GLOBAL CLIMATE BULLETIN
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I. DESCRIPTION OF THE CLIMATE SYSTEM (MARCH 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 continue to evolve (fig.1) especially in the in the South-Eastern part of the basin. The SSTs are warming, Above Normal temperatures are observed especially close to South-America in the subtropical regions and also in the equatorial waveguide. In both hemispheres, the positive anomaly in the western part which extend to the higher latitudes continue to decrease. Even, it becomes close to normal in the South-Western part of the Pacific basin and along the SPCZ.

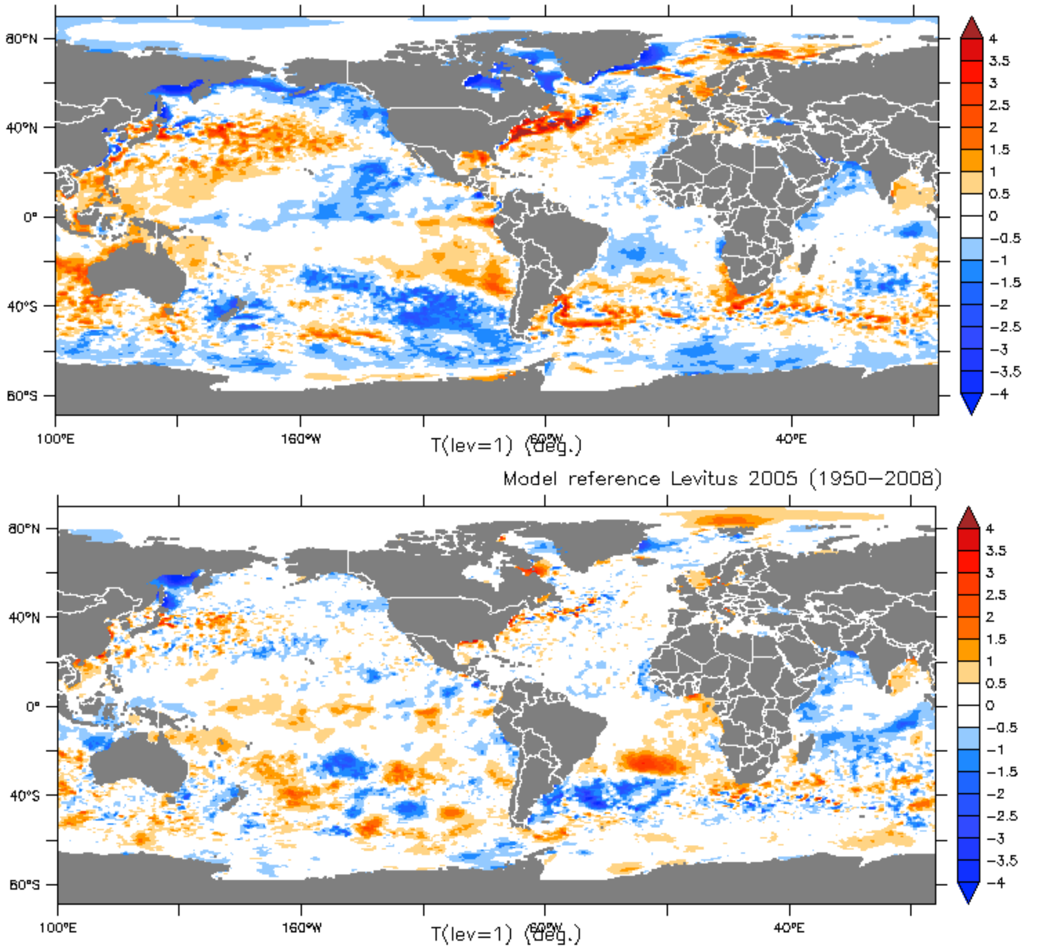


fig.1: top : SSTs Anomalies in March 2012 (°C) (reference 1950-2008)
bottom : SST tendency (current – previous month) http://bcg.mercator-ocean.fr/

The Atlantic show some evolutions in the Southern hemisphere, especially in the sub-tropics and the Guinean Gulf, while the Indian Ocean is mostly cooling especially close to the equatorial waveguide and in the North-Western part of the basin.

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, the patterns are quite fragmented and show conditions not too far from normal.
In the equatorial wave guide of the Indian Ocean, the heat content is decreasing (consistently with the cooling of SSTs) in the regions close to the equatorial waveguide.

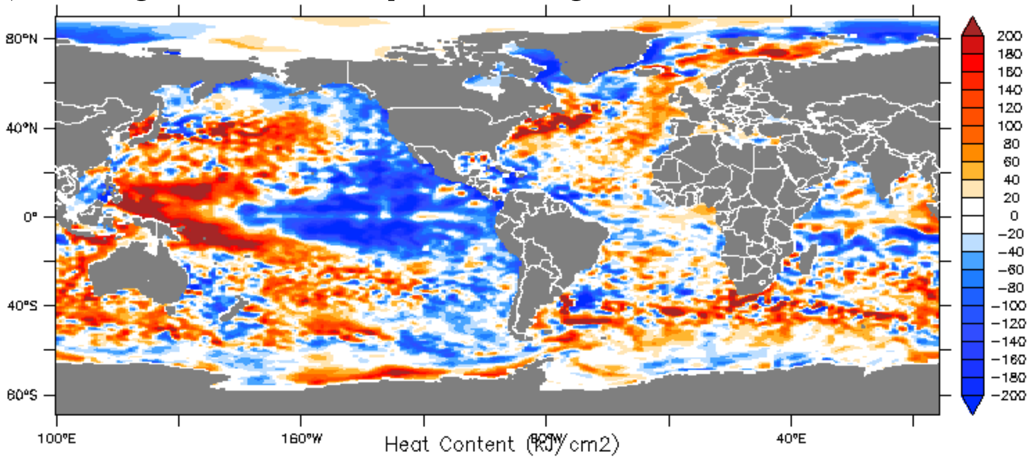


fig.2: map of Heat Content Anomalies (first 300m) in March 2012 (kJ/cm²). (reference 1950-2008)
http://bcg.mercator-ocean.fr/

I.1.b Pacific Basin

In March, a positive anomaly in the Eastern equatorial Pacific continue to develop (fig.3) while close to the date line the negative anomaly related to La Niña is still visible but significantly weaker than for the previous month. In the Western part of the basin the negative zonal Trade Wind anomaly continue to weaken while on the most Eastern part only meridional anomalies are present.

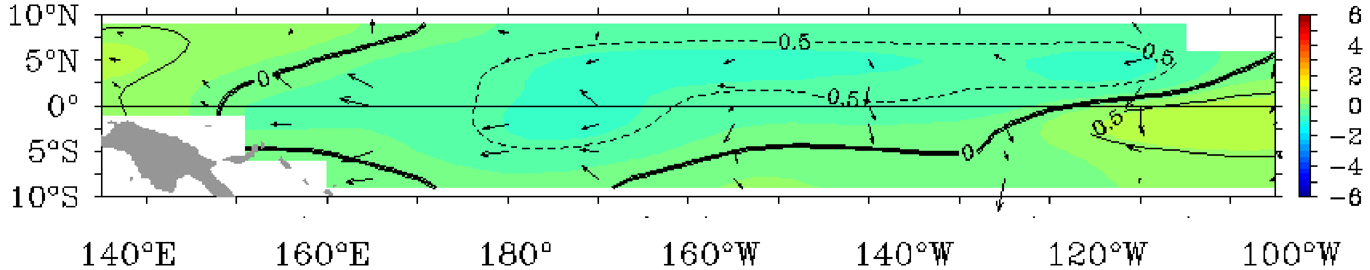


fig.3: SST Anomalies and Wind anomalies in March 2012 over the Equatorial Pacific from TAO/TRITON.
http://www.pmel.noaa.gov/tao/jsdisplay/monthly-summary/monthly-summary.html

In the Niño boxes (4, 3.4, 3 et 1+2 ; see definition in Annex) the SST anomalies are still negative in the central part while they return to close to Normal in the Eastern part of the basin. The monthly averages in March are respectively -0,7°C, -0,6°C, -0,3°C and +0,3°C from West to East (ending phase of La Niña).

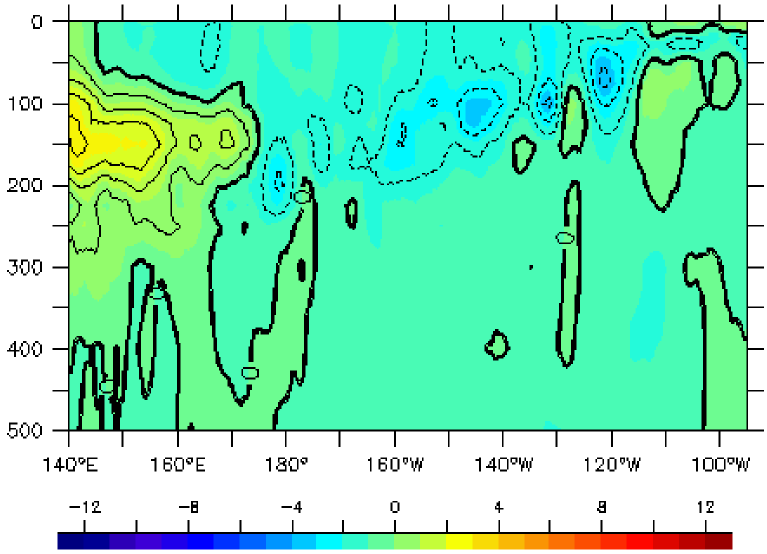


fig.4: Oceanic temperature anomaly in the first *500 metres* in the Equatorial Pacific, in March 2012 *(http://bcg.mercator-ocean.fr/)*

In the equatorial waveguide (fig. 4) the warming in the eastern part is now visible under the surface and the negative anomaly under the surface has dramatically decreased. On the Western side the warm reservoir around 150 m the positive anomaly seems to decrease and the slow Eastward propagation to stop. To be quoted that the last MJO forecast doesn't show a strong MJO activity for the next month.
Looking to the thermocline structure, in March over the Equatorial Pacific, the La Niña like dipole is disappearing (fig. 5). At the end of the period one can see the trace of the SST warming on the most eastern part and also some traces of Kelvin wave propagation in the equatorial waveguide.

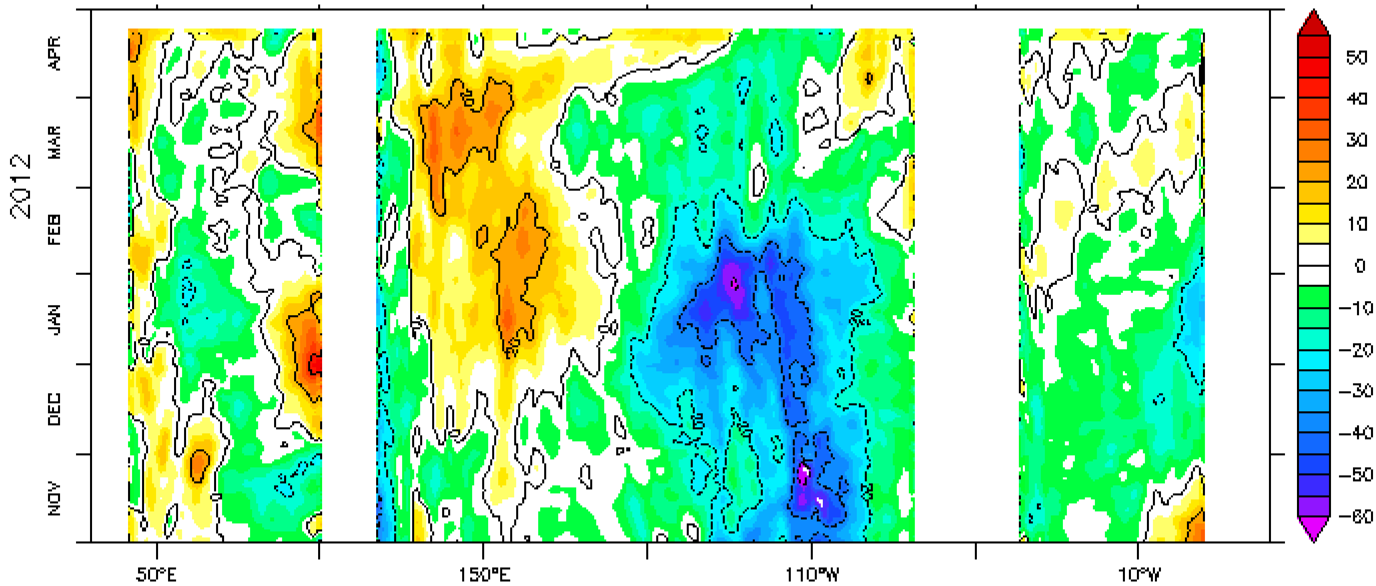


fig.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 6 month period. http://www.ecmwf.int/

I.1.c Atlantic Basin

The Northern part of the tropical Atlantic ocean is now close to normal in the Western part while the negative anomaly develops close to West African coasts. In the equatorial waveguide the negative anomaly previously noted is vanishing consistently with the heat content behaviour. In the Southern Hemisphere (Tropics and sub-tropics), one can notice still below normal conditions and a dipole pattern between the mid-latitudes and the sub-tropics. However, both anomalies are decreasing. These changes contribute to a South/North meridionnal gradient which should influence the beginning of the West African monsoon. In the equatorial waveguide (fig. 5) there is some traces of a Kelvin wave propagation which could lead to a warming of subsurface temperature. The signal is consistent with the surface signal (see SST comments) and the heat content.

I.1.d Indian Basin

In the Indian Ocean, there is a general cooling in the equatorial and North-Western regions, but more marked in the central and eastern part. Consequently, the DMI has dramatically changed from a negative to a positive phase (+0.45°C). In the Southern hemisphere, the Eastern part is still above normal while the western part returns close to normal conditions. In subsurface the thermocline is deeper than normal elsewhere in the equatorial waveguide but with some indication of weakening.

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 dramatic evolutions with respect of the previous month. On can remark the very strong Divergent Circulation anomaly (negative anomaly) over the Western Pacific which extends toward Japan to the North and Australia and the SPCZ region to the South. This anomaly is likely partly related to the MJO which was especially active during the March period in the regions close to the maritime sub-continent. This anomaly also extend toward Central Pacific and the French Polynesia in the Southern Hemisphere. In the Northern Hemisphere, over the Central Tropical Pacific there is a positive anomaly (convergent circulation anomaly ; downward anomaly motion) followed in the Eastern part of the basin by a Divergent Circulation anomaly clearly related to the positive SST anomaly. The SOI is still positive (+ 0.7) even if both contributors (Tahiti and Darwin) show negative anomalies, especially in relationship with the Divergent Circulation anomalies already pointed out (West and Southern Pacific).

A strong positive anomaly (convergent circulation anomaly ; downward anomaly motion) has developed over the Southern Atlantic likely in relationship with the cold SSTs in this area. Interestingly, this large scale pattern could influence the West African monsoon circulation by strengthening the Northward low level circulation. Associated also with the positive anomaly over the West Tropical Atlantic and the Northern part of the Caribbean, one can remarks the local divergent circulation anomaly over the North of South America and the most Southern 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 region is contrasted with both the influence of an enhanced large scale convection (Eastern side) and the influence of a convergent circulation anomaly (over Pakistan). One can also remark the enhancement of the indirect Walker cell of the Indian ocean.

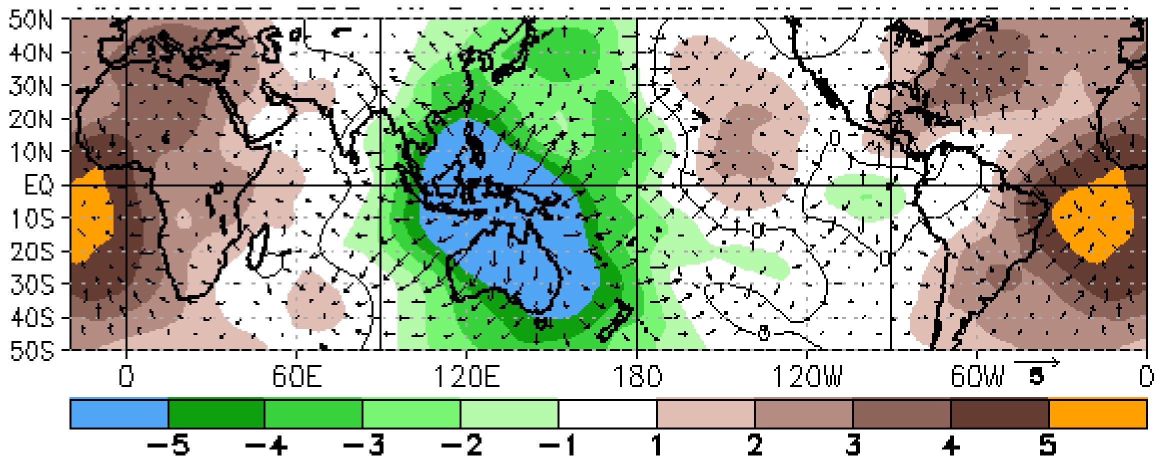


fig.6: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly for March 2012. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly).
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

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 all across the Pacific Basin. The anomalies which reach the Caribbean and the North Eastern region of North America seem to be well related to tropical forcing. The positive anomaly seen on the North-Western façade of Europe could be also partly related to tropical forcing.

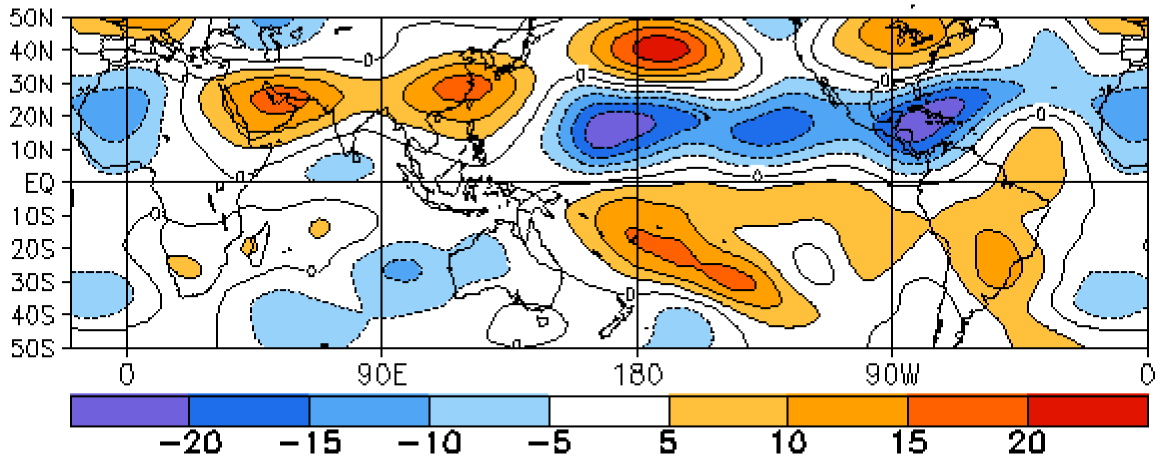


fig.7: Stream Function Anomalies at 200 hPa in March 2012.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

Over the Northern Hemisphere the Geopotential height at 500 hPa (fig. 8) shows a strong positive anomalies over the North-Eastern part of North America and the North-Western façade of Europe. Obviously these anomalies are very consistent with the Stream Function anomalies already discussed. The main atmospheric modes in the Northern hemisphere (see next table) which show noticeable values are the East Pacific/North Pacific (-2.6); the East Atlantic/ West Russia (+1.3) and the Polar/Eurasia (-1.4). The NAO mode is positive (+0.9) but it's not corresponding to an increased zonal circulation (only a projection effect). The EP/NP mode is clearly related to the Pacific forcing (see stream function discussion). It's less clear for the EA/WR mode even if the positive anomaly could be (at least partly) tropically forced.

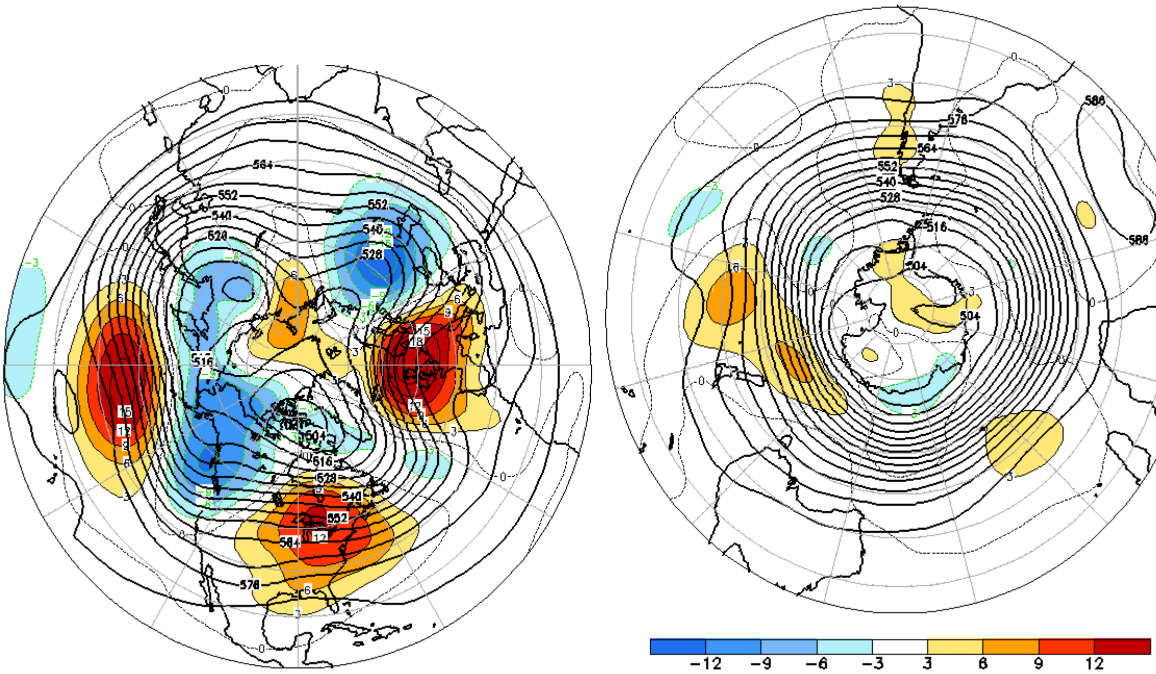


fig.8: Anomalies of Geopotential height at 500hPa in March 2012 (left North Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige9.shtml, and right South Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige15.shtml)

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

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
MAR 12	0.9	-0.6	0.8	-2.6	-0.2	---	1.3	-0.5	-1.4
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

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

I.2.b Precipitation

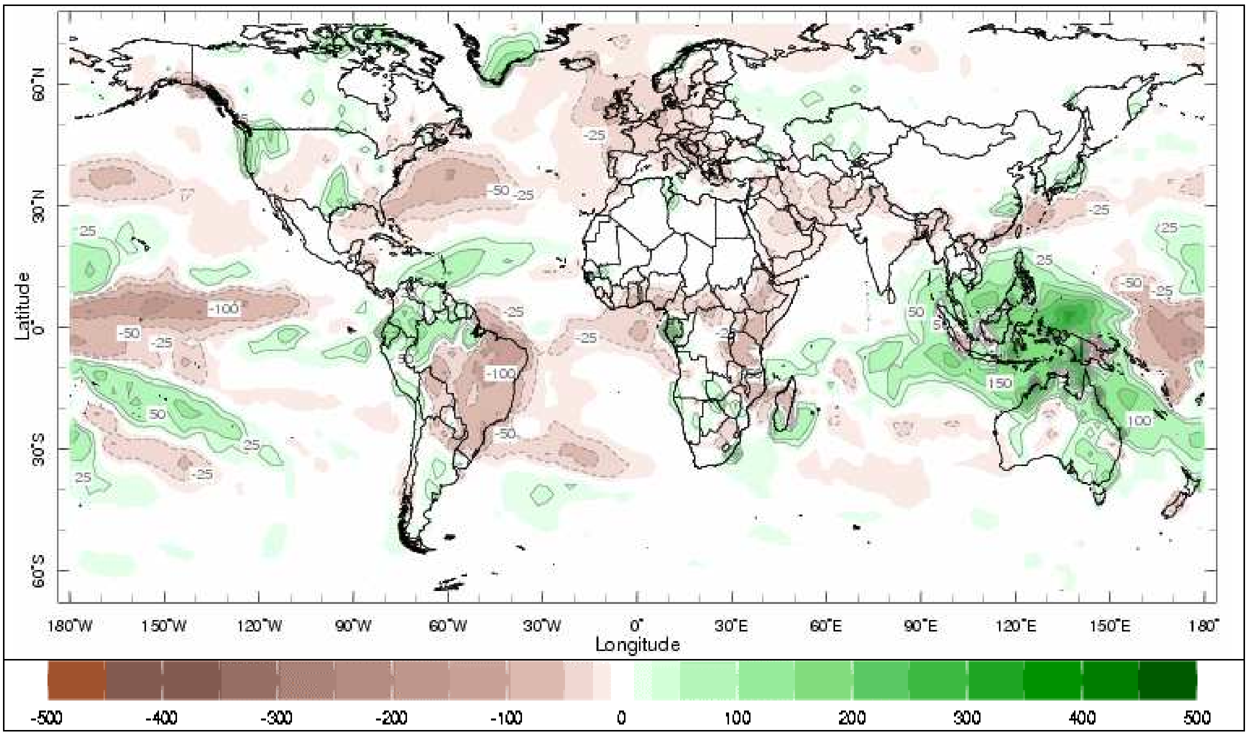


fig.9: Rainfall Anomalies (mm) in March 2012 (departure to the 1979-2000 normal) – Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/

Accordingly to the strong Divergent Circulation anomalies over the maritime sub-continent one remarks strong positive rainfall anomalies over these regions. Interestingly, there is a strip of positive anomaly which extends toward Central Pacific and the French Polynesia in the Southern Hemisphere in close relationship with the Velocity Potential anomaly field already discussed. Above normal rainfall are also observed on the Northern part of South America while it's the opposite on the Eastern side (Nordeste Brazil). One can notice the differences in the Northern and Southern part of the Caribbean in relationship with the velocity potential anomalies. The negative anomalies on the Eastern coasts of Africa and Central Pacific are also very consistent with the velocity potential anomaly field.
In Europe, the negative anomalies are related to the Geopotential and stream function anomalies over the North-Western façade of Europe and the induced blocked zonal circulation in these mid-latitudes regions.

I.2.cTemperature

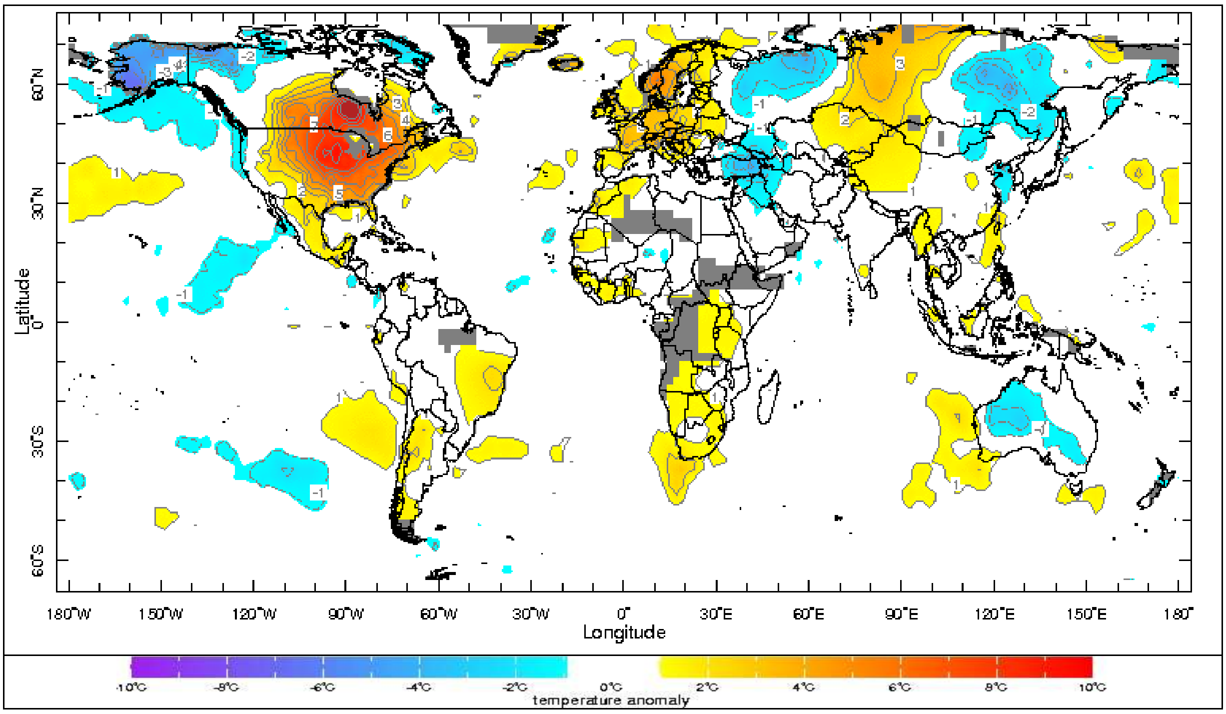


fig.10: Temperature Anomalies (°C) in March 2012 (departure to the 1979-2000 normal) **http://iridl.ldeo.columbia.edu/maproom/.Global/.Atm_Temp/Anomaly.html**

For temperatures (fig. 10) the strongest anomalies are still in the Northern hemisphere ; strongly positive over the northern part of North America and positive over Europe, Strongly negative over Alaska. These anomalies are perfectly fitting Geopotential Heigh and Stream Function anomalies and are likely partly related to Tropical forcing (see general Circulation discussion). Then a tripole pattern (negative/positive/negative) cover the Russian federation up to the Eastern coast of Siberia.
In the Southern hemisphere the anomalies are less large likely in relationship the Geopotential field which shows only little anomalies.

I.2.d Sea Ice

In Arctic, the sea-ice extension anomaly (fig.9) is progressively reaching the normal values. However one can remark some regional modulation North to Norway (deficit) and on the Pacific side (excess).
In Antarctic, the sea-ice extension anomaly (fig. 9bis – right) is very above normal (close to + 2 std) with some regional modulation and some strong positive anomalies. However, at the end of the period, there is a tendency to return to the normal situation.

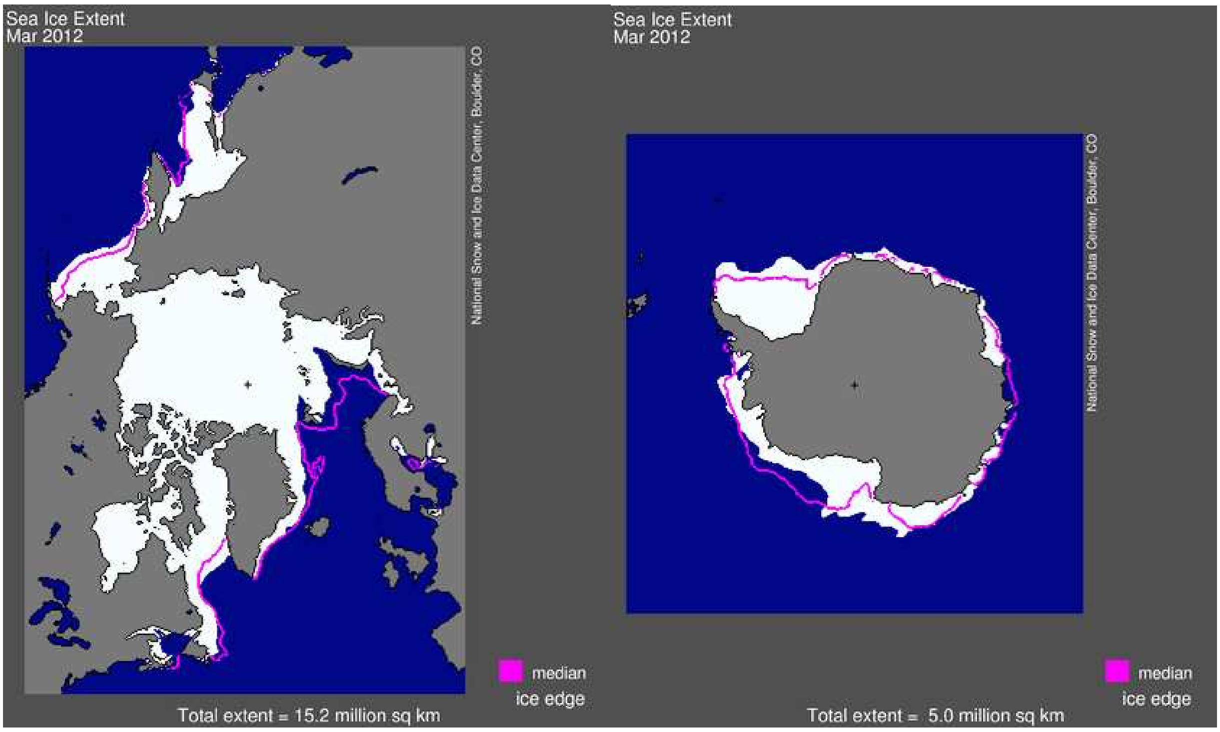


fig.11: Sea-Ice extension in Arctic (left), and in Antarctic (right) in March 2012. The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

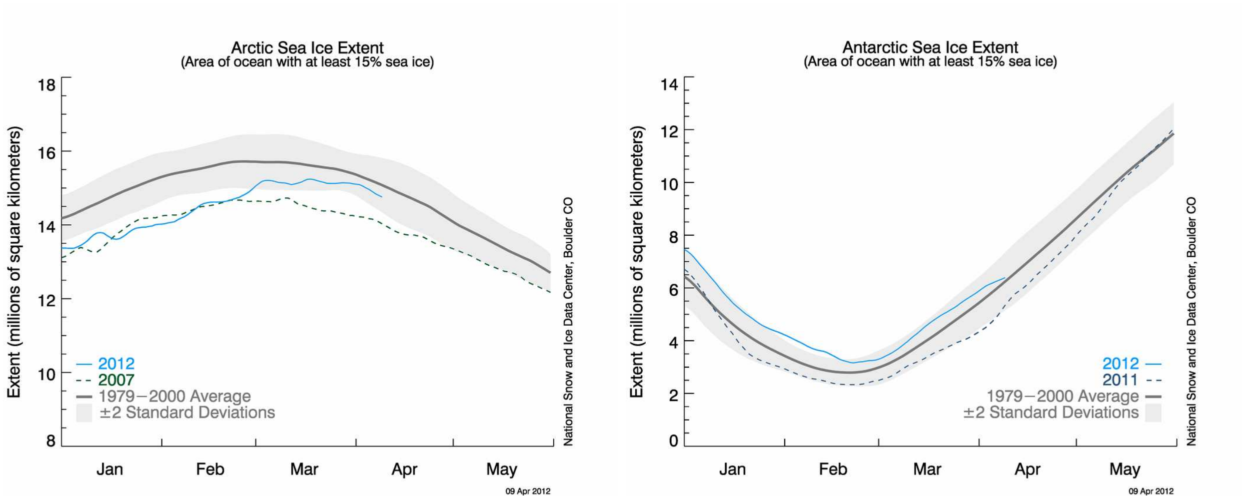


fig. 9bis : Sea-Ice extension evolution from NSIDC
http://nsidc.org/data/seaice_index/images/daily_images/N_stddev_timeseries.png

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

II.1. OCEANIC FORECASTS

II.1.a Sea Surface Température (SST)

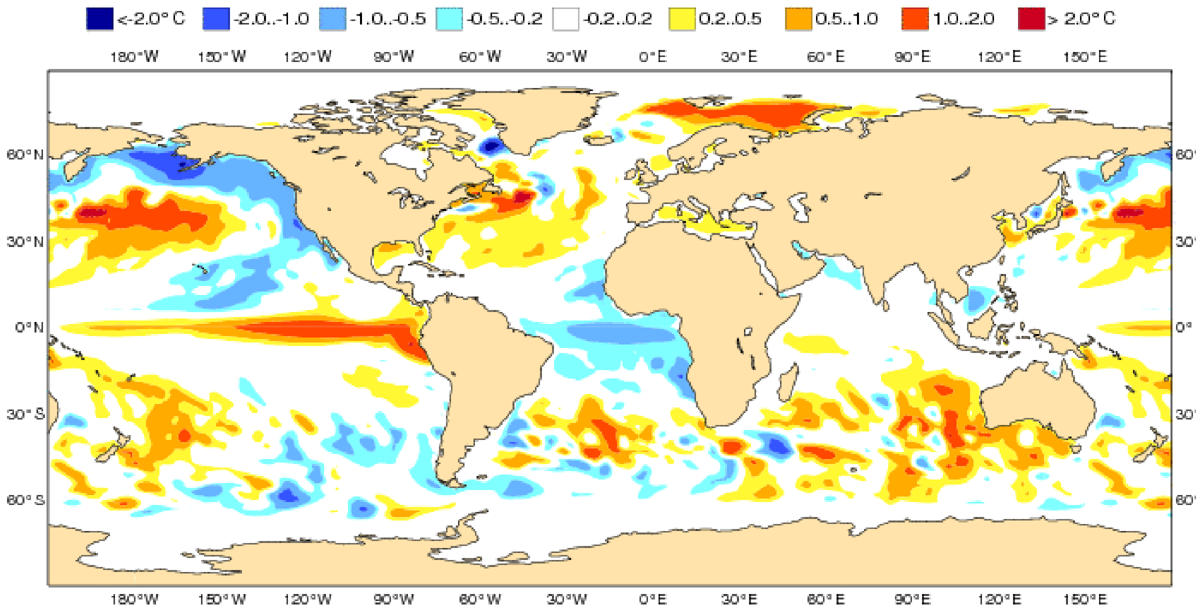


fig.12: SST anomaly forecast (in °C) from ECMWF for May-June-July, issued in April.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

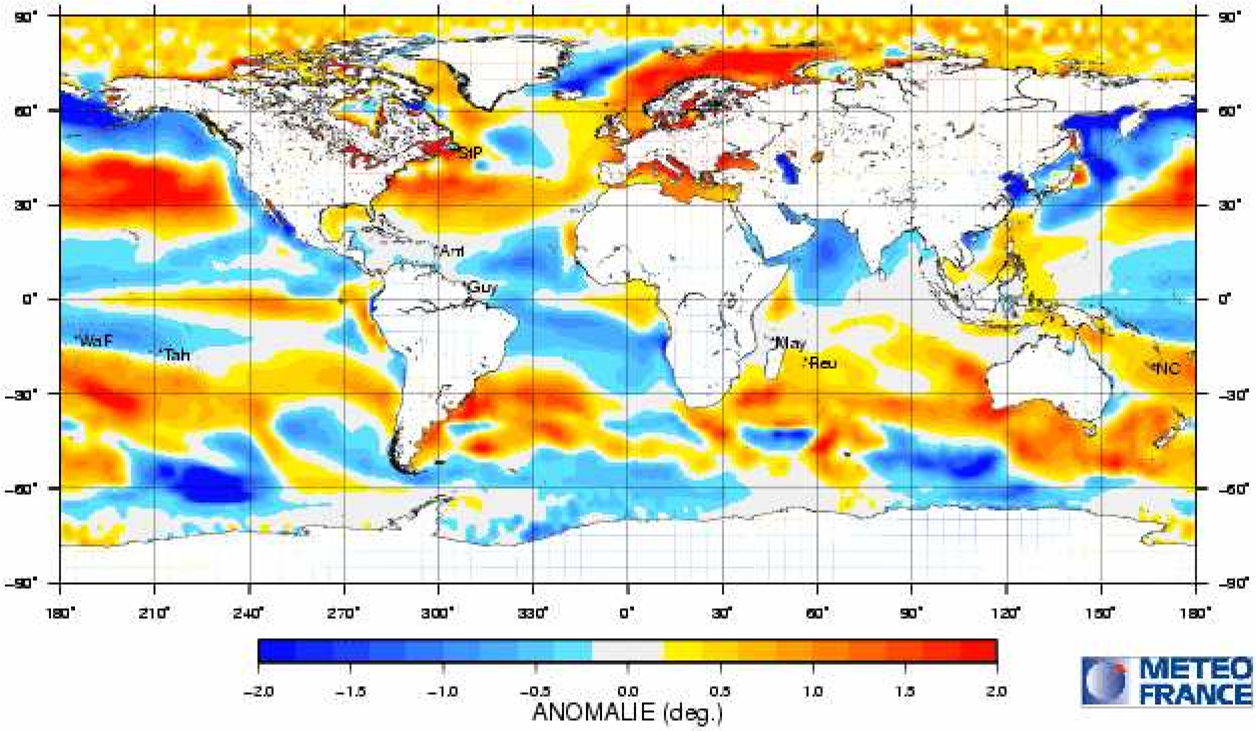


fig.13: SST Anomaly forecast (recalibrated with respect of observation) from Météo-France May-June-July, issued in April. http://elaboration.seasonal.meteo.fr/

The 2 models are very consistent over most of the Pacific including mid-latitudes SSTs. 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 related to the westward expansion of the positive anomaly in the equatorial waveguide. This leads 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 in the Southern hemisphere the proposed scenarios are quite similar. For the equatorial and North Tropical Atlantic, there is some differences, especially in the Guinean Gulf where Meteo-France is likely penalized by its warm bias in this region. In ECMWF, there is a quite strong negative anomaly located over the equator while it is north-westward shifted in MF. Both models are forecasting cold SSTs in the Southern Hemisphere and also cold SSTs on the Eastern part on the North Tropical Atlantic. This pattern should influence the behaviour of the West African Monsoon, especially in term of inter-hemispheric gradients and its relationship with the ITCZ behaviour.

In Euro-SIP forecast, in the Pacific the patterns are quite similar to the one already discussed just above. The warm coastal event is clearly visible.
Over the South and Eastern North Tropical Atlantic the likely scenario is colder than normal conditions. The absence of signal in the Guinean gulf can be likely related to the Meteo-France positive bias over this region. However, Euro-SIP is forecasting close to Normal conditions all over the equatorial waveguide.
Last, in the Indian Ocean, one can see close to normal conditions in most of the Tropics and warmer than normal conditions over the Southern part of the basin ; especially in regions close to Australia. However, the North-Western part of the basin should face Below Normal conditions.

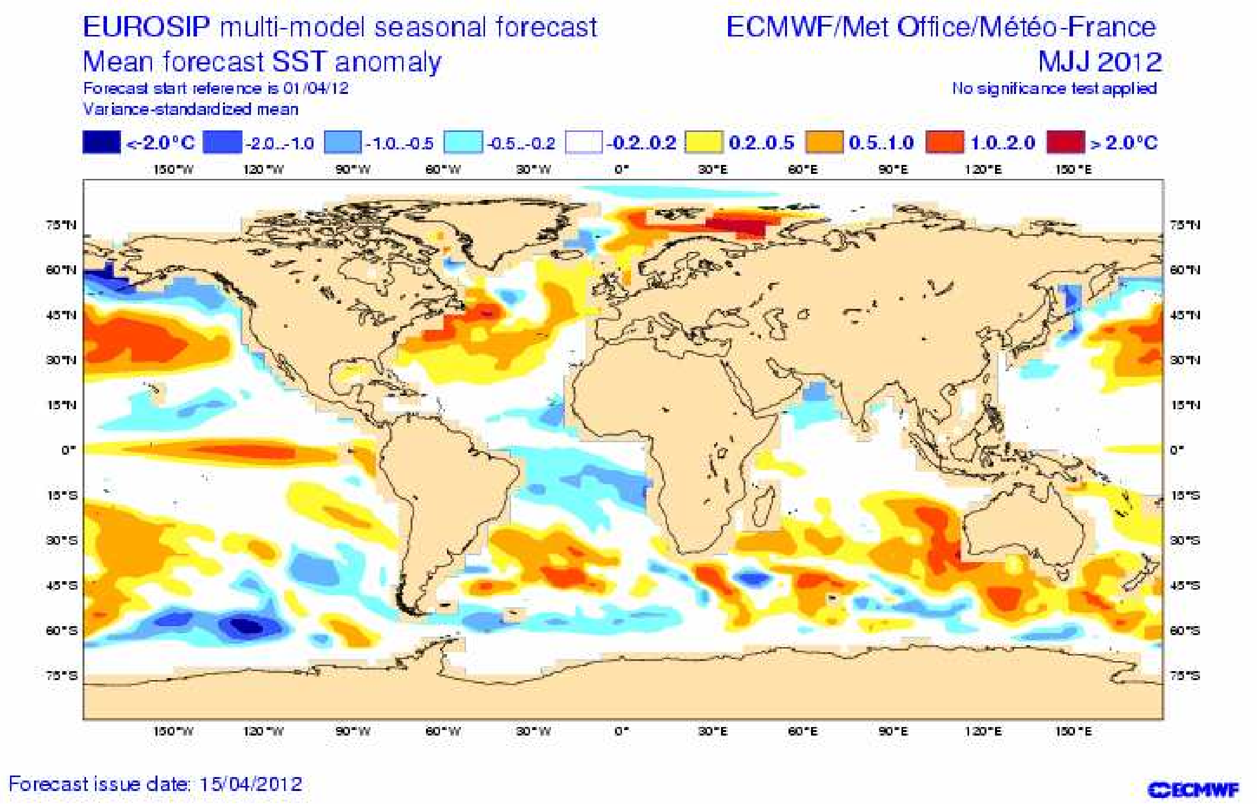


fig.14: SST Forecasted anomaly (in °C) from Euro-SIP valid for May-June-July, issued in April.

II.1.b ENSO Forecast :

Forecasted Phase for MJJ : Close to Neutral conditions (possibly evolving to El Niño condition later on)

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 May-June-July on average, most of dynamical models forecast conditions close to normal. However, some of the models are forecasting some warm events which could develop during the summer or fall period. For the statistical models, they are forecasting close to neutral conditions, which seems to be not surprising as in term of historical data such an evolution is quite rare. However, the question of the development of an El Niño event for the end of this year becomes relevant.

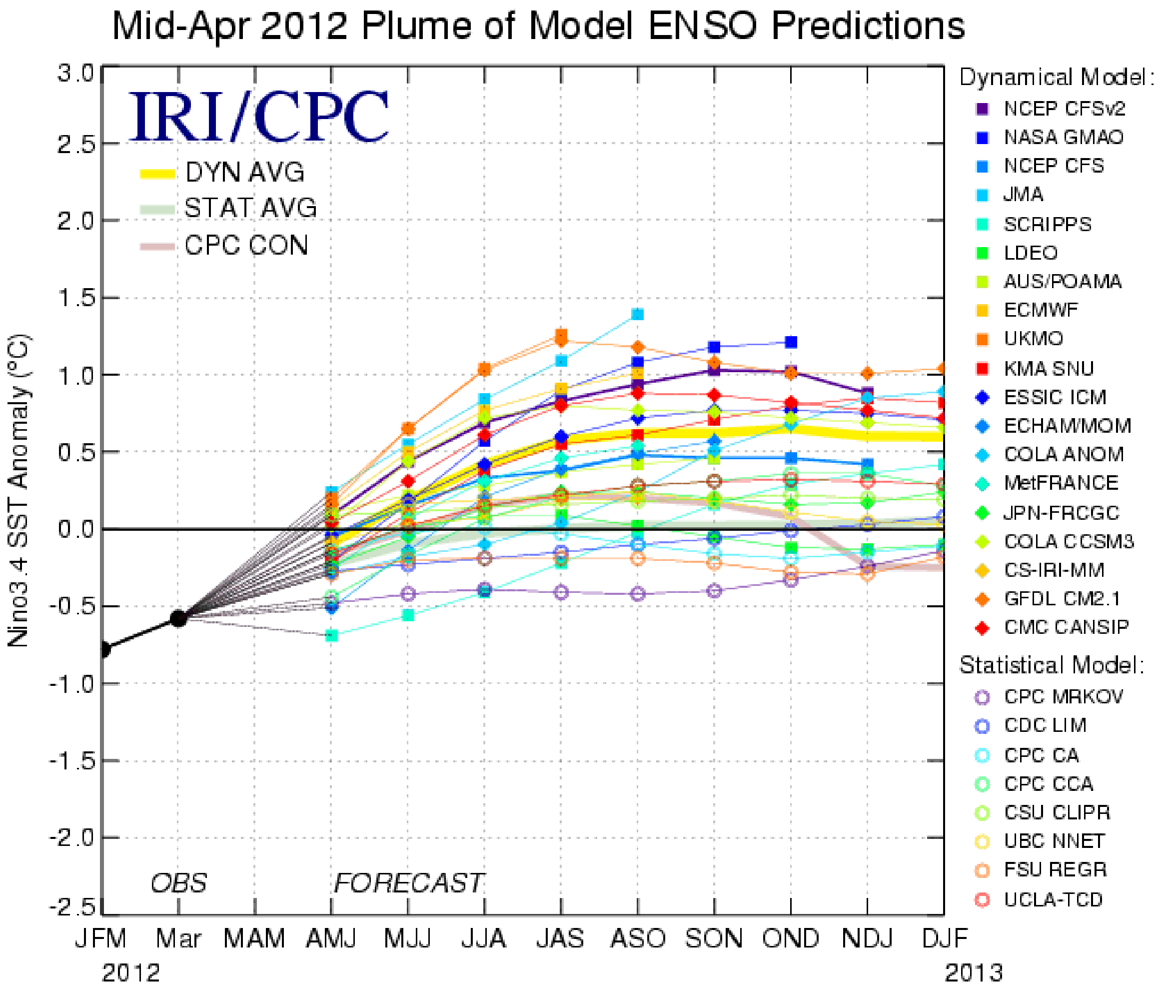


fig.15: **Synthesis of Niño 3.4 forecasts (120° to 165°W) issued in April by IRI :** **http://iri.columbia.edu/climate/ENSO/currentinfo/SST_table.html**

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 MJJ.

SEASON	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ	DJF
Value « La Niña » **Value « El Niño »**	***-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***	***-0,65*** ***0,65***
Average, statistical models	-0.2	-0.1	-0	0	0	0	0	0	0.1
Average, dynamical models	-0.1	0.2	0.4	0.6	0.6	0.6	0.7	0.6	
Average, all models	**-0.1**	**0.1**	**0.3**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.3**

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 to reach the Niño threshold. The spread of the forecasts is normal (for such a forecast) in Météo-France and becomes very large in ECMWF. In both models, one can notice that the Niño 3 index can reach the highest values consistently with the development of a coastal event (however, it is the box where the spread is the larger).

NIÑO 4 NIÑO 3.4 NIÑO 3

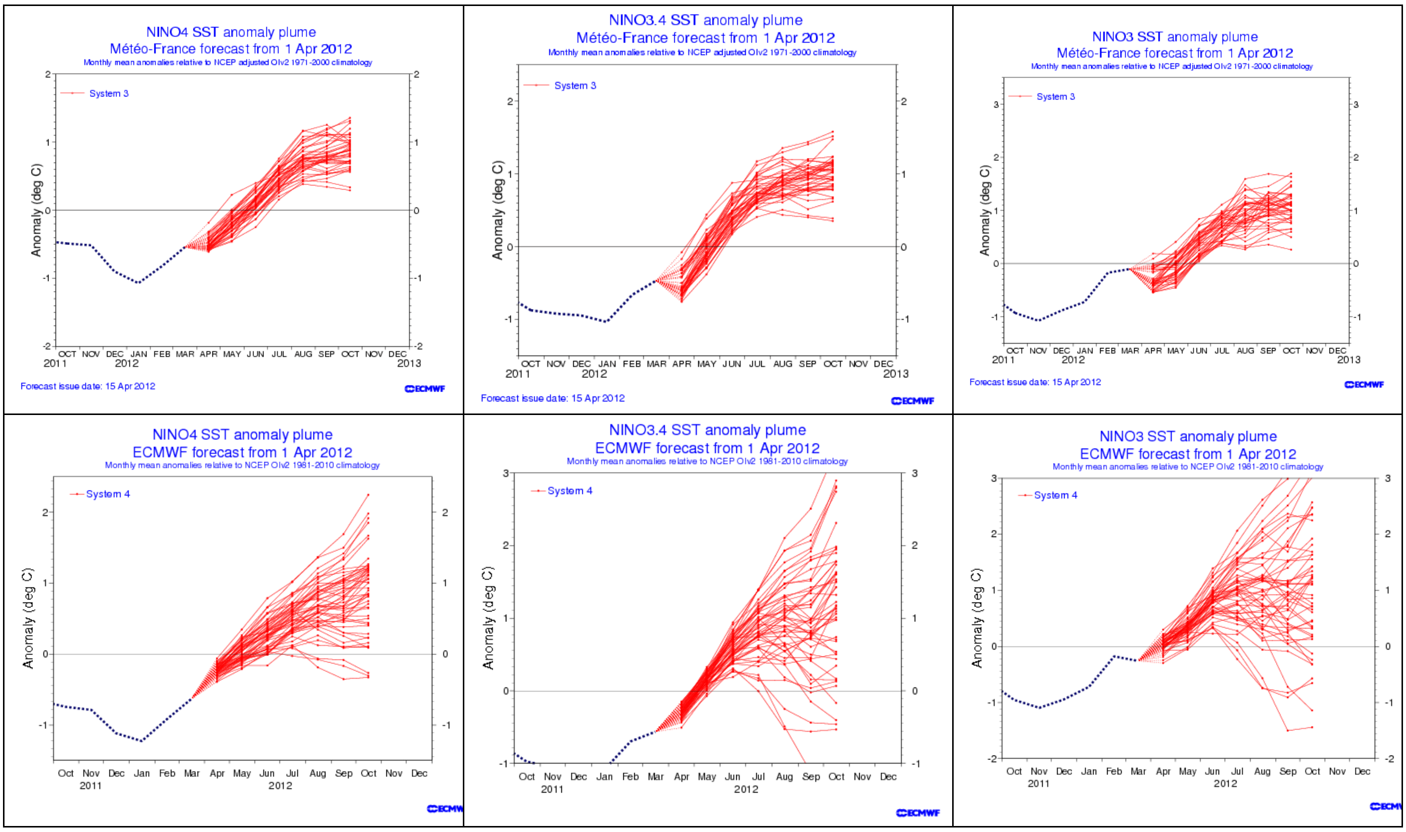


fig.16: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (bottom) issued in April, monthly mean for individual membres. (http://www.ecmwf.int/)

II.1.c Atlantic Ocean forecasts :

Forecasted Phase: ***Cold then warming in the South/North Tropical part***

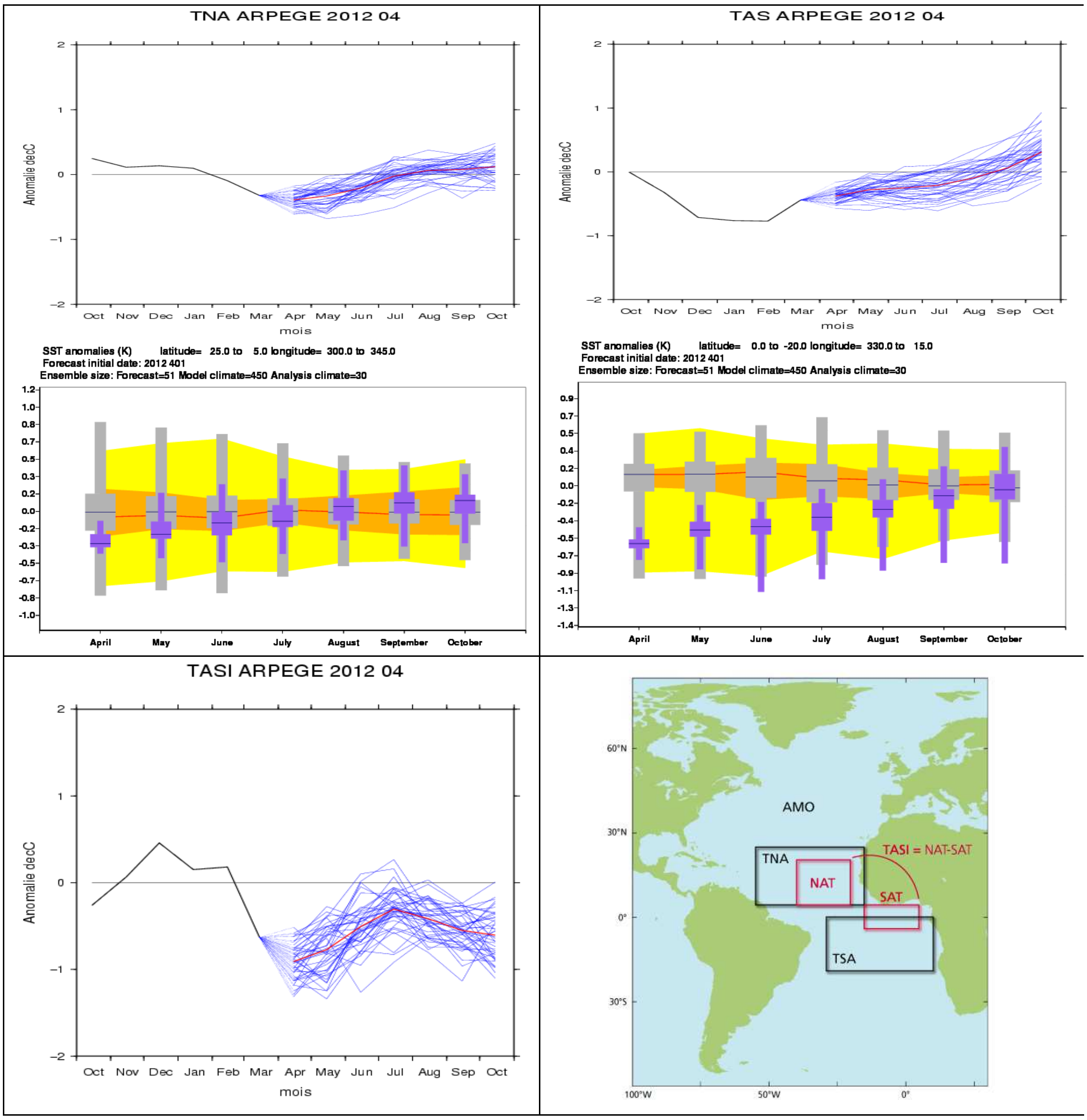


fig.17: SSTs anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, issued in April, plumes and climagrams correspond to 41 members and monthly means.

In both models, the Plumes or climagrams show the same time tendency : they indicate cold conditions at the beginning and then continuous warming in both Northern and Southern Tropical parts which lead to close to normal conditions at the end of the period for the Southern box and since August for the Northern box. Because of the warm bias in MF, the TASI index is negative. However, looking to ECMWF forecasts, one can remark that the Tropical Southern part of the basin is colder than the Tropical Northern part ; this should favour some South-North inter-hemispheric gradient which should favour the dynamic of the ITCZ and of the monsoon flux over the West African continent.

II.1.d Indian Ocean forecasts :

Forecasted Phase: ***Cold then warming in the West/East equatorial part***

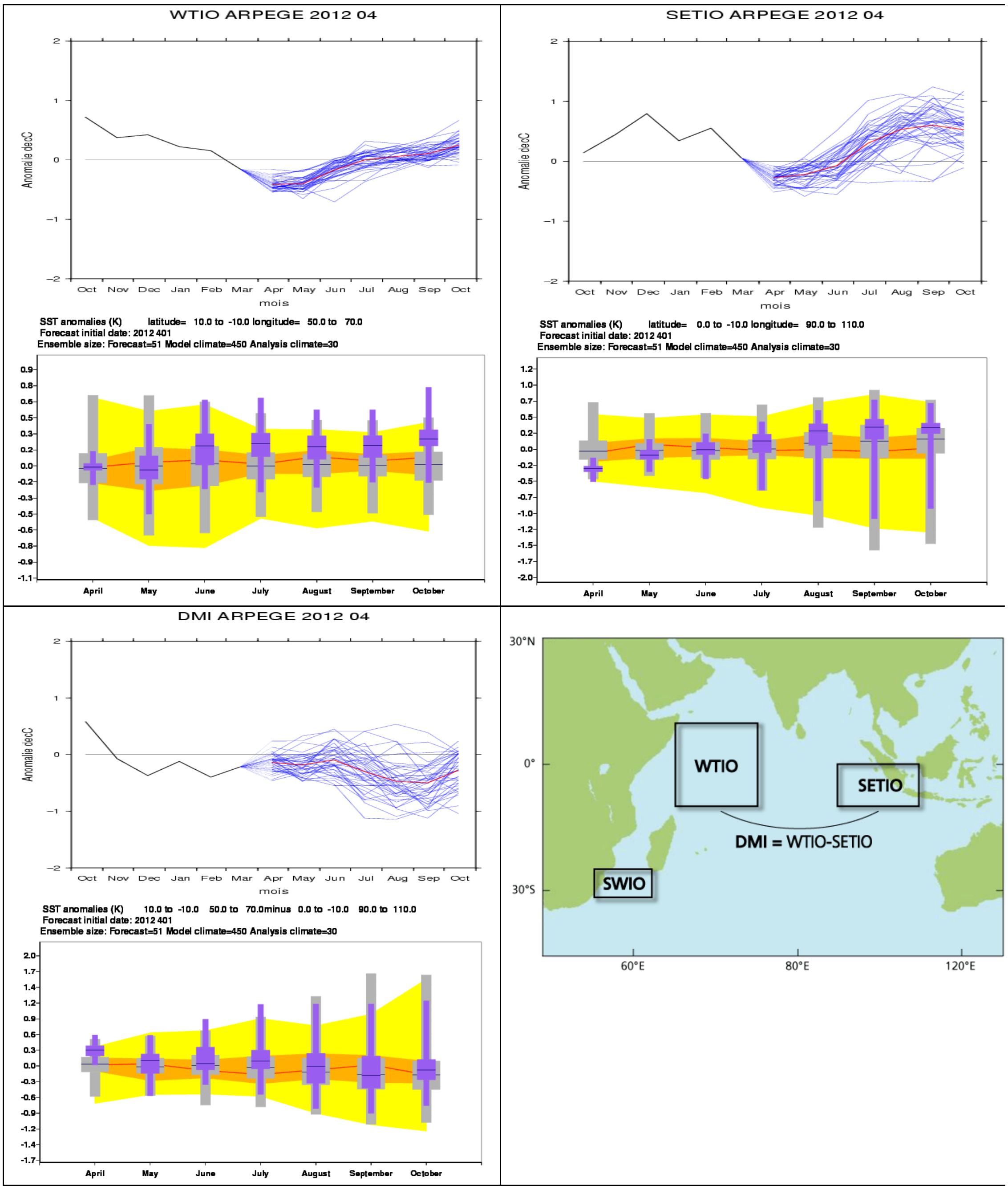


fig.18: SSTs anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, issued in April, plumes and climagrams correspond to 41 members and monthly means.

In both models, the Plumes or climagrams show some similarity : they indicate a continuous warming in the Western part of the basin while, in Eastern Equatorial Indian Ocean, they show a warming in June and July even if the SETIO index shows a larger spread than the WTIO, likely partly related to some uncertainty in the development of the warm event in the Pacific. Consequently, the DMI is mostly negative over the period in MF and close to Normal in ECMWF (with a large spread in both models which led to be cautious in using this forecast).

II.2. GENERAL CIRCULATION FORECAST

II.2.a Global Forecast

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). However, the ECMWF pattern is eastward shifted by 40-50° of longitude. This leads to dramatic changes in the Hadley-Walker circulation anomalies in the 2 models.

In more detail, over the Western Pacific ECMWF shows a strong atmospheric response with a divergence anomaly (upward motion) while it is located over South-East Asia in MF. Nevertheless, ECMWF show a weak response in term of Stream function anomaly while MF shows more activity but mostly trapped within the Tropics.

Over the Atlantic, both models indicate a convergent circulation anomaly (downward motion) located over the equator in ECMWF and close to the North-Eastern coast of South-America in MF. This difference is very consistent with the SST field. Again, the ECMWF response in term of Stream Function is very weak while we have some indication of meridionnal propagation in MF especially toward Mediterranean regions.

Last over the Indian ocean and Indian sub-continent, the 2 models are showing large differences in terms of Velocity Potential anomalies. In MF a large negative anomaly is visible over South-East Asia and also over Africa (North to the equator) while the signal is very weak over India and Africa in ECMWF.

The reason of such a large difference is unclear but one can guess that the differences over the Pacific (especially the westward extension of the positive anomaly) can influence a lot the Hadley-Walker circulations over the South-East Asia, India and Africa. These differences could also be related to model uncertainty and especially to differences in the sensitivity to oceanic forcing.

In conclusion for Europe, it is difficult to assess a clear indication of tropical forced teleconnection excepted may be for the Mediterranean regions (and especially over the Western part of the basin).

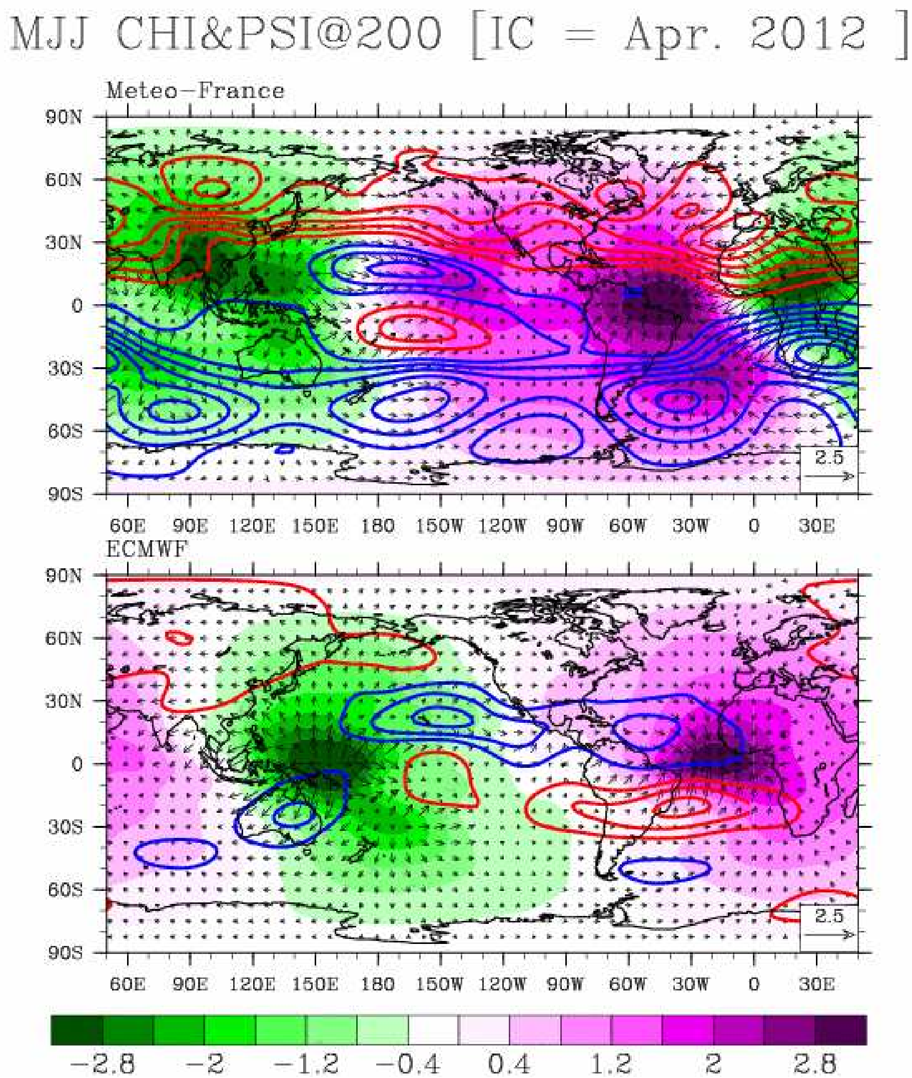


fig.19: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), asociated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa for May-June-July, issued in April by Météo-France (top) and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

II.2.b North hemisphere forecast and Europe

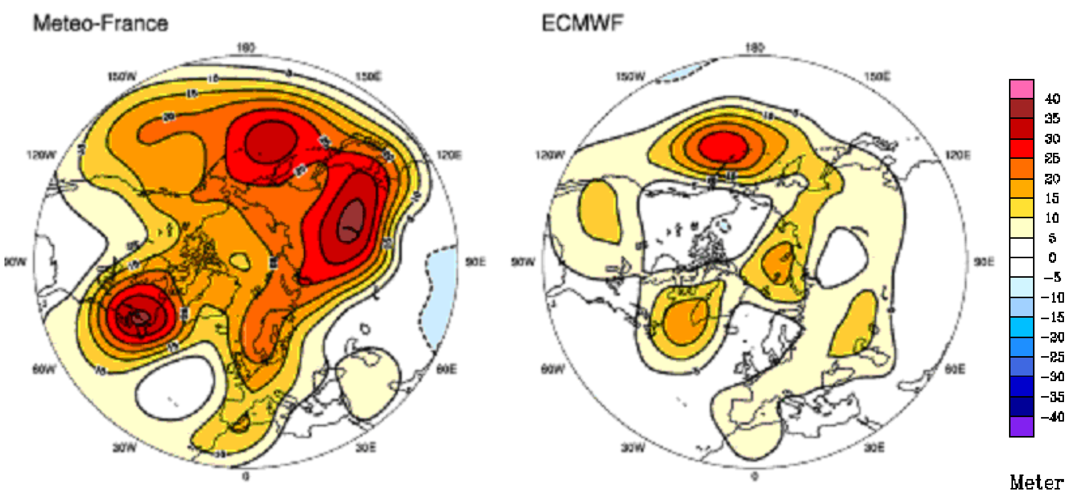


fig.20: Anomalies of Geopotential Height at 500 hPa for May-June-July, issued in April from Météo-France (left) and ECMWF (right). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip

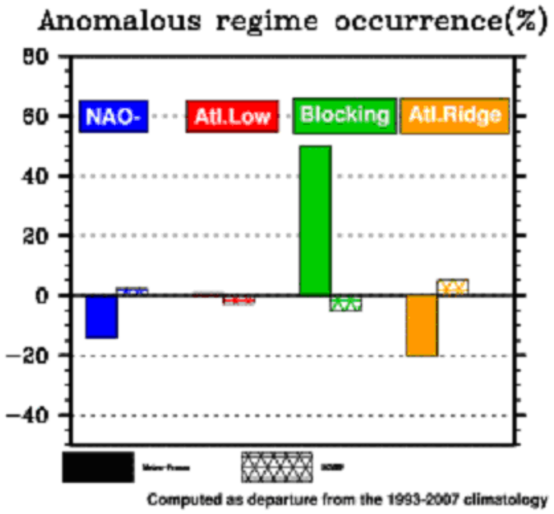


fig.21: North Atlantic Regime occurrence anomalies from Météo-France and ECMWF : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

Consistently with the stream function field, ECMWF model shows a few Geopotential Height anomaly at 500hPa (fig. 20) ; they are weak but positive over Europe. In MF there is stronger anomalies which are partly related to the climate trend and could be interpreted as partly tropically forced for the Mediterranean regions. So, not surprisingly, this infers, in the occurrence frequency, large differences in the two models ; namely no significant signal in ECMWF and an increase of Blocking regimes (partly related to Climate Trend) and a decrease of NAO- in MF model. To be noted that Blocking regime favours warm temperatures over the Northern part of European continent.
The General atmospheric circulation in MF and in the low troposphere (see figure 22) is likely the consequence of the excess of blocking regimes. The meridionnal wind has an enhanced Northward anomaly component over the western façade of Europe while it is the opposite on the Eastern side. Then looking to the zonal wind anomalies, there is a decrease of the zonal circulation between 40° and 60°N. The zonal wind anomaly over the Western part of the Mediterranean basin is very consistent with the Stream Function anomaly.

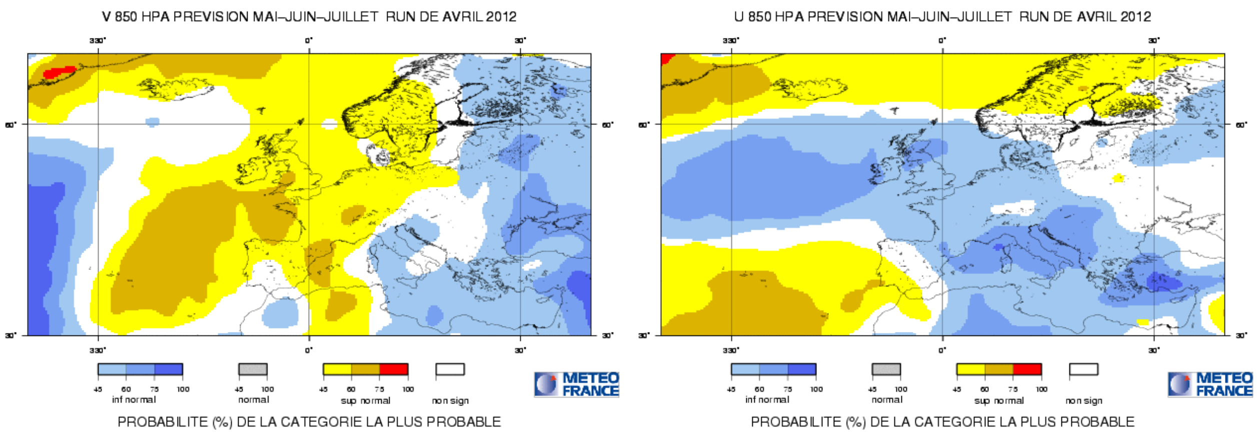


fig.22: Most likely category for the meridional (left) and zonal (right) wind at 850 hPa for May-June-July, issued in April from Météo-France.

II.3. IMPACT : TEMPERATURE FORECASTS

II.3.a ECMWF

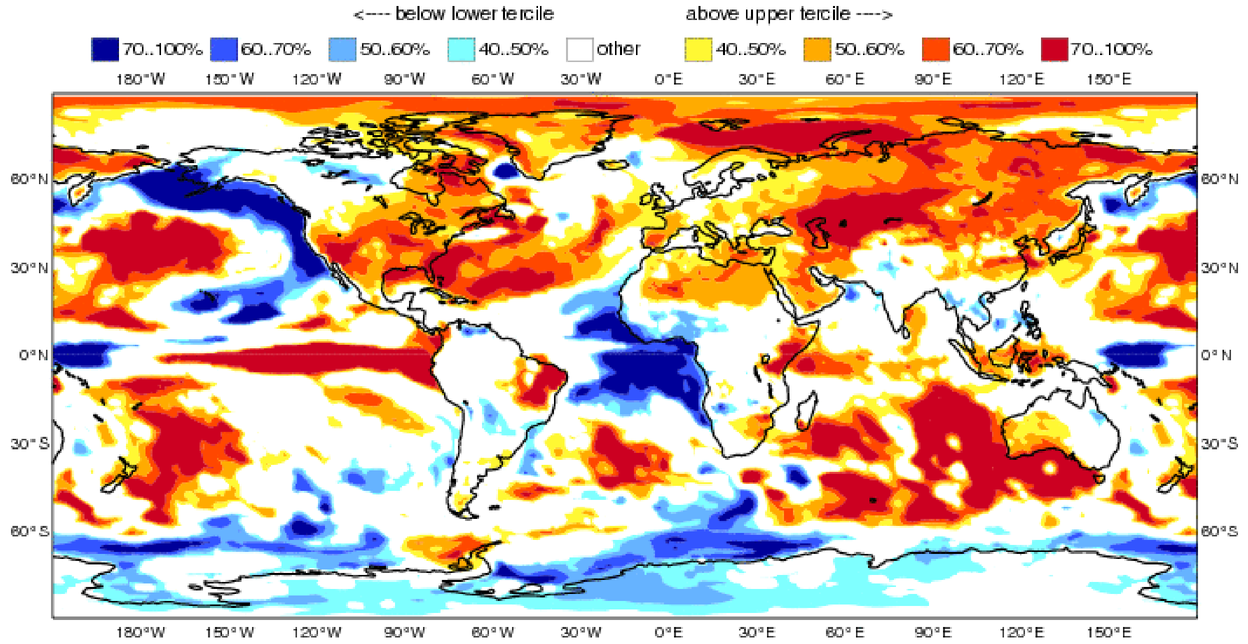


fig.23: Most likely category probability of T2m from ECMWF for May-June-July, issued in April. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.3.b Météo-France

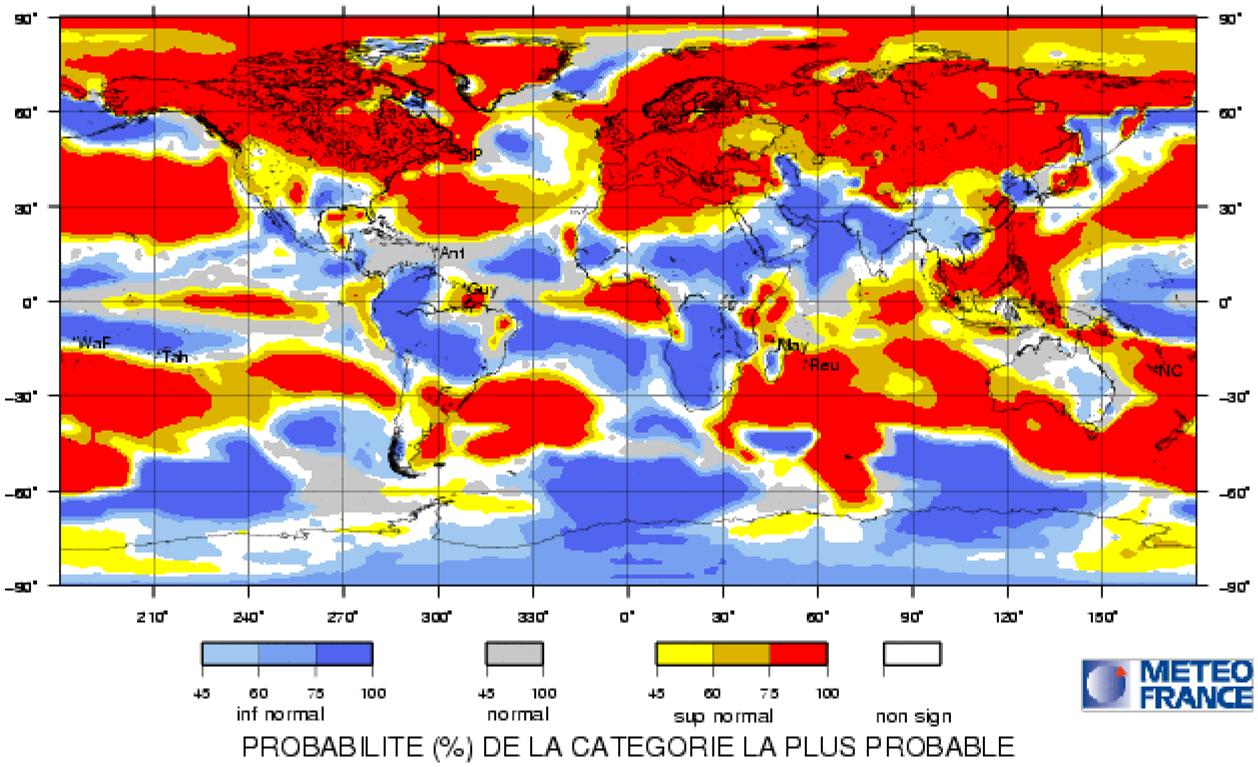


fig.24: Most likely category of T2m for May-June-July, issued in April. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.3.c Met Office (UKMO)

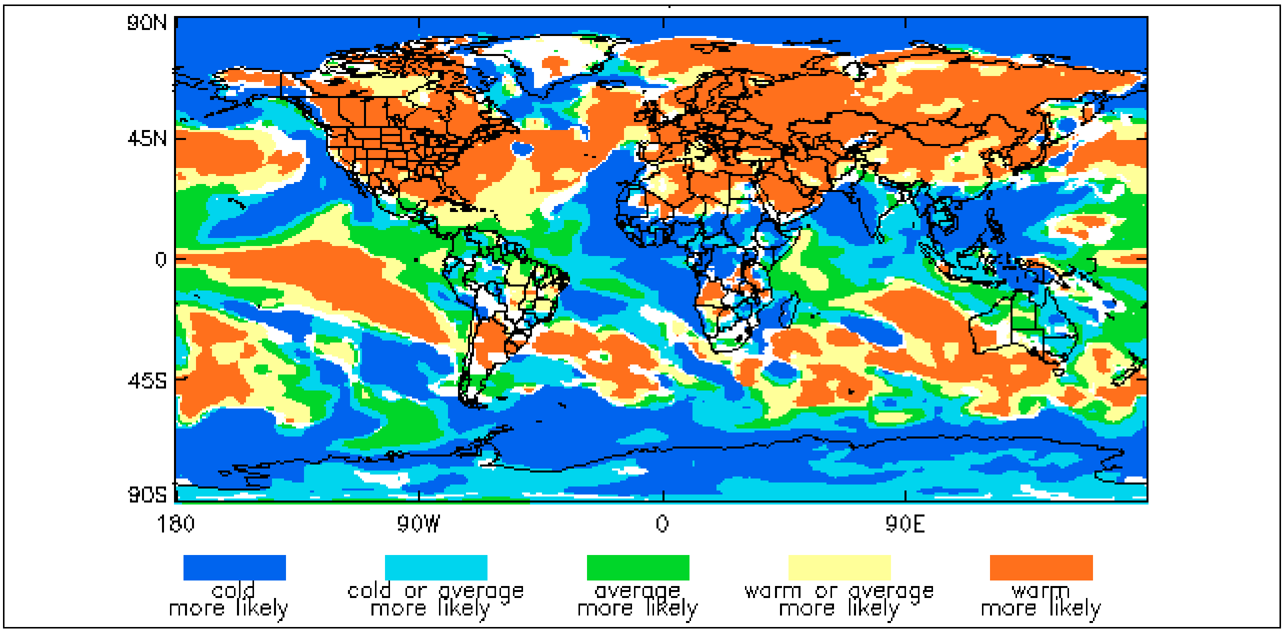


fig.25: Most likely category of T2m for May-June-July, issued in April from UK Met Office. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://www.metoffice.gov.uk/

II.3.d Japan Meteorological Agency (JMA)

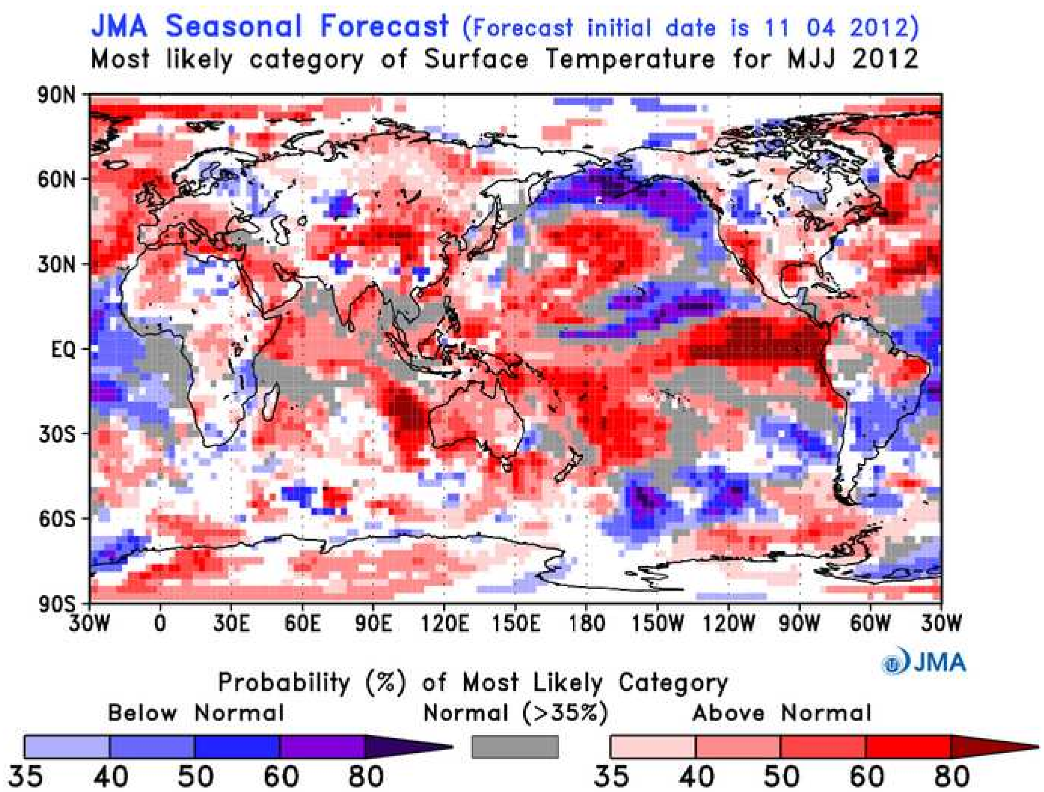


fig.26: Most likely category of T2m for May-June-July, issued in April from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/4mE/fcst/fcst_gl.html

II.3.e Euro-SIP

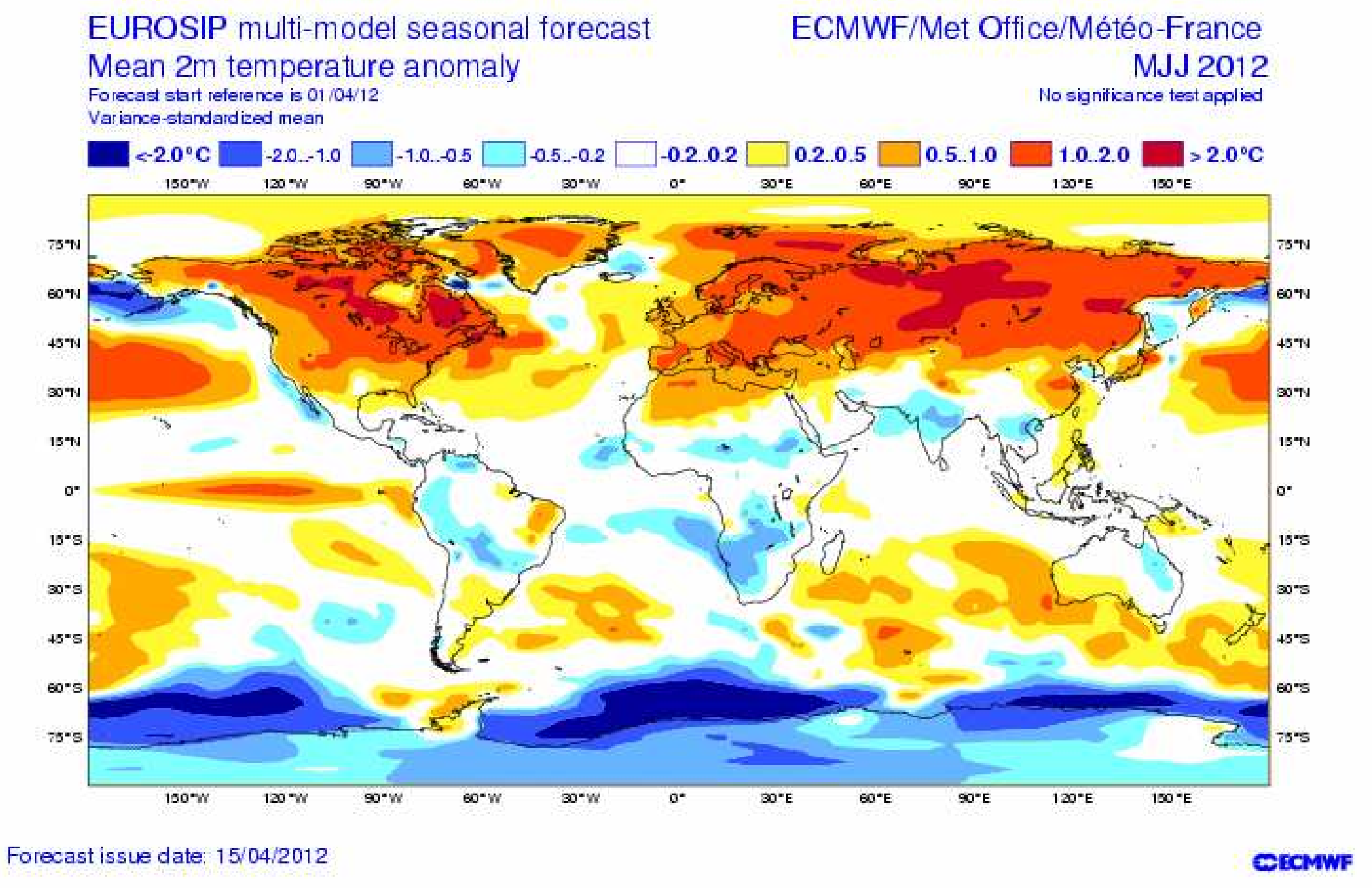


fig.27: Multi-Model Probabilistic forecasts for T2m from EuroSip for May-June-July, issued in April. (2 Categories, Below and Above normal – White zones correspond to No signal and Normal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

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, some predictability seems to exist in relationship with the West African signal for the mid-latitude especially over the regions close to the Mediterranean basin (see discussion in the general circulation section and especially comments about the Stream Function anomalies). 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.

For the Indian regions, the temperature forecasts is likely under the influence of SST on the North Western side and of rainfall on the Eastern side.

Over West Africa and Sahelian regions, the Below Normal conditions are likely related to rainfall.

II.3.f International Research Institute (IRI)

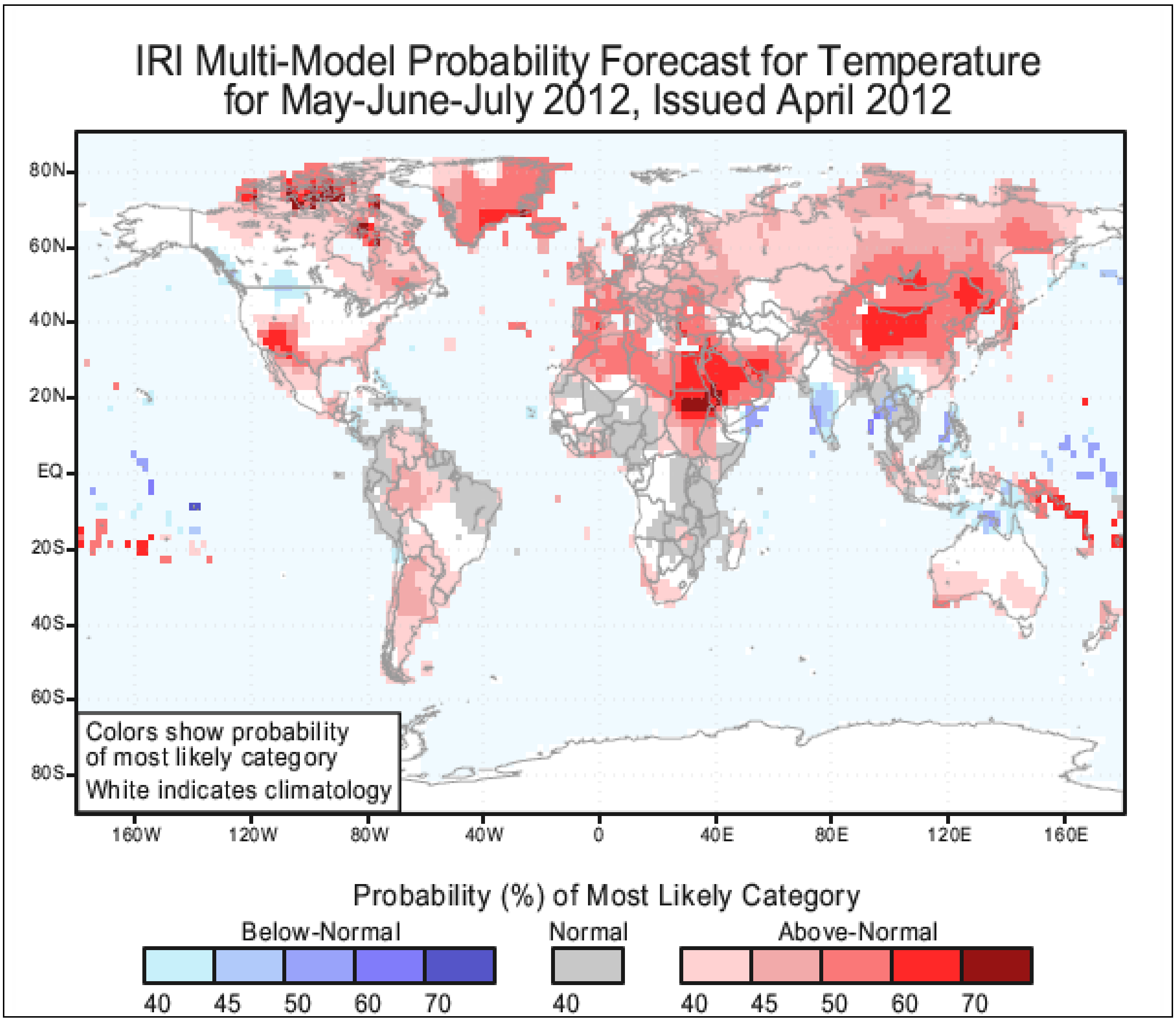


fig.28: Most likely category of T2m for May-June-July, issued in April from the IRI multi-model ensemble. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://iri.columbia.edu/climate/forecast/net_asmt/

One can notice a large consensus with the Euro-Sip forecast for the Northern hemisphere (excepted on a northern portion of North America,). Some large differences exist over Africa and South America. For Europe, the tendency given by Euro-SIP (Above Normal Scenario) is mainly confirmed.

II.4. IMPACT : PRECIPITATION FORECAST

II.4.a ECMWF

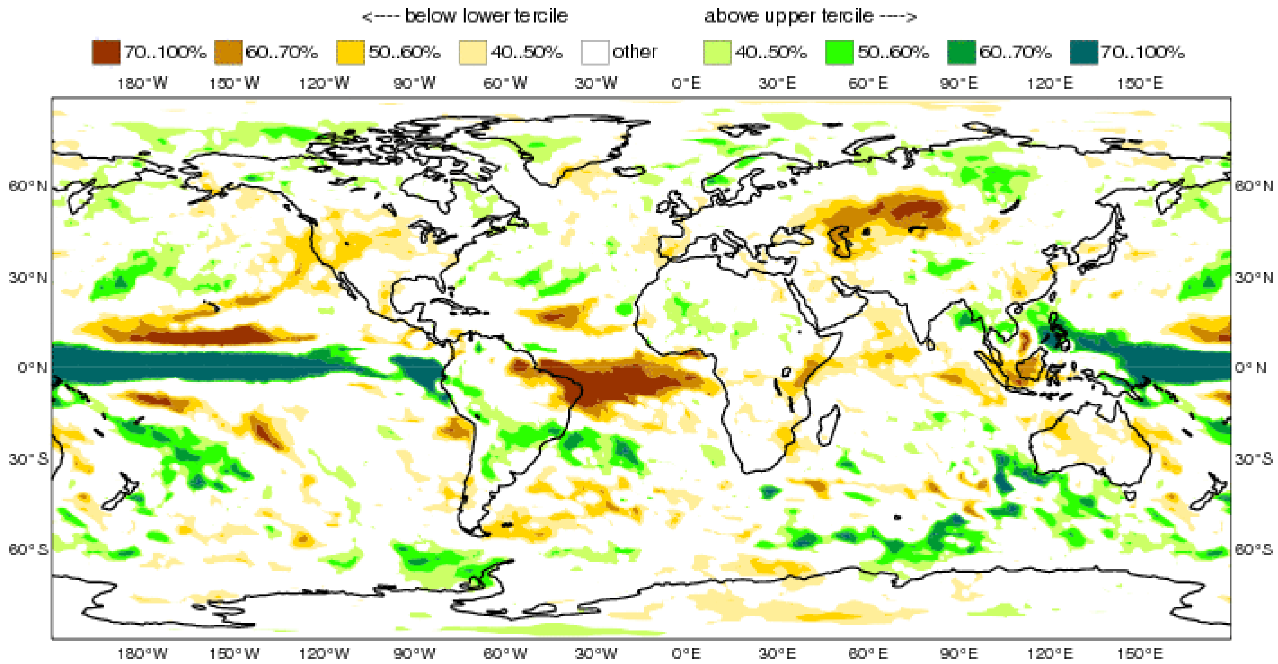


fig.29: Most likely category probability of rainfall from ECMWF May-June-July, issued in April. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/charts/seasonal_charts_s2/

II.4.b Météo-France

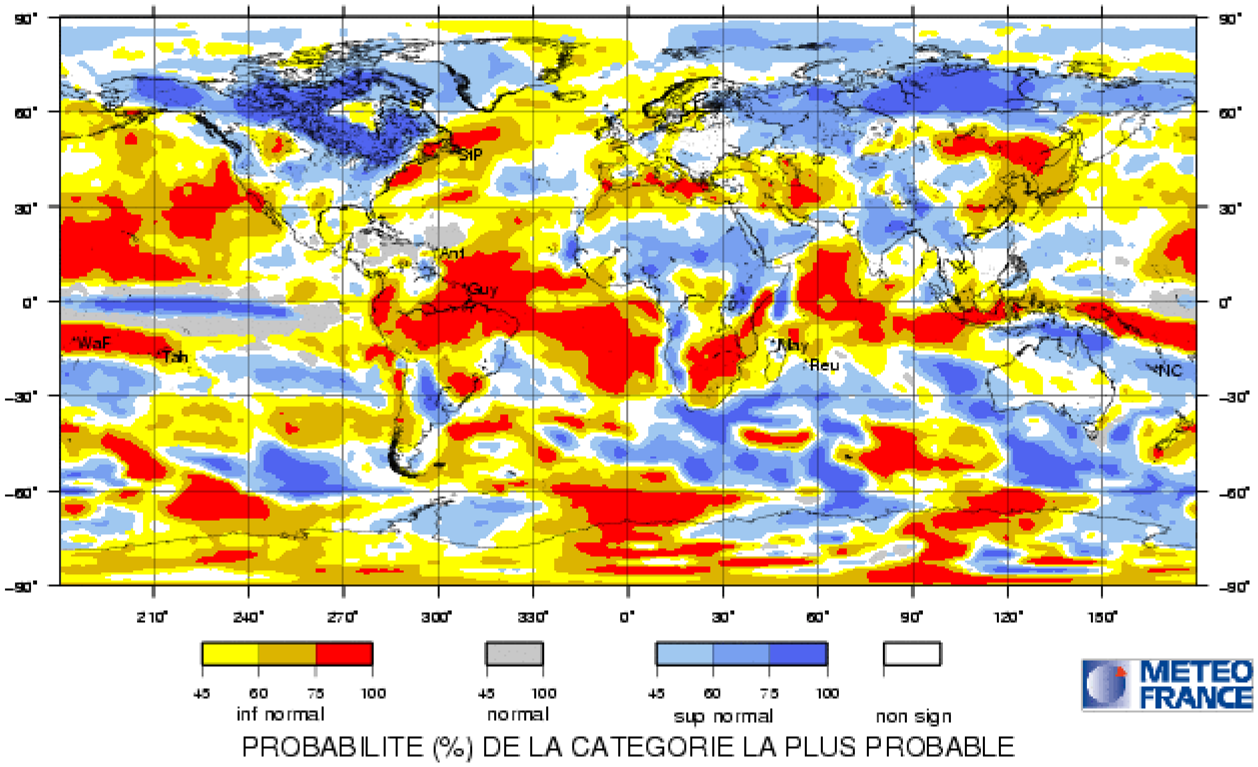


fig.30: Most likely category of Rainfall for May-June-July, issued in April. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.4.c Met office (UKMO)

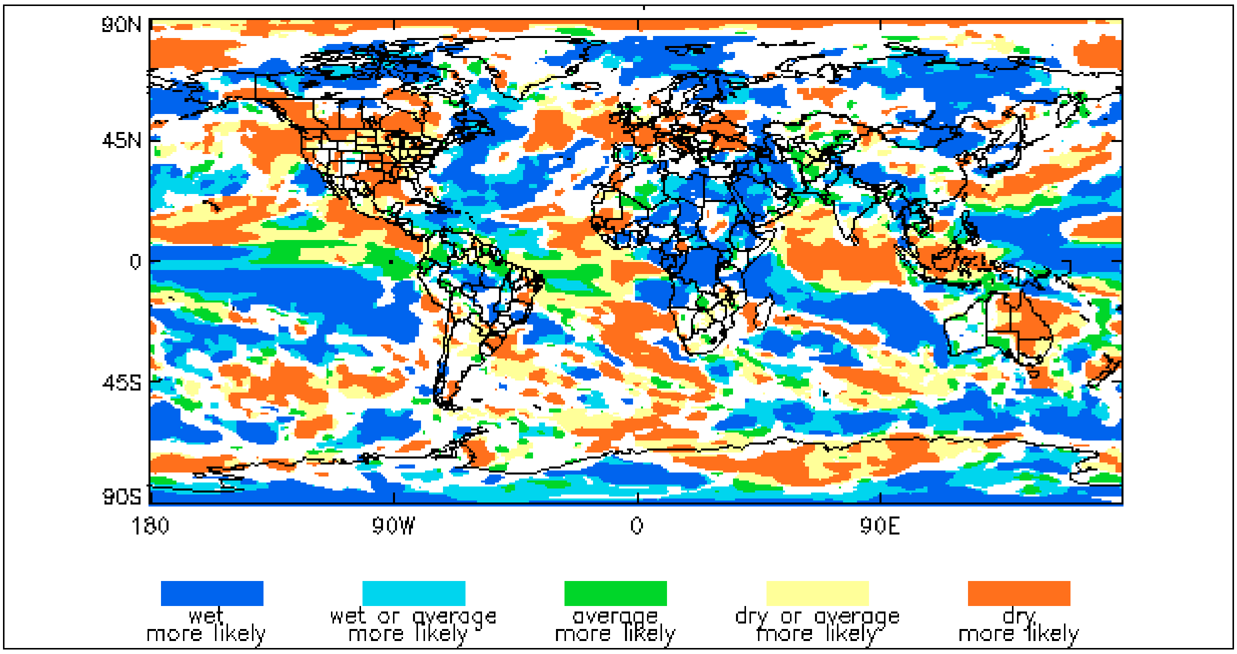


fig.31: Most likely category of Rainfall for May-June-July, issued in April from UK Met Office. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. **http://www.metoffice.gov.uk/**

II.4.d Japan Meteorological Agency (JMA)

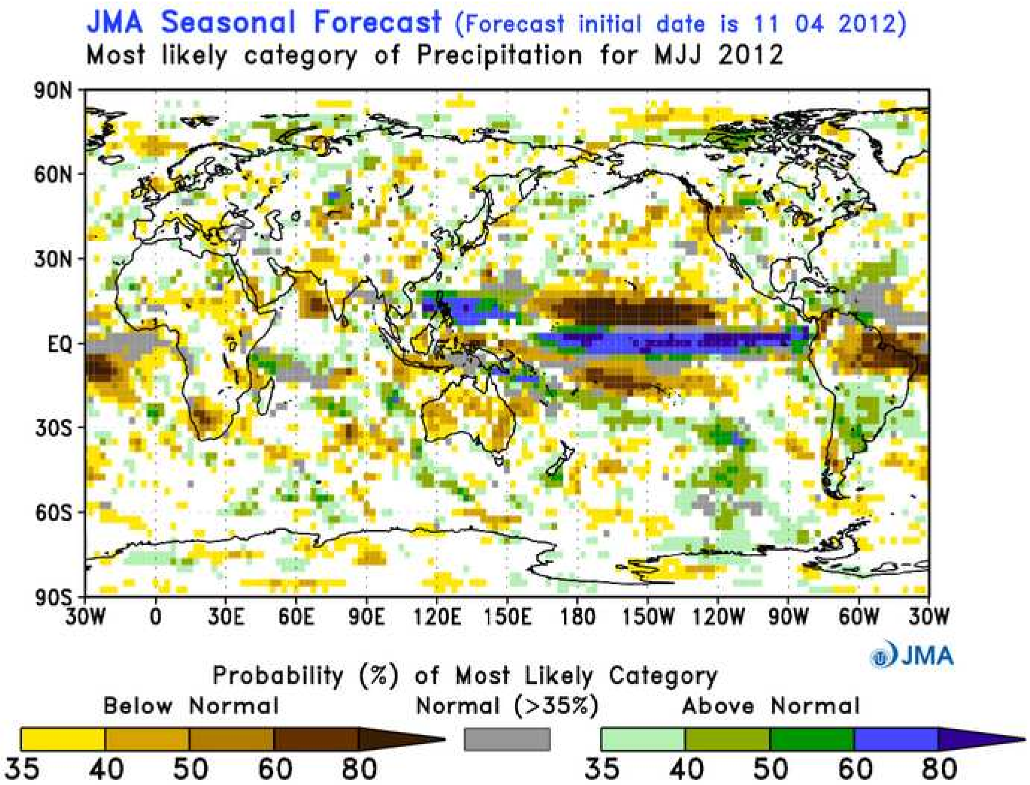


fig.32: Most likely category of Rainfall for May-June-July, issued in April from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/4mE/fcst/fcst_gl.html

II.4.e Euro-SIP

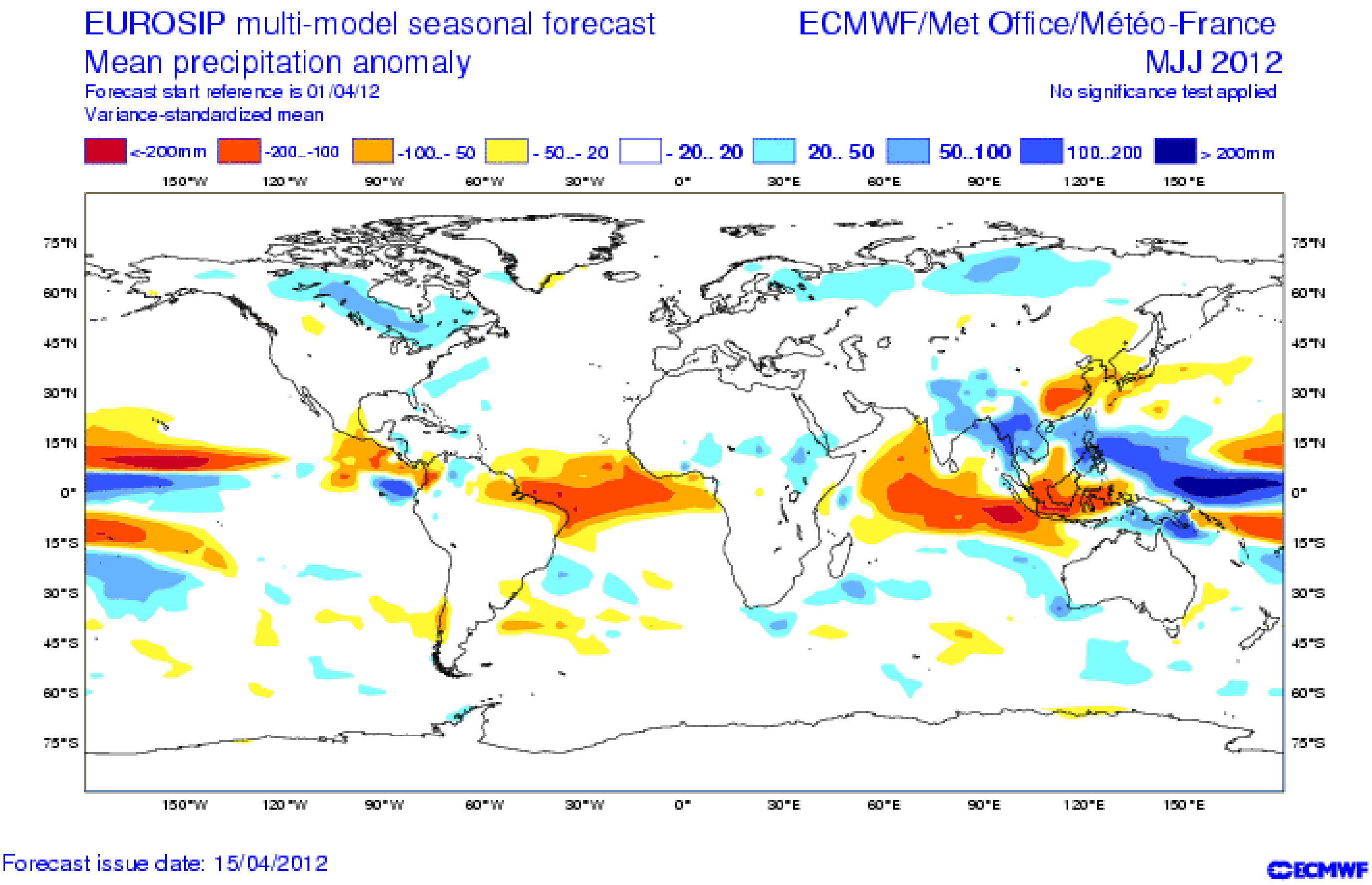


fig.33: Multi-Model Probabilistic forecasts for precipitation from EuroSip for May-June-July, issued in April. (2 Categories, Below and Above normal – White zones correspond to No signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

Referring to Euro-SIP forecasts, there is some consistency over North-East Europe and Siberia, East Asia, Canada, North regions of South America and Nordeste Brazil, and regions close to South-East Asia including some part of India.
Over India, one can see that the forecast is not fully consistent with the development of a Niño event. The rainfall forecast especially for the Eastern part of India, seems to be linked to the South-East Asian monsoon which is (also a bit surprisingly) more active than Normal in Euro-SIP. Last, to be noticed that the last MJO forecast (mid-April) doesn't indicate any major activity in the longitude of the Indian sub-continent neither Eastward.
Last, over Eastern and Central Sahel there is some indication of Above Normal conditions while Below normal conditions should prevail along the coast of the Guinean Gulf.

II.4.f International Research Institute (IRI)

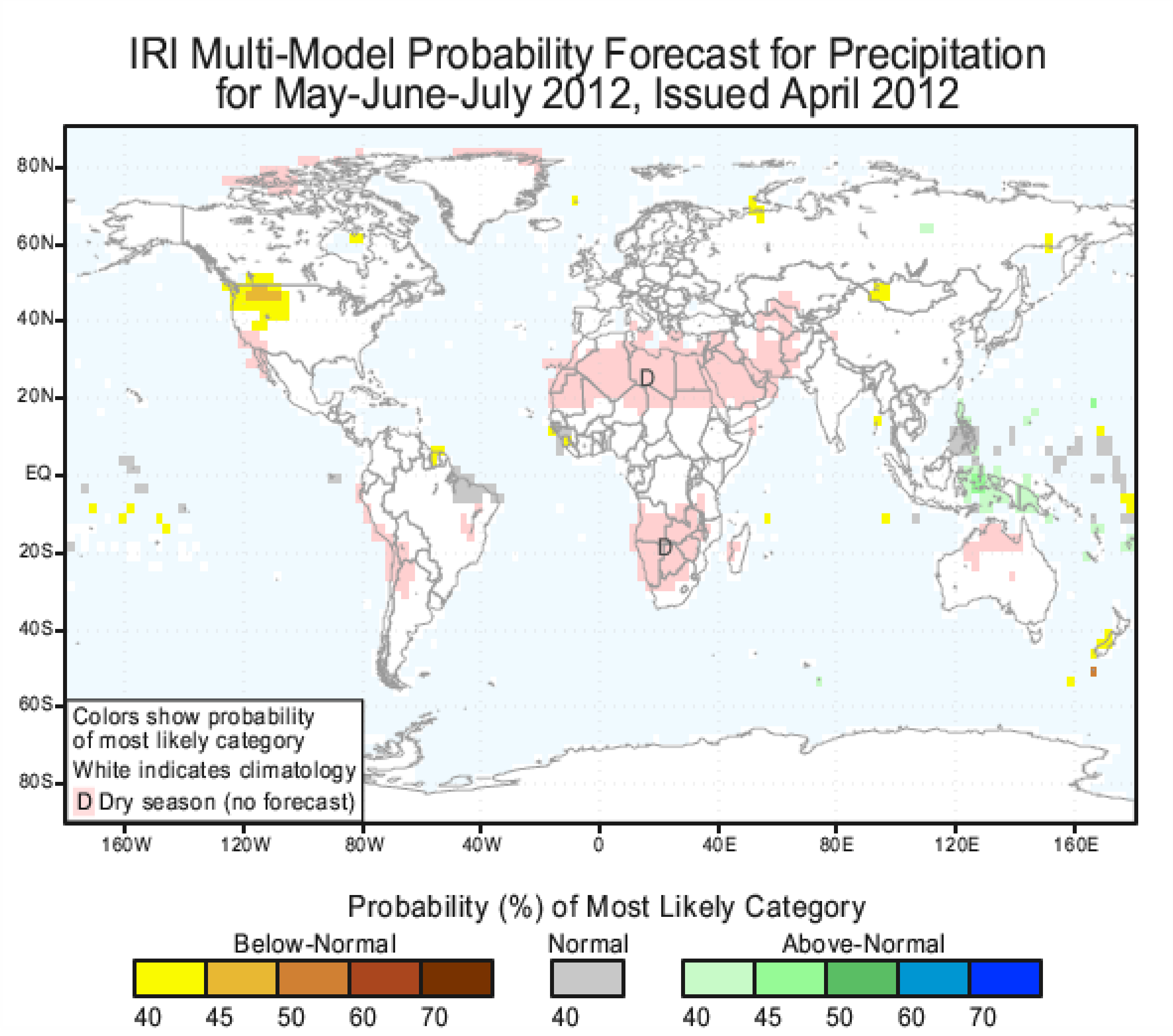


fig.34: Most likely category of Rainfall for May-June-July, issued in March from the IRI multi-model ensemble. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://iri.columbia.edu/climate/forecast/net_asmt/

The IRI forecast shows No Signal more or less everywhere. Consequently, over Europe, there is a clear indication for No Privileged Scenario (Climatology forecast).

II.5. REGIONAL TEMPERATURES

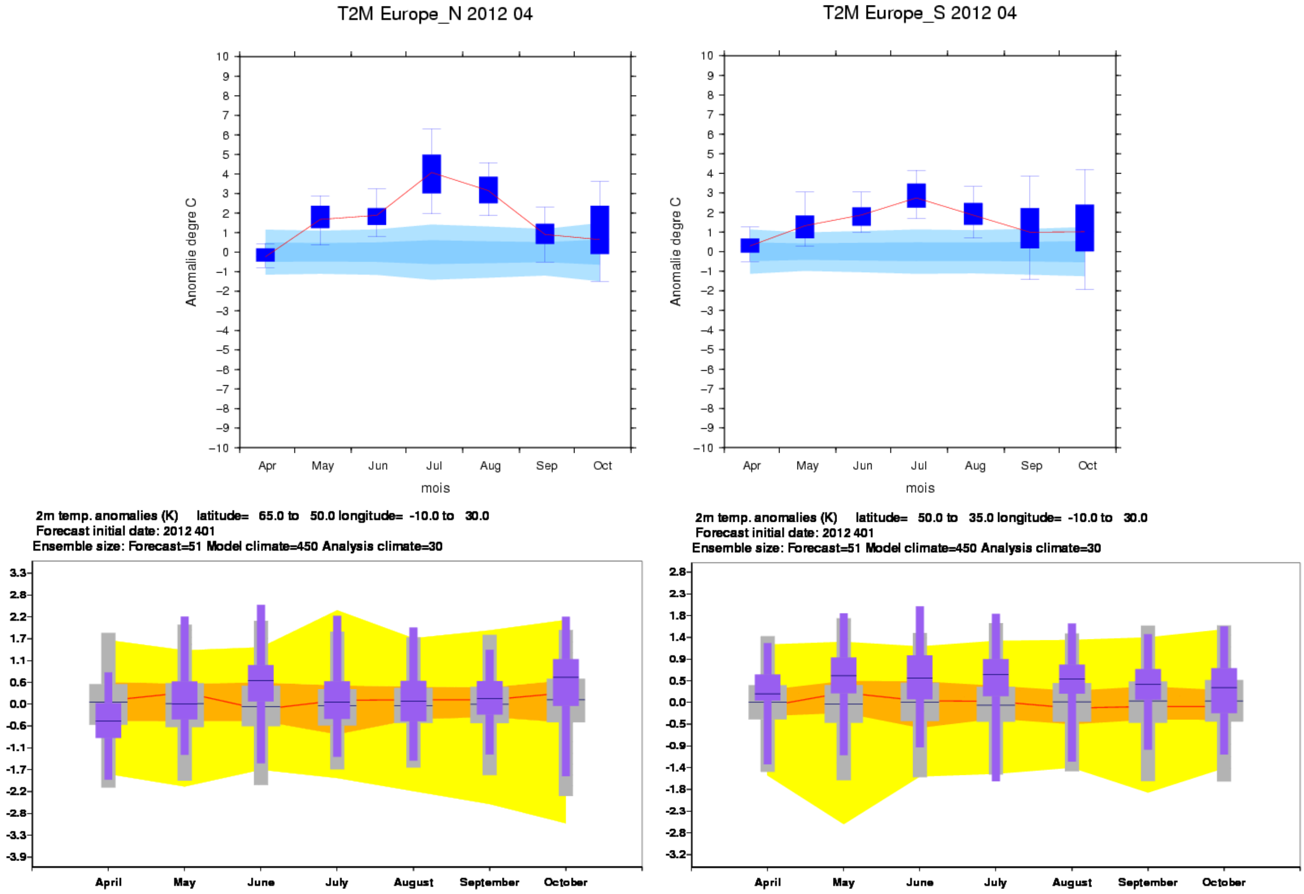


fig.35: Climagrams for T2m in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom) issued in March.

For both Northern and Southern Europe, the 2 models show some consistency for Above normal conditions on the MJJ period and beyond. This is particularly true for Southern Europe while for Northern Europe there is a large difference in July and August. For the later box, the differences between the two models can be related to the model uncertainties and to the climate trend representation which is clearly overestimated in MF which is very likely biased by the Climate trend leading to strong impact on the Geopotential Height (overestimation of blocking conditions - see fig. 20). In Météo-France, for Northern Europe, there is a reasonable skill from May to June, then the score stay close to 0.55 (better than climatology). For Southern Europe there is skill from May to August, even the ROC stay above 0.6 during all this period, the skill become close or worst than climatology.

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

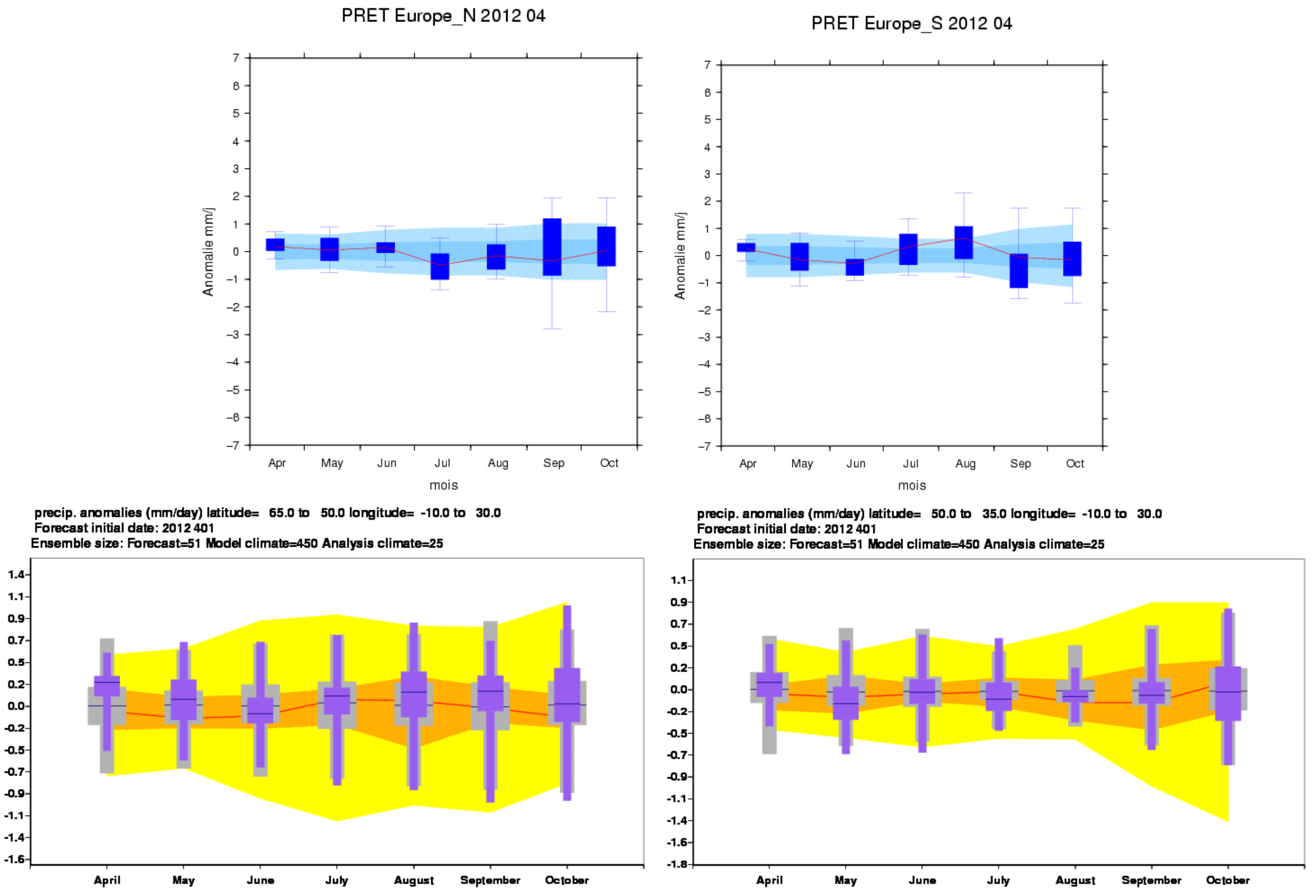


fig.36: Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom), issued in March.

For Northern Europe both models tend to forecast slightly Above normal conditions. However, the predictability seems to be suite low (referring to the General Circulation discussion). MF ROC are slightly above 0.5 from May to July and then close or below climatology. For Southern Europe, ECMWF show intraseasonal evolutions which give a trend toward Below Normal conditions while in Météo-France there is some trend toward Below Normal conditions during the 2 first months which is counterbalanced by a jump to Above Normal conditions in July (and August). The MF ROC scores show some skill in May and June and come close or worst than climatology after. So these intraseasonal evolution should be interpreted with caution.
Last one should notice that referring to the General Circulation discussion, the Below Normal situation should be relevant for the most Western part of the Southern Europe box (especially the Iberic Peninsula and North-Western Africa).

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

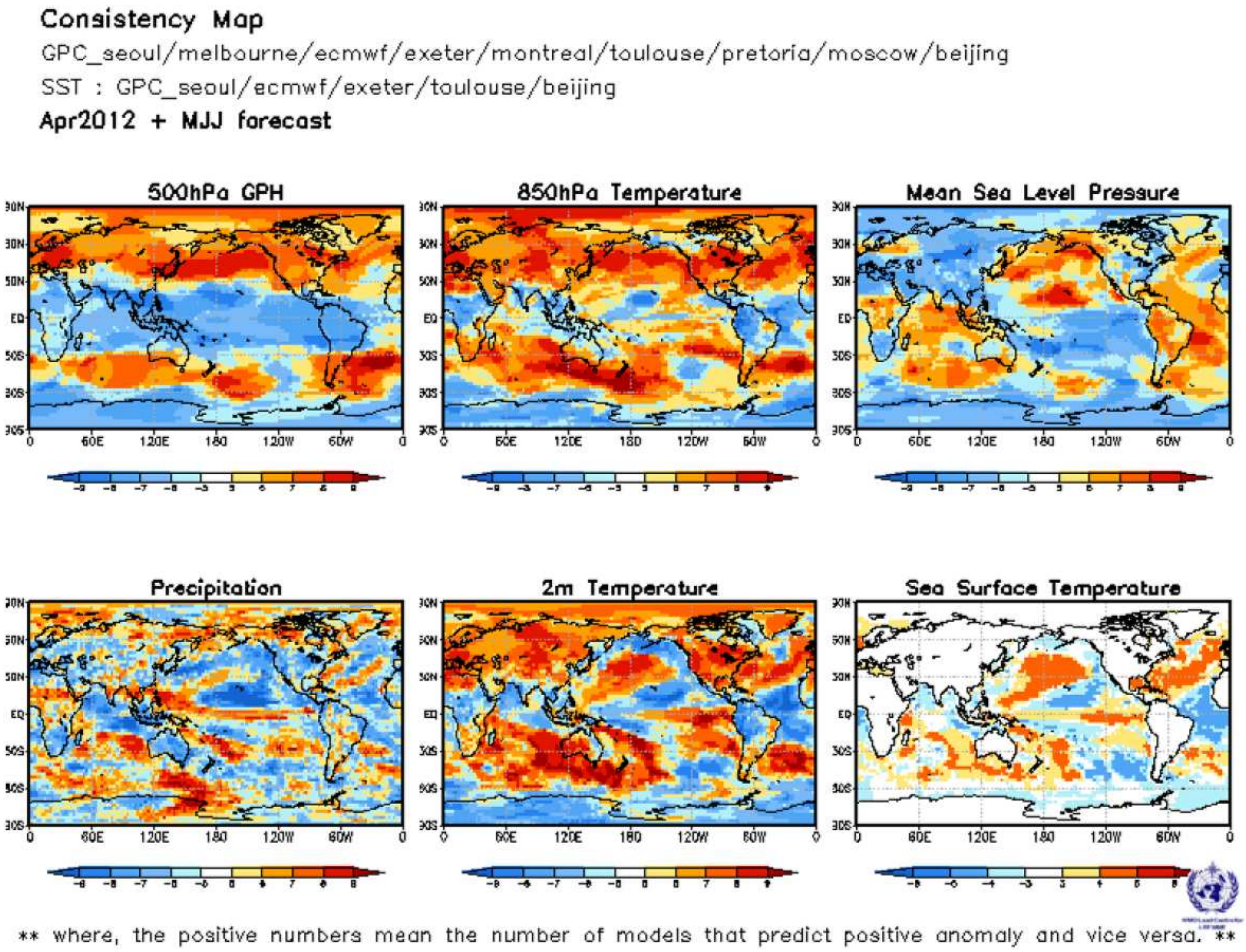


fig.37: GPCs Consistency maps from LC-MME http://www.wmolc.org/

For T2m, over the Northern hemisphere, all the models are quite consistent with a positive anomaly covering all the continental surfaces, excepted for the Indian sub-continent and South East Asia in relationship with the positive anomaly for precipitation over these regions. So the Euro-SIP forecast is likely a very good synthesis to take on board.

For precipitation, there is less consistency. However, one can notice the tendency already pointed out in Euro-SIP for Above normal conditions in the most Northern part of Europe and Below normal conditions over the Western part of the Mediterranean basin.

II.7. "EXTREME" SCENARIOS

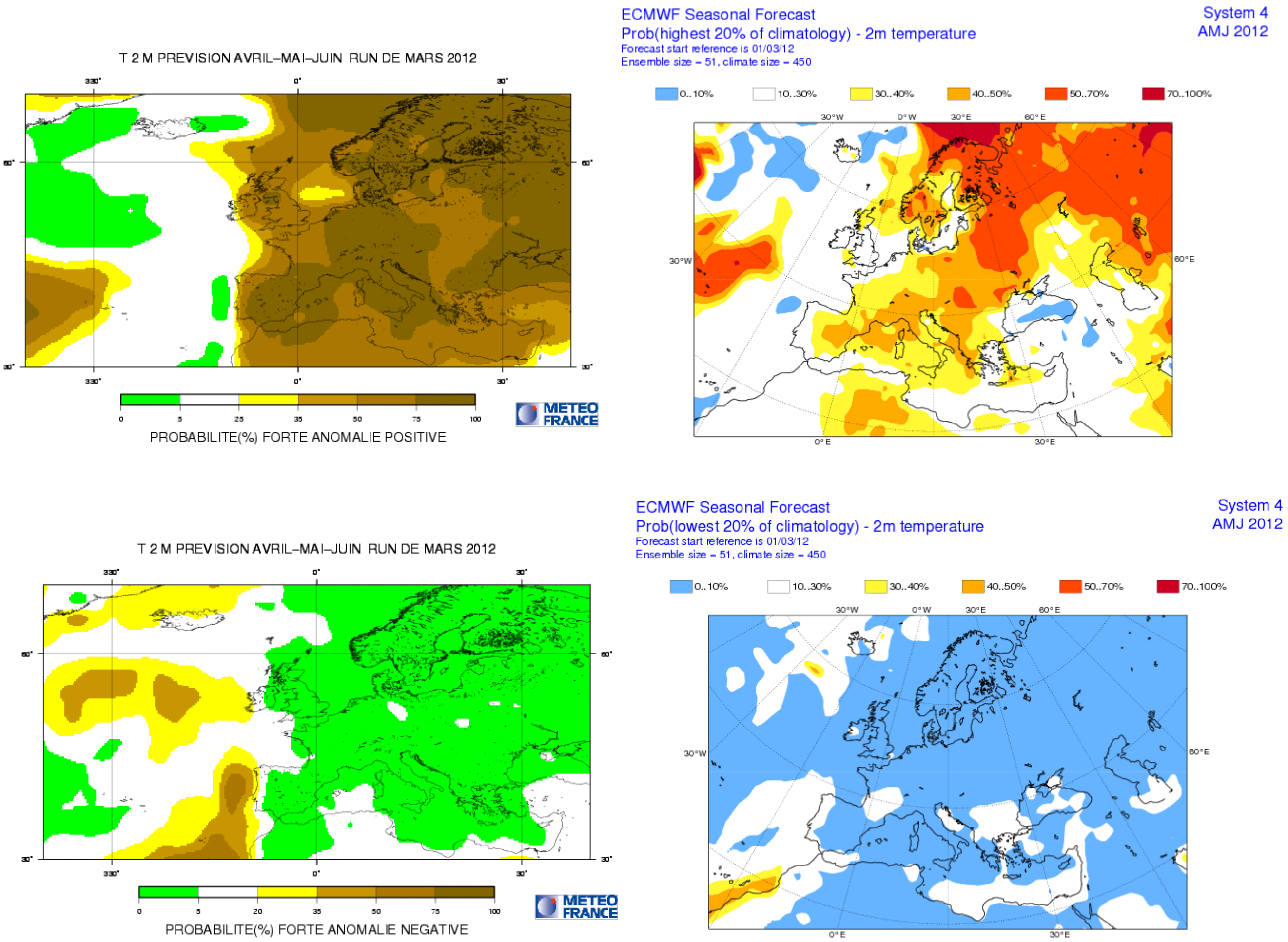


fig.38: Top : Probability of « extreme » above normal conditions for T2m for Meteo-France (left - highest ~15% of the distribution) and ECMWF (right - highest 20% of the distribution).
Bottom : Probability of « extreme » Below normal conditions for rainfall for Meteo-France (left - lowest ~15% of the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

There is some very consistent signal over 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). Also to be quoted that the probability of very Below Normal scenario is very low everywhere. In Météo-France the ROC score is really above climatology for the very above normal scenario (locally it can reaches 0.8) 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..

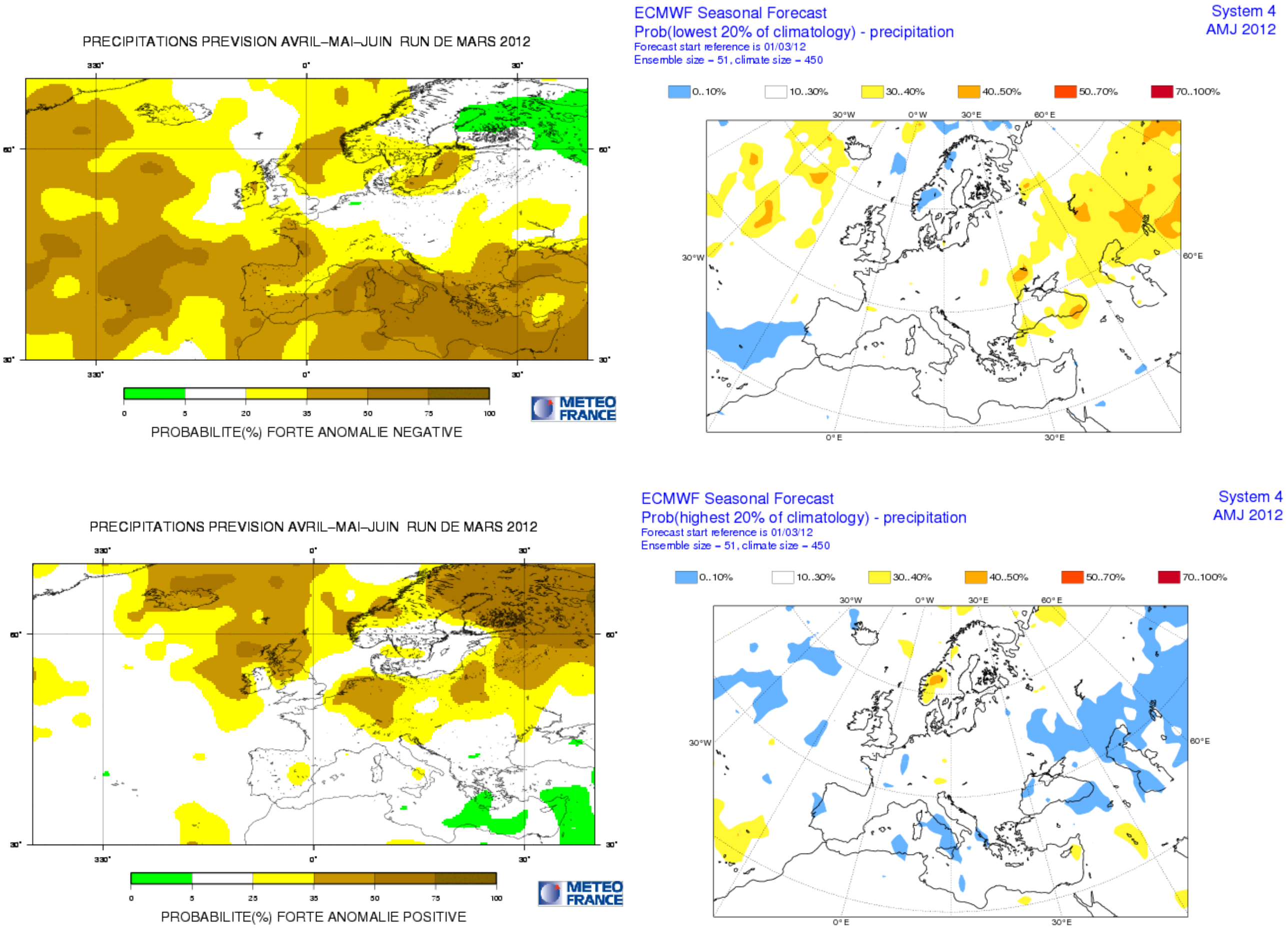


fig.39: Top : Probability of « extreme » Below normal conditions for rainfall for Meteo-France (left - lowest ~15% of the distribution) and ECMWF (right - lowest 20% of the distribution)
Bottom : Probability of « extreme » Above normal conditions for rainfall for Meteo-France (left - highest ~15% of 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 (likely in relationship with the Stream Function anomalies) 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. Referring to the general Circulation discussion, it seems that some predictability could exist over the Mediterranean basin (especially the Western part).
Then it seems that the excess of Blocking regimes in MF is mainly due to tan unrealistic climate trend which pollute the summer forecast.
For temperature, whatever the reasons, the Above Normal scenario makes sense for most of European countries.
For rainfall, the predictability is low but some consistent signal seems to exist for the East-Northern part of Europe (Above Normal scenario) and for coastal regions of the Mediterranean basin (Below Normal scenario), especially on the most western side of the basin. 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

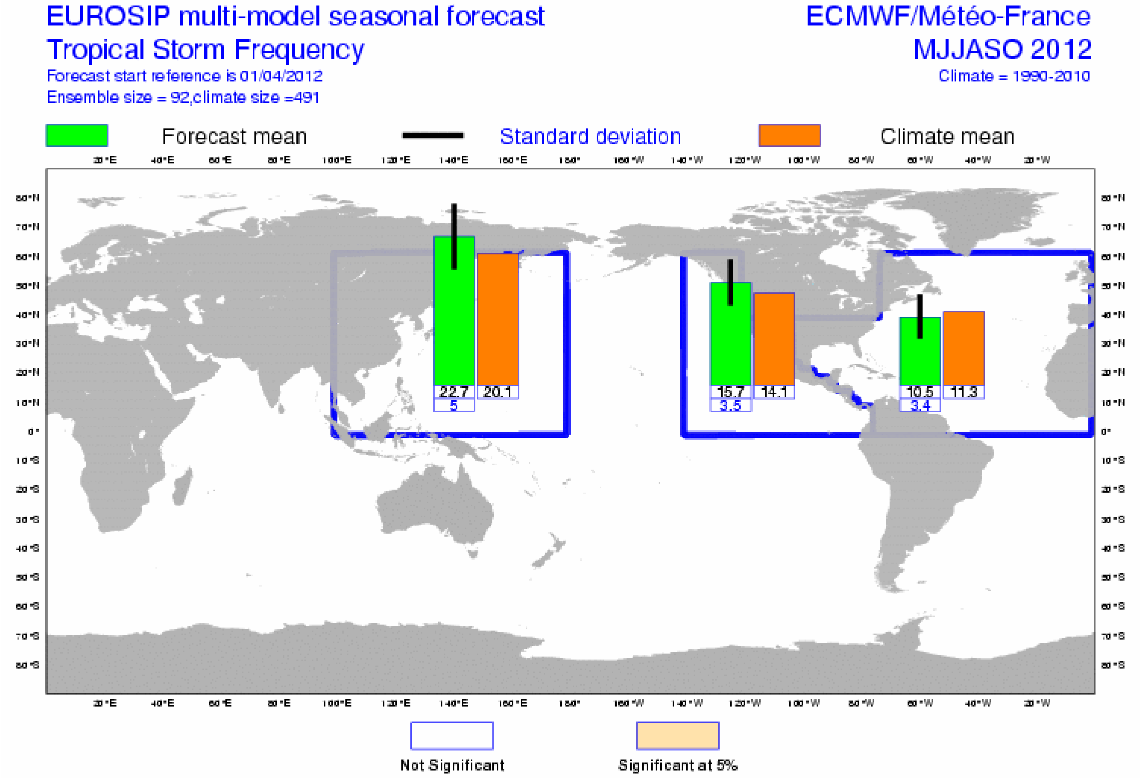


fig.40: Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF) for the May to October 2012 period, issued in April.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro/eurosip_tropical_storm_frequency/

For the beginning of the season in the Northern hemisphere, Euro-Sip forecasts indicate a close to normal cyclonic activity elsewhere.

Synthesis of Temperature forecasts for May-June-July 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*	*3/4*	*3/4*				
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 May-June-July 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	No privileged scenario	No privileged scenario	No privileged scenario	No privileged scenario	No privileged scenario				
MF	No privileged scenario	RR Below normal (Dry)	No privileged scenario	No privileged scenario	No privileged scenario				
Met Office	No privileged scenario	No privileged scenario	No privileged scenario	No privileged scenario	RR Below normal (Dry)				
JMA	No privileged scenario	No privileged scenario	No privileged scenario	No privileged scenario	No privileged scenario				
Synthesis	*4/4*	*3/4*	*4/4*	*4/4*	*3/4*				
Eurosip	No privileged scenario	No privileged scenario	No privileged scenario	No privileged scenario	No privileged scenario				
IRI	No privileged scenario	No privileged scenario	No privileged scenario	No privileged scenario	No privileged scenario				
Privileged Scénario 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, 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).

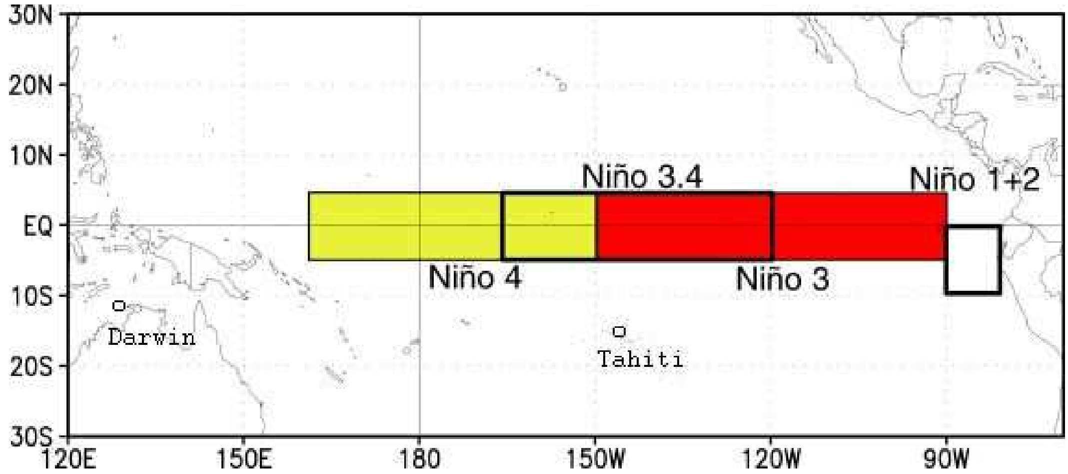
In order to better interpretate the results, it is recommended to look to verification maps and graphs which give some insight into the expected level of skill for a specific parameter, region and period. A set of scores is presented on the web-site of the Lead-Centre for Verification (see http://www.bom.gov.au/wmo/lrfvs/)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