GLOBAL CLIMATE BULLETIN
n°154 - APRIL 2012

Table of Contents

I. DESCRIPTION OF THE CLIMATE SYSTEM (FEBRUARY 2012)

I.1. OCEANIC ANALYSIS

I.1.a Global Analysis

In the Tropical Pacific while there is still trace of the Niña event (Central and Western Pacific) the situation evolves (fig.1). In the half Eastern part of the basin the SSTs are warming, Above normal temperatures are observed especially close to South-America in the equatorial waveguide but also in the higher latitudes of the Southern hemisphere. In the Southern hemisphere, the positive anomaly surrounding the negative one in close to the equator has dramatically decreased. In the highest latitude of the Northern Hemisphere, the positive anomaly seems to decrease.

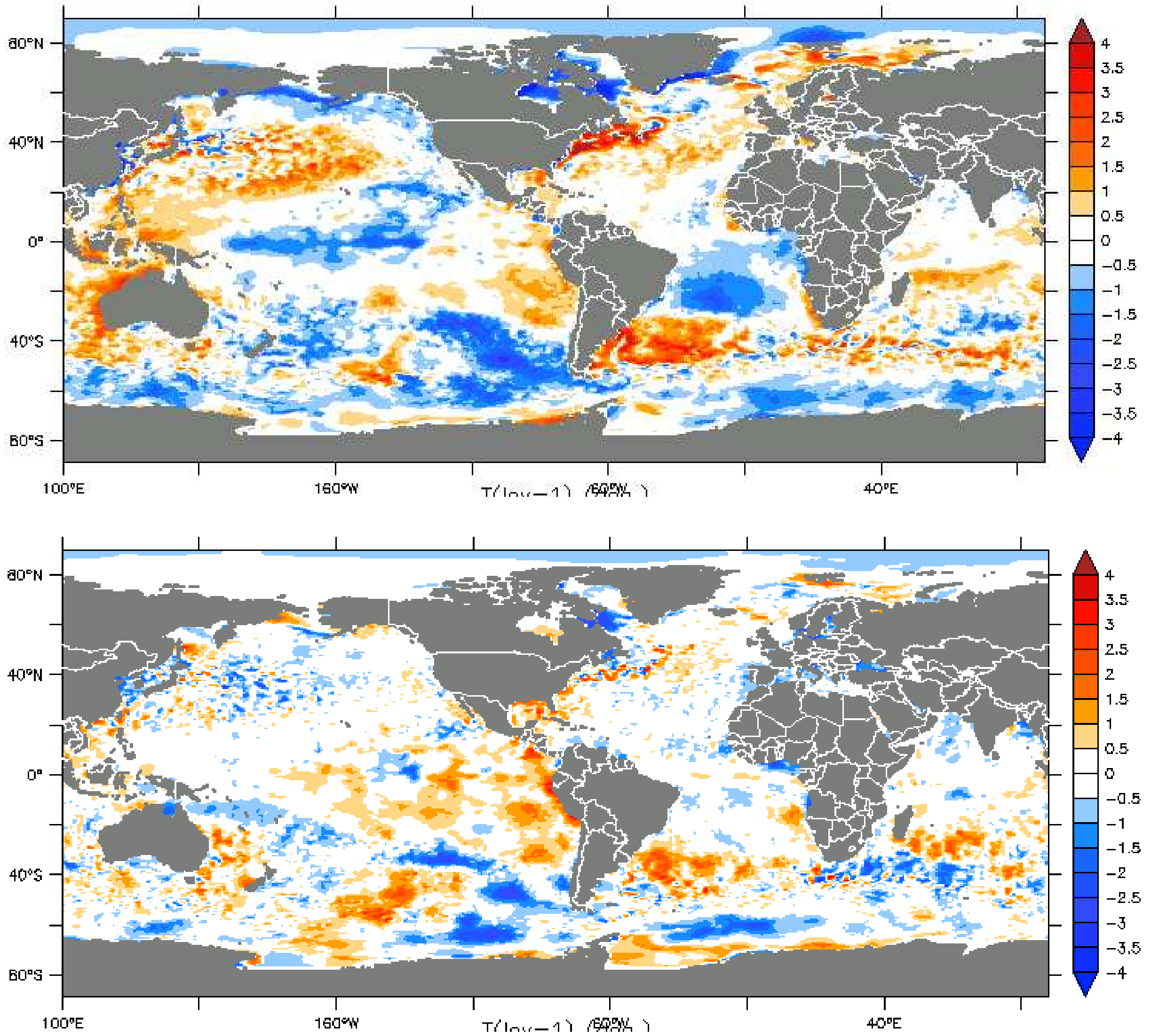


fig.1: top : SSTs Anomalies in February 2012 (°C) (reference Levitus 1950-2008)
bottom : time tendency (February-January) http://bcg.mercator-ocean.fr/

Elsewhere in the Tropics and the mid and high latitudes of the Northern Hemisphere there is only little evolutions.
In subsurface (fig.2), in the equatorial Pacific waveguide, the heat content anomalies show some dissimilarity with the SSTs and thermocline depth anomalies (see fig. 5) showing negative anomalies in the Eastern part. In the Western Pacific there is still the trace of the Niña event consistently with the SSTs.
In Tropical Atlantic, one can remarks still some opposite patterns between the North (positive anomaly) and South (negative anomaly) part of the basins despite the patterns are quite fragmented (likely related to the resolution effect).
In the equatorial wave guide of the Indian Ocean, the main tendency is a cooling (already pointed out for the SSTs) in the Western part and a warming in the Eastern part leading to a negative DMI.

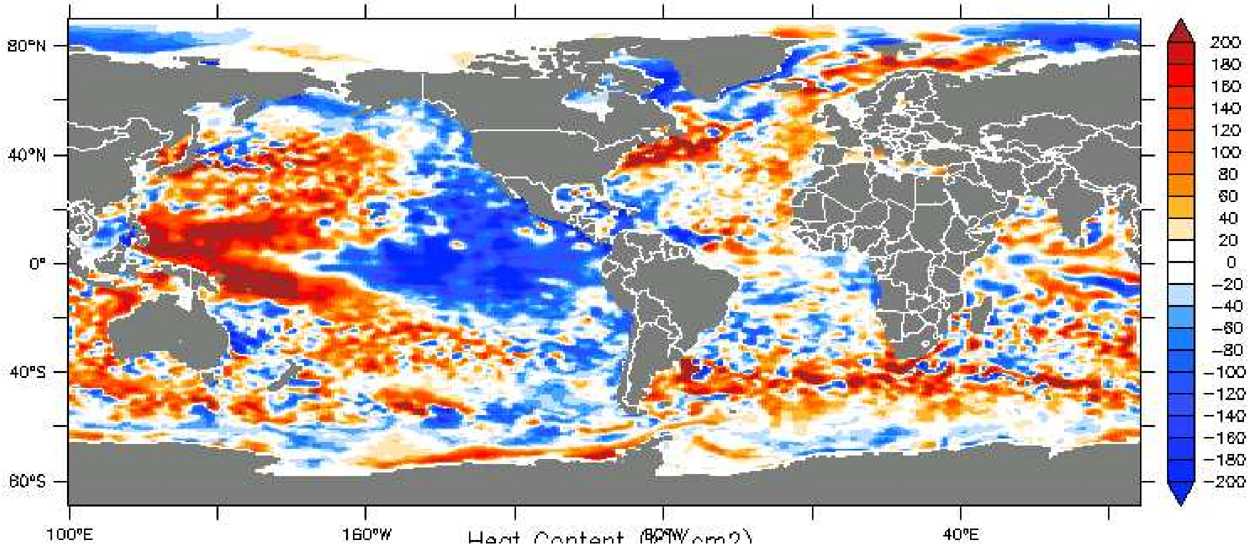


fig.2: map of Heat Content Anomalies (first 300m) in February2012 (kJ/cm²). (reference Levitus 1950-2008) http://bcg.mercator-ocean.fr/

I.1.b Pacific Basin

In January, a positive anomaly in the Eastern equatorial Pacific has developed (fig.3) while close to the date line the negative anomaly related to La Niña is still visible. In the Western part of the basin the negative zonal Trade Wind anomaly has weakened while a positive anomaly is observed on the most Eastern part of the basin consistently with the development of the SST anomaly.

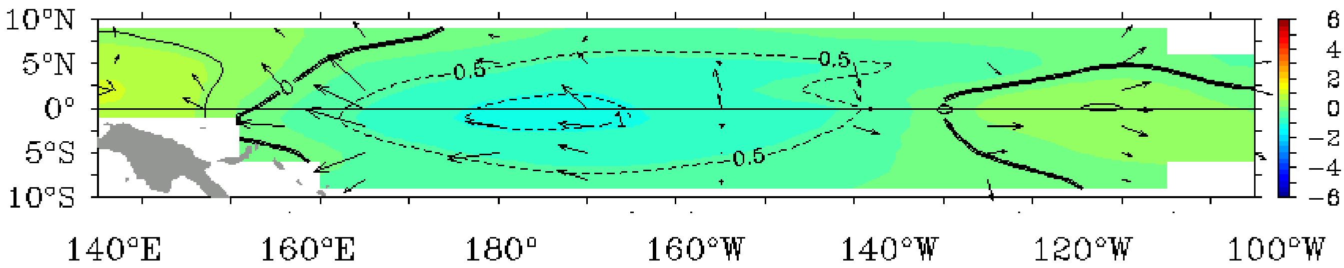


fig.3: SST Anomalies and Wind anomalies in February 2012 over the Equatorial Pacific from TAO/TRITON. http://www.pmel.noaa.gov/tao/jsdisplay/monthly-summary/monthly-summary.html

In the Niño boxes (4, 3.4, 3 et 1+2 ; see definition in Annex) the SST anomalies are negative everywhere and have slightly decreased. The monthly averages in January are respectively -1,2°C, -1,1°C, -0,8°C and -0,8°C from West to East (weak to moderate La Niña).

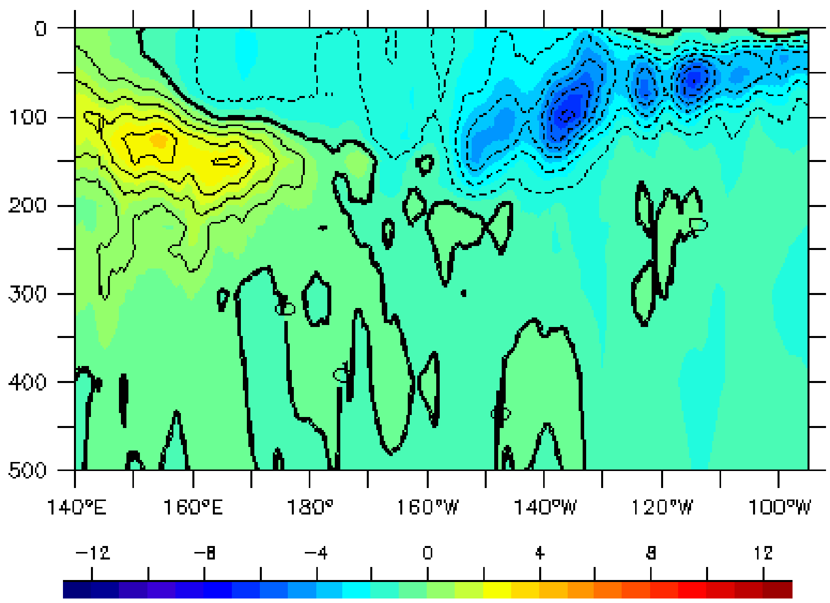


fig.4: Oceanic temperature anomaly in the first 500 metres in the Equatorial Pacific, in February 2012 (http://bcg.mercator-ocean.fr/)

In the equatorial waveguide (fig. 4) and conversely to the SSTs, under the surface the negative cold anomalies are still well developed. However, on can see a thin layer of positive anomalies at the surface indicating that the warming in the eastern part already pointed out is not related to the subsurface oceanic dynamic in the equatorial wave guide. On the Western side the warm reservoir around 150 m continue to strengthen and to propagate eastward (slowly).
In February over the Equatorial Pacific, the La Niña like dipole structure is still present (fig. 5) in the thermocline structure (deeper than normal on western part and thinner than normal on Eastern part) but it shows signs of weakeness and one can see the trace of the SST warming on the most eastern part at the end of the period. There is not too much traces of Kelvin wave propagation in the equatorial waveguide.

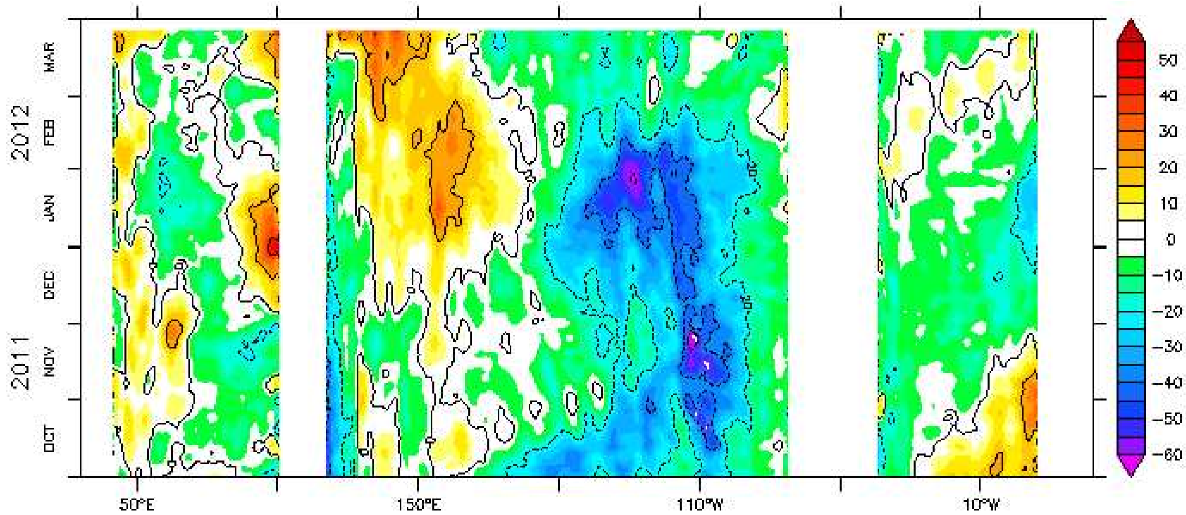


fig.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 6 month period. http://www.ecmwf.int/

I.1.c Atlantic Basin

In the equatorial waveguide (fig. 5) the Atlantic thermocline depth is thinner than normal in the eastern part and deeper than normal in the western part despite the anomalies are quite weak. Interestingly there is traces of a Kelvin wave propagation, especially at the end of the period. The signal is consistent with the surface signal (see SST comments) and the heat content.

The Northern part of the tropical Atlantic ocean is now close to normal while in the equatorial waveguide a negative anomaly is clearly visible (Eastern part). In the Southern Hemisphere (Tropics and sub-tropics), one can notice below normal conditions and a dipole pattern between the mid-latitudes and the sub-tropics. However, only the mid latitude shows significant evolution with a strengthening of the positive anomaly.

I.1.d Indian Basin

In the Indian Ocean, it remains mostly slightly warmer than normal in the Tropics. In the Southern hemisphere, the dipole pattern observed South to 20°S is still visible and positive anomalies close to western coast of Australia as well.

I.2. ATMOSPHERE

I.2.a Atmosphere : General Circulation

Looking to the Velocity Potential Anomaly field in the high troposphere (fig. 6), the patterns of General Circulation (especially Hadley-Walker circulations) show quite large evolution with respect of the previous month. They are not fully similar to La Niña like patterns. Over the Central Tropical Pacific there is a strong positive anomaly (convergent circulation anomaly ; downward anomaly motion). This convergent circulation anomaly widely extends to Australia and the SPCZ. The SOI is still positive (+ 0.5) but it has dramatically decreased (+ 2.5 in December).
A strong negative anomaly (divergent circulation anomaly ; upward anomaly motion) has developed over Northern and Western Africa and also over the North-Western part of South-America (with an extension up to Central America and Mexico. The pattern over Tropical North Atlantic is quite complex especially over the Caribbean (with a slight -but well marked in term of convergent circulation- positive anomaly over the northern part of the islands). The pattern over Africa is very important to follow in the West African monsoon development perspective.
Last the situation over the Indian Ocean shows a convergent circulation anomaly along the eastern coast of Africa and a divergent circulation anomaly over the southern part of India and Northern part of the oceanic basin. Such a dipole pattern could influence the beginning of the Indian monsoon and should be carefully monitored in the next months (especially in relationship with the SST deveolpements in the Eastern Equatorial Pacific).

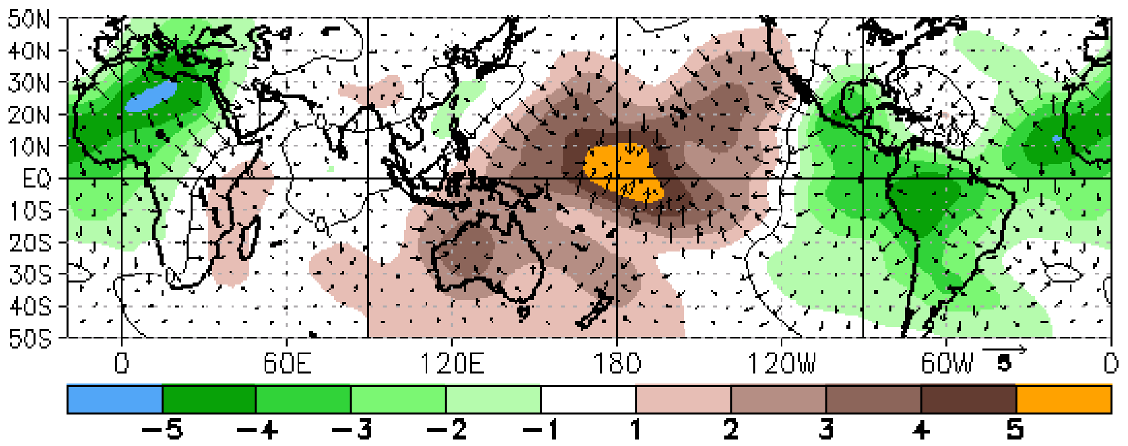


fig.6: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly for January 2012. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly). **http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml**

Looking to the Stream Function anomalies in the high troposphere (fig. 7), with respect of the previous month one can remark that anomalies are present across the Pacific Basin. However, the identification of the teleconnection patterns is not very easy over Pacific and the Atlantic as well (especially the positive anomaly over the mid latitudes of the North Atlantic sector).

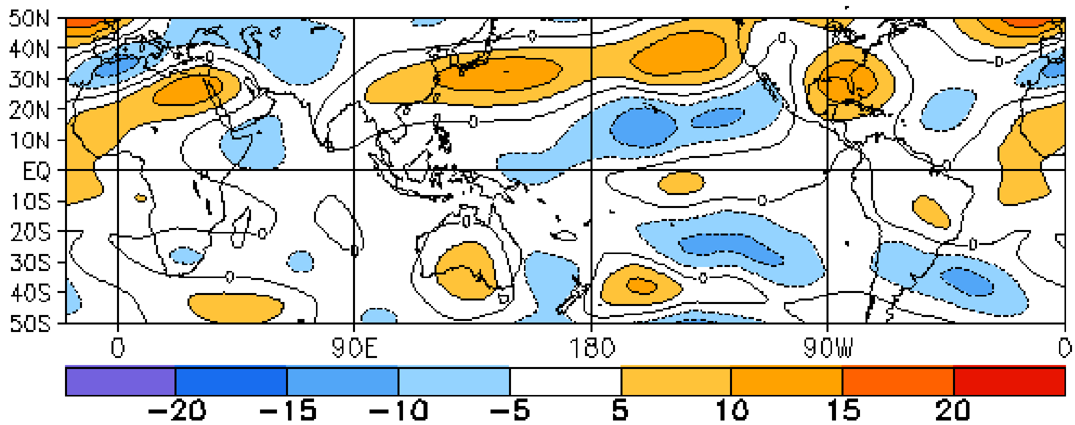


fig.7: Stream Function Anomalies at 200 hPa in February 2012.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

Over the Northern Hemisphere the Geopotential height at 500 hPa (fig. 8) shows a strong positive anomalies over the mid latitudes of the North Atlantic sector (Western façade of Europe) indicating a blocked zonal circulation over these regions. Only two of the main atmospheric modes in the Northern hemisphere show noticeable values ; the East Atlantic mode (-1.7 – see next table) and the West Pacific mode (+1). Generally speaking, the activity of atmospheric modes in relationship with the strong temperature anomaly over most of European countries are not bringing too much explanation.
Over the Pacific regions consistently with the Stream Function, there is no major anomalies which lead to a strong active PNA mode.

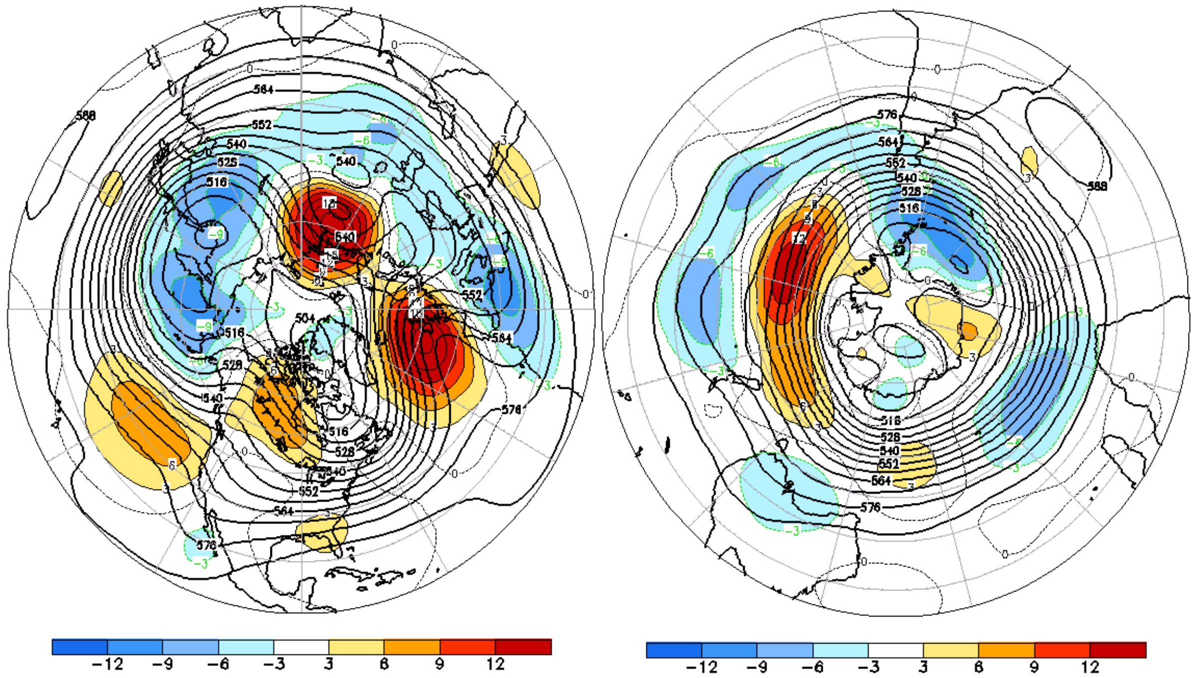


fig.8: Anomalies of Geopotential height at 500hPa in December 2011 (left North Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige9.shtml, and right South Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige15.shtml)

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 12	0.0	-1.7	1.0	-0.3	0.7	0.4	-0.6	0.3	0.2
JAN 12	0.9	-1.8	-1.6	-1.9	0.1	-0.2	-0.5	0.6	-2.3
DEC 11	2.2	0.1	-0.4	---	0.1	0.7	-0.5	0.5	0.7
NOV 11	1.3	-0.1	0.4	-1.3	-0.8	---	2.1	0.6	-0.4
OCT 11	0.9	-0.3	1.1	-0.8	0.9	---	0.1	-0.3	0.3
SEP 11	0.7	1.8	0.5	-0.5	-0.4	---	-0.3	-0.6	-1.1

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

I.2.b Precipitation

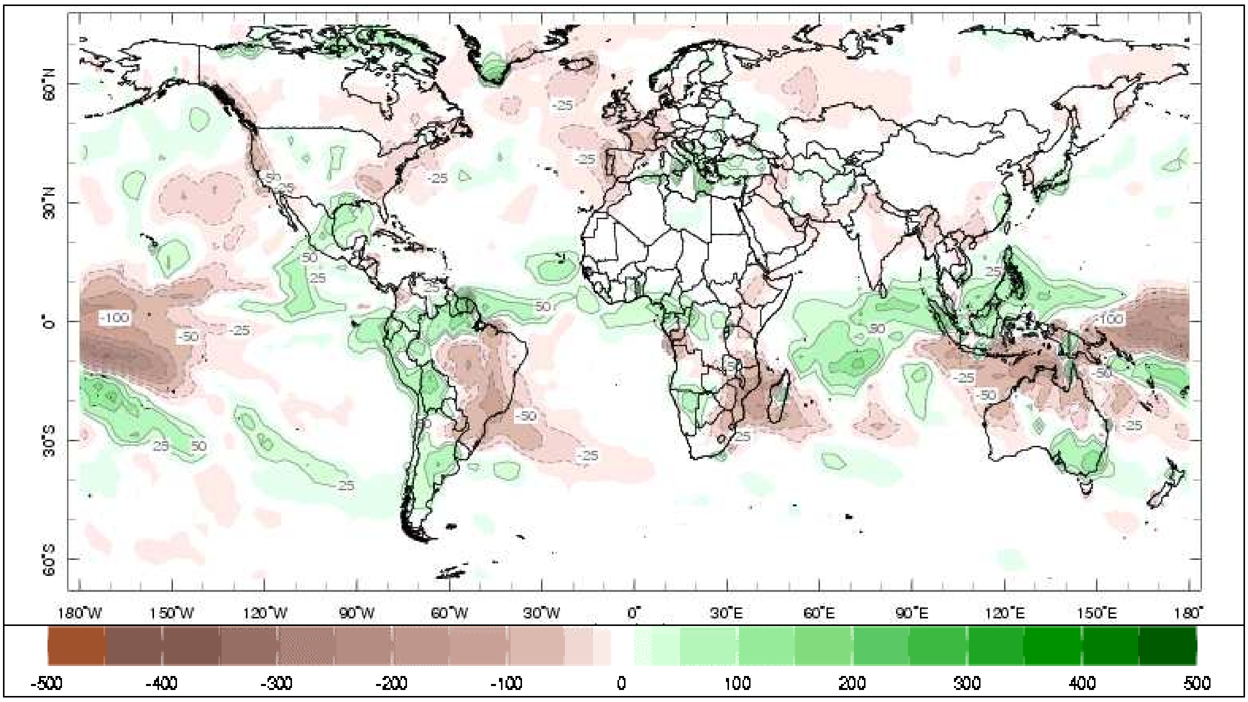


fig.9: Rainfall Anomalies (mm) in February 2012 (departure to the 1979-2000 normal) – Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maprom/.Global/.Precipitation/

Accordingly to the strong Divergent Circulation anomalies the Western coast of South America lead to Above normal rainfall while it's the opposite on the Eastern side. Positive anomalies are also visible close to the western part of the African continent. The negative anomalies on the Eastern coasts of Africa, Australia and Central Pacific are very consistent with the velocity potential anomaly field. In Europe, the negative anomalies on the western façade are related to the Geopotential field anomalies over the North Atlantic sector and the induced blocked zonal circulation in the mid-latitudes. The positive anomalies in the Eastern part of the Mediterranean basin are related to the divergent circulation anomalies already pointed out in section 1.2.a over North Africa.

I.2.cTemperature

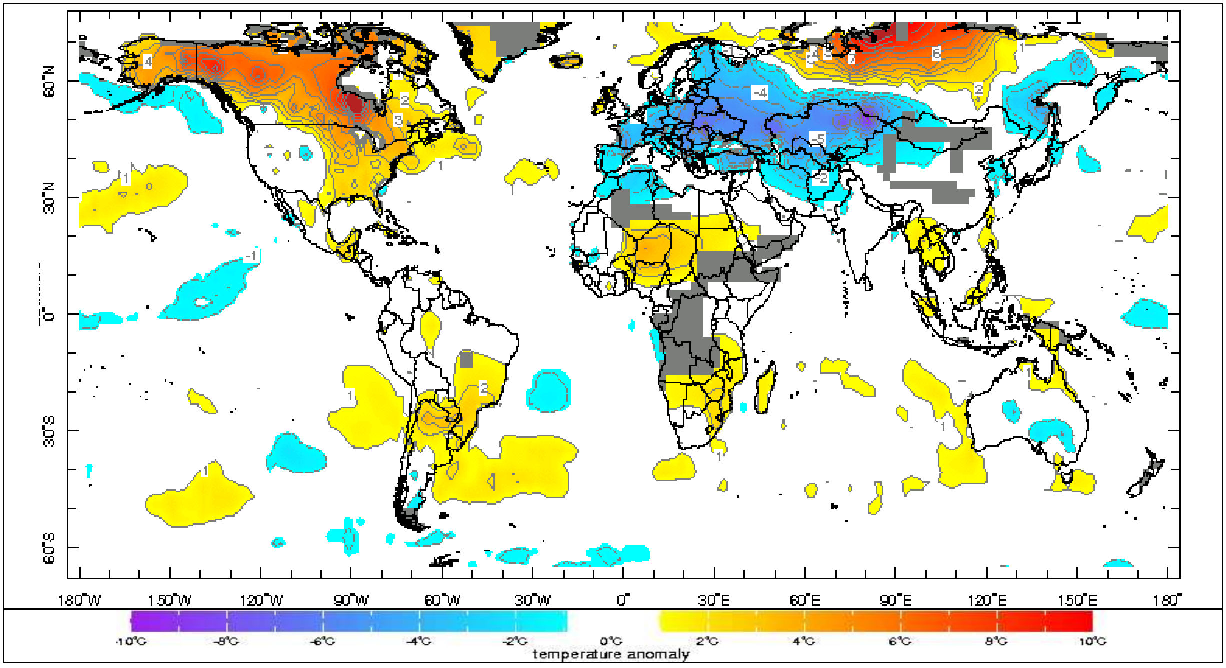


fig.10: Temperature Anomalies (°C) in February 2012 (departure to the 1979-2000 normal) **http://iridl.ldeo.columbia.edu/maproom/.Global/.Atm_Temp/Anomaly.html**

For temperatures (fig. 10) the strongest anomalies are in the Northern hemisphere ; positive over the northern part of North America, positive over Siberia and negative from Ukraine up to the western coast of Europe. Reviews of the cold wave over the Northern hemisphere (Asia and Europe) has been already edited by the Tokyo Climate Centre and by the Regional Climate Centre-Network for the RA VI. The positive anomalies are fully consistent with the climate change signal.
In the Southern hemisphere the anomalies are less large. However, one can highlight the positive anomalies over the Southern part of Brazil and Argentina and countries north to South Africa.

I.2.d Sea Ice

In Arctic, the sea-ice extension anomaly (fig.9) is still far below normal (much more than –2 std) with some regional modulation close to Greenland and on the Pacific side. It is very close to the observed 2007 sea-ice extension – record year (fig. 9bis – left).
In Antarctic, the sea-ice extension anomaly (fig. 9bis – right) is very above normal (close to + 2 std) with some regional strong positive anomalies.

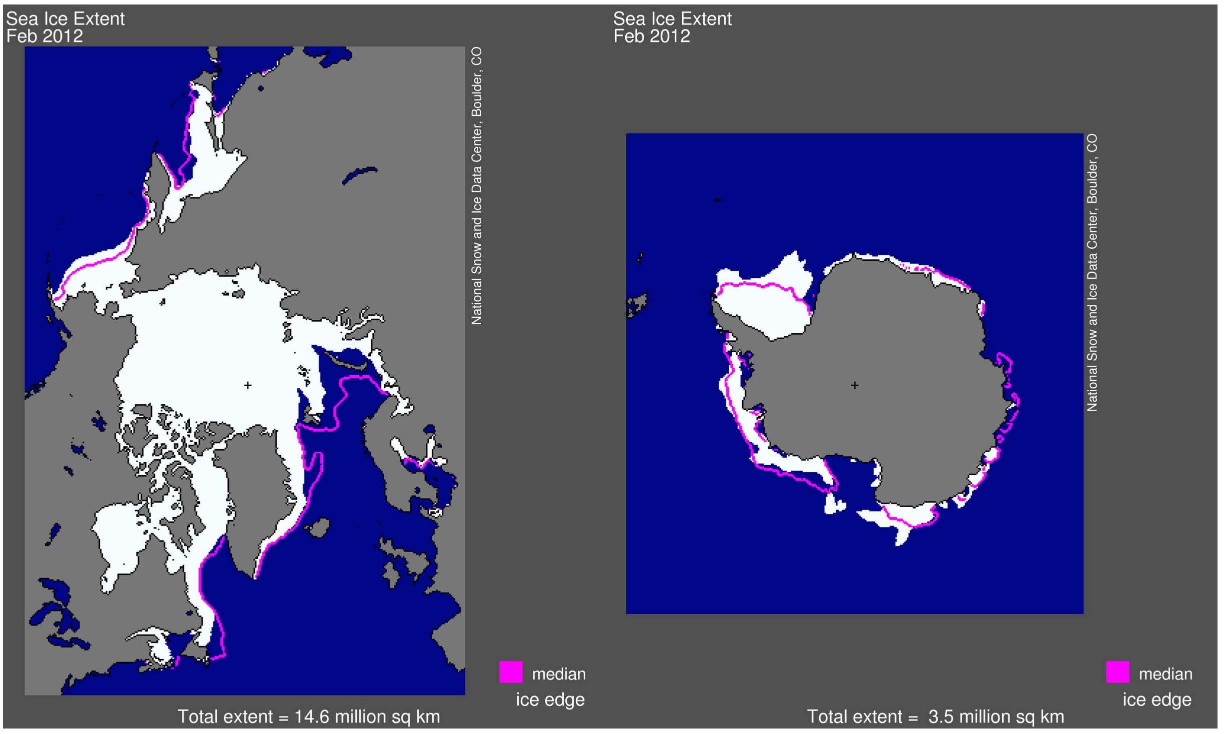


fig.11: Sea-Ice extension in Arctic (left), and in Antarctic (right) in February 2012. The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

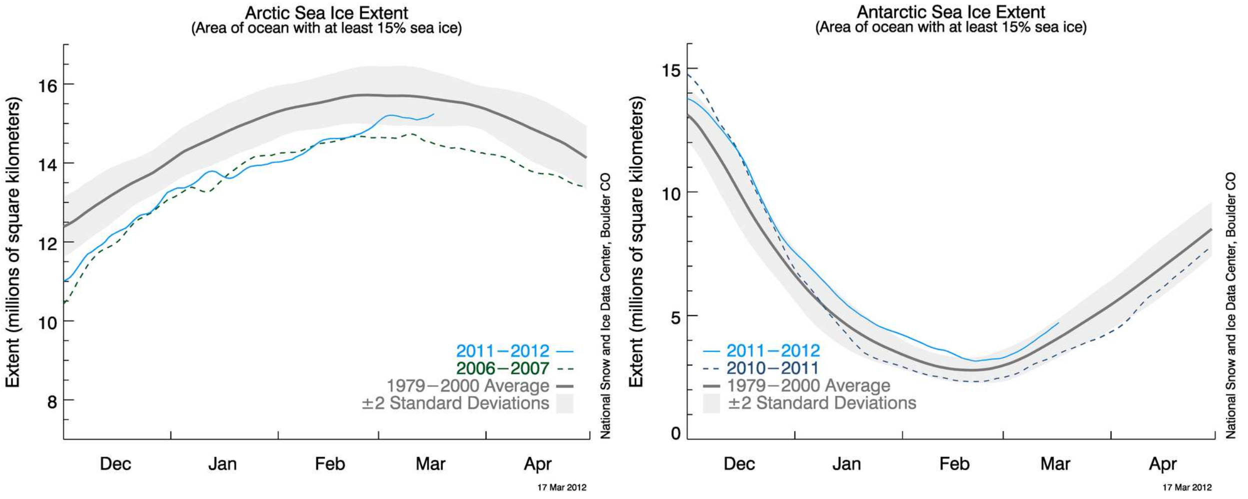


fig. 9bis : Sea-Ice extension evolution from NSIDC
http://nsidc.org/data/seaice_index/images/daily_images/N_stddev_timeseries.png

II. SEASONAL FORECASTS FOR APRIL-MAY-JUNE FROM DYNAMICAL MODELS

II.1. OCEANIC FORECASTS

II.1.a Sea Surface Température (SST)

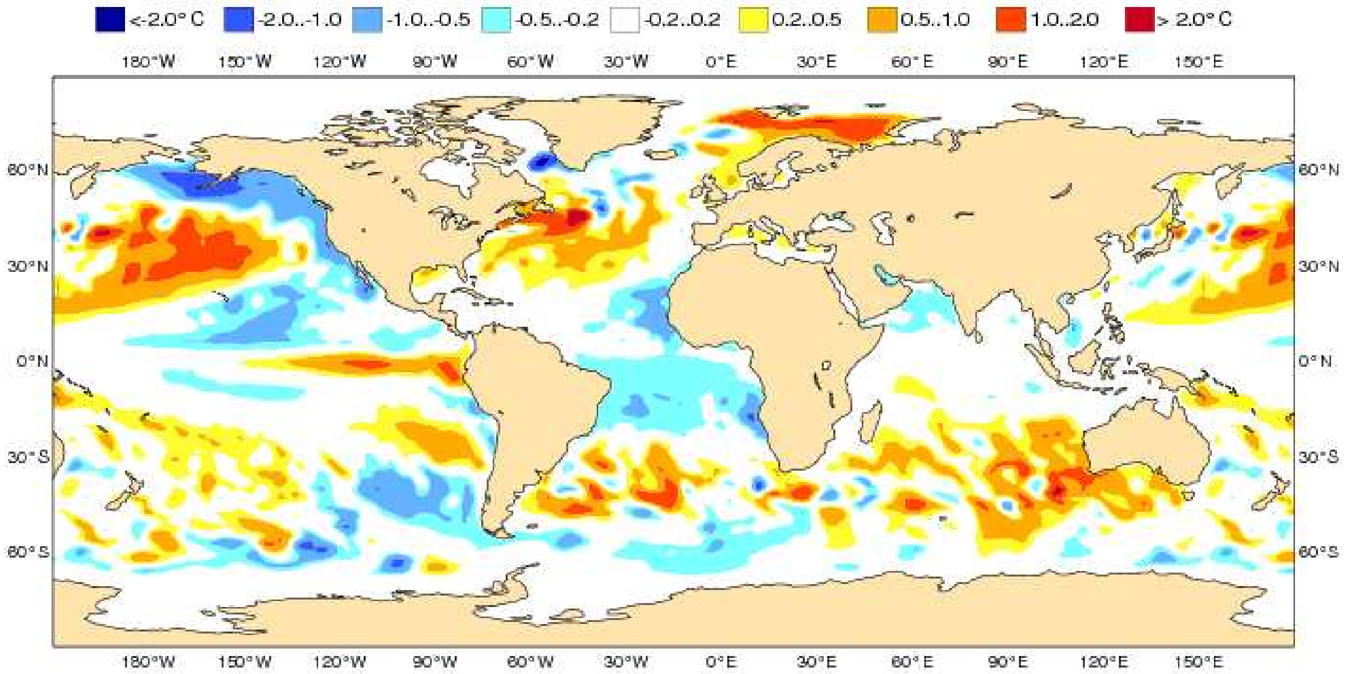


fig.12: SST anomaly forecast (in °C) from ECMWF for April-May-June, issued in March.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

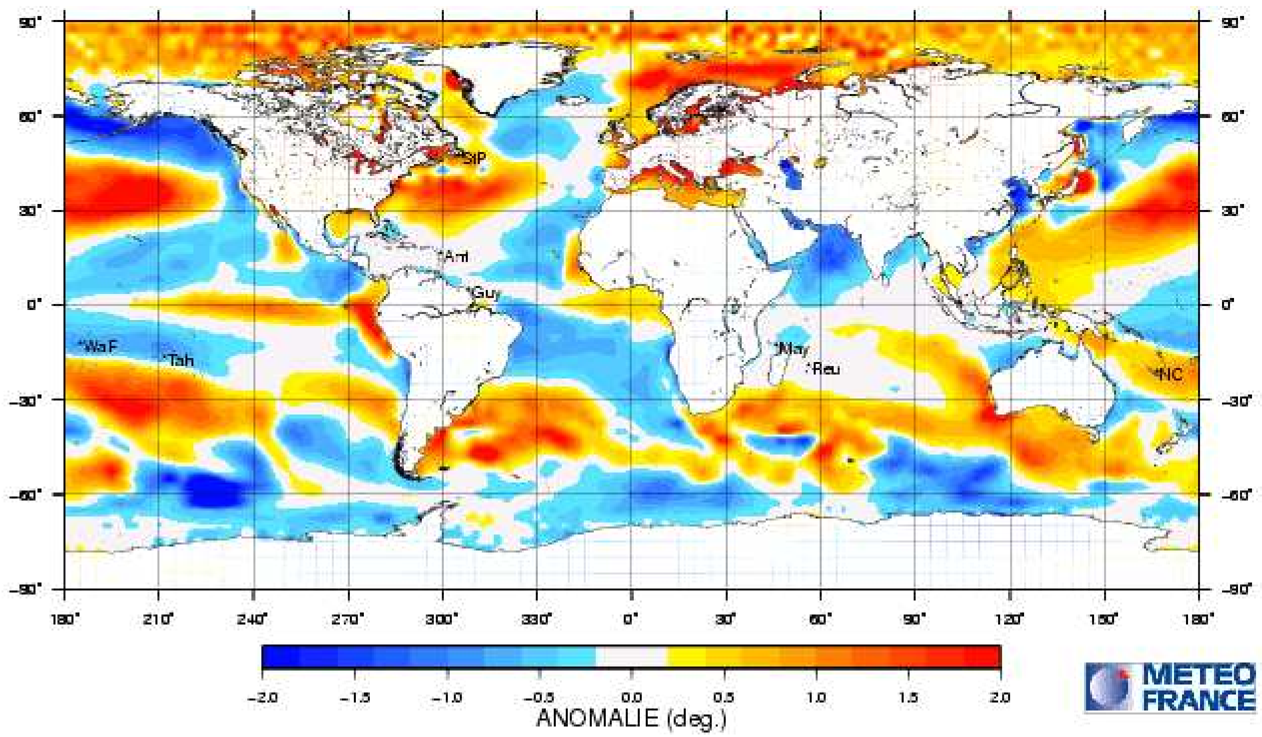


fig.13: SST Anomaly forecast (recalibrated with respect of observation) from Météo-France April-May-June, issued in March. http://elaboration.seasonal.meteo.fr/

The 2 models are very consistent over most of the ocean including mid-latitudes SSTs. Interestingly both models are developing a coastal event in the eastern Equatorial Pacific ; event which strengthen and propagate westward along the 7 month range of the forecast.
The main difference is on the location in the Southern Pacific of the positive anomaly which can lead to some large regional differences in the forecast of temperature and rainfall. Namely the French Polynesia is facing cold SSTs in Meteo-France while it is warm SSTs in ECMWF. This difference can be related to model uncertainty especially in relationship with ITCZ and SPCZ representation.
Over the Atlantic the scenarios proposed by the two models are quite similar at the exception of the Guinean Gulf where Meteo-France is likely penalized by its warm bias in this region. Both models are forecasting cold SSTs in the Southern Hemisphere and also cols SSTs on the Eastern part on the North Tropical Atlantic. This pattern will influence the behaviour of the West African Monsoon, especially in term of inter-hemispheric gradients (related to the ITCZ behaviour).
Last to be notice that the North Western part of the Indian Oceanic basin should face below normal conditions.
Because of the consistency between the individual models, in the Euro-Sip forecast the patterns are quite similar to the one already discussed just above. The warm coastal event is clearly visible and the cold condition over the South Atlantic and eastern North Tropical Atlantic as well. The absence of signal in the Guinean gulf can be likely related to the Meteo-France positive bias over this region.
Last, in the Indian Ocean, one can see close to normal conditions in the Tropics and warmer than normal conditions over the Southern part of the basin ; especially in regions close to Australia.

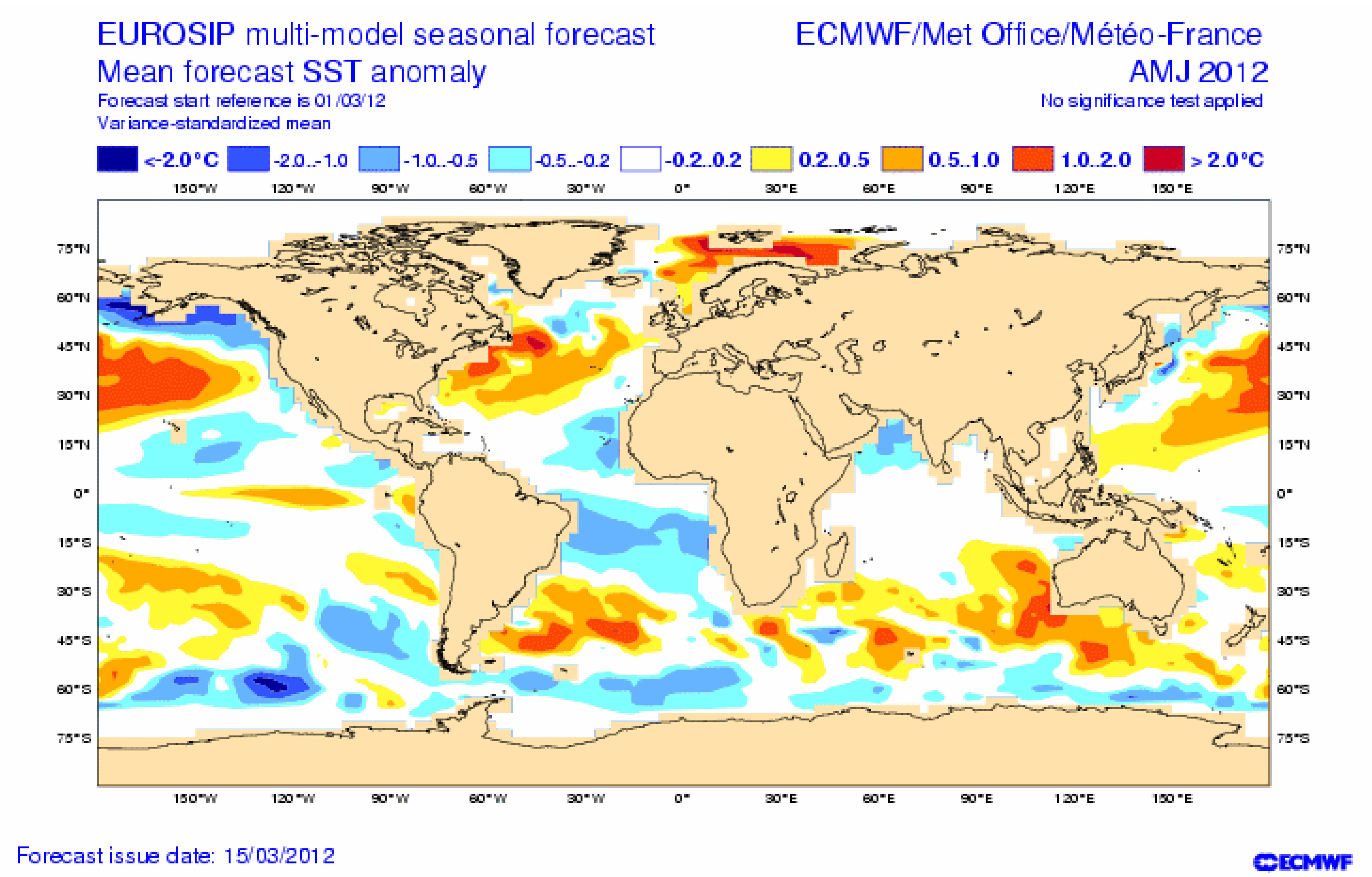


fig.14: SST Forecasted anomaly (in °C) from Euro-SIP valid April-May-June, issued in March.

II.1.b ENSO Forecast :

Forecasted Phase : Close to Neutral conditions

IRI provide a synthesis of several model forecast for the Niño 3.4 box (see definition in Annex) including models from Euro-Sip and statistical models. The figure 15 shows the ensemble mean of these models (circle for statistical models and squares for dynamical coupled models). The yellow thick line indicate the average of all dynamical models.

For April-May-June on average, most of statistical and dynamical models forecast conditions close to normal. However, some of the models are forecasting some warm events which could develop during the summer period. The question of the development of an El Niño event for the end of this year becomes relevant.

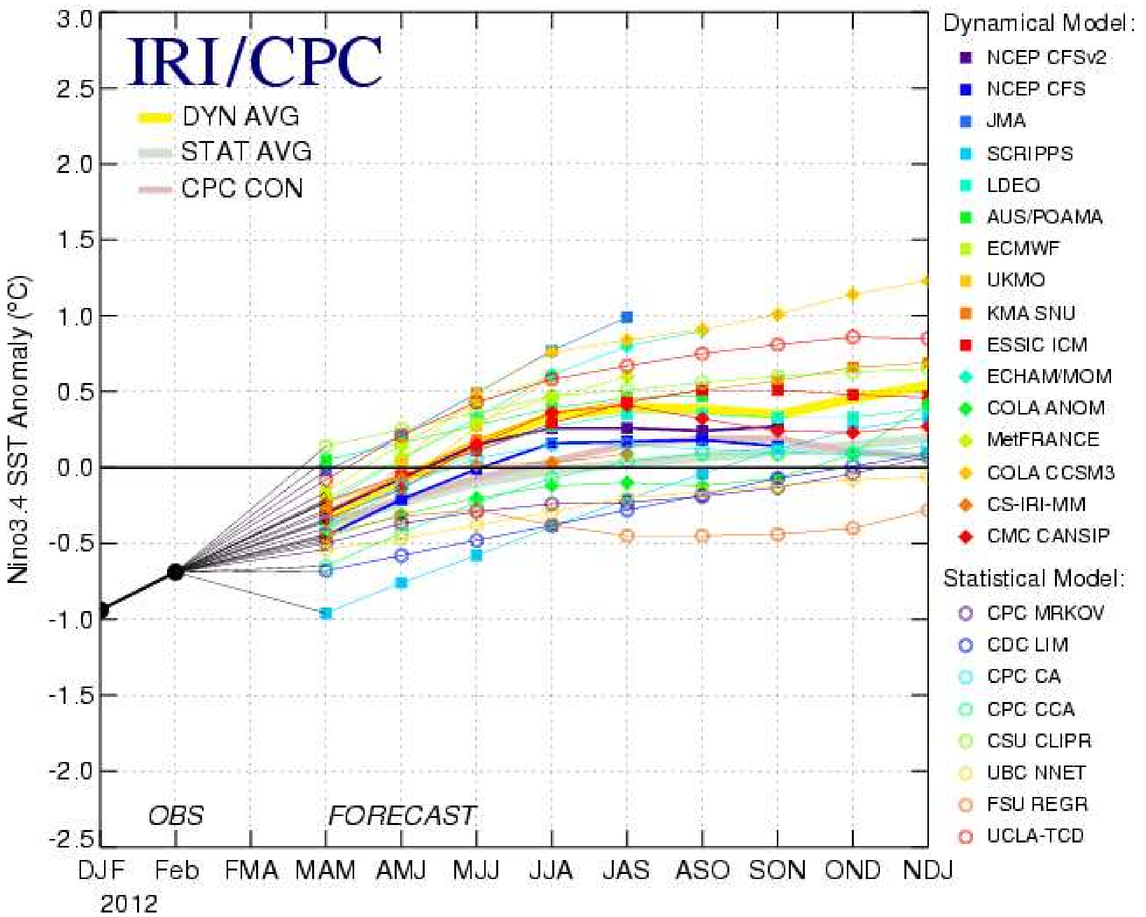


fig.15: Synthesis of Niño 3.4 forecasts (120° to 165°W) issued in March by IRI :
http://iri.columbia.edu/climate/ENSO/currentinfo/SST_table.html

The following table (from IRI) give the SST values currently used to decide the nature of forecasted event for the Niño3.4 box (« El Niño », « La Niña » or « neutral » : these values depend on the season and a situation is considered as « Neutral » if the forecast is within theses critical values. The 3 last lines give the 3-month mean of the different categories of models. This clearly reflect the "Neutral" condition which prevails for AMJ.

SEASON	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
Value « La Niña » **Value « El Niño »**	***-0,40*** ***0,40***	***-0,45*** ***0,45***	***-0,50*** ***0,45***	***-0,50*** ***0,45***	***-0,50*** ***0,45***	***-0,55*** ***0,50***	***-0,75*** ***0,70***	***-0,75*** ***0,75***	***-0,70*** ***0,70***
Average, statistical models	**-0.4**	**-0.2**	**-0.1**	**-0**	**0**	**0.1**	**0.1**	**0.1**	**0.2**
Average, dynamical models	**-0.3**	**-0.1**	**0.2**	**0.3**	**0.4**	**0.4**	**0.3**		
Average, all models	**-0.3**	**-0.1**	**0.1**	**0.2**	**0.3**	**0.3**	**0.2**	**0.3**	**0.4**

The figure 16 shows plumes from Météo-France and ECMWF for the 3 Niño boxes (see definition in Annex). Both models forecast a warming up to normal conditions at spring and they forecast a continuation of this warming along the 7 months of the forecast. The spread of the forecasts is not to much in Météo-France and may be more dispersed in ECMWF (but noting the march initial conditions and the spring barrier of predictability).

NIÑO 4 NIÑO 3.4 NIÑO 3

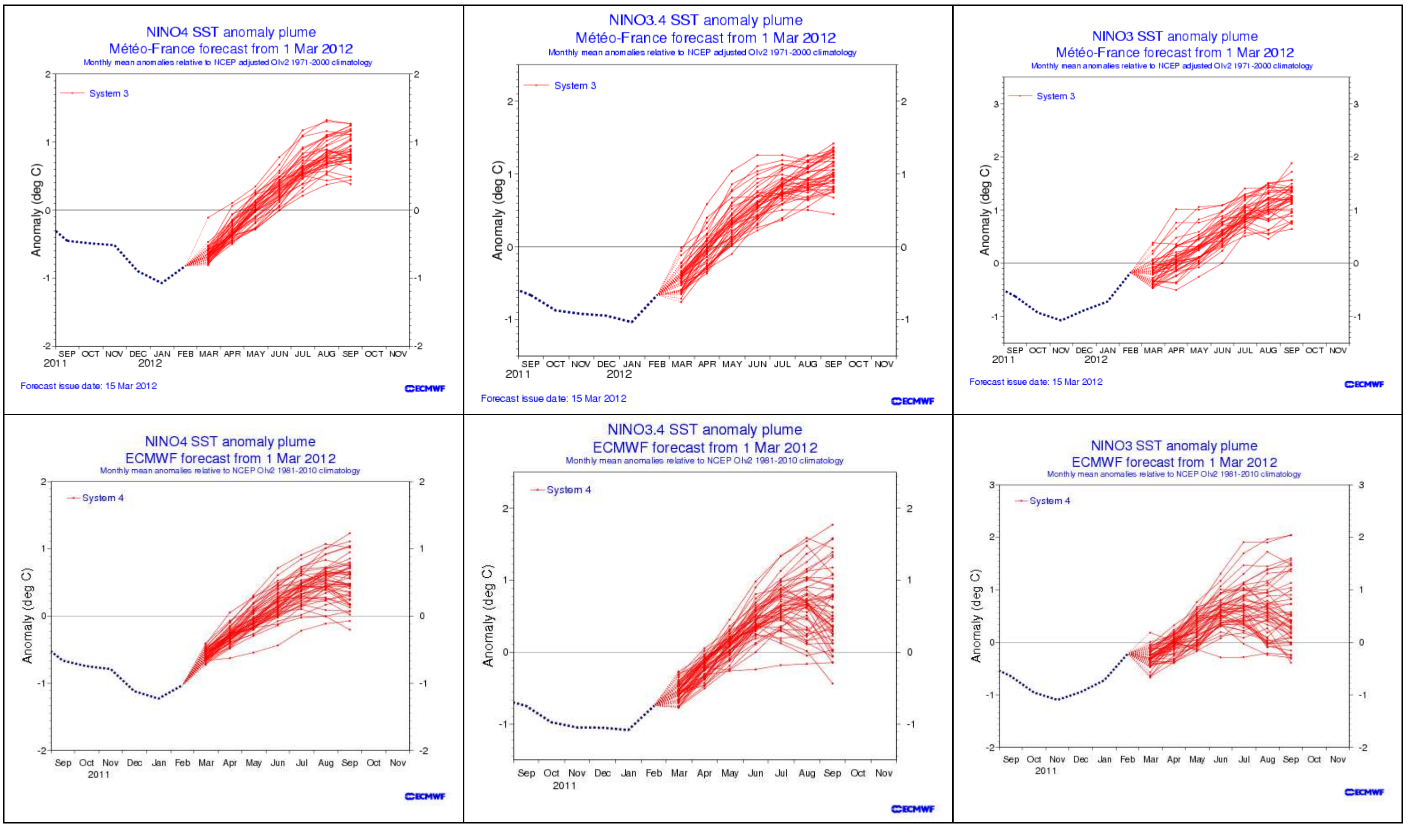


fig.16: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (bottom) issued in March, monthly mean for individual membres. (http://www.ecmwf.int/ **)**

II.1.c Tropical Atlantic forecasts :

Forecasted Phase: Colder than normal conditions in the North/South Tropical Atlantic

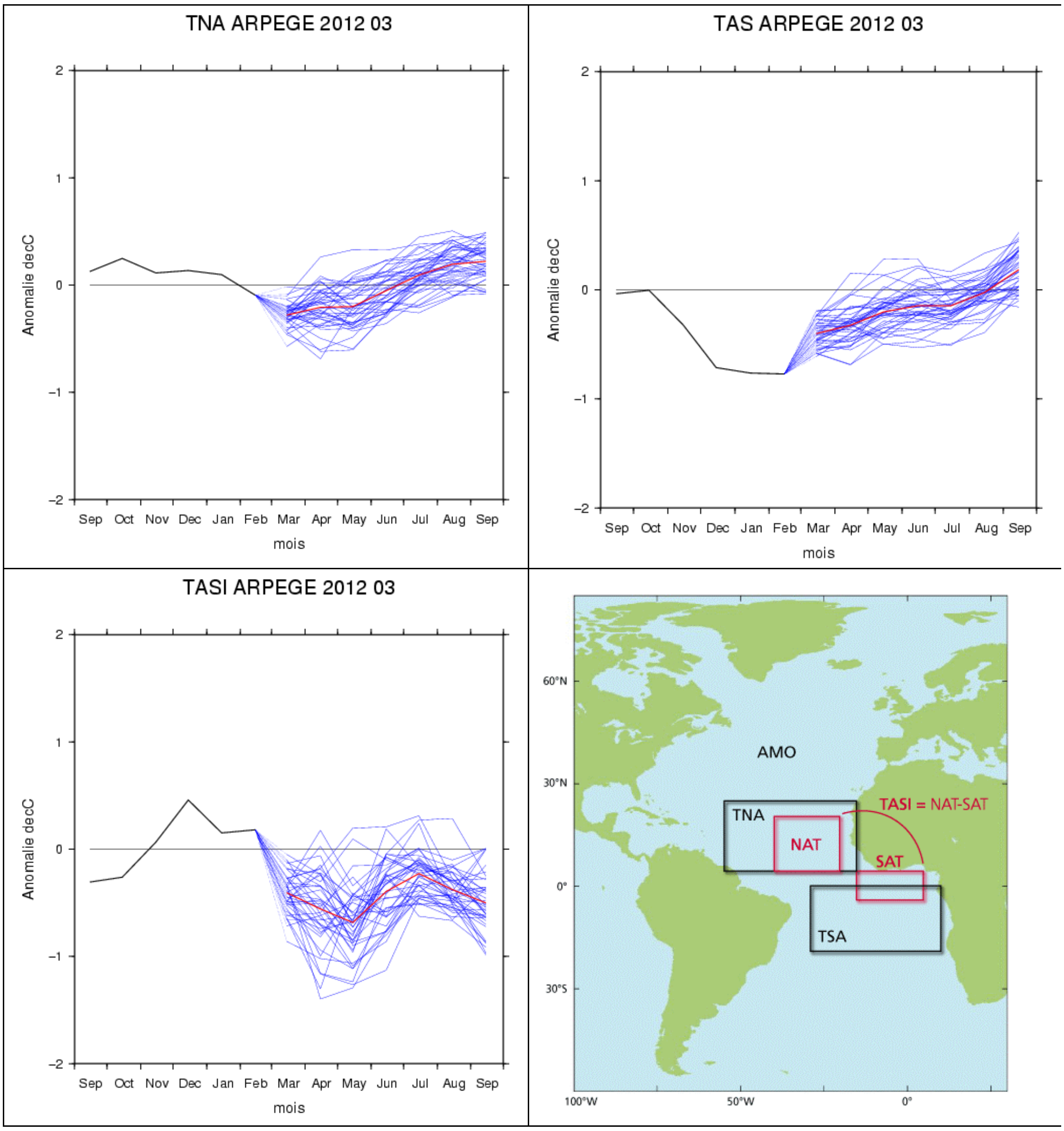


fig.17: SSTs anomaly forecasts in the Tropical Atlantic boxes from Météo-France, issued in March, plumes correspond to 41 members and monthly means.

The Plumes confirm that on average the forecast corresponds to colder than normal conditions in both the North and South Tropical Atlantic. However, one can notice that the North Tropical Atlantic is becoming neutral in June and warmer than normal in July and August while the warming is slower in the Southern part of the Tropical basin. This difference is important to highlight as for the West African Monsoon, we should get positive inter-hemispheric gradient during the West African monsoon, which should favour the northward displacement of the ITCZ and consequently the quality of the rainy season over the Sahel. A negative value of TASI is forecasted all over the period. However, the TASI index is potentially biased because of the likely positive bias of Météo-France forecast in the Guinean Gulf and one can notice the the very large spread of the ensemble.

II.1.d Indian Ocean forecasts :

Forecasted Phase: Cold/Close to Neutral conditions in the West/East equatorial part

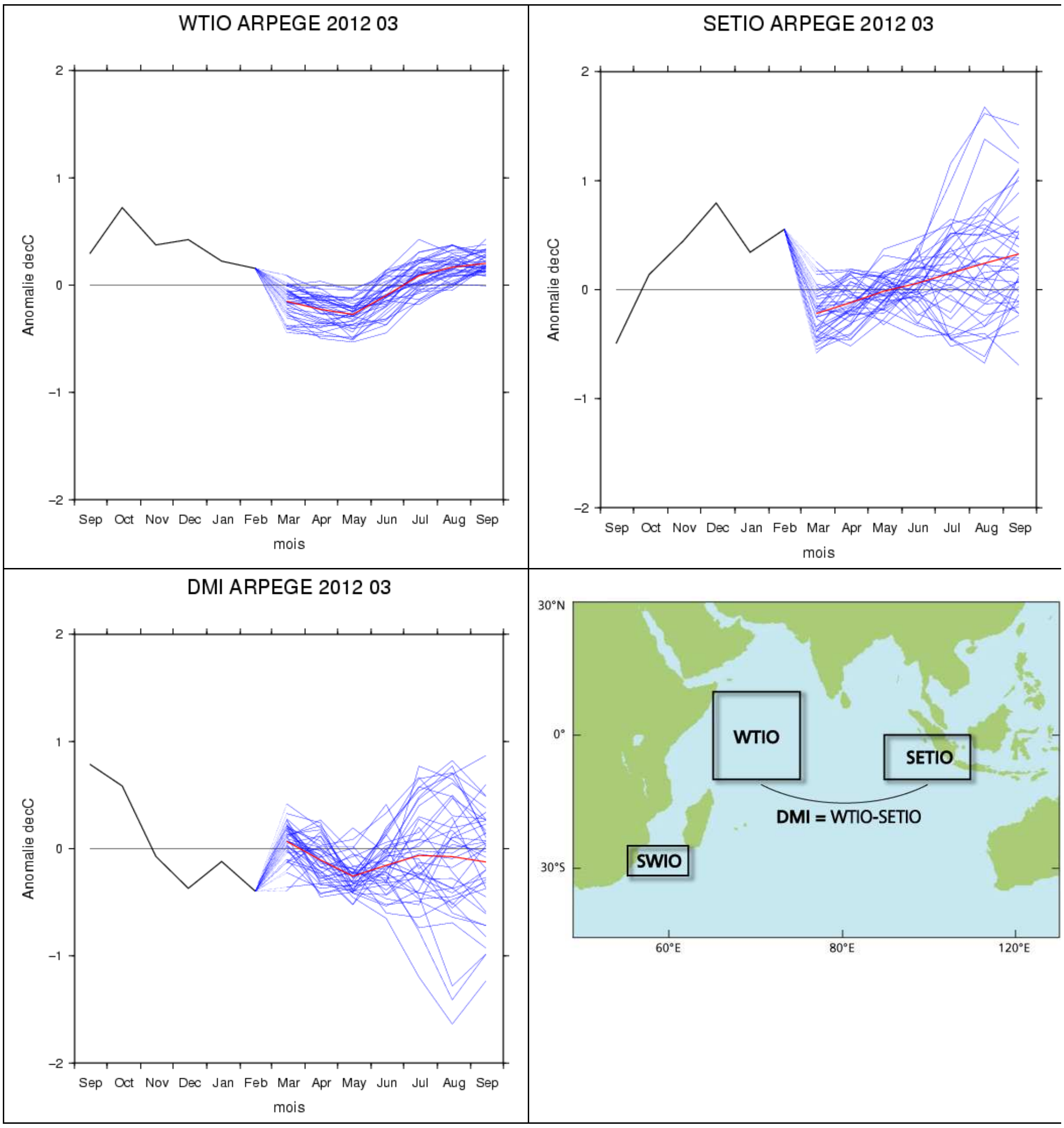


fig.18: SSTs anomaly forecasts in the Indian Ocean boxes from Météo-France, issued in March, plumes correspond to 41 members and monthly means.

The Plumes show that most of the members are forecasting close to normal conditions in Eastern Equatorial Indian Ocean (but continuously warming) and cold conditions in the western part (also with a warming in summer). The SETIO index shows a large spread among all members of the ensemble during all the period, likely partly related to some uncertainty in the development of the warm event in the Pacific. Nevertheless, the DMI is mostly negative over the period even if one can notice the large spread which led to be cautious in using this forecast.

II.2. GENERAL CIRCULATION FORECAST

II.2.a Global Forecast

First, looking to the Tropics one remark a large consistency between both the divergent circulation anomalies over the Pacific and the Atlantic. Nevertheless, the intensity of the atmospheric response is different ; more intense in MF than in ECMWF. The main differences appear on the Indian sub-continent and Africa, likely in relationship with the intensity differences already pointed out and an eastward shift of the convection on West Pacific in ECMWF (with respect of MF pattern).

As a first glance, the velocity potential anomaly field (cf. fig. 19) show in the Tropics a 1 wave number pattern in both models (ECMWF and Meteo-France).

In details, over the Central Pacific both models show an atmospheric response with a divergence anomaly (upward motion) over the maritime continent. Interestingly, the Tropical Divergent circulation anomaly extends far to the North and South (along the SPCZ region) over the Western Pacific. In the Central Pacific the atmospheric response is more complex with a convergence circulation anomaly (downward motion) very visible in MF and strongly weakened in ECMWF. Nevertheless, both models show the same response in terms of Stream function anomaly which is trapped within the Tropics.

Over the Tropical Atlantic, both models indicate a convergent circulation anomaly (downward motion) more intense in MF. Again, the respective northward and southward propagation of Stream Function Anomalies are not very clear indicating that the predictability seems to be not very high for the concerned mid-latitude regions.

Last over the Indian ocean and Indian sub-continent, the 2 models are showing large differences in terms of Velocity Potential anomalies. While both models indicate a positive anomaly just South to India over the ocean, in MF a large negative anomaly is visible from South-East Asia up to Eastern Africa while the signal is very weak over India in ECMWF and opposite and North-Westward shifted in ECMWF.

The reason of such a large difference is unclear but one can guess that the large differences over the Pacific (in terms of intensity and especially in the western part) can influence a lot the Hadley-Walker circulations over the Indian and African regions.

These differences could be related to model uncertainty and especially to differences in the sensitivity to oceanic forcing. In conclusion, it is difficult to assess a clear indication of tropical forced teleconnection for Europe ; so one should be cautious as the predictability seems still to be limited for AMJ.

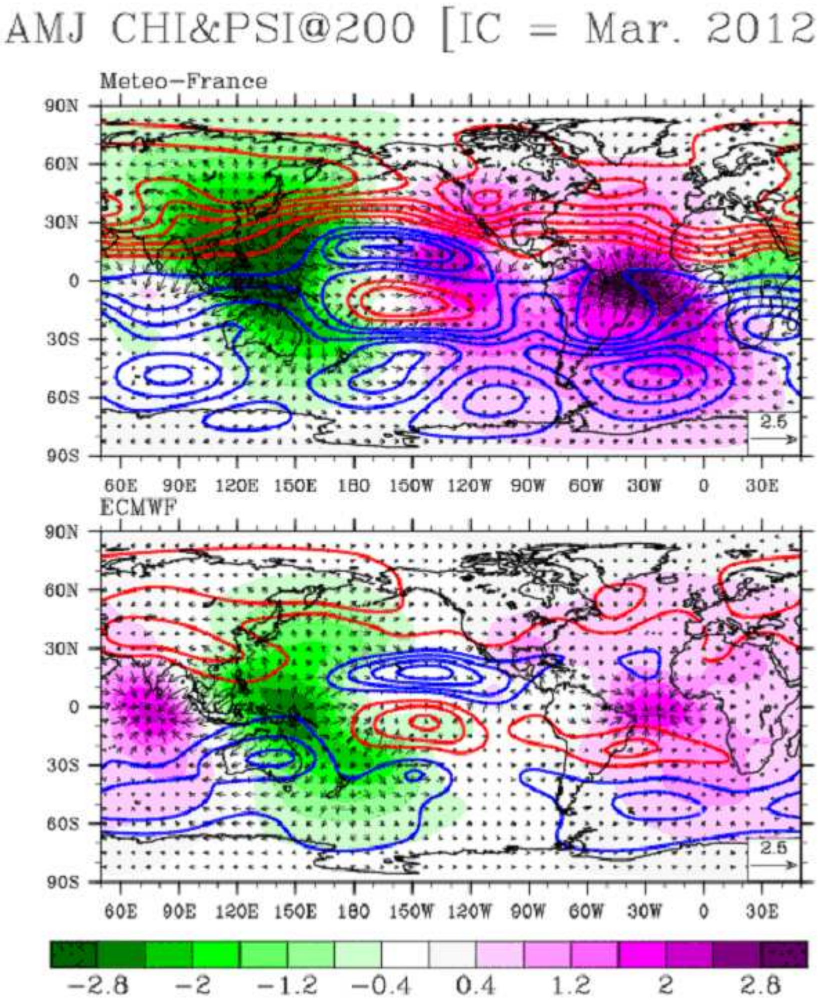


fig.19: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), asociated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa for April-May-June, issued in March by Météo-France (top)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

II.2.b North hemisphere forecast and Europe

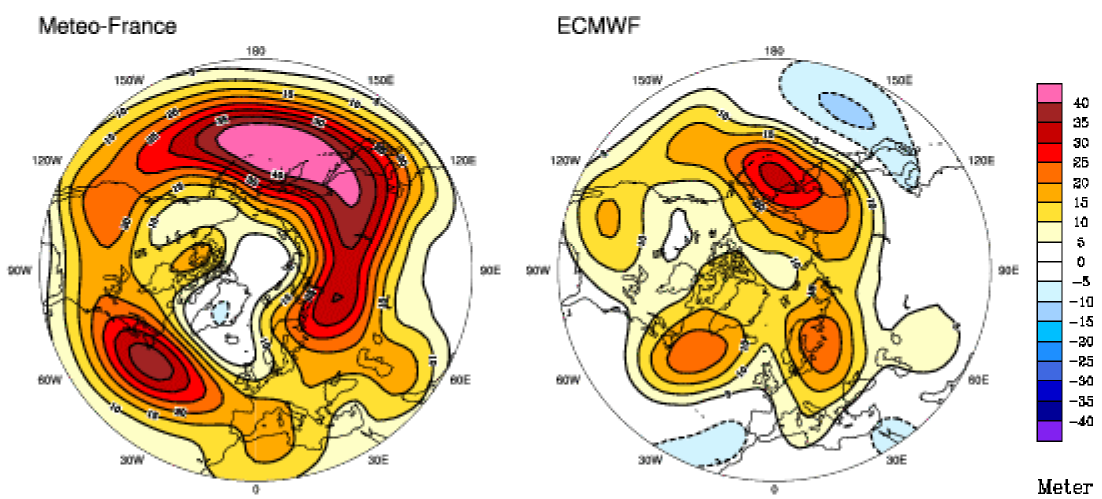


fig.20: Anomalies of Geopotential Height at 500 hPa for April-May-June, issued in March from Météo-France (left) and ECMWF (right).

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

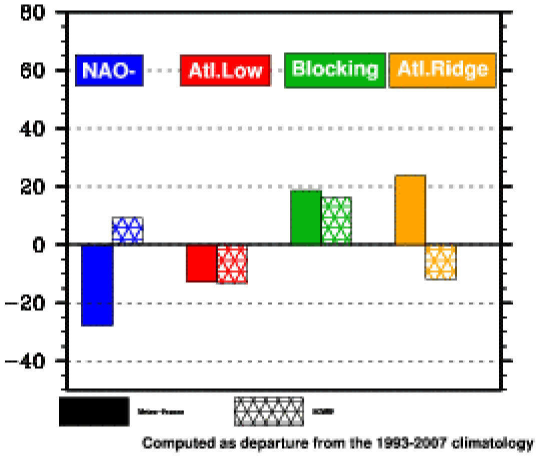


fig.21: North Atlantic Regime occurrence anomalies from Météo-France and ECMWF : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

The Meteo-France and ECMWF models show a positive Geopotential Height anomaly at 500hPa (fig. 20) in the mid-latitudes South to Greenland (but southward shifted in MF). The same signal exists also over Scandinavia and Northern Europe. Part of these anomalies are likely related to the climate trend, especially in MF. So, not surprisingly, this infers, in the occurrence frequency, an increase of Blocking regimes and a decrease of Atlantic Low in both models. The differences for the other regimes can likely be related to the model response uncertainty. To be notice that AR and Blocking regimes are the ones which favour warm temperatures over the European continent.

The General atmospheric circulation in the low troposphere (see figure 22) is clearly related and consistent with the Geopotential Height in MF. Over most of western facade of Europe the meridionnal wind show a clear Northward anomaly while it’s the opposite over the related Atlantic sector. The positive anomaly North to 50°N in the zonal wind seems to corresponds to an increase of the zonal circulation likely in relationship with the AR regimes and the strong Geopotential height anomaly across the North Atlantic.

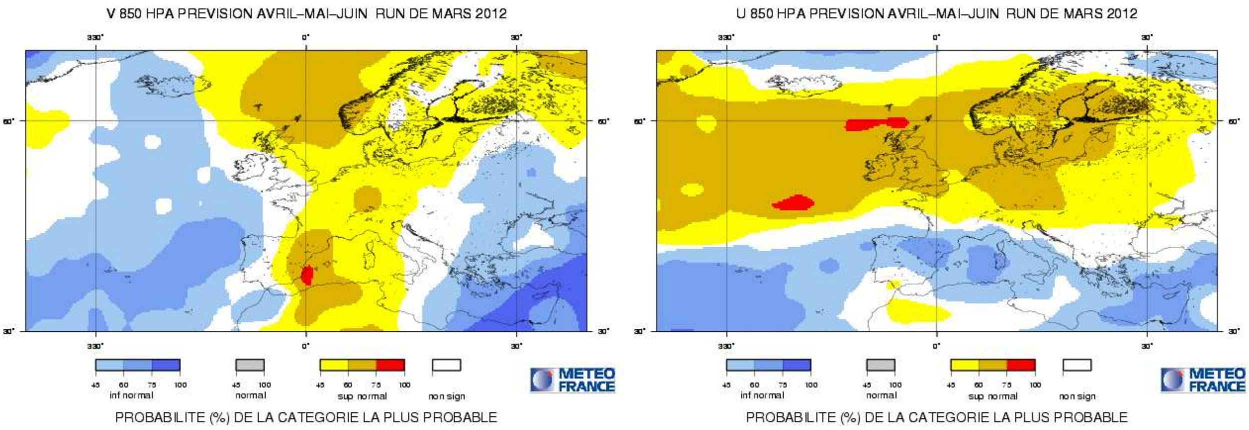


fig.22: Forecasted anomalies of meridional (left) and zonal (right) wind at 850 hPa for April-May-June, issued, in March from Météo-France.

II.3. IMPACT : TEMPERATURE FORECASTS

II.3.a ECMWF

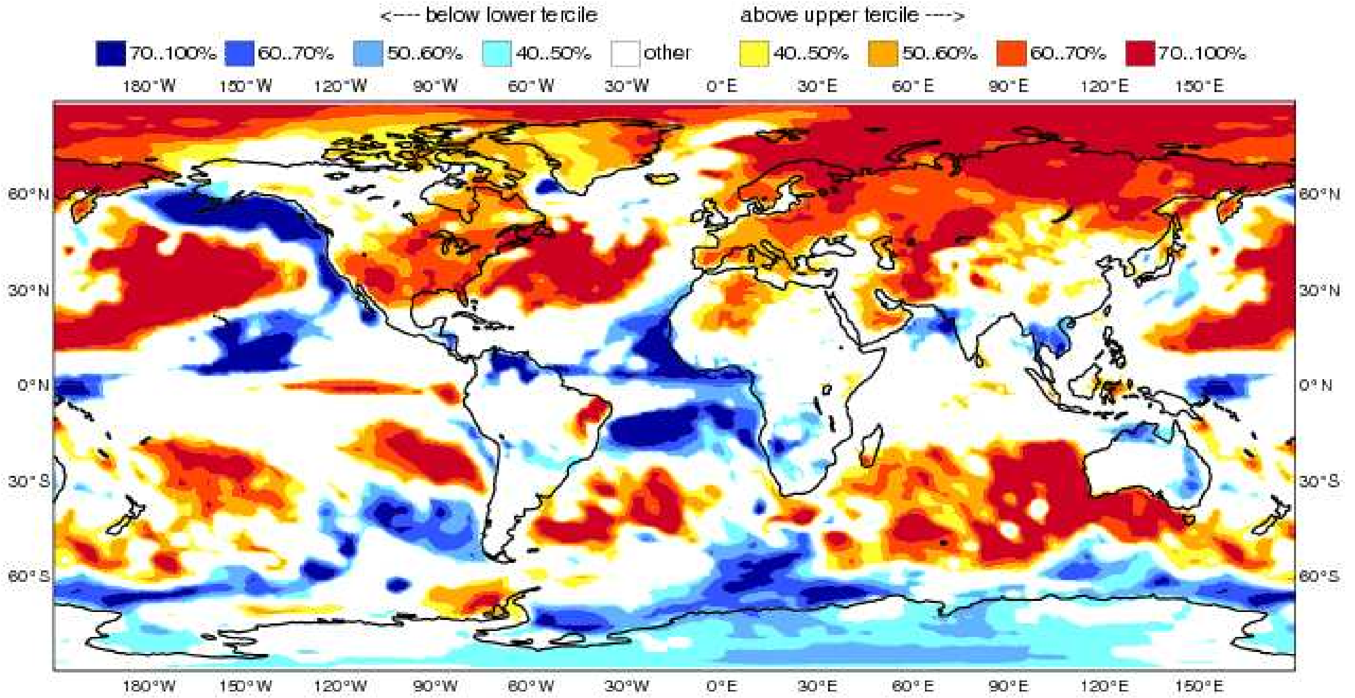


fig.23: Most likely category probability of T2m from ECMWF for April-May-June, issued in March. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.3.b Météo-France

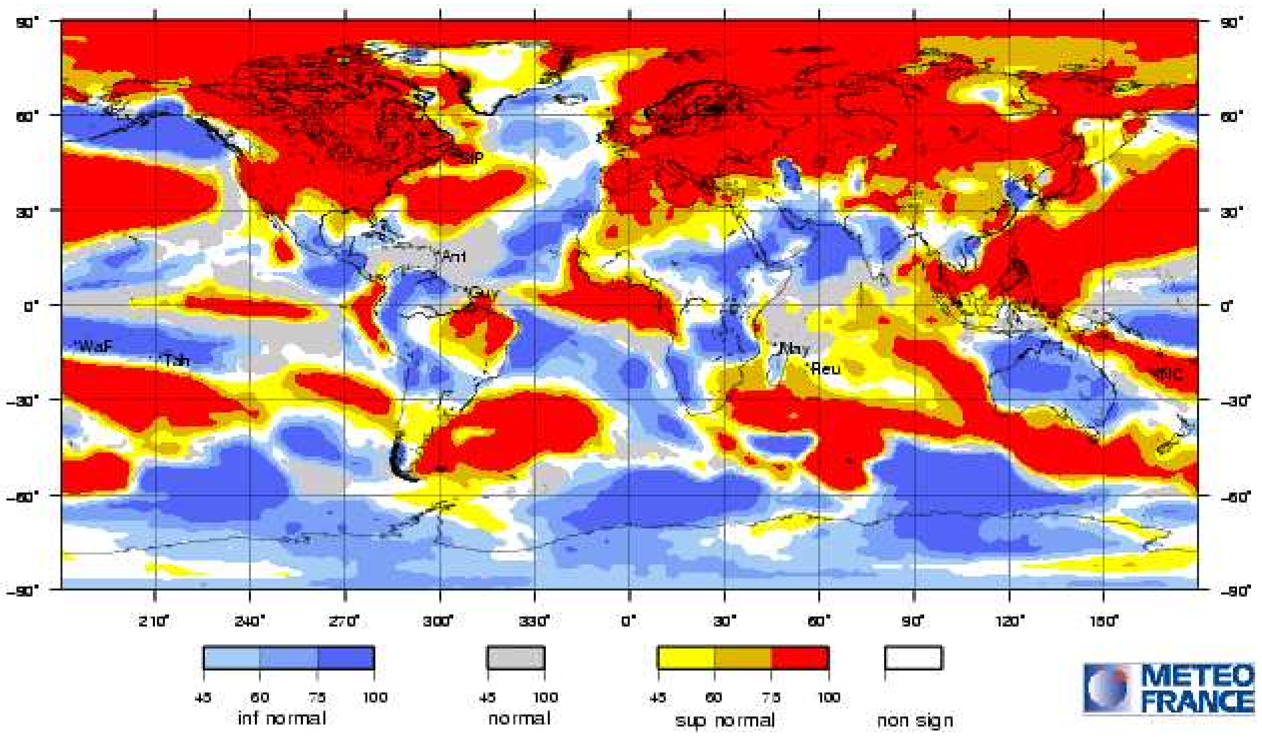


fig.24: Most likely category of T2m for April-May-June, issued in March from Météo-France. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://elaboration.seasonal.meteo.fr/

II.3.c Met Office (UKMO)

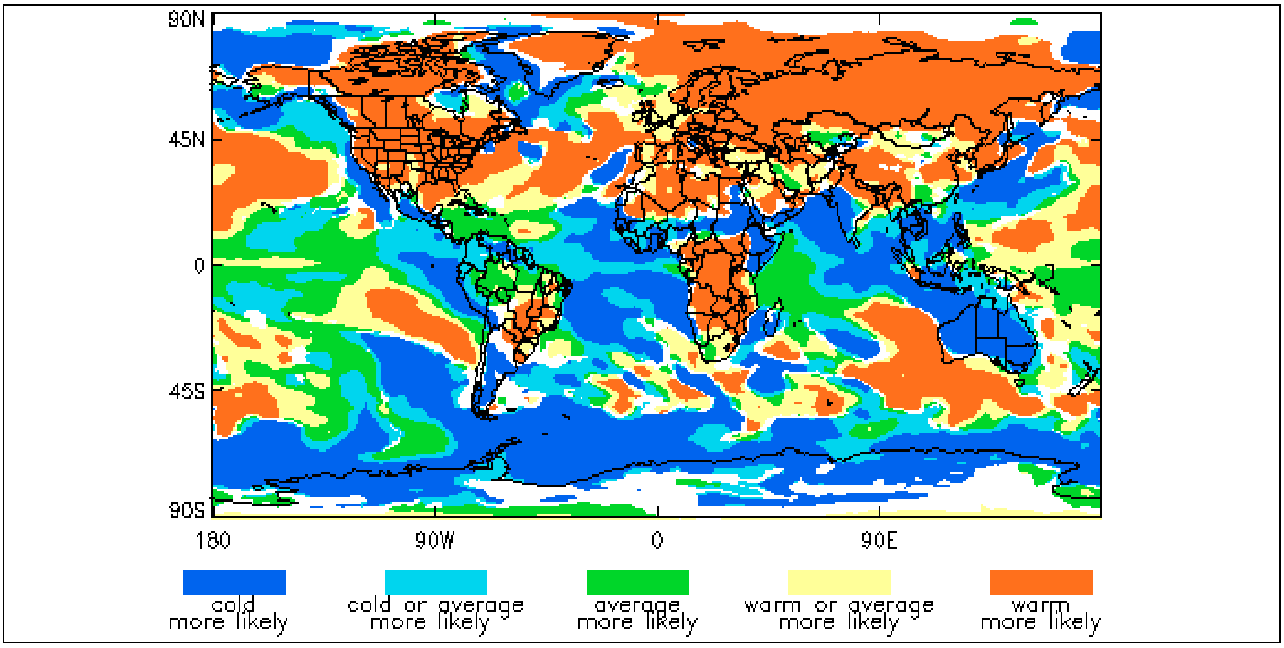


fig.25: Most likely category of T2m for April-May-June, issued in March from UK Met Office. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://www.metoffice.gov.uk/

II.3.d Japan Meteorological Agency (JMA)

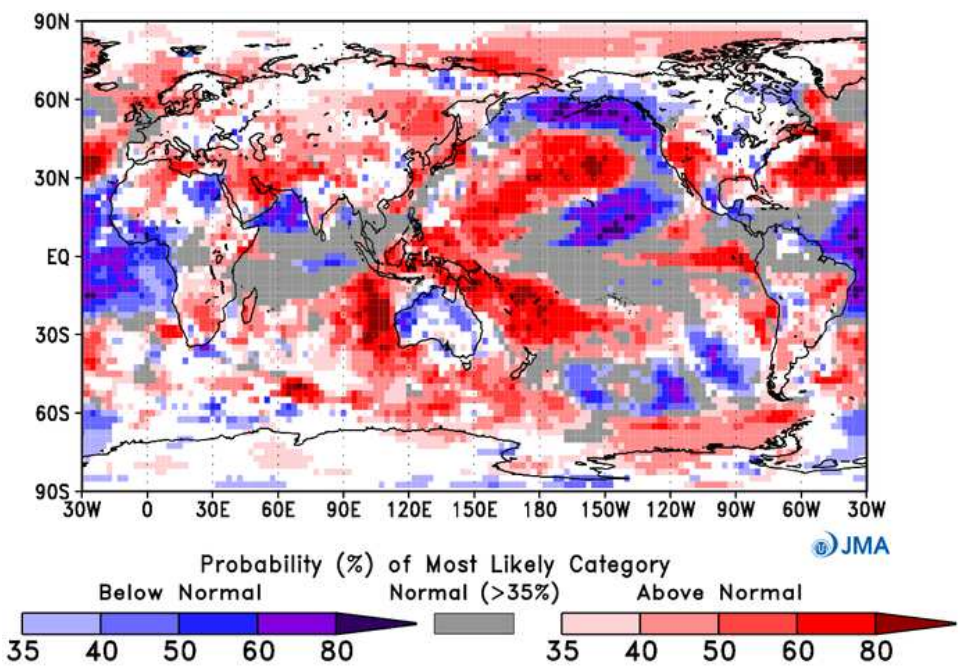


fig.26: Most likely category of T2m for April-May-June, issued in March from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. .
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/4mE/fcst/fcst_gl.html

II.3.e Euro-SIP

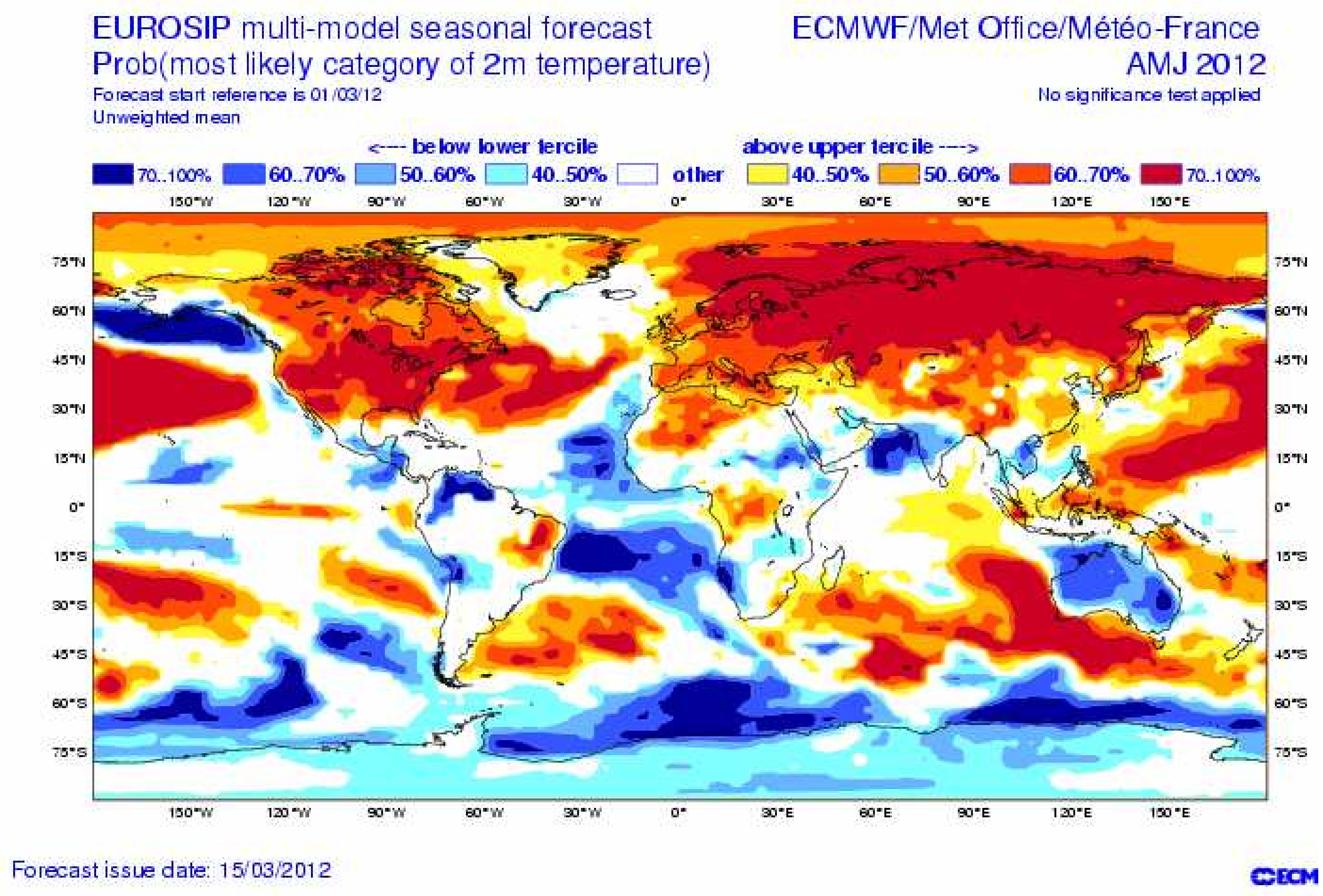


fig.27: Multi-Model Probabilistic forecasts for T2m from EuroSip for April-May-June, issued in March. (2 Categories, Below and Above normal – White zones correspond to No signal and Normal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

Most of the continent in the Northern Hemisphere face Above Normal situations. The signal is very consistent in all Euro-SIP individual models. As discussed in the previous section part of the signal is likely related to the Climate Trend. In addition, the predictability is not well establish for the mid-latitude (see discussion in the general circulation section and especially comments about the Stream Function anomalies) indicating that there is some uncertainty, especially over the western façade of Europe. However and interestingly, one can notice that on a statistical point of view, the occurrence of an El Niño tends to favour above normal temperature end of spring and beginning of summer in different regions of the RA VI. So consequently, the Euro-Sip forecast makes sense and most of Europe should face Above Normal conditions.

II.3.f International Research Institute (IRI)

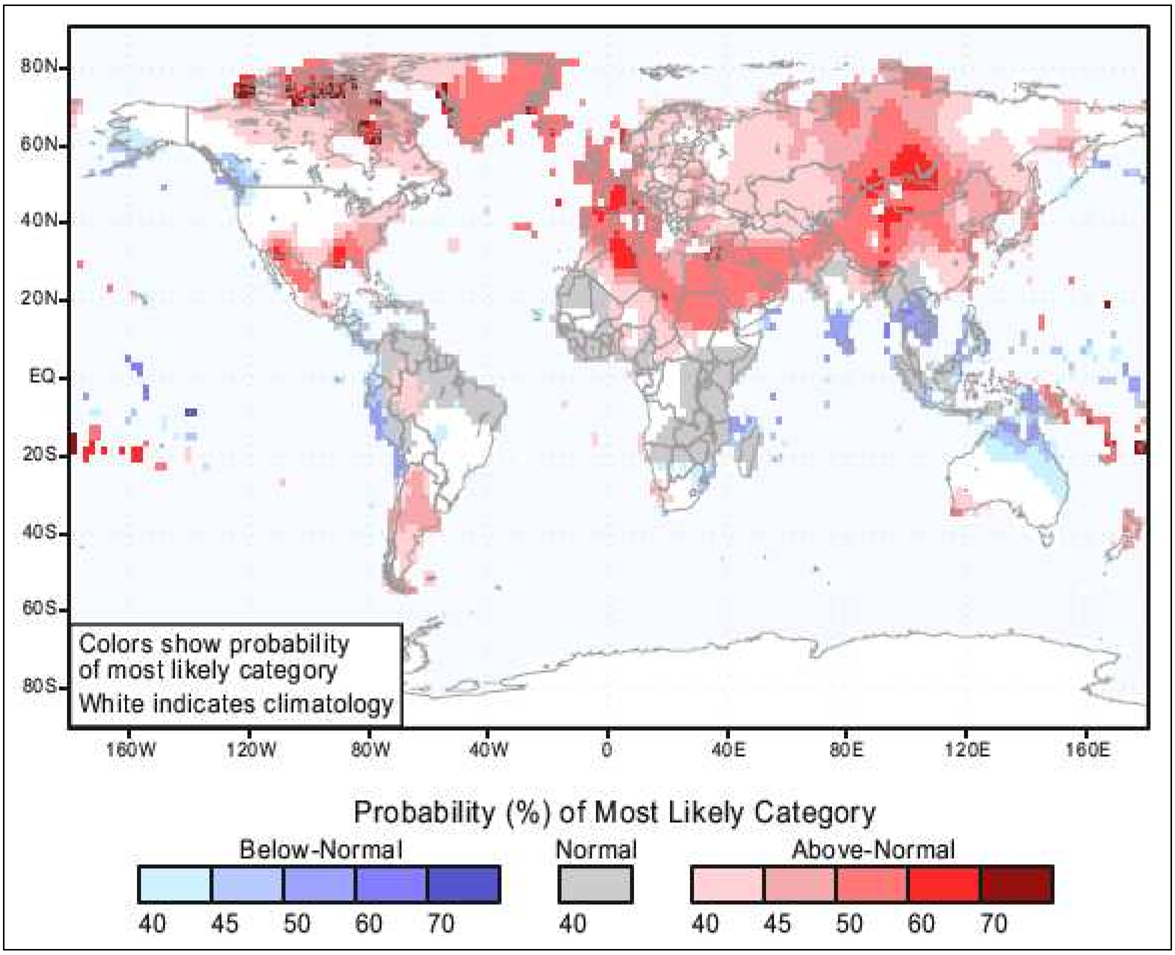


fig.28: Most likely category of T2m for April-May-June, issued in March from the IRI multi-model ensemble. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://iri.columbia.edu/climate/forecast/net_asmt/

One can notice a large consensus with the Euro-Sip forecast for the Northern hemisphere (excepted on the north-eastern coast of North America,). Some large differences exist on Africa and South America.

II.4. IMPACT : PRECIPITATION FORECAST

II.4.a ECMWF

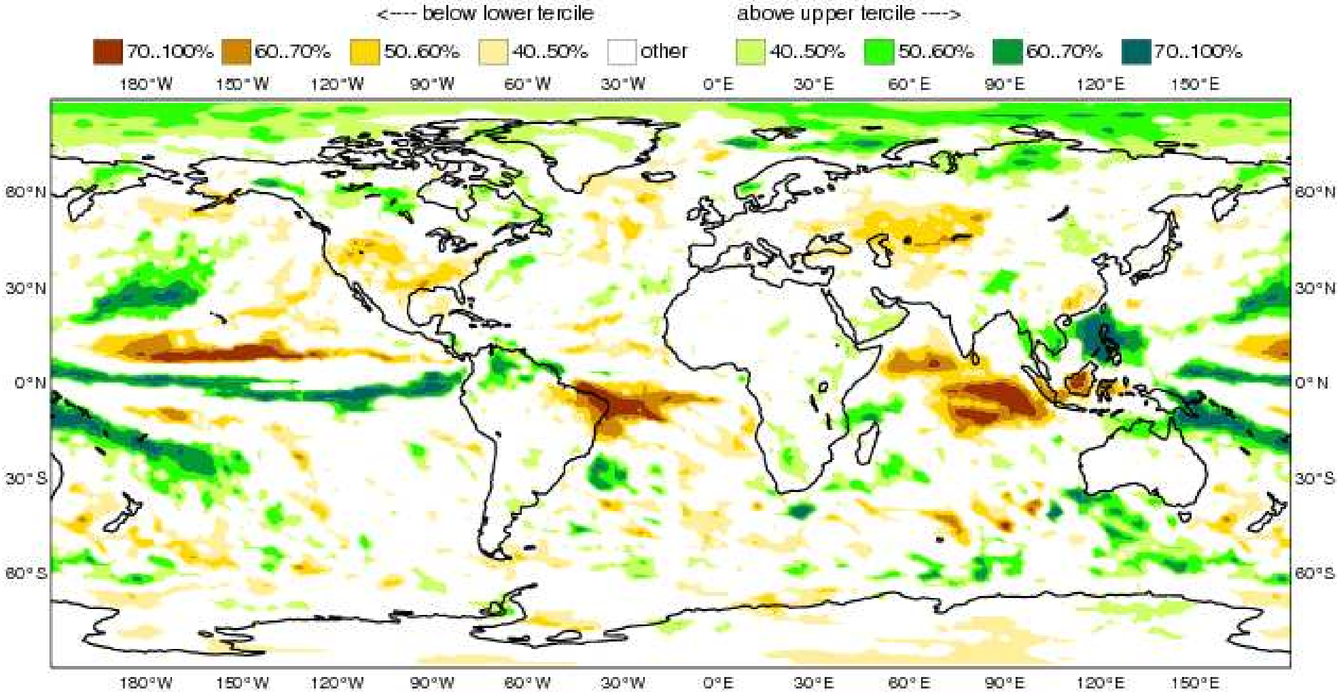


fig.29: Most likely category probability of rainfall from ECMWF for April-May-June, issued in March. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/charts/seasonal_charts_s2/

II.4.b Météo-France

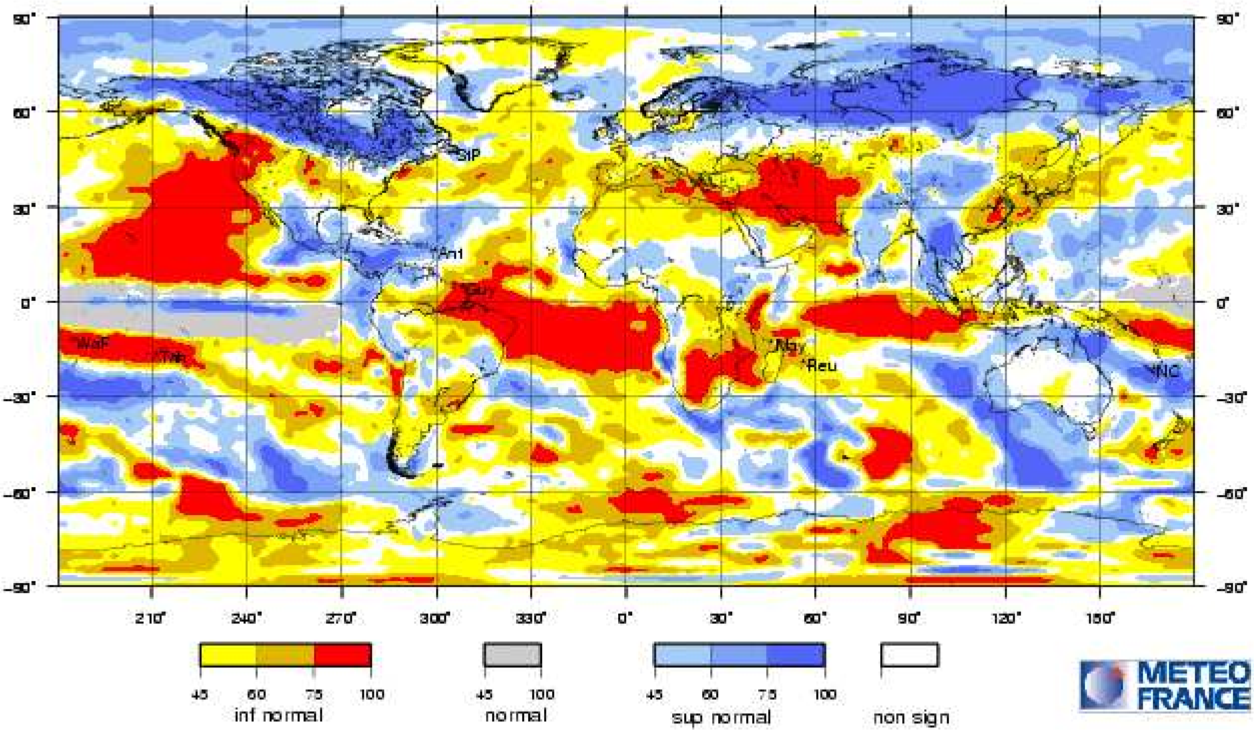


fig.30: Most likely category of Rainfall for April-May-June, issued in March. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.4.c Met office (UKMO)

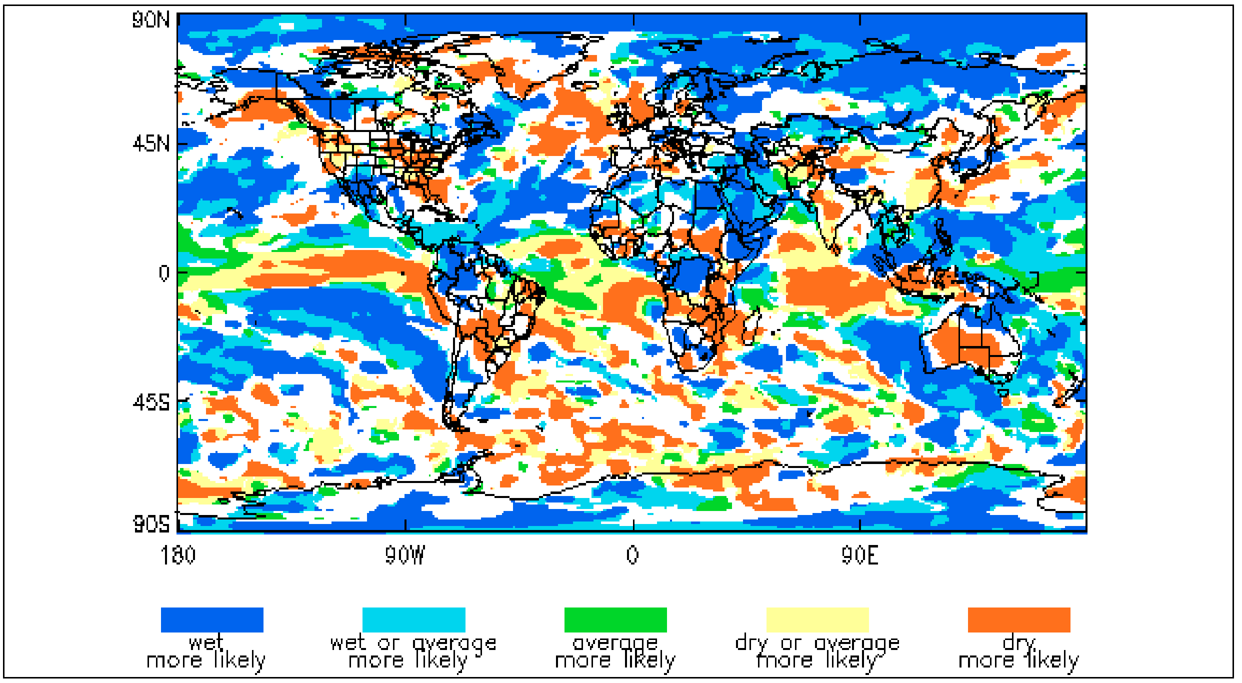


fig.31: Most likely category of Rainfall for April-May-June, issued in March from UK Met Office. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://www.metoffice.gov.uk/

II.4.d Japan Meteorological Agency (JMA)

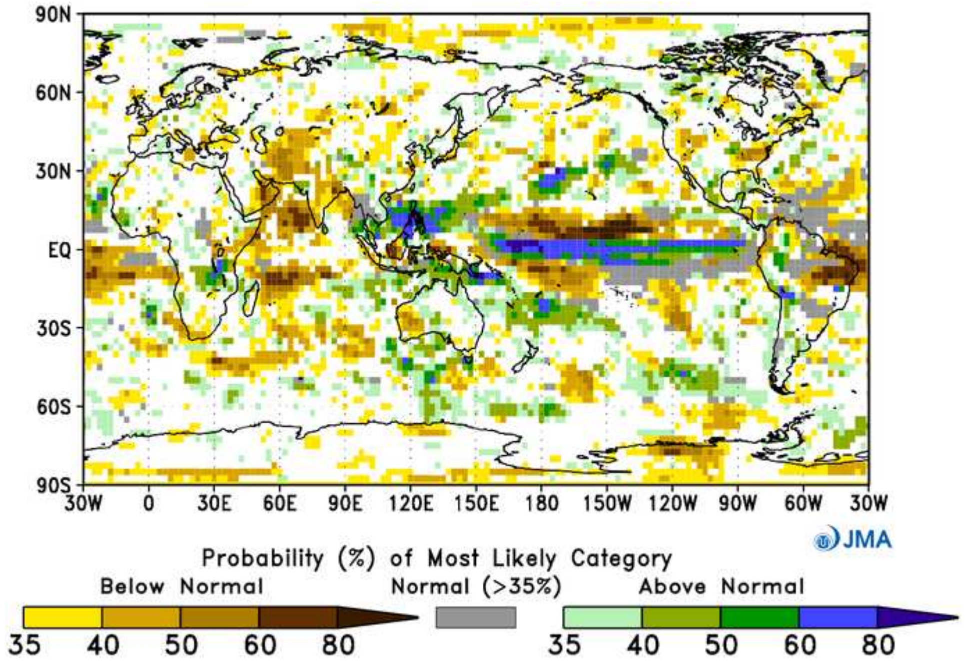


fig.32: Most likely category of Rainfall for April-May-June, issued in March from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/4mE/fcst/fcst_gl.html

II.4.e Euro-SIP

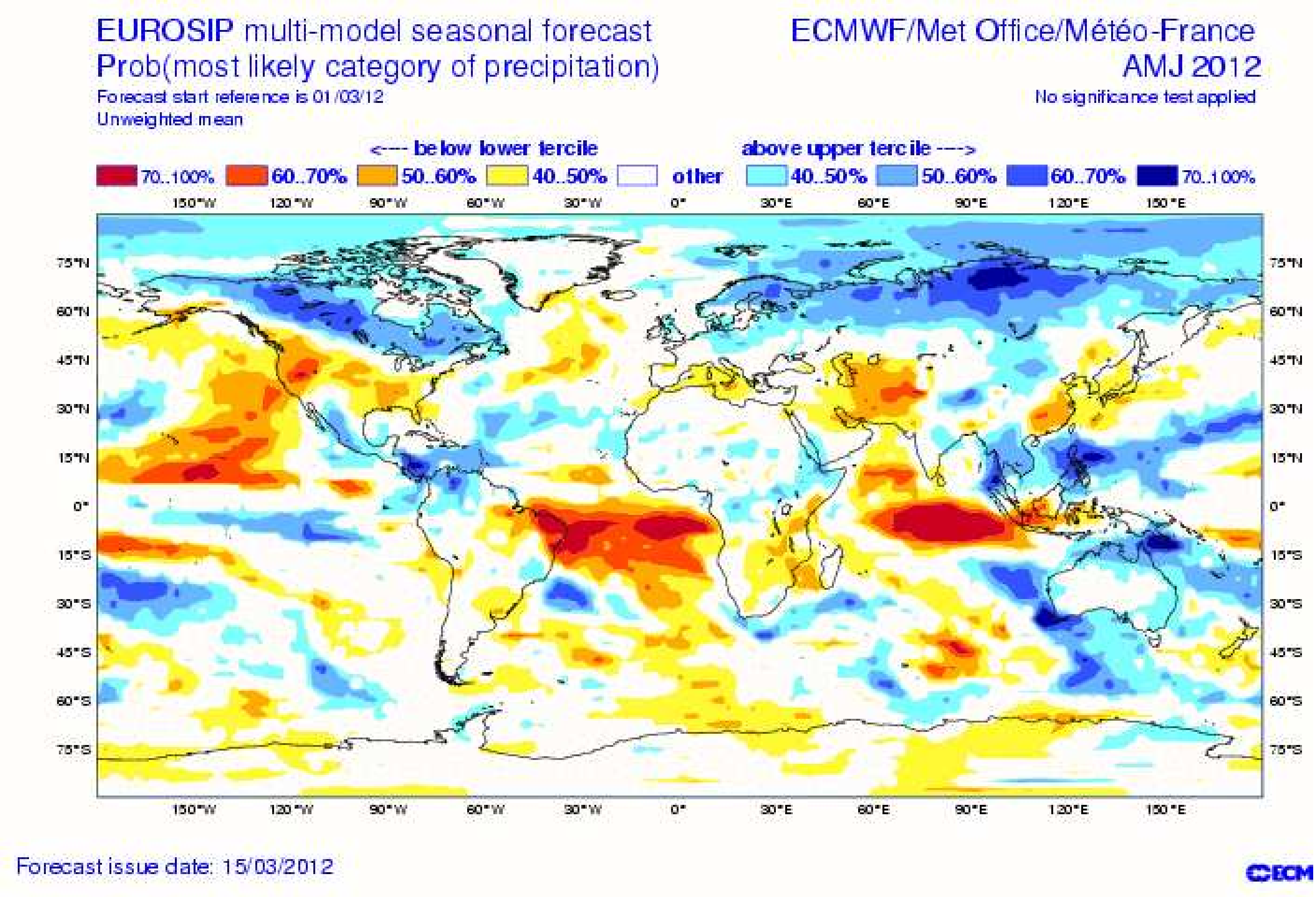


fig.33: Multi-Model Probabilistic forecasts for precipitation from EuroSip for April-May-June, issued in March. (2 Categories, Below and Above normal – White zones correspond to No signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

Referring to Euro-SIP forecasts, there is some consistency over Northern Europe and Siberia, North America, Central America and the Southern part of the Caribbean, Nordeste Brazil, Australia, South-East Asia and regions close to Iran.
One can see that the forecast is not consistent with the development of a Niño event, likely in relationship with the limited predictability already discussed and some atmosphere/ocean coupling not yet active.
For Europe, despite the limited predictability, it seems that Below Normal conditions could be forecasted for coastal regions surrounding the Mediterranean Basin while Above Normal conditions should prevail for the Northern Europe.

II.4.f International Research Institute (IRI)

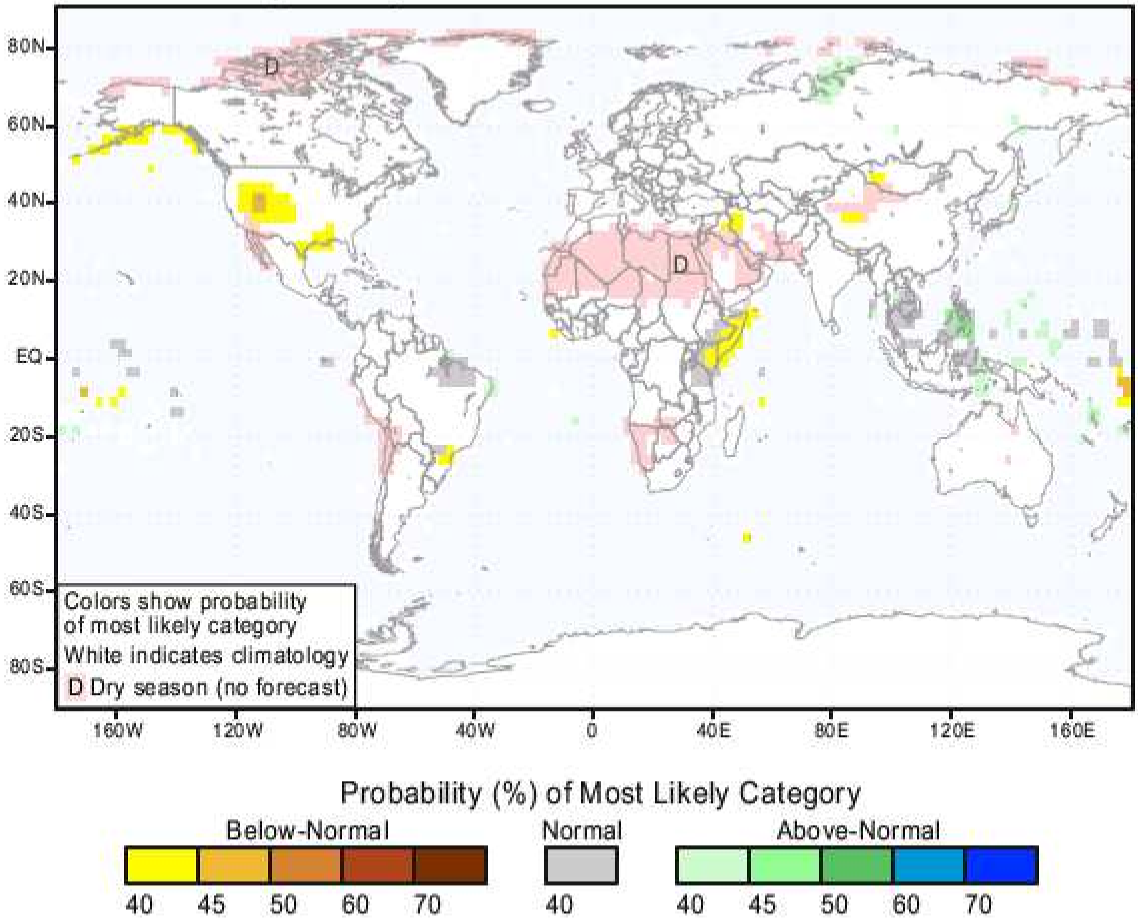


fig.34: Most likely category of Rainfall for April-May-June, issued in March from the IRI multi-model ensemble. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. **http://iri.columbia.edu/climate/forecast/net_asmt/**

The IRI forecast shows No Signal more or less everywhere. However, there is some traces of consistency with Euro-SIP over USA and Eastern Africa. Any way, for the European continent there is no signal.

II.5. REGIONAL TEMPERATURES

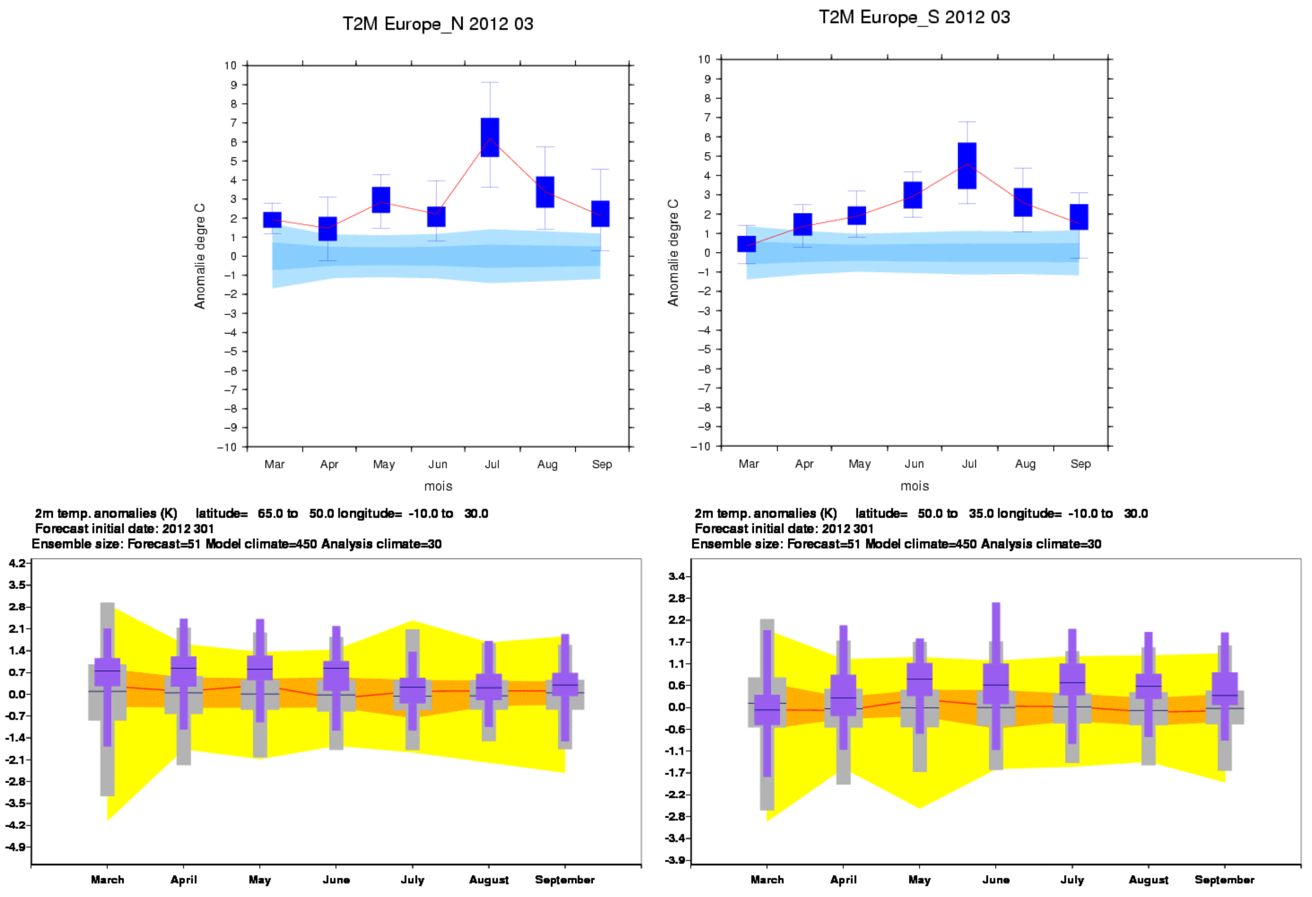


fig.35: Climagrams for T2m in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom) issued in March.

For both Northern and Southern Europe, the 2 models show some consistency for Above normal conditions on the AMJ period. With respect of the General Circulation discussion and T2m discussion, this is not surprising ; the question being to separate the part related to the climate trend from the part related to the seasonal anomaly . The differences between the two models can be likely related to the model uncertainties and to the climate trend representation which is clearly overestimated in MF, leading to unrealistic forecasts also very visible in Z500 forecasts. In Météo-France, for Northern Europe, there is a reasonable skill from April to June, no score in July and some score after. For Southern Europe there is only little skill in April and May while some noticeable skill exist from June to August.

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

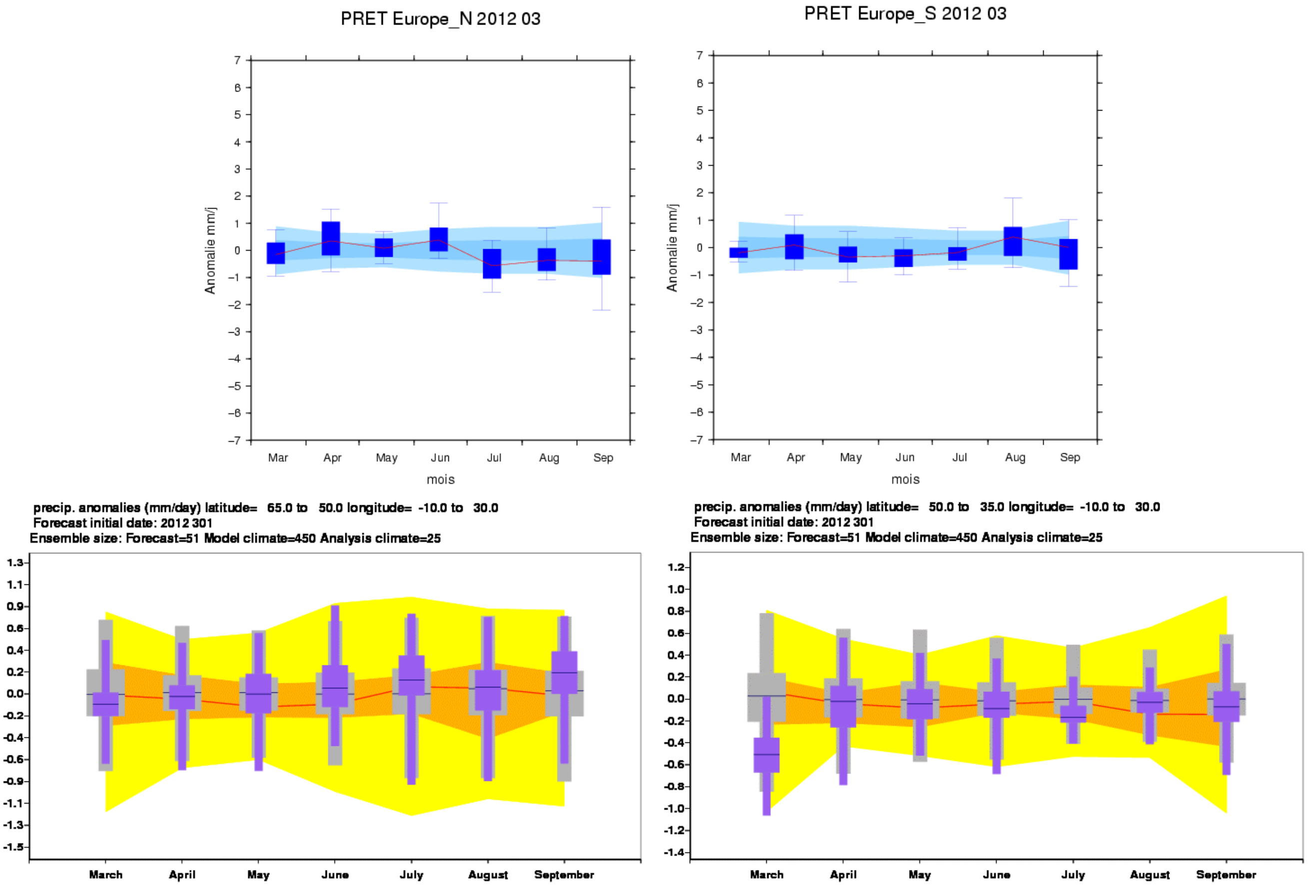


fig.36: Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom), issued in March.

For Northern Europe both models tend to forecast slightly Above normal conditions (a bit more marked in MF than in ECMWF). However, excepted for March, the scores are very close to climatology. For Southern Europe, ECMWF show intraseasonal evolutions close to normal conditions (precisely close to climatology) while in Météo-France there is some tendency to be close to climatology in March and then a tendency to have Below Normal conditions. However, here also the scores are very close to climatology. So these intraseasonal evolution should be interpreted with caution. Last one should notice that the size of the boxes doesn't allow to distinguish the coastal regions surrounding the Mediterranean basin.

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

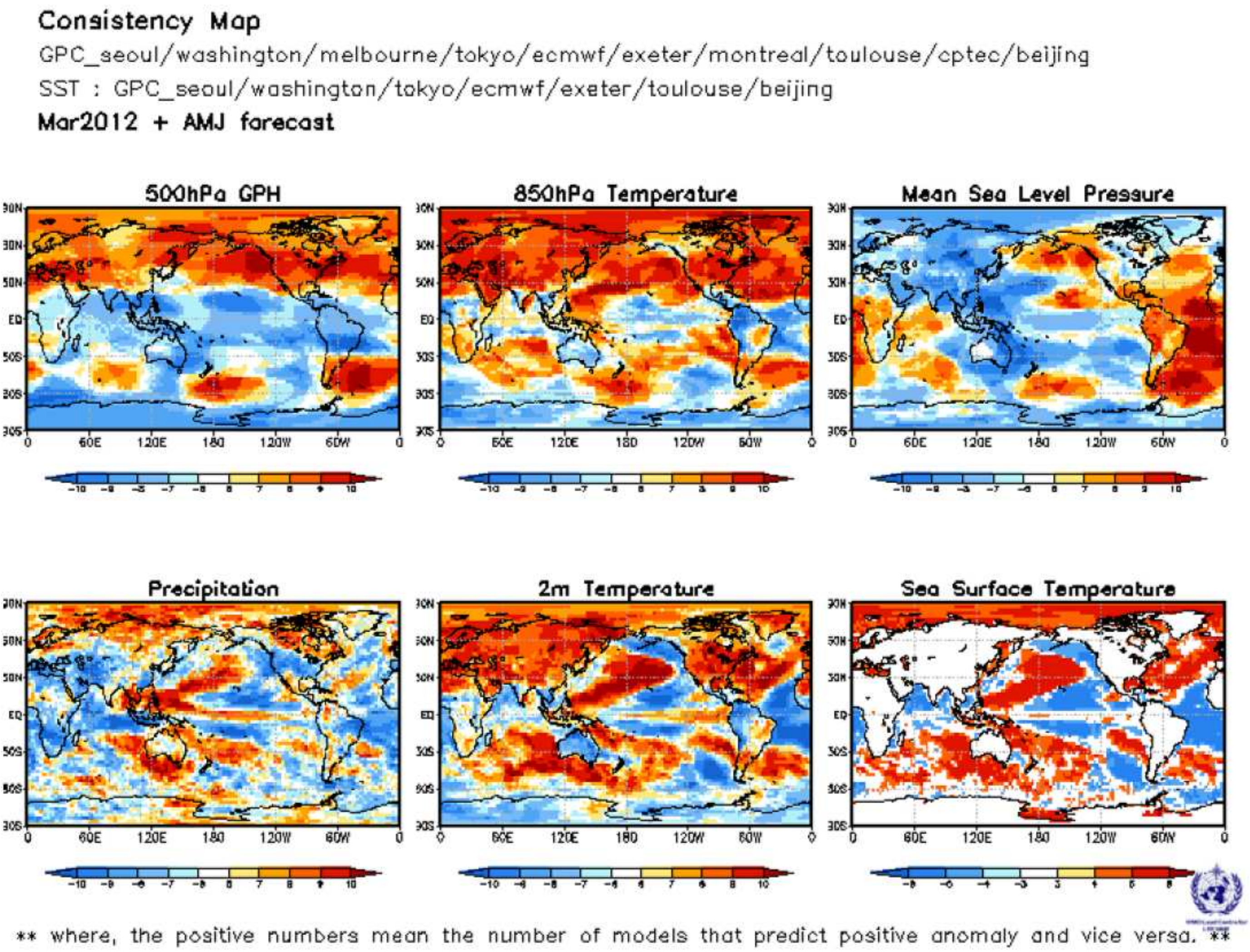


fig.37: GPCs Consistency maps from LC-MME http://www.wmolc.org/

For T2m, over the Northern hemisphere, all the models are very consistent with a positive anomaly covering all the continental surfaces. So the Euro-SIP forecast is likely a very good synthesis to take on board. For precipitation, there is only clearly less consistency. However, one can notice the tendency already pointed out in Euro-SIP for Above normal conditions in Northern Europe and below normal conditions around the Mediterranean basin. Again, the Euro-SIP forecast could make sense despite the low predictability for rainfall.

II.7. “EXTREME” SCENARIOS

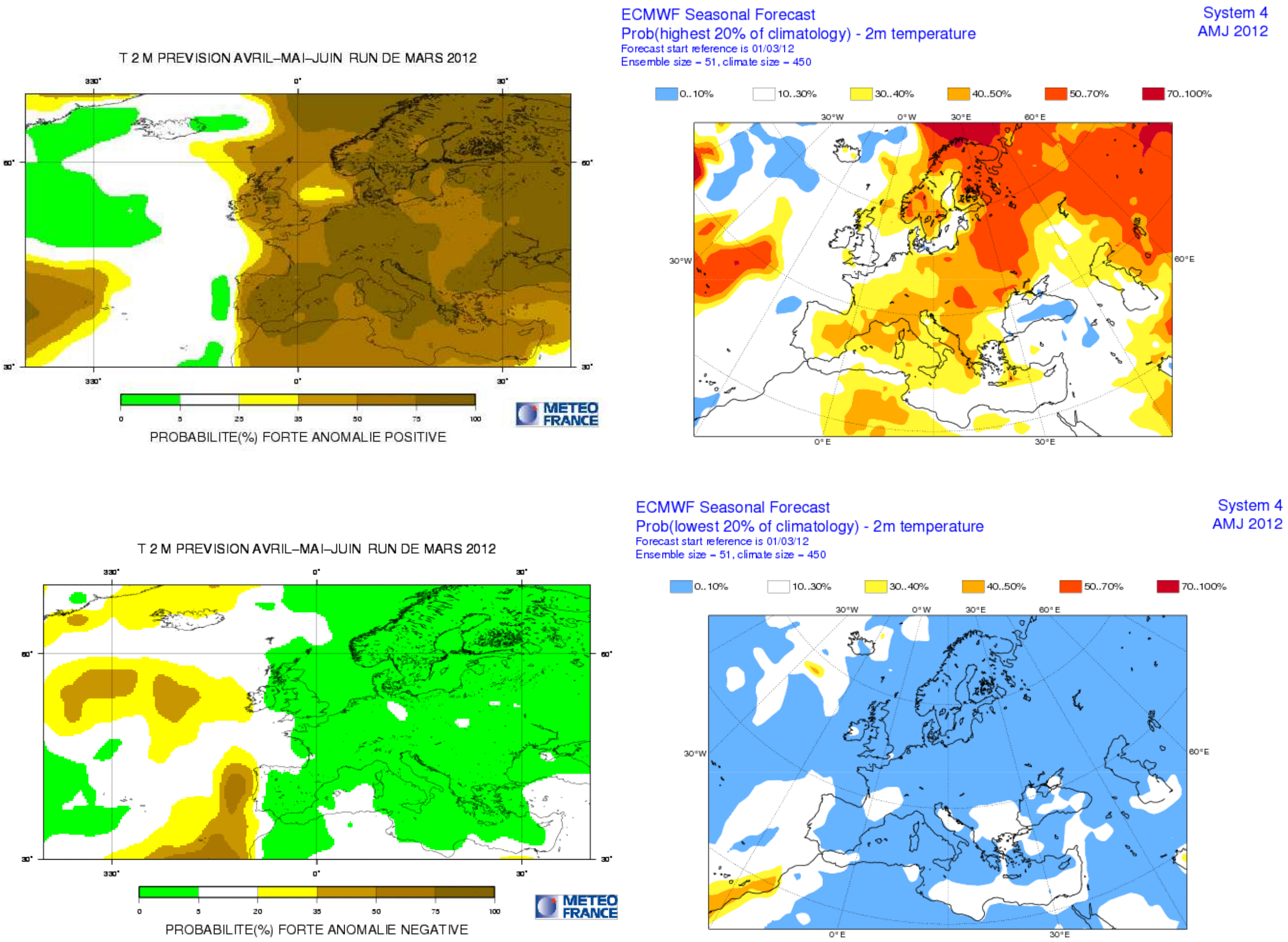


fig.38: Top : Probability of « extreme » above normal conditions for T2m for Meteo-France (left - highest ~15% of the distribution) and ECMWF (right - highest 20% of the distribution).
Bottom : Probability of « extreme » Below normal conditions for rainfall for Meteo-France (left - lowest ~15% of the distribution) and ECMWF (right – lowest 20% of the distribution).
For April-May-June, issued in March.

There is some consistent signal on Europe for enhanced probabilities of very above normal scenario even if there is some differences in the probabilities (probabilities stronger in MF likely in relationship with the unrealistic climate trend already discussed). In Météo-France the ROC score is above climatology for the very above normal scenario (locally it can reaches 0.7) indicating some skill for the forecast over these regions. To be notice that there is some lack of skill on the very Northern part of Scandinavia and for regions around and East to the Black sea..

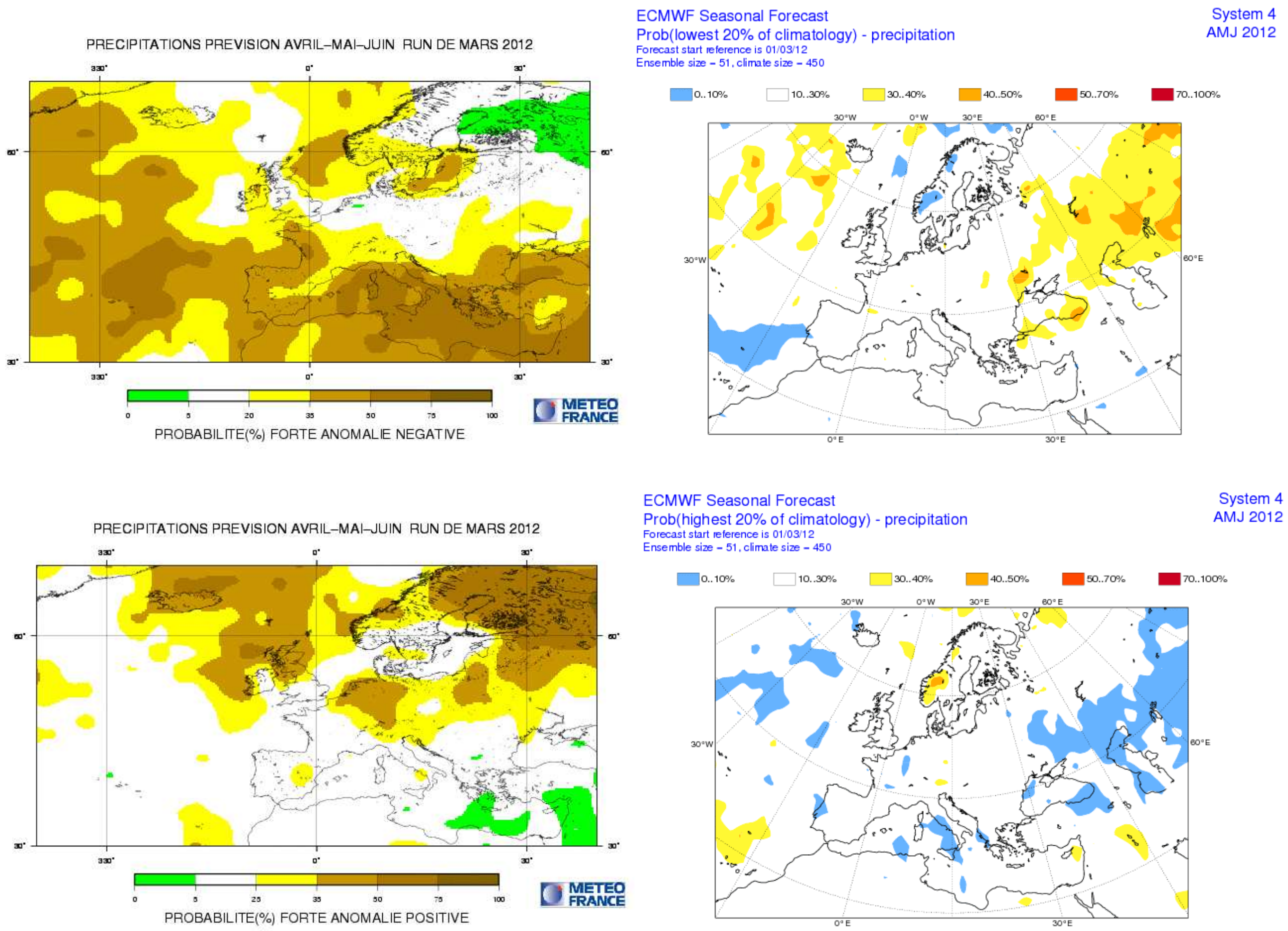


fig.39: Top : Probability of « extreme » Below normal conditions for rainfall for Meteo-France (left - lowest ~15% of the distribution) and ECMWF (right - lowest 20% of the distribution)
Bottom : Probability of « extreme » Above normal conditions for rainfall for Meteo-France (left - highest ~15% of the distribution) and ECMWF (right – highest 20% of the distribution).
for April-May-June, issued in March.

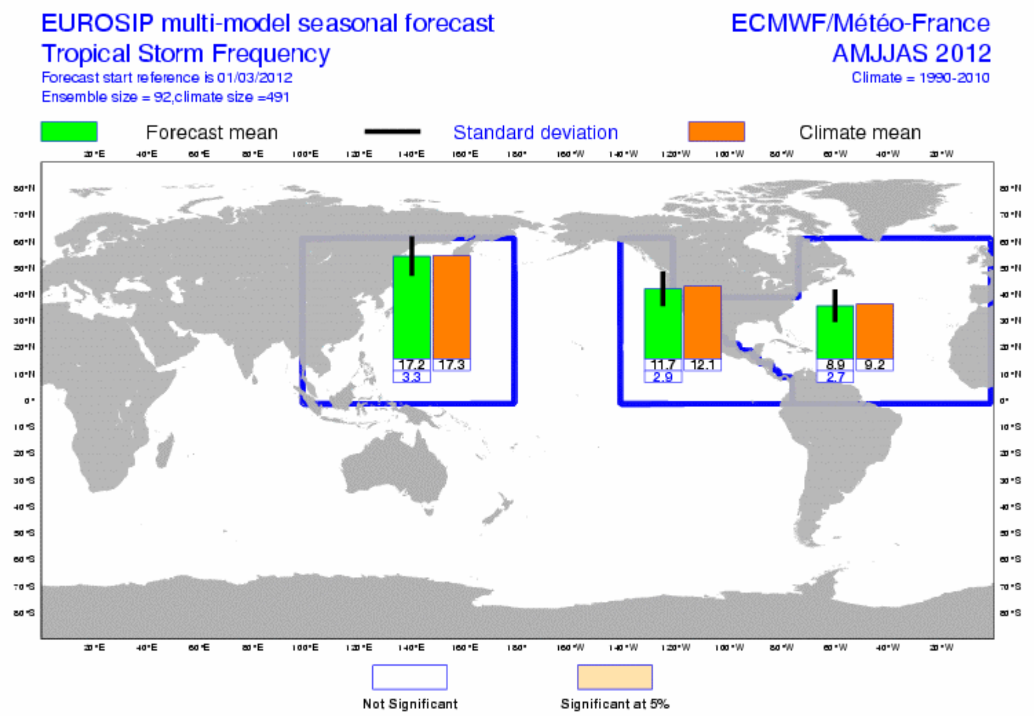
For the very Below and Above Normal scenarios, even if the probabilities are high in Meteo-France there is no consistency between the 2 models. When adding the low predictability consideration, it's seems difficult to infer any useful information from these forecast.

II.8. DISCUSSION AND SUMMARY

Forecast over Europe

The first comment is about the predictability which seems to be not very high for Europe (see general circulation discussion). Related to Geopotential Height forecasts, it seems that the exceedance of Blocking regimes and deficit of Atlantic Ridge regimes make sense despite it's difficult to separate the climate trend part from the seasonal one (especially for blocking regimes). Interestingly these two regimes are the ones which favour warm temperature and potentially heat waves on the western side of Europe.
For temperature, whatever the reasons, the Above Normal scenario makes sense for most of European countries.
For rainfall, the predictability is quite low but some consistent signal seems to exists for the Northern part of Europe (Above Normal scenario) and for coastal regions of the Mediterranean basin (Below Normal scenario). Elsewhere "No privileged Scenario" should prevails (Climatology forecast).
However, some downscaled information could details these scenarios for specific countries or sub-regions.

Tropical Cyclone activity



For the beginning of the season in the Northern hemisphere, Euro-Sip forecasts indicate a close to normal cyclonic activity elsewhere. For the North Tropical Atlantic this is likely related to the cooling of the Tropical Atlantic counterbalanced by a quite active ITCZ.

fig.40: Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF) for the April to September 2012 period, issued in March.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro/eurosip_tropical_storm_frequency/

Synthesis of Temperature forecasts for April-May-June 2012 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									
JMA									
Synthesis	*3/4*	*4/4*	*3/4*	*3/4*	*4/4*				
Eurosip									
IRI									
Privileged Scénario by RCC-LRF Node	***Above Normal***	***Above Normal***	***Above Normal***	***Above Normal***	***Above Normal***				

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

Synthesis of Rainfall forecasts for April-May-June 2012 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									
JMA									
Synthesis		*3/4*	*4/4*	*4/4*	*2/4*				
Eurosip									
IRI									
Privileged Scénario by RCC-LRF Node	***Above Normal***	***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, 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.

■ IRI and Euro-SIP provide multi-model forecasts. Euro-Sip is presently composed using 3 models (ECMWF, Météo-France and UK Met Office). IRI uses several coupled and forced models optimally combined.

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).

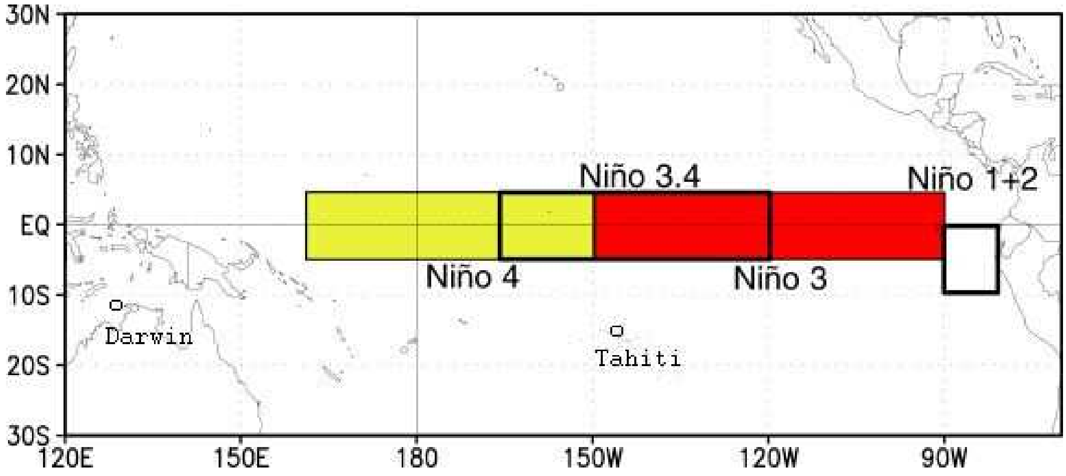
In order to better interpretate the results, it is recommended to look to verification maps and graphs which give some insight into the expected level of skill for a specific parameter, region and period. A set of scores is presented on the web-site of the Lead-Centre for Verification (see http://www.bom.gov.au/wmo/lrfvs/)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

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).

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.