.18: SSTs anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, issued in March, plumes / climagrams correspond to 41 / 51 members and monthly means.

In WTIO : Slightly warmer than normal conditions in both models with reasonable spread. However MF indicates a continuous decrease while ECMWF gives a stable signal.
In SETIO : Warmer than normal in MF and ECMWF likely consistently with the Western Pacific SSTs behaviour. Reasonable spread in both models.
DMI (IOD) : Close to normal conditions in both models becoming progressively negative (in relationship with SETIO evolutions).

II.2. GENERAL CIRCULATION FORECAST

II.2.a Global Forecast

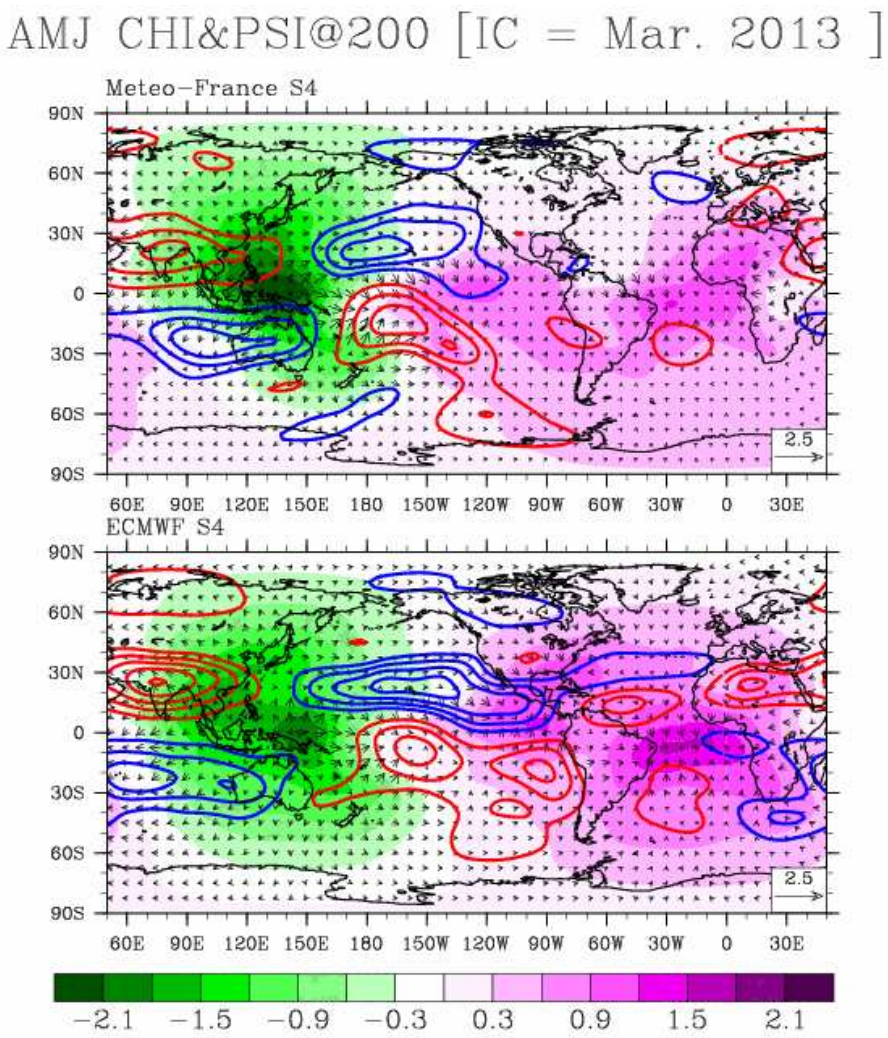


fig.19: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), associated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa for AMJ, issued in March by Météo-France (top) and ECMWF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

Velocity potential anomaly field (cf. fig. 19 – insight into Hadley-Walker circulation anomalies) :
in the Tropics : atmospheric response quite consistent but with some regional differences.
Over the Pacific : Good consistency between the 2 models on the Western part with negative anomaly over the maritime continent and the warm pool. Consequently Divergent circulation anomaly (upward motion) over the West Tropics extending both Northward and Southward along the Eastern coast of Asia and toward Australia (consistently with SSTs) and Convergent circulation anomaly (downward motion) in the Eastern Pacific ; the MF response being westward shifted with respect of ECMWF one.
Over Indian Ocean : very consistent signal in both models ; some enhanced Divergent circulation anomaly over Eastern Indian Ocean (in relationship with the West Pacific anomaly) counterbalanced in the South-Eastern part by a convergent circulation anomaly (downward anomaly motion – close to Madagascar and South Africa)
Over Atlantic : the models show consistency over South Atlantic ; especially a positive anomaly in the equatorial regions (just South to the equator – downward anomaly motion) despite it is stronger in ECMWF with respect of MF. There is more differences in the Northern Tropical Atlantic especially along the Eastern coast of the American North continent.

Stream Function anomaly field (cf. fig. 19 – insight into teleconnection patterns tropically forced) :
In both models, over the Pacific the atmospheric response is quite consistent in both models despite some amplitude difference (stronger response in ECMWF). However, there is no propagation of the signal toward mid-latitudes. Over the Atlantic the response of both models is weaker than over the Pacific and also with no signal conveyed toward the mid-latitudes. So as a conclusion the predictability is very limited over mid-latitudes regions everywhere and especially over Europe. This conclusion is very consistent also with the Spring barrier of predictability (considering the present forecast).

II.2.b North hemisphere forecast and Europe

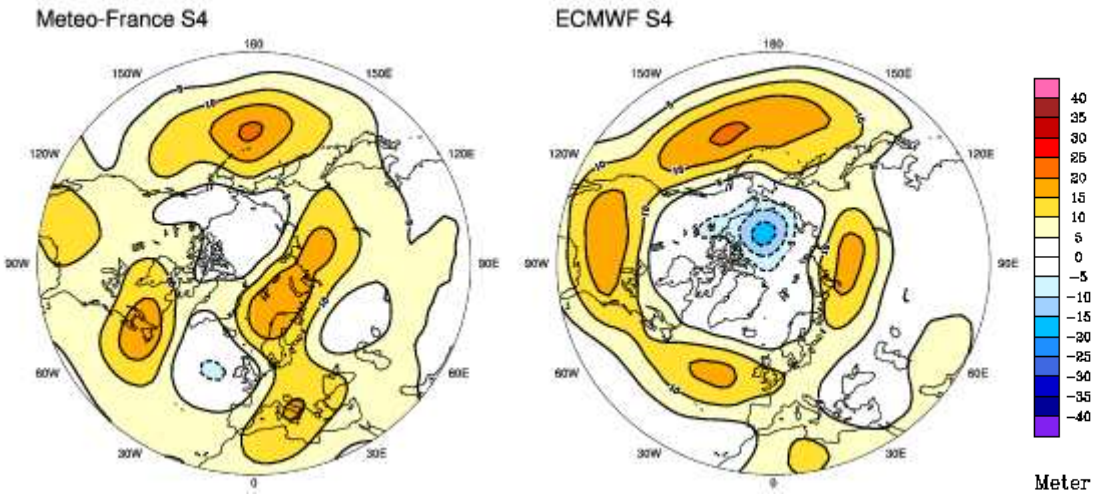


fig.20: Anomalies of Geopotential Height at 500 hPa for AMJ, issued in March from Météo-France (left) and ECMWF (right).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip

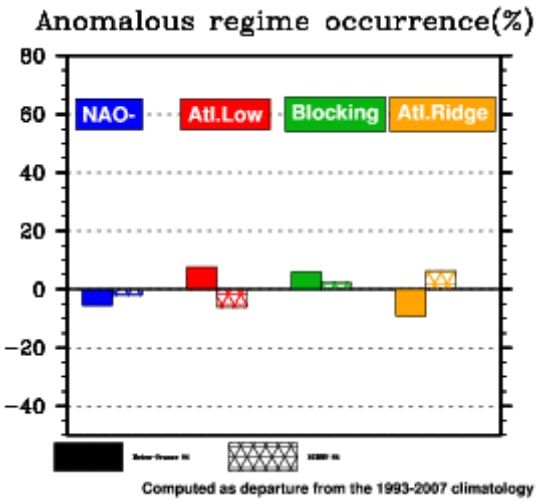


fig.21: North Atlantic Regime occurrence anomalies from Météo-France and ECMWF : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

Geopotential height anomalies (fig. 20 – insight into mid-latitude general circulation anomalies) :
As seen on the Stream Function anomalies, there is no clear signal conveyed from the tropics toward the mid-latitudes. So it's difficult to interprete these anomalies with respect of tropical forcing sources. The differences between the two models can likely be related to the model uncertainty.
North Atlantic Circulation Regimes (fig. 21) : As a consequence, there is only little signal in the circulation regimes forecasts. This is very consistent with the very limited predictability already pointed out.

General atmospheric circulation in MF in the low troposphere (see fig. 22) : the mid-latitude circulation in MF seems to be clearly related to the internal dynamic; So the zonal and meridionnal circulation over Europe don't show strong signal. In addition, due to the limited predictability, these patterns are not directly interpretable in term of teleconnection pattern.

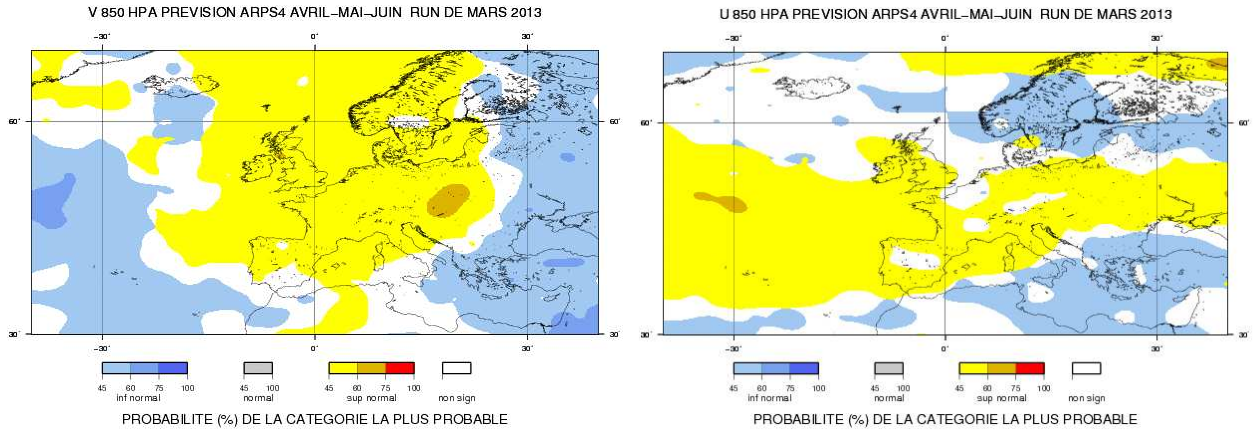


fig.22: Most likely category for the meridional (left) and zonal (right) wind at 850 hPa for AMJ, issued in March from Météo-France.

II.3. IMPACT : TEMPERATURE FORECASTS

II.3.a ECMWF

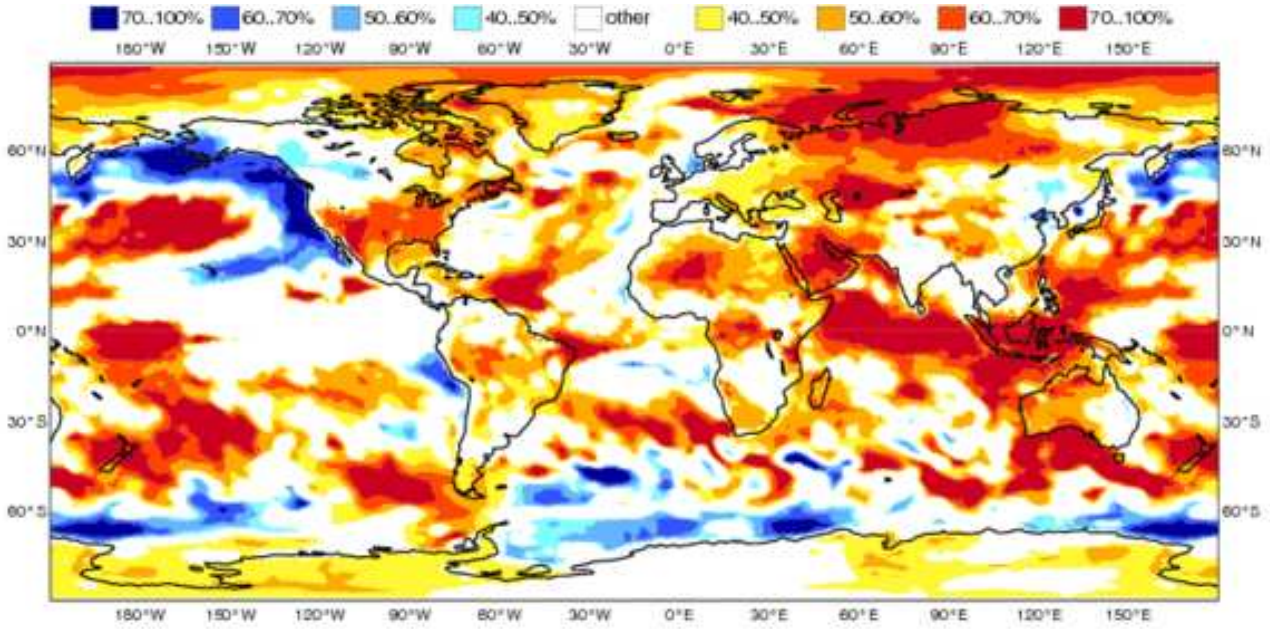


fig.23: Most likely category probability of T2m from ECMWF for AMJ, issued in March. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.3.b Météo-France

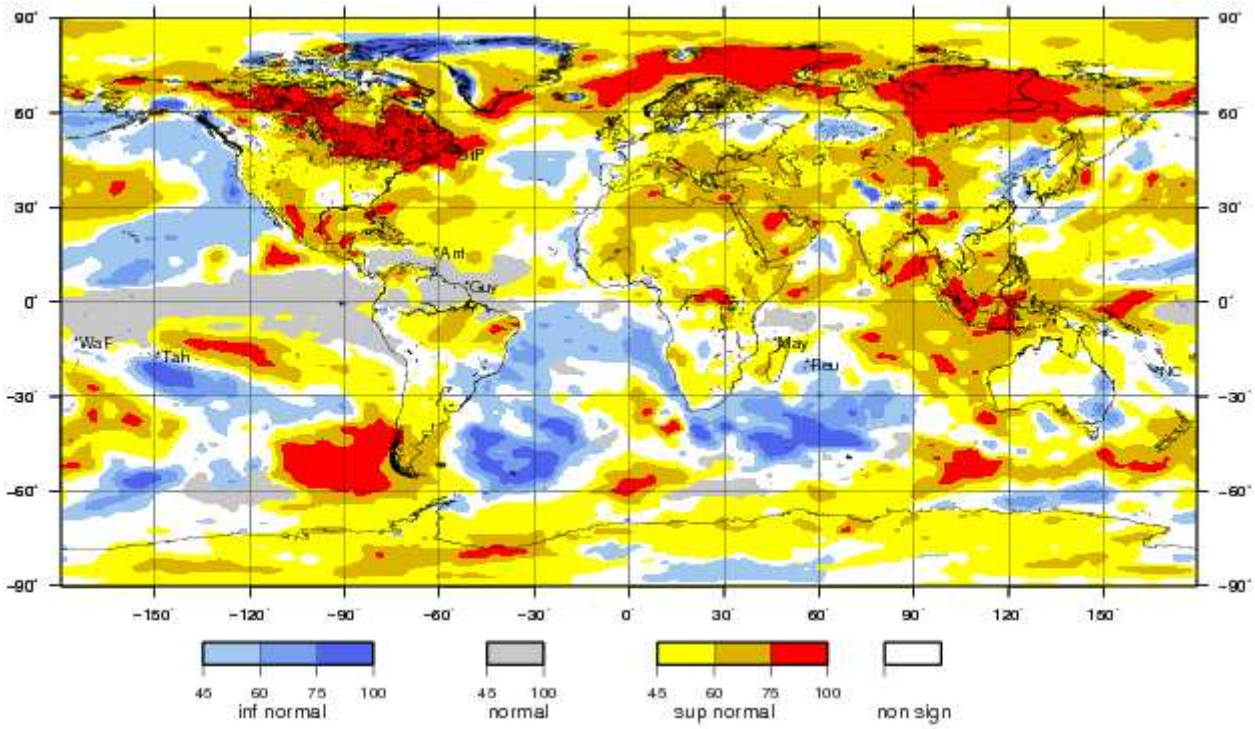


fig.24: Most likely category of T2m for AMJ, issued in March. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.3.c Met Office (UKMO)

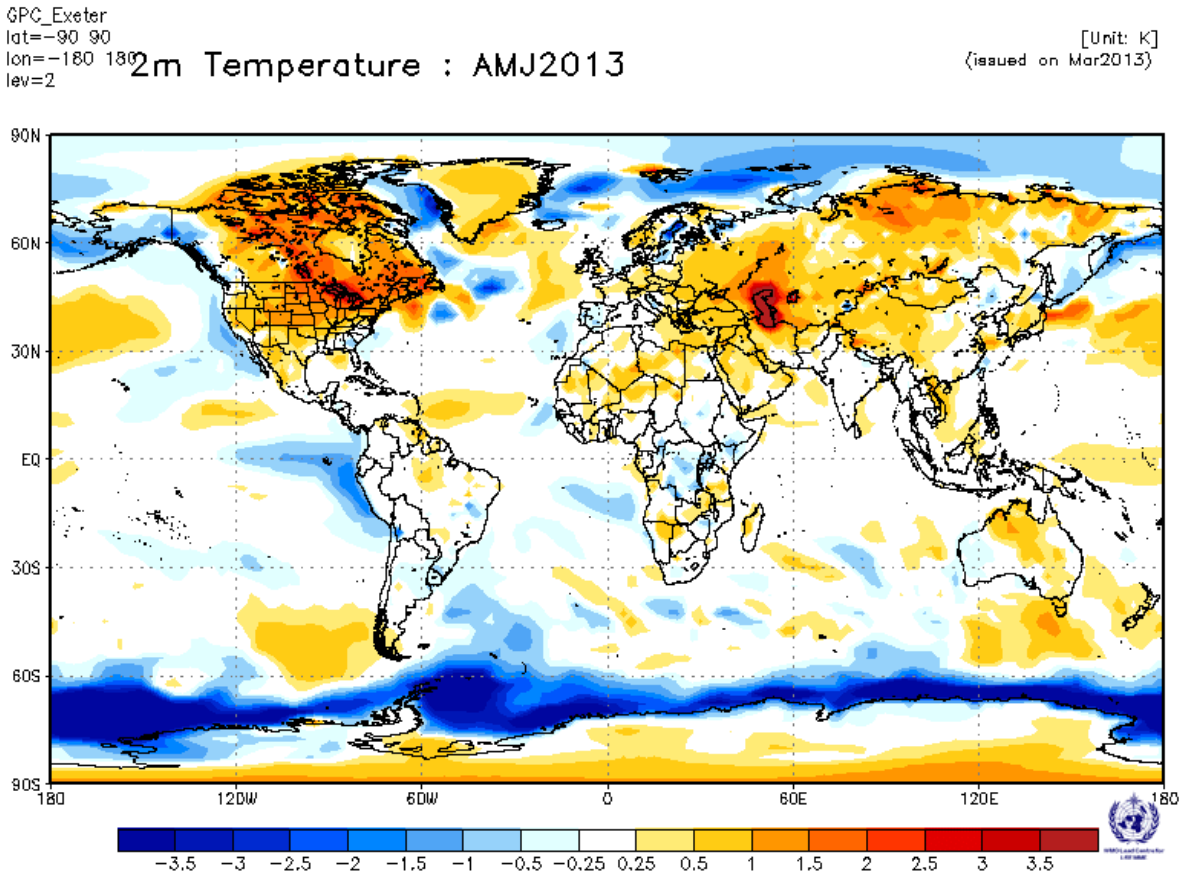


fig.25: T2m anomaly for AMJ, issued in March from UK Met Office. https://www.wmolc.org/

II.3.d Climate Prediction Centre (CPC)

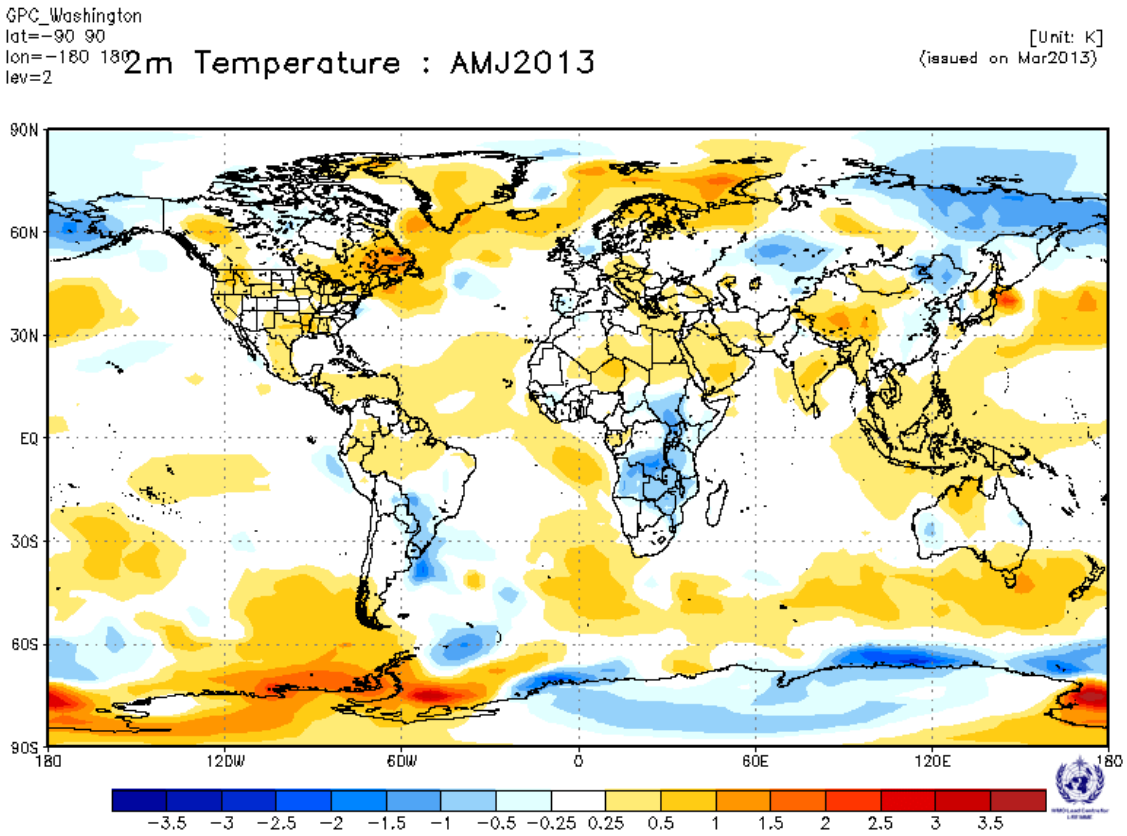


fig.26: T2m Anomaly for AMJ, issued in March from CPC. https://www.wmolc.org/

II.3.e Japan Meteorological Agency (JMA)

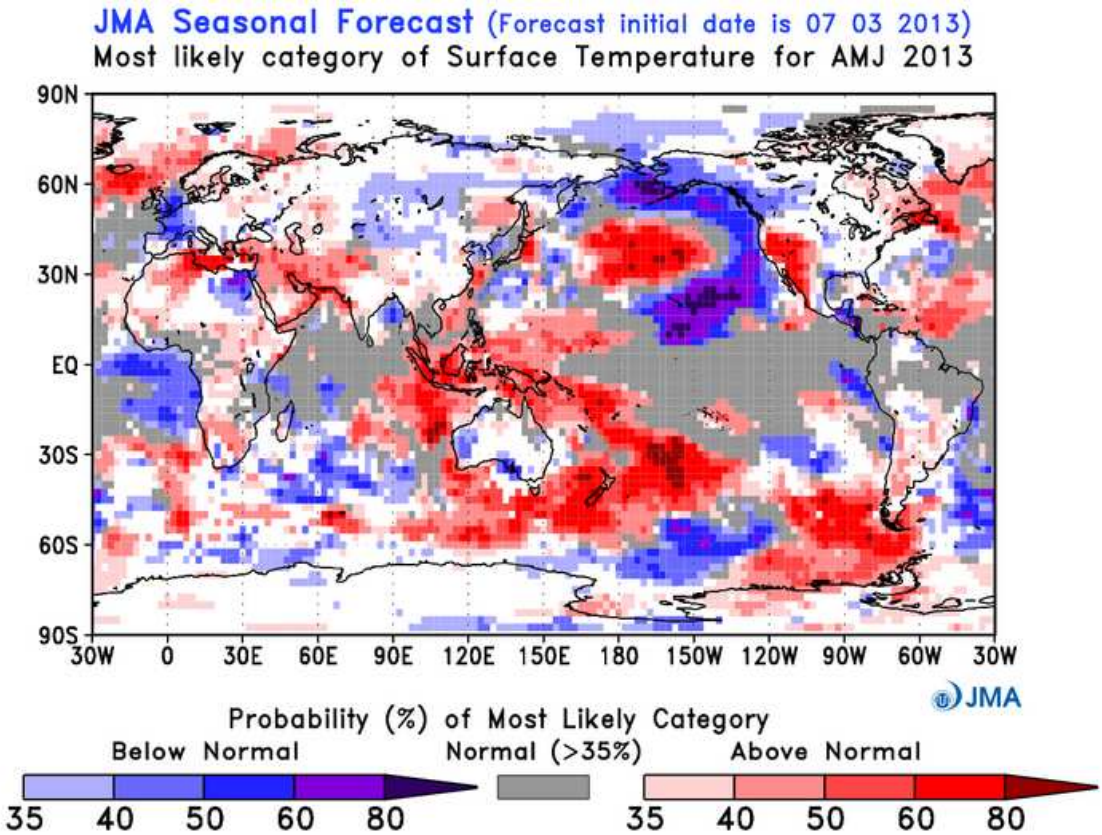


fig.27: Most likely category of T2m for AMJ, issued in March from MAM. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/

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

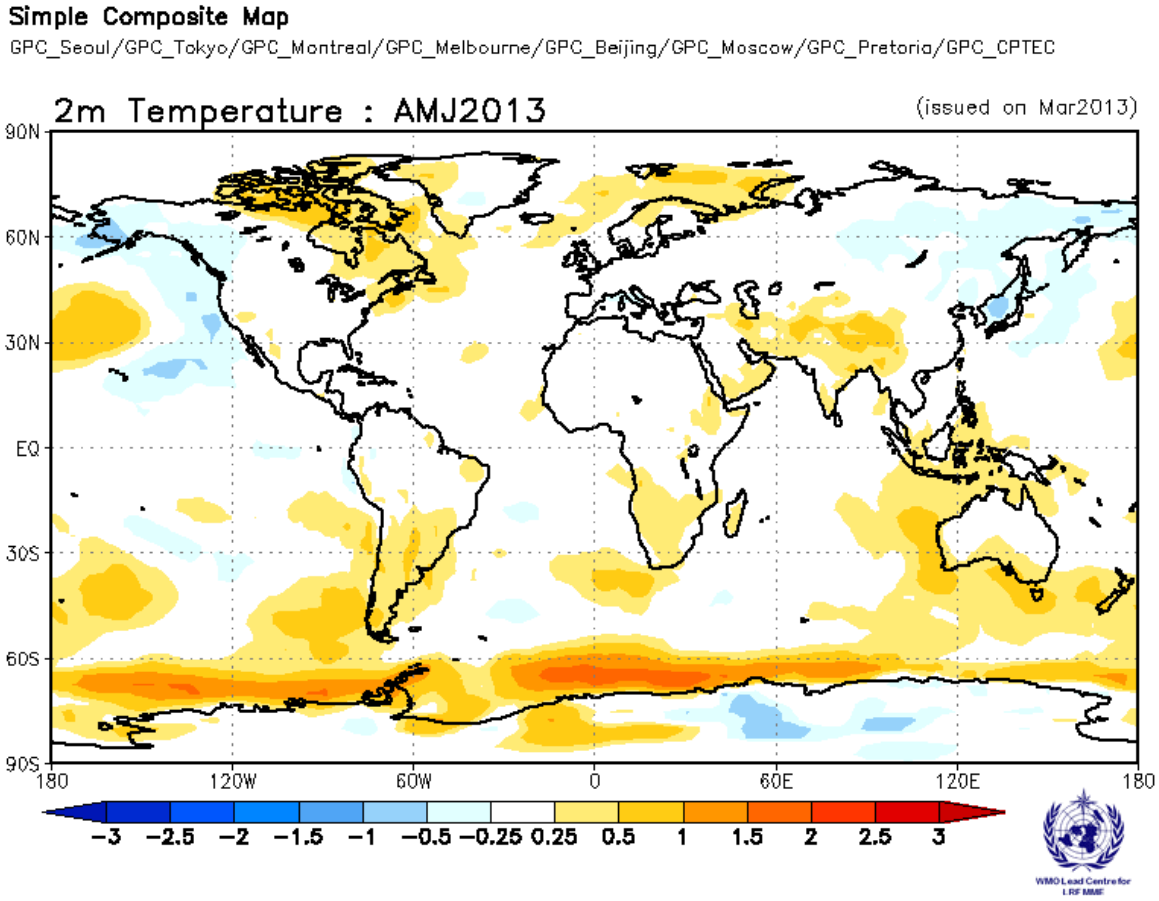


fig.28: T2m MME Anomaly for AMJ, issued in March from LC-MME. The MME composition corresponds to the GPCs not used in EuroSIP https://www.wmolc.org/

II.3.g Euro-SIP

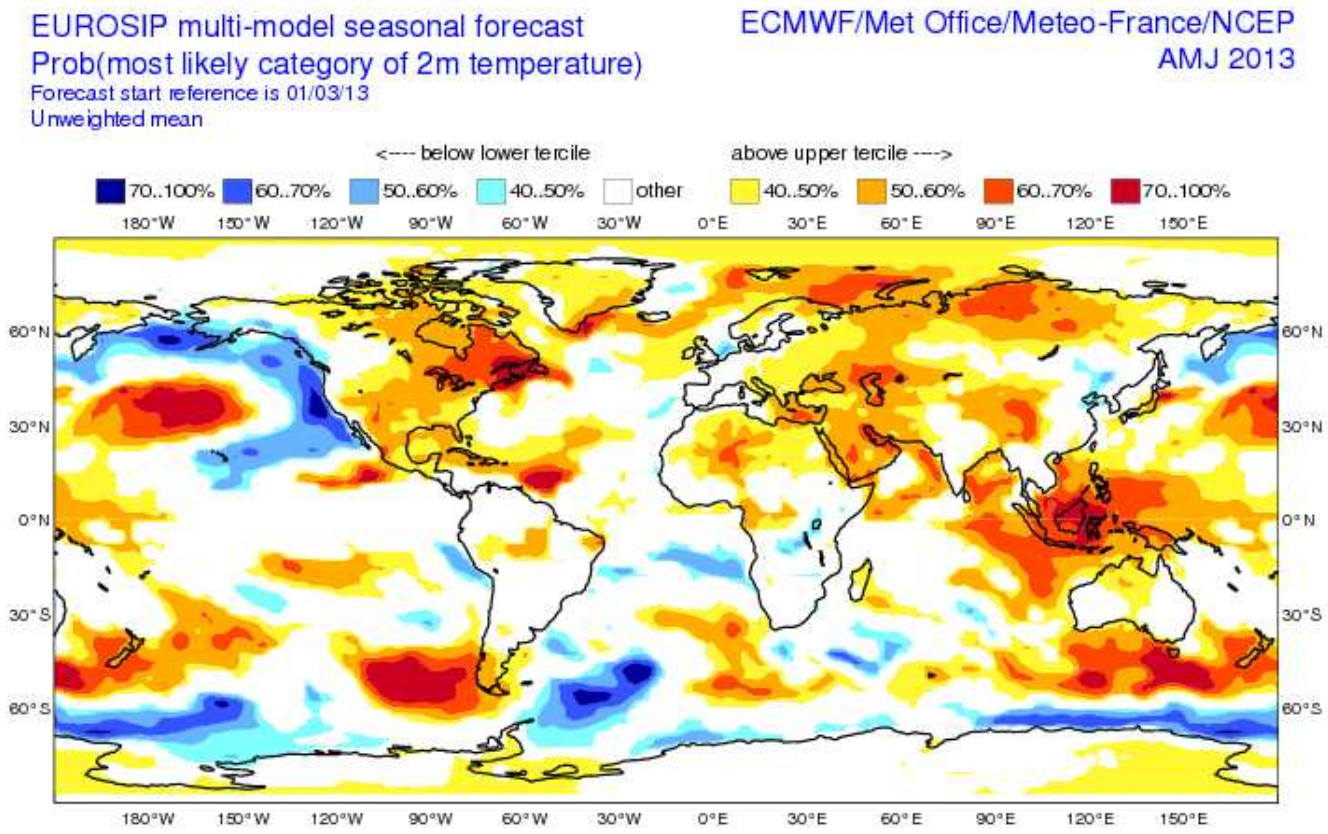


fig.29: Multi-Model Probabilistic forecasts for T2m from EuroSip for AMJ, issued in March. (2 Categories, Below and Above normal – White zones correspond to No signal and Normal).

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

North-America : Warmer than normal conditions around the Mexico Gulf up to the Hudson Bay (including a large portion of US). Colder than normal over the coastal areas of Alaska and West Canada.
South-America : No signal more or less everywhere.
Australia : Warmer than normal on the Northern coast.
Asia : Warmer than normal conditions over the maritime continent, India and adjacent regions up to the Arabic Peninsula and Siberia. Below normal conditions close to Korea.
Africa : Warmer than normal conditions over North African countries.
Europe : No signal over most of the western part of the continent. Warmer than normal scenario over Eastern and South-Eastern regions.
Take care that part of the signal could be related to the climate trend.

II.4. IMPACT : PRECIPITATION FORECAST

II.4.a ECMWF

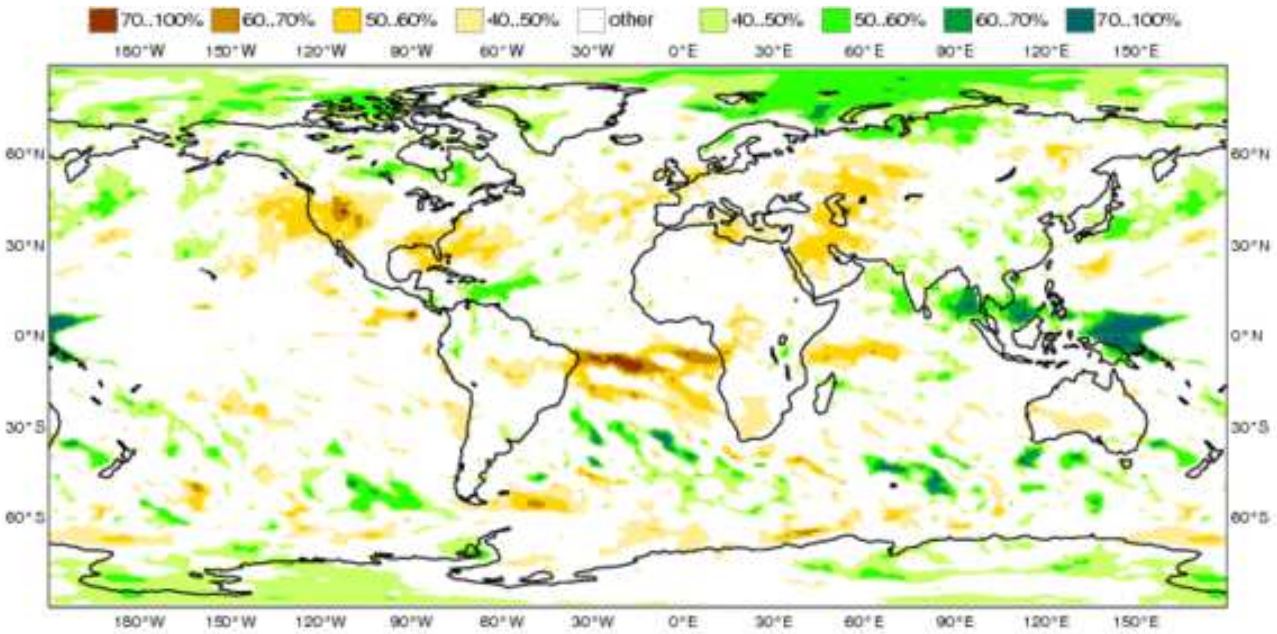


fig.30: Most likely category probability of rainfall from ECMWF for AMJ, issued in March. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/charts/seasonal_charts_s2/

II.4.b Météo-France

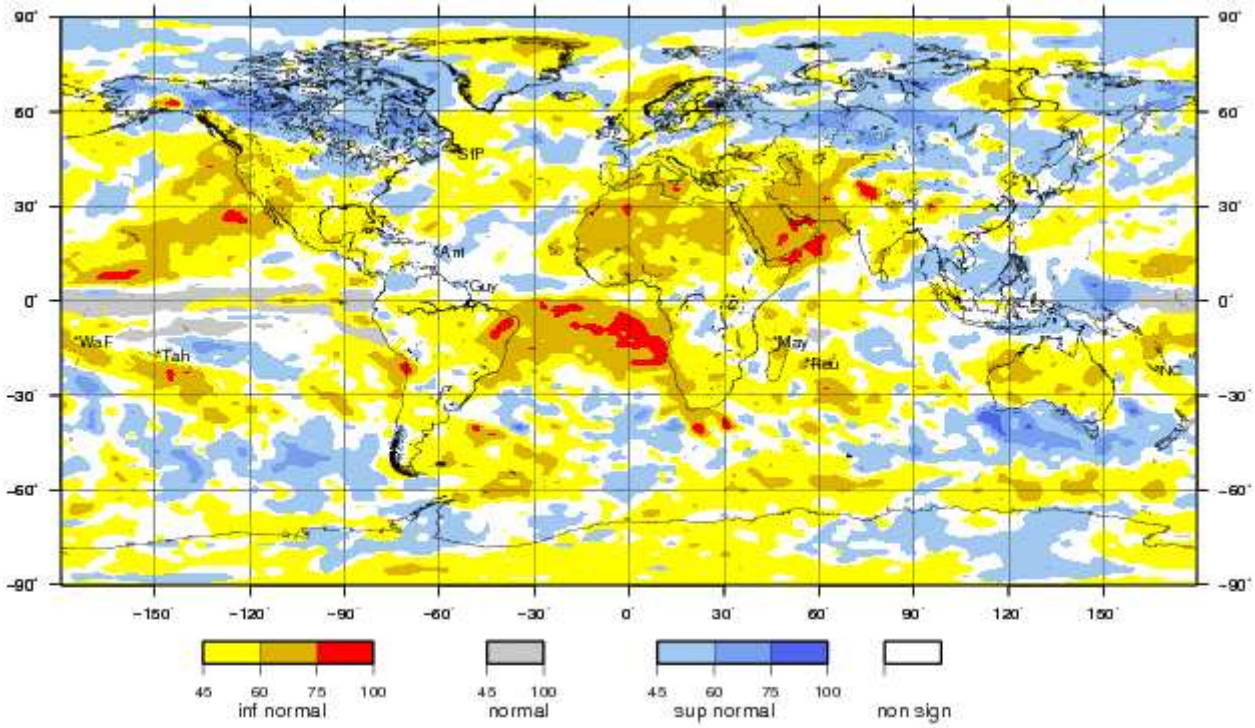


fig.31: Most likely category of Rainfall for AMJ, issued in March. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.4.c Met office (UKMO)

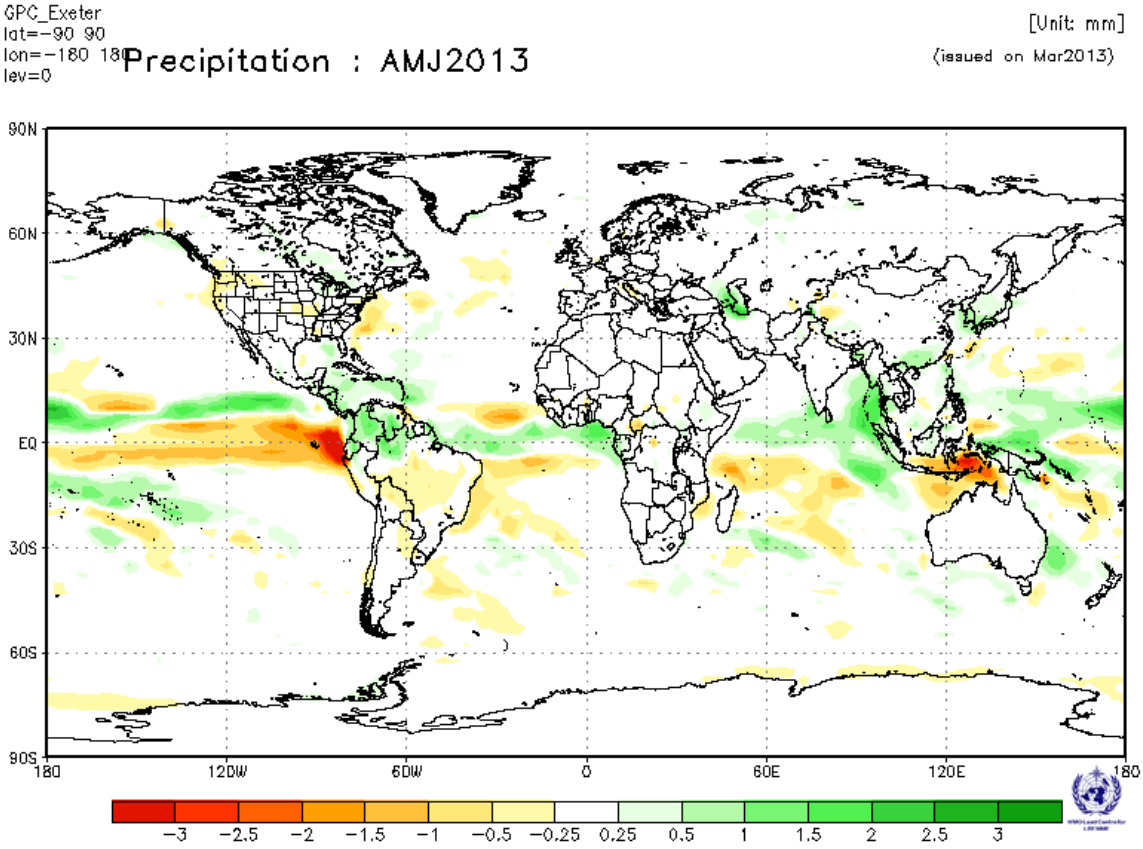


fig.32: Rainfall anomaly for AMJ, issued in March from UK Met Office. https://www.wmolc.org/

II.4.dClimate Prediction Centre (CPC)

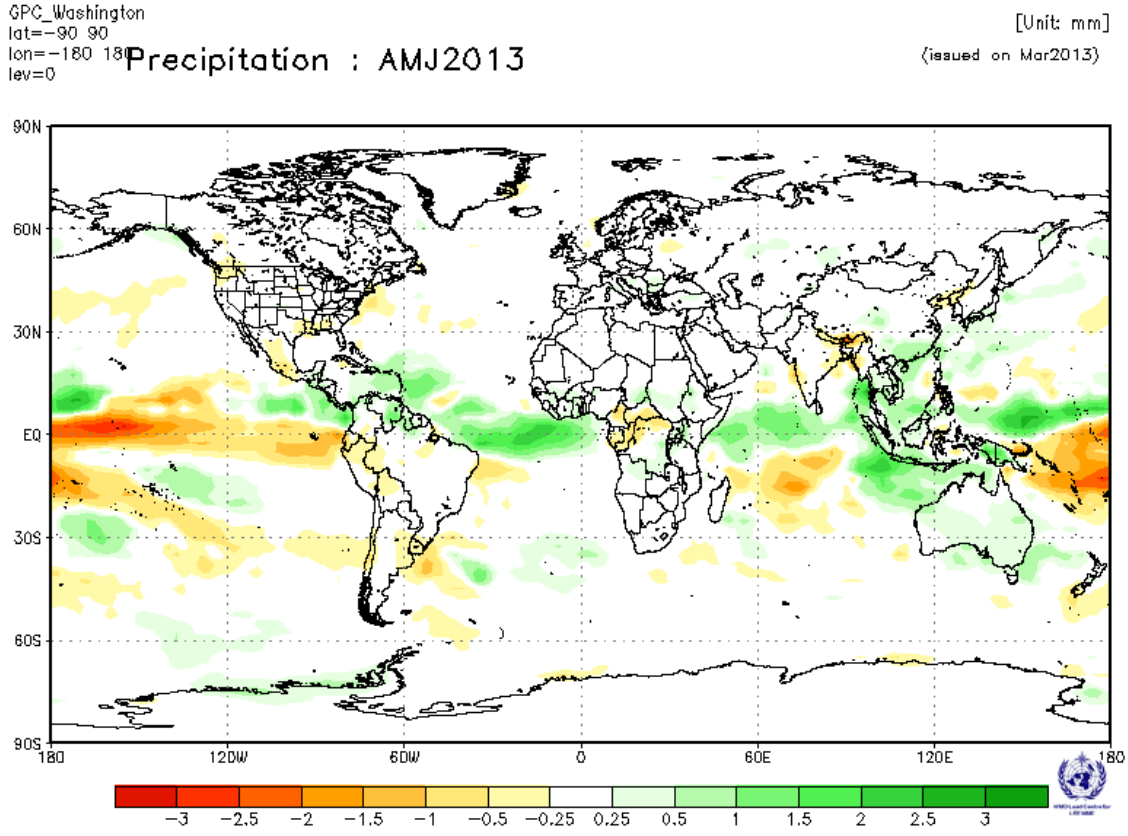


fig.33: Rainfall Anomaly for AMJ, issued in March from CPC. https://www.wmolc.org/

II.4.e Japan Meteorological Agency (JMA)

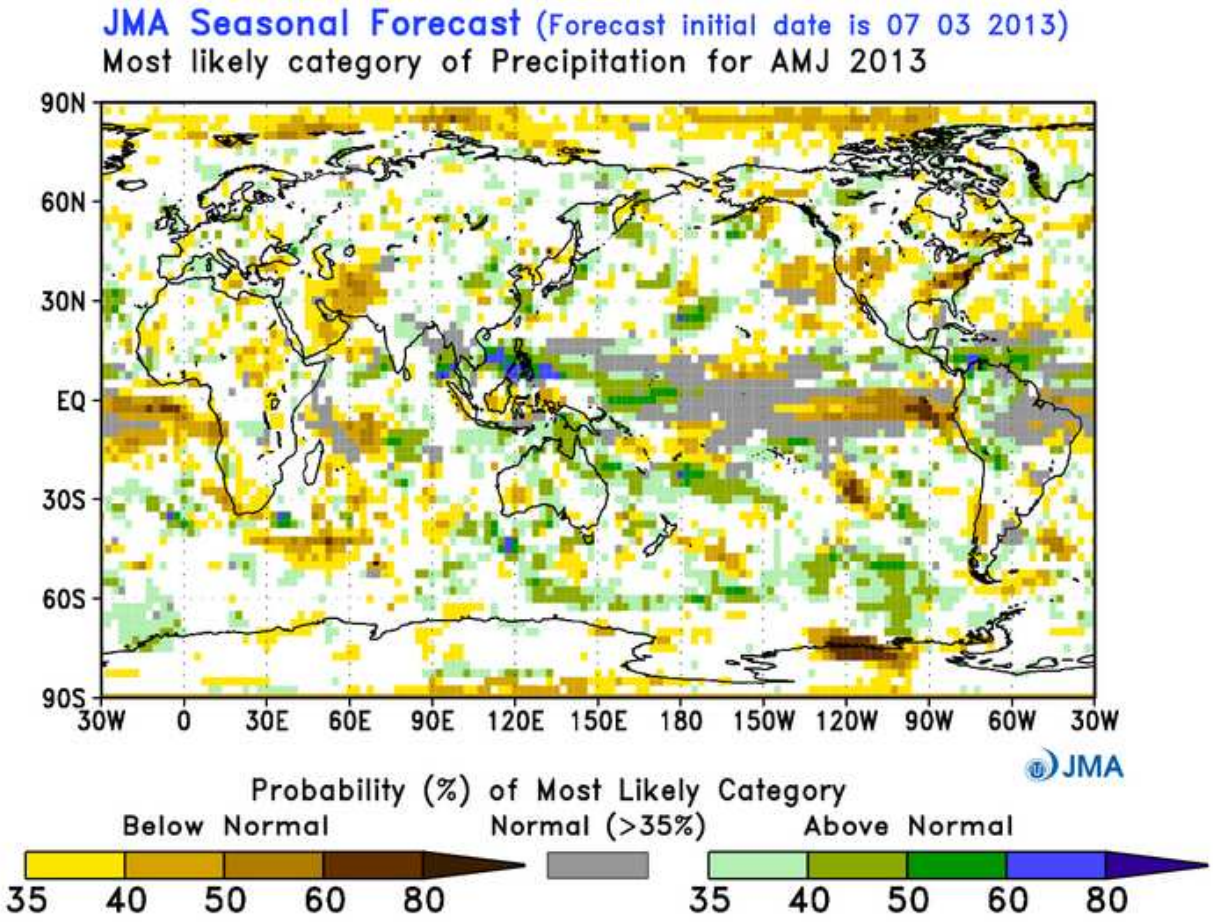


fig.34: Most likely category of Rainfall AMJ, issued in March from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/

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

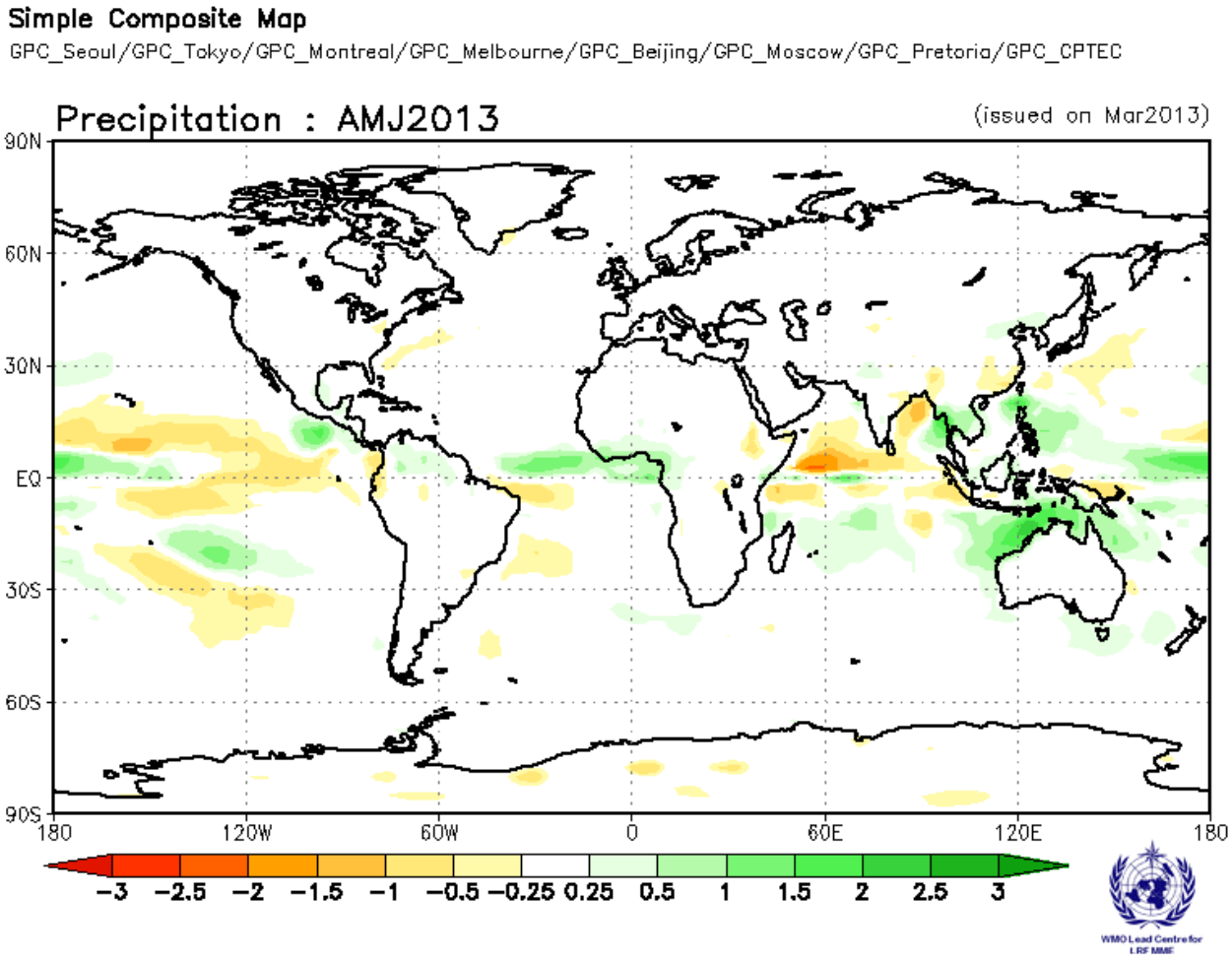


fig.35: Rainfall MME anomaly for AMJ, issued in March from LC-MME. The MME composition corresponds to the GPCs not used in EuroSIP. https://www.wmolc.org/

II.4.g Euro-SIP

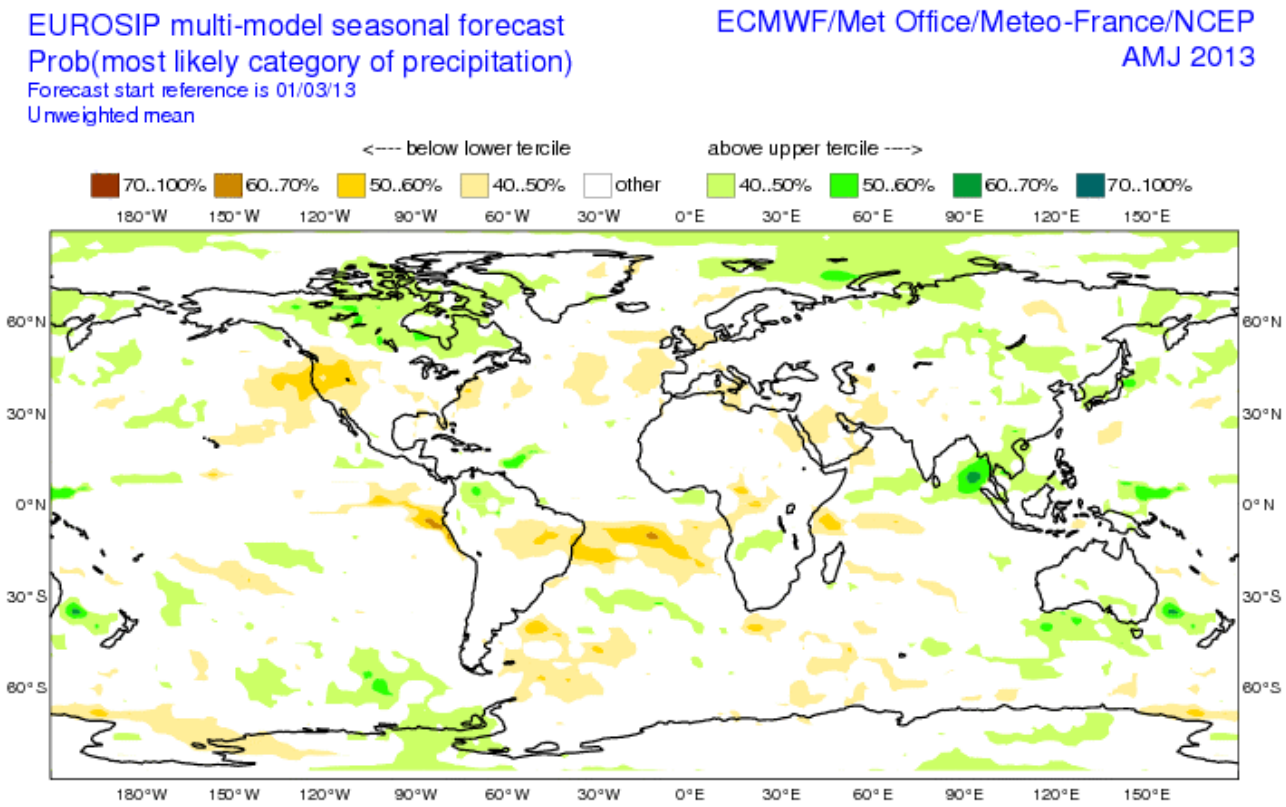


fig.36: Multi-Model Probabilistic forecasts for precipitation from EuroSip for AMJ, issued in March. (2 Categories, Below and Above normal – White zones correspond to No signal).

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

Some consistent signal in the Tropics and especially around the Pacific ; wet scenarios over the maritime continent/South-East Asia and SPCZ region, equatorial Atlantic and dry scenarios over the Western and Eastern coast of US.

For Europe No signal everywhere and more generally for the mid latitude of Northern Hemisphere to the exception, for Canada, of the region North to the Great Lakes.

II.5. REGIONAL TEMPERATURES

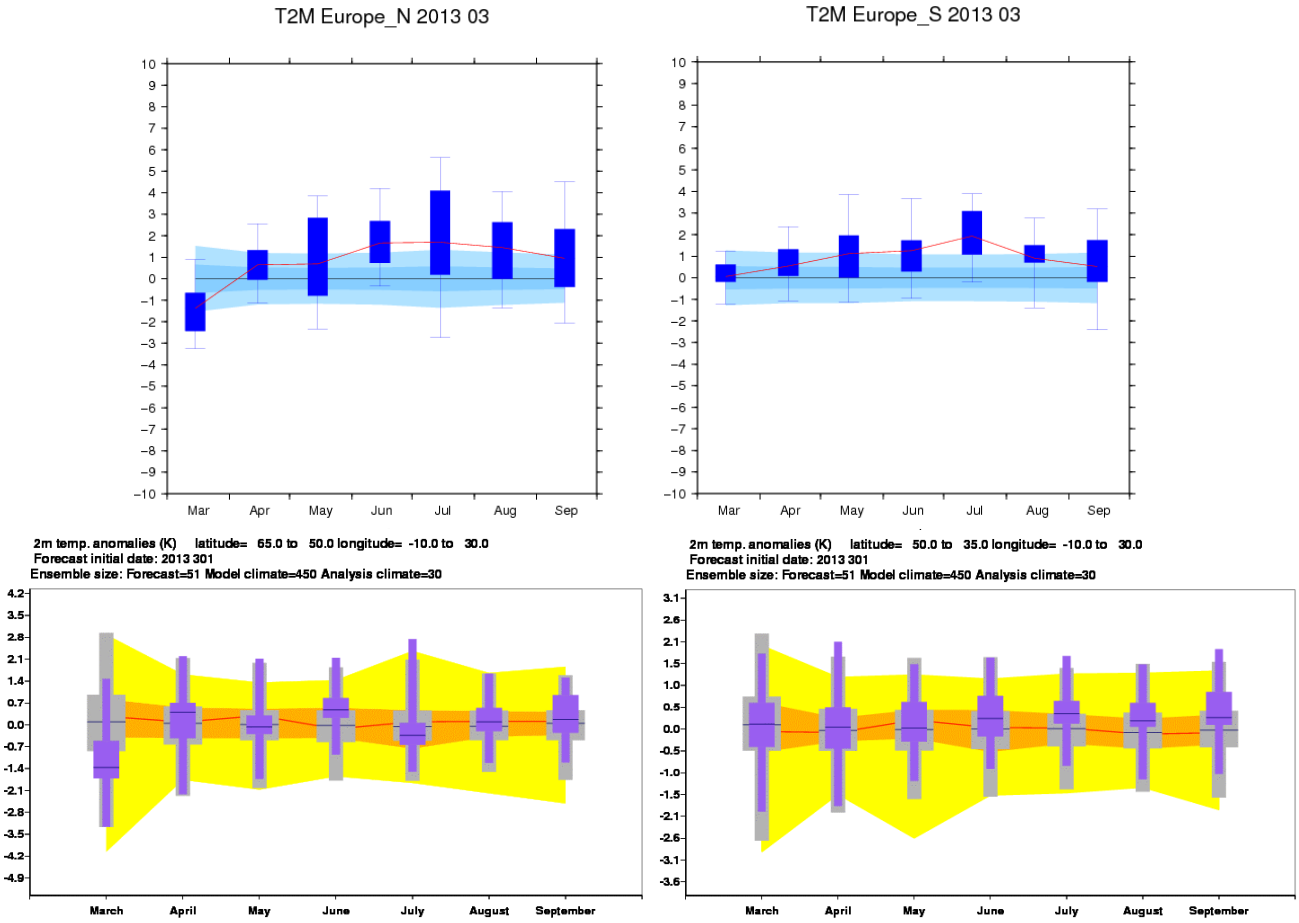


fig.37: Climagrams for T2m in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom) issued in March.

For both Northern and Southern Europe : little consistency between the 2 models (in relationship with the Z500 differences, North Atlantic circulation regimes and poor predictability) and large spread (with respect of the climate reference).
Take care that due to the system change (from system 3 to system 4) the verification scores are not available yet.

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

REGIONAL PRECIPITATIONS

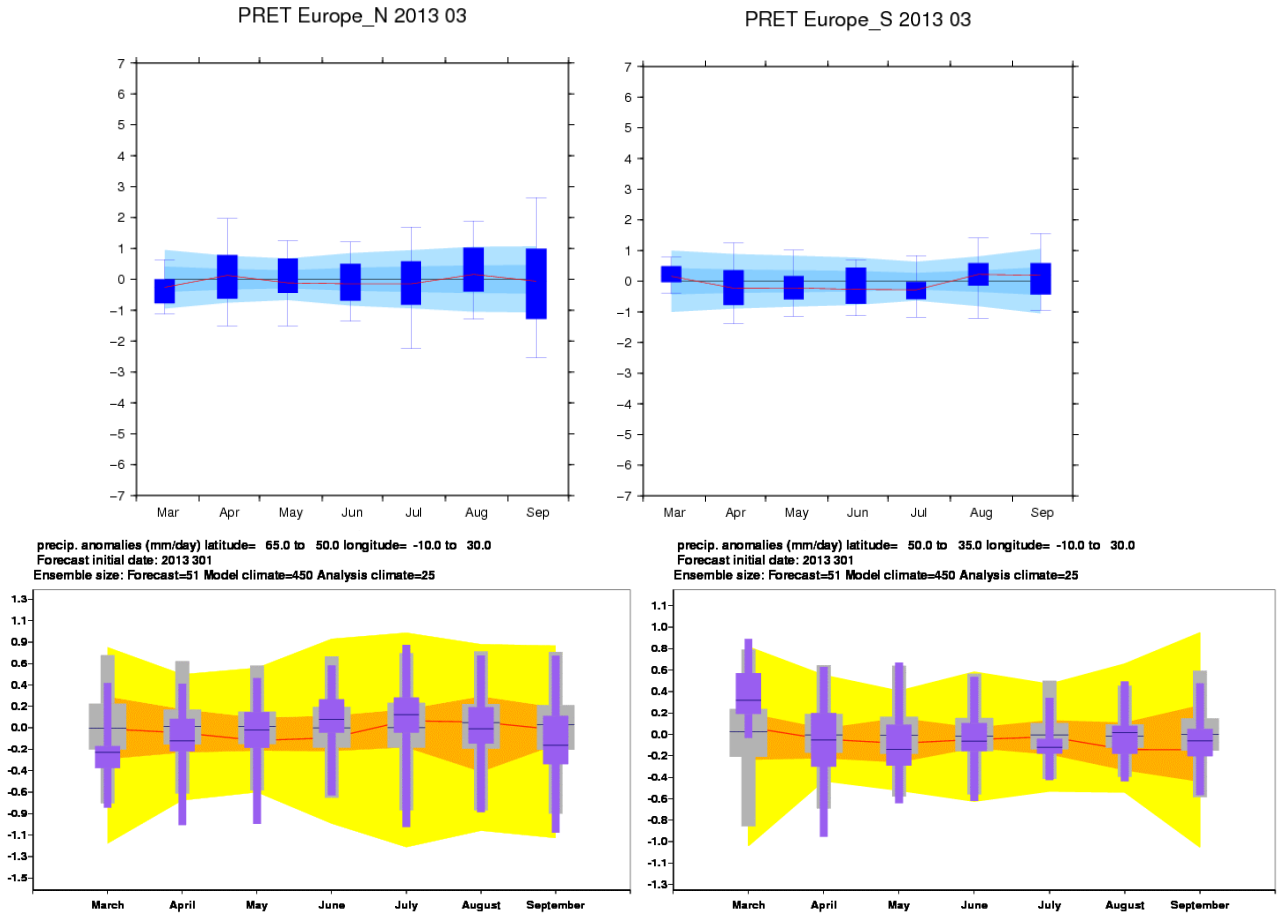


fig.38: Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom), issued in March.

For Northern Europe : Large spread in the evolution of the 2 models and conditions close to Climatology in MF and slightly above normal in ECMWF.
For Southern Europe : some similarity in the time evolution of the 2 models. The spread is larger than the climate reference. Signal close to climatology in ECMWF and slightly below normal in MF.
Adding the low predictability consideration, these intraseasonal evolutions should be considered as indicating No Signal.
Take care that due to the system change (from system 3 to system 4) the verification scores are not available yet.

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

II.6. MODEL'S CONSISTENCY

II.6.a GPCs consistency maps

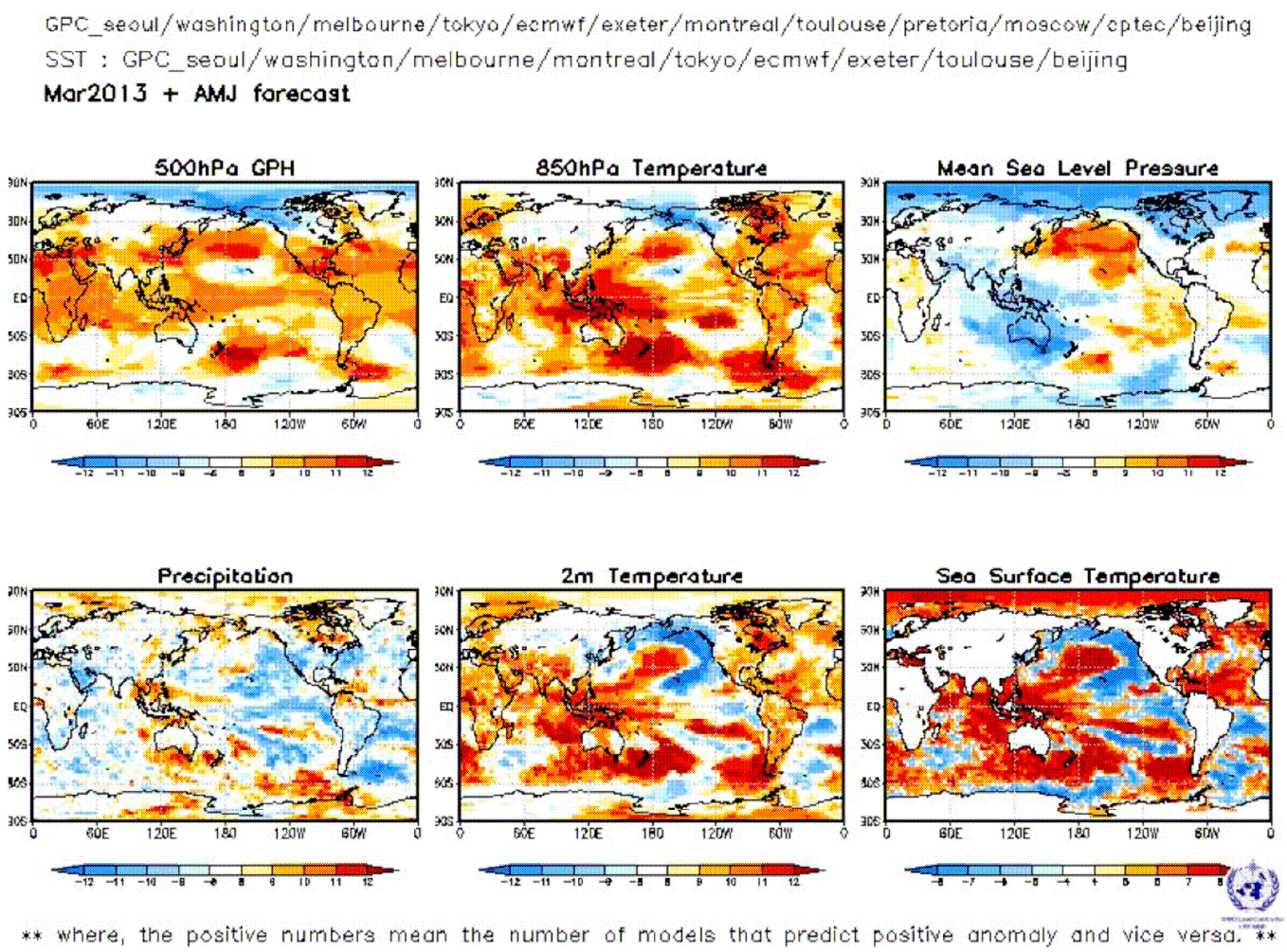


fig.39: ***GPCs Consistency maps from LC-MME*** *http://www.wmolc.org/*

For SST : Quite large consistency over the Pacific and the Atlantic and the Eastern and Northern Indian Ocean ; Less consistency on the South-West Indian Ocean.
For Z500 : Across the Atlantic sector poor consistency in the mid-latitudes and better consistency (Above normal conditions) in the Tropics.
For T2m : Consistent signal over a large portion of South America, Eastern US and Canada and West Canada, part of the African continent, regions in the vicinity of India and the maritime continent. For Europe, there is some consistent signal around the Eastern part of the Mediterranean basin up to Norway.
For precipitation : some robust signal ; Dry scenario over the Eastern and Western US, Arabic Peninsula, East of South America (especially Brasil), and possibly iver South-Africa. Wet scenario over North Canada, North of South America (and part of the Caribbean) and close to the maritime continent.

II.7. "EXTREME" SCENARIOS

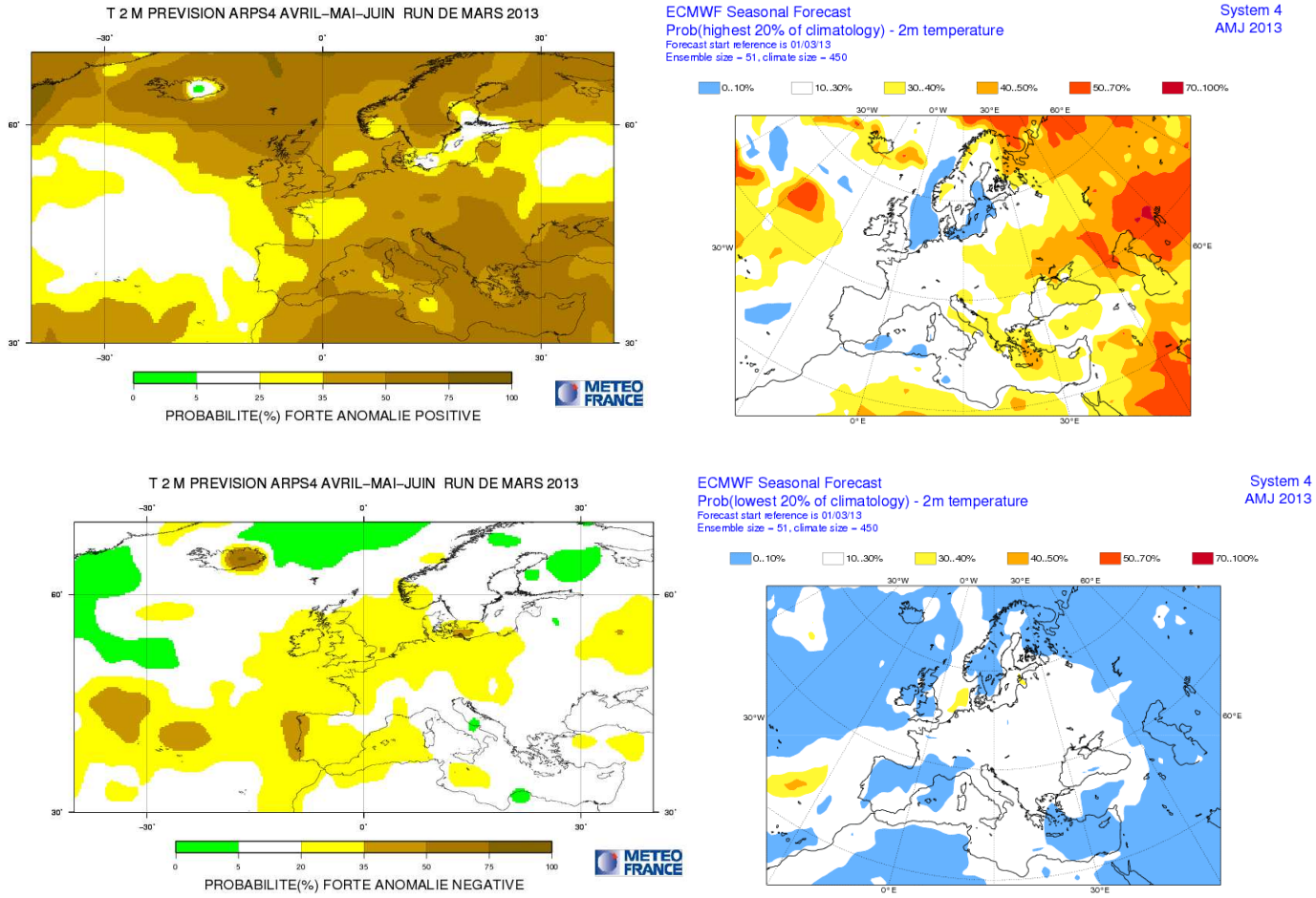


fig.40: Top : Probability of « extreme » above normal conditions for T2m for Meteo-France (left - highest ~15% of the distribution) and ECMWF (right - highest 20% of the distribution).
Bottom : Probability of « extreme » Below normal conditions for rainfall for Meteo-France (left - lowest ~15% of the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

No consistency between the 2 models for the Very Above Normal scenario to the exception of the most Eastern regions of Europe where there is some enhanced probabilities for Very Above temperatures.
No signal for very Below Normal scenario.
So in relationship with the current predictability and the model uncertainties, it seems difficult to use these forecast.
Take care that due to the system change (from system 3 to system 4) the verification scores are not available yet.

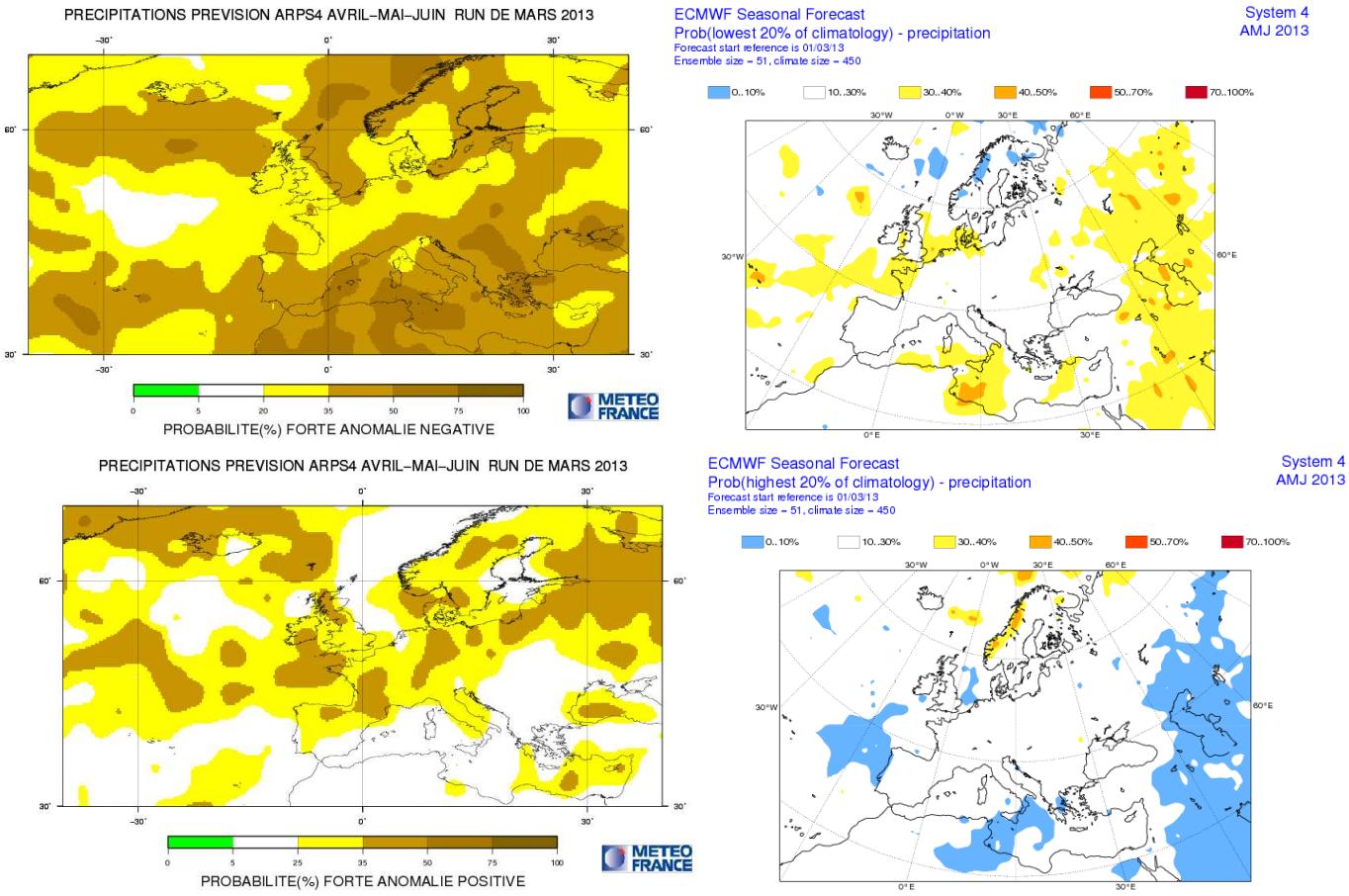


fig.41: Top : Probability of « extreme » Below normal conditions for rainfall for Meteo-France (left - lowest ~15% of the distribution) and ECMWF (right - lowest 20% of the distribution)
Bottom : Probability of « extreme » Above normal conditions for rainfall for Meteo-France (left - highest ~15% of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

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

II.8. DISCUSSION AND SUMMARY

Forecast over Europe

For this forecast the first and main comment is about the predictability in the climate system. The oceanic forcing is low more or less everywhere (excepted in the vicinity of the Maritime continent) and no teleconnection patterns seem to be present in the forecasts. As a consequence for Europe the predictability is very limited at seasonal scales.
So in such a context, the EuroSIP forecasts are likely a good synthesis of possible scenarios across the planet and more specifically over European regions.
For rainfall, “No Privileged Scenario” covers most of the European continent.
For temperature : the Above Normal scenario could prevail for Central (only slightly enhanced probability), East Europe and the Eastern part of the Mediterranean basin. There is more uncertainty over the western façade of Europe (No privileged scenario).
However, some downscaled information could details these scenarios for specific countries or sub-regions.

Tropical Cyclone activity

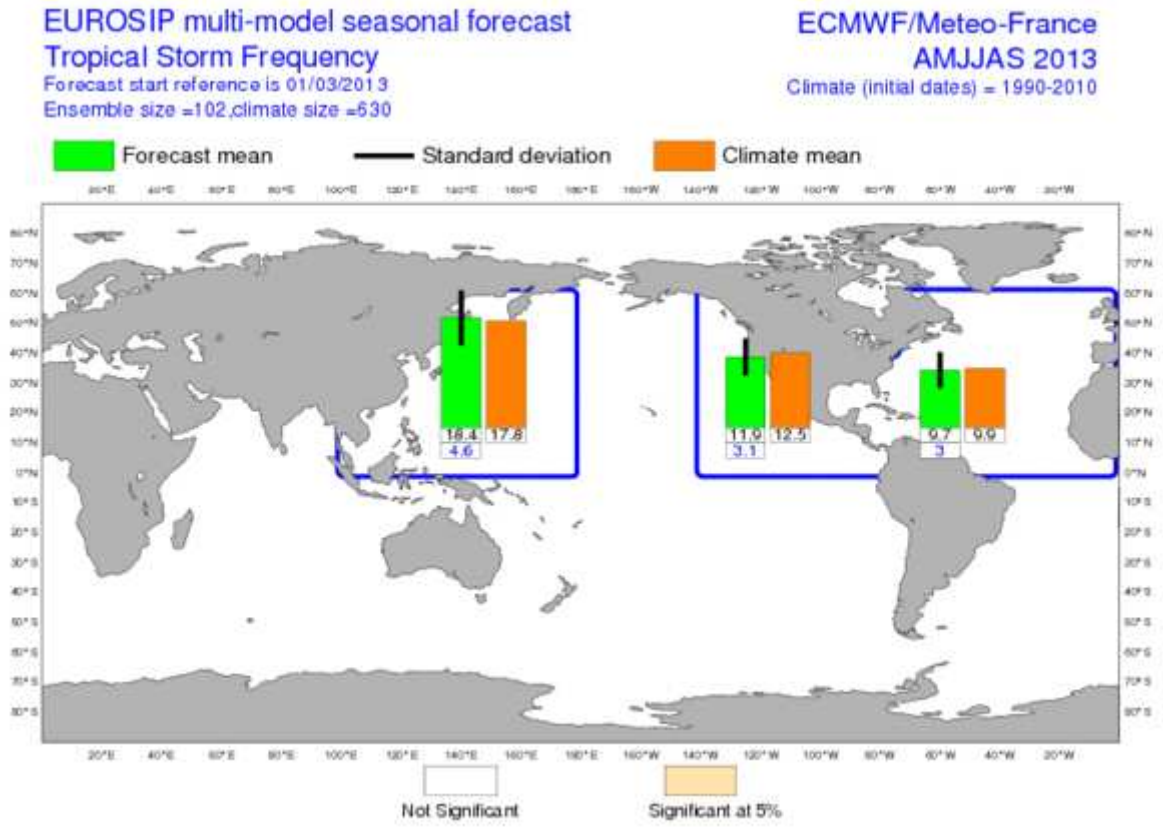


fig.42: Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF) for the AMJJAS period, issued in March.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro/eurosip_tropical_storm_frequency/

For the Tropical Cyclone season and in relationship with the low oceanic forcing, Euro-Sip forecasts indicate a close to normal condition everywhere.

WMO RA VI
Pilot RCC-Network

Synthesis of Temperature forecasts for April-May-June 2013 for European regions

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

MODELS	Northern Europe	Southern Europe	Central Europe	Eastern Europe	SEE Region
CEP					
MF					
Met Office					
CPC					
JMA					
synthesis					
LC-MME					
Eurosip					
privileged scenario by RCC-LRF node	*no privileged scenario*	*no privileged scenario*	*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 2013 for European regions

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

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

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

III. ANNEX

III.1. SEASONAL FORECASTS

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

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

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

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

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

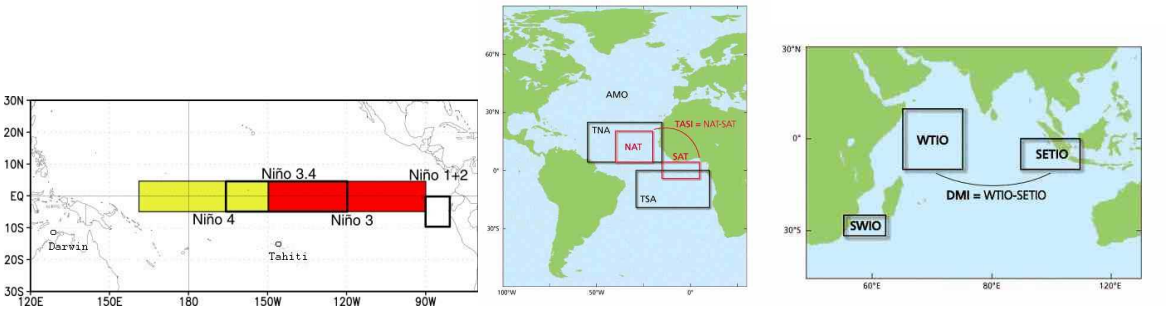
El Niño and La Niña events primarily affect tropical regions and are monitored by following the SST evolution in specific area of the equatorial Pacific.

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

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

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

Oceanic boxes used in this bulletin :



III.3.LAND BOXES

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