METEO FRANCE
Toujours un temps d'avance

GLOBAL CLIMATE BULLETIN
n°150 - DECEMBER 2011

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I. DESCRIPTION OF THE CLIMATE SYSTEM (OCTOBER 2011)

I.1. GLOBAL ANALYSIS

I.1.a Ocean

In the Tropical Pacific the situation shows only little evolution (fig.1) with always a cooling East to the date line and close to normal conditions in the warm pool. Still in the Pacific at the highest latitude of the Northern Hemisphere, the positive anomaly continue to strengthen as a result of the atmospheric forcing.
The tropical Atlantic ocean remains slightly warmer than normal especially in its northern part and over the Caribbean Basin. In the Northern Atlantic, there is still a negative anomaly strip (but less intense) centred around 50°N while a positive anomaly develops in the Eastern part from Spain to West Africa.
The Indian Ocean is warmer than normal in its equatorial part. Positive anomalies are still visible on the Western part of the basin, from Tanzania up to the Great Horn of Africa. In the most Eastern part, the negative anomaly vanished. In the Southern hemisphere the strip of positive SST anomaly extending from Madagascar up to Australia continue to decrease.

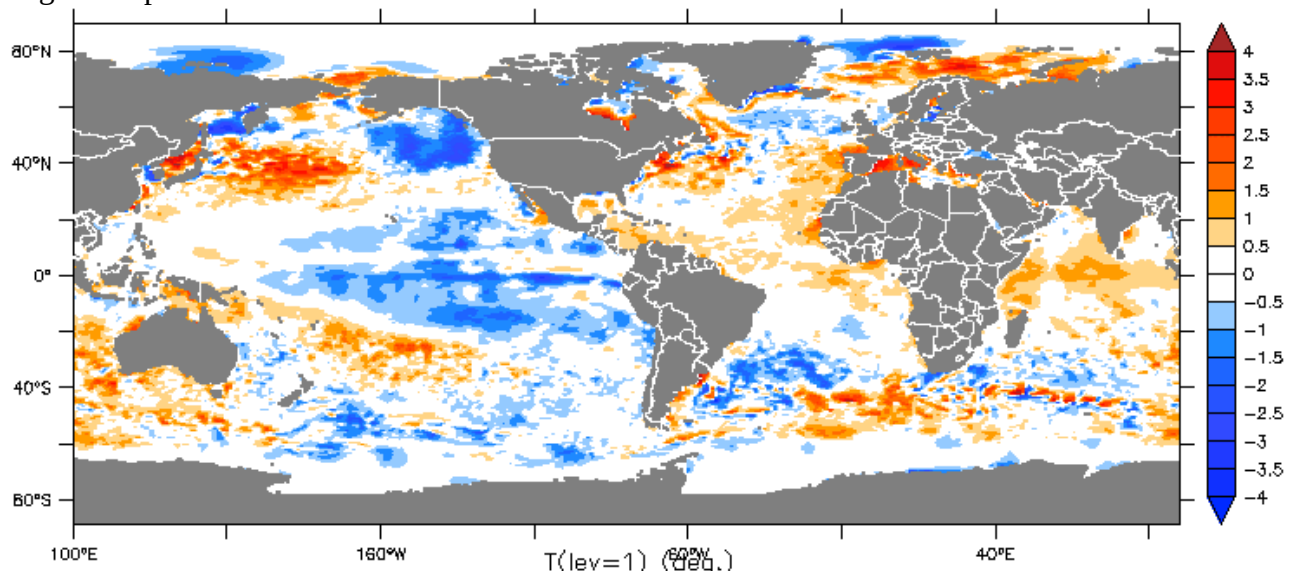


fig.1: SSTs Anomalies in October 2011 (°C). (reference Levitus 1980-2008)
http://bcg.mercator-ocean.fr/

In subsurface (fig.2), in the equatorial Pacific waveguide, the heat content anomalies show some similarity with the SSTs and thermocline depth anomalies (see next figure) showing negative anomalies, persistent in the Central and strengthened in the Eastern part. Conversely to the SST signal, there are positive anomalies in the Western part, in both sides of the equator.
In Tropical North Atlantic, the heat content anomaly is mostly positive, excepted along the eastern coast of South America. To be notice that the heat content in the Caribbean is not consistent with the SST signal. In the mid-latitude of North-East Atlantic, the heat content anomalies are similar to the previous month ; the anomalies being likely due to the atmospheric influence onto the ocean.
In the equatorial wave guide of the Indian Ocean, the anomalies have decreased. However, there is still a contrast between the central and western part (positive anomaly) and the most eastern part (negative anomaly).

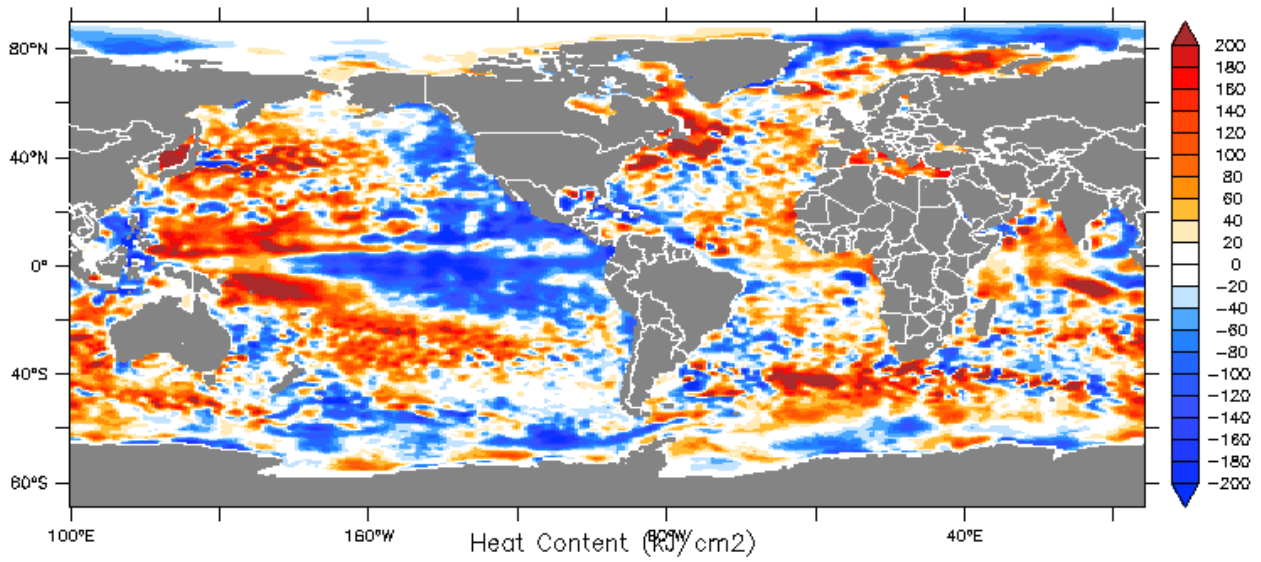


fig.2: map of Heat Content Anomalies (first 300m) in October 2011 (kJ/cm^2). (reference Levitus 1980-2008) http://bcg.mercator-ocean.fr/

In October over the Equatorial Pacific, the La Niña like dipole structure is very visible (deeper than normal on western part and thinner than normal on Eastern part). Some clear trace of Kelvin wave propagation are visible from West to East in the equatorial waveguide (starting at the very beginning of October). One can notice the strengthening of the dipole at the end of October/beginning of November. Over the Atlantic, beginning of October, a positive anomaly is visible on the Eastern part of the basin. A cooling phase appears over the whole basin at the end of the period in relationship with the MJO activity. Last over the Indian ocean, the structure of the thermocline depth anomaly is unclear. The only clear evolution is the disappearance of the negative anomaly on the most Eastern part. To be noticed the close to normal situation in the most Western part.

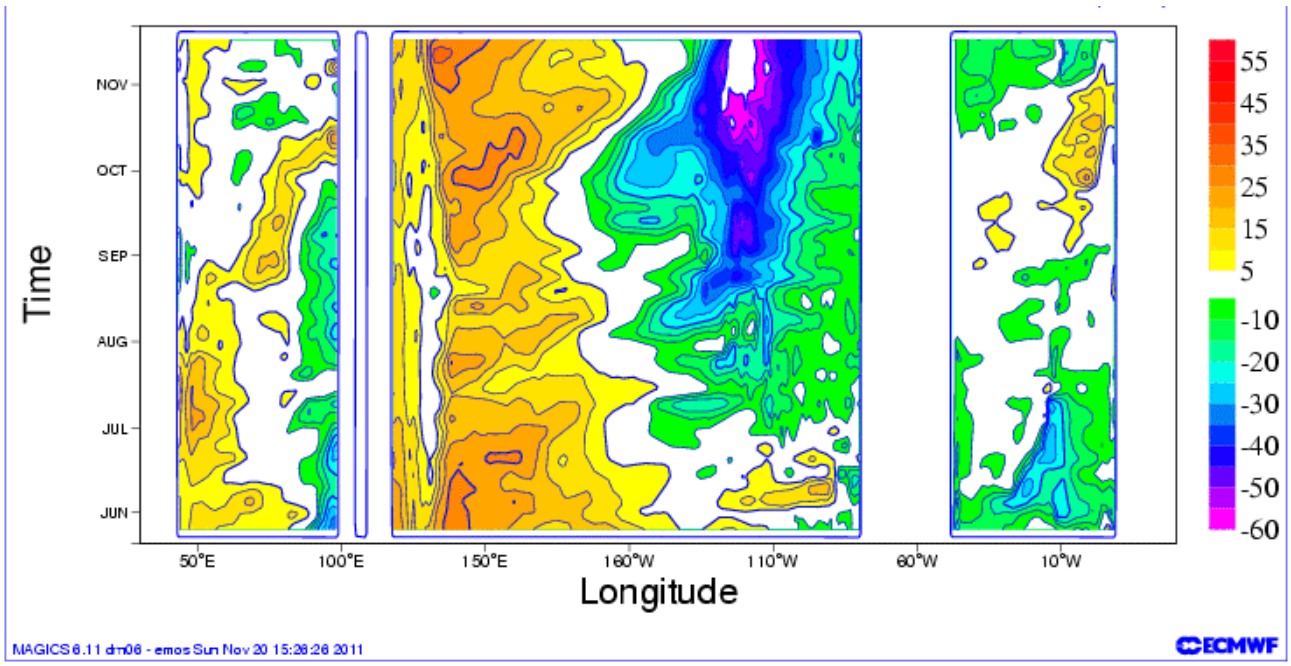


fig.3: Hovmeoller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 6 month period. http://www.ecmwf.int/

I.1.b Atmosphere : General Circulation

Looking to the Velocity Potential Anomaly field in the high troposphere (fig.4), the patterns of General Circulation (especially Hadley-Walker circulations) are not fully similar to La Niña like patterns. In more details, over most of the Tropical Pacific the anomaly is mostly positive (Convergent circulation anomaly ; Downward anomaly motion). Associated to these anomalies, the SOI is still positive (+ 0.8). However, the strong negative anomaly over the Western part of the North Tropical Indian Ocean seems to interact and consequently to deeply modify the Hadley-Walker circulation in the Tropics, in relationship with the MJO activity especially marked in October over these regions. Over the African continent, the divergent circulation anomaly over the Nigeria could be consistent with a La Niña response like the one on the Eastern coast of Southern America or on the convergent circulation anomaly over the Southern part of US.

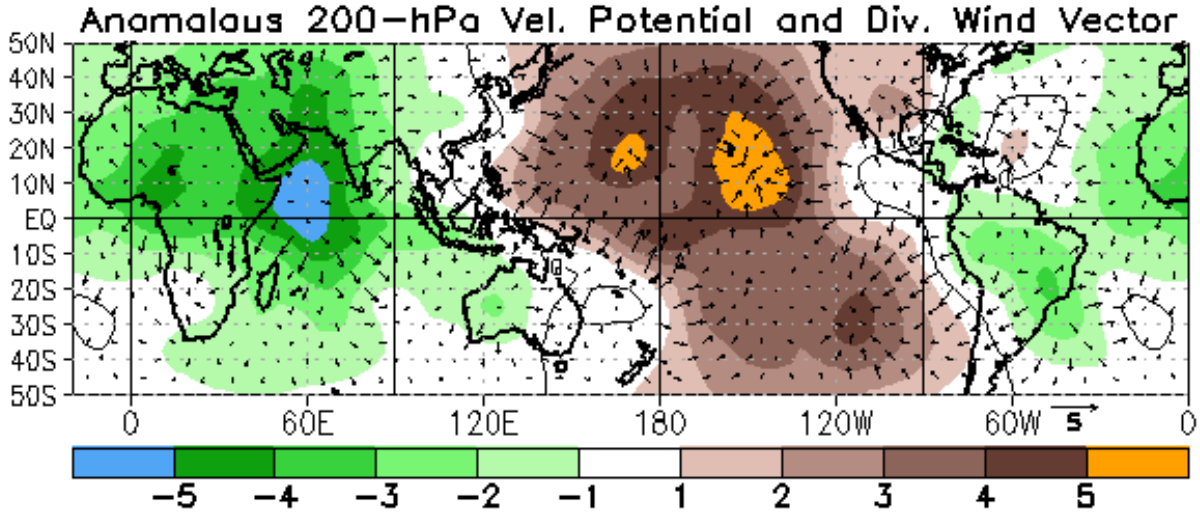


fig.4: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly for October 2011. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly).
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

Looking to the Stream Function anomalies in the high troposphere (fig. 5), with respect of the previous month one can remark that even if anomalies are visible on the Pacific Basin, the teleconnection patterns are not very strong across the Pacific (and the Atlantic).

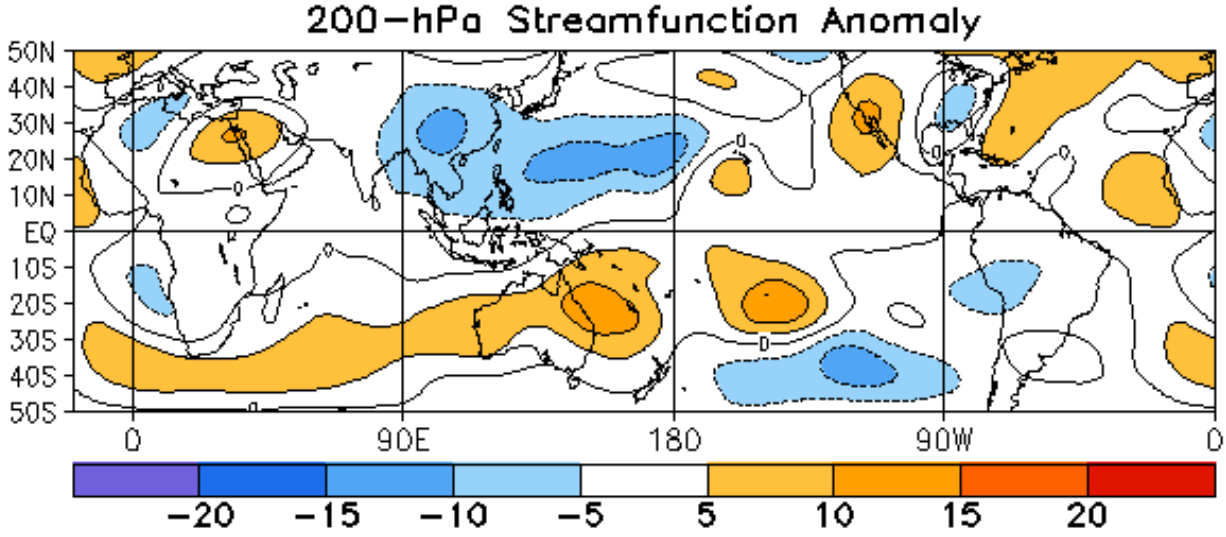


fig.5: Stream Function Anomalies at 200 hPa in October 2011.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

Over the Northern Hemisphere the Geopotential height at 500 hPa (fig. 6) shows a positive anomalies over the Atlantic façade of Europe, North Canada and Siberia. Especially, the enhanced Geopotential height over Atlantic are consistent with the SSTs evolutions already pointed out for the Eastern Atlantic basin. A negative anomaly is seen on the North Atlantic sector close to Greenland and Iceland. The NAO mode (positive phase) is partly related to this negative anomaly. However, in relationship with the positive anomaly over the Atlantic façade of Europe, this is not leading to an increased zonal circulation on these regions. As a consequence, the European Blocking Index was positive over most of October.
Last and related to the previous comment on the Stream Function, on can notice that the PNA mode shows some activity but projecting onto the positive phase while it should be negative in a La Niña situation.

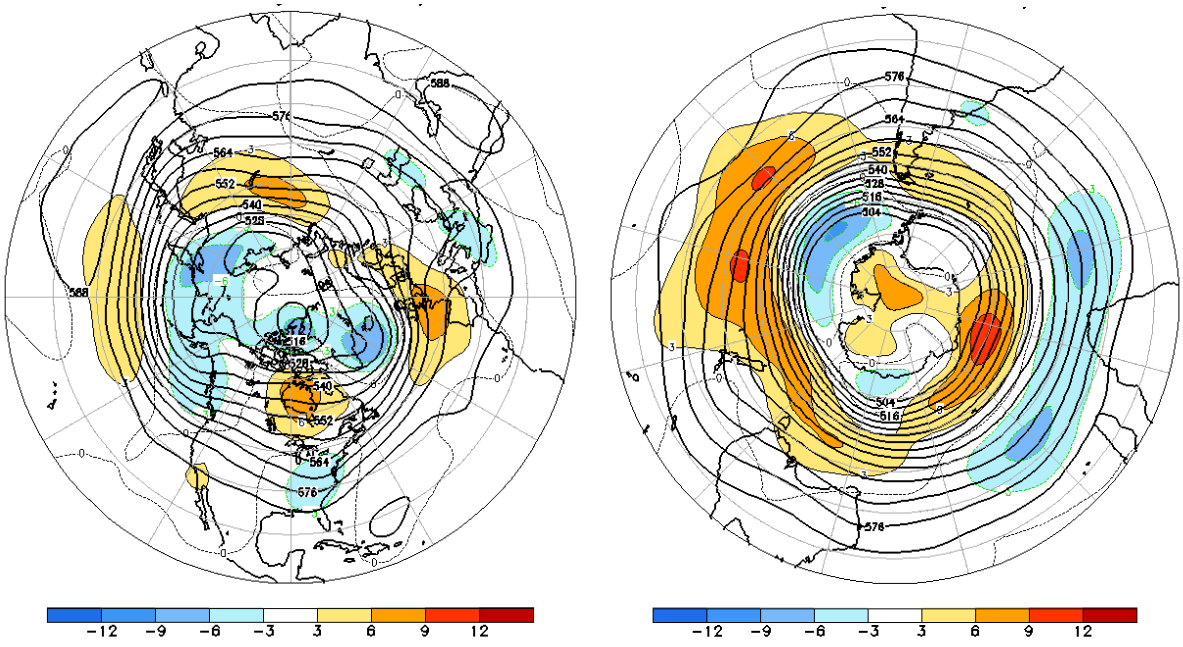


fig.6: Anomalies of Geopotential height at 500hPa in October 2011 (left North Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige9.shtml, and right South Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige15.shtml)

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
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
AUG 11	-1.9	1.0	-0.5	-0.7	1.4	---	1.0	0.2	-0.3
JUL 11	-1.5	0.4	-0.3	-2.2	-0.8	---	-0.8	2.5	-0.3
JUN 11	-1.0	-0.2	0.8	-0.5	0.3	---	-0.3	-0.6	-1.1
MAY 11	0.0	-0.7	0.4	-1.2	0.3	---	-1.5	-1.1	-0.6

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

I.1.c Precipitation

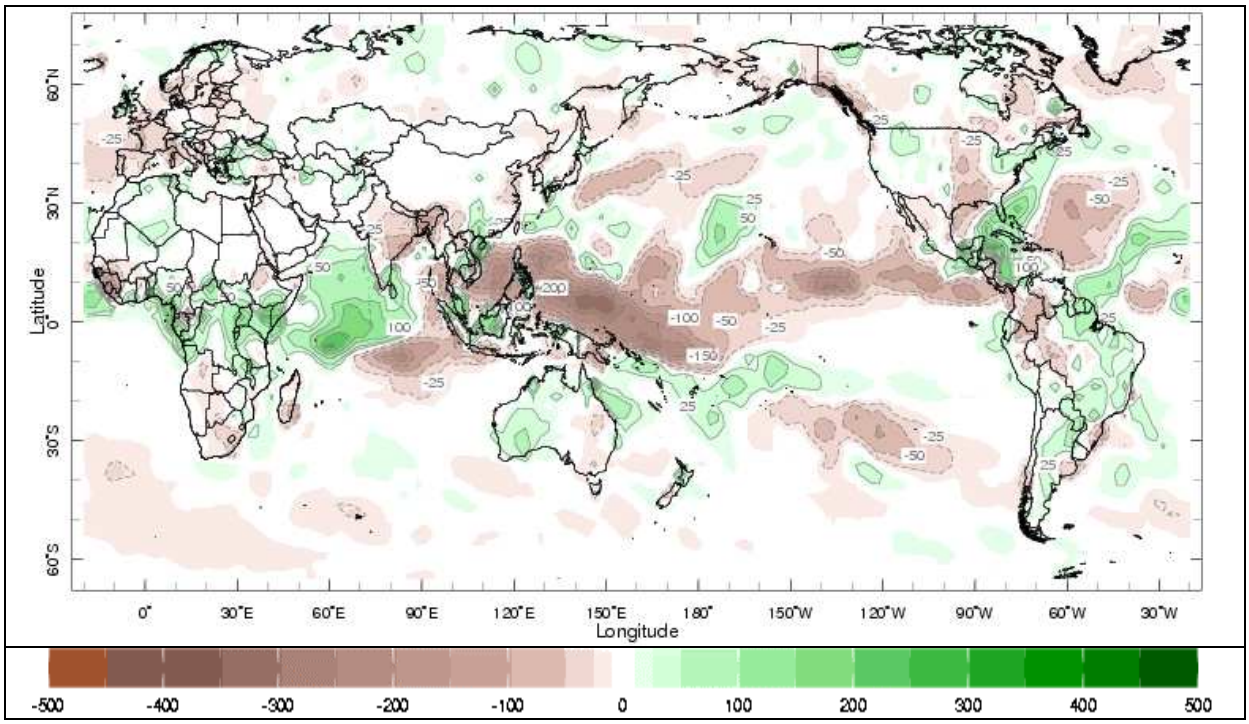


fig.7: Rainfall Anomalies (mm) in October 2011 (departure to the 1979-2000 normal) – Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maprom/.Global/.Precipitation/

Accordingly to general Circulation patterns, the rainfall situation is below Normal over the Central and Eastern Pacific while some strong positive anomalies are present on the Western part. Extended negative anomalies are also visible across the whole American continents (both South and North). In relationship with the geopotential Height anomalies the precipitation (fig.7) has been Above normal over North-Western Europe and Below normal on most of the other part of Europe.

I.1.dTemperature

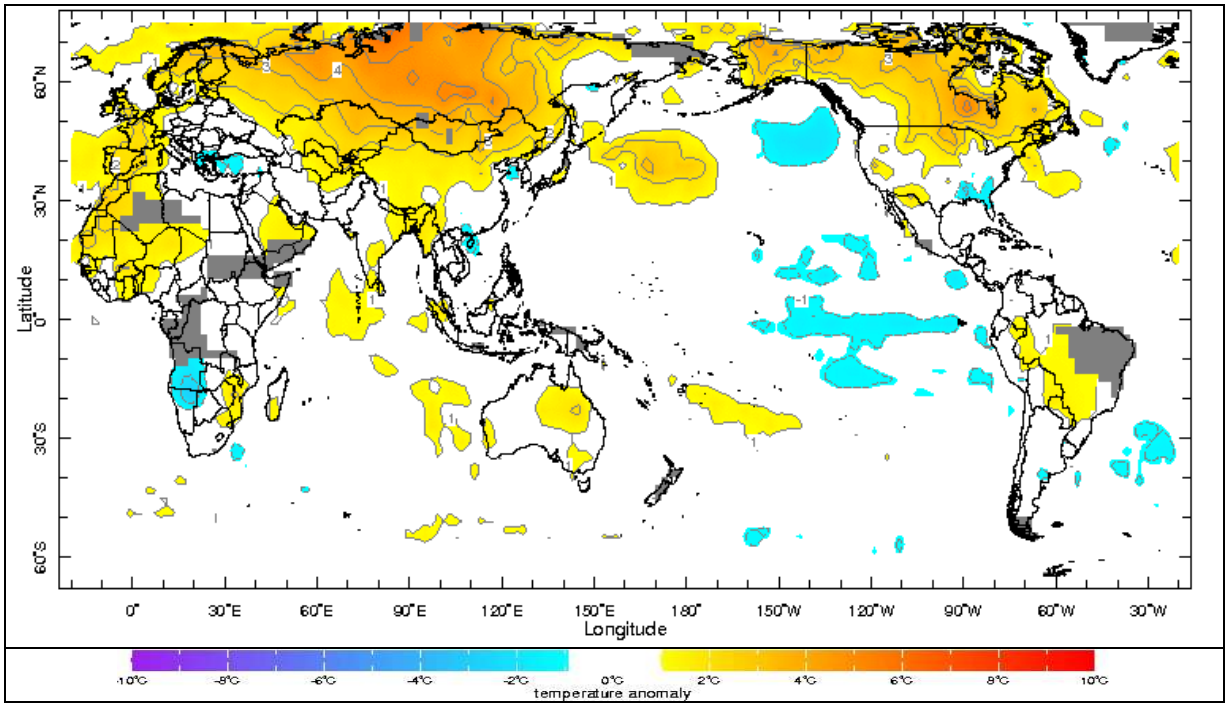


fig.8: Temperature Anomalies (°C) in October 2011 (departure to the 1979-2000 normal) http://iridl.ldeo.columbia.edu/maproom/.Global/.Atm_Temp/Anomaly.html

In October, temperatures (fig.8) have been above normal over most of the continents and especially over West Europe, from Scandinavia up to Siberia (including a large part of China, Mongolia and Kazakhstan), and most of the Canada.

I.1.e Sea Ice

In Arctic in October, the sea-ice extension (fig.9) is far below normal, excepted over the Greenland sea. It is very close to the observed 2007 sea-ice extension – record year for the minimum reached at the end of the boreal summer (fig. 9bis – left).
In Antarctic, the sea-ice extension (fig. 9bis – right) is very close to normal

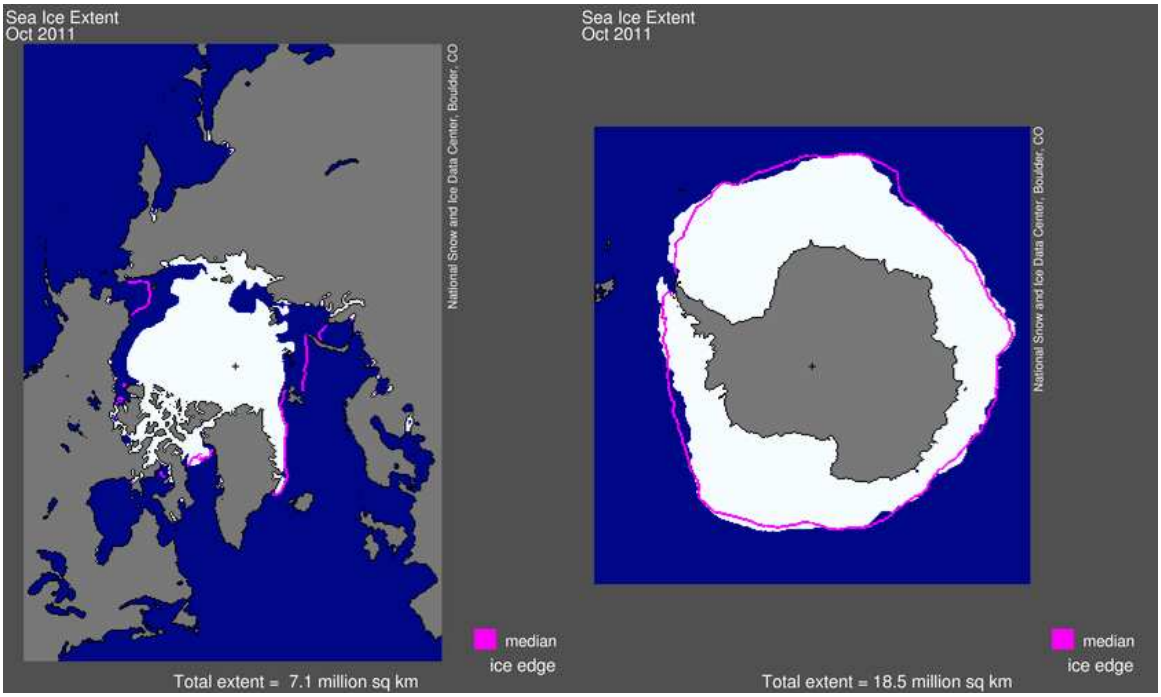


fig.9: Sea-Ice extension in Arctic (left), and in Antarctic (right) in October 2011. The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

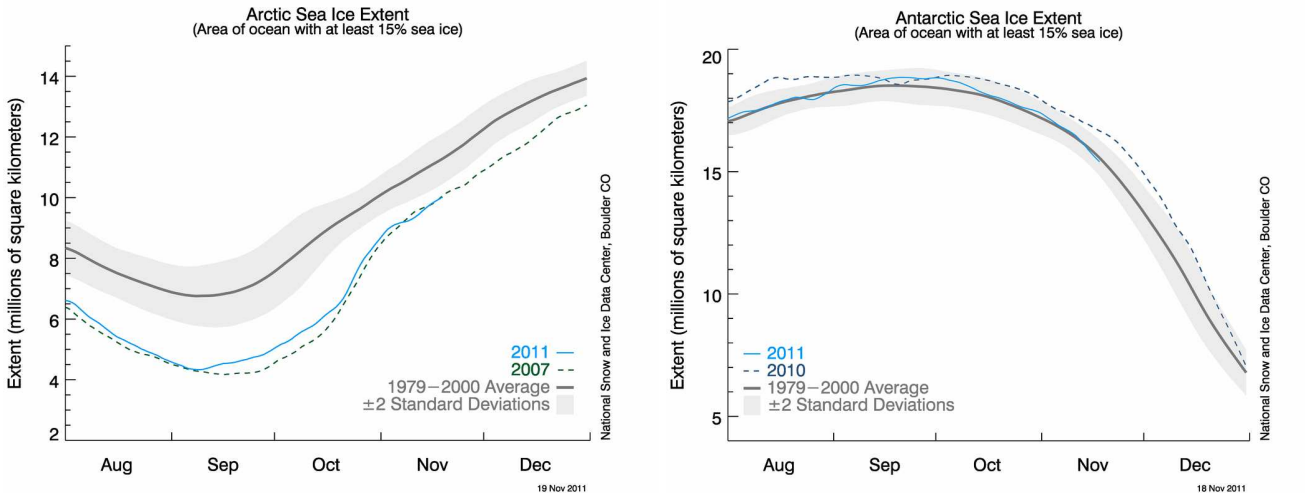


fig. 9bis : Sea-Ice extension evolution from NSIDC
http://nsidc.org/data/seaice_index/images/daily_images/N_stddev_timeseries.png

I.2. OCEANIC TROPICAL DYNAMIC

I.2.a Pacific Basin

In October, the negative anomaly in the equatorial Pacific has extended (fig.10) and strengthened ; most of the equatorial waveguide is now cooler than normal. In the Western part of the basin the Trade Wind anomaly has decreased and one can remark that the positive anomaly on the most north western part has slightly increased consistently with the subsurface analysis (see hereafter and Heat content analysis).

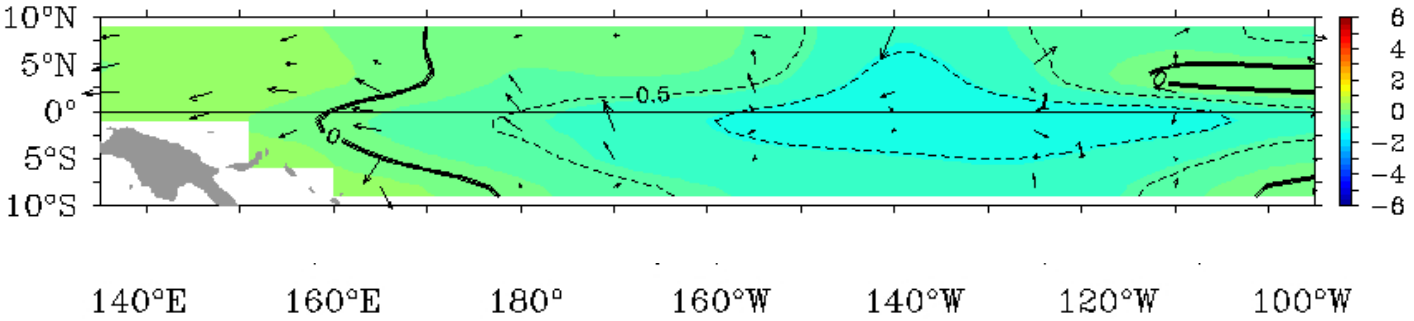


fig.10: SST Anomalies and Wind anomalies in October 2011 over the Equatorial Pacific from TAO/TRITON.
http://www.pmel.noaa.gov/tao/jsdisplay/monthly-summary/monthly-summary.html

In the Niño boxes (4, 3.4, 3 et 1+2 ; see definition in Annex - fig.11) the SST anomalies are negative everywhere and have increased. The monthly averages in October are respectively -0,7°C, -1,0°C, -1,0°C et -0,6°C from West to East.

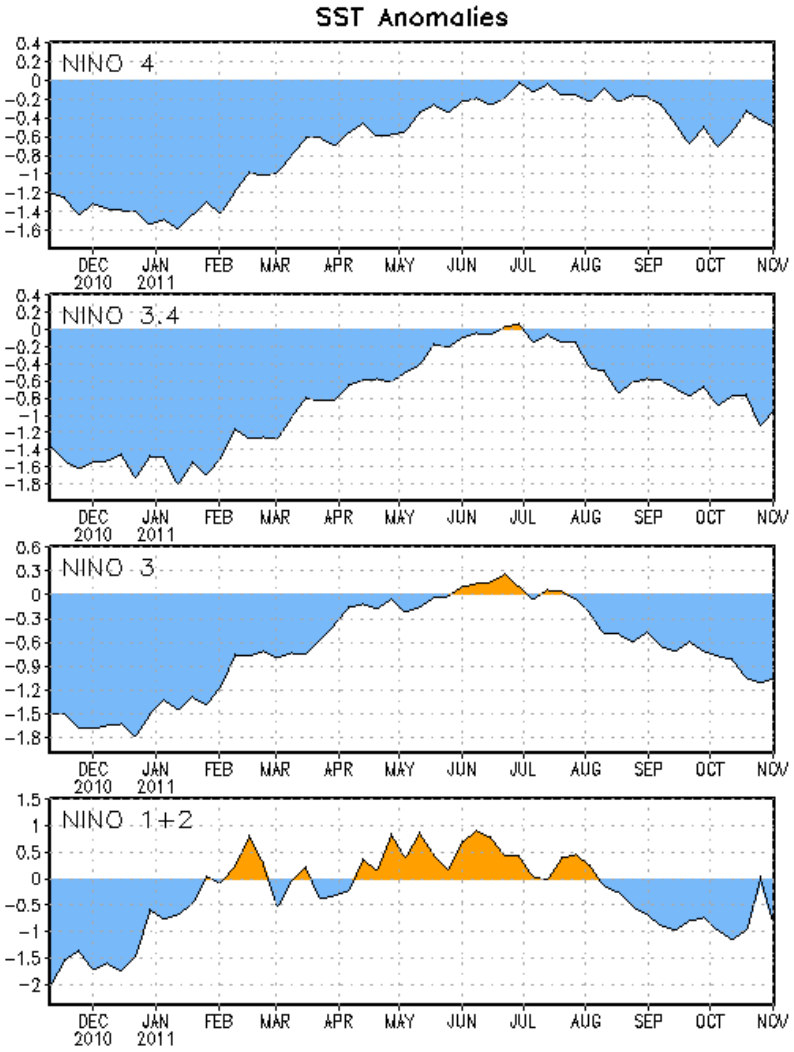


fig.11: Time series of SST anomalies in Niño boxes (departure to 1971-2000 normal - Smith and Reynolds, 1998)
http://www.cpc.ncep.noaa.gv/products/analysis_motoring/enso_advisory/ensodisc.doc

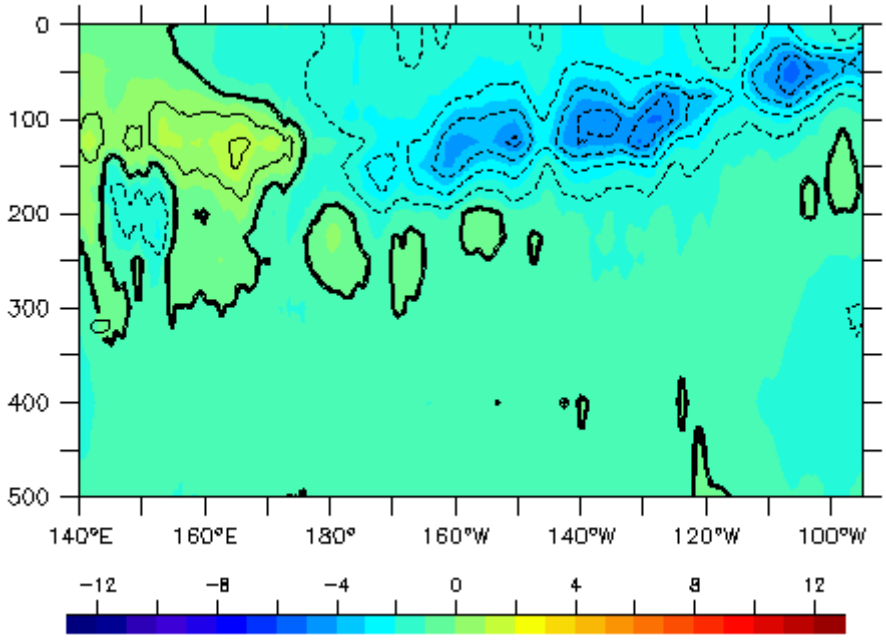
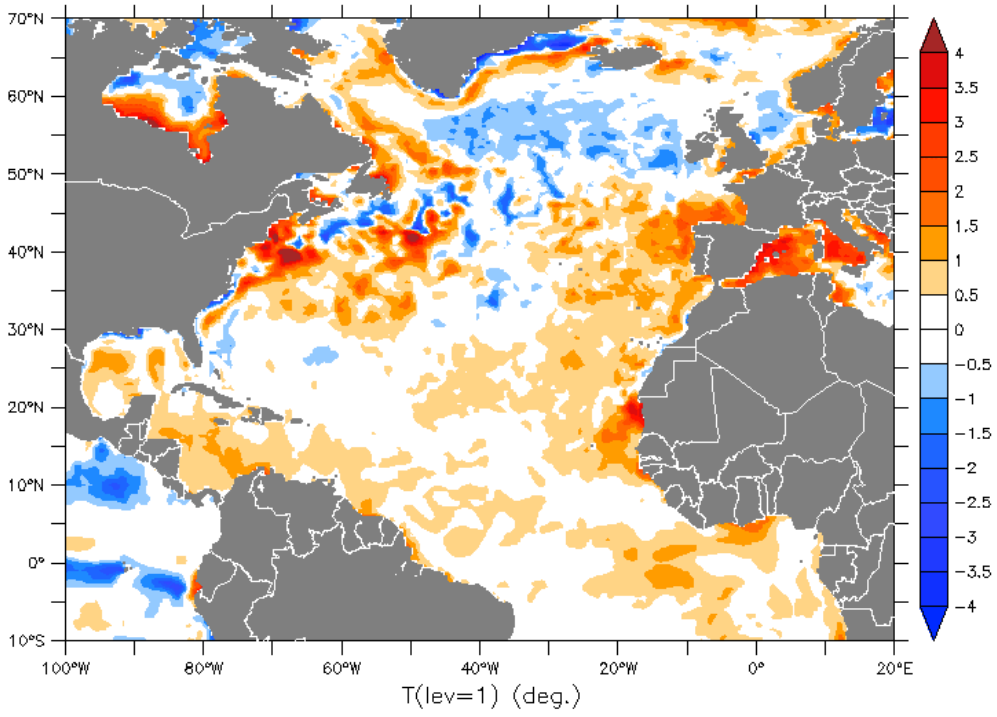


fig.12: Oceanic temperature anomaly in the first 500 metres in the Equatorial Pacific, in October 2011 (http://bcg.mercator-ocean.fr/)

In the equatorial waveguide (fig. 12) under the surface the negative cold anomalies have propagated eastward and reached the surface close to South American coast. To be quoted the behaviour on the West side with some enhancement of the warm reservoir between 100 and 150 m and traces of Eastward propagation.

I.2.b Atlantic Basin



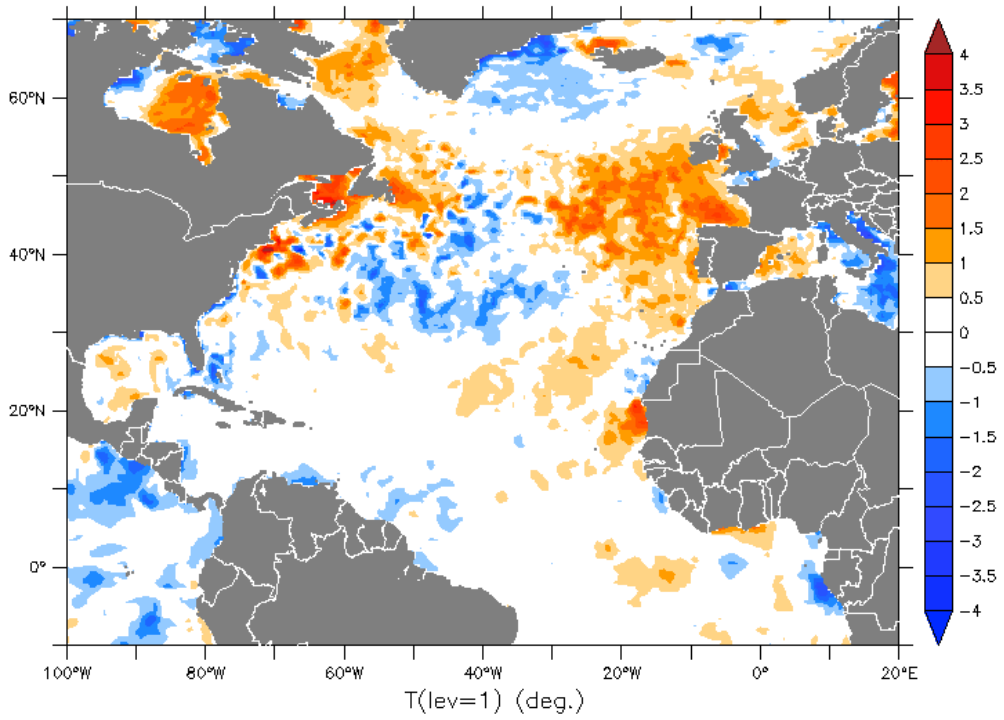


fig.13: **Top : SST Anomalies in October 2011 (reference Levitus 1950-2008). Bottom : SST anomaly time tendency (October-September) document provided by Mercator-océan (http://bcg.mercator-ocean.fr/).**

In the extra tropics North to the equator (fig. 13), there is still a negative anomalies between 50°N and 60°N on the Atlantic but they noticeably decreased. This is likely in relationship with the General Circulation and especially the existence of a broad ridge on the Eastern part of the basin. Consequently the SSTs are warming all along Western European and African coasts. In the Tropics and the equatorial wave guide, the evolution is very limited with respect of the previous month. The Tropical Atlantic is still warmer than normal especially from Cuba to the Northern coast of South America.

I.2.c Indian Basin

Most of the Indian oceanic basin shows positive anomaly in the Tropics North to the equator (fig.1). This anomaly deeply impact the General Circulation and the associated precipitations (see relevant sections). The DMI is still in a positive phase (because of the positive anomaly).

II. SEASONAL FORECASTS FOR DECEMBER-JANUARY-FEBRUARY FROM DYNAMICAL MODELS

II.1. OCEANIC FORECASTS

II.1.a Sea Surface Température (SST)

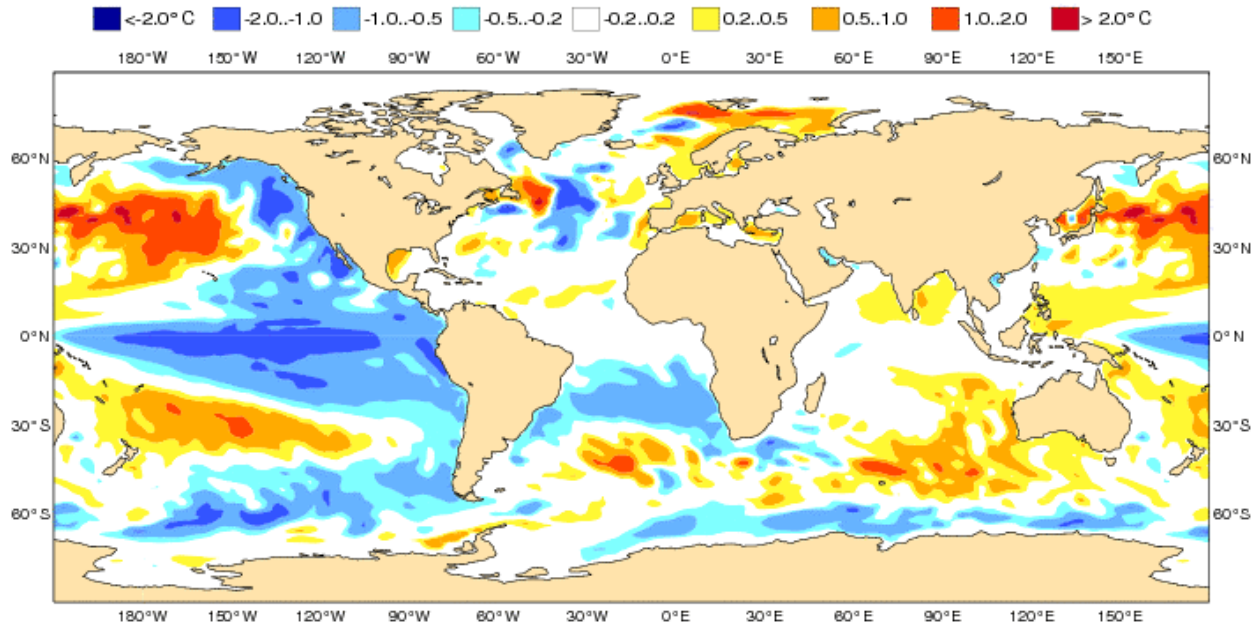


fig.14: SST anomaly forecast (in °C) from ECMWF for December-January-February, issued in November.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

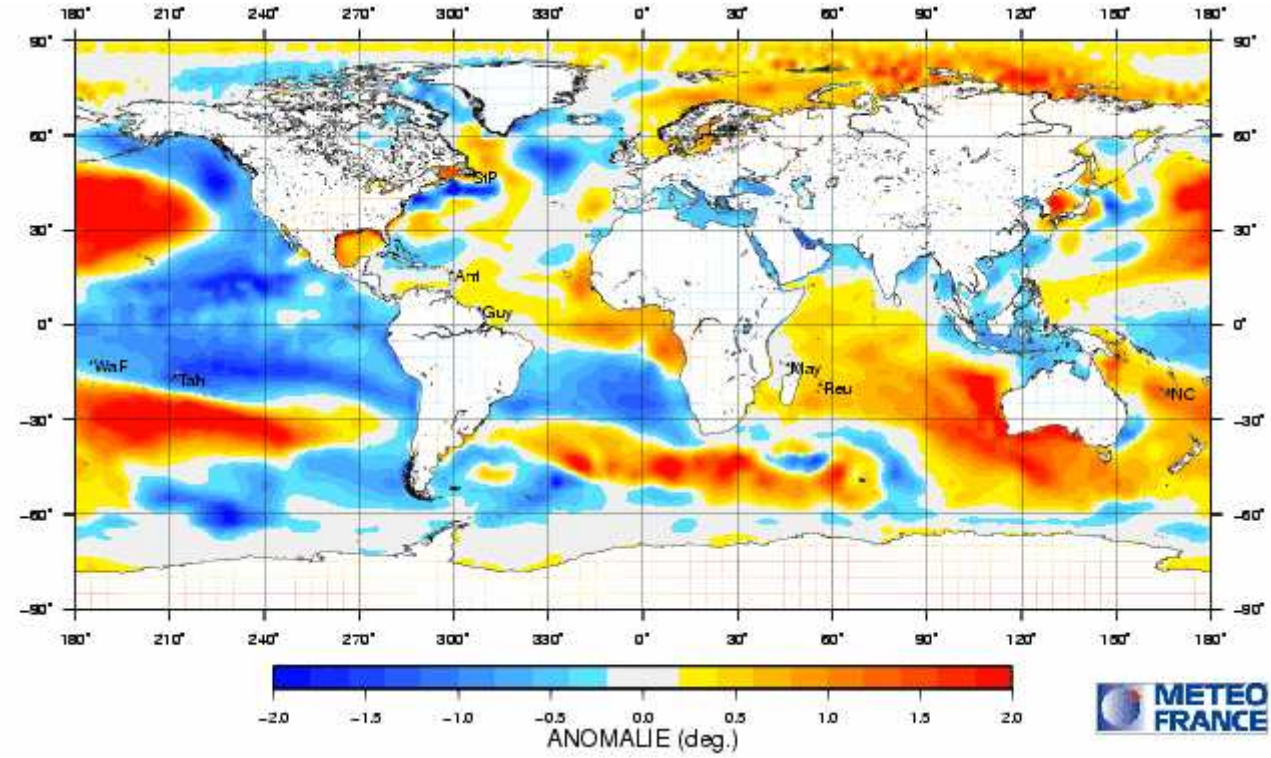


fig.15: SST Anomaly forecast (recalibrated with respect of observation) from Météo-France for December-January-February, issued in November. http://elaboration.seasonal.meteo.fr/

The 2 models are quite consistent over all the oceanic basins even if some regional differences can be found. The main differences are around the maritime continent, in the North-Western Pacific, the Northern part of the Indian Ocean. Most of the Tropical Pacific is colder than normal while strong positive anomalies develop in the sub-tropic/mid latitude regions. In the Atlantic, there is large similarity even if the Meteo-France model give stronger anomalies (especially warm anomalies in the Tropics). Over the Indian Ocean, the 2 models tend to forecast above normal temperature over the oceanic basin and especially in the South-Eastern part (close to Australia).
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 cooling in the Central and Eastern Pacific is clearly visible ; it is extending close to the warm pool. The warm Tropical Atlantic is also noticeable.
Last, in the Indian Ocean, one can see the warmer than normal conditions over most of the basin.

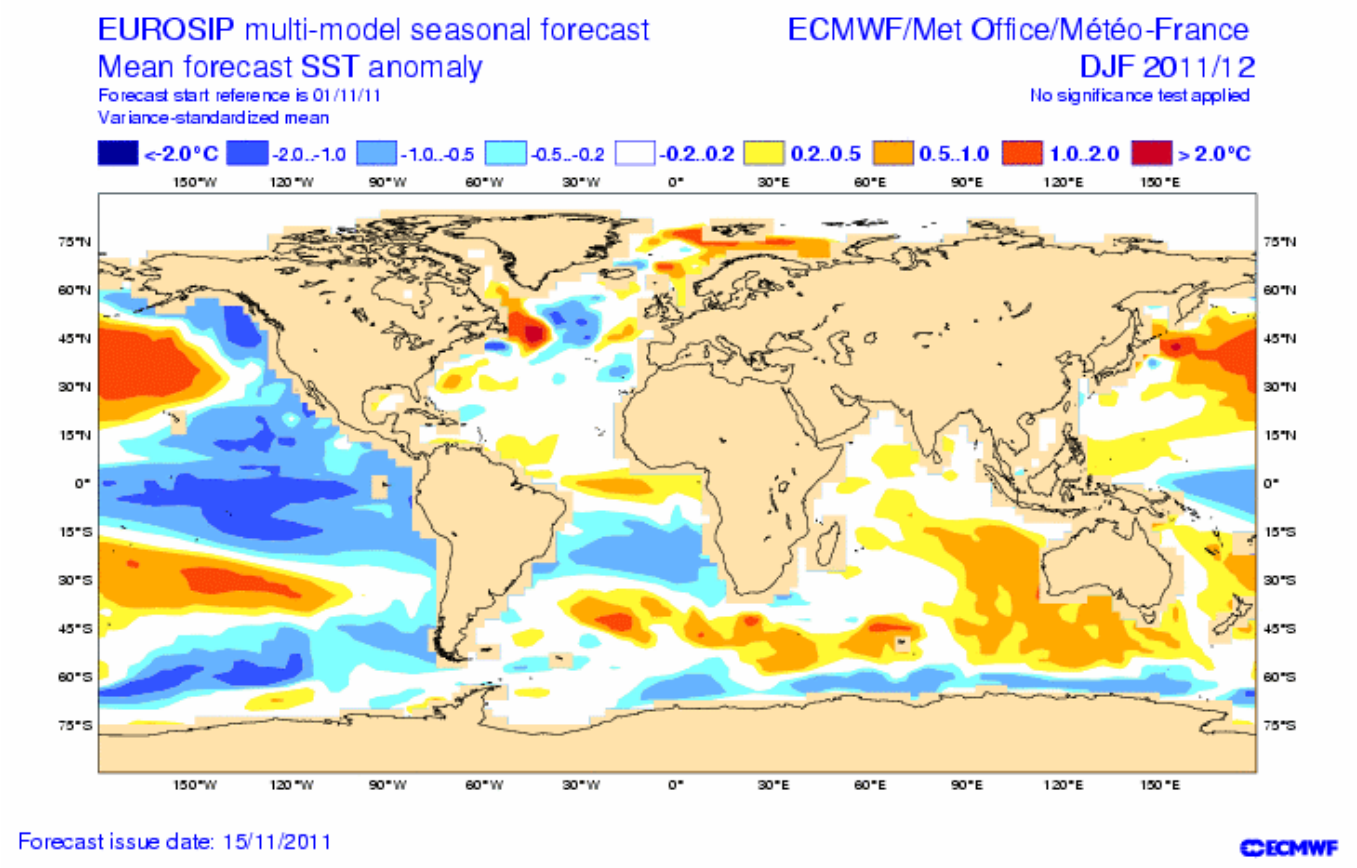


fig.16: SST Forecasted anomaly (in °C) from Euro-SIP valid for December-January-February, issued in November.

II.1.b ENSO Forecast :

Forecasted Phase : weak (possibly moderate) La Niña

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 17 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 December-January-February on average, both statistical and dynamical models forecast conditions below La Niña threshold. The strengthening of this event doesn't seem to be the most likely scenario for this winter.

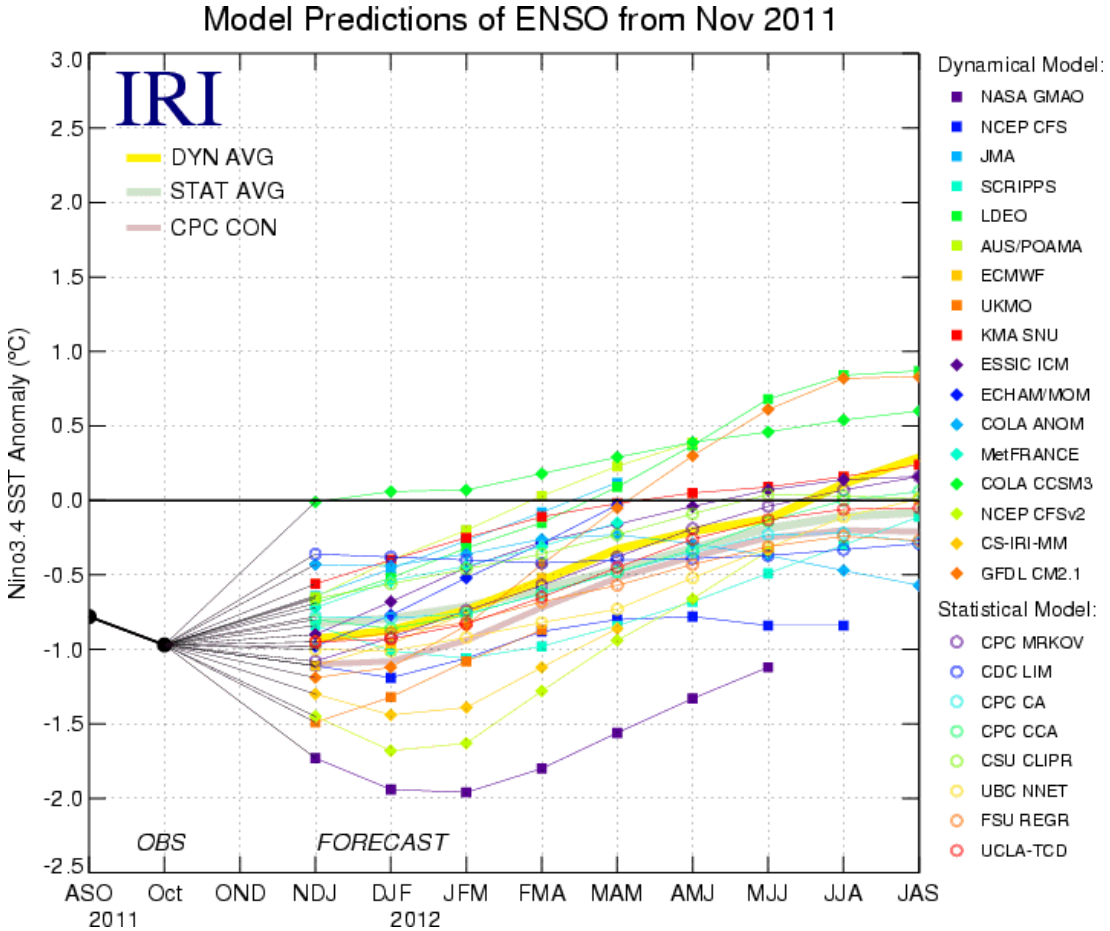


fig.17: Synthesis of Niño 3.4 forecasts (120° to 165°W) issued in November by IRI : http://iri.columbia.edu/climate/ENSO/currentinfo/SST_table.html

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 "weak to moderate La Niña" condition which prevails for DJF.

SEASON	NDJ	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS
Value « La Niña » **Value « El Niño »**	***-0,70*** ***0,70***	***-0,65*** ***0,65***	***-0,55*** ***0,50***	***-0,45*** ***0,40***	***-0,40*** ***0,40***	***-0,45*** ***0,45***	***-0,50*** ***0,45***	***-0,50*** ***0,45***	***-0,50*** ***0,45***
Average, statistical models	**-0.9**	**-0.8**	**-0.7**	**-0.6**	**-0.4**	**-0.3**	**-0.2**	**0**	**0.1**
Average, dynamical models	**-0.9**	**-0.9**	**-0.7**	**-0.5**	**-0.3**	**-0.2**	**-0.1**		
Average, all models	**-0.9**	**-0.8**	**-0.7**	**-0.6**	**-0.4**	**-0.3**	**-0.2**	**0**	**0.1**

The figure 18 shows plumes from Météo-France and ECMWF for the 3 Niño boxes (see definition in Annex). Both models forecast colder than normal conditions below the Niña threshold but with no real strengthening of the cold anomaly. The spread of the forecasts is not to much in both Météo-France and ECMWF.

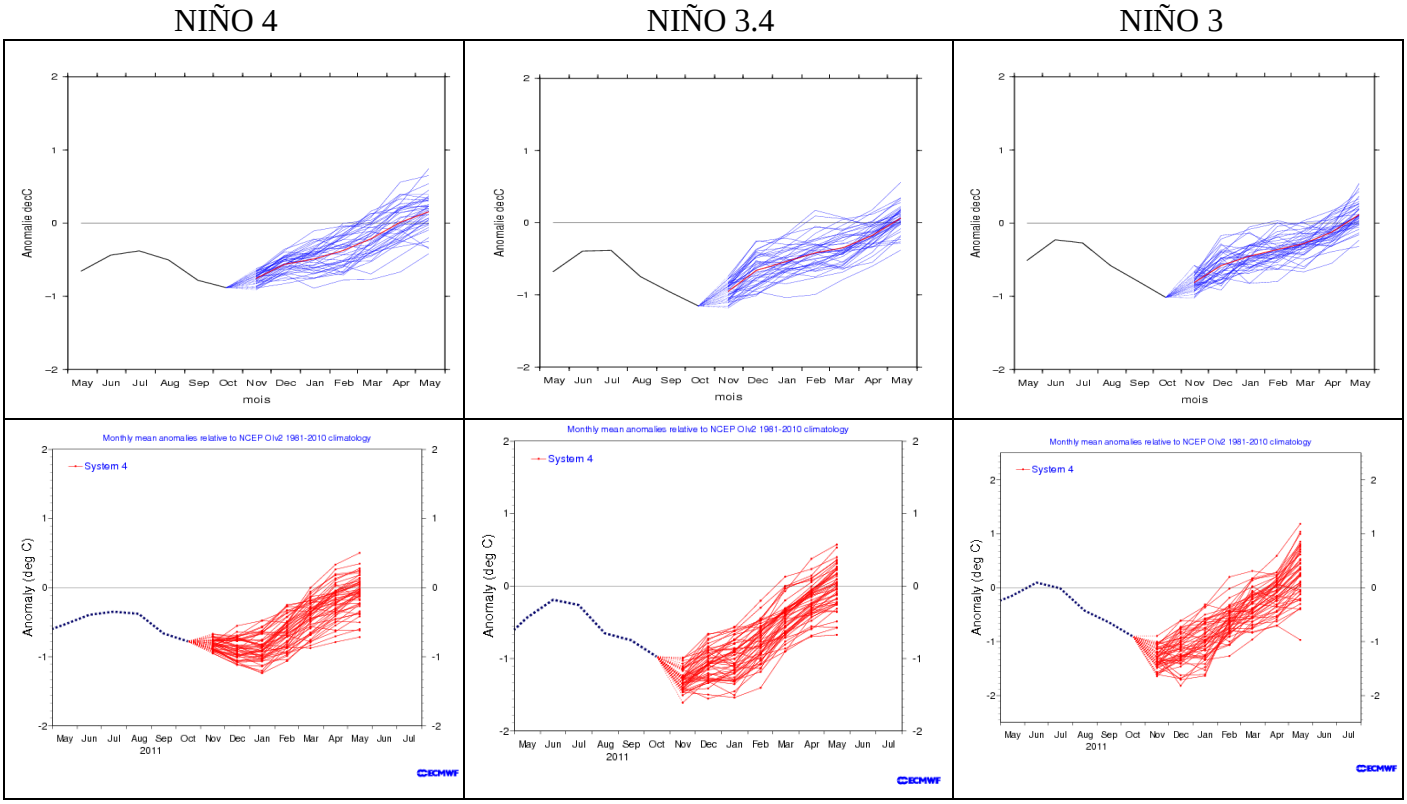


fig.18: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (bottom) issued in November, monthly mean for individual membres. (http://www.ecmwf.int/)

II.1.c Tropical Atlantic forecasts :

Forecasted Phase: close to normal conditions in the Tropical Atlantic

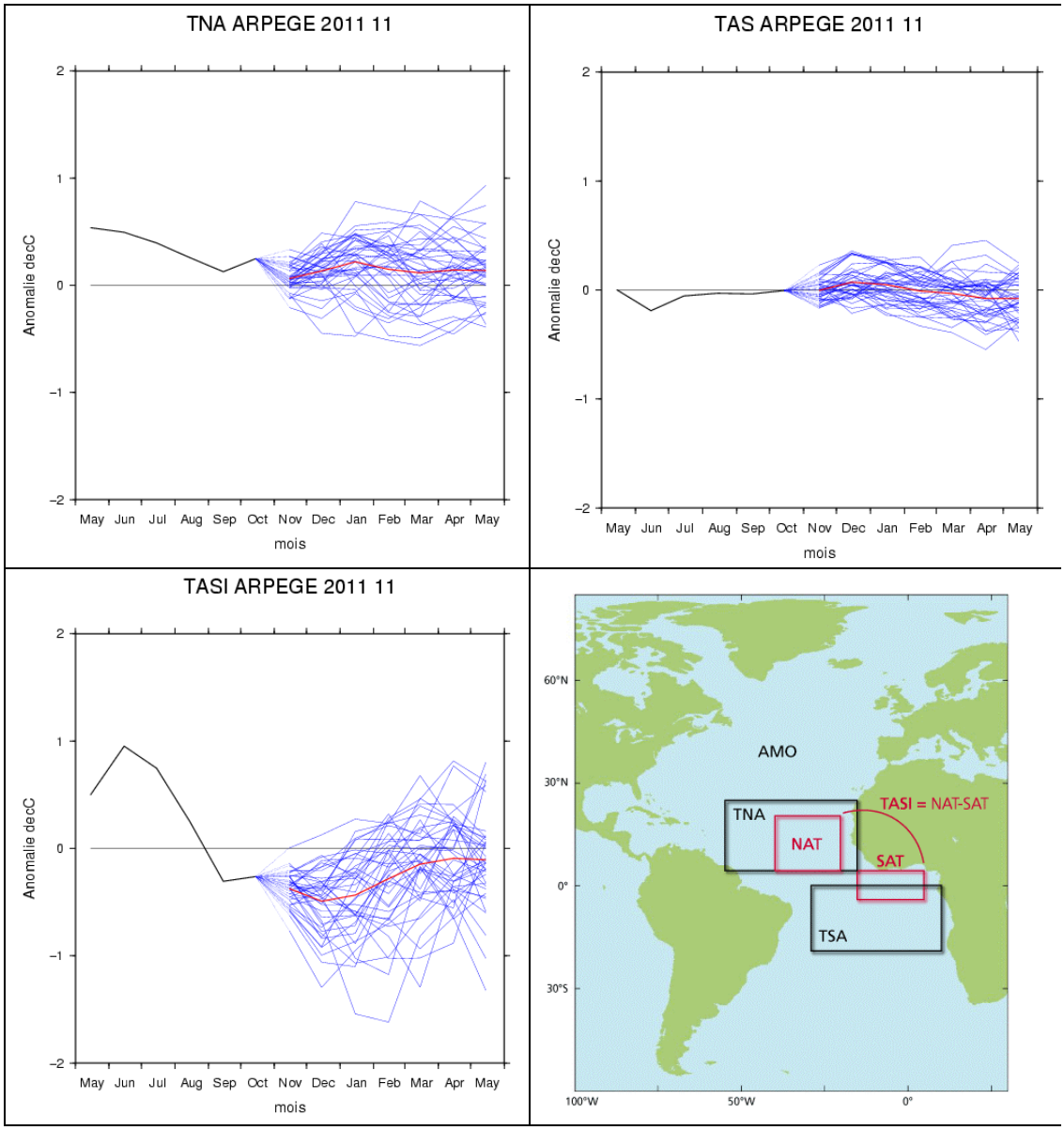


fig.19: SSTs anomaly forecasts in the Tropical Atlantic boxes from Météo-France, issued in November, plumes correspond to 41 membres and monthly means.

The Plumes confirm that on average the forecast corresponds to close to normal conditions in the Tropical Atlantic both in the North and in the South. However, one can notice the quite great dispersion of the ensemble for the TNA box. A negative value of TASI is forecasted all over the period, corresponding to a warmer temperature in the Guinean Gulf with respect of the temperature in the East Northern tropics. However, the TASI index must be interpreted with caution because of the likely positive bias of Météo-France forecast in the Guinean Gulf and the very large spread of the ensemble.

II.1.d Indian Ocean forecasts :

Forecasted Phase: Positive phase of the DMI

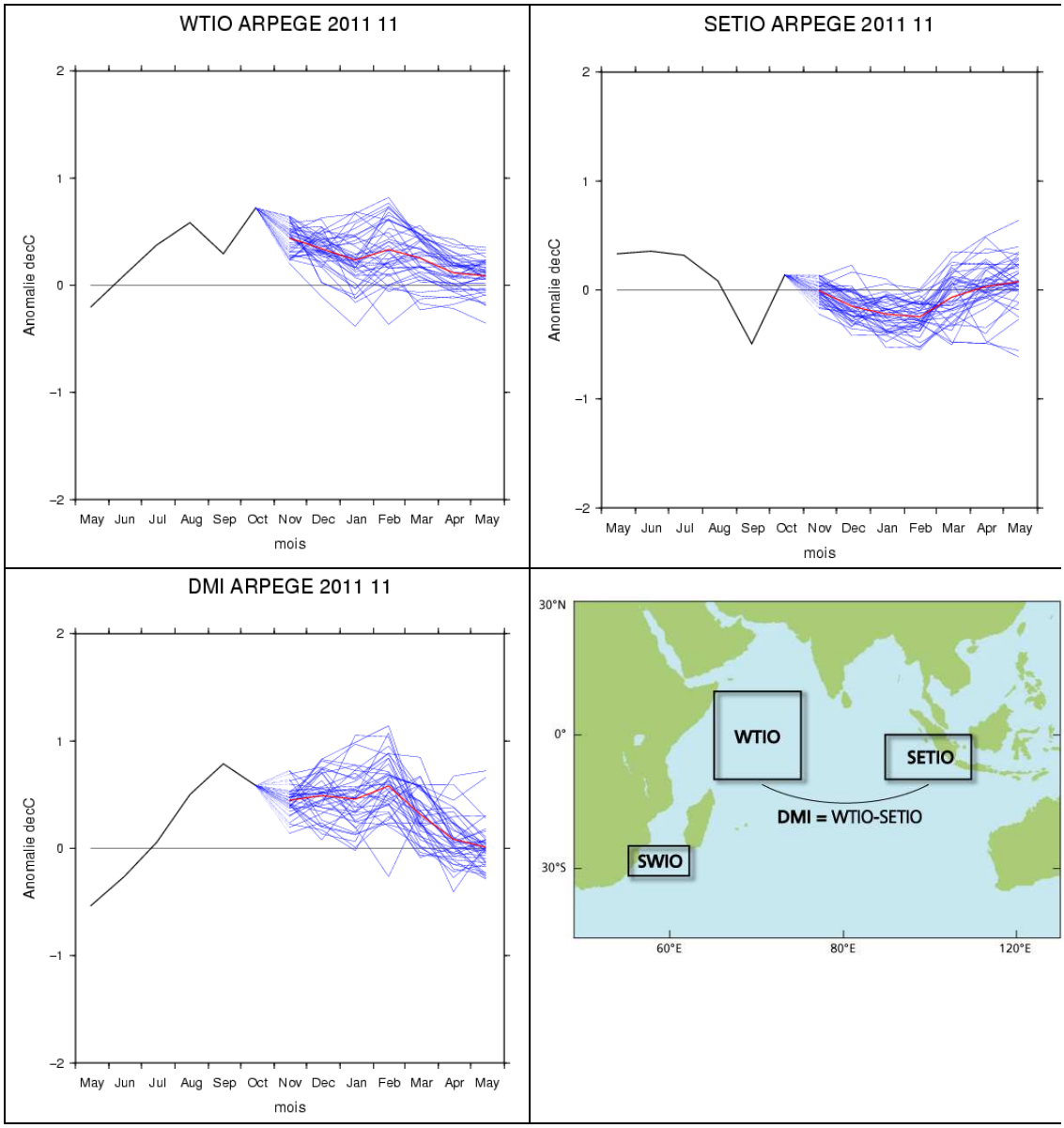


fig.20: SSTs anomaly forecasts in the Indian Ocean boxes from Météo-France, issued in November, plumes correspond to 41 membres and monthly means.

The Plumes show that most of the members are forecasting Above normal conditions in the Western Indian Ocean and Below normal conditions in the eastern part of the basin. Both indices show a quite good consistency among all members of the ensemble during all the period. As a consequence, the DMI remains in a positive phase during all the period and one can notice a limited spread (despite it remains quite large) with respect of the previous forecasts.

II.2. GENERAL CIRCULATION FORECAST

II.2.a Global Forecast

As a first glance, the velocity potential anomaly field (cf. fig.21) show in the Tropics a 1 wave number pattern in ECMWF while in Meteo-France it is more a 2 wave number pattern. In details, over the Central Pacific both models show an atmospheric La Niña response with a convergence anomaly (downward motion) East to the date line and a divergence anomaly (upward motion) over the maritime continent. One remark the greater sensitivity (as usual) of ECMWF to the Pacific forcing. As the negative anomaly seen in ECMWF expand widely through the Indian ocean, the divergent circulation anomaly is quite different over these regions up to the Eastern coast of the African continent. Last over the Tropical Atlantic, Météo-France has a clear negative anomaly (divergent circulation anomaly) from West Africa to Nordeste Brasil while this structure is not present in ECMWF. But interestingly, in the Northern hemisphere, both models show an enhanced divergent circulation.

In terms of teleconnections, the 2 models show some consistency. The main anomalies visible on the stream functions are developing first across the latitudes of the Pacific basin (in a PNA like pattern) but also (less strong) over the North Atlantic sector from US up to the Western side of the European continent. This Atlantic pattern could likely be related to the Tropical Atlantic forcing and the enhanced divergent circulation already pointed out just above. As a conclusion, the predictability in mid-latitudes, especially over Europe, in DJF should increase with respect of the previous forecast.

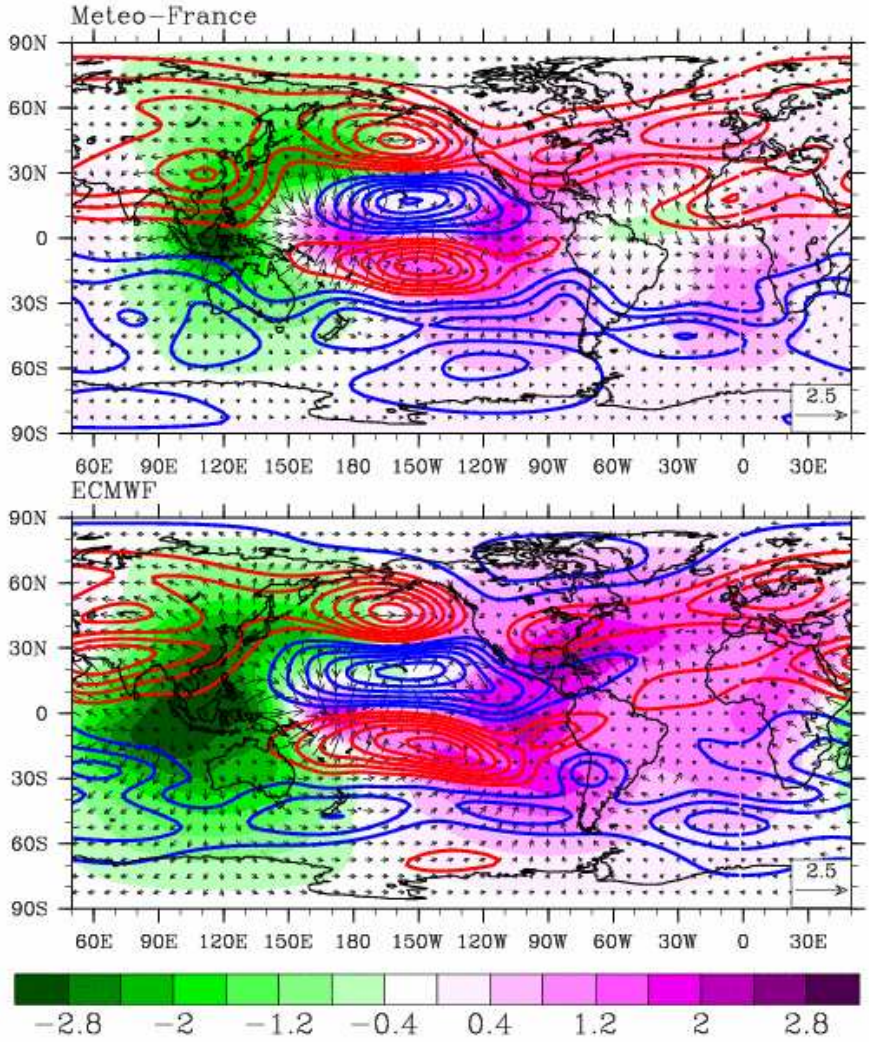


fig.21: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), asociated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa for December-January-February issued in November by Météo-France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

II.2.b North hemisphere forecast and Europe

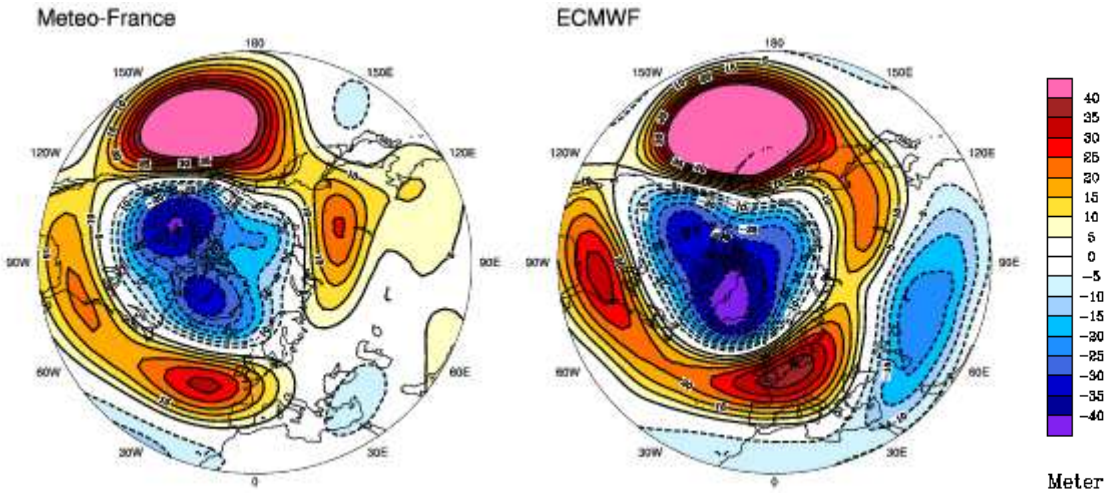


fig.22: Anomalies of Geopotential Height at 500 hPa for December-January-February issued in November from Météo-France (left) and ECMWF (right).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip

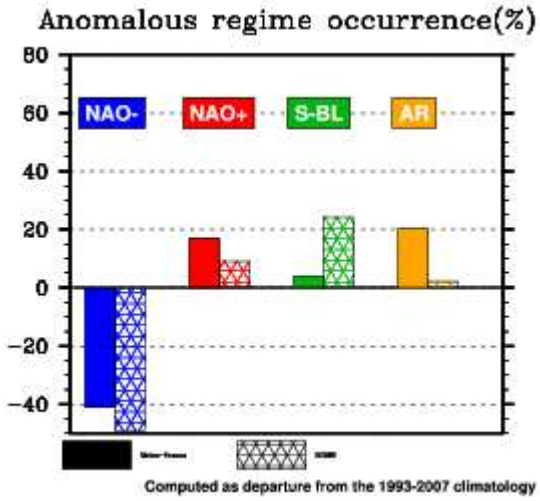


fig.23: North Atlantic Regime occurrence anomalies from Météo-France and ECMWF : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

Related to the Stream Function anomaly, the Meteo-France and ECMWF models show a positive Geopotential Height anomaly at 500hPa (fig. 22) all across the North Atlantic sector from Florida to France for Meteo-France and from Florida to North-West Europe for ECMWF. This infer an Atlantic Ridge regime anomaly (enhanced frequency) especially well marked in Meteo-France (fig. 23) and the large Blocking regime frequency enhancement in ECMWF. Because of the geopotential height anomaly, the NAO + regimes are also more frequent but without any strengthening of the zonal circulation at the latitude of France. The winter storm track should be shifted northward consistently with the Z500 anomalies. The deficit of NAO - regime seems to be also very consistent with the general circulation response related to the expected teleconnections and SST forcings.

The General atmospheric circulation in the low troposphere (see figure 24) is clearly related and consistent with the Geopotential Height. Over most of Western Europe, both meridionnal wind show negative anomalies which is typical of an Atlantic Ridge regime predominance while the zonal wind show an

opposition between regions South vs North to 50°N (weakening / strengthening of the zonal circulation) consistently with a northward shift of winter storm tacks.

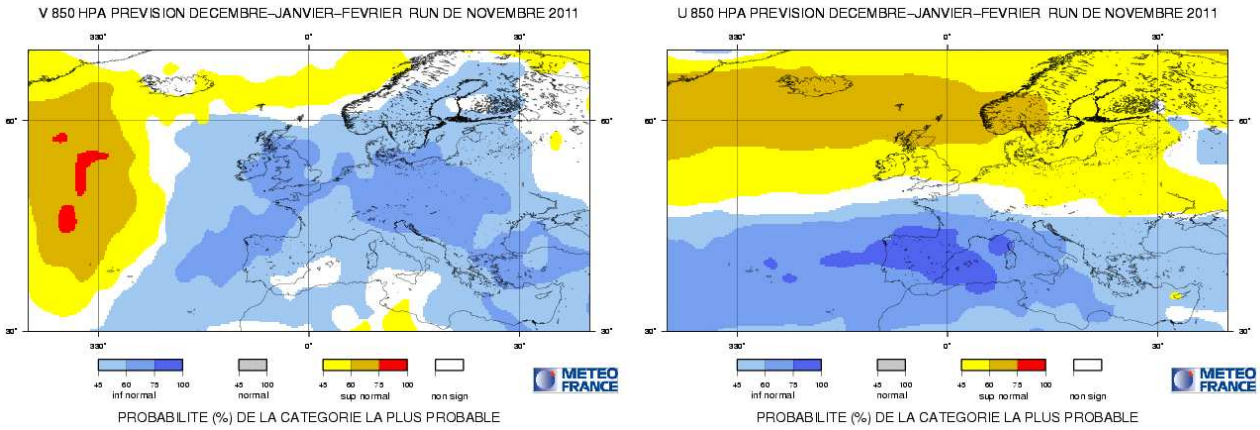


fig.24: Forecasted anomalies of meridional (left) and zonal (right) wind at 850 hPa for OND from Météo-France issued in November.

II.3. IMPACT : TEMPERATURE FORECASTS

II.3.a ECMWF

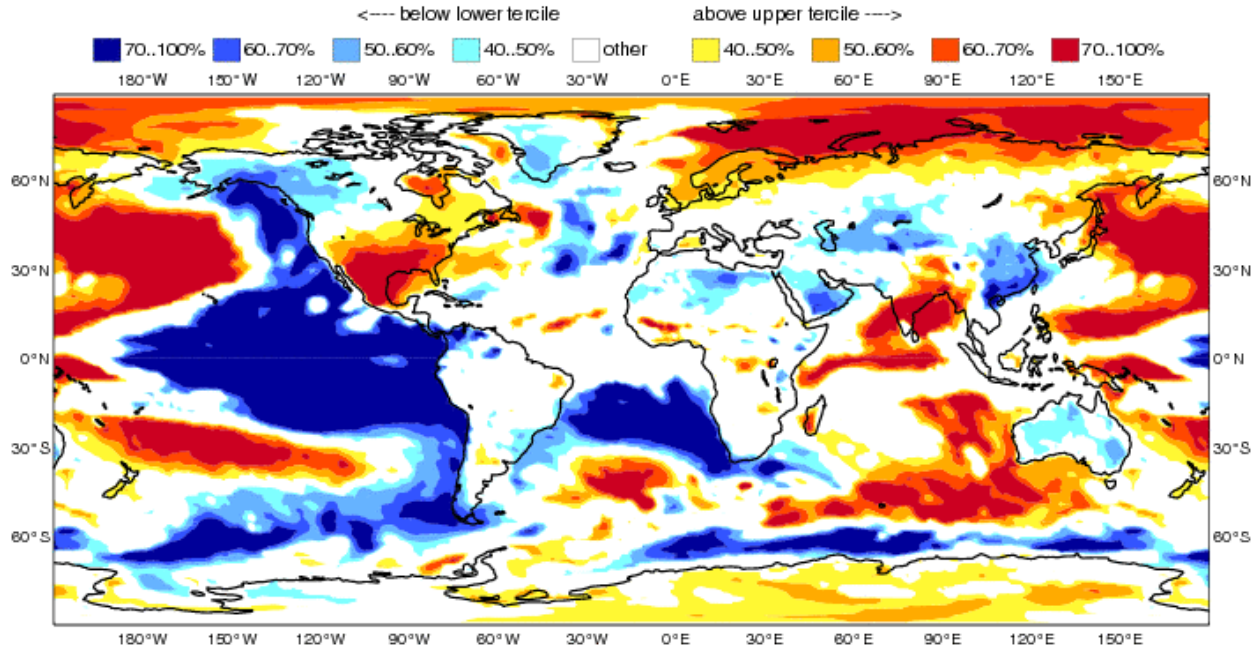


fig.25: Most likely category probability of T2m from ECMWF for December-January-February issued in November. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.3.b Météo-France

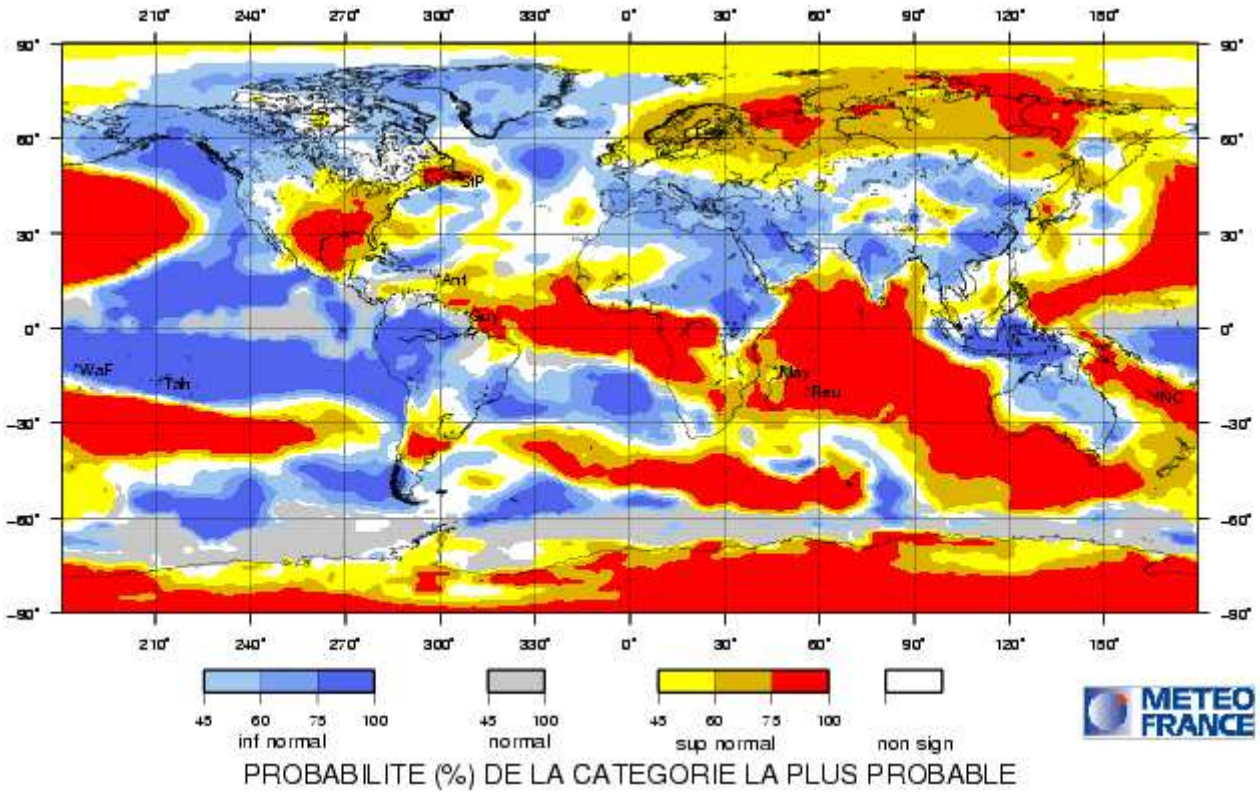


fig.26: Most likely category of T2m for December-January-February issued in November from Météo-France. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://elaboration.seasonal.meteo.fr/

II.3.c Met Office (UKMO)

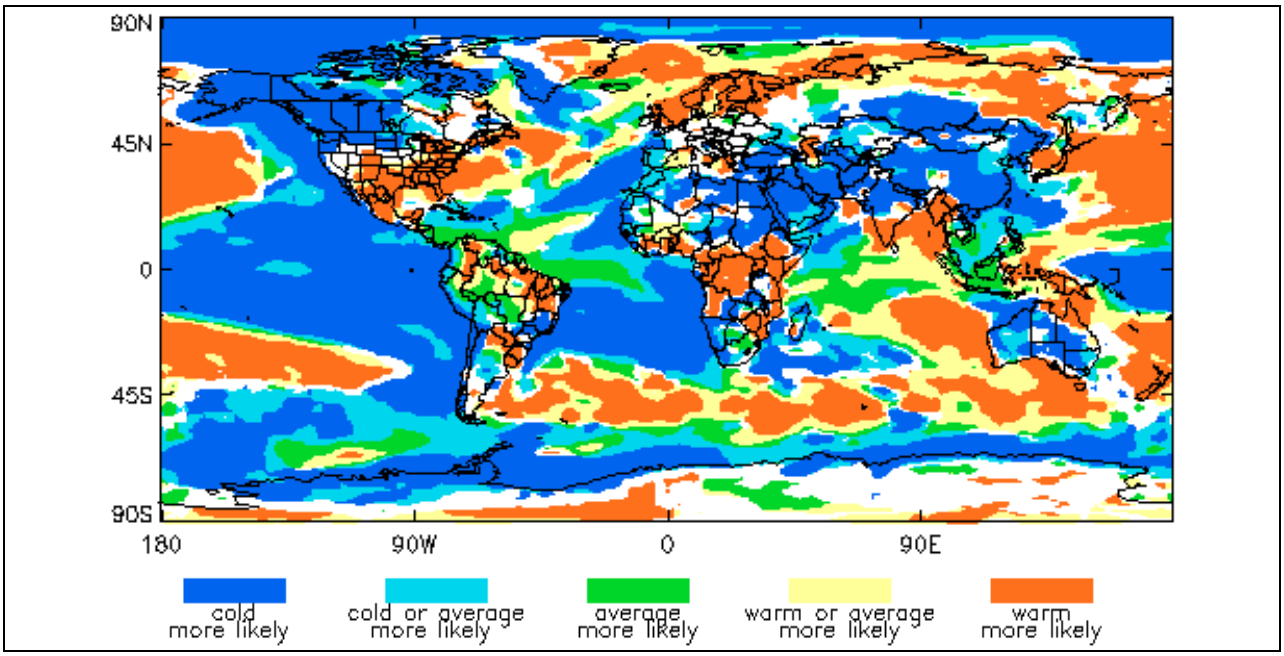


fig.27: Most likely category of T2m for December-January-February issued in November from UK Met Office. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://www.metoffice.gov.uk/

II.3.d Japan Meteorological Agency (JMA)

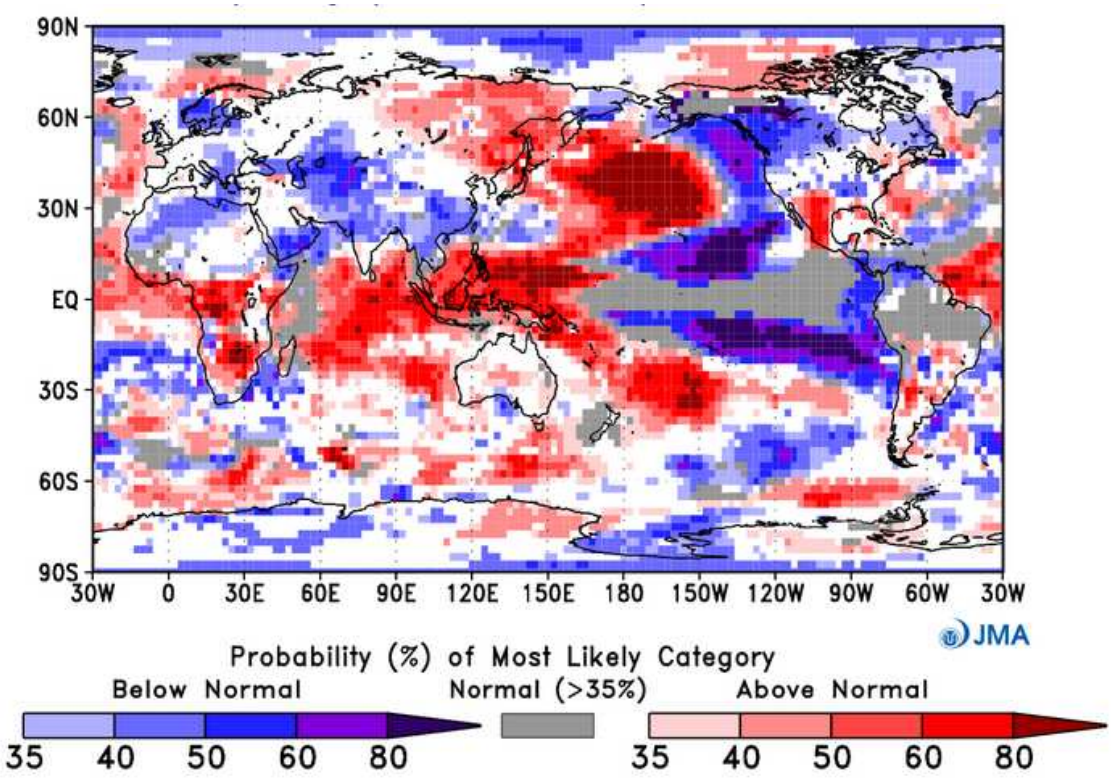


fig.28: Most likely category of T2m for December-January-February issued in November from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. .
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/4mE/fcst/fcst_gl.html

II.3.e Euro-SIP

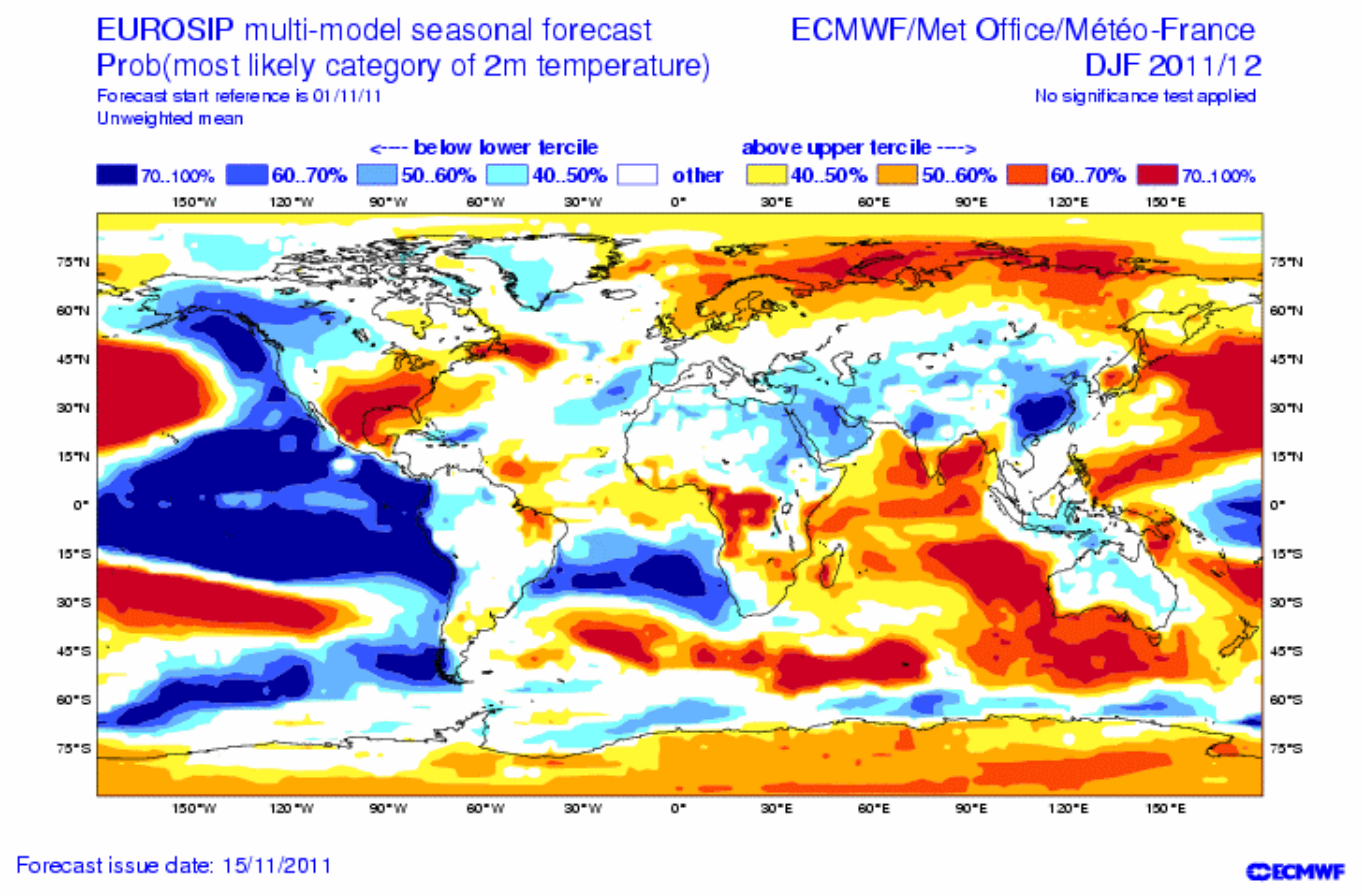


fig.29: Multi-Model Probabilistic forecasts for T2m from EuroSip for December-January-February, issued in November. (2 Categories, Below and Above normal – White zones correspond to No signal and Normal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

A PNA like pattern over the North American continent is clearly visible on the Euro-SIP forecast. However, the previous forecast was already the same while the observation in October was less clear. So the strength of this PNA response is one of the uncertainty of this forecast as it is a crucial signal for the predictability on our regions (see General Circulation discussion). Some signals exist over Europe. Around the Mediterranean basin, the Below normal scenario could make sense (see General circulation discussion) for some countries while the Above normal scenario for Northern Europe is consistent with the Atlantic regime forecasts and the Z500 anomalies. Last, we have to notice that the predictability seemed to increased, in relationship with the Pacific and Atlantic forcing (see PNA comment). However, it is less than the previous winter where teleconnection patterns were more stronger.

II.3.f International Research Institute (IRI)

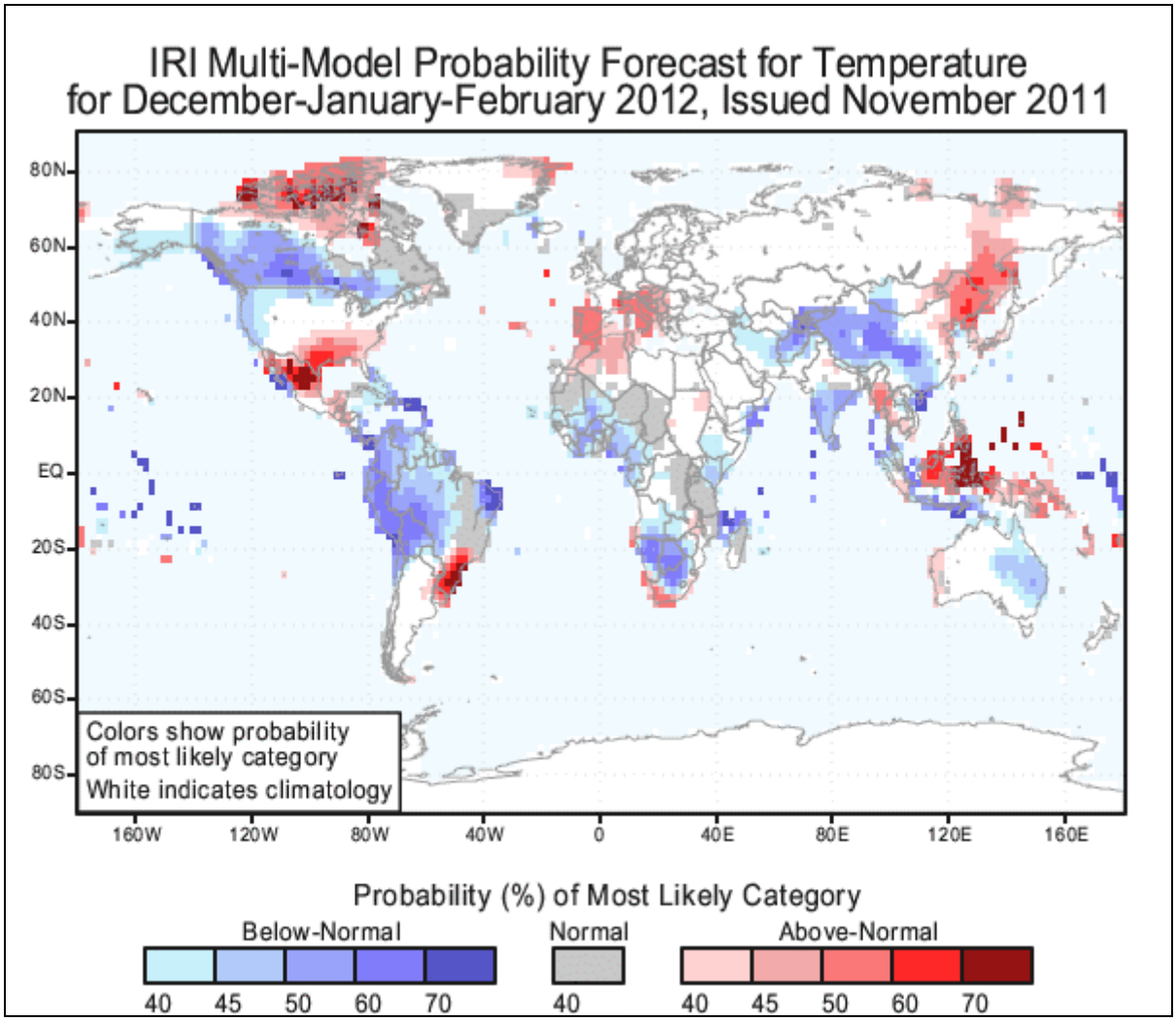


fig.30: Most likely category of T2m for December-January-February, issued in November from the IRI multi-model ensemble. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://iri.columbia.edu/climate/forecast/net_asmt/

One can notice some consistency with the Euro-Sip forecast (e.g. the PNA like pattern, East Asia, …) but not over Europe neither Africa.

II.4. IMPACT : PRECIPITATION FORECAST

II.4.a ECMWF

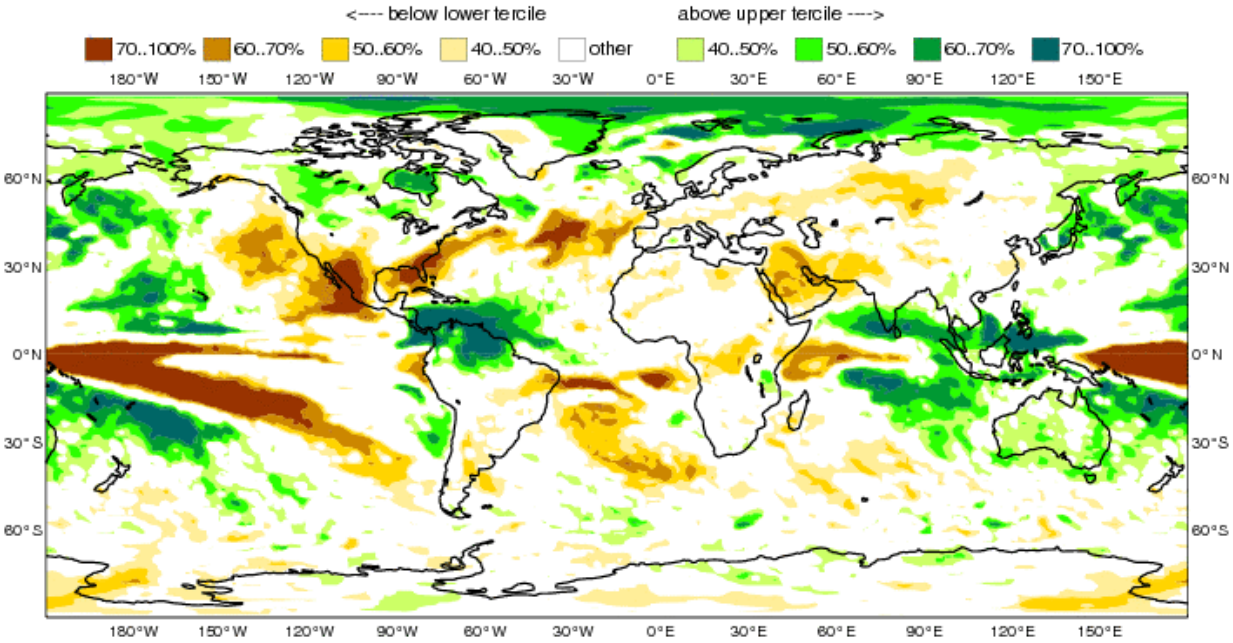


fig.31: Most likely category probability of rainfall from ECMWF for December-January-February, issued in November. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/charts/seasonal_charts_s2/

II.4.b Météo-France

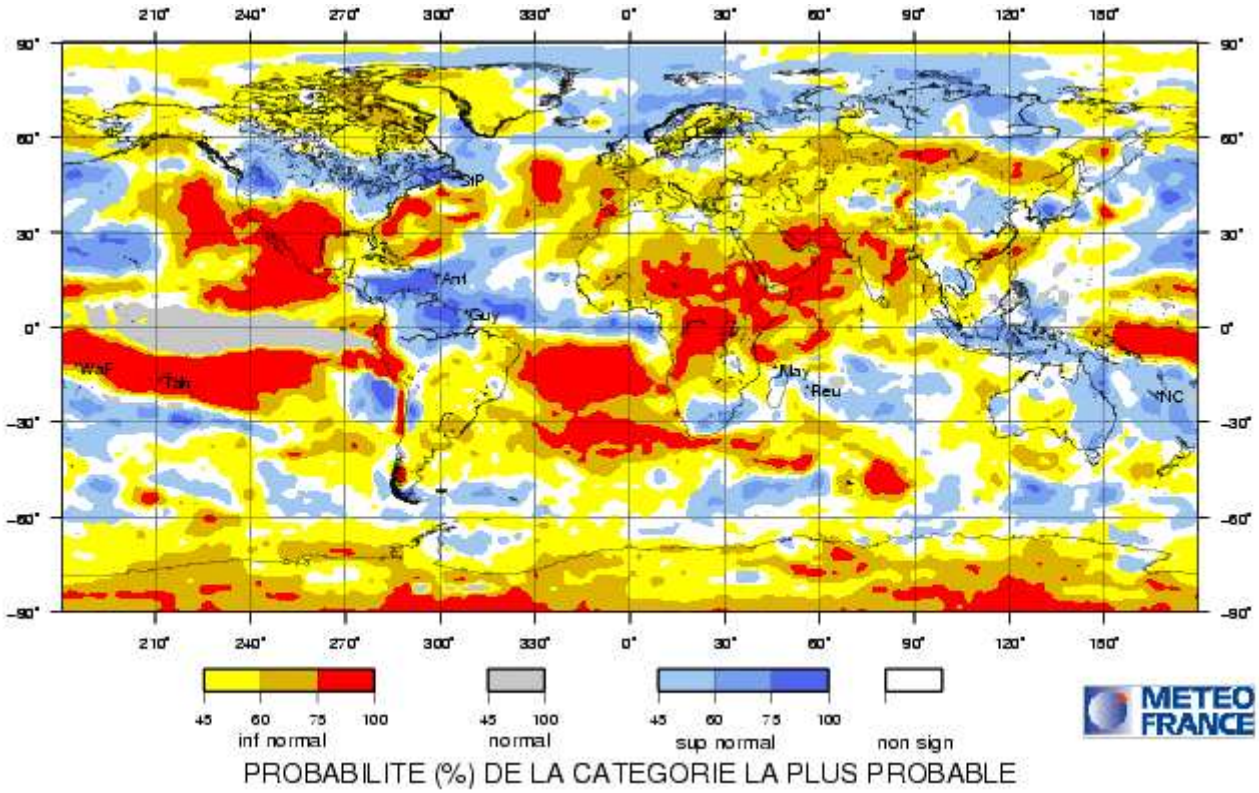


fig.32: Most likely category of Rainfall for December-January-February, issued in November from Météo-France. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://elaboration.seasonal.meteo.fr/

II.4.c Met office (UKMO)

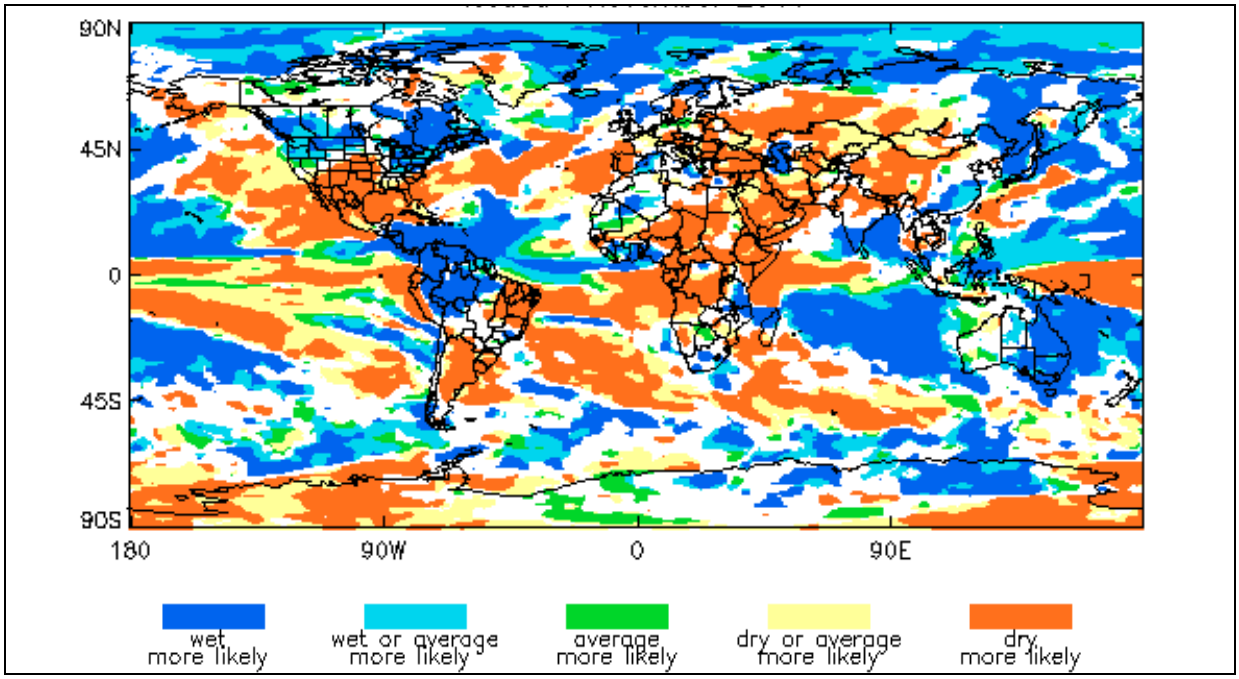


fig.33: Most likely category of Rainfall for December-January-February, issued in November from UK Met Office. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://www.metoffice.gov.uk/

II.4.d Japan Meteorological Agency (JMA)

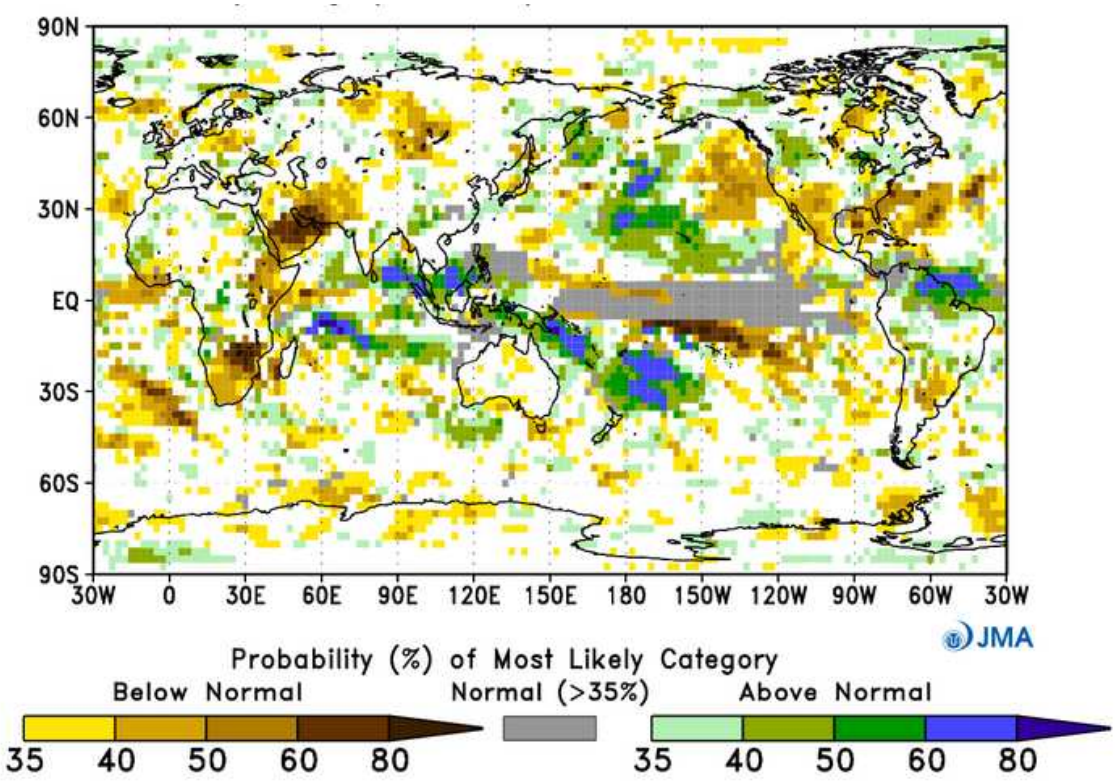


fig.34: Most likely category of Rainfall for December-January-February, issued in November from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/4mE/fcst/fcst_gl.html

II.4.e Euro-SIP

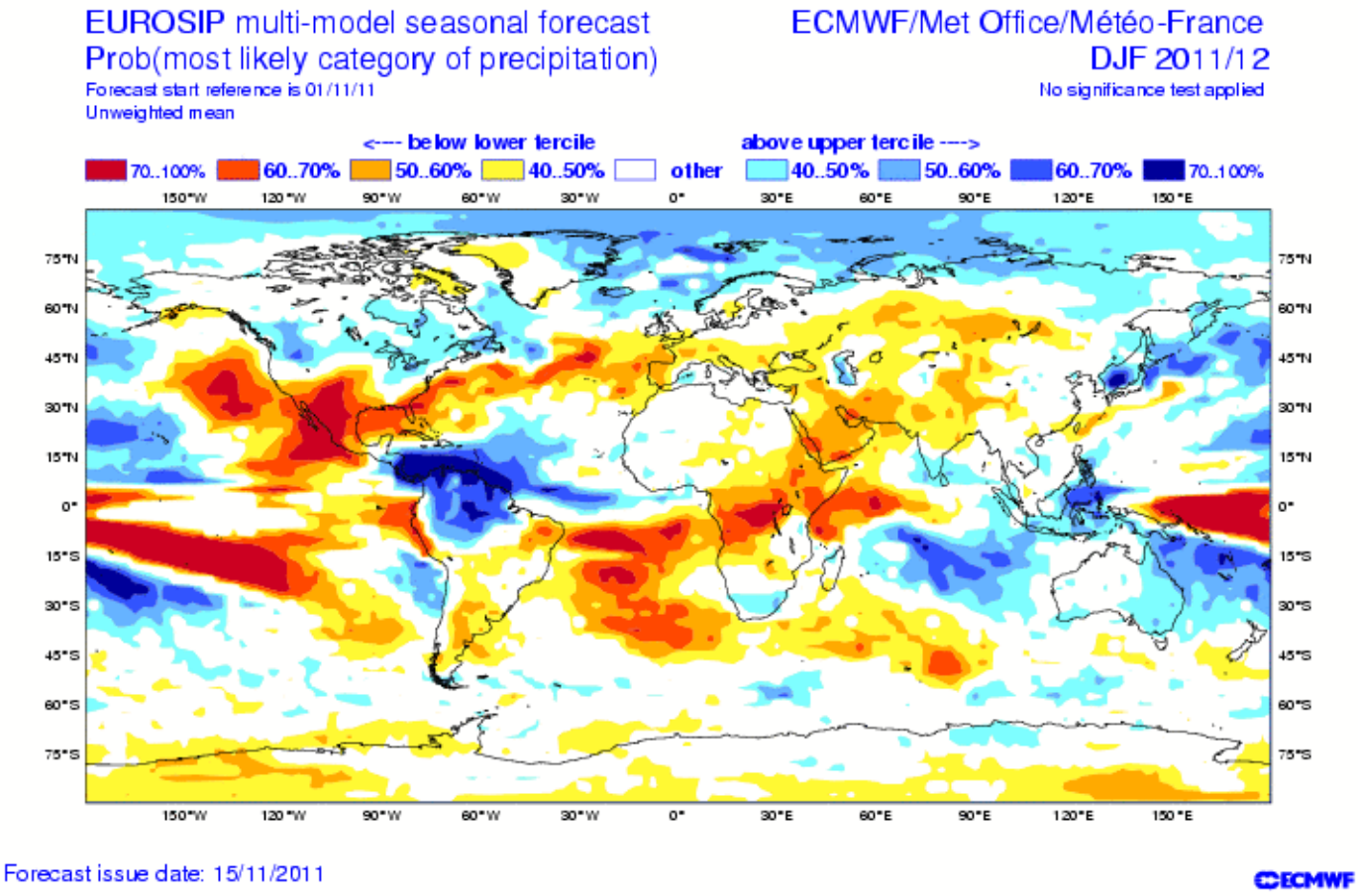


fig.35: Multi-Model Probabilistic forecasts for precipitation from EuroSip for December-January-February, issued in November. (2 Categories, Below and Above normal – White zones correspond to No signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

Even if the predictability is likely limited for rainfall (see previous discussion), there is some consistent signal on the most western part of Europe and regions close to the Mediterranean sea (related to the Atlantic regime predominance – see section II.2.b). To be notice also the PNA like response in term of precipitation over the North American continent and some La Niña like patterns in the Tropics (Pacific, Australia and maritime continent, South Africa, South America, …). One important uncertainty in this forecast is the strength of the PNA like response of the atmosphere in the models which could be overestimated (see temperature discussion).

II.4.f International Research Institute (IRI)

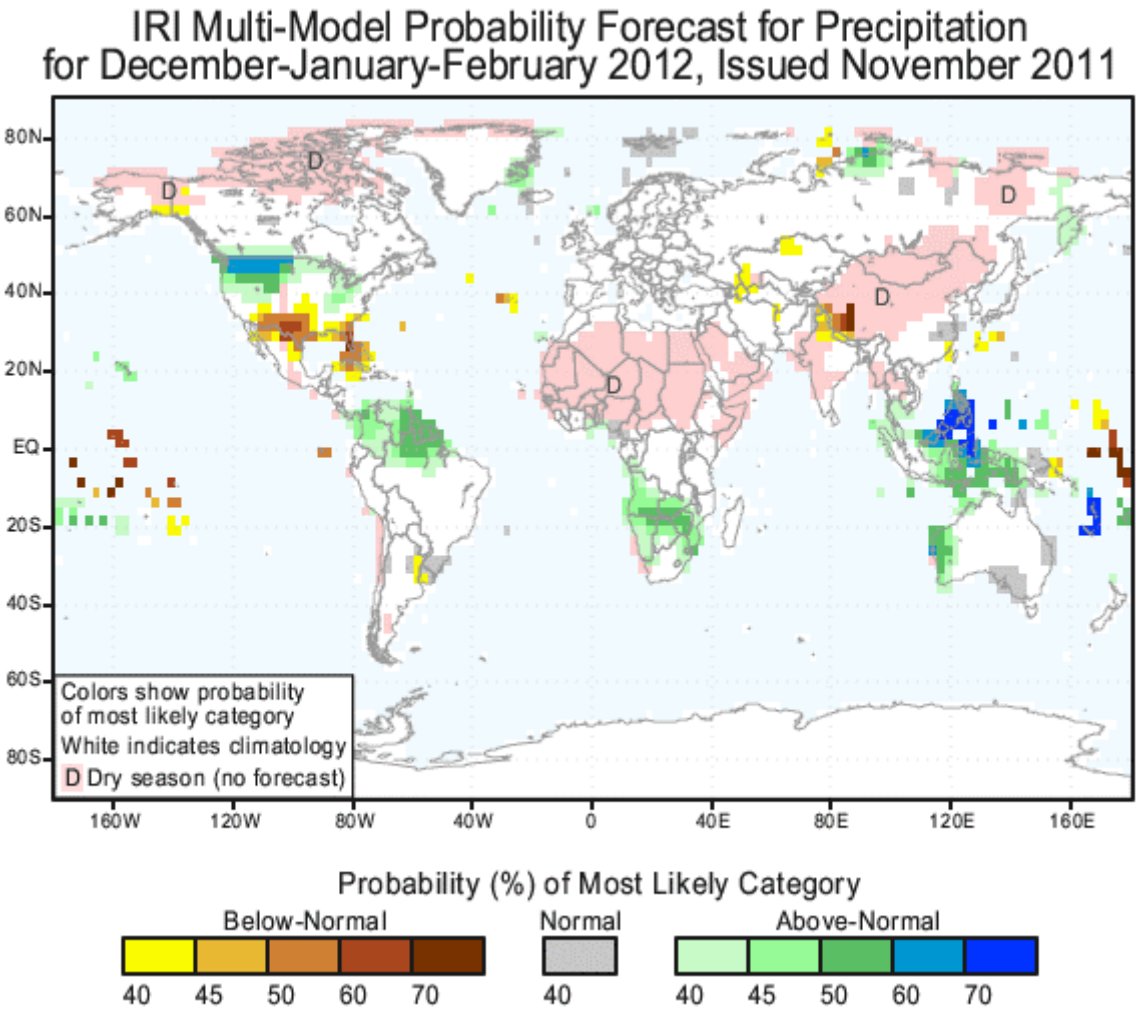


fig.36: Most likely category of Rainfall for December-January-February, issued in November from the IRI multi-model ensemble. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://iri.columbia.edu/climate/forecast/net_asmt/

The IRI forecast are quite consistent with the Euro-SIP, especially over the maritime continent, GHACOF region, North of South America , the North American continent and the Pacific. It's not the case for the European continent where no signal is forecasted conversely to Euro-SIP.

II.5. REGIONAL TEMPERATURES

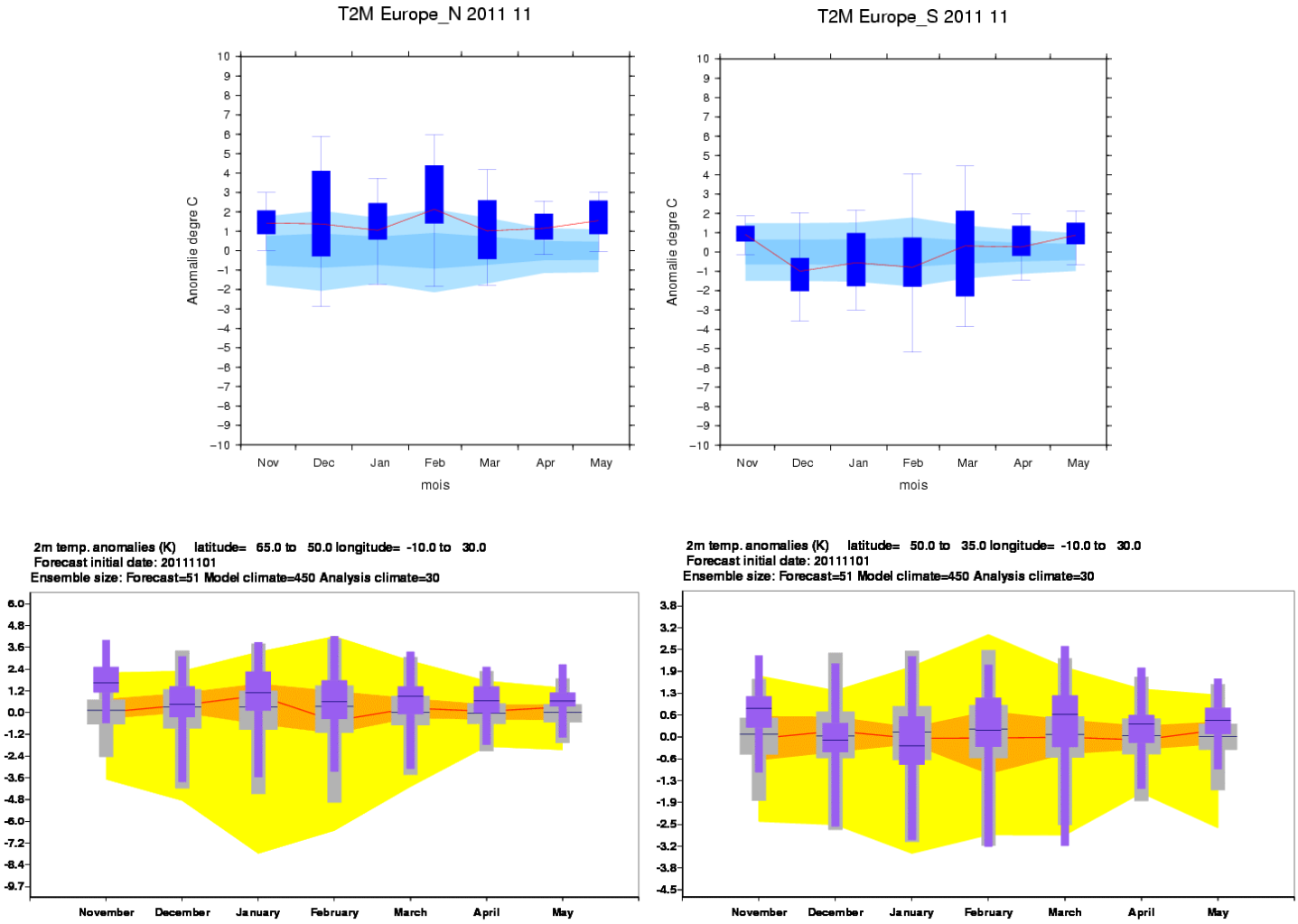


fig.37: Climagrams for T2m in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom) issued in November.

For Northern Europe, the 2 models show some consistency for Above normal conditions. With respect of the General Circulation discussion, this should be especially relevant for Scandinavian regions. For Southern Europe, because of the different response of the 2 models (and Mediterranean sea SST), there is less consistency. The differences between the two models can be likely related to the model uncertainties (especially the sensitivity to both Pacific and Atlantic tropical forcing). One additional remark is about the size of the boxes which merge regions with different behaviour (with respect of this forecast). In Météo-France, for Northern Europe, there is some skill in November, January and February (for Above normal scenarios) and little skill December. For Southern Europe there is only some skill in November, little skill in January and February.

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

REGIONAL PRECIPITATIONS

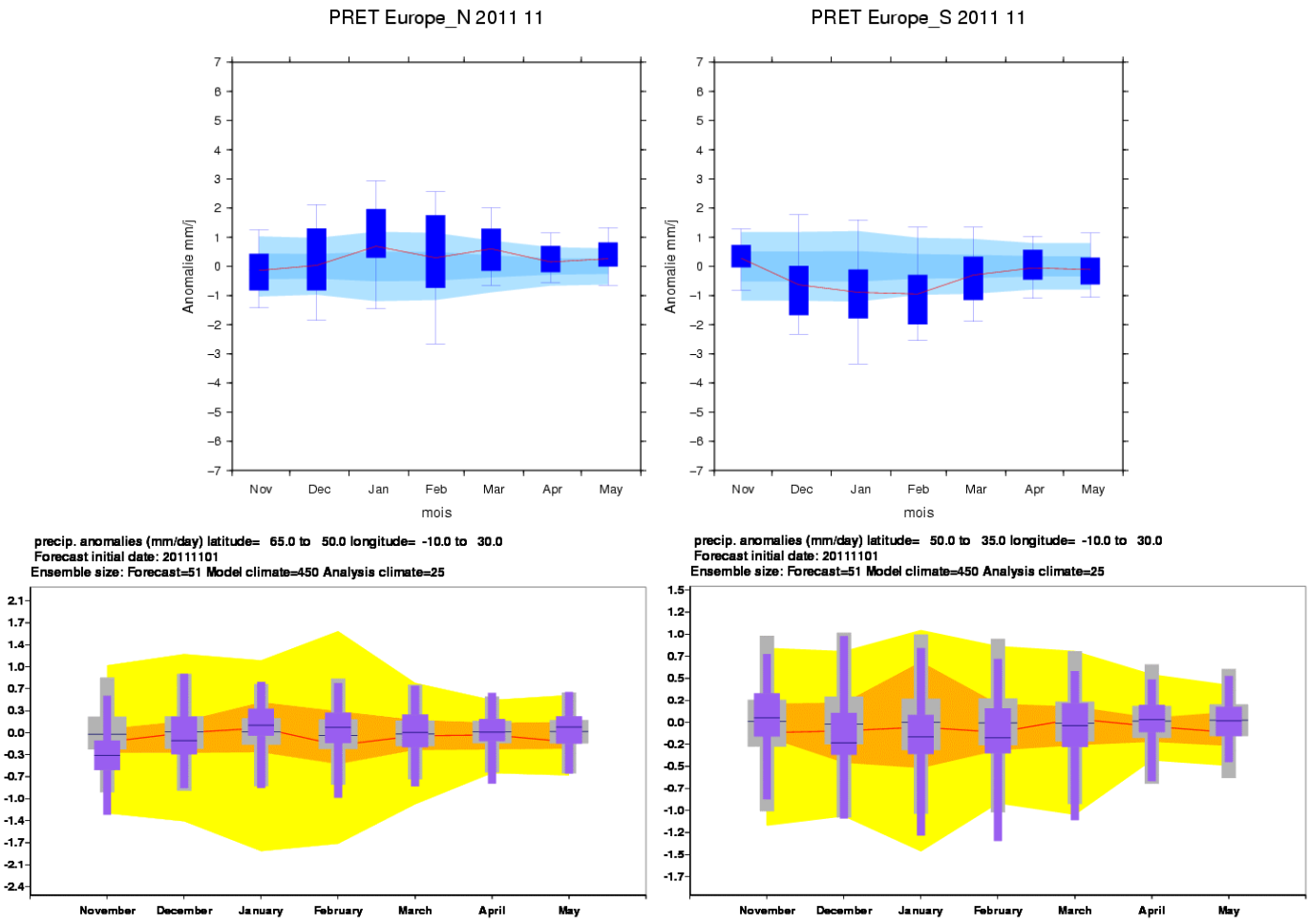


fig.38: Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom), issued in November.

As already seen in Euro-Sip forecast, there is some consistent signal for Southern Europe. The below normal scenario could make sense for regions close to the Mediterranean sea. For Northern Europe, the signal is less clear despite the intraseasonal evolution are quite similar in both models. In Météo-France for Southern Europe some skills exist in November and then are close or worst than climatology while for Northern Europe, there is some skill in November and still a little from December to February. So these intraseasonal evolution should be interpreted with caution. The main conclusion about these graphs is that there is some uncertainty in the rainfall scenarios for both regions.

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

II.6. MODEL'S CONSISTENCY

II.6.a GPCs consistency maps

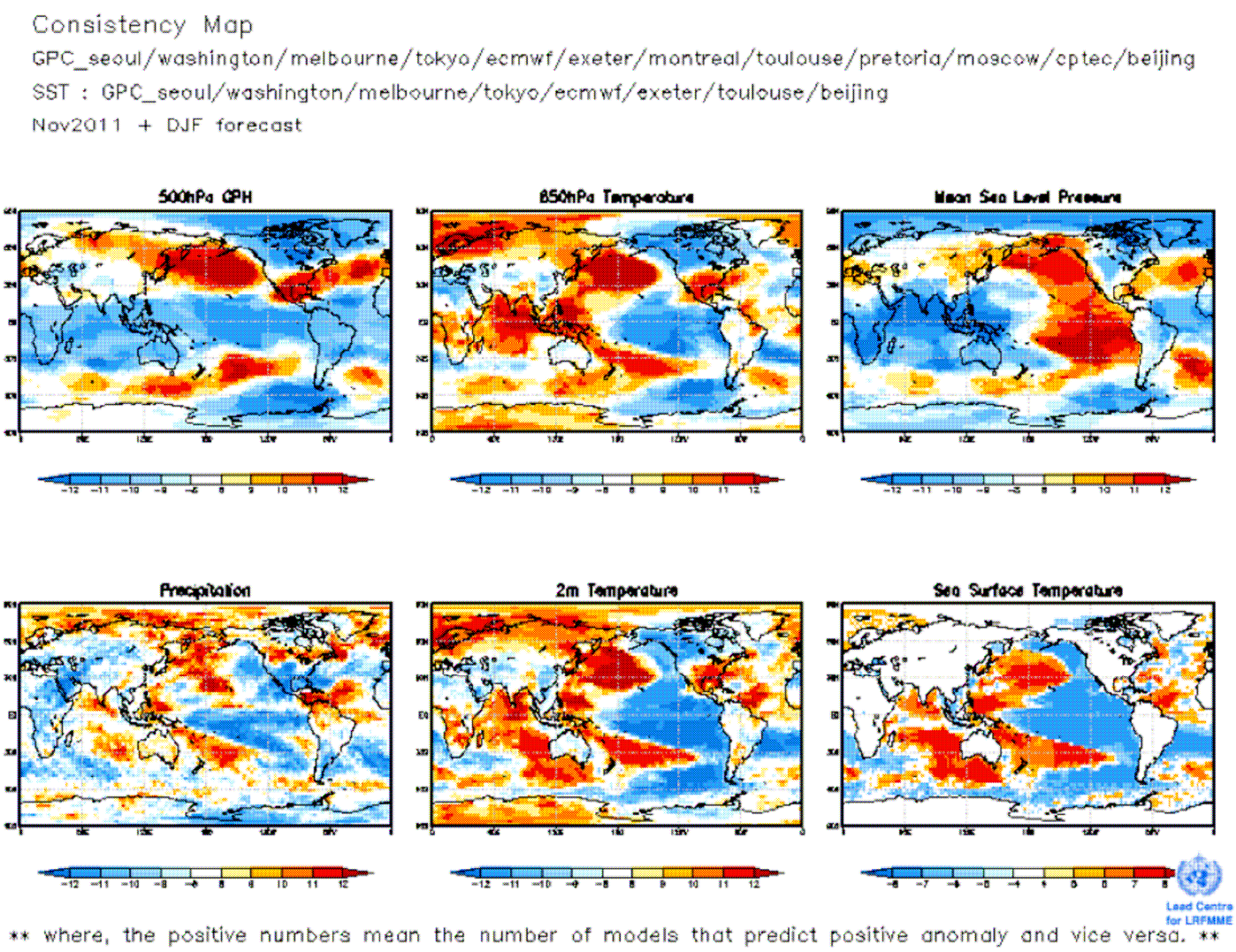


fig.39: GPCs Consistency maps from LC-MME http://www.wmolc.org/

Over the North Atlantic sector, all the models are very consistent with a positive anomaly starting from South US up to France. The PNA like response is also present in most of the models. So, the Euro-Sip conclusions seems to be applicable to the GPCs forecasts, especially for the temperature over the Northern Europe and regions close to the Mediterranean basin. For precipitation, there is little consistency over most of the regions excepted for regions surrounding the Mediterranean sea where below normal conditions seem to prevail.

II.7. “EXTREME” SCENARIOS

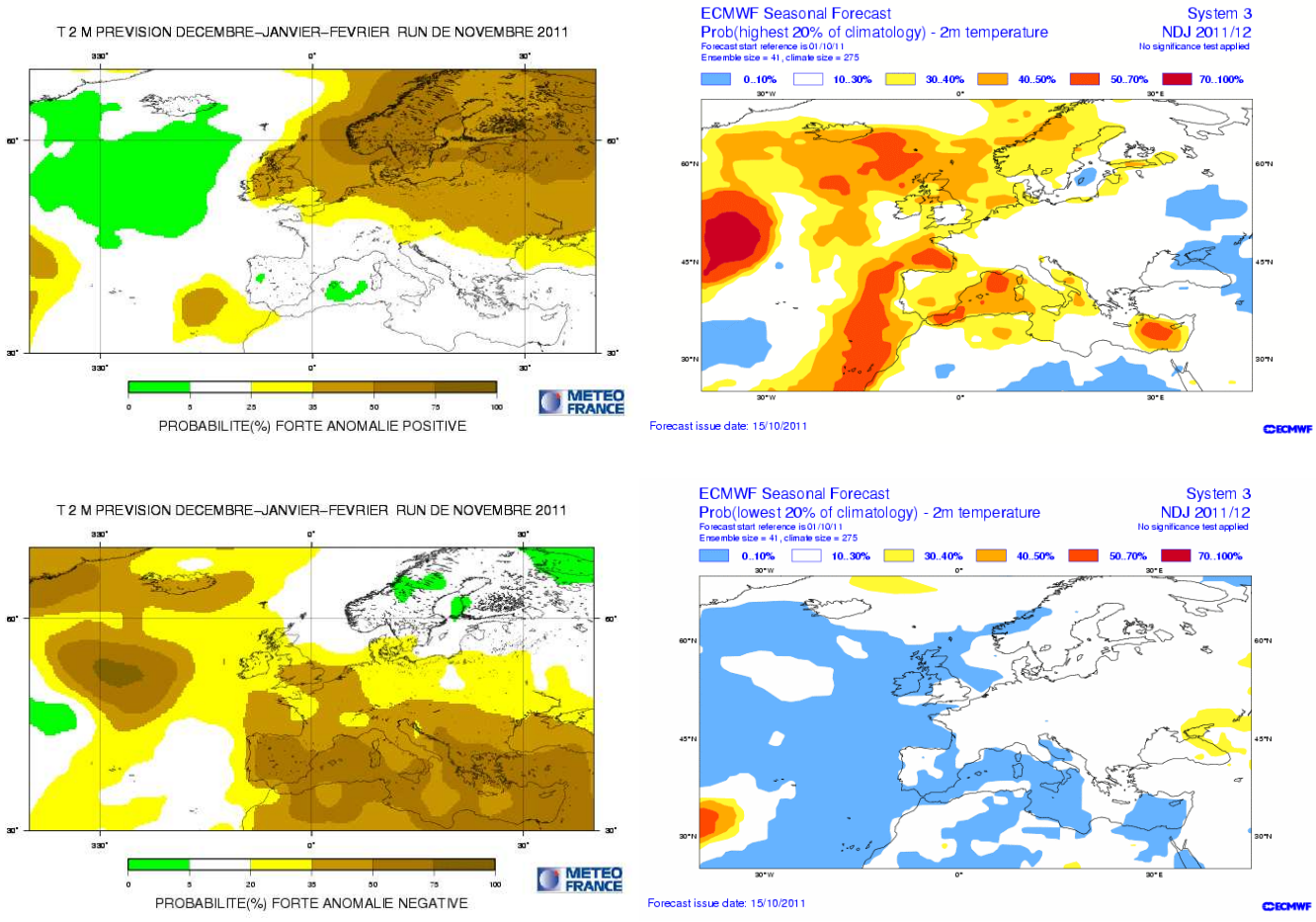


fig.40: Top : Probability of « extreme » above normal conditions for T2m for Meteo-France (left - highest ~15% of the distribution) and ECMWF (right - highest 20% of the distribution).
Bottom : Probability of « extreme » Below normal conditions for rainfall for Meteo-France (left - lowest ~15% of the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

For Southern Europe there is little consistency in the “Extreme” scenario probabilities (related to the differences in model response and a limited predictability). However, there is some consistent signal on Northern Europe (enhanced probabilities of very above normal scenario). However, in Météo-France the score is close to climatology limiting the interpretation of the map (especially for Scandinavia). For the very below normal scenario, for regions close to Mediterranean sea the skill is only a little leading also to difficulties to interpret the map.

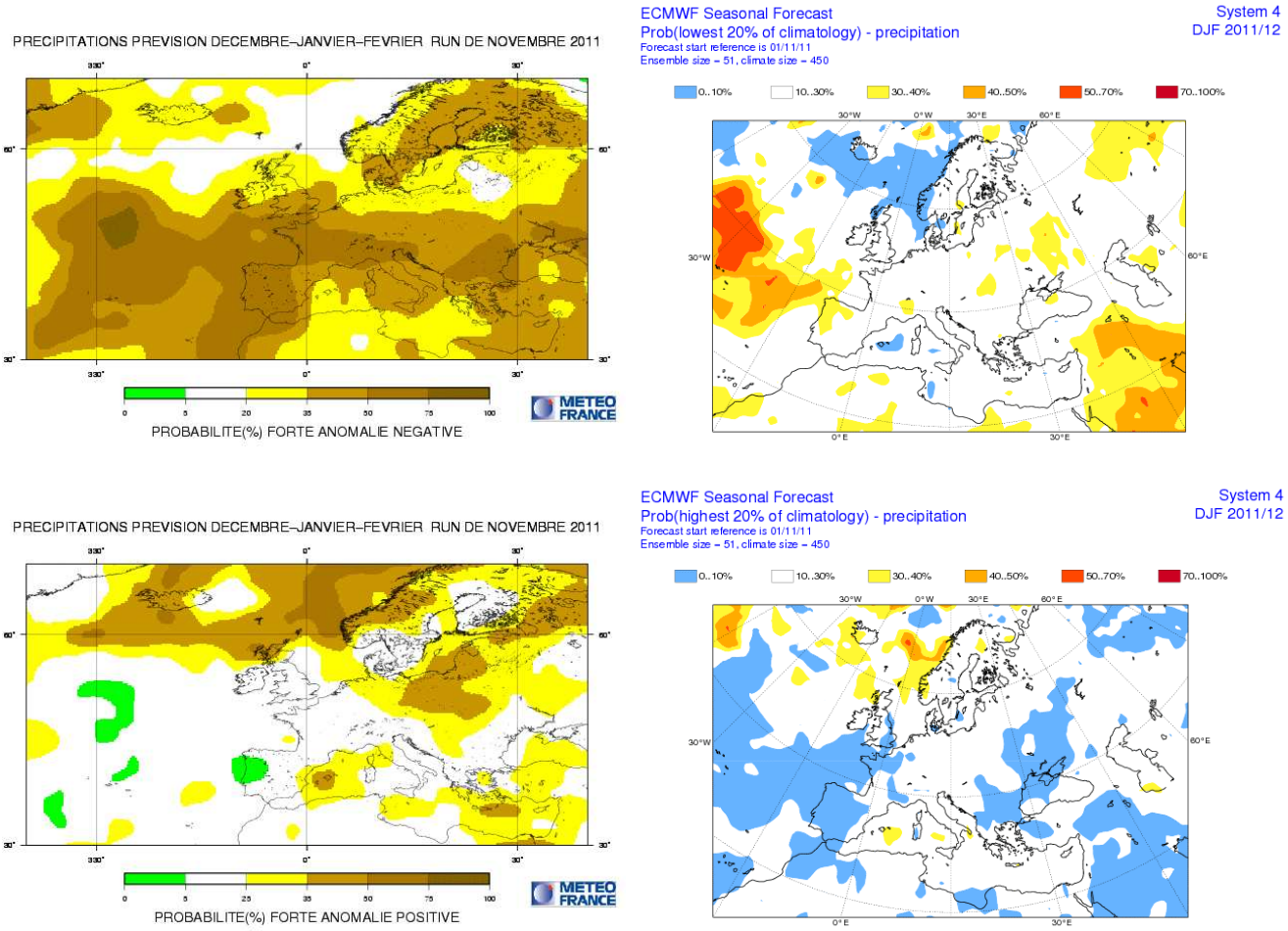


fig.41: Top : Probability of « extreme » Below normal conditions for rainfall for Meteo-France (left - lowest ~15% of the distribution) and ECMWF (right - lowest 20% of the distribution)
Bottom : Probability of « extreme » Above normal conditions for rainfall for Meteo-France (left - highest ~15% of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

For the very below Normal scenario, even if the probabilities are high in Meteo-France, there is not too much skill for these forecasts. So it seems a bit difficult to be confident in using this information because of the skill and because of the divergence of model responses. However, one can notice the enhancement of both Very Above Normal scenario probabilities over Scandinavia where some skill exists. This should be consistent with a Northward shift of winter storm tracks (and General Circulation forecasts) seen in both models.

II.8. DISCUSSION AND RESUME

Forecast over Europe

The first comment is about the predictability which seems to increase in relationship with the Niña event and the Tropical Atlantic which reinforce the Pacific signal across the Atlantic sector. Related to Geopotential Height forecasts, it seems that the deficit of NAO - regimes is a consistent scenario for most of the models. The Atlantic Ridge vs Blocking regimes can be seen as result of the model uncertainty. The models are also quite consistent for some enhanced frequency of NAO + regimes (and a positive phase of the AO) but likely associated to a Northward shift of the storm tracks.
For temperature, the Above Normal scenario makes sense for Northern Europe. The below Normal scenario should be consistent with the forecasted General Circulation for regions close to the Mediterranean sea. Elsewhere the dispersion of the different models and the size of the boxes lead to "No privileged Scenario".
For rainfall, some consistent signal exists for the Mediterranean basin (Below Normal conditions). Then elsewhere the dispersion of the different models and the size of the boxes lead to "No privileged Scenario". However, the Above Normal conditions could be privileged for Scandinavian regions.

Tropical Cyclone activity

For the beginning of the season in the Southern hemisphere, Euro-Sip forecasts indicate a more active than normal cyclonic activity over the South-East Indian Ocean and a less active than normal cyclonic activity over the South Pacific.

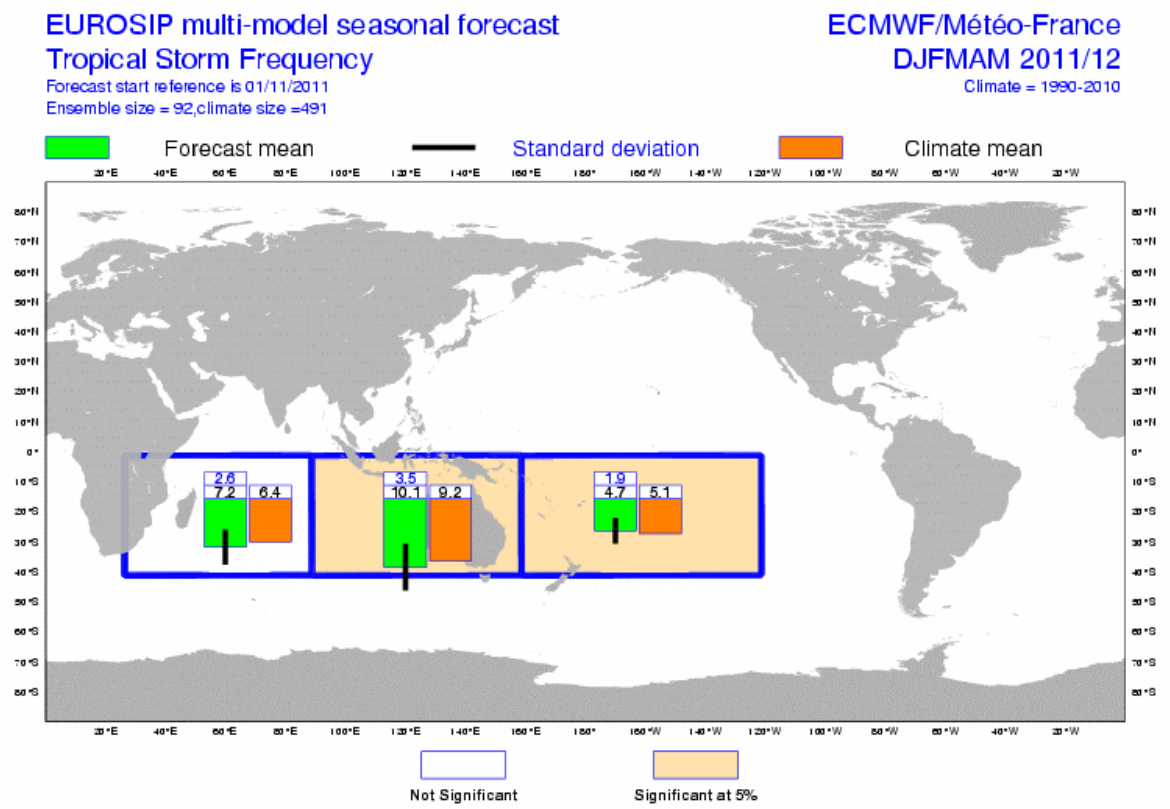


fig.42: Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF) for the November 2011 to April 2012 period, issued in November.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro/eurosip_tropical_storm_frequency/

Synthesis of Temperature forecasts for December-January-February 2011/2012 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	*(34)*	*(3/4)*	*(3/4)*	*(3/4)*	*(3/4)*				
Eurosip									
IRI									
Privileged Scénario by RCC-LRF Node	***Above Normal***	***No privileged scenario***	***No privileged scenario***	***No privileged scenario***	***Below Normal***				

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

Synthesis of Rainfall forecasts for December-January-February 2011/2012 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	*(4/4)*	*(3/4)*	*(44)*						
Eurosip									
IRI									
Privileged Scénario by RCC-LRF Node	***No privileged scenario***	***Below Normal***	***No privileged scenario***	***No privileged scenario***	***Below Normal***				

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).

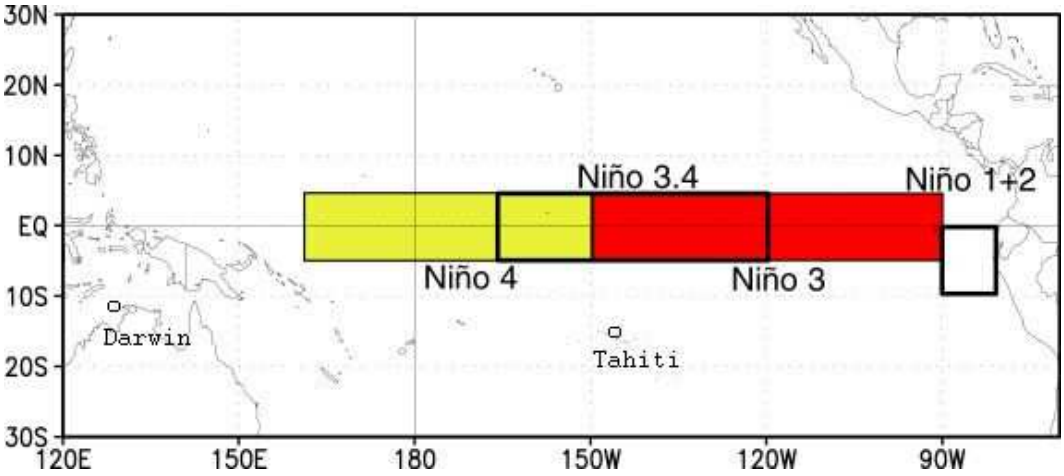
In order to better interpretate the results, it is recommended to look to verification maps and graphs which give some insight into the expected level of skill for a specific parameter, region and period. A set of scores is presented on the web-site of the Lead-Centre for Verification (see http://www.bom.gov.au/wmo/lrfvs/)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