GLOBAL CLIMATE BULLETIN
n°163 - JANUARY 2013

Table of Contents

I. DESCRIPTION OF THE CLIMATE SYSTEM (NOVEMBER 2012)

I.1. OCEANIC ANALYSIS

I.1.a Global Analysis

At the Surface (fig. 1) :
For the Pacific : In the equatorial wave guide SSTs are close to normal excepted a positive anomaly close to Papua New Guinea. A positive anomaly is also visible in the SPCZ region. The negative anomaly on the most Eastern part has vanished. Little evolutions elsewhere to the exception of the mid/high-latitudes in the North Pacific (cooling close to Japan and warming over the Bering sea consistently with the Z500 anomaly).

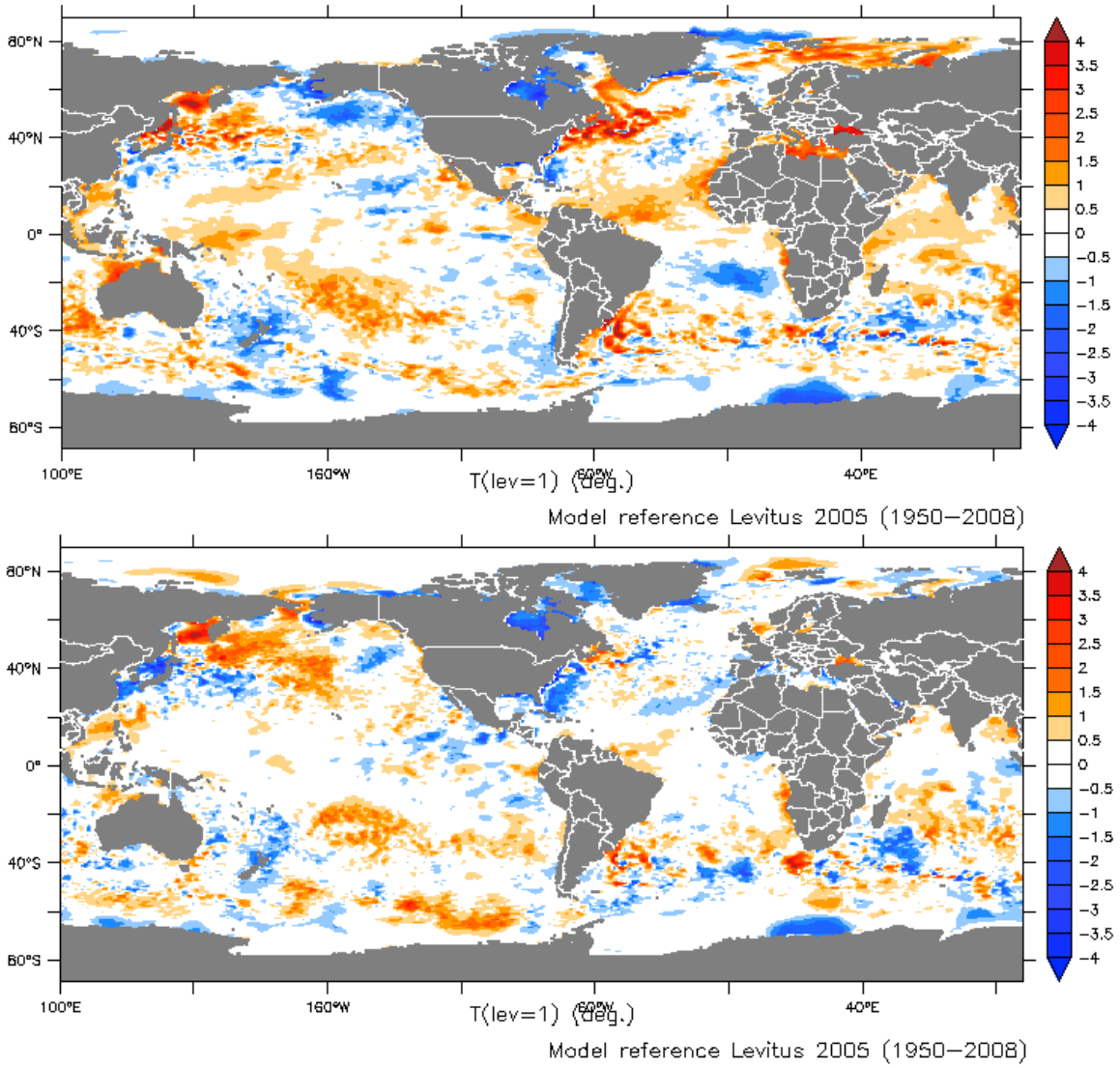


fig.1: **top : SSTs Anomalies in November 2012 (°C) (reference 1950-2008)**
bottom : SST tendency (current – previous month) http://bcg.mercator-ocean.fr/

For the Tropical Atlantic : little evolution in the equatorial band with still some positive anomaly in the Guinean Gulf and close to normal close to South America. In the Southern Tropics, still a negative anomaly while the Northern Tropical part is warmer than normal. Over the North Atlantic : warmer than normal conditions along the Eastern coast of North America.
In the Indian Ocean : mostly warmer than normal from West Australia up to the Great Horn of Africa. The South Western part is cooling.
In subsurface (fig.2) :
In the Pacific : in the equatorial waveguide, heat content anomalies mostly negative over Western and Eastern regions and consistent with the temperature in subsurface (negative anomaly around 150m excepted around 120°W with a positive anomaly) and the thermocline depth anomalies (see fig. 4 & 5). Note the positive anomalies in the most Western part off equator (especially in the Northern hemisphere between 10°N and 20°N) while the signal is weaker at the surface. In the mid/high latitudes of the Northern hemisphere, great consistency with the surface signal.
In Tropical Atlantic : Little evolution. Positive anomaly developed in the Guinean Gulf. Persistence of the patterns observed last month. The Northern Atlantic is mostly above normal especially on the Western side up to the Labrador sea. Over South Atlantic anomalies are consistent with SST.
In the Indian Ocean : heat content consistent with SST signal in the regions close to the equatorial waveguide and Australia. Little evolutions with respect of previous month to the exception the South Tropics (cooling).

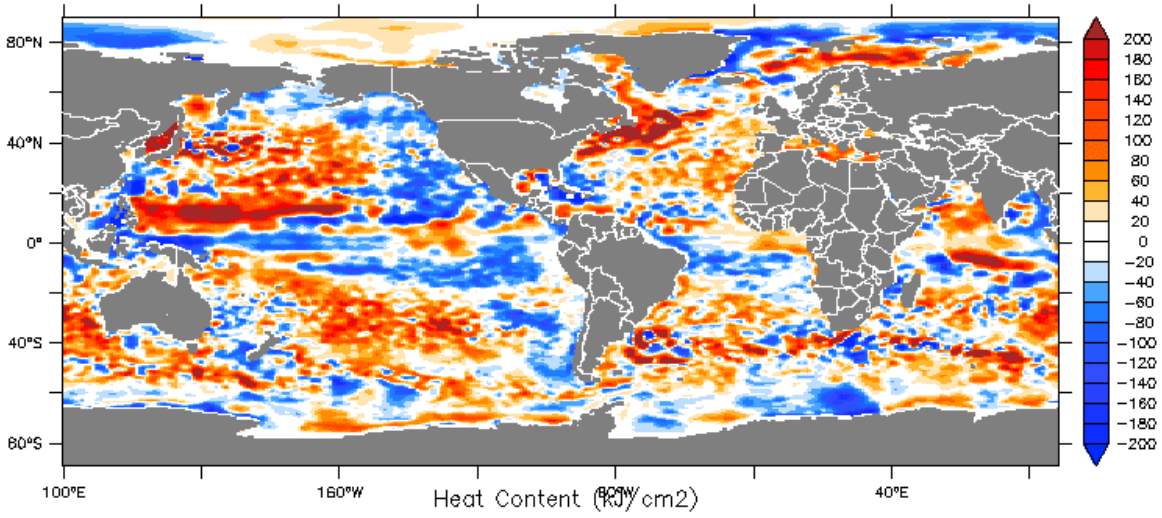


fig.2: map of Heat Content Anomalies (first 300m) in November 2012 (kJ/cm²). (reference 1950-2008) http://bcg.mercator-ocean.fr/

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

A positive anomaly developed around the dateline while it is vanishing on the eastern part. Little anomalies of the Trade Wind (some negative anomalies west to 160°W). The SOI is still slightly positive (0,3).

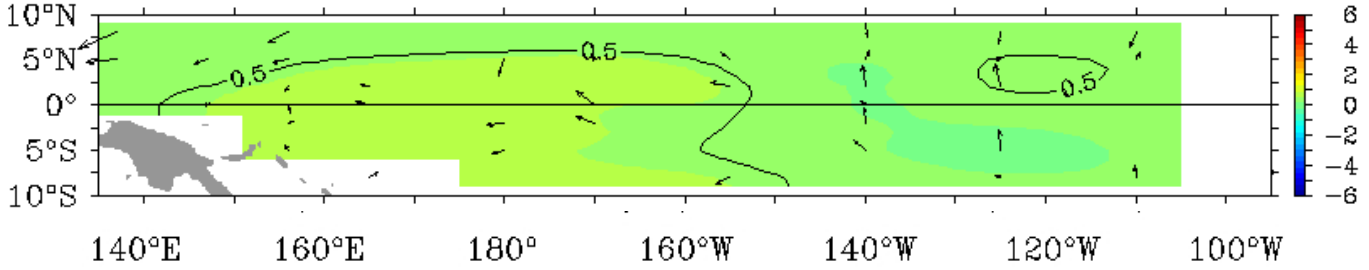


fig.3: SST Anomalies and Wind anomalies in November 2012 over the Equatorial Pacific from TAO/TRITON. http://www.pmel.noaa.gov/tao/jsdisplay/monthly-summary/monthly-summary.html

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

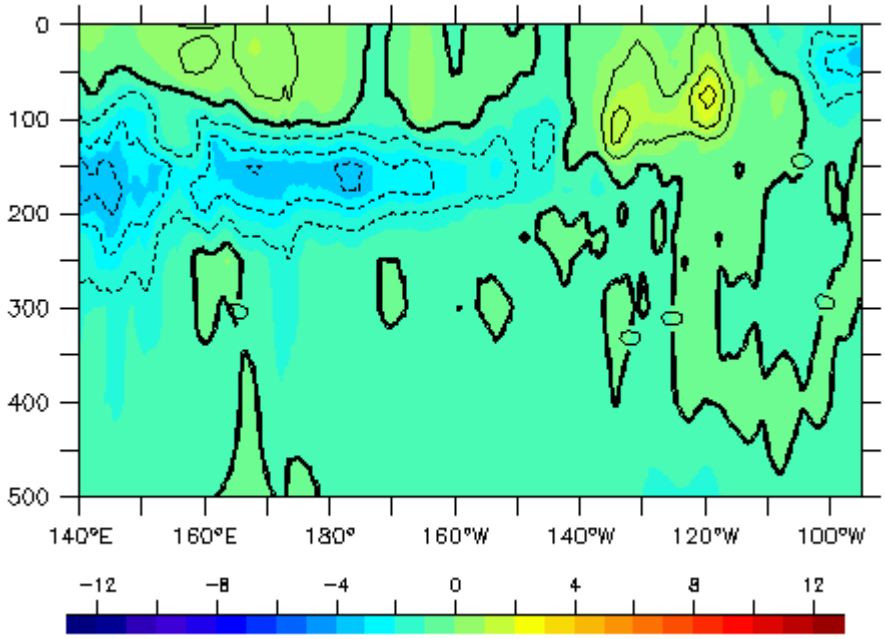


fig.4: Oceanic temperature anomaly in the first *500 metres* in the Equatorial Pacific, in November 2012 http://bcg.mercator-ocean.fr/

In the equatorial waveguide (fig. 4) : some traces of warmer than normal conditions under the surface close to the date line and to 120°W. On the most Eastern part negative anomaly (close to 50m depth) To be quoted the negative anomaly close to 150m which propagate from the most western part up to the centre of the basin.

The thermocline structure (fig. 5) : Thinner than normal over the western part and deeper than normal close to 120°W. Some wave propagation signal of the negative and positive anomalies is visible across the basin.

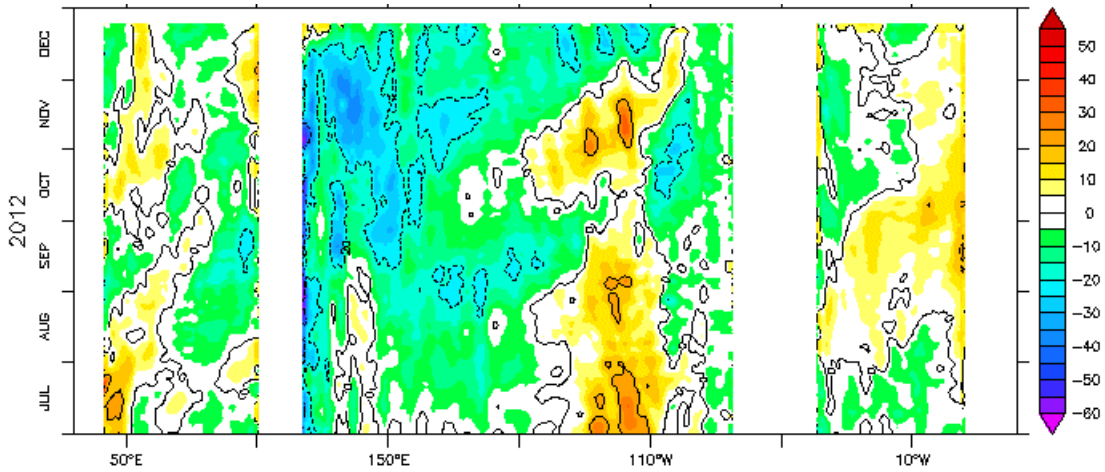


fig.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 6 month period. http://bcg.mercator-ocean.fr/

I.1.c Atlantic Basin

Northern Tropical Atlantic : mostly warmer than normal, with little evolution since the last month.

Equatorial waveguide : a weak dipole like pattern with deeper/warmer than normal conditions for the thermocline/SST on the Eastern part (Guinean Gulf) while in the Western part there is a weak thinner/cooler than normal signal.
The Southern Tropical Atlantic : Still cooler than normal. Some traces of warmer than normal conditions in the mid-latitudes.

I.1.d Indian Basin

Southern Tropical Indian Ocean : warmer than normal (especially close to Australia).
Equatorial waveguide : warmer than normal conditions in Western part and Normal in Eastern part warming at the end of the period. The IOD is still positive.
Northern Tropical Indian Ocean : mostly warmer than normal.

I.2. ATMOSPHERE

I.2.a Atmosphere : General Circulation

Velocity Potential Anomaly field in the high troposphere (fig. 6 – insight into Hadley-Walker circulation anomalies) : 2 main anomalies along the equator and quite a lot of sub-regional patterns.
On the Pacific : Clear Divergent circulation anomaly (upward anomaly motion) on the Western side (which extends along the SCPZ). Quite a lot of additional sub-regional cells ; Convergent circulation anomalies in the South Tropics (close to French Polynesia) and the North-Western Tropics. Some weak but discernable Divergent circulation anomaly on the North-Eastern Tropics likely in relationship with the convergent circulation anomaly over the Gulf of Mexico and Florida (regional cell).
On the Atlantic : Strong and large convergent circulation anomaly (downward anomaly motion) close to the North-Eastern coast of South America and the Gulf of Mexico. It could be partly related to the MJO and likely also related to the atmospheric dynamic in the Tropics. However, this pattern merge with the pattern visible on the sub-tropics of North Atlantic and consistent with the SST. A weak divergent circulation anomaly (upward anomaly motion) is visible in the South-Western subtropics (possibly strengthening the main positive anomaly).
On the Indian Ocean : negative anomaly (divergent circulation anomaly - upward anomaly motion) on the Eastern part which extends toward the South-Western part of the basin. It is likely and partly related to the MJO activity. This anomaly extends also toward western Australia and East Asia. To be quoted the convergent circulation anomaly on the eastern coast of South-Africa.

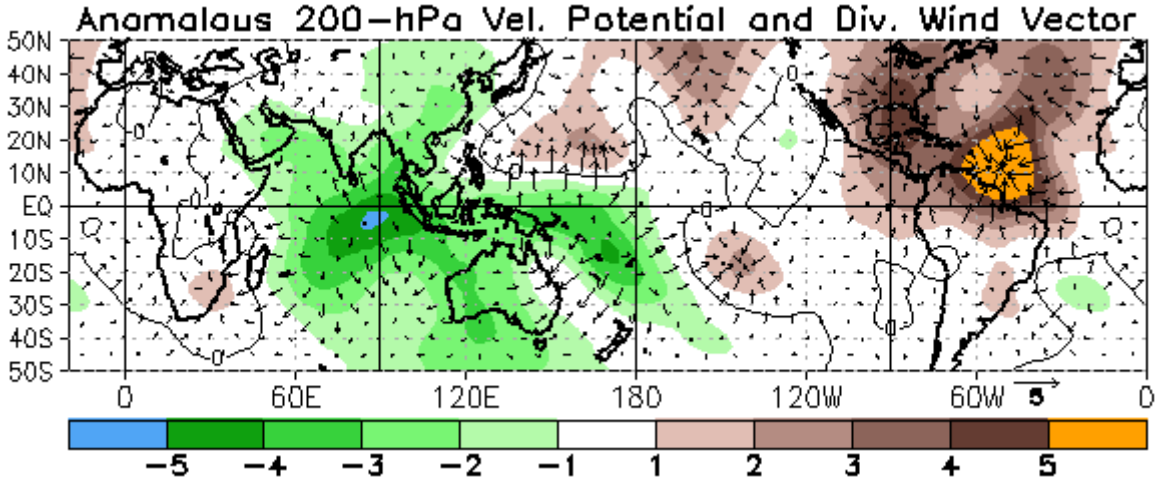


fig.6: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly in November 2012. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly).
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

Stream Function anomalies in the high troposphere (fig. 7 – insight into teleconnection patterns tropically forced) : Clear strengthening of the rotational circulation with respect of the previous month. However one part of the signal seems to come from the mid latitudes while some sub-regional influence seems to comes from the Tropics. So a real difficulty to clearly separate the tropical forcing from the mid-latitude dynamic. Some patterns to highlight : over the North-Western Pacific with some tropical influence on the mid-latitude circulation ; over the North-Western Sub-Tropical Atlantic (possibly induced by modifications of Walker circulation). The patterns crossing Europe up to Arabic regions seems to come from the mid-latitude dynamic.

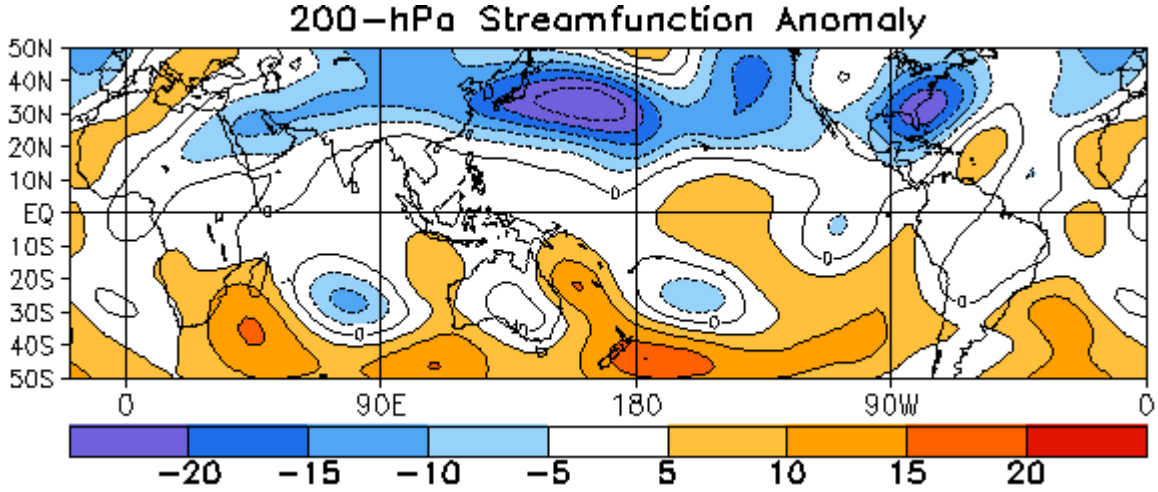


fig.7: Stream Function Anomalies at 200 hPa in November 2012.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

Geopotential height at 500 hPa (fig. 8 – insight into mid-latitude general circulation) : In relationship with previous discussion, the main anomaly (North-Western Pacific) is likely related to the mid-latitude dynamic and the influence of the Tropical Pacific (see WP mode). The dipole pattern close to the Caribbean could be related to tropical forcing (both SSt and dynamic). The other patterns should very likely related to the mid-latitude dynamic and the annular modes (both in Southern and Northern hemisphere). Consequently the main active atmospheric modes in the Northern hemisphere (see next table) is the West Pacific mode (-2.0). The PNA is still negative (-1.1). For Europe, the most active mode is the EA mode (1.0) ; some activity in the mid-latitudes being visible through the NAO (-0,7) and Scandinavian modes (-0.7).

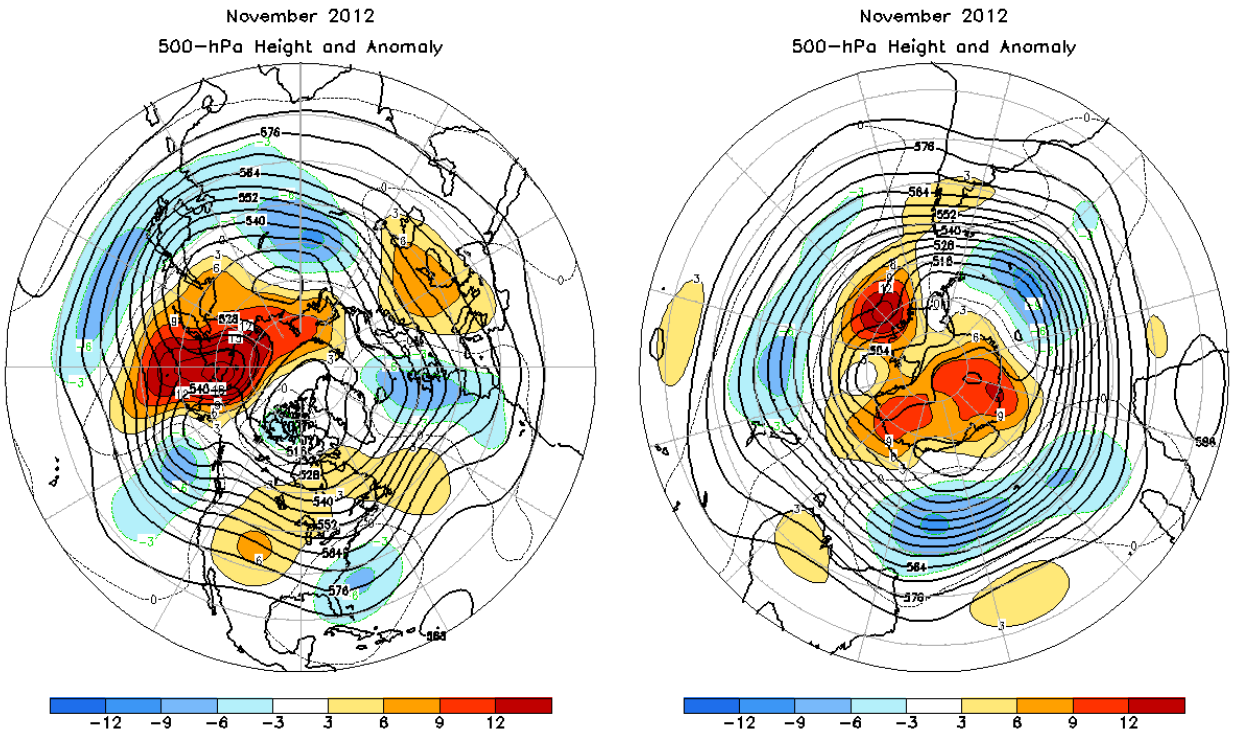


fig.8: Anomalies of Geopotential height at 500hPa in November 2012 (left North Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige9.shtml, and right South Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige15.shtml)

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
NOV 12	**-0.7**	**1.1**	**-2.0**	**0.1**	**-1.1**	**---**	**-0.6**	**0.7**	**-0.2**
OCT 12	-1.7	-0.3	-2.5	0.6	-1.1	---	-1.0	-0.3	-0.2
SEP 12	-0.4	0.4	0.7	0.2	-0.4	---	-0.5	-0.9	-0.7
AUG 12	-1.4	1.4	-0.1	0.6	-0.2	---	1.1	0.8	1.0
JUL 12	-1.3	1.0	0.6	-1.0	-0.6	---	-1.4	-0.6	1.0
JUN 12	-2.2	-0.1	-1.4	-0.9	-0.4	---	0.0	-1.4	-1.8

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

I.2.b Precipitation

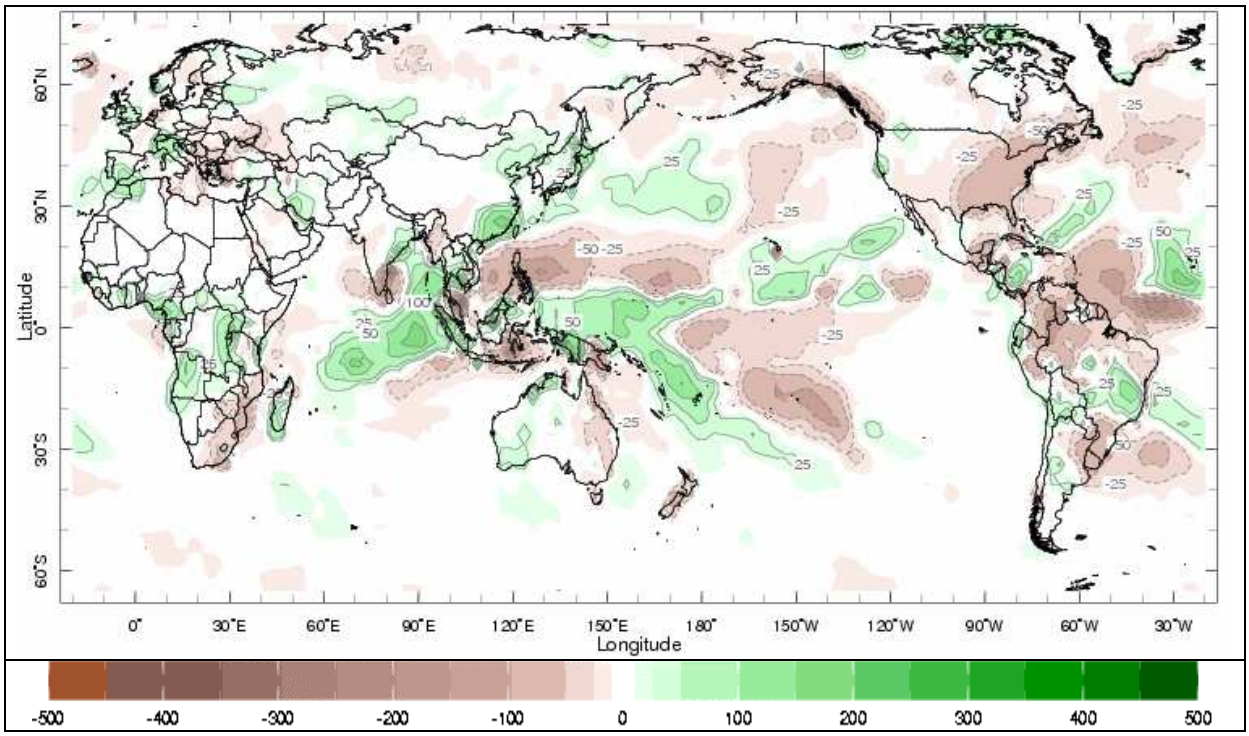


fig.9: Rainfall Anomalies (mm) in November 2012 (departure to the 1979-2000 normal) – Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/

In relationship with quite a lot of sub-regional patterns in the Velocity Potential anomaly field, the patterns are quite fragmented.

Pacific : good consistency with the Divergent/Convergent Circulation anomalies ; especially over the Tropical Pacific (both Southern and Northern), the SCPZ region and Australia.

Atlantic/Africa : The positive anomalies on the Western coast and the Guinean Gulf seem to be related to sub-regional forcing. The large negative anomaly close to the North-Eastern coast of South America is clearly related to the strong downward anomaly motion over these regions. The dipole pattern over South/Central Brazil correspond to sub-regional pattern dynamically forced. Last, the positive anomaly crossing the Caribbean is likely partly dynamically partly SST forced.

Indian Ocean : strong positive anomaly corresponding to the strong divergent anomaly circulation. Over the Eastern coast of South Africa, negative anomaly consistent with the velocity potential field.

Australia : some traces of a dipole pattern positive/negative anomalies over Western/Eastern regions.

North America : mostly dry over coastal area of West Canada and all the Eastern part of US.

Over Europe : to be quoted the negative anomalies (dry) in the South-Eastern part and some sub-regional positive anomalies (especially around to the Western Mediterranean basin).

I.2.cTemperature

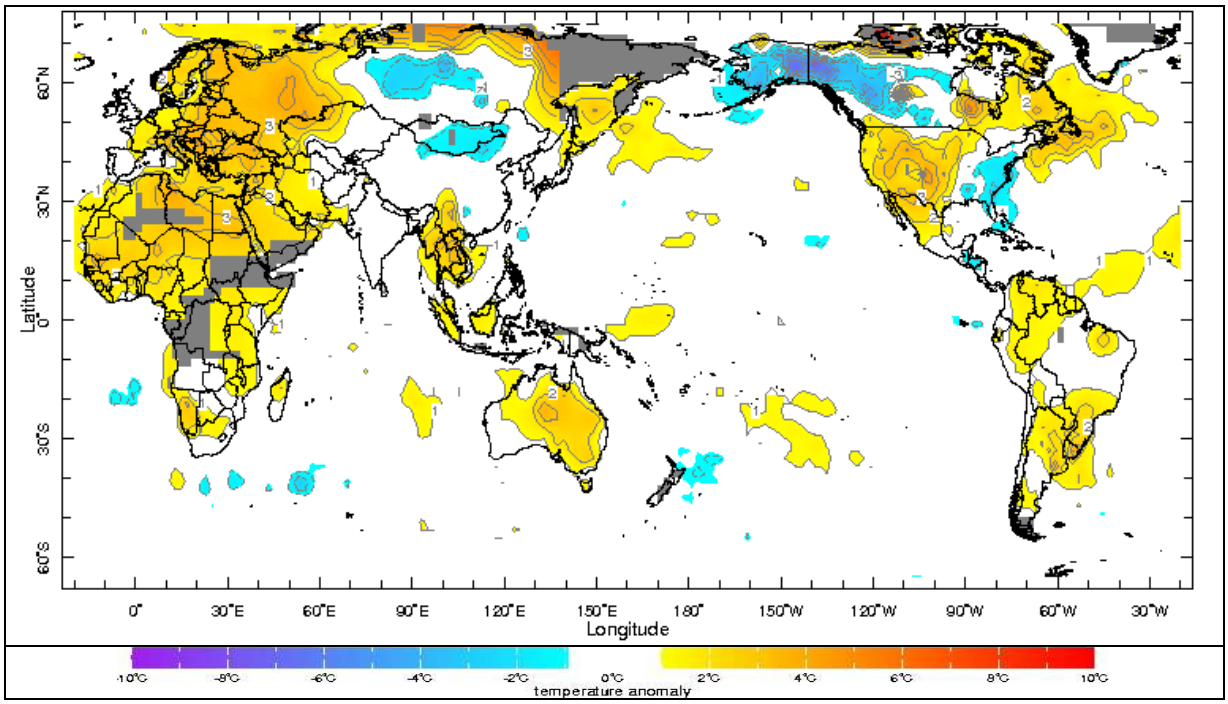


fig.10: Temperature Anomalies (°C) in November 2012 (departure to the 1979-2000 normal) http://iridl.ldeo.columbia.edu/maproom/.Global/.Atm_Temp/Anomaly.html

North-America : Dipole patterns Cooler/Warmer than normal over West/East Canada and Warmer/Cooler than normal over West/East US. Also warmer than normal conditions over Northern Mexico. These anomalies are quite consistent with the Z500 anomalies previously discussed.
South-America : Warmer than normal conditions spread more or less everywhere.
Australia : Warmer than normal conditions on the half eastern part.
Asia : Close to normal conditions excepted over Siberia/Mongolia (cooler than normal relatd to Z500 anomalies ?) and South-East and North-East Asia China (strong positive anomaly over the most northern regions consistent with the Z500 anomaly).
Africa : Warmer than normal conditions over most of the continent (including the Arabic Peninsula).
Europe : Above normal conditions everywhere to the exception of the most western part (UK and Iberic Peninsula).

I.2.d Sea Ice

In Arctic (fig. 11 - left) : still the sea-ice extension reached its minimum value and new record (negative anomaly below 2007 value). But the growing rate lead to conditions close to 2007.
In Antarctic (fig. 11 - right) : still above normal sea-ice extension anomaly (but evolution toward the mean value) with some regional modulation.

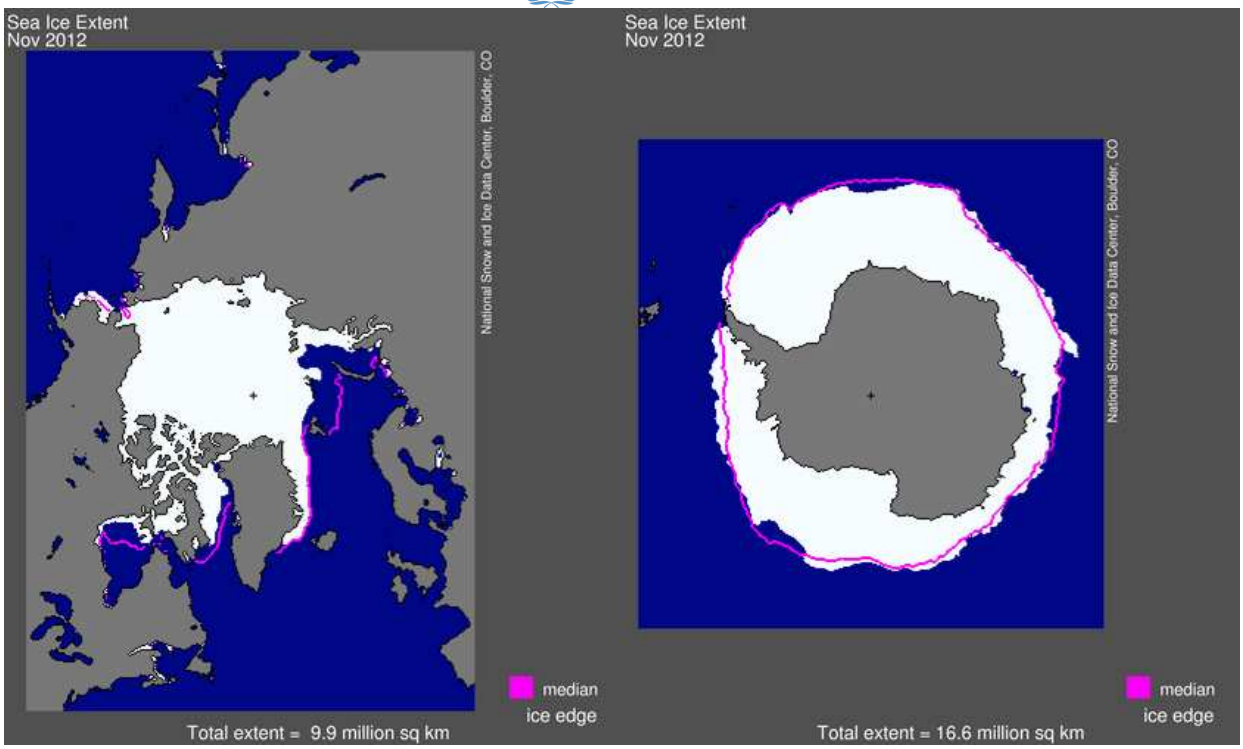


fig.11: Sea-Ice extension in Arctic (left), and in Antarctic (right) in November 2012. The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

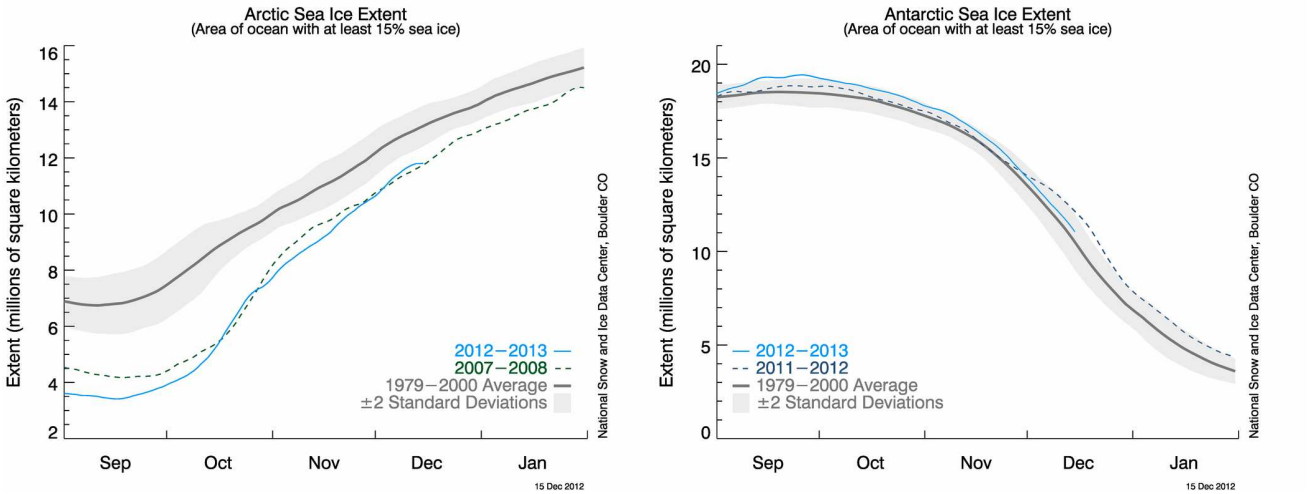


fig. 9bis : Sea-Ice extension evolution from NSIDC
http://nsidc.org/data/seaice_index/images/daily_images/N_stddev_timeseries.png

II.SEASONAL FORECASTS FOR JFM FROM DYNAMICAL MODELS

II.1. OCEANIC FORECASTS

II.1.a Sea Surface Température (SST)

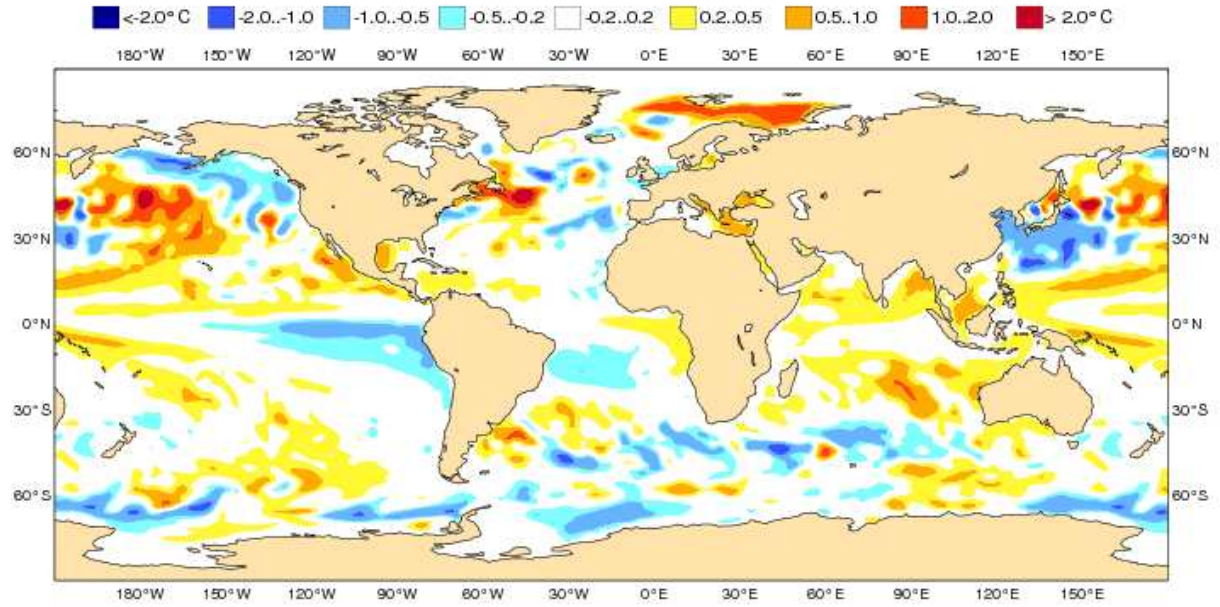


fig.12: SST anomaly forecast (in °C) from ECMWF for JFM, issued in December.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

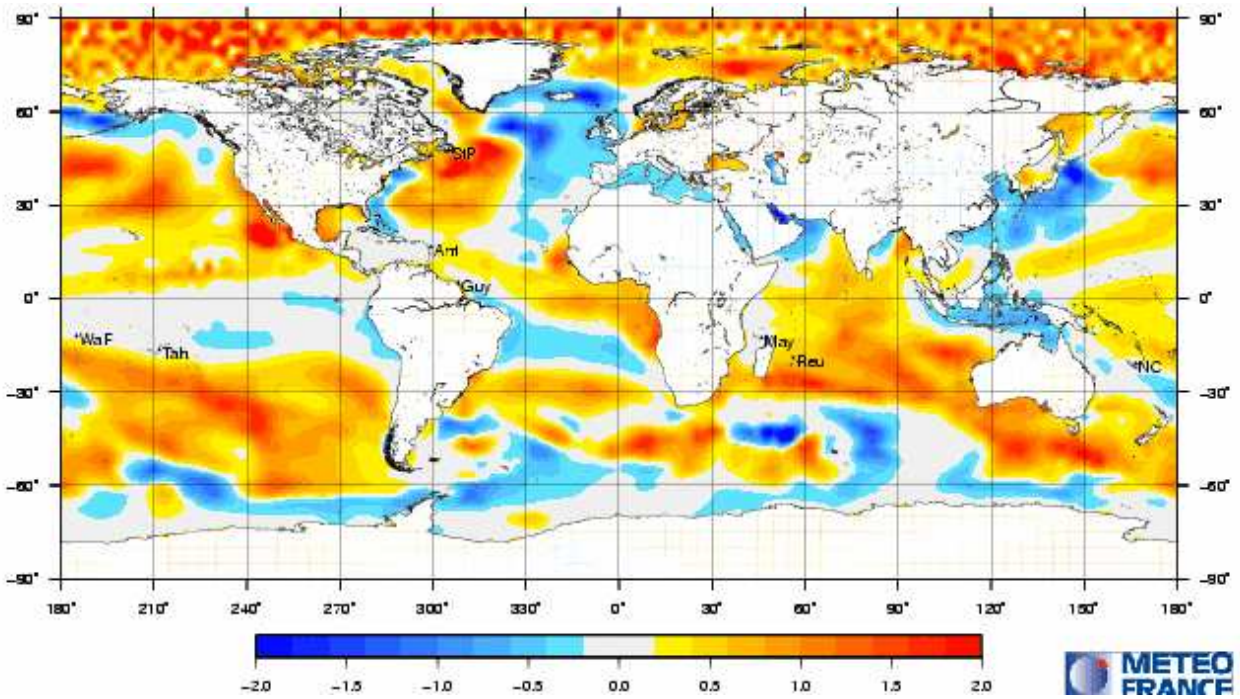


fig.13: SST Anomaly forecast (recalibrated with respect of observation) from Météo-France for JFM, issued in December. http://elaboration.seasonal.meteo.fr/

For the 2 individual models :

At large scale consistent over the Atlantic and Indian ocean Tropics. Like for the previous month the main difference comes from the Pacific.
Pacific : in the Eastern equatorial regions, colder than normal conditions are developed by ECMWF while there is only little trace in MF. Conversely warmer than normal conditions are developed in MF West to the dateline while there is only a weak signal in ECMWF. However, over the SPCZ region warmer than normal conditions in both MF and ECMWF. Warmer than normal conditions close to California. Better consistency for the sub-tropics and mid-latitudes.
Atlantic : both models consistent over the South Atlantic (slightly colder than normal in the Tropics/sub-Tropics), the Tropical North Atlantic (warmer than normal) and the mid-latitudes of the Northern hemisphere. Close to the Equator warmer than normal signal in both models including the Guinean Gulf.
Indian Ocean : Very consistent patterns in both models. Warmer than normal more or less everywhere to the exception of the region of the maritime continent.
To be quoted that there is only little differences in the mid-latitudes.

In Euro-SIP :
Patterns very similar to one already presented on individual models in relationship with the consistency of forecasts of individual models at large scales.
Pacific : Equatorial waveguide : warmer than normal conditions West to the date line, close to normal in the Central Pacific and Colder than normal in the Eastern part. A tripole pattern (from West sub-tropics to East High Latitudes) is present. To be quoted that NCEP present a different solution than ECMWF and MF with a cooling located in the central part of the basin (instead in the Eastern part).
Atlantic : warmer than Normal conditions in the equatorial regions and North-West Tropics. Colder than normal conditions in the Eastern Sub-tropics and Tropics. A strong positive anomaly is still present close to Newfoundland.
Indian Ocean : mostly warmer than normal conditions everywhere to the exception of regions of the maritime continent (close to normal).

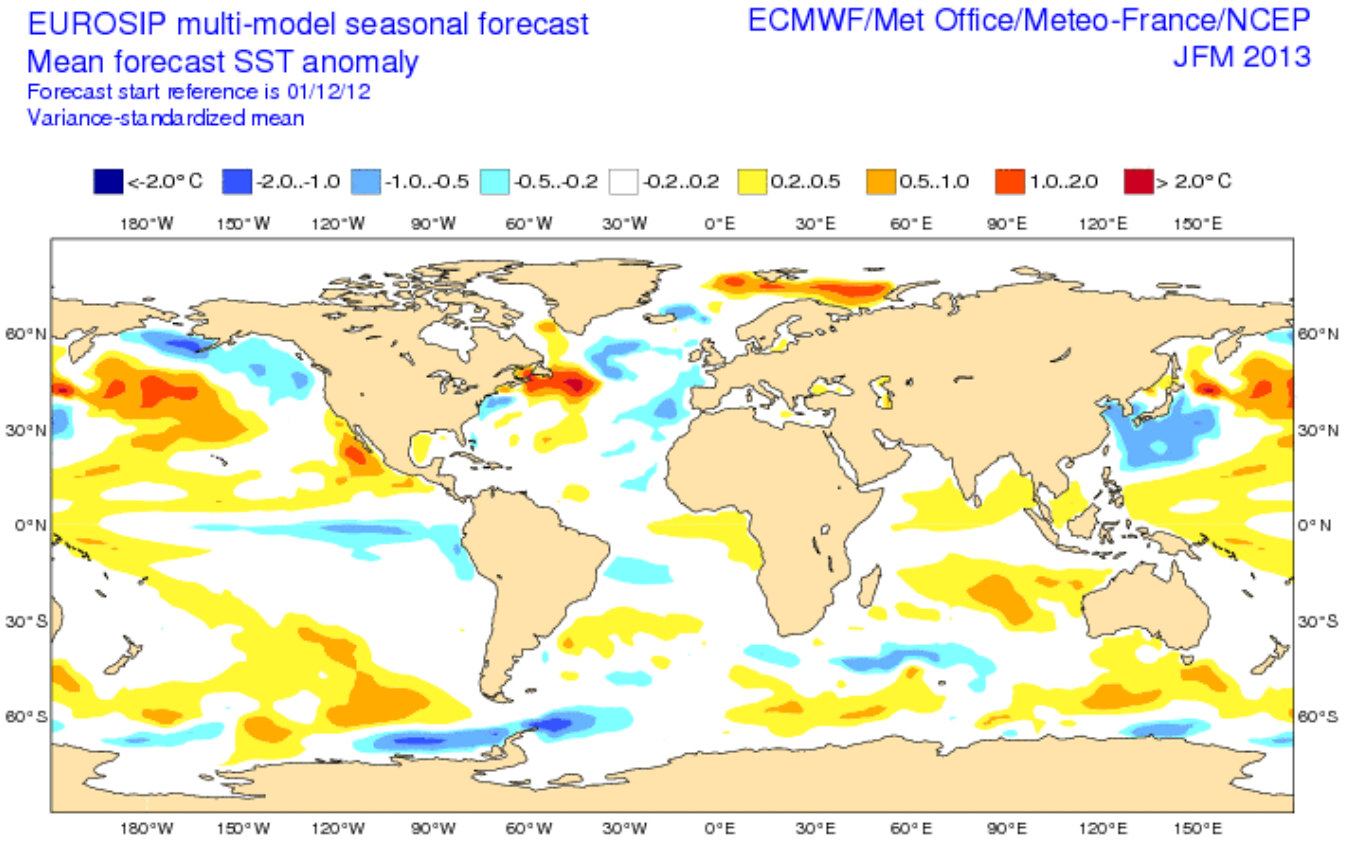


fig.14: SST Forecasted anomaly (in °C) from Euro-SIP valid for JFM, issued in December.

II.1.b ENSO Forecast :

Forecasted Phase for NDJ : neutral (but positive anomaly)

Synthesis of several model forecast for the Niño 3.4 box from IRI (see definition in Annex) including models from Euro-Sip and statistical models. Ensemble mean on figure 15 (circle for statistical models and squares for dynamical coupled models). The average of all dynamical models corresponds to the yellow thick line.

For JFM : a large set of dynamical models give close to normal conditions. Two models (one is part of Euro-SIP) are giving cold solutions in the Pacific (even one being beyond the La Niña threshold). For the statistical models, they are mostly forecasting close to normal conditions. So a neutral condition is expected in winter up to the beginning of Spring.

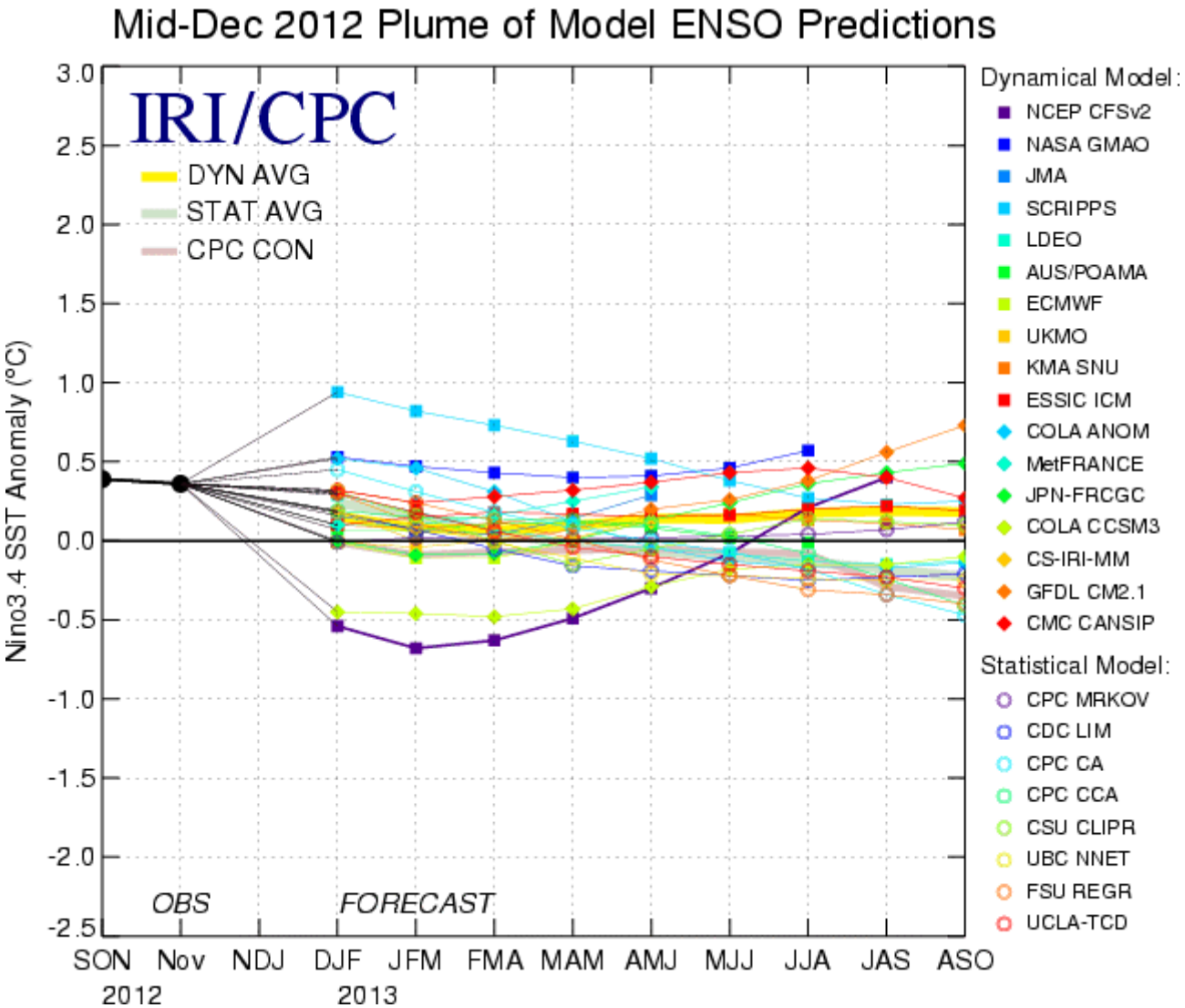


fig.15: Synthesis of Niño 3.4 forecasts (120° to 165°W) issued in November by IRI : http://iri.columbia.edu/climate/ENSO/currentinfo/SST_table.html

In the following table (from IRI) : current SST thresholds 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. The Dynamical models average reflects the likely neutral conditions and the statistical models too.

SEASON	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	AS0
Value « La Niña »	***-0,65***	***-0,55***	***-0,45***	***-0,40***	***-0,45***	***-0,50***	***-0,50***	***-0,50***	***-0,55***
Value « El Niño »	***0,65***	***0,50***	***0,40***	***0,40***	***0,45***	***0,45***	***0,45***	***0,45***	***0,50***
Average, statistical models	0.2	0.2	0.1	0	-0.1	-0.1	-0.1	-0.2	-0.2
Average, dynamical models	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
Average, all models	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**	**0**	**0.1**	**0**	**0**

Plumes from Météo-France and ECMWF for the 3 Niño boxes (see definition in Annex – fig. 16) :
In both models the neutral conditions prevail for the JFM period. One can only notice that some warming still could occur beginning of spring (in MF) but also some cooling (in ECMWF). Last, the spread of both models is still quite large but is decreasing with respect of the previous month.

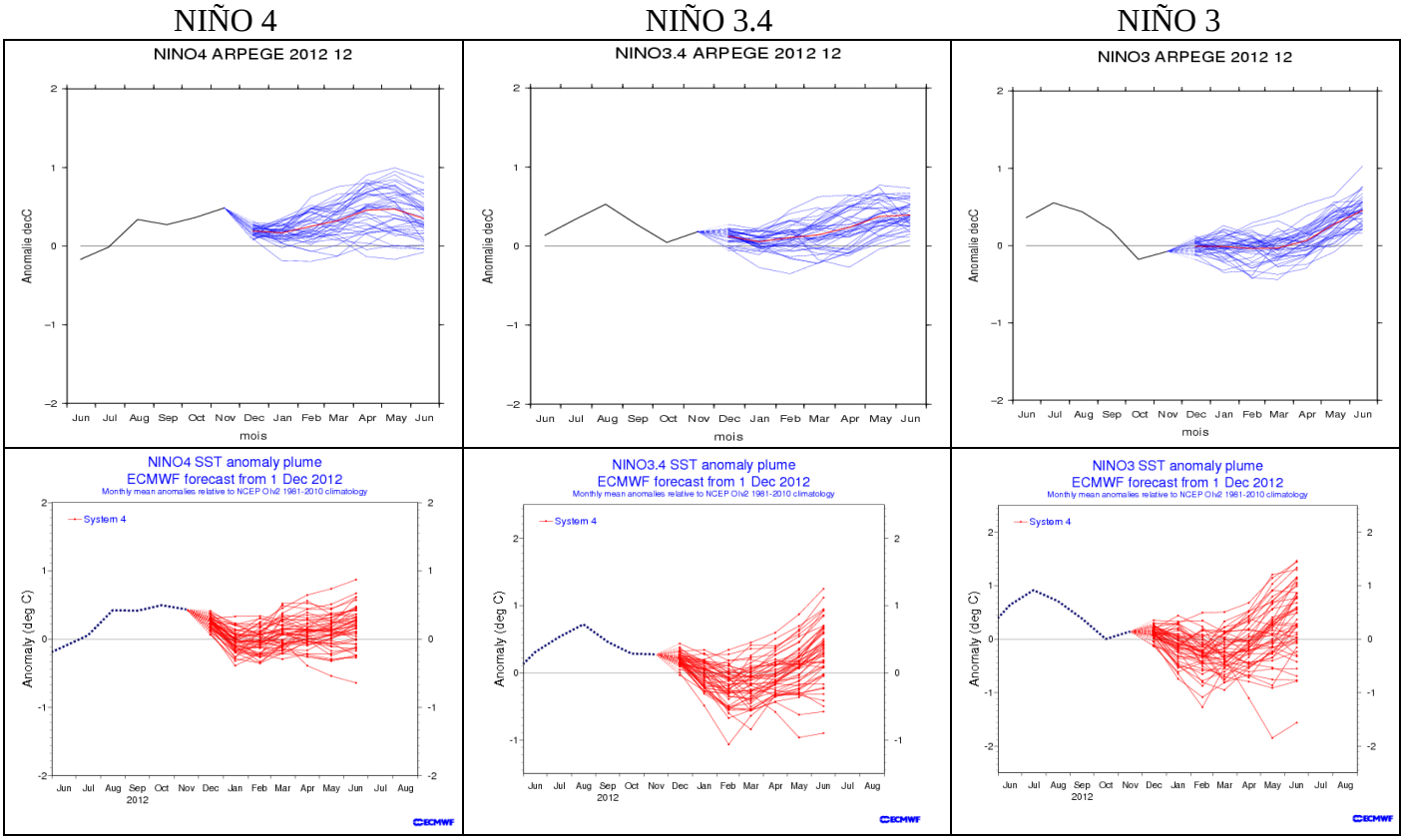


fig.16: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (bottom) issued in December, monthly mean for individual membres. (http://www.ecmwf.int/ **)**

II.1.c Atlantic Ocean forecasts :

Forecasted Phase: ***warmer than normal/close to normal in the Northern/Southern Tropics***

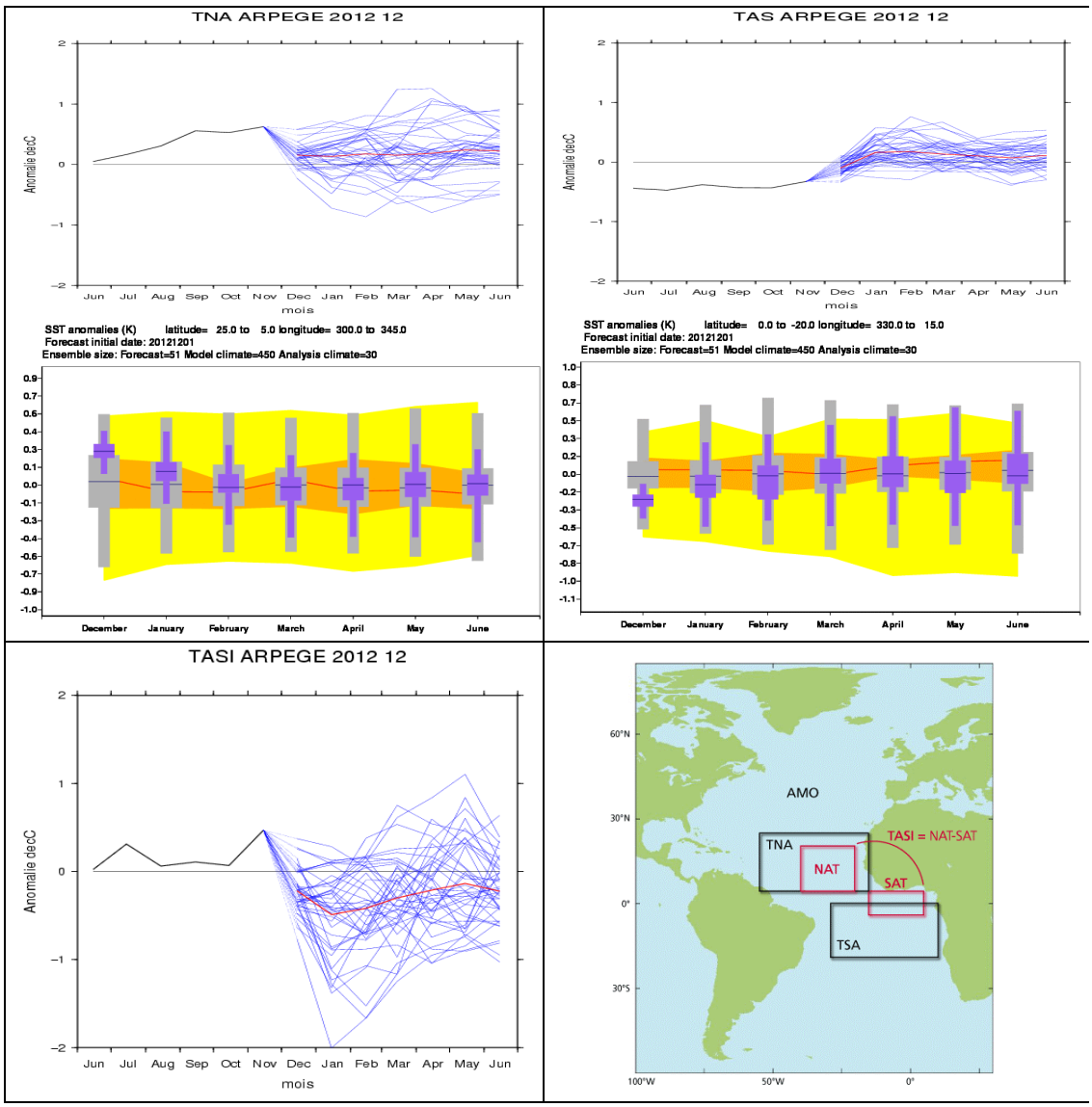


fig.17: SSTs anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, issued in December, plumes / climagrams correspond to 41 / 51 members and monthly means.

North Tropical Atlantic : slightly warmer than normal conditions with a continuous decrease in ECMWF. Large spread in MF to be highlighted.
South Tropical Atlantic : in both models same time tendency starting with slightly cold conditions and a continuous warming leading to slightly warmer than normal conditions by mid-winter (in MF) or close to normal (ECMWF).
The inter-hemispheric SST gradient should remains positive (or possibly close to normal).
TASI : the TASI index is slightly negative (in relationship with the MF warm bias). However, warmer than normal conditions developed in the Guinean Gulf in both models. The spread is very large which lead to be cautious on this interpretation.

II.1.d Indian Ocean forecasts :

Forecasted Phase: *IOD slightly positive with uncertainty*

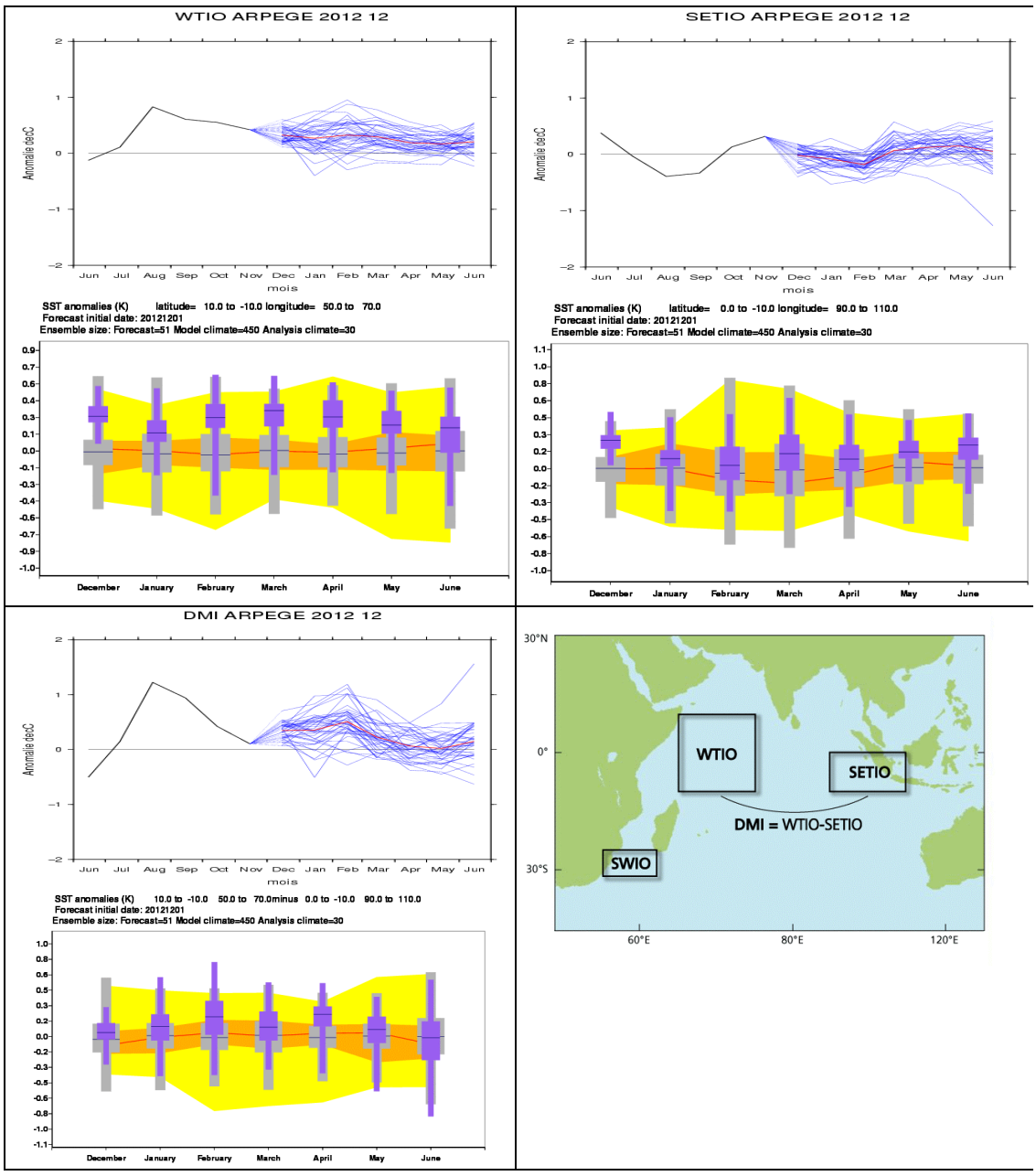


fig.18: SSTs anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, issued in December, plumes / climagrams correspond to 41 / 51 members and monthly means.

In WTIO : Warmer than normal conditions in both models with little spread.
In SETIO : Close to normal in MF for the DJF period. In ECMWF, warmer than normal conditions, in relationship with differences (with MF) in the Equatorial Pacific evolution. To be quoted the relative little spread in both models.
DMI (IOD) : Despite the differences in the Eastern equatorial part, slightly positive phase quite stable in both models.

II.2. GENERAL CIRCULATION FORECAST

II.2.a Global Forecast

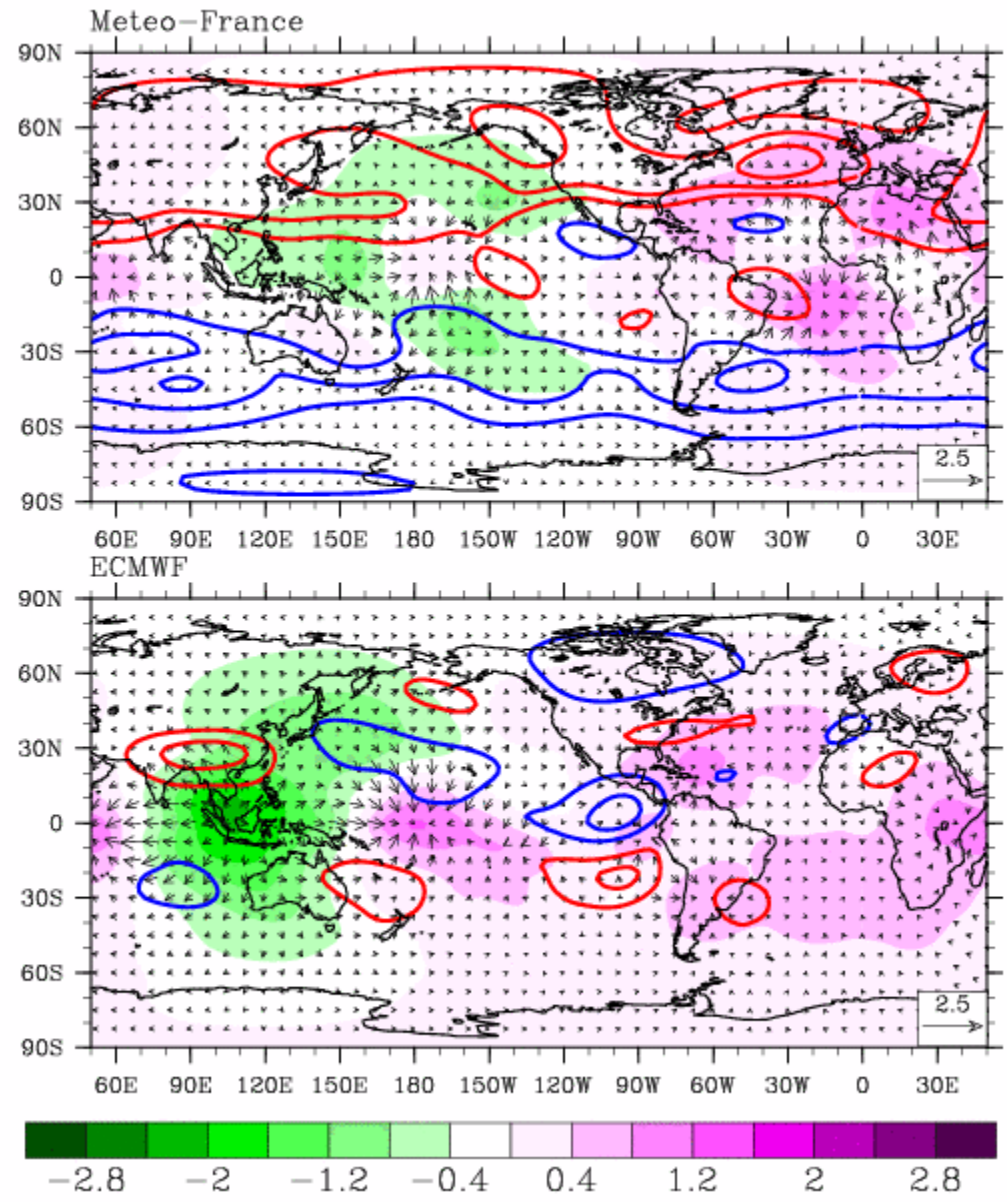


fig.19: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), asociated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa for JFM, issued in December by Météo-France (top) and ECMWF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

Velocity potential anomaly field (cf. fig. 19 – insight into Hadley-Walker circulation anomalies) :
in the Tropics : less difference in atmospheric response in the 2 models with respect of the previous forecast. However, the differences lead to some large impact in terms of temperature and rainfall forecasts.
Over the Central Pacific : Close to the dateline, in both models a convergent circulation anomaly. However, it is stronger and on the equator in ECMWF while it is weaker and Northward shifted in MF. ECMWF shows a divergent circulation anomaly over the maritime continent. There is also some weaker traces in MF but Eastward shifted (and slightly North). Also to be quoted the extension of the negative anomaly in MF up to the North-East of Hawaï and an extension over the SCPZ region in MF which doesn't exist in ECMWF.

Over Indian Ocean/West Pacific : Likely in relationship with the Divergent circulation anomaly close to the maritime continent, the Walker cell is modified (Convergent Circulation anomaly on the western tropical part of the basin and east Africa in both models – slightly eastward shifted in MF).
Over Atlantic : convergent circulation anomaly (downward motion) in the South Tropics (weaker in ECMWF) and close to the Caribbean (weaker in MF). In MF, one can highlight the positive anomaly (convergent circulation anomaly) over the North-Eastern part of Africa.
Stream Function anomaly field (cf. fig. 19 – insight into teleconnection patterns tropically forced) :
In both models, over the Pacific weak signal toward the mid-latitudes. However, in ECMWF some possible teleconnection patterns propagating from the dateline up to Eastern US. In MF, the structure of the anomaly field seems to be more related to mid-latitudes, even if the pattern (positive anomaly) across the North Atlantic sector could be partly strengthened by the tropical forcing.
Nevertheless, it's still difficult to infer a clear diagnosis on the predictability as it seems that the difference between ECMWF and MF are in the range of model uncertainties and that the mid-latitude dynamic should prevail especially on the Western façade of Europe.

II.2.b North hemisphere forecast and Europe

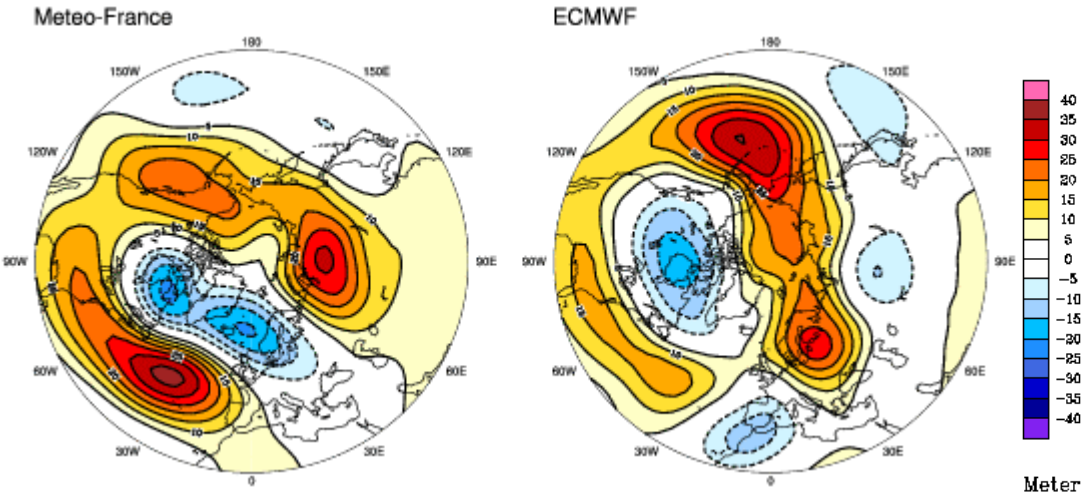


fig.20: Anomalies of Geopotential Height at 500 hPa for JFM, issued in December from Météo-France (left) and ECMWF (right).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip

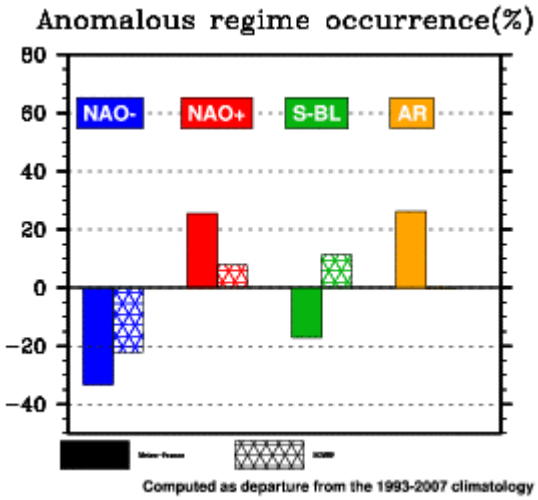


fig.21: North Atlantic Regime occurrence anomalies from Météo-France and ECMWF : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

Geopotential height anomalies (fig. 20 – insight into mid-latitude general circulation anomalies) :
At a glance, the global structure look quite similar but rotated between ECMWF and MF. This could be partly related to the difference in the atmospheric response to the tropical forcing (especially the Pacific – see previous discussions). However, some consistency exists in terms of Geopotential Heigh anomalies especially over the Eastern North American continent and Western Atlantic. There is also some similar signal close to the Bering sea. Then, MF develops a positive anomaly across the whole North Atlantic sector while ECMWF shows a positive anomaly over Scandinavia.
North Atlantic Circulation Regimes (fig. 21) : in both models increased occurrence of NAO+ and deficit of NAO – regimes. The rotation in the Z500 anomalies lead to increased occurrence of Blocking regimes in ECMWF and of AR in MF. Interestingly whatever the final solution, this should infer an increased variability for the winter period as the most likely regimes give opposite effects in terms of temperature and rainfall.
General atmospheric circulation in MF in the low troposphere (see fig. 22) : signal over Europe mostly consistent with the increased occurrence of AR regimes in relationship with the large Z500 anomaly across the North Atlantic sector.

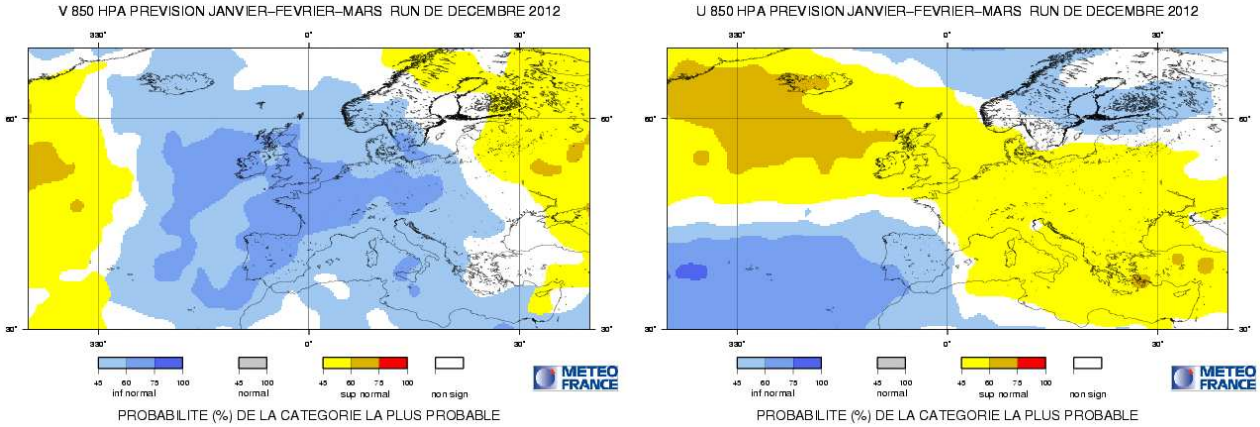


fig.22: Most likely category for the meridional (left) and zonal (right) wind at 850 hPa for JFM, issued in December from Météo-France.

II.3. IMPACT : TEMPERATURE FORECASTS

II.3.a ECMWF

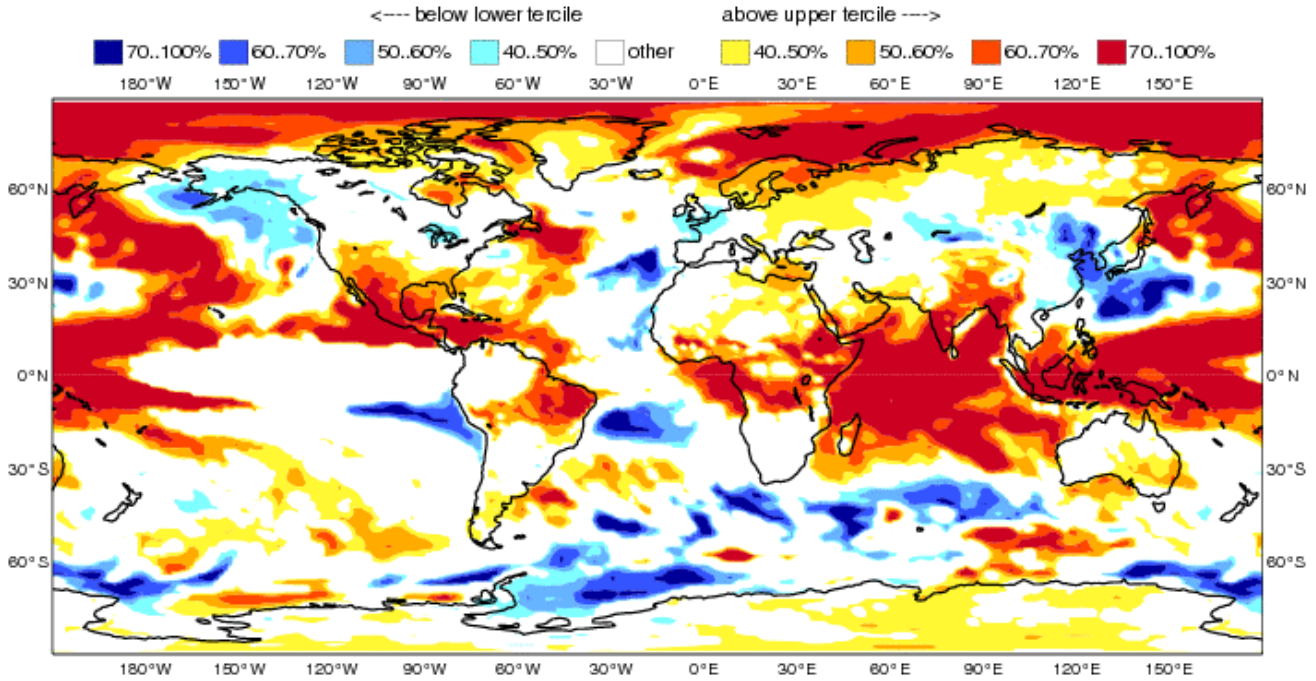


fig.23: Most likely category probability of T2m from ECMWF for JFM, issued in December. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.3.b Météo-France

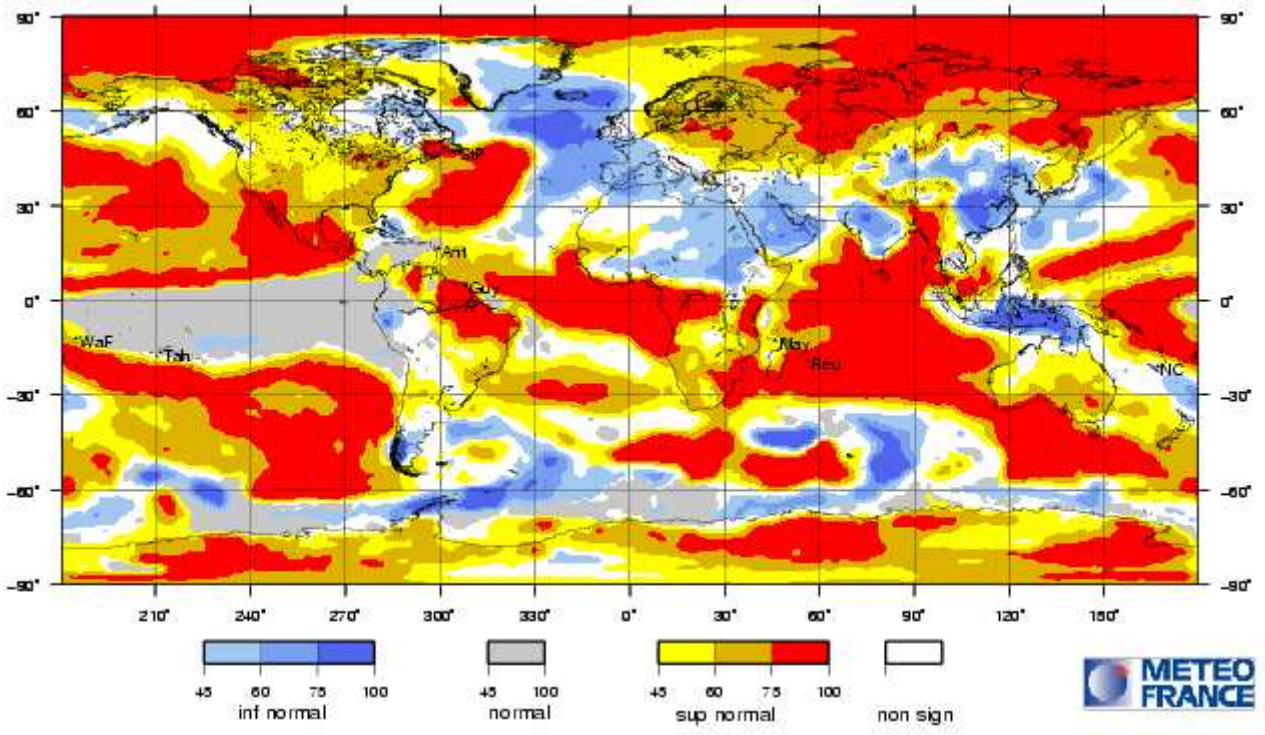


fig.24: Most likely category of T2m for JFM, issued in December. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.3.c Met Office (UKMO)

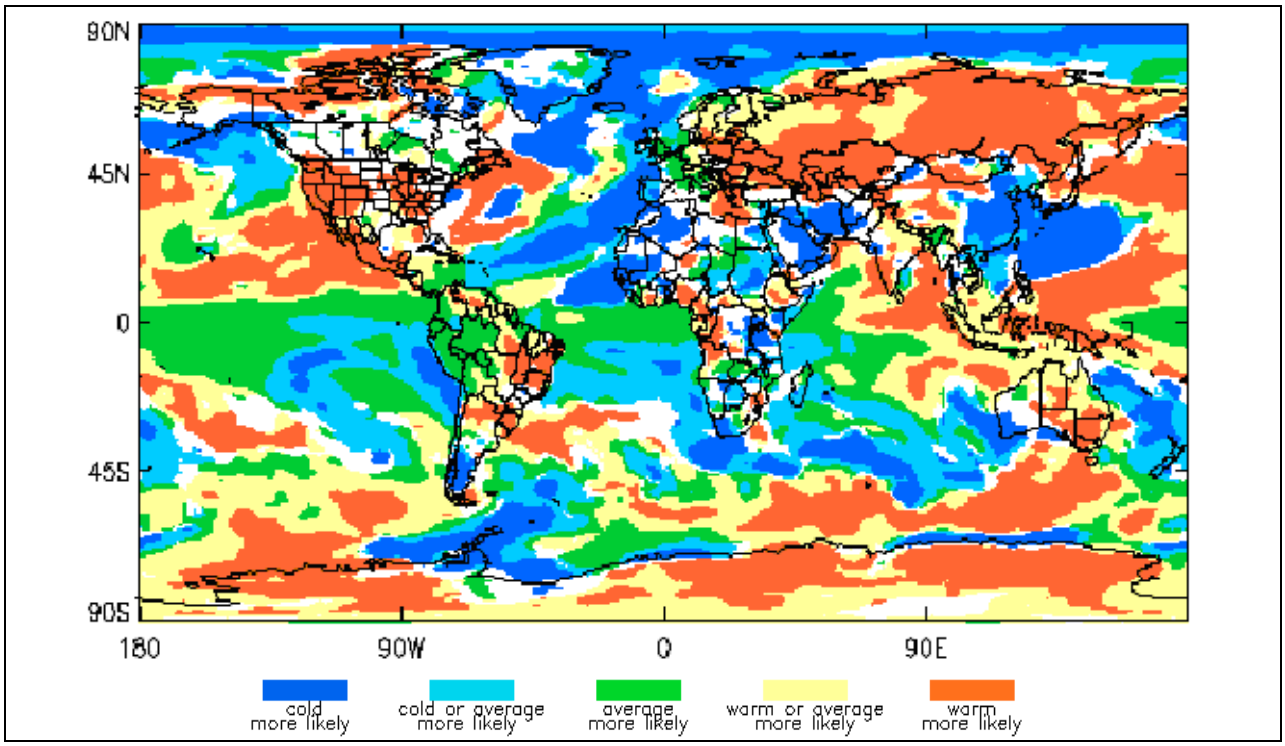


fig.25: Most likely category of T2m for JFM, issued in December from UK Met Office. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://www.metoffice.gov.uk/

II.3.d Japan Meteorological Agency (JMA)

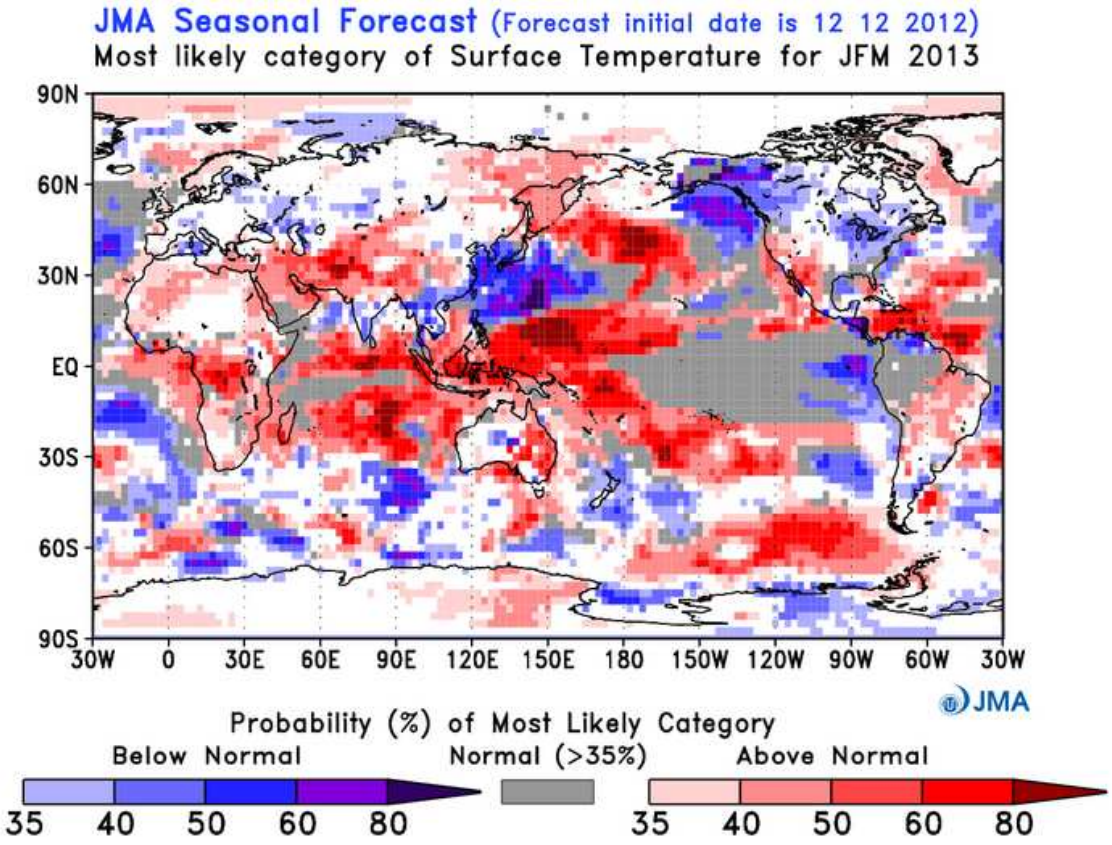


fig.26: Most likely category of T2m for JFM, issued in December from JMA. Categories Above, Below and Close to Normal. White zones means No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/4mE/fcst/fcst_gl.html

II.3.e Euro-SIP

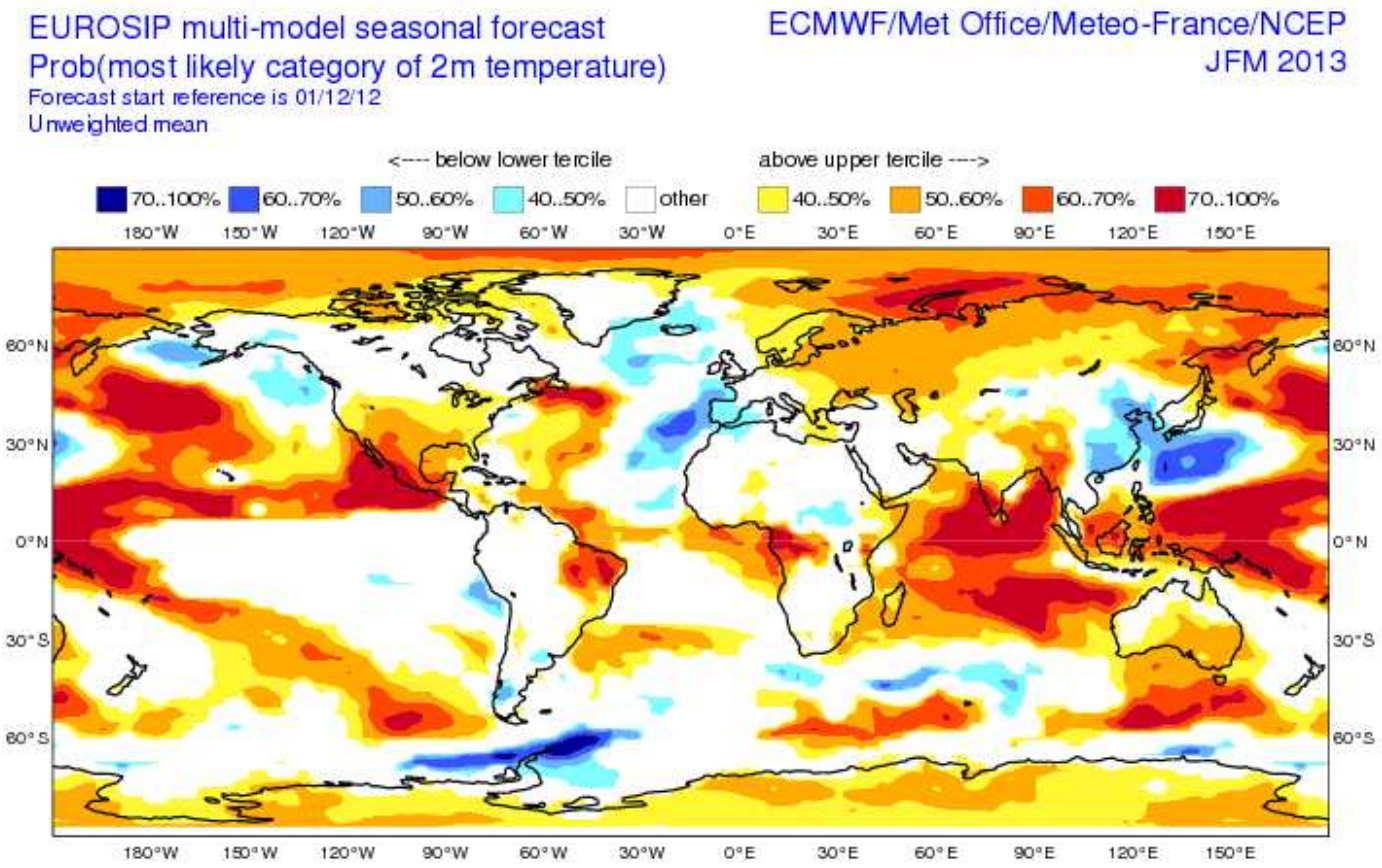


fig.27: Multi-Model Probabilistic forecasts for T2m from EuroSip for JFM, issued in December. (2 Categories, Below and Above normal – White zones correspond to No signal and Normal).

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

North-America : Warmer than normal conditions over most of the US extending toward Mexico.
South-America : Warmer than normal conditions over the North-Eastern part of the continent (Brazil).
Australia : mostly Warmer than normal (especially the half Eastern part).
Asia : Warmer than normal conditions over Miramar and the Southern part of India and Siberia. Below normal conditions over Eastern Asia (China / Korea).
Africa : Warmer than normal conditions on one hand along the Guinean Gulf and Equatorial Africa.
Europe : Warmer than normal scenario over most of Northern and Eastern regions. A weak signal over the Iberic Peninsula for Below Normal conditions.
Taking on board the limited predictability and the differences between the different models (especially in term of SST evolutions) ; the multi-model is very likely a good guidance for the final forecast for JFM.

II.3.fInternational Research Institute (IRI)

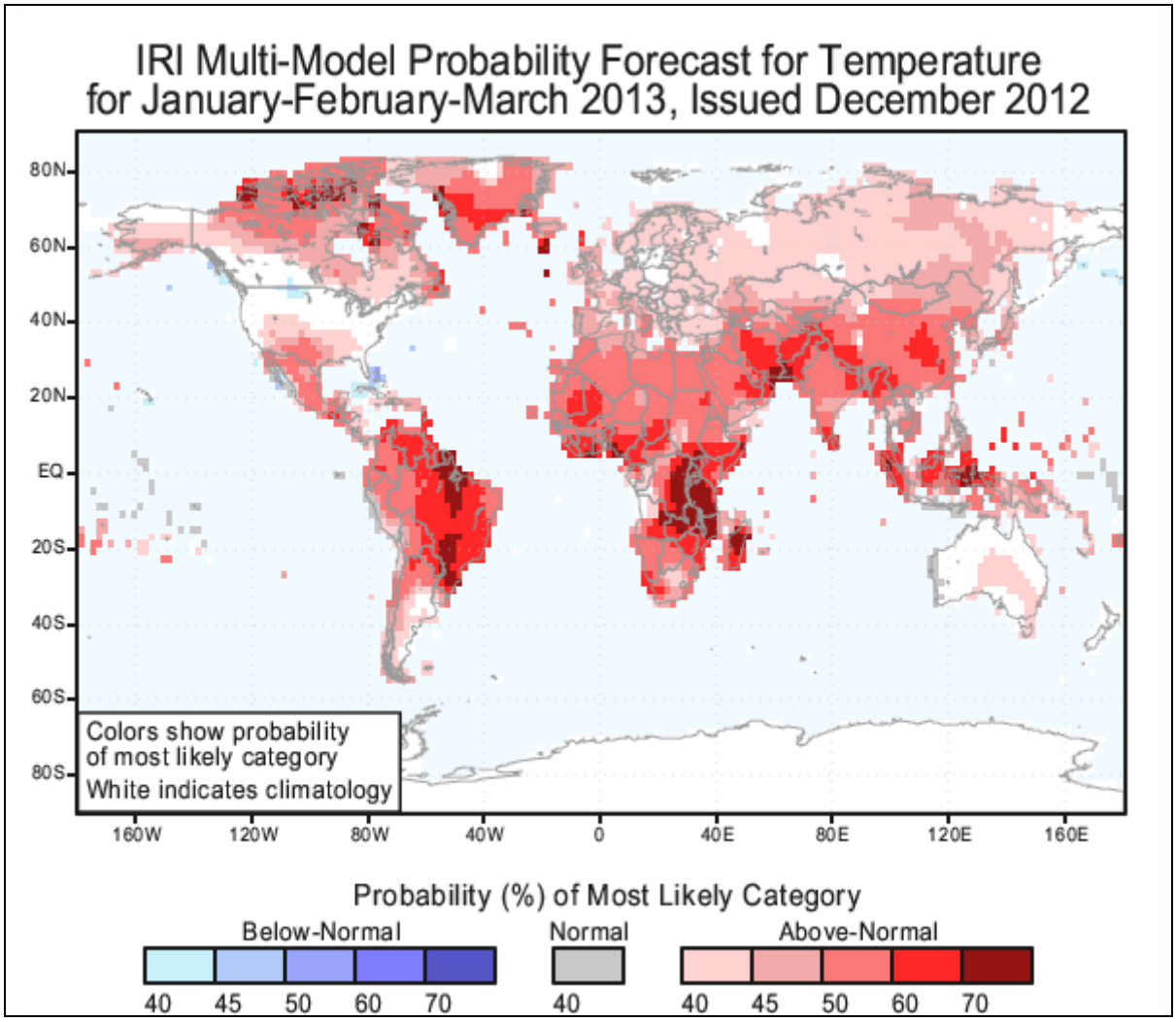


fig.28: Most likely category of T2m for JFM, issued in December from the IRI multi-model ensemble. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://iri.columbia.edu/climate/forecast/net_asmt/

Surprisingly (with respect of consistency maps – see section II.6), most of the signal is warmer than normal ; likely the trace of climate change and possibly related to the climatology period. So quite a lot of differences over Europe, Asia, Africa and American continents.

II.4. IMPACT : PRECIPITATION FORECAST

II.4.a ECMWF

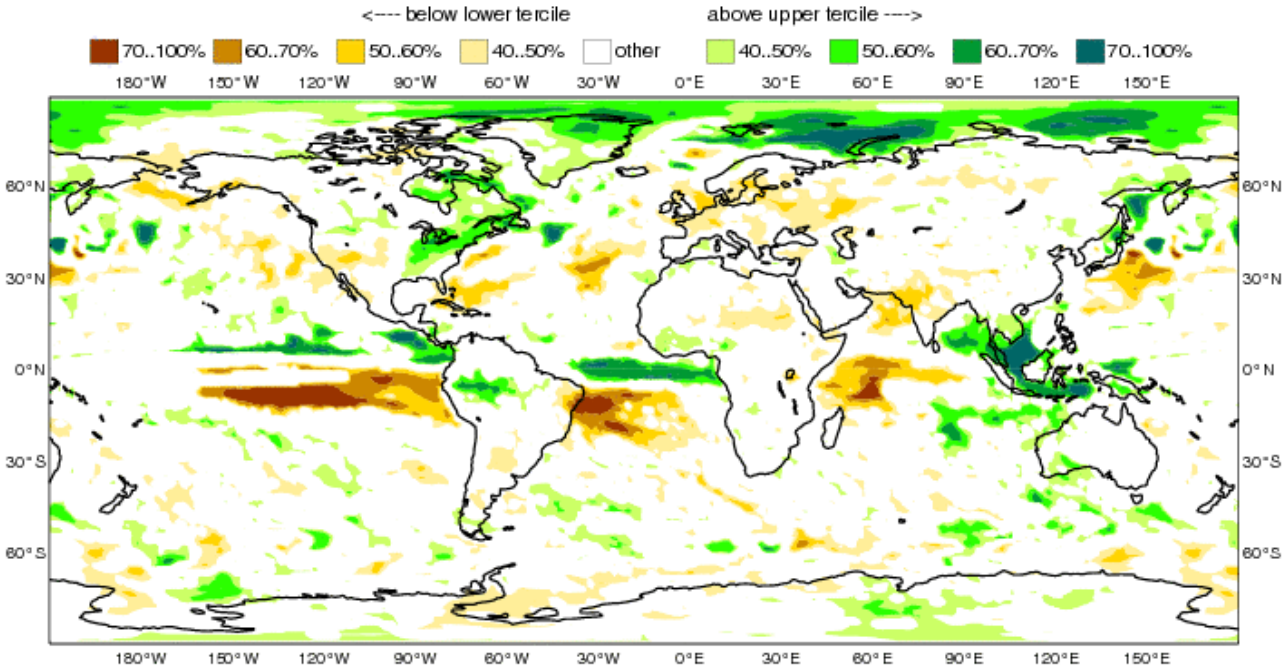


fig.29: Most likely category probability of rainfall from ECMWF for JFM, issued in December. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/charts/seasonal_charts_s2/

II.4.b Météo-France

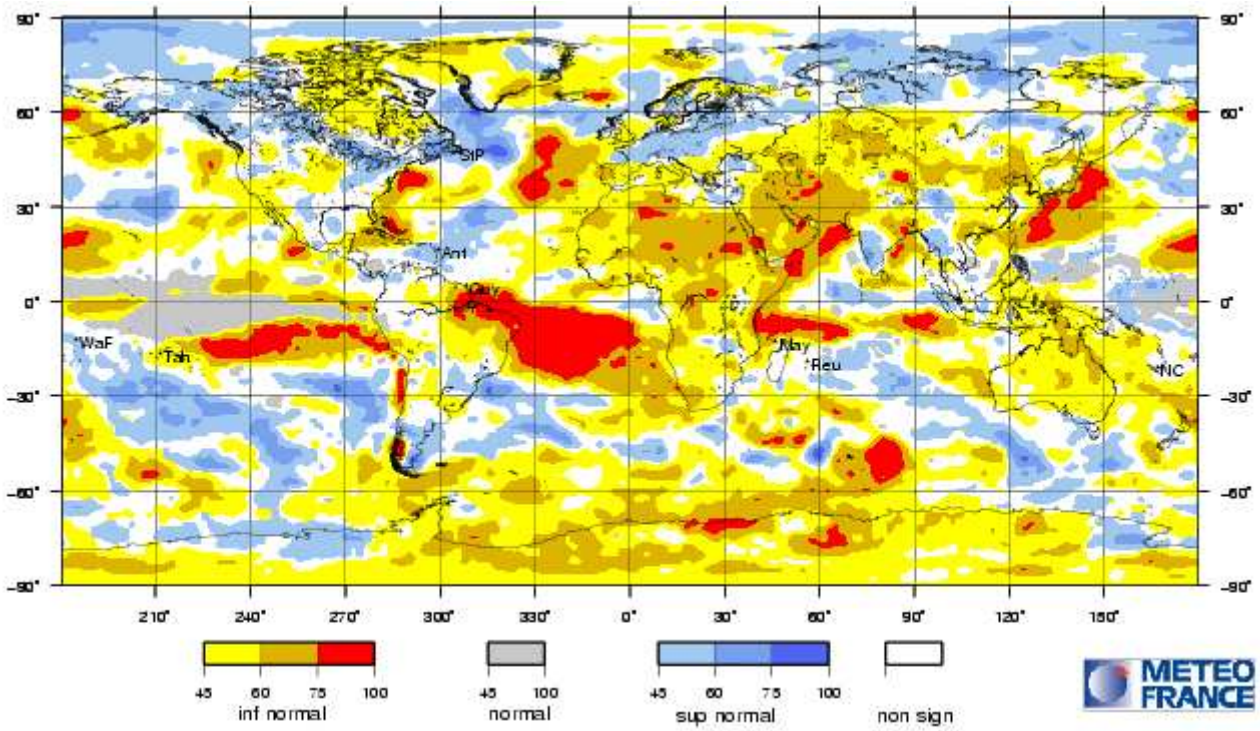


fig.30: Most likely category of Rainfall for JFM, issued in December. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.4.c Met office (UKMO)

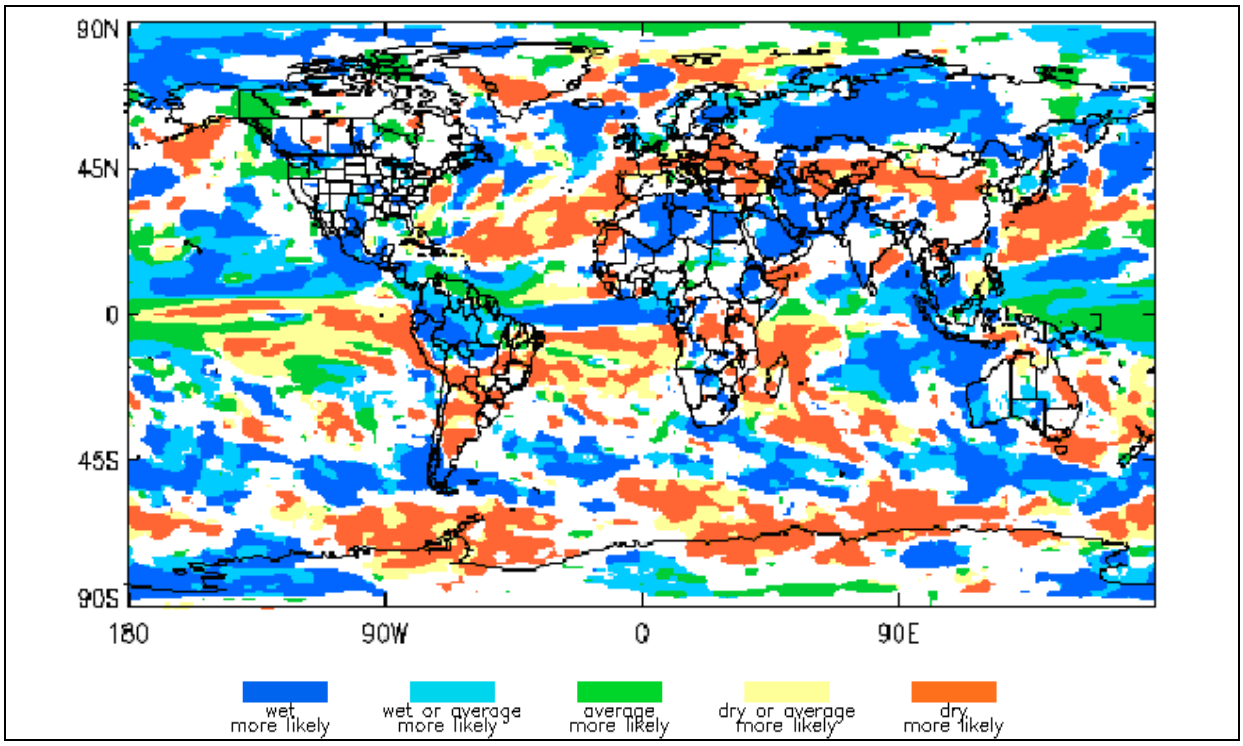


fig.31: Most likely category of Rainfall for DJF, issued in November from UK Met Office. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://www.metoffice.gov.uk/

II.4.d Japan Meteorological Agency (JMA)

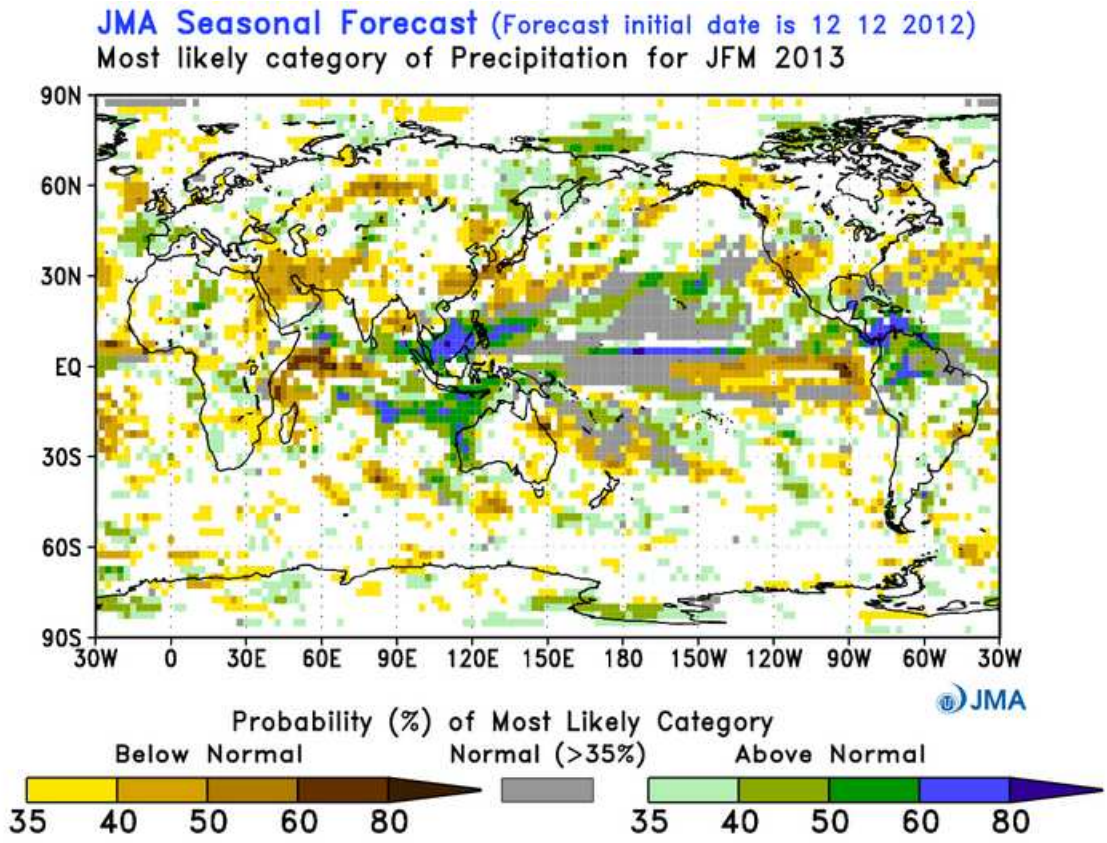


fig.32: Most likely category of Rainfall for JFM, issued in December from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/4mE/fcst/fcst_gl.html

II.4.e Euro-SIP

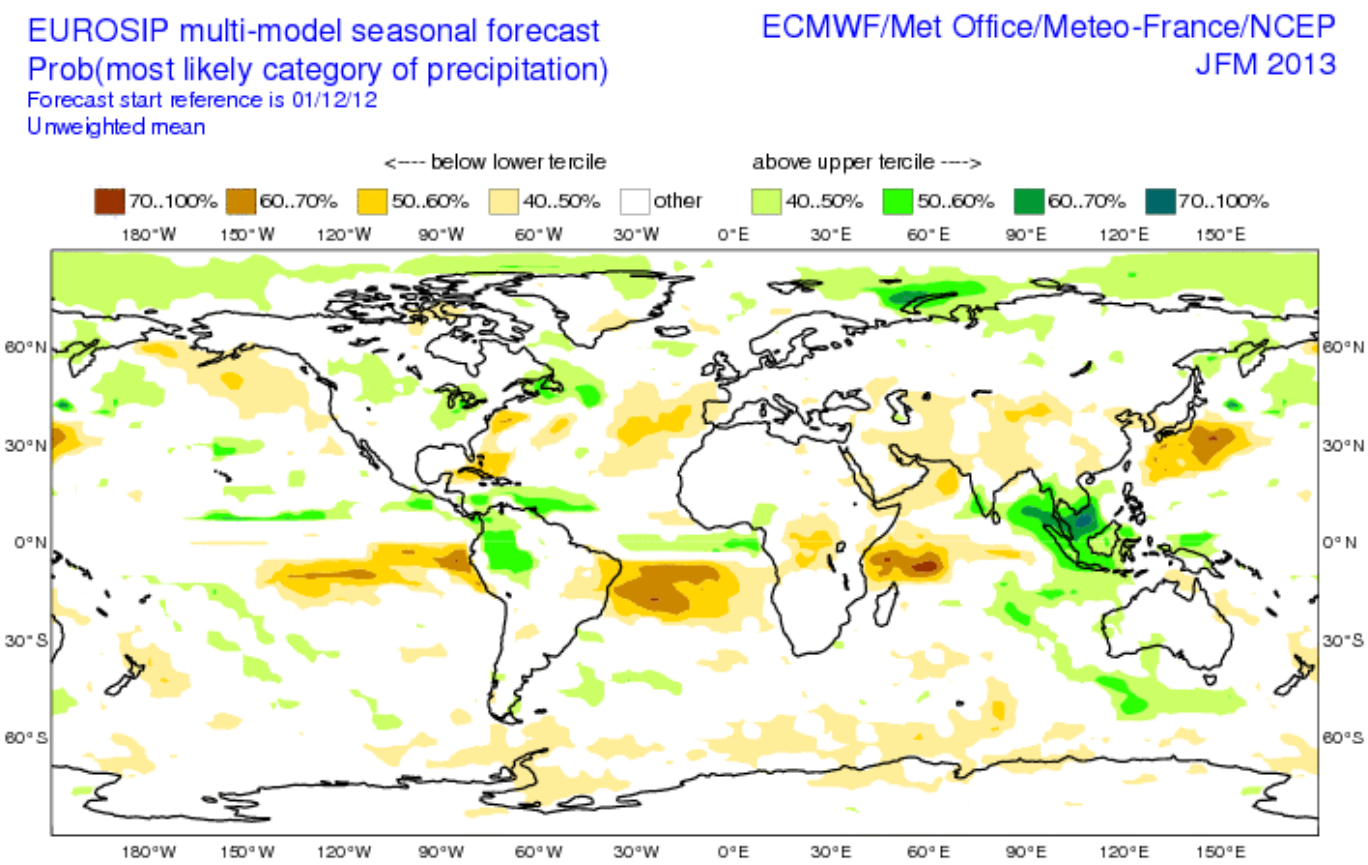


fig.33: Multi-Model Probabilistic forecasts for precipitation from EuroSip for JFM, issued in December. (2 Categories, Below and Above normal – White zones correspond to No signal).

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

Little consistent signal over the continents (likely in relationship with the differences already discussed between the different models) :
Below Normal scenario over Equatorial Africa, Nordeste Brazil and some regions in Western Asia.
Above normal scenario over a part of the maritime continent, North-Western part fo South America and the Southern part of the Caribbean.
For Europe (and more generally for the mid latitude of Northern Hemisphere) Not too much signal excepted close to the Iberic Peninsula (slight enhanced probabilities for the dry scenario) consistently with the Z500 anomalies.
Like for the temperature and taking on board the limited predictability and the differences between the different models (especially in term of SST evolutions) ; the multi-model is very likely a good guidance for the final forecast for JFM

II.4.f International Research Institute (IRI)

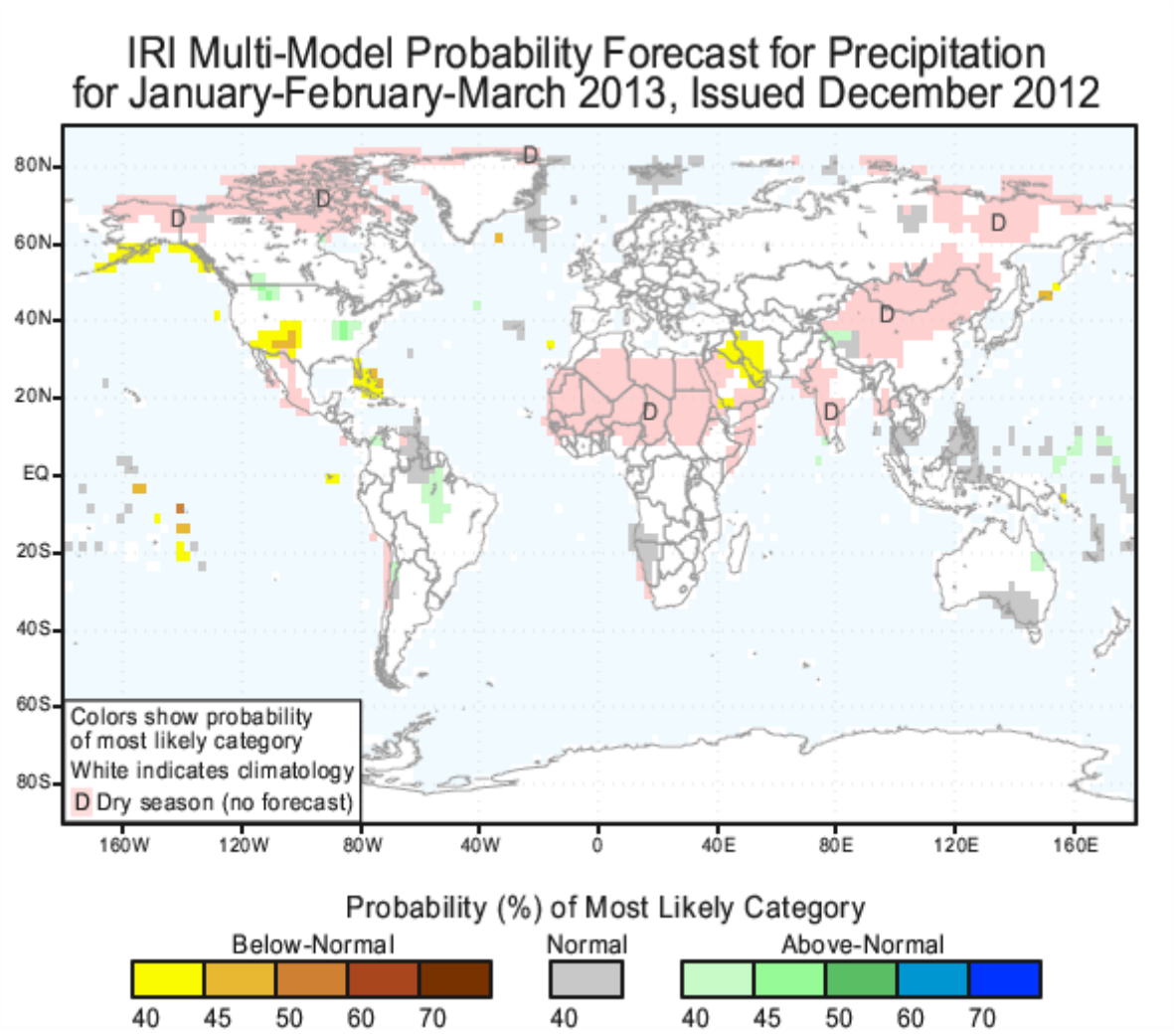


fig.34: Most likely category of Rainfall for JFM, issued in December from the IRI multi-model ensemble. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://iri.columbia.edu/climate/forecast/net_asmt/

The IRI forecast shows No Signal more or less everywhere to the exception of very local areas. Consequently, over Europe, there is a clear indication for No Privileged Scenario (Climatology forecast).

REGIONAL TEMPERATURES

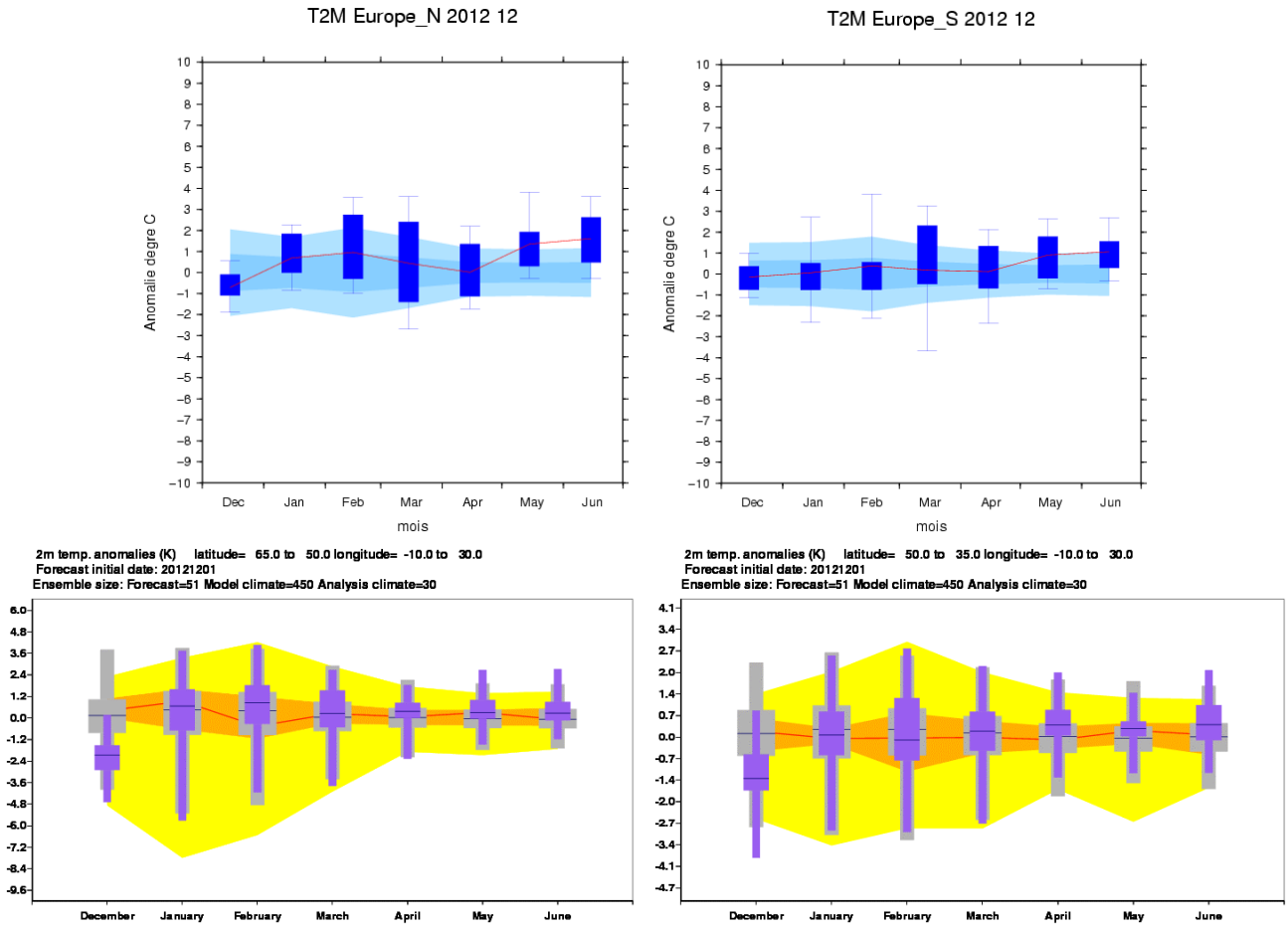


fig.35: Climagrams for T2m in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom) issued in December.

For Northern Europe : some consistency between the 2 models (in relationship with the Z500 anomaly) and large spread (with respect of the climate reference). Above Normal temperature seems to prevail.
For Southern Europe : little consistency between the 2 models in relationship with the differences in the circulation regimes. Above normal scenario in ECMWF and oriented toward no signal (due to the marge spread) in MF. Also a large spread in ECMWF.
In MF, for Northern Europe ROC skill is above climatology for F and M and only close to climatology or worst for the other months (especially for the lower tercile category). For Southern Europe excepted in J, ROC is close or worst than climatology in MF.

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

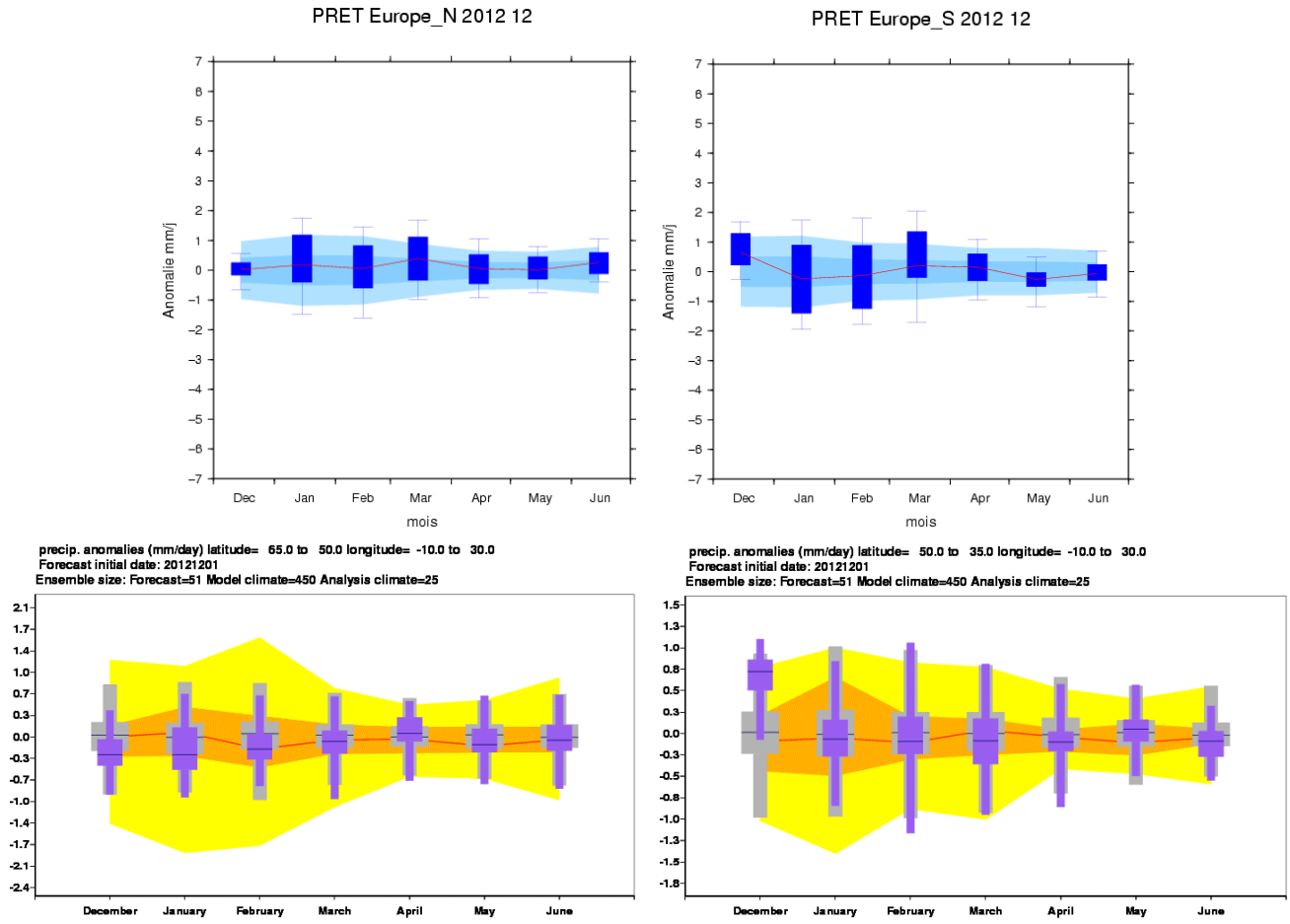


fig.36: Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom), issued in December.

For Northern Europe : Large spread in the evolution of the 2 models and conditions close to Climatology in both models. In MF, there is some skill in ROC scores in J and still a little in F.
For Southern Europe : some similarity in the time evolution of the 2 models. The spread is large. Close to normal conditions on average. In MF, ROC scores are close or worst than climatology excepted for J where some skill is present.
So these intraseasonal evolutions should be considered as indicating No Signal.

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.5. MODEL'S CONSISTENCY

II.5.a GPCs consistency maps

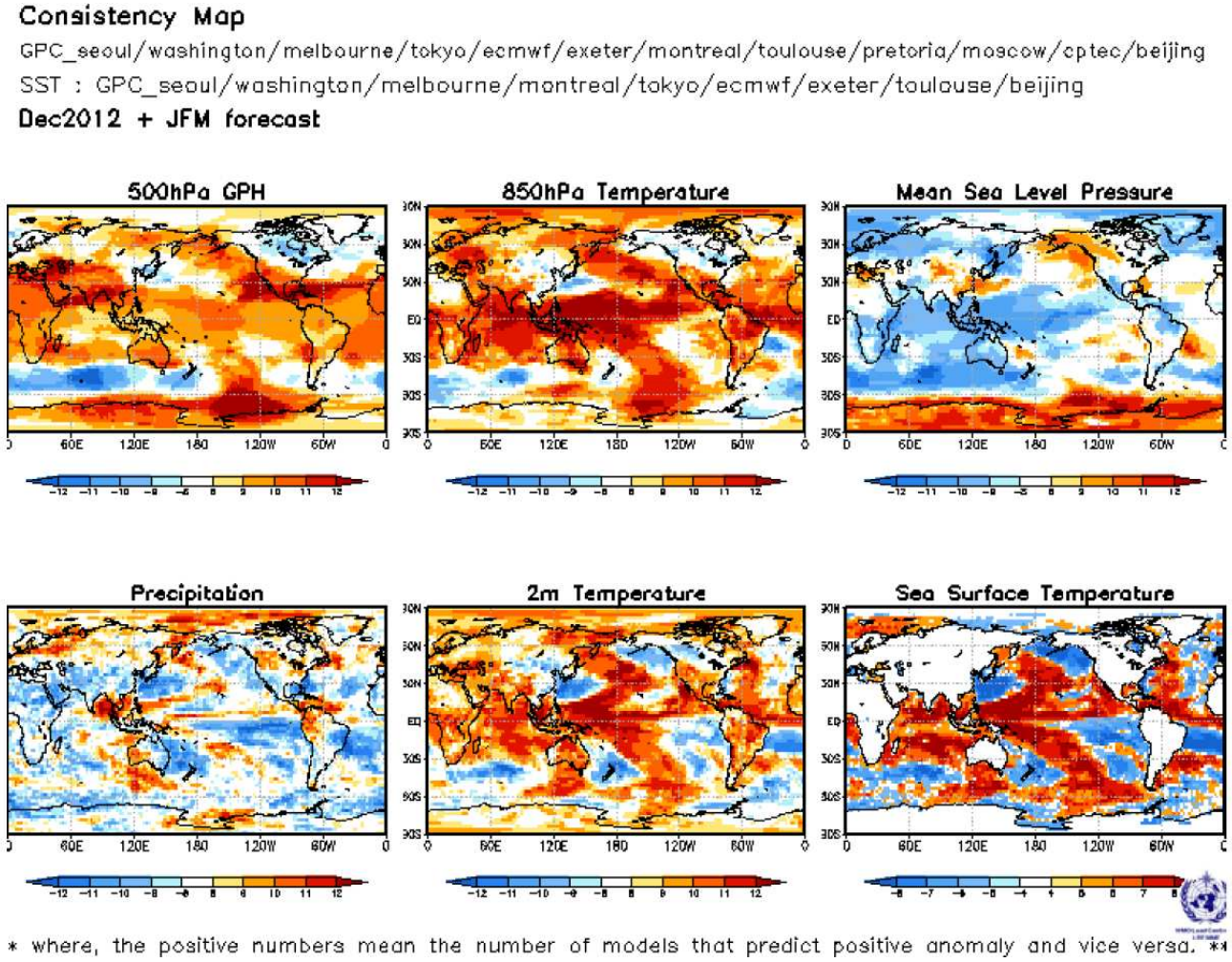


fig.37: ***GPCs Consistency maps from LC-MME*** *http://www.wmolc.org/*

For SST : pretty good consistency for a warmer than normal Indian Ocean, Warm Tropical North-West Atlantic (and equatorial waveguide) and Cool Tropical South Atlantic, Equatorial West Pacific warmer than normal and Eastern part mostly colder than normal.
For Z500 : Little consistency over the North Atlantic mid and high latitude and Europe (excepted for the Mediterranean basin – Above Normal conditions).
For T2m : some consistent signal especially on the South-East and Eastern part of the European continent (Above normal scenario). Consistency over the Equatorial Africa, Australia and South America and US and Central America. So some similarity with Euro-SIP (Central and Northern South America, Australia, East Asia and Eastern Siberia, India and adjacent regions.
For precipitation : some consistency over the continents : above normal over the maritime continent, Southern Caribbean and North-West South America and West Canada ; Below normal for North-Eastern Brazil, Eastern coast of Australia, Northern part of the Caribbean and regions close to the Arabic Peninsula.

II.6. "EXTREME" SCENARIOS

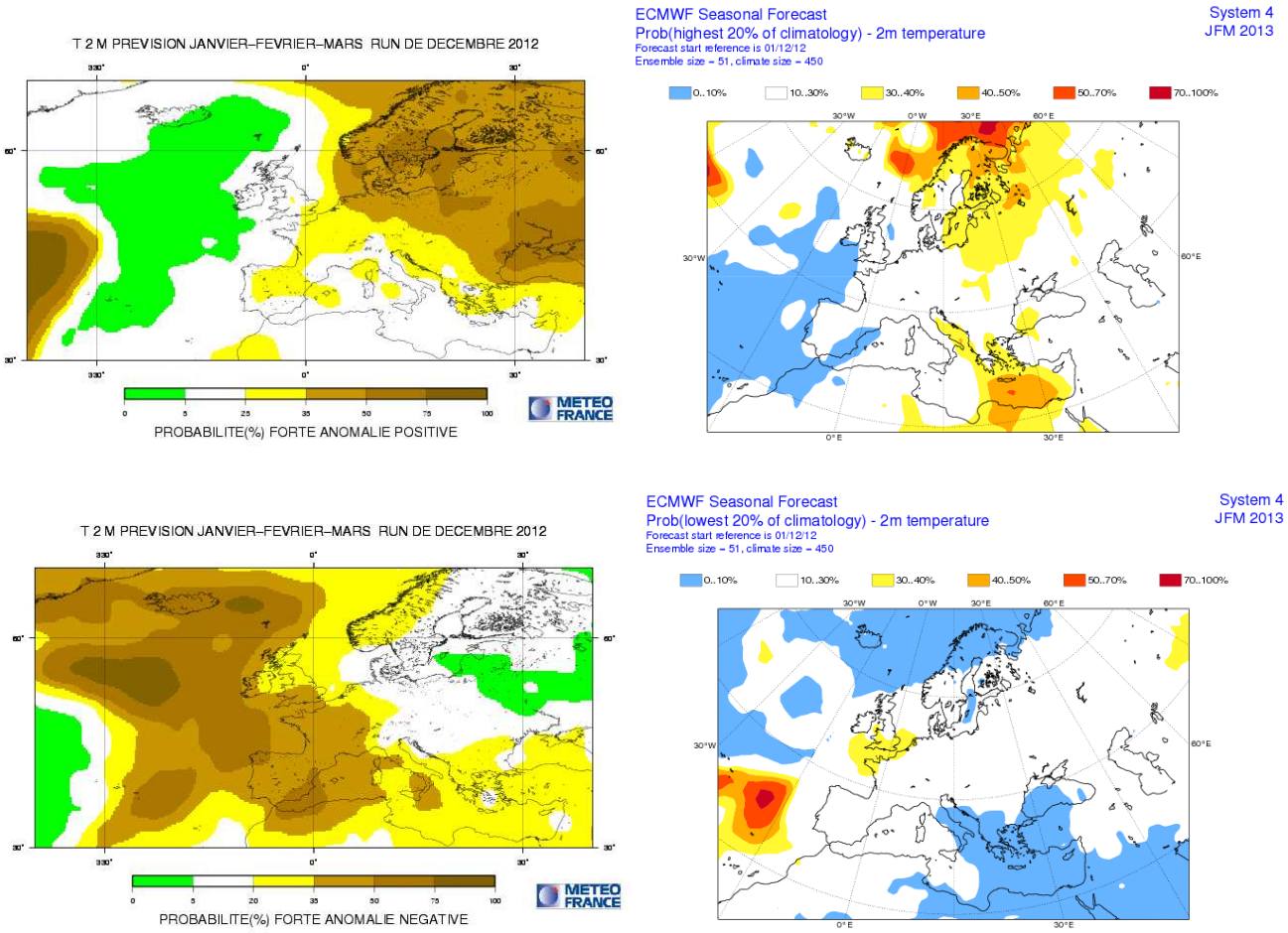


fig.38: Top : Probability of « extreme » above normal conditions for T2m for Meteo-France (left - highest ~15% of the distribution) and ECMWF (right - highest 20% of the distribution).
Bottom : Probability of « extreme » Below normal conditions for rainfall for Meteo-France (left - lowest ~15% of the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

No consistency between the 2 models for the Very Above Normal scenario (to the exception of the most Northern regions of Western Europe) and for very Below Normal scenario neither . This is related to the differences already pointed out in the North Atlantic circulation.
In Météo-France ROC score for the very Above scenario is above climatology over most of the European continent (and especially close to Norway and the Baltic sea).
For the very Below scenario the scores are close or worst than climatology everywhere to the exception of regions close to UK and South-East European regions.
Any way, in relationship with the limited predictability and the different response of the models, it seems difficult to use these forecast.

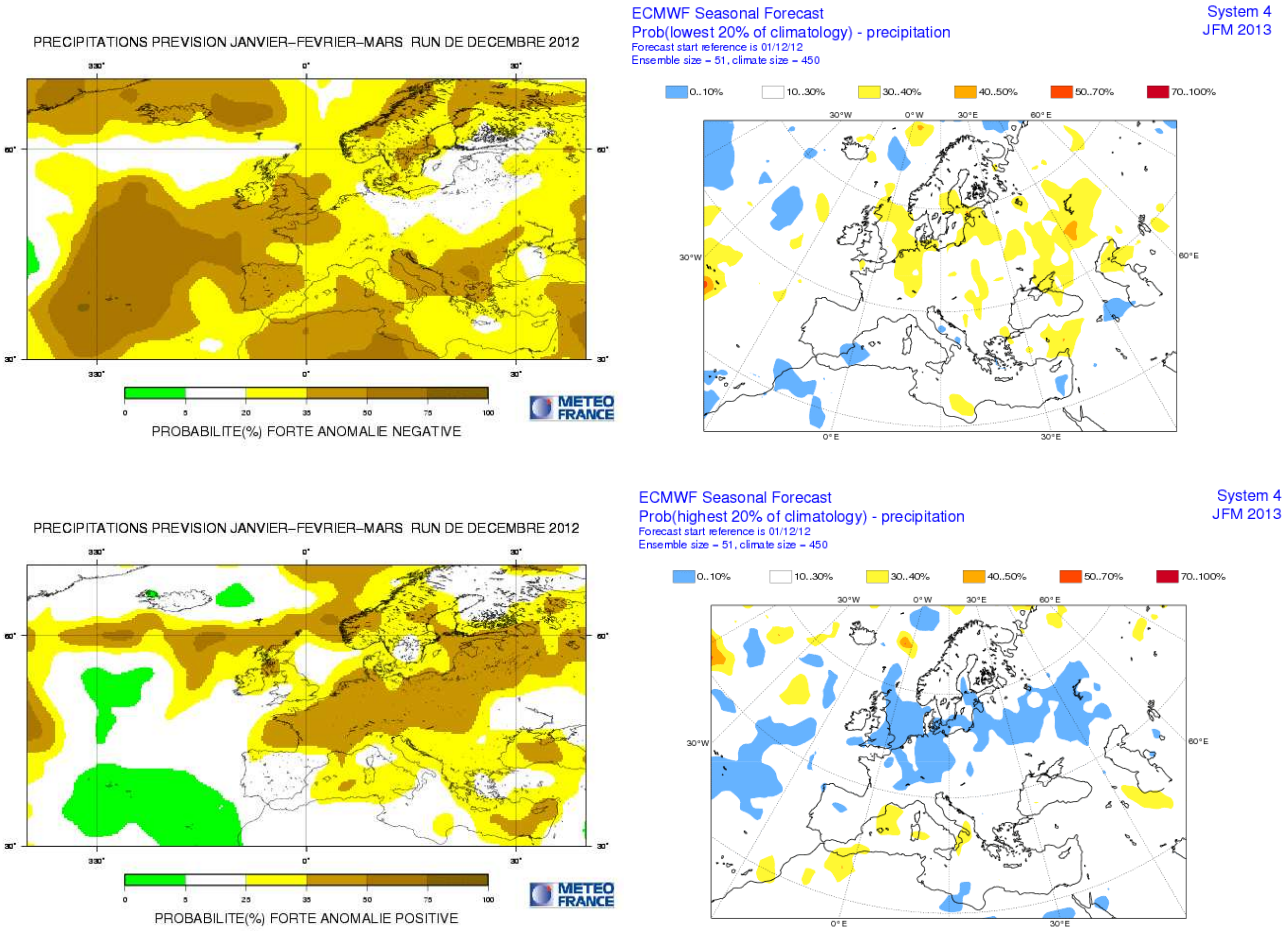


fig.39: Top : Probability of « extreme » Below normal conditions for rainfall for Meteo-France (left - lowest ~15% of the distribution) and ECMWF (right - lowest 20% of the distribution)
Bottom : Probability of « extreme » Above normal conditions for rainfall for Meteo-France (left - highest ~15% of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

The probability of very Below Normal scenario is enhanced (and sometime very high) everywhere in MF while it is close to climatology in ECMWF but with some fragmented enhanced probabilities.
For the very Above scenario, no consistency.
In MF, for the extreme Above normal scenario, some skill exists around the mediterranean regions and also around the Baltic Sea. For the Extreme below Normal scenario, still some skill close to Norway and adjacent regions and in the SEE region.
Any way, in relationship with the limited predictability and the different response of the models, it seems difficult to be confident using these forecast.

II.7. DISCUSSION AND SUMMARY

Forecast over Europe

For this forecast the main comment is about the limited predictability in the climate system. It seems that the mid-latitude dynamic should prevail during winter period. This is illustrated by the large differences in the atmospheric response of MF and ECMWF in Tropical regions and consequently over the western façade of Europe. To be quoted that whatever the preferred model choice, the winter climate over the western façade of Europe should correspond to a high variability. In this context, the Euro-SIP forecast is likely the best possible forecast to issue.
For rainfall : "No Privileged Scenario" covers most of the European continent. There is only a little signal for Western Mediterranean regions (below Normal scenario for the Iberic Peninsula).
For temperature : the Above Normal scenario should prevail for Northern and Eastern Europe. There is more uncertainty over the western façade of Europe (despite some possible Below Normal scenario over the Iberic Peninsula).
However, some downscaled information could details these scenarios for specific countries or sub-regions.

Tropical Cyclone activity

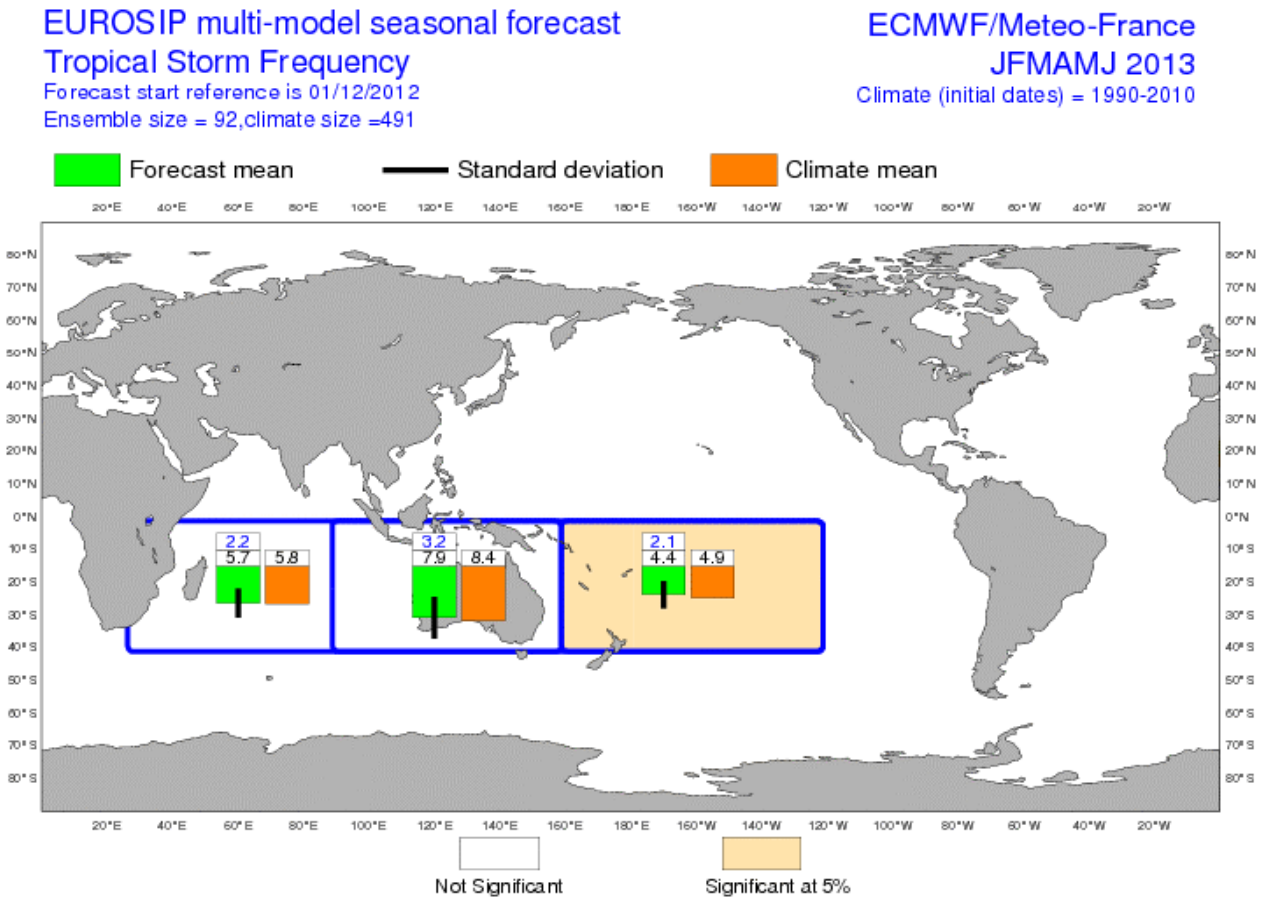


fig.40: Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF) for the JFMAMJ 2013 period, issued in December.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro/eurosip_tropical_storm_frequency/

For the Tropical Cyclone season in the Southern hemisphere, Euro-Sip forecasts indicate a close to normal condition over South West of Indian Ocean and close to Australia (signal not significant with respect of the climatology) and a Below normal activity in the South-West Pacific.

WMO RA VI
Pilot RCC-Network

Synthesis of Temperature forecasts for January-February-March 2013 for European regions

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

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

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

WMO RA VI
Pilot RCC-Network

Synthesis of Rainfall forecasts for January-February-March 2013 for European regions

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

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

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

III. ANNEX

III.1. SEASONAL FORECASTS

Presently several centres provide seasonal forecasts, especially those designated as Global Producing Centres by WMO (see http://www.wmo.int/pages/prog/wcp/wcasp/clips/producers_forecasts.html).
■ BoM, CMA, 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).

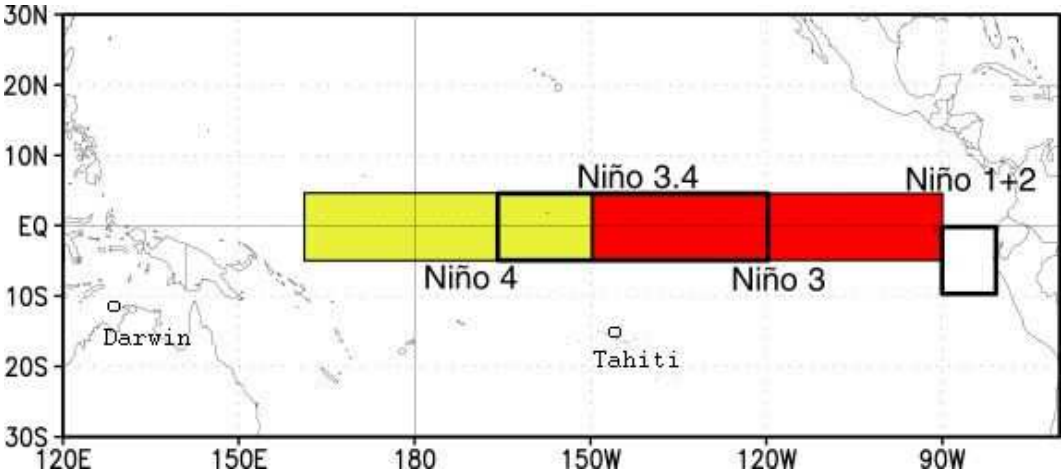
In order to better interpretate the results, it is recommended to look to verification maps and graphs which give some insight into the expected level of skill for a specific parameter, region and period. A set of scores is presented on the web-site of the Lead-Centre for Verification (see http://www.bom.gov.au/wmo/lrfvs/)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