GLOBAL CLIMATE BULLETIN
n°176 - FEBRUARY 2014

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I. DESCRIPTION OF THE CLIMATE SYSTEM (DECEMBER 2013)

I.1. OCEANIC ANALYSIS

I.1.a Global Analysis

At the Surface (fig. 1) :
Still little evolutions in the equatorial regions excepted may be to the cooling in the Indian Ocean (mostly Western part). In the tropics, warming in the vicinity of the South-East Atlantic and cooling close to Australia. In the mid latitudes of the Northern hemisphere mostly warming over the Pacific and across the Southern Atlantic.

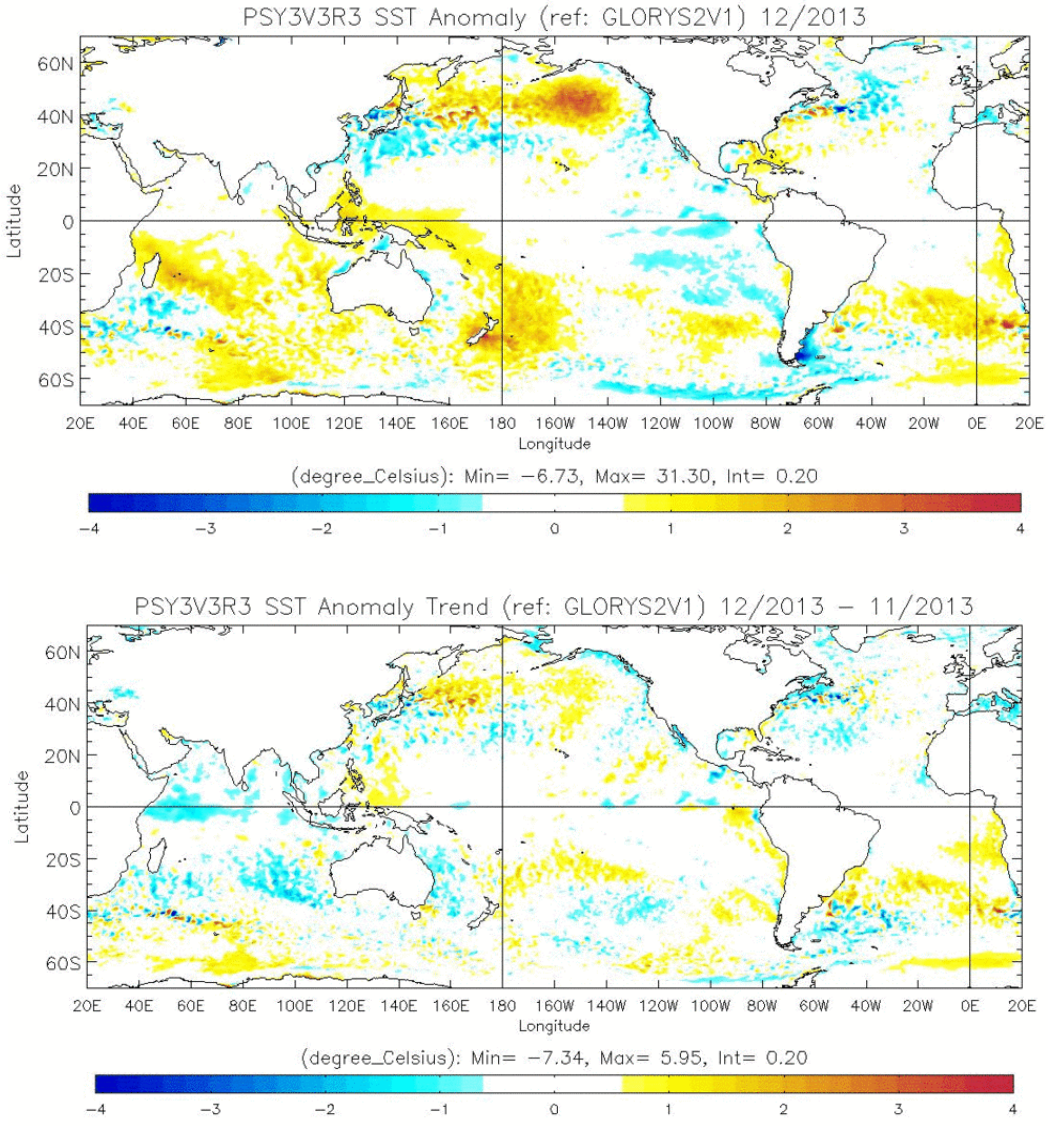


fig.1: top : SSTs Anomalies (°C) (reference Glorys 1993-2009); bottom : SST tendency (current – previous month) http://bcg.mercator-ocean.fr/

In subsurface (fig.2) :

In the Pacific : in the equatorial band (10°N-10°S), heat content anomalies strong and positive West to the dateline (including the vicinity of the Maritime continent). Off equator, Strong positive anomalies in the Northern hemisphere between 10°N and 20°N not visible at the surface and Negative anomaly in the Eastern part of the basin (both Hemispheres). In the mid-latitude the signal is consistent with the surface signal.
In the Atlantic : in the equatorial waveguide little anomalies to the exception of positive anomalies in the Guinean Gulf. Negative anomaly just South to the equator. Some negative anomaly over the Northern Mid-Latitude Atlantic.
in the Southern tropics negative anomalies on the Eastern side.
In the Indian Ocean : In the equatorial waveguide signal mostly positive in the central and Eastern part and close to 0 but cooling in the Western part. The IOD is neutral but clearly negatively oriented.

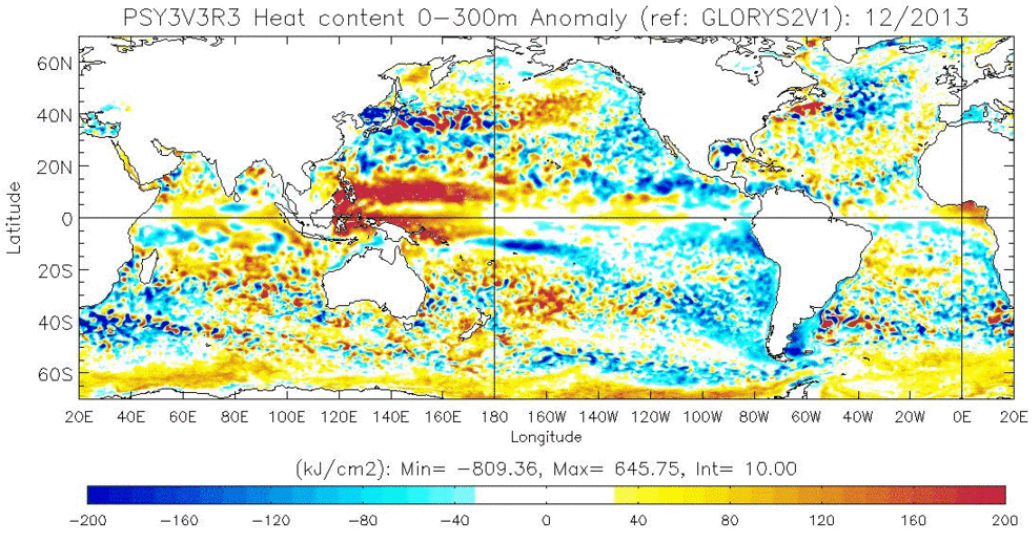


fig.2: map of Heat Content Anomalies (first 300m) (in kJ/cm^2). (reference Glorys 1992-2009)
http://bcg.mercator-ocean.fr/

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

The dipole between the Western and most Eastern part of the basin is visible. SOI close to 0 (+0.1). However, a negative trade wind anomalies is present over the half western part of the basin.
In the Niño boxes (4, 3.4, 3 et 1+2 ; see definition in Annex) the monthly averages are respectively 0°2C, -0°C, -0°C to -0.2°C from West to East.

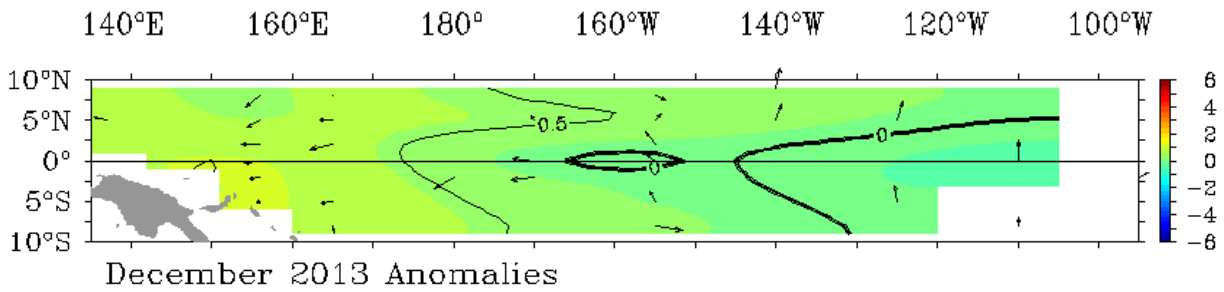


fig.3: SST and Wind anomalies over the Equatorial Pacific from TAO/TRITON.
http://www.pmel.noaa.gov/tao/jsdisplay/monthly-summary/monthly-summary.html

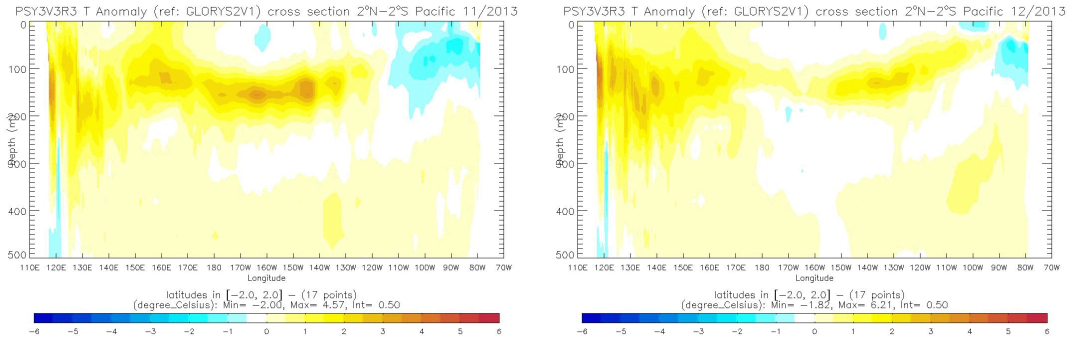


fig.4: Oceanic temperature anomaly in the first *500 metres* in the Equatorial Pacific, in previous month (left) and current month (right) http://bcg.mercator-ocean.fr/

In the equatorial waveguide (fig. 4) : Clear traces of propagation of Kelvin waves under the surface (warmer than normal) from the Western side and across the basin in the lower layers (around 150m). Interestingly the warm reservoir on the most western parties increases consistently with the trade wind anomaly. The negative anomaly on the most Eastern side is vanishing in relationship with the Kelvin wave propagation (warm signal).

The thermocline structure (fig. 5) : Clear traces of wave propagation of positive anomalies across the Pacific starting end of October in the Western part and landing end of December in the Eastern part.

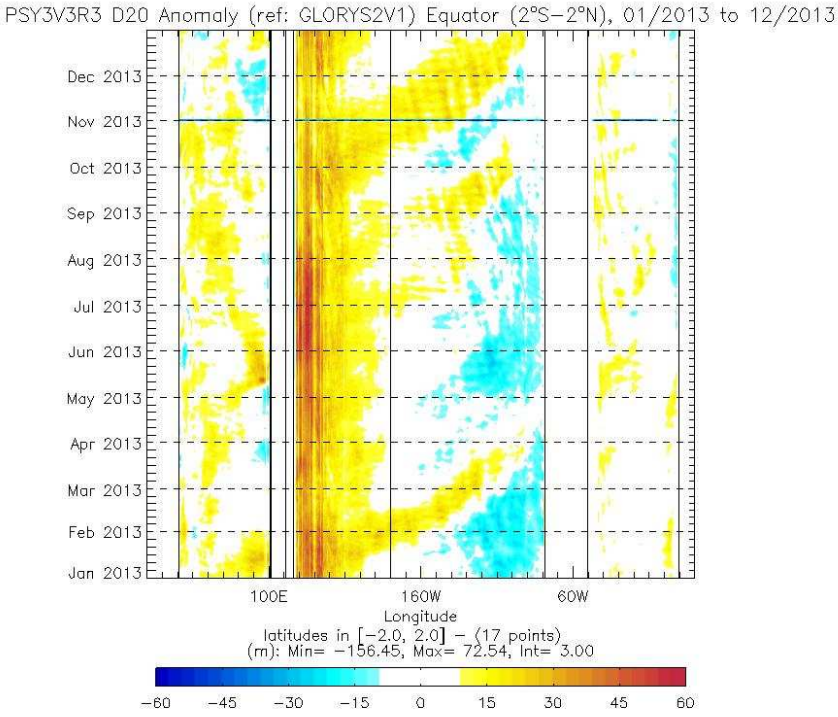


fig.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 24 month period. http://bcg.mercator-ocean.fr/

I.1.c Atlantic Basin

Northern Tropical Atlantic : slightly warmer than normal conditions and little evolutions.
Equatorial waveguide : weak signal.
The Southern Tropical Atlantic : weak negative anomalies to the exception of the most Eastern part (positive anomaly along the coast of Africa).
The TASI index is positive but seems to decrease.

I.1.d Indian Basin

Southern Tropical Indian Ocean : mostly warmer than normal but cooling close to Australia. and the maritime
continent. A positive anomaly conspicuous covering most of the South Tropics/Sub-Tropics.
Equatorial waveguide : weak signal but cooling in the Western part. The DMI is neutral but negatively oriented.
Northern Tropical Indian Ocean : Slightly warmer than normal more or less everywhere.

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) : Some MJO activity (close to the Maritime Continent during half of the month) and quite a lot of fragmented cells in the Sub-Tropics and Tropics (could indicate a poor Ocean/Atmosphere coupling at global scale).

On the Pacific : Signal mostly off equator. Divergent circulation anomalies (upward anomaly motion) in the vicinity of the maritime continent extending along the SCPZ. Then quite a lot of successive positive and negative cells across the Pacific up to the Eastern part.
On the Atlantic : Convergent circulation anomalies (downward anomaly motion) over the Northern Tropical Atlantic (especially the Caribbean and in the Central part). In the Southern hemisphere, weaker signal but with a positive anomaly over South Africa.
On the Indian Ocean : Divergent circulation anomalies (upward anomaly motion) over most of the basin, especially.

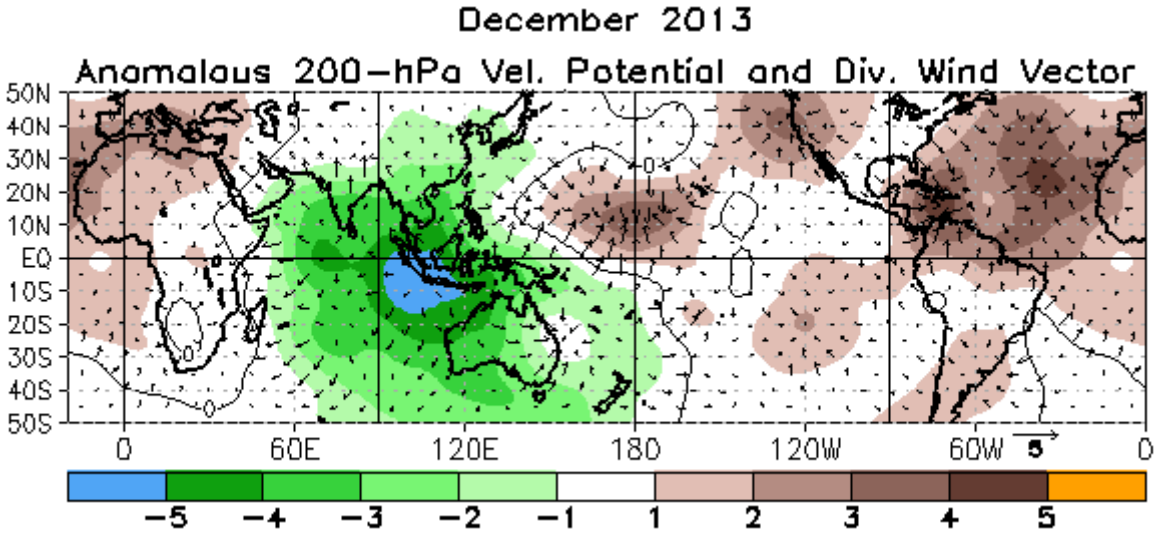


fig.6: Velocity Potential Anomalies at 200 hPa and associated divergent circulation. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly). http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

Stream Function anomalies in the high troposphere (fig. 7 – insight into teleconnection patterns tropically forced) : Weak signal in the Tropics from Africa up to the Maritime continent. Some signal East to the dateline and over the North Atlantic but which are difficult to clearly link to SST forcing. Nevertheless, the main anomalies are likely related to mid-latitude signal partly influenced by the Tropics.

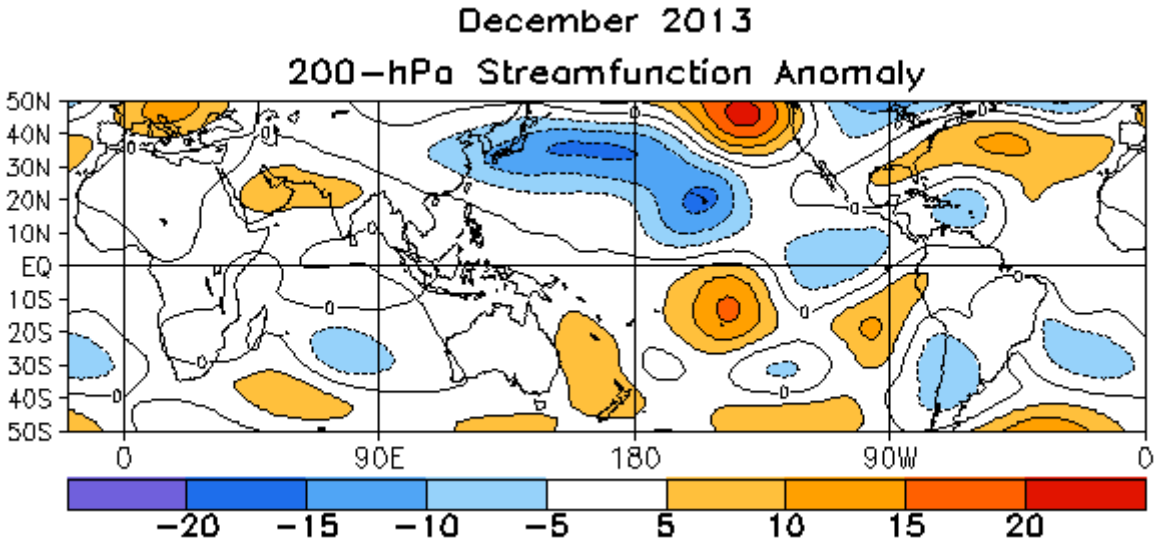


fig.7: Stream Function Anomalies at 200 hPa.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

Geopotential height at 500 hPa (fig. 8 – insight into mid-latitude general circulation) : Consistently with the previous analysis, some large anomalies observed in the mid/high latitudes of the North Pacific, across the Atlantic up to Europe. A weak but existing negative anomaly across the Pacific which is consistent with the Stream Function analysis.
Some activity in the atmospheric modes ; main active modes are found over the Pacific : West Pacific (-2.) and PNA (-1.2) and global TNH (+1.8) ; over Europe a positive NAO (0.8) and East Atlantic (+1.2), negative Scandinavian mode (-0.7). To be quoted the Polar Eurasian mode reversed (-0.8).

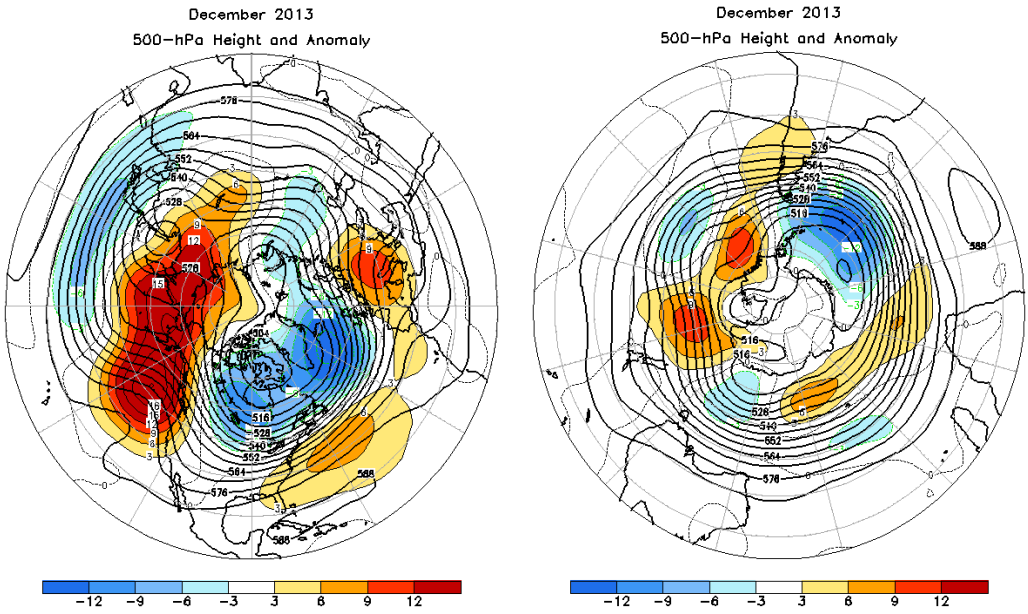


fig.8: Anomalies of Geopotential height at 500hPa (left North Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige9.shtml, and right South Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige15.shtml)

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
DEC 13	**0.8**	**1.2**	**-2.0**	**--**	**-1.2**	**1.8**	**-0.4**	**-0.7**	**-0.8**
NOV 13	0.8	0.1	0.0	1.2	-1.1	---	-0.9	-0.7	2.6
OCT 13	-0.9	1.4	-0.1	1.0	-0.2	---	0.6	0.7	0.8
SEP 13	0.4	-0.6	1.9	-1.4	0.4	---	-0.6	0.4	-1.6
AUG 13	1.1	0.3	-0.2	-1.1	-0.1	---	-1.9	-0.8	0.0
JUL 13	0.7	0.6	-0.9	0.9	-0.7	---	-0.2	0.0	-0.3

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

I.2.b Precipitation

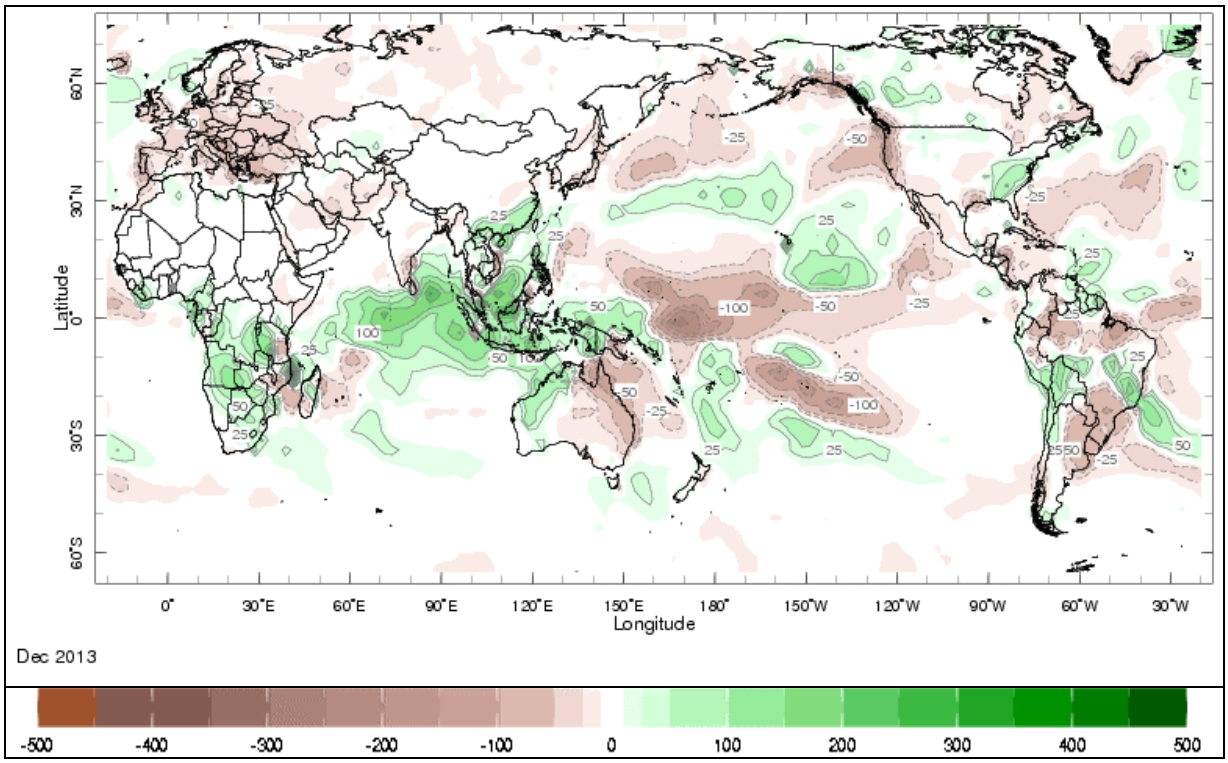


fig.9: Rainfall Anomalies (in mm) (departure to the 1979-2000 normal) – Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/

Pacific : good consistency with the Velocity Potential anomalies. In the vicinity of Australia (positive anomaly), and then the succession of negative/positive anomalies across the Pacific.
Atlantic/Africa : negative anomaly over part of the Brazil and the Caribbean. Some wetter than normal conditions over the Africa South to the Equator and close to the Guinean Gulf. To be qioted the dipole Wetter/Drier than normal over the South/North Caribbean.
Indian Ocean : A strong positive anomaly in the equatorial regions (mostly consistent with the SSTs) and especially close to the Maritime continent (see MJO activity).
Australia : a contrast between the North-Western coast (wetter than normal) and the Eastern part (drier than normal conditions).
North America : Drier than normal conditions along the Eastern and wetter than normal condition over the Eastern USA.
South America : Tripole like pattern (Drier/Wetter/Drier than normal) from North Argentina up to North Brazil.
Europe : mostly drier than normal more or less everywhere.

I.2.cTemperature

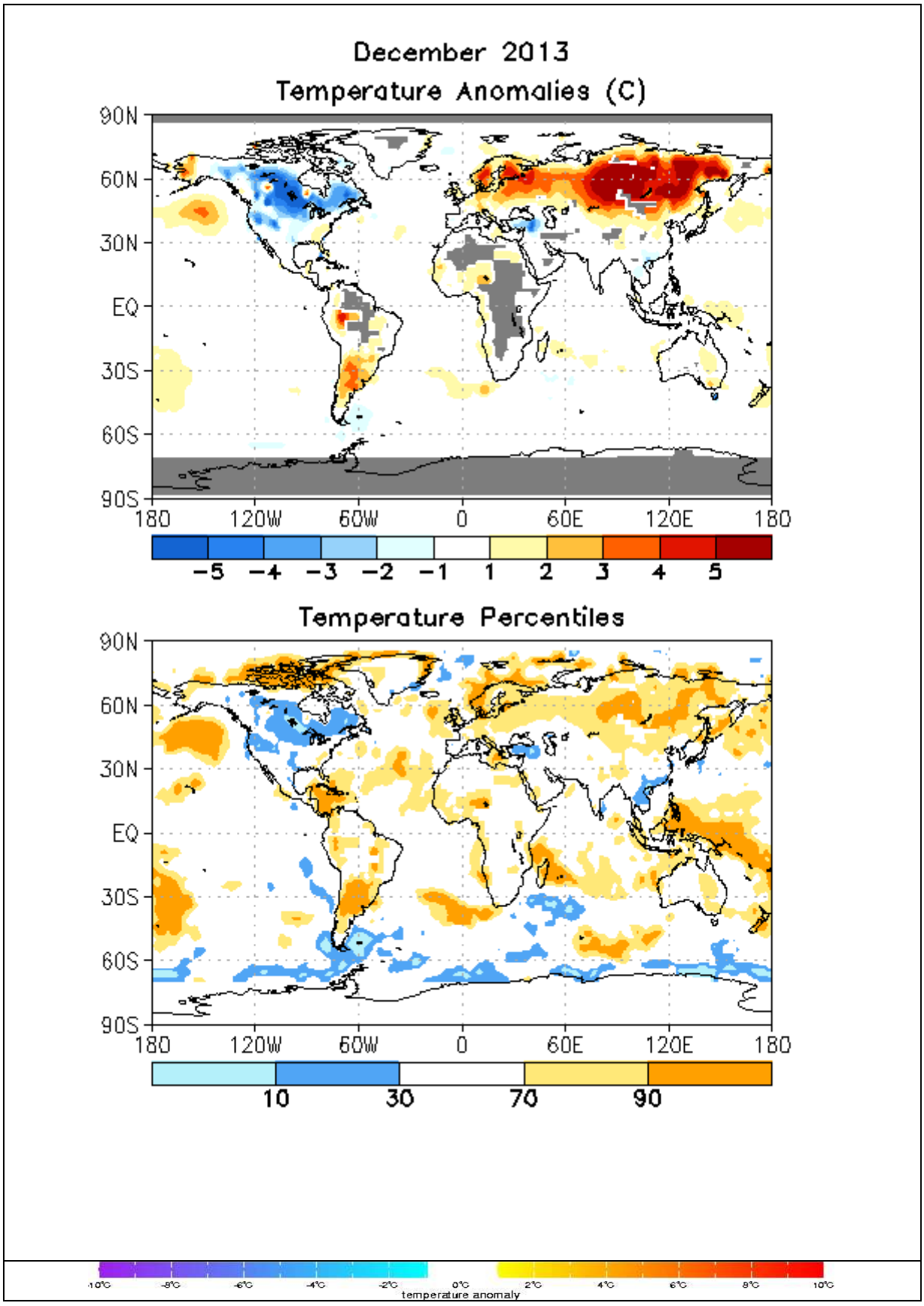


fig.10: Temperature Anomalies (in °C) (departure to the 1979-2000 normal)

http://iridl.ldeo.columbia.edu/maproom/.Global/.Atm_Temp/Anomaly.html

North-America : Colder than normal conditions over Canada and positive anomalies over Alaska.
South-America : warmer than normal conditions South Brazil and Argentina. Also over the Caribbean.
Australia : weak positive anomalies on the Eastern part.
Asia : Very strong positive anomalies over the Northern part of the continent which extends up to North West Europe.
Africa : Weak positive anomalies along the western coast.
Europe : Warmer than normal conditions over a large portion of the continent to the exception of regions in the vicinity of Turkey (colder than normal conditions).

I.2.d Sea Ice

In Arctic (fig. 11 - left) : well below normal sea-ice extension (negative anomaly close to 2 standard deviation).
In Antarctic (fig. 11 - right) : well above normal sea-ice extension anomaly (on record) with some large regional modulation.

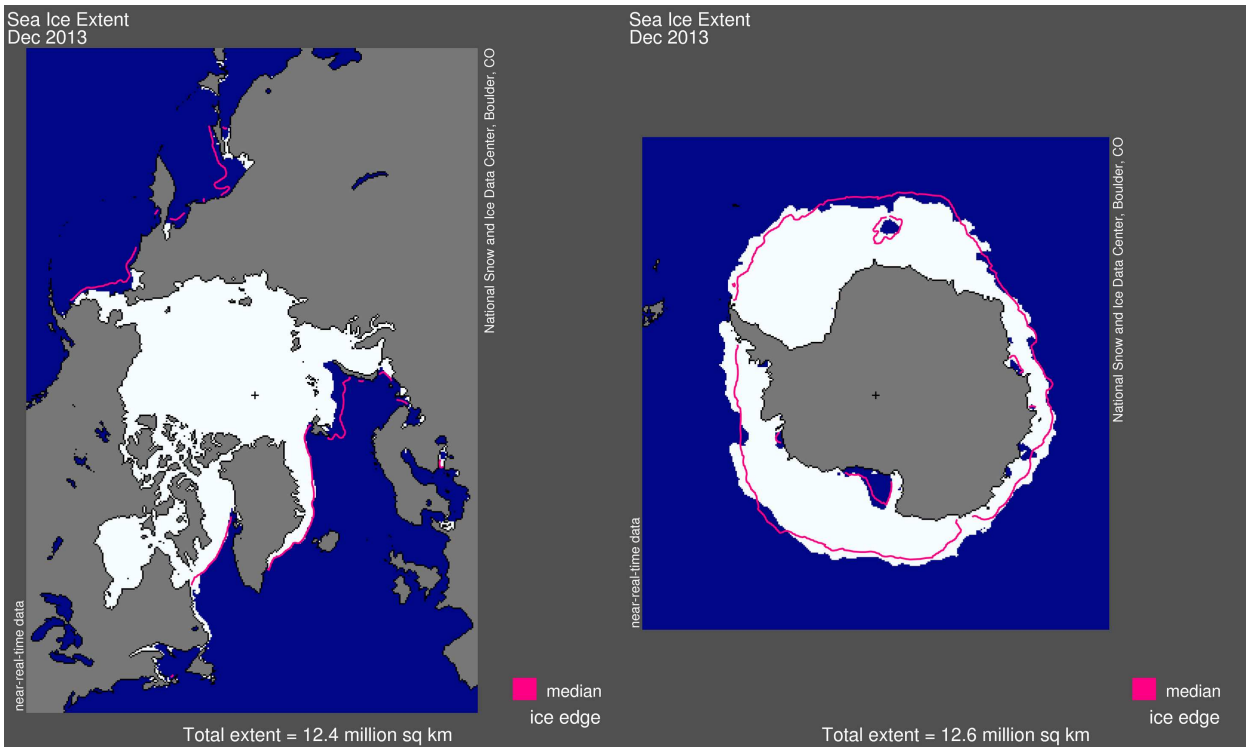


fig.11: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

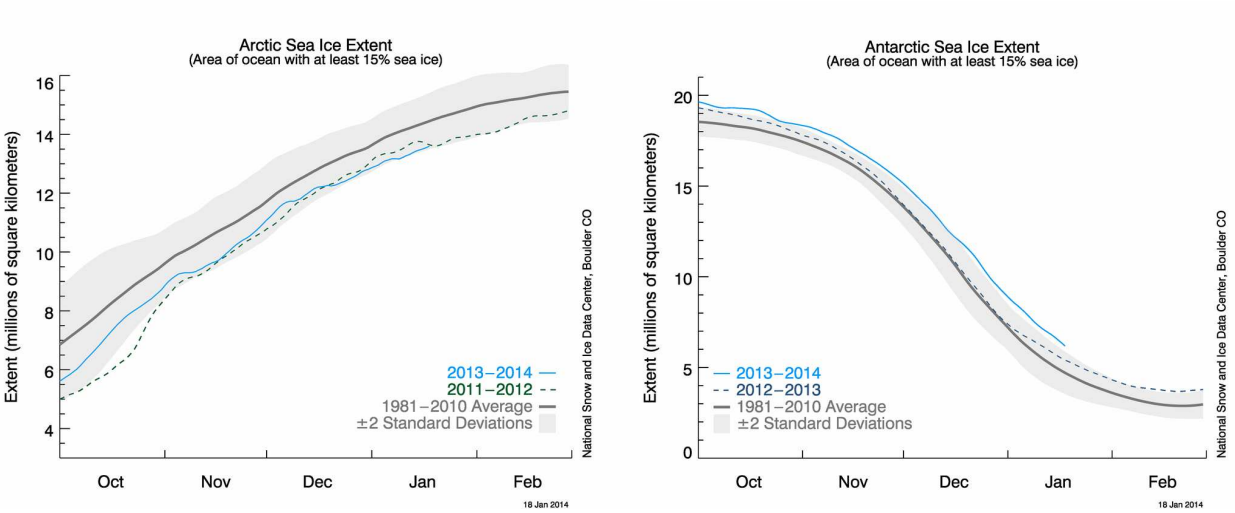


fig. 9bis : Sea-Ice extension evolution from NSIDC
http://nsidc.org/data/seaice_index/images/daily_images/N_stddev_timeseries.png

II. SEASONAL FORECASTS FOR FMA FROM DYNAMICAL MODELS

II.1. OCEANIC FORECASTS

II.1.a Sea Surface Temperature (SST)

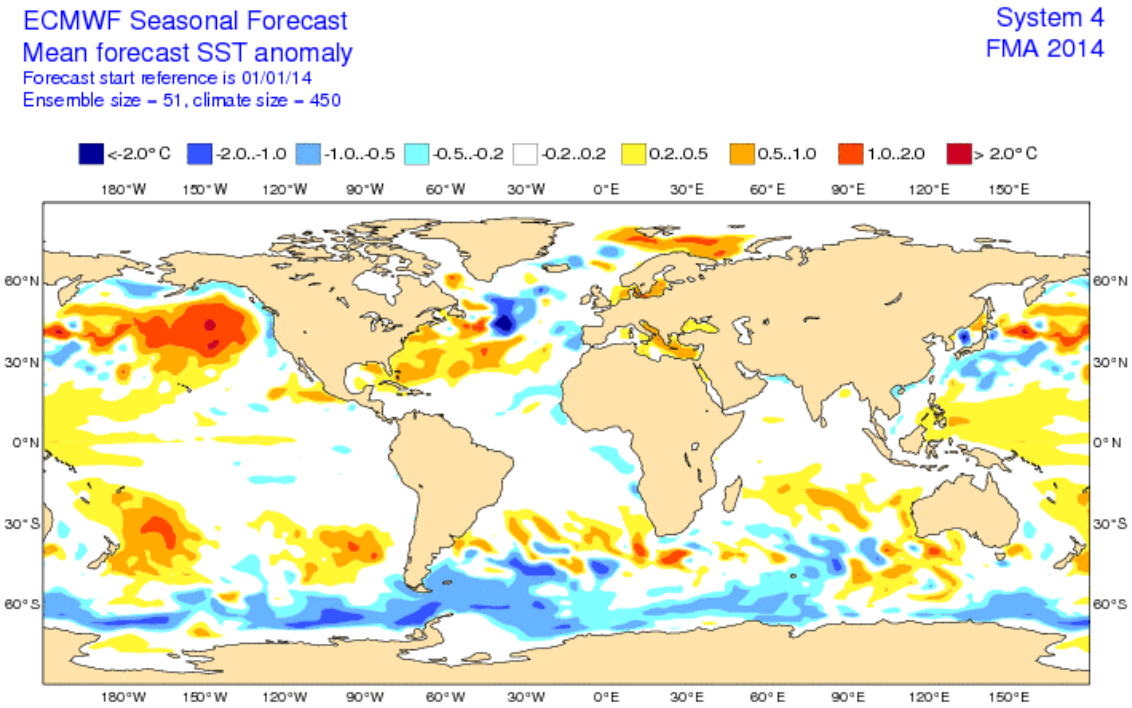


fig.12: SST anomaly forecast (in °C) from ECMWF.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

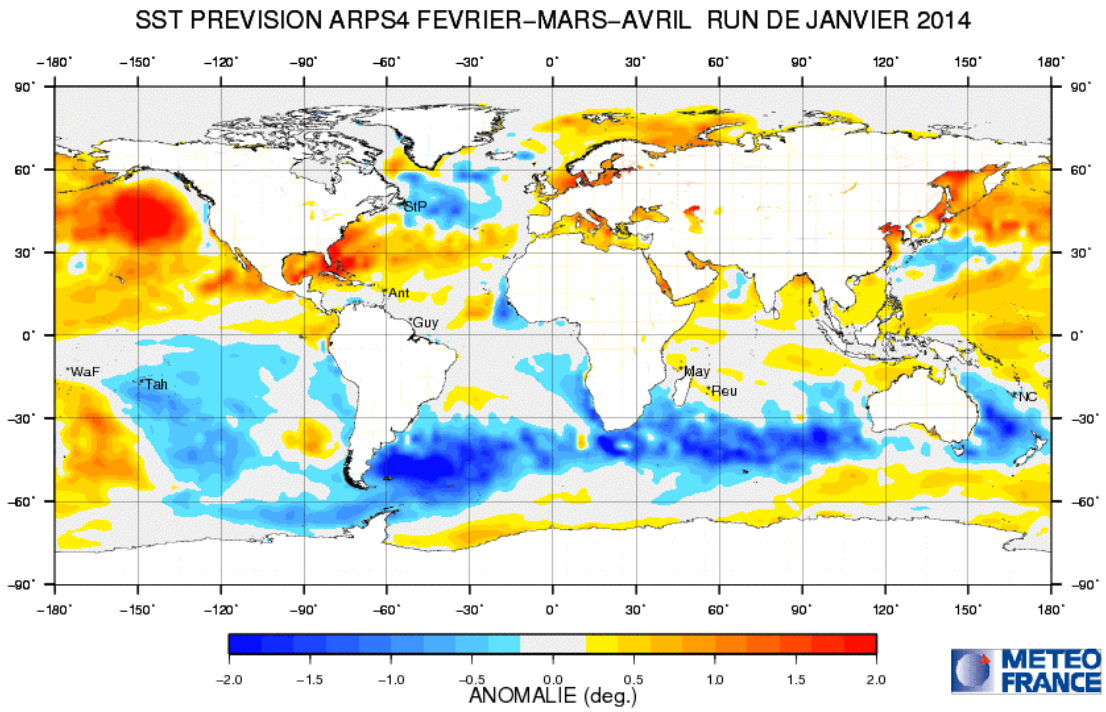


fig.13: SST Anomaly forecast (in°C - recalibrated with respect of observation) from Météo-France.
http://elaboration.seasonal.meteo.fr/

For the 2 individual models :
Whatever the differences in the post-processing of the anomalies (including reference period for the hindcast ; 81-2010 for ECMWF and 91-2010 for MF system 4), mostly consistent SST forecasts, especially over the Northern Hemipshere (taking into account the hindcast period differences).
Pacific : consistent signal in both models for a warmer than normal conditions West to the dateline (warm pool region) and along the SPCZ. However, MF warming is shifted eastward with respect of ECMWF's ones. Off equator on the East-Southern Tropics, development of a negative anomaly (between 0° and 30°S in MF and less visible in ECMWF). Very good consistency over the Northern hemisphere (to the exception of the coastal area of North America) with mostly warmer than normal conditions.
Atlantic : in both model very good consistency in the Northern Tropics and mid-latitudes. Close to normal in the Southern Tropics and consistent negative anomalies developments along the Western coast (differences partly related to the hindcast issue).
Indian Ocean : consistent forecast in both models for close to normal conditions in the Tropical band. Large differences in the Southern mid-latitudes.

In Euro-SIP :
Some robust patterns appear in the tropics across the Pacific and the mid-latitudes of the Northern Hemisphere.
Pacific : generally speaking very consistent with MF and ECMWF across the basin (positive anomaly West to the dateline and along the SPCZ). Quite consistent patterns in the subtropics and the mid-latitudes of both hemispheres.
Atlantic : Weak signal over the Tropics. Slight warmer than normal conditions in the North Tropical Atlantic. Consistent signal from the North Caribbean up to the central part of the basin and in the mid-latitudes above.
Indian Ocean : weak signal over a large portion of the Tropical basin. Still some trace of Warmer than normal conditions in the Southern Sub-Tropics.

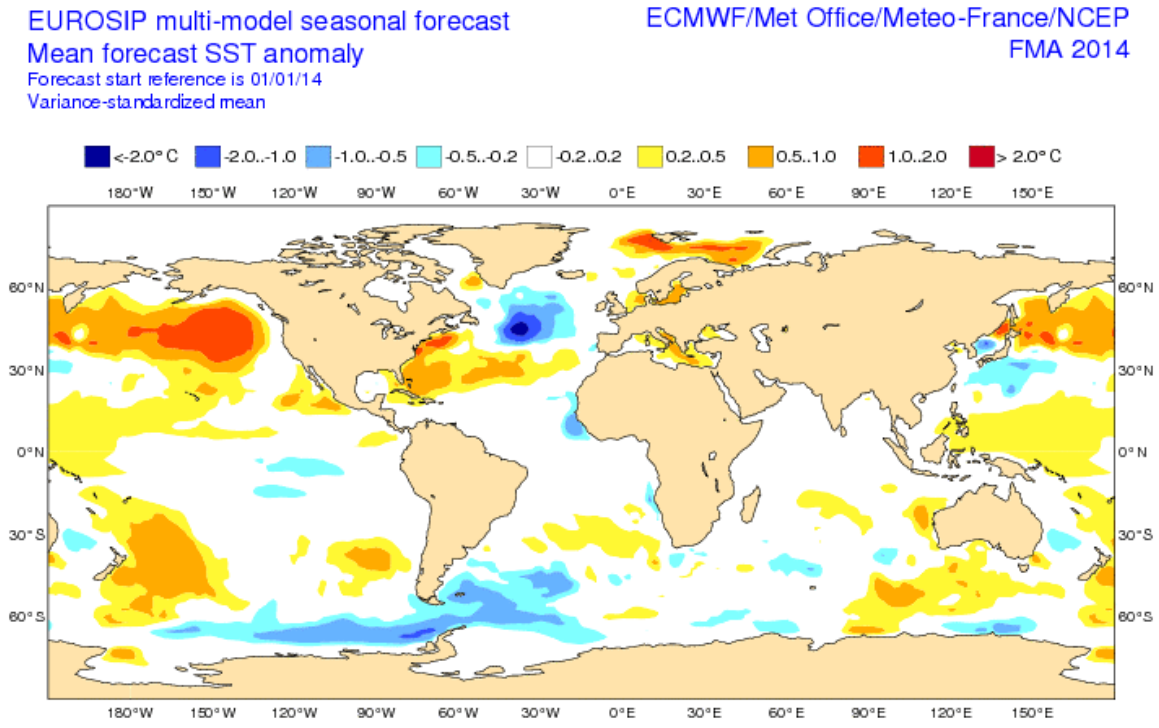


fig.14: SST Forecasted anomaly (in °C) from Euro-SIP. http://www.ecmwf.int/

II.1.b ENSO Forecast :

Forecasted Phase : Neutral

For FMA : the majority of the models are in the range of neutral conditions for the targeted period despite all are negatively oriented. Most of the dynamical models show a tendency to a warming on time (with an increased trend end of spring and beyond (especially on the Eastern part).

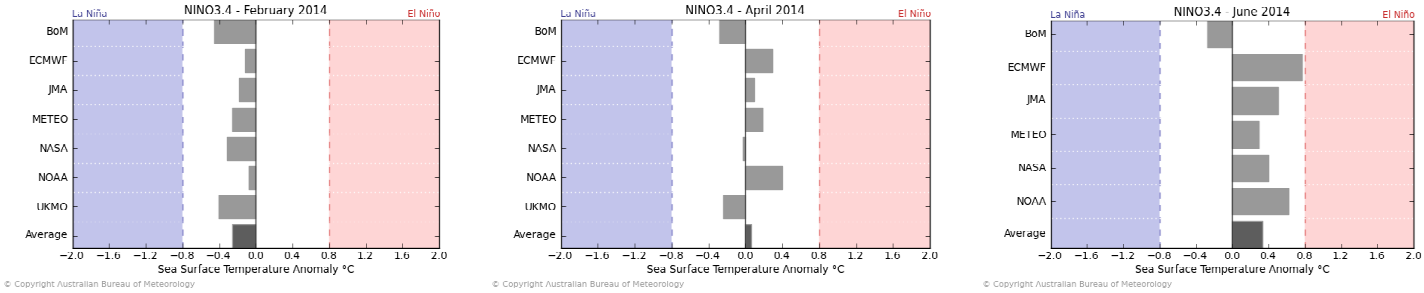
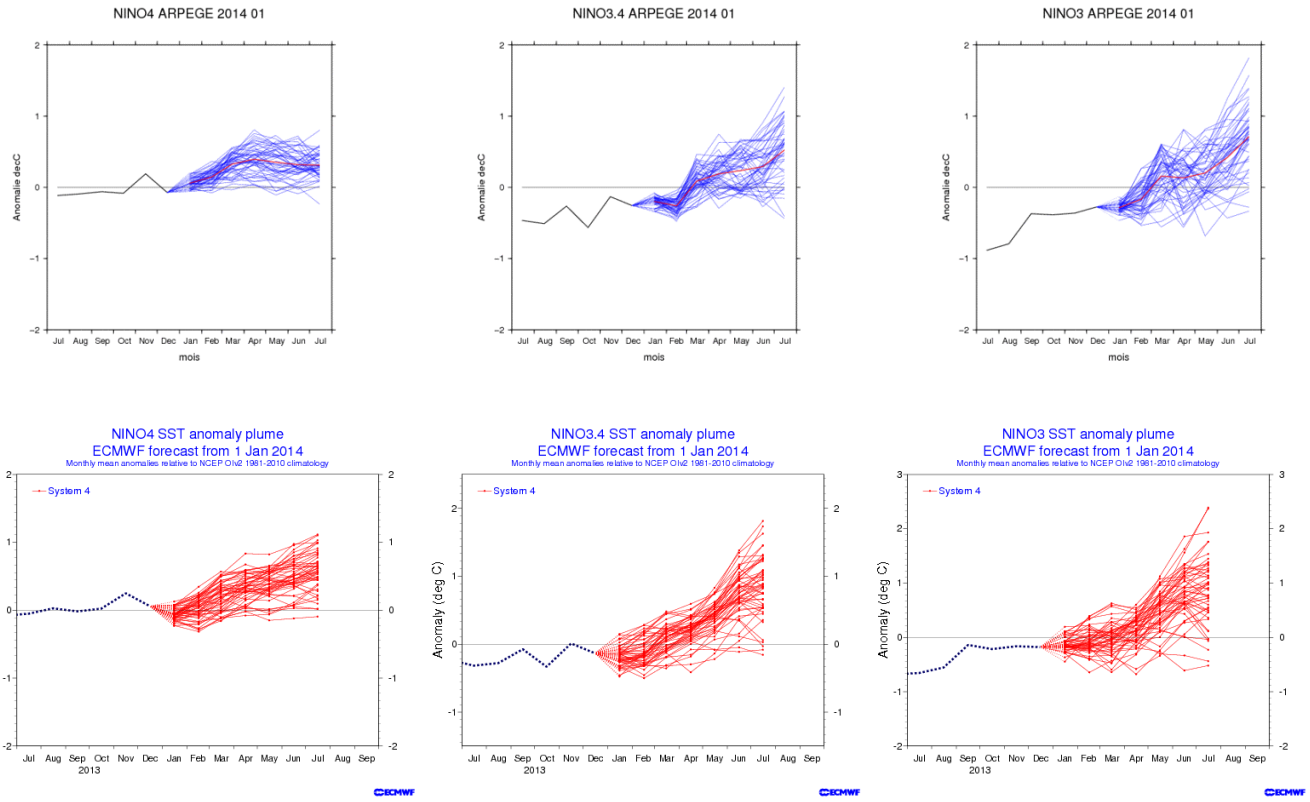


fig.15: Synthesis of Niño 3.4 forecasts from several GPC by BoM :
http://www.bom.gov.au/climate/ahead/model-summary.shtml#tabs=Pacific-Ocean

Plumes from Météo-France and ECMWF for the 3 Niño boxes (see definition in Annex – fig. II.1.5) : In both models and on average, prevailing conditions in the normal range for FMA. In both models clear warming end of Spring/beginning of Summer. In both models large uncertainty consistent with the Spring barrier of predictability (but reduced uncertainty in the central part). In EuroSIP Plumes, close to normal conditions on average ; the same tendency is visible.



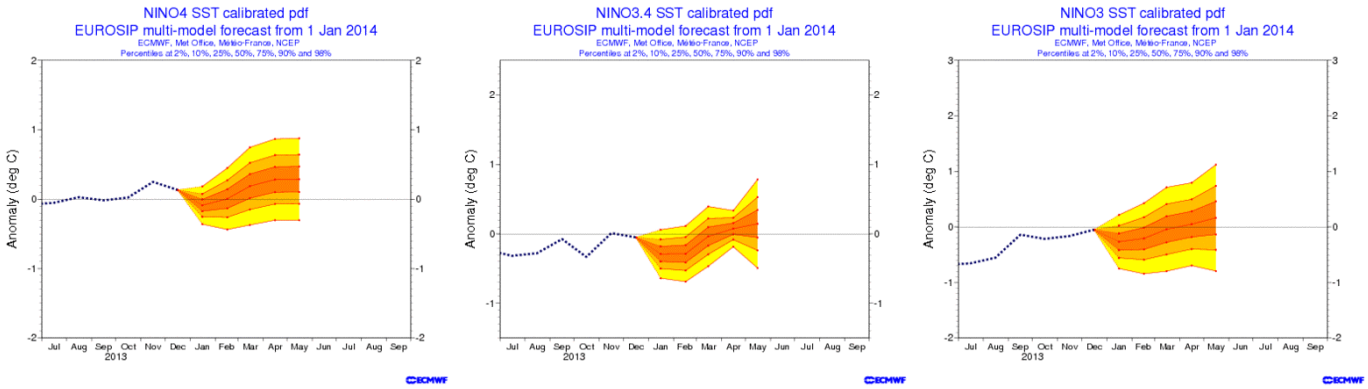
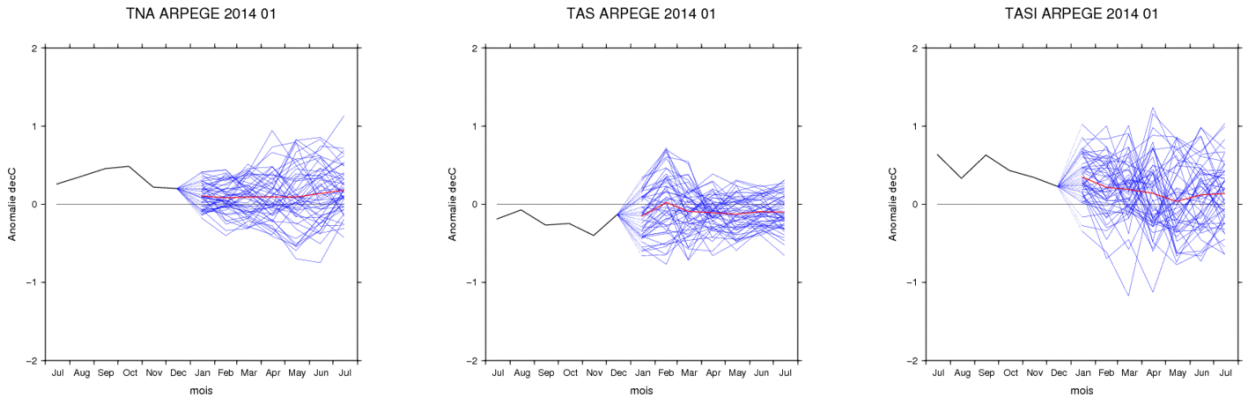


fig.16: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members - and EuroSIP (bottom) – recalibrated distributions.
(http://www.ecmwf.int/)

II.1.c Atlantic Ocean forecasts :

Forecasted Phase: Above Normal evolving close to normal in the Northern Tropics, Below Normal in the Southern Tropics - TASI on the positive side



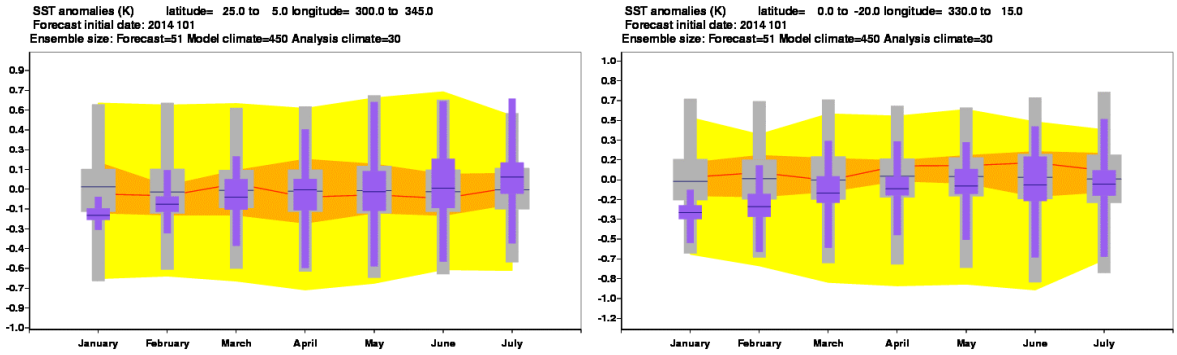


fig.17: SSTs anomaly forecasts in the Atlantic Ocean boxes from Météo-France (top) and ECMWF (bottom), plumes / climagrams correspond to 51 members and monthly means.

North Tropical Atlantic : warmer than normal conditions in both models. Evolution very similar. Larger spread in MF vs ECMWF.
South Tropical Atlantic : starting with Colder than normal conditions and progressive warming then in both models leading to Normal conditions beginning of Spring.
The inter-hemispheric SST gradient is consistent between the two models and positive.
TASI : the TASI index is positive for FMA even the spread is large (in MF).

II.1.d Indian Ocean forecasts :

Forecasted Phase: West positive and East slightly positive
IOD slightly positive

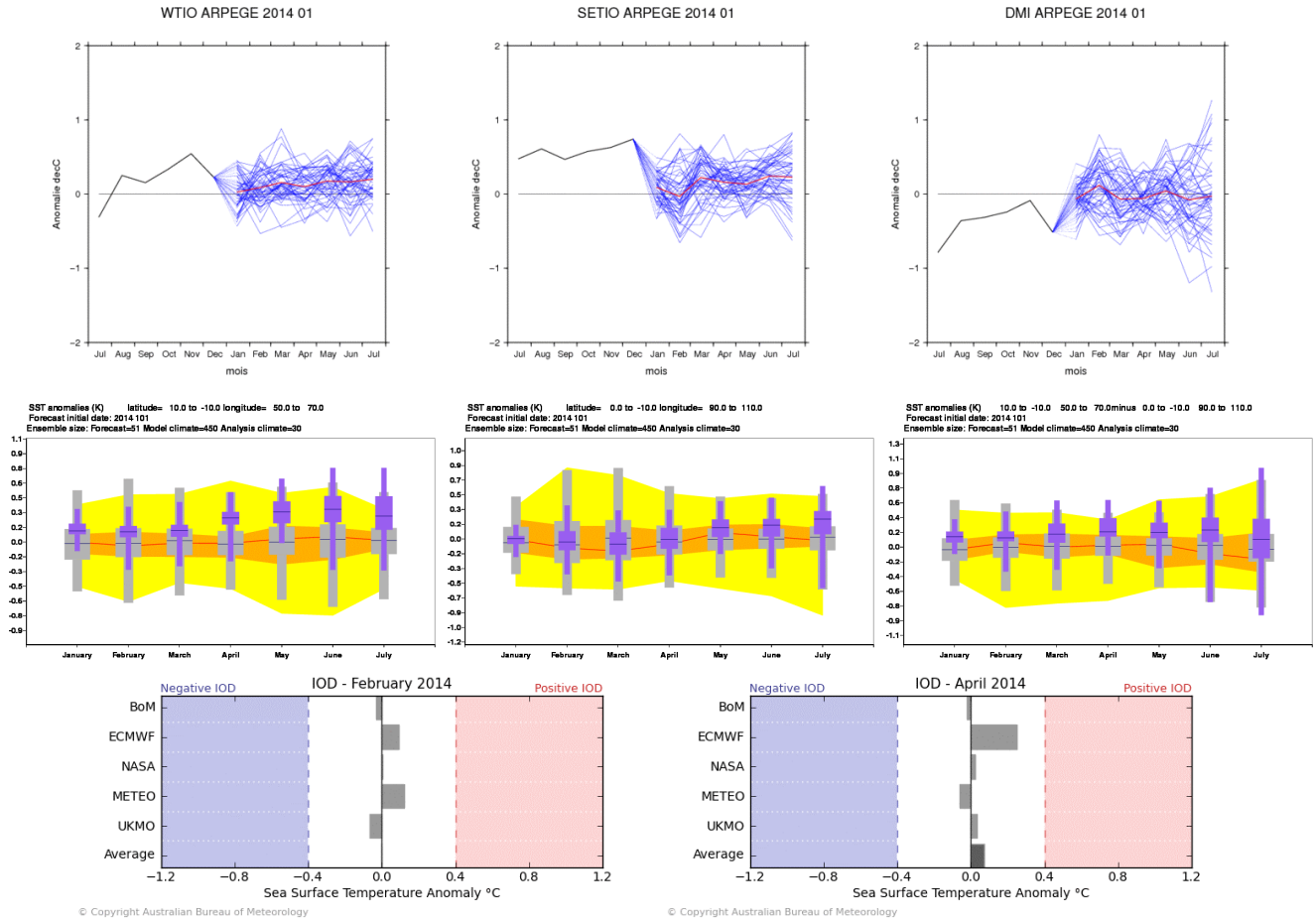


fig.18: SSTs anomaly forecasts in the Indian Ocean boxes from Météo-France (top), ECMWF (middle), plumes / climagrams correspond to 51 members and monthly means. Synthesis for IOD (bottom) for several GPCs from BoM http://www.bom.gov.au/climate/ahead/model-summary.shtml#tabs=Indian-Ocean

In WTIO : little differences in the two models. Mostly Warmer than normal.
In SETIO : Mostly Above normal conditions in both models. The differences can be related to hindcast issues.
DMI (IOD) : Slightly positive on FMA. Quite large spread in both models. The evolution to the close to neutral value is confirmed by other models.

II.2. GENERAL CIRCULATION FORECAST

II.2.a Global Forecast

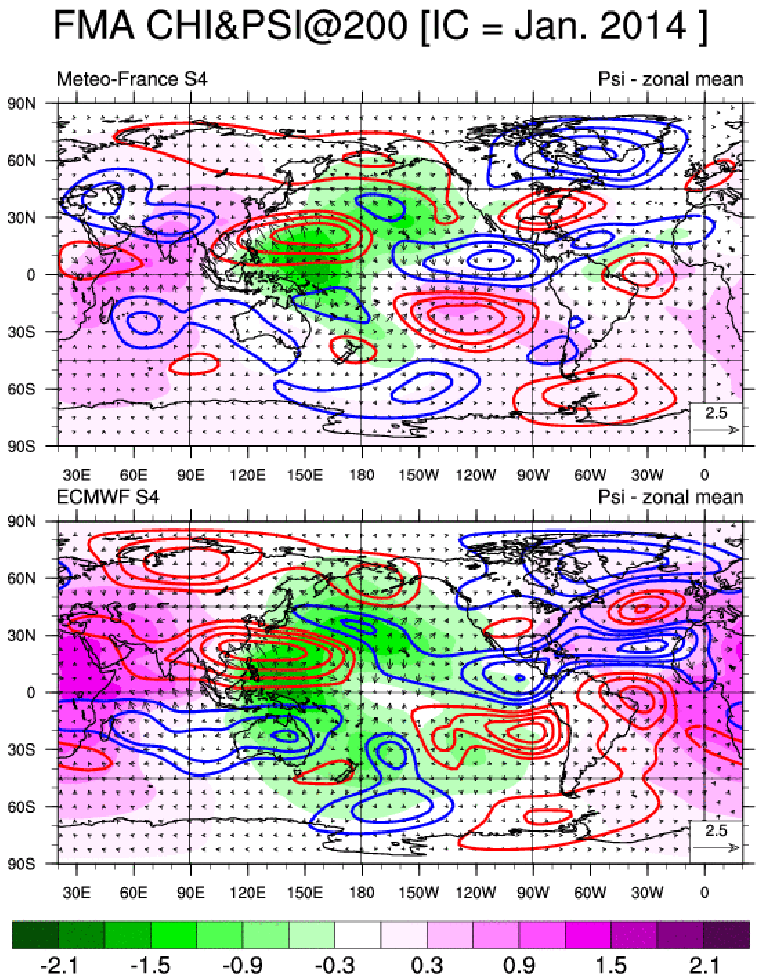


fig.19: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), associated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa by Météo-France (top) and ECMWF (bottom).

Velocity potential anomaly field (cf. fig. 19 – insight into Hadley-Walker circulation anomalies) :
Some consistency in the general patterns from the maritime continent up to the Greenwich meridian but some differences in the location possibly related to the model uncertainty as the SST forecasts are quite consistent (see SST discussion).

Over the Pacific : On warm pool; negative anomaly (Divergent circulation anomaly - upward motion anomaly) in both models (extending along the SCPZ region) but with a clear Eastward shift (~10° of Longitude) in MF compared to ECWMF. East to the date line; positive anomaly in MF (Convergent circulation anomaly - downward motion anomaly) in the Southern hemisphere not visible in ECMWF. Enhanced upward anomaly motion over most of the Northern Pacific in both models.
Over Indian Ocean : quite consistent signal in relationship with SST anomaly developments ; Convergent circulation anomaly over West to 90°E extending in ECMWF over Eastern side of Africa.
Over Atlantic : Weak signal in MF while the signal is stronger in ECMWF, especially over the Southern hemisphere. However, some consistency between both models.
One can quote that the atmospheric responses from both models are close to the one proposed by JMA. Most of the differences can likely be related to model uncertainty.

Stream Function anomaly field (cf. fig. 19 – insight into teleconnection patterns tropically forced) : without consideration on the exact location of the patterns, the atmospheric responses are quite consistent in both models and with JMA

Over the Pacific : In both models, the atmospheric response is quite consistent in Northern Hemisphere with a meridionnal propagation from Western Tropics toward Central Pacific (likely trapped signal). The connection with higher latitude anomalies is less clear in spite of some probable interaction. Over the Eastern Pacific also indication of consistent atmospheric responses. However, the patterns are not similar in terms of location leading to differences in terms of impact over the continents.
Over the Atlantic : here also some consistency between the response of the 2 models (confirmed by JMA forecast). In the Northern Hemisphere, ECMWF develops a response in the Tropics and mid-latitudes. There is clear similarities in MF even if the exact location is a bit different.
Over the Indian Ocean : some consistency only in the Southern Sub-Tropics (from Australia to Madagascar).

As a conclusion the **predictability for FMA** seems to be quite good in the Tropics (especially over the Pacific and Atlantic). There is more uncertainty over the Indian Ocean (but good consistency for the Southern sub-tropics). For Europe there is a quite consistent signal in the models. So one could infer some weak but existing predictability at least for the General Circulation over the Atlantic. However, the impact in term of Temperature and Rainfall is more difficult to infer because of the model uncertainty and the mix between Winter and Spring (differences in term of location of the main anomalies and impacts of circulation regimes different at Spring vs Winter).

II.2.b North hemisphere forecast and Europe

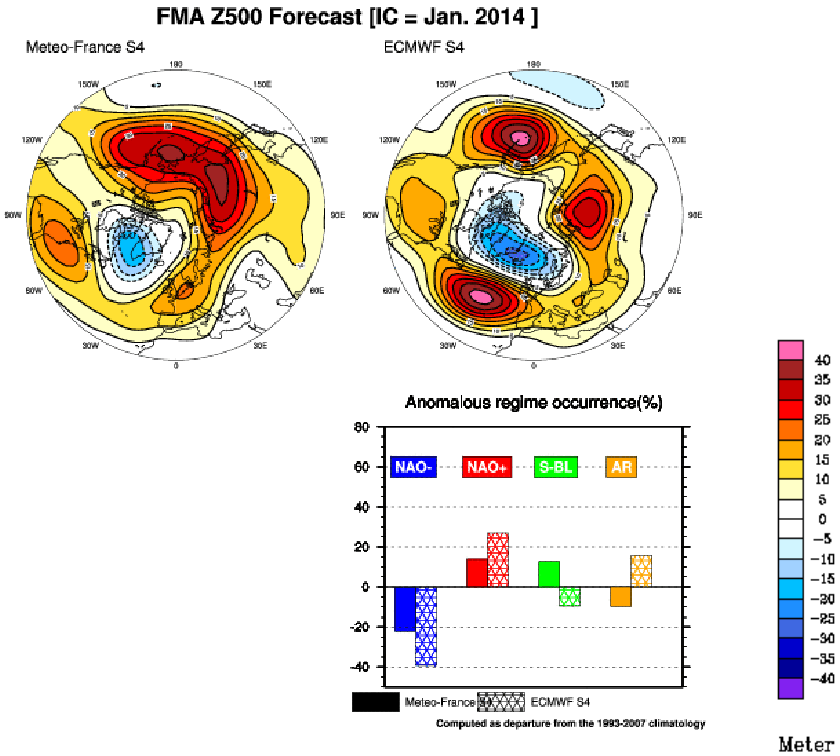


fig.20: Anomalies of Geopotential Height (top) at 500 hPa from Meteo-France (left) and ECMWF (right). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip and North Atlantic Regime occurrence anomalies (bottom) from Météo-France and ECMWF : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

Geopotential height anomalies (fig. 20 – insight into mid-latitude general circulation anomalies) :
As seen on the Stream Function anomalies, quite consistent in both models (despite the differences in terms of exact location of the anomalies. Strong signal in the Geopotential Heigh coming from the Pacific but with some positioning differences between the 2 models. Over the Atlantic still some differences in exact location but some consistency for an increased meridional gradient and some positive anomaly over at least part of Western Europe and the Mediterranean basin.
North Atlantic Circulation Regimes (fig. 20) : As a consequence, a consistent signal in the regimes forecast corresponding to a deficit of NAO – circulations and an exceedance of NAO + regimes. The difference between MF and ECMWF likely corresponds to the model uncertainty (ECMWF with a tendency to Atlantic Ridge exceedance and MF with a tendency to Blocking regime exceedance).

II.3. IMPACT : TEMPERATURE FORECASTS

II.3.a ECMWF

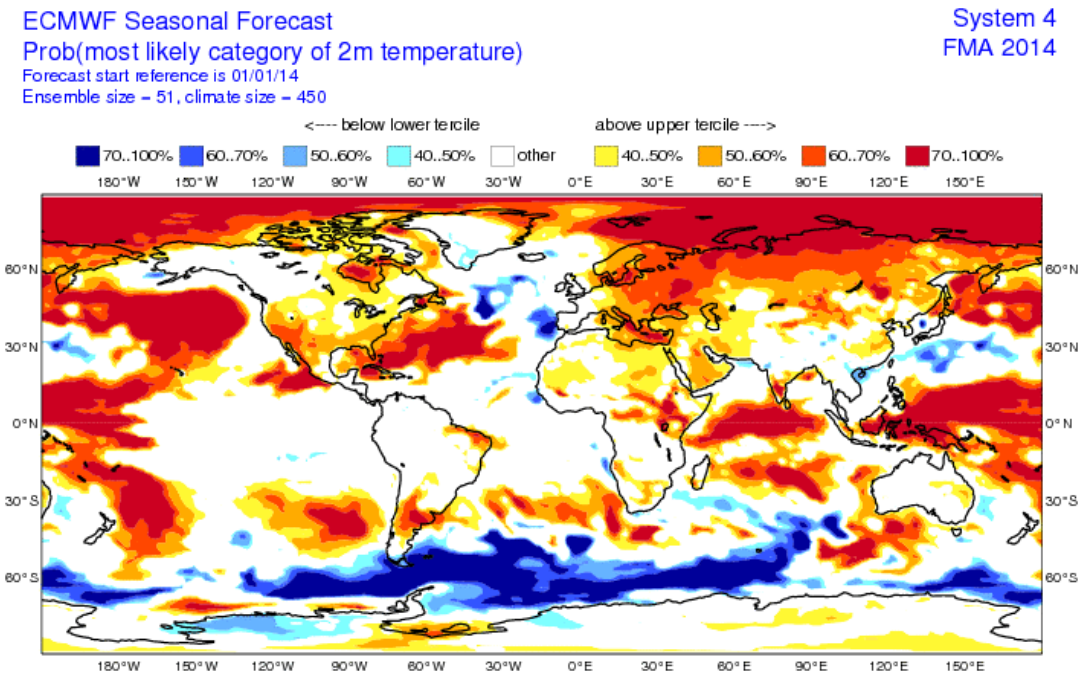


fig.21: Most likely category probability of T2m from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.3.b Météo-France

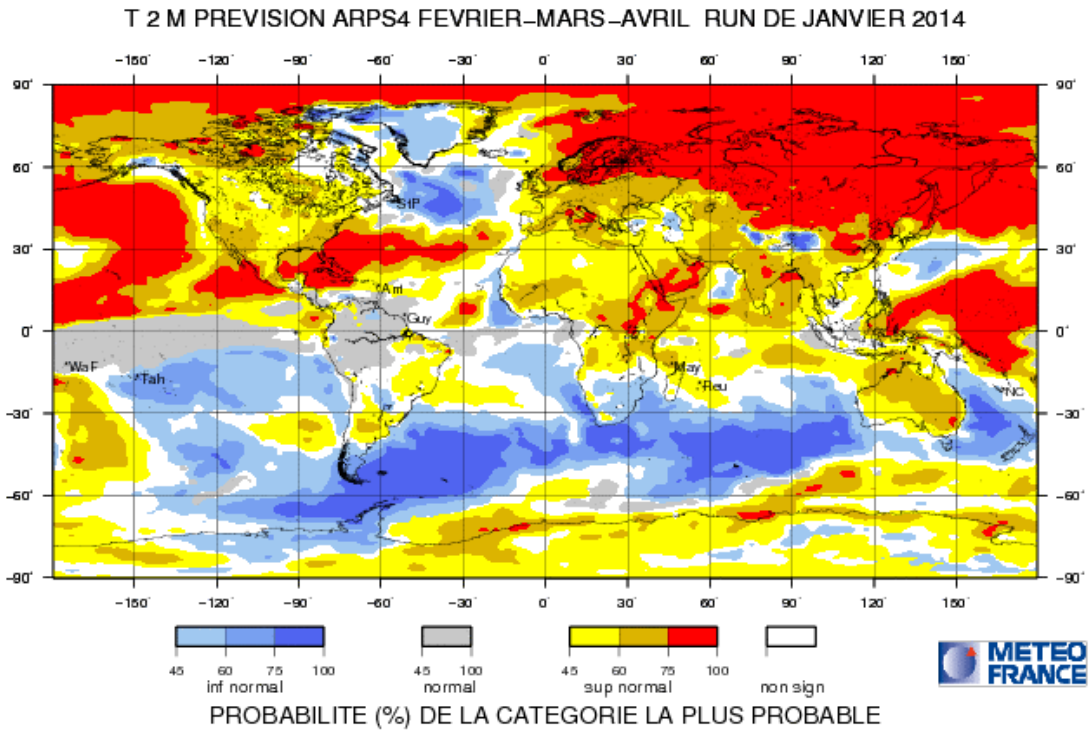


fig.22: Most likely category of T2m from Meteo-France. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.3.c Met Office (UKMO)

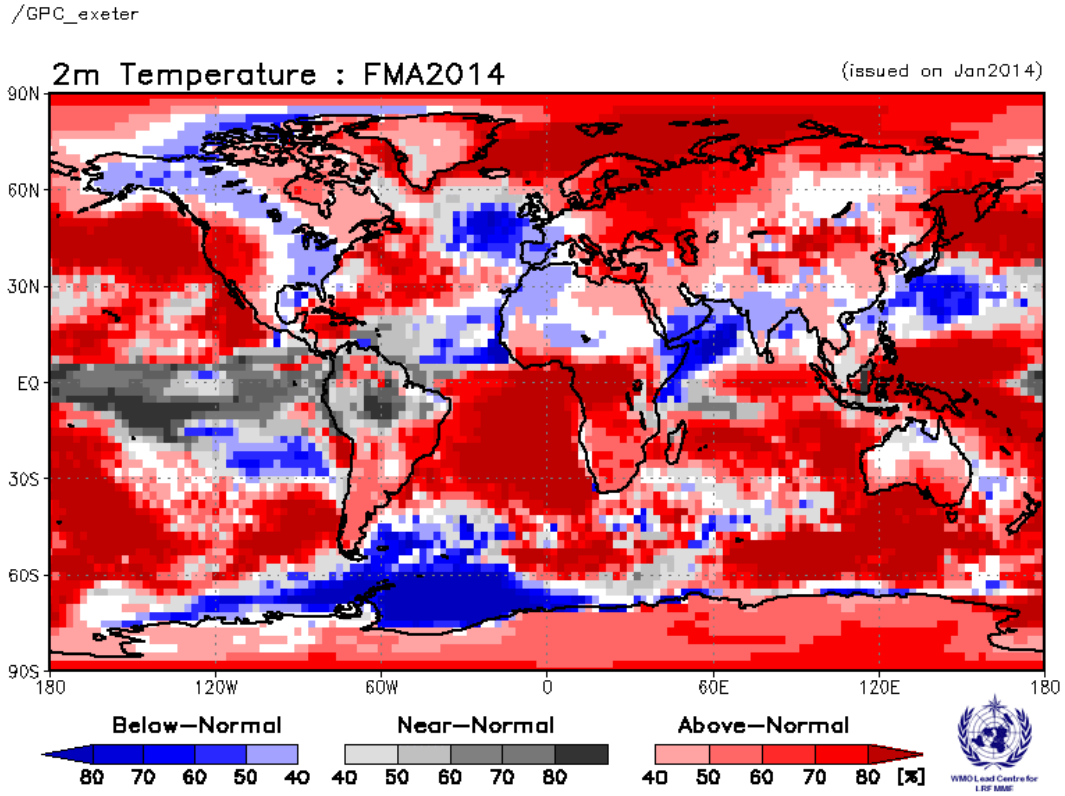


fig.23: **Most likely category of T2m Anomaly from UK Met Office.** **https://www.wmolc.org/**

II.3.d Climate Prediction Centre (CPC)

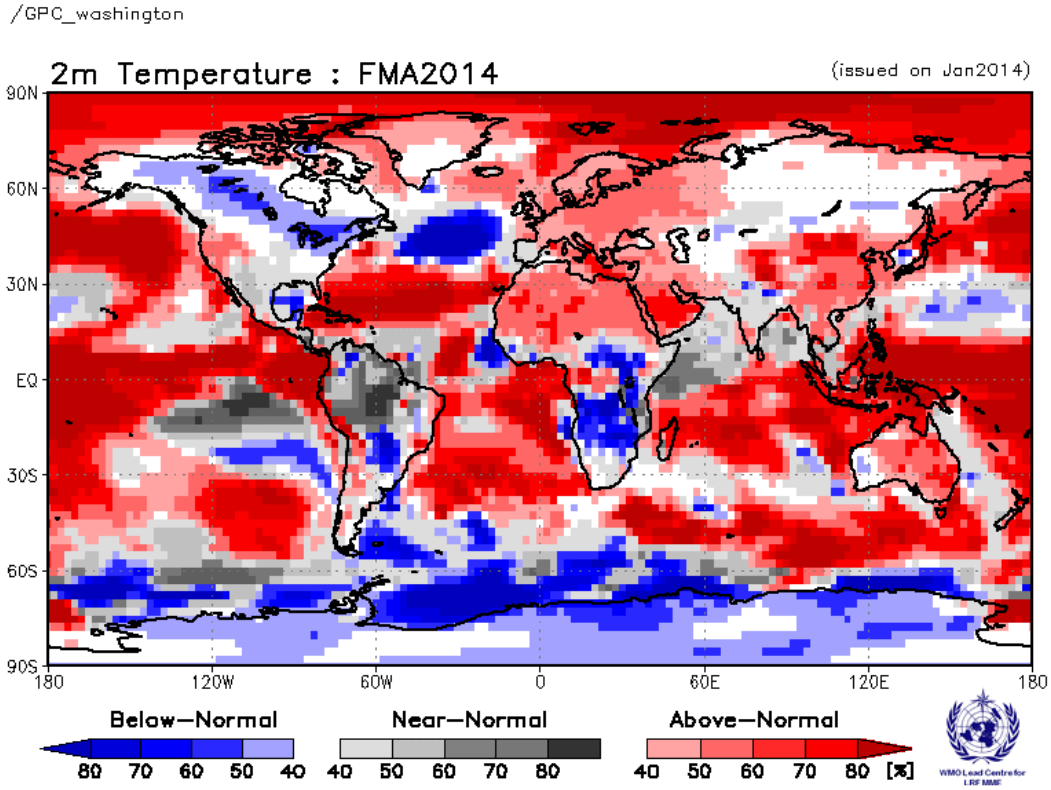


fig.24: **Most likely category of T2m Anomaly from CPC.** **https://www.wmolc.org/**

II.3.e Japan Meteorological Agency (JMA)

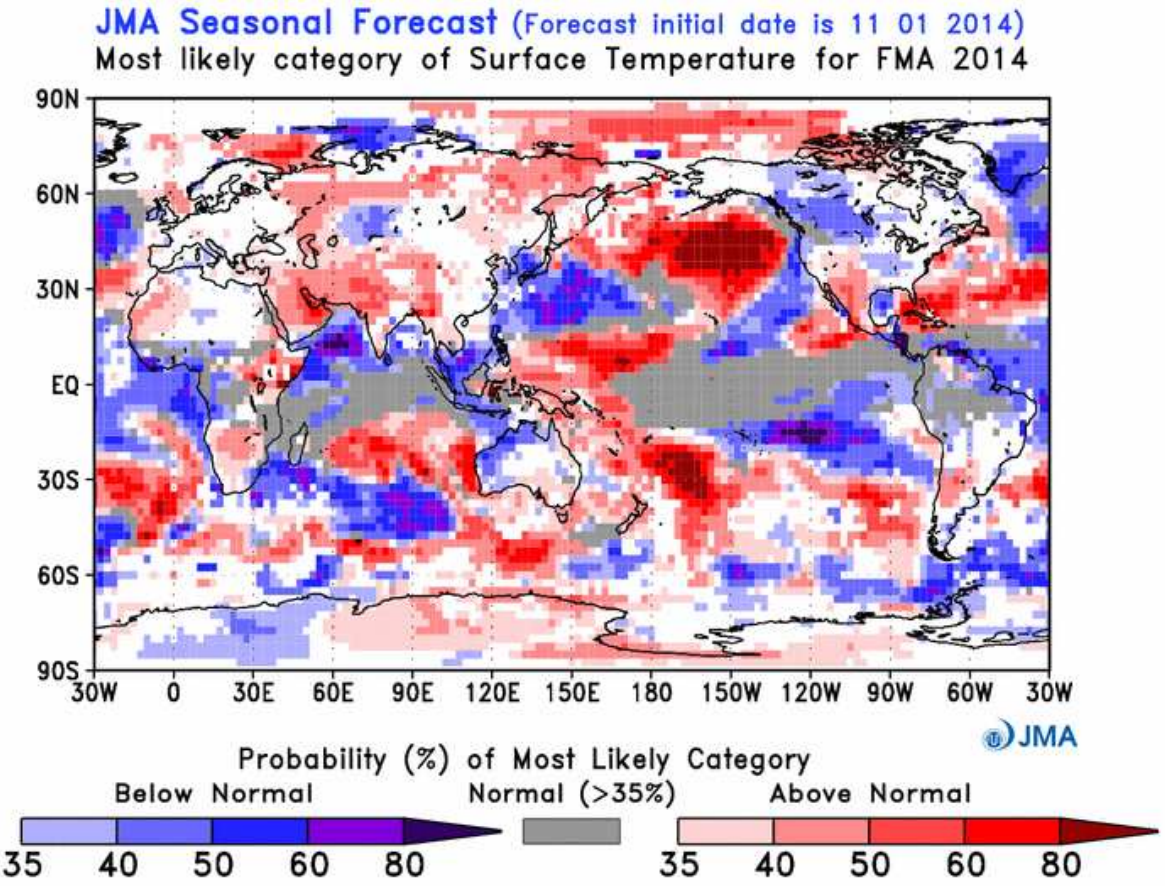


fig.25: Most likely category of T2m from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/

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

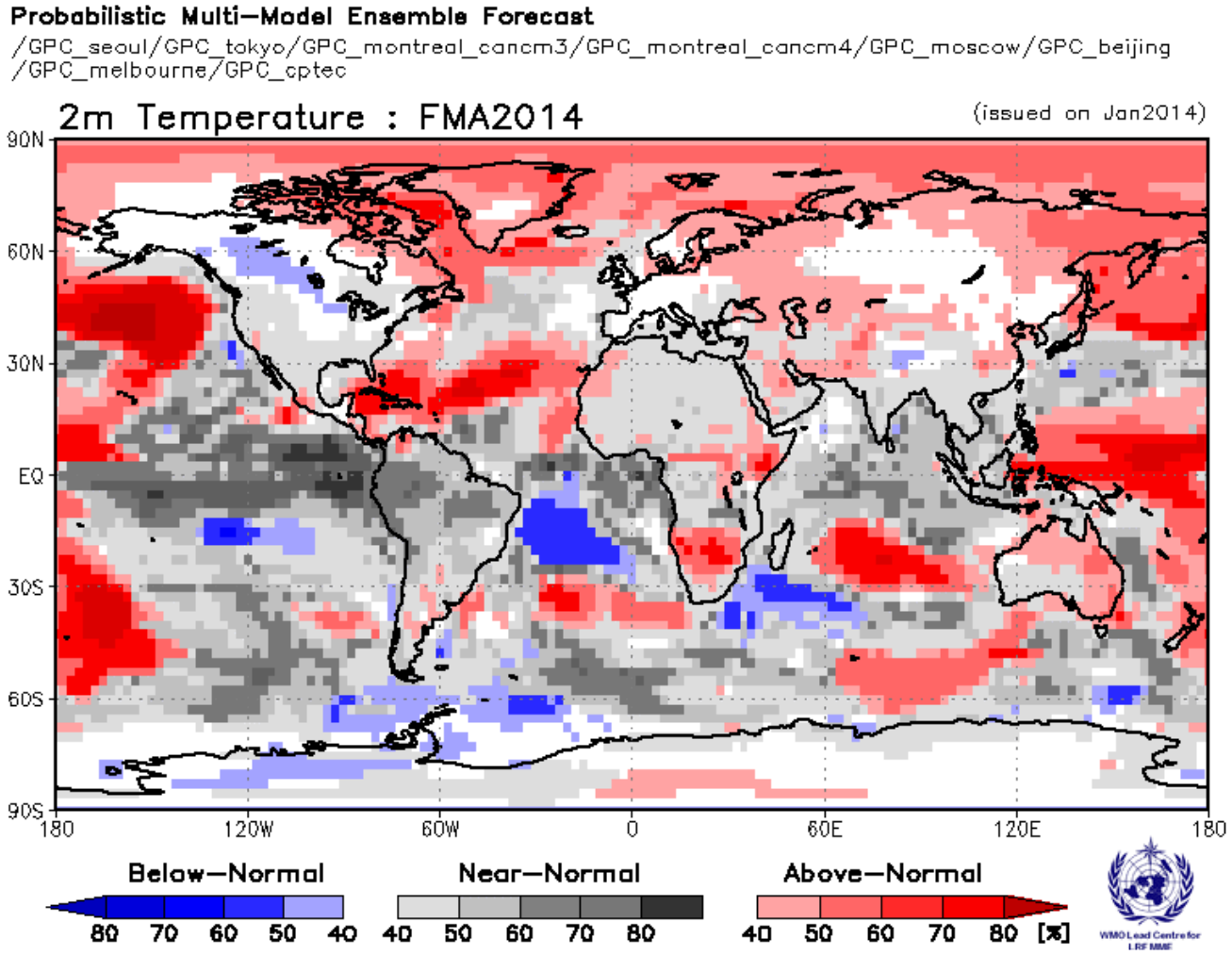


fig.26: MME most likely category of T2m from LC-MME. The MME composition corresponds to the GPCs not used in EuroSIP https://www.wmolc.org/

II.3.g Euro-SIP

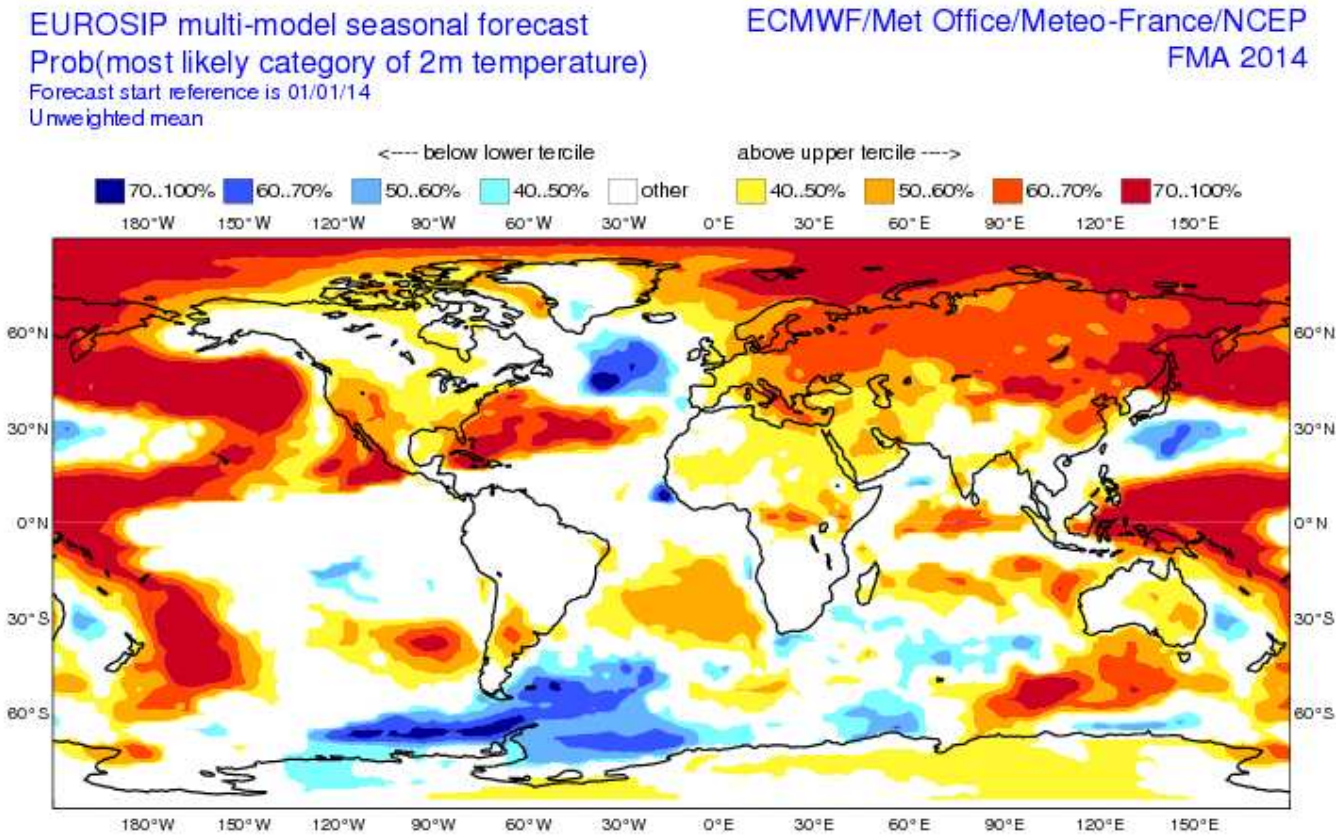


fig.27: Multi-Model Probabilistic forecasts for T2m from EuroSip.
(2 Categories, Below and Above normal – White zones correspond to No signal and Normal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

North-America : enhanced probabilities (Warmer than normal) in the most Northern regions and over a large portion of US up to Mexico. Same signal over part of Central America and the Caribbean.
South-America : Some consistent signal over the Southern and North-Eastern part of the continent (warmer than normal).
Australia : enhanced probabilities for warmer than normal conditions over most of the continent.
Asia : Mostly Warmer than normal conditions in the mid and high latitudes ; strong probability in the vicinity of the maritime continent.
Africa : Warmer than normal conditions over Equatorial and Eastern regions .
Europe : Enhanced probabilities for Warmer than normal conditions over the most Northern regions especially the Eastern part. Slightly enhanced probability for colder than normal scenario over coastal areas of Mediterranean basin.

II.4. IMPACT : PRECIPITATION FORECAST

II.4.a ECMWF

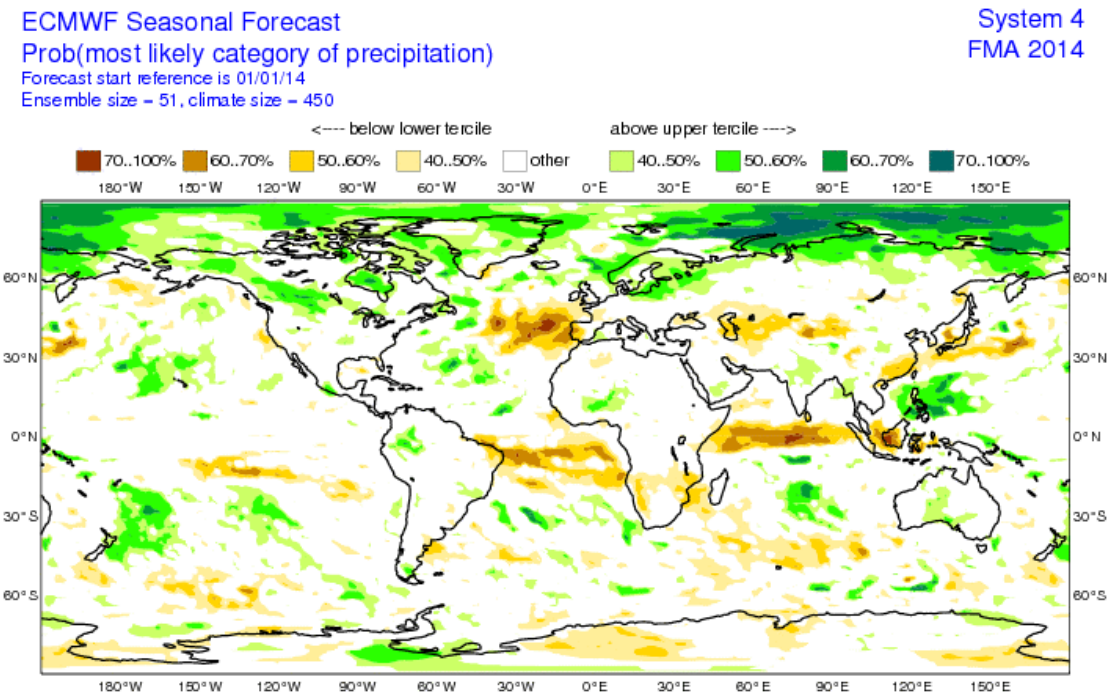


fig.28: Most likely category probability of rainfall from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/charts/seasonal_charts_s2/

II.4.b Météo-France

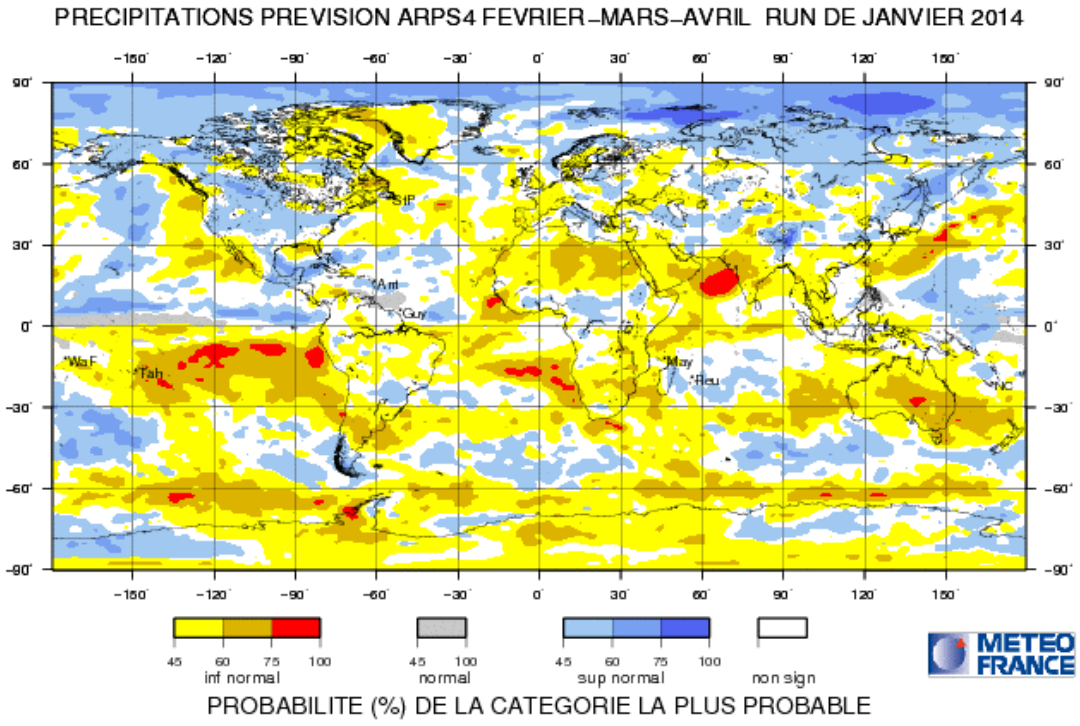


fig.29: Most likely category of Rainfall from Meteo-France. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.4.c Met office (UKMO)

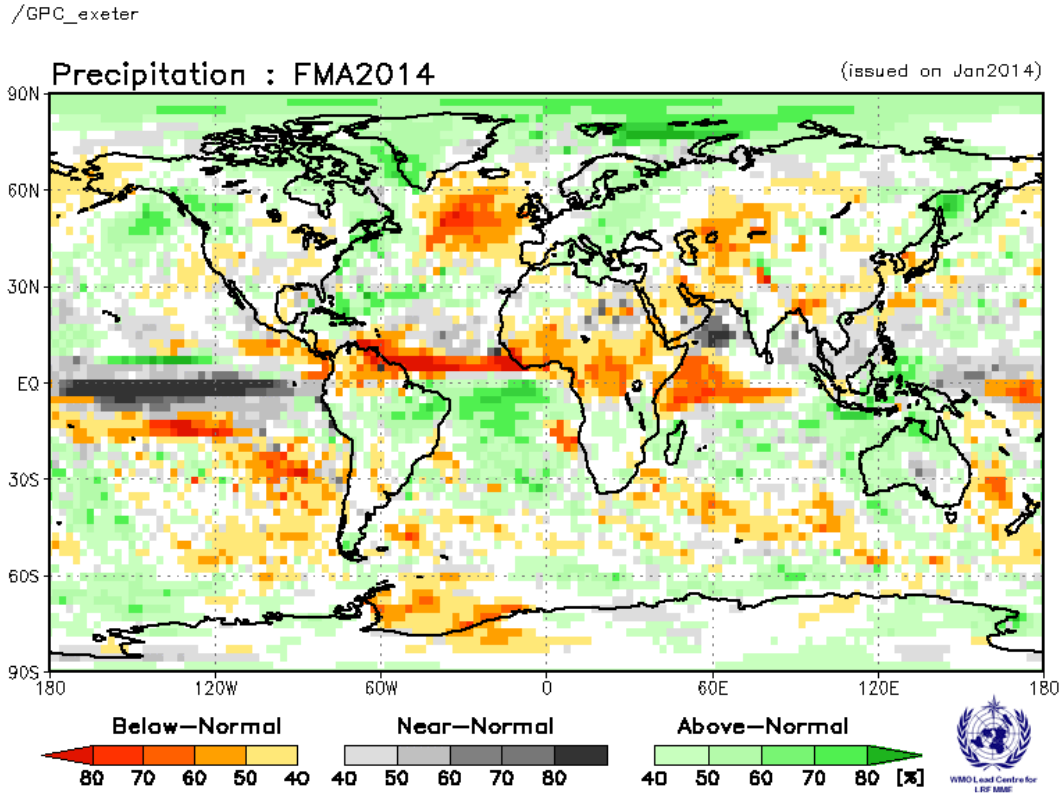


fig.30: **Category probabilities of Rainfall from UK Met Office.** **https://www.wmolc.org/**

II.4.d Climate Prediction Centre (CPC)

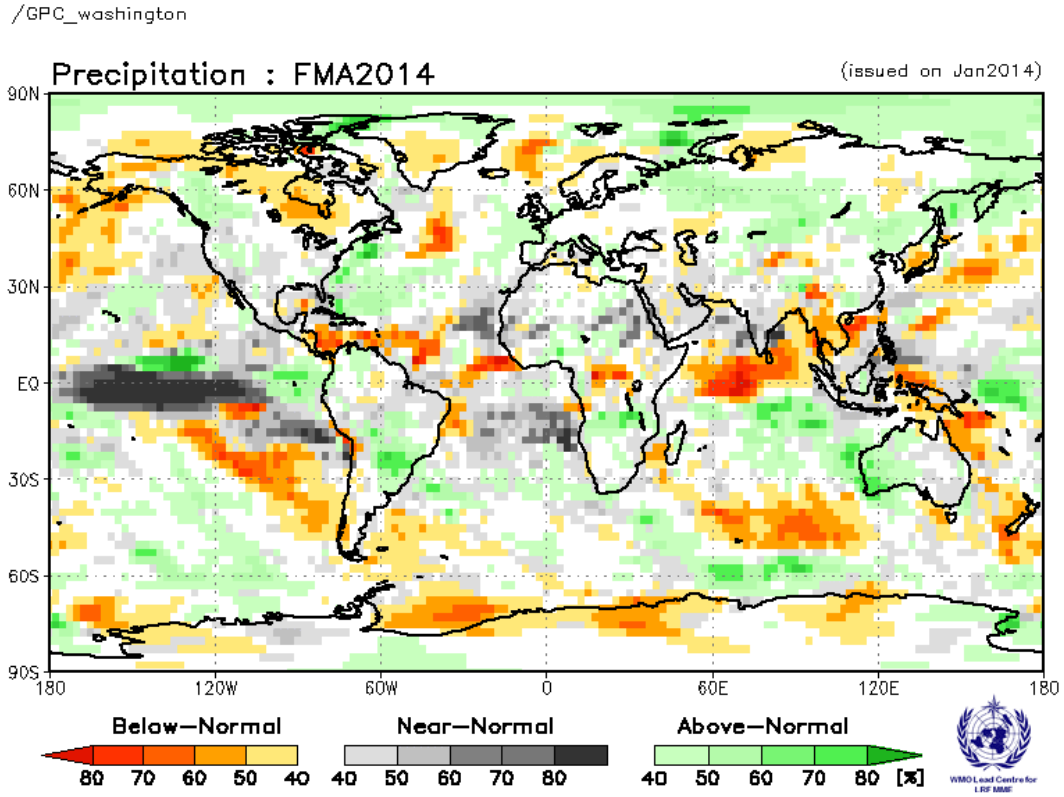


fig.31: **Most likely category of Rainfall from CPC.** **https://www.wmolc.org/**

II.4.e Japan Meteorological Agency (JMA)

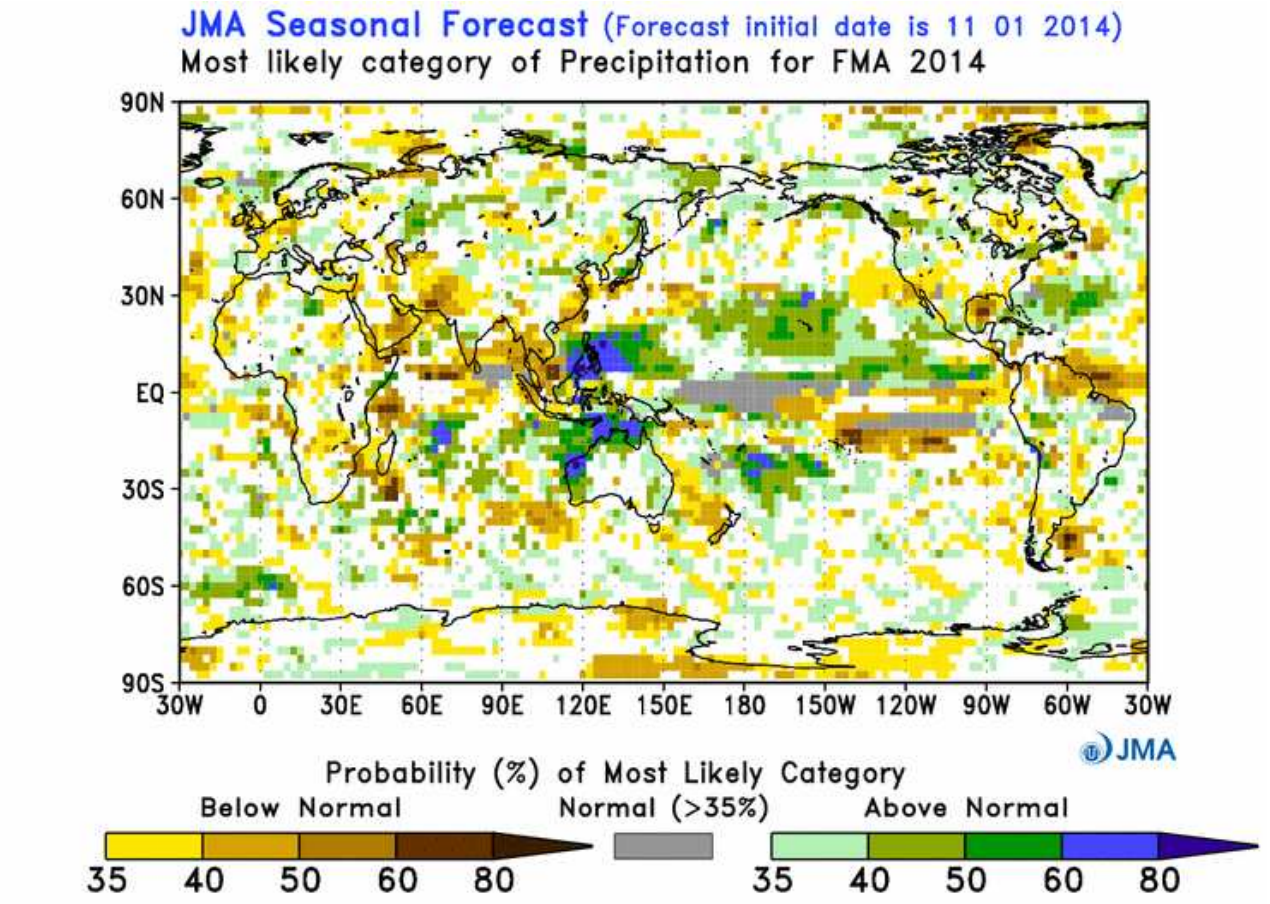


fig.32: Most likely category of Rainfall from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/

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

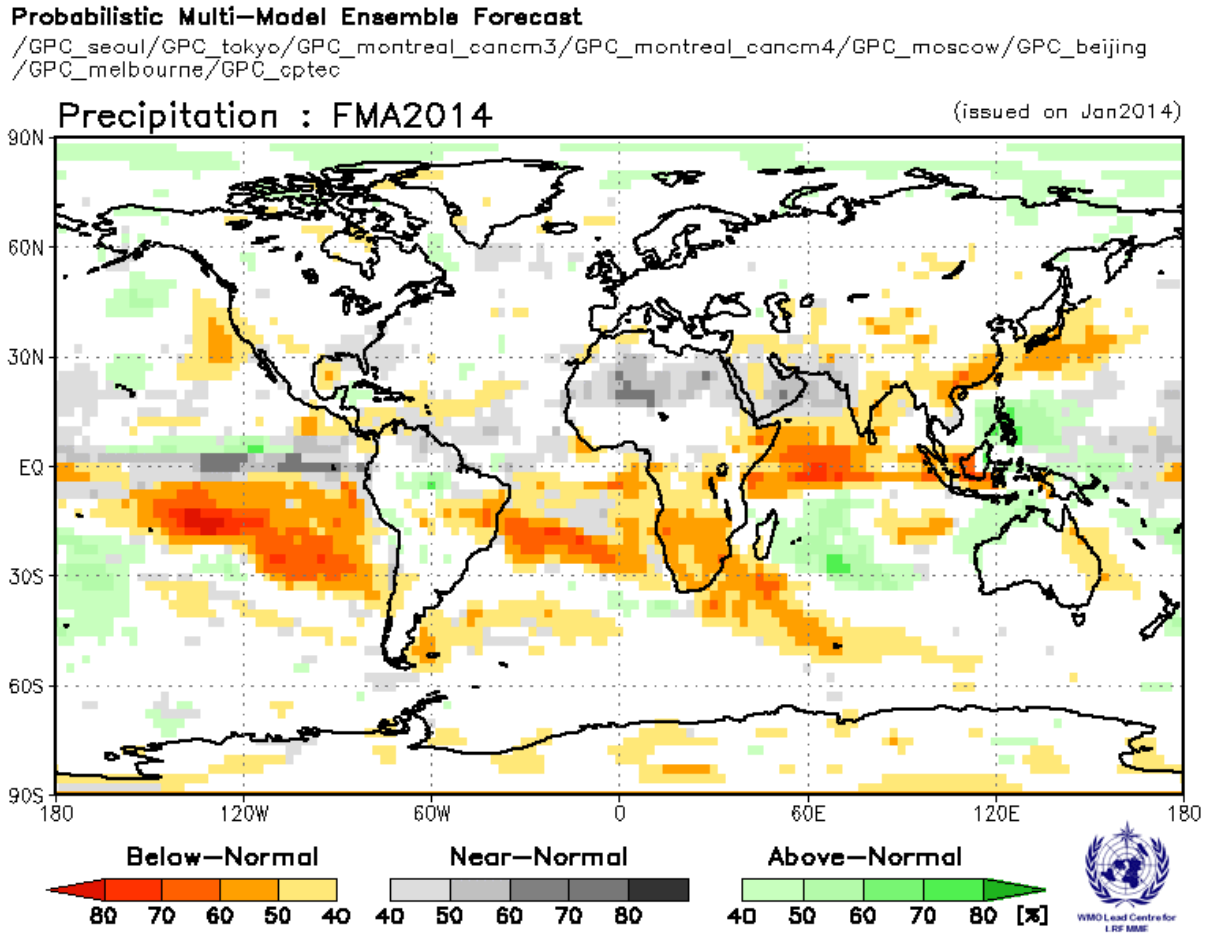


fig.33: **MME most likely category of Rainfall from LC-MME. The MME composition corresponds to the GPCs not used in EuroSIP.** **https://www.wmolc.org/**

II.4.g Euro-SIP

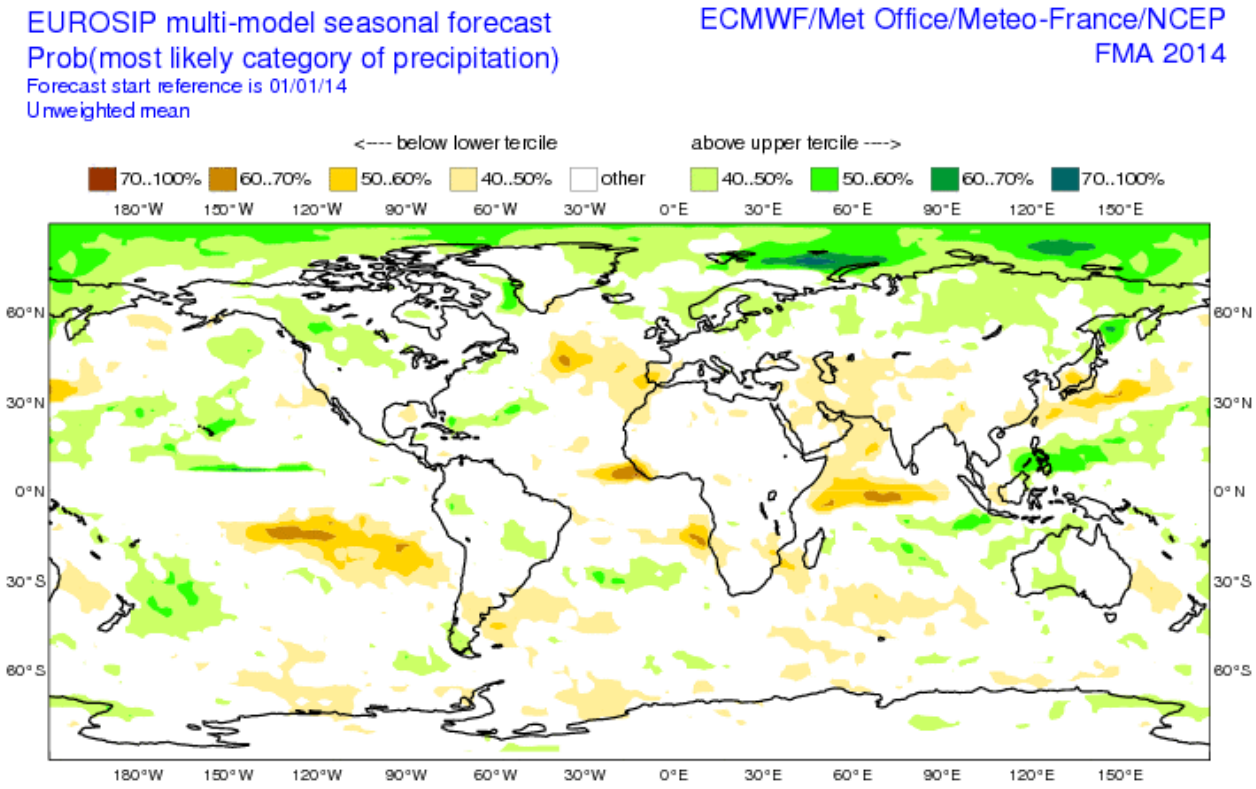


fig.34: Multi-Model Probabilistic forecasts for precipitation from EuroSip. (2 Categories, Below and Above normal – White zones correspond to No signal).

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

In the Tropics : A very few consistent signals ; slightly enhanced probabilities for wet scenarios close to Maritime continent, Canada and Siberia. Slightly enhanced probabilities for dry scenarios over some coastal areas of Africa, part of Argentina and regions in the vicinity of the Arabian sea and the Persic Gulf.

For Europe : No signal more or less everywhere to the exception of the South Western part of Europe (slightly enhanced probability for dry scenario) and the most North-Western part (slightly enhanced probability for wet scenario) consistently with the general circulation pattern (NAO + regimes favoured).

II.5. REGIONAL TEMPERATURES

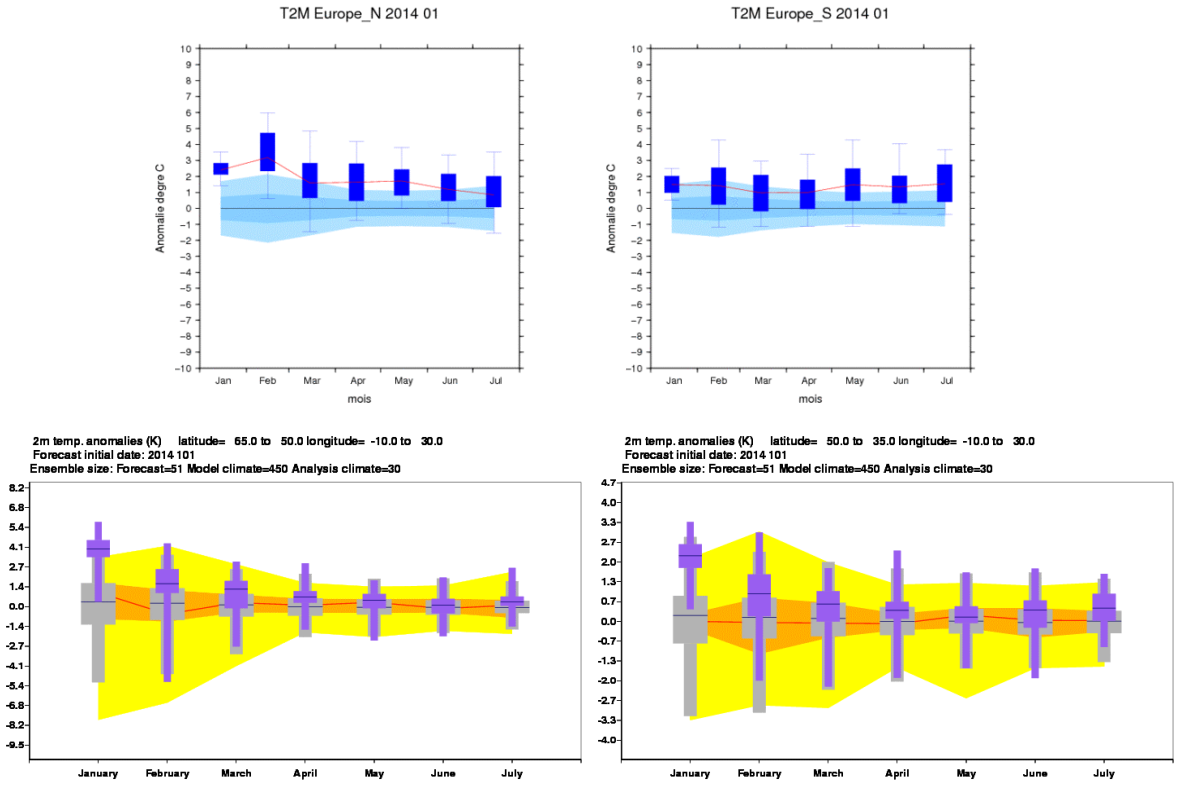


fig.35: Climagrams for T2m in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom - idem).

For Northern Europe: consistent signal between the 2 models. Well Above normal conditions progressively decreasing ; MF staying warmer than ECMWF.

For Southern Europe: same comment ; consistent signal between the 2 models. mostly Well Above Normal and progressive decrease. The spread is large in both models.

The verification scores from MF give some skill over the 3 months of FMA, especially for Northern Europe with monthly ROC scores close to 0.6.

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

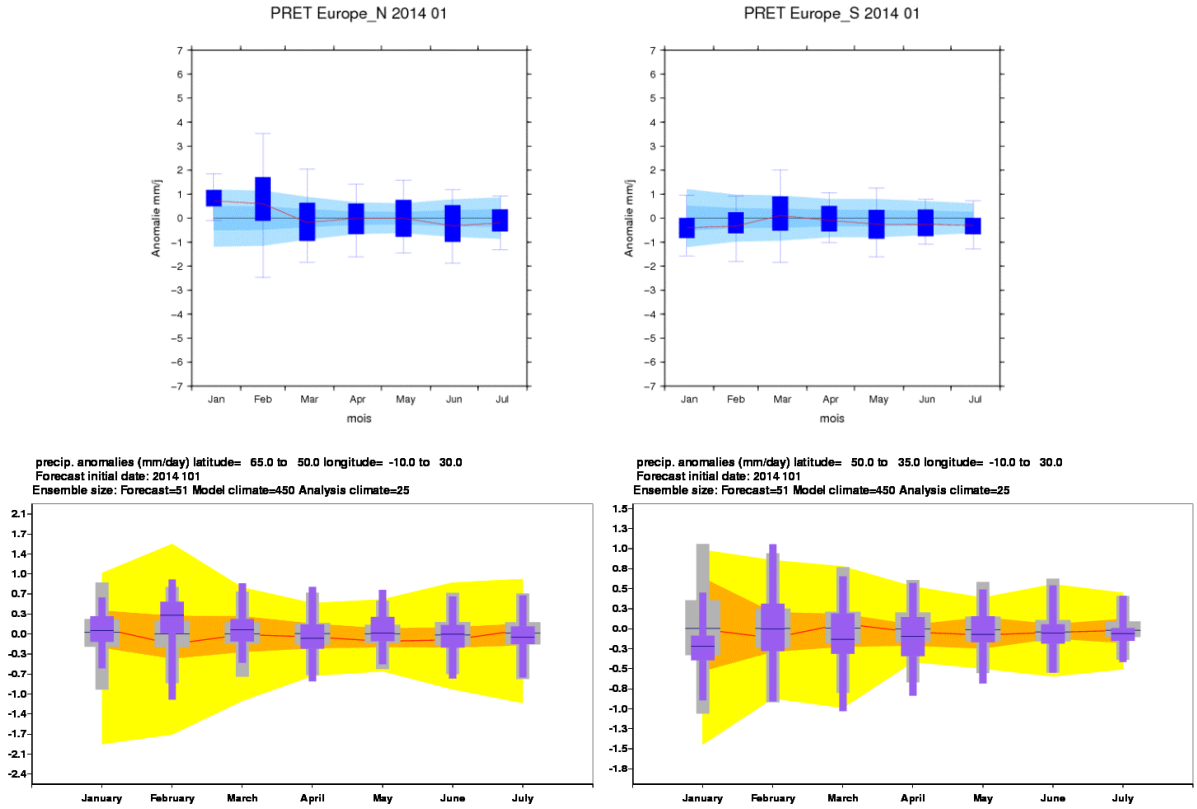


fig.36: Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom - idem).

The forecasts show little consistency on time but are quite consistent with respect of the Z500 forecasts.

For Northern Europe : Large spread but a tendency for Above normal conditions.

For Southern Europe : Also large spread and tendency for Below normal conditions (despite located at different months).

In MF, there is only significant skill for February over Southern Europe (ROC ~0.56).

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

II.6. MODEL'S CONSISTENCY

II.6.a GPCs consistency maps

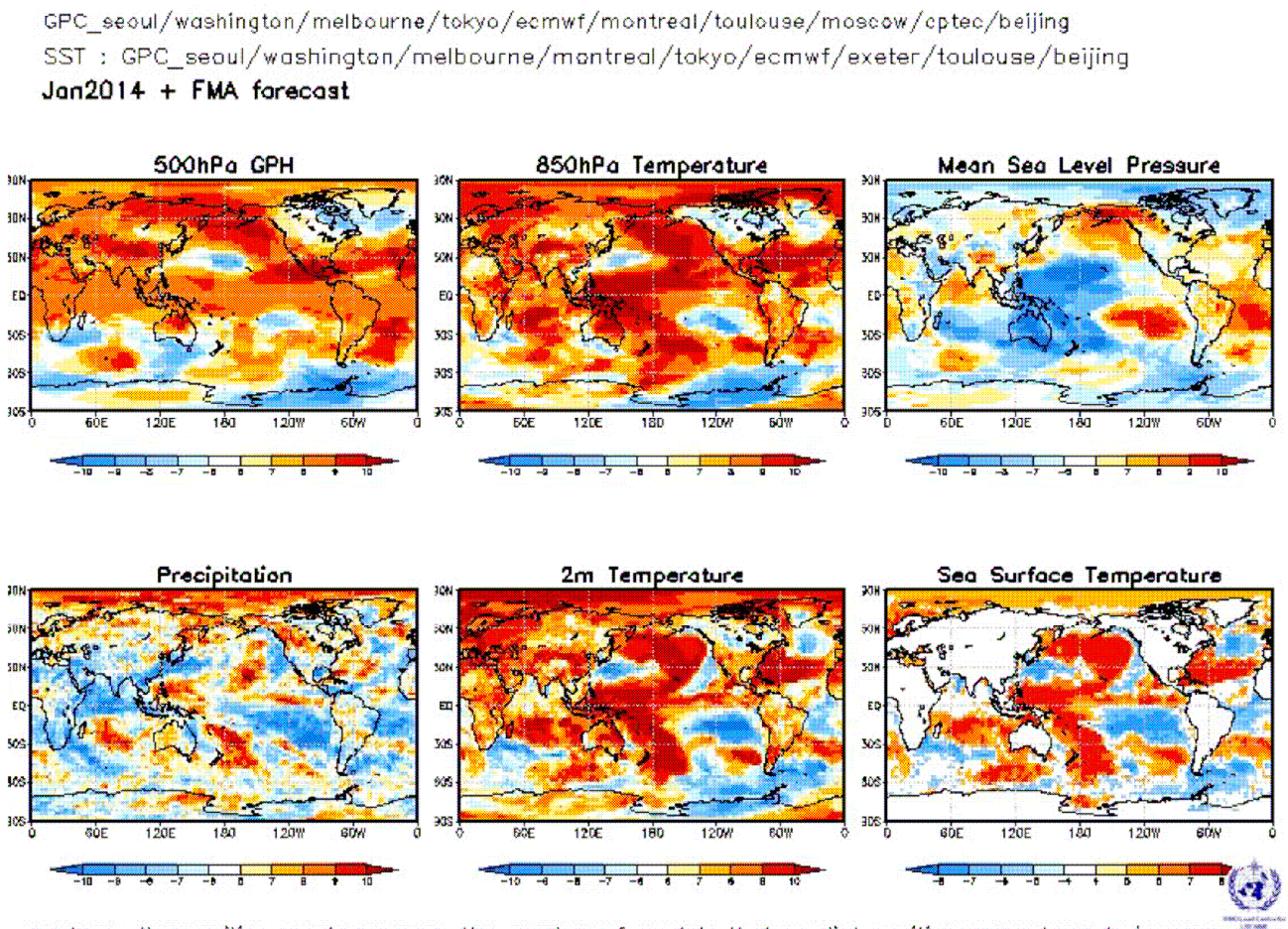


fig.37: ***GPCs Consistency maps from LC-MME*** *http://www.wmolc.org/*

For SST : Very consistent signal (warmer than normal) in the warm pool and along the SCPZ regions, in the Southern Tropics of the Indian Ocean and in Tropical North Atlantic. Also to be quoted the warmer than normal conditions over the North Pacific. Some consistency also for colder than normal conditions over the Tropical South Pacific (East to the dateline) and the South Tropical Atlantic (close to Brazil).

For Z500 : Mostly Above normal consistent signal in the Tropics and in Northern hemisphere over most of the European and Asian continents, South America, the Southern part of the North America and Central America and the Caribbean. For the Atlantic, some consistent signal for Above Normal conditions over the Southern part of the basin (consistent with a deficit of NAO – occurrences) despite the increased occurrence of NAO + is less visible (less consistency of the negative anomaly).

For T2m : Some consistent signal (warmer than normal) mostly over regions with consistent Above normal conditions in Z500; especially a large portion of Europe and Asia, the Subtropical part of the Indian Ocean, the regions in the vicinity of the Maritime Continent and the Warm Pool and a large part of Australia.

For precipitation : Some consistent signal : Drier than normal over part of South and Eastern Africa, South-East Asia (especially along the Eastern coast). Wetter than normal over North-Eastern Siberia and West Canada, in the Warm Pool and along the SCPZ regions and the Southern Sub-Tropical Indian Ocean.

II.7. "EXTREME" SCENARIOS

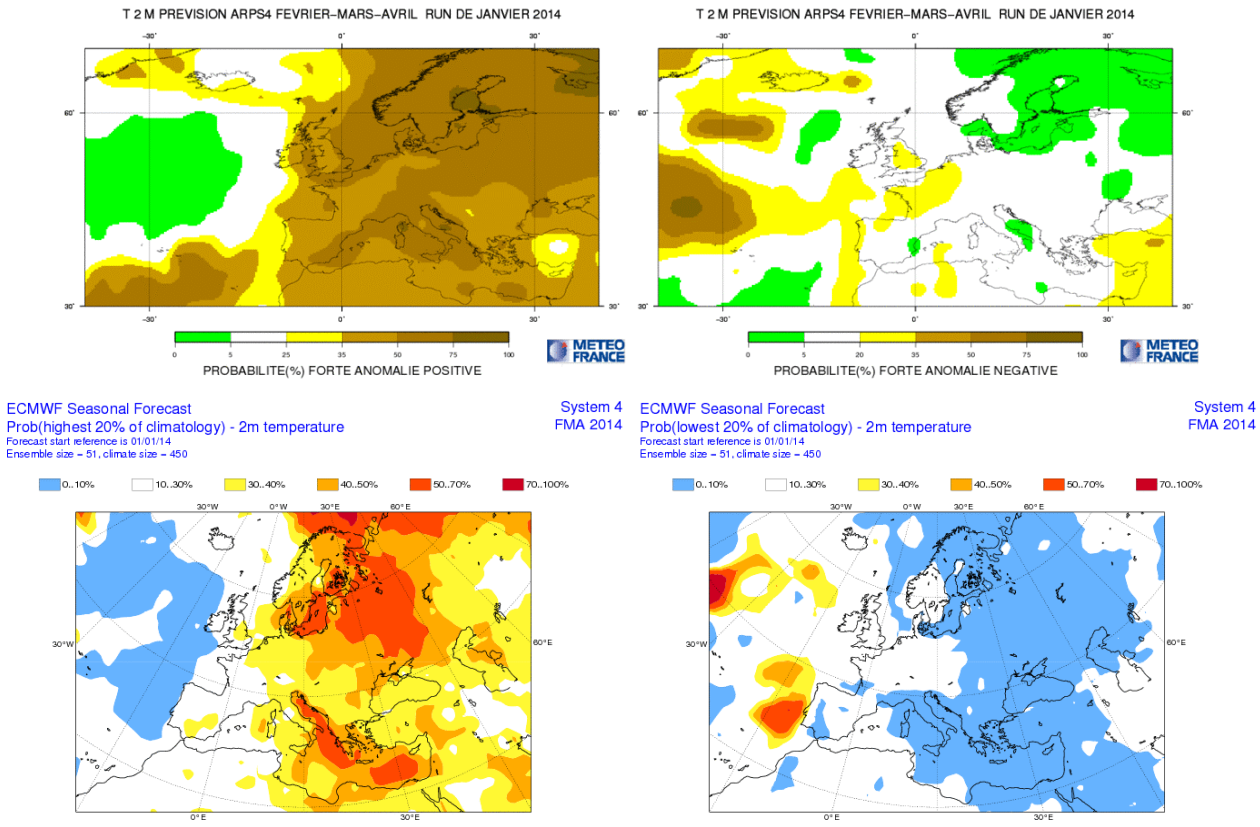


fig.38: Top : Probability of « extreme » above normal conditions from T2m for Meteo-France (left - highest ~15% of the distribution and right lowest ~15% of the distribution)
Bottom : idem from ECMWF (left - highest 20% of the distribution and right lowest 20% of the distribution).

Quite consistent signal between MF and ECMWF for both well Above conditions to the exception in ECMWF of the most western façade. In MF, the ROC scores are significant over most of the area to the exception of the Iberic Peninsula and close to Norway.

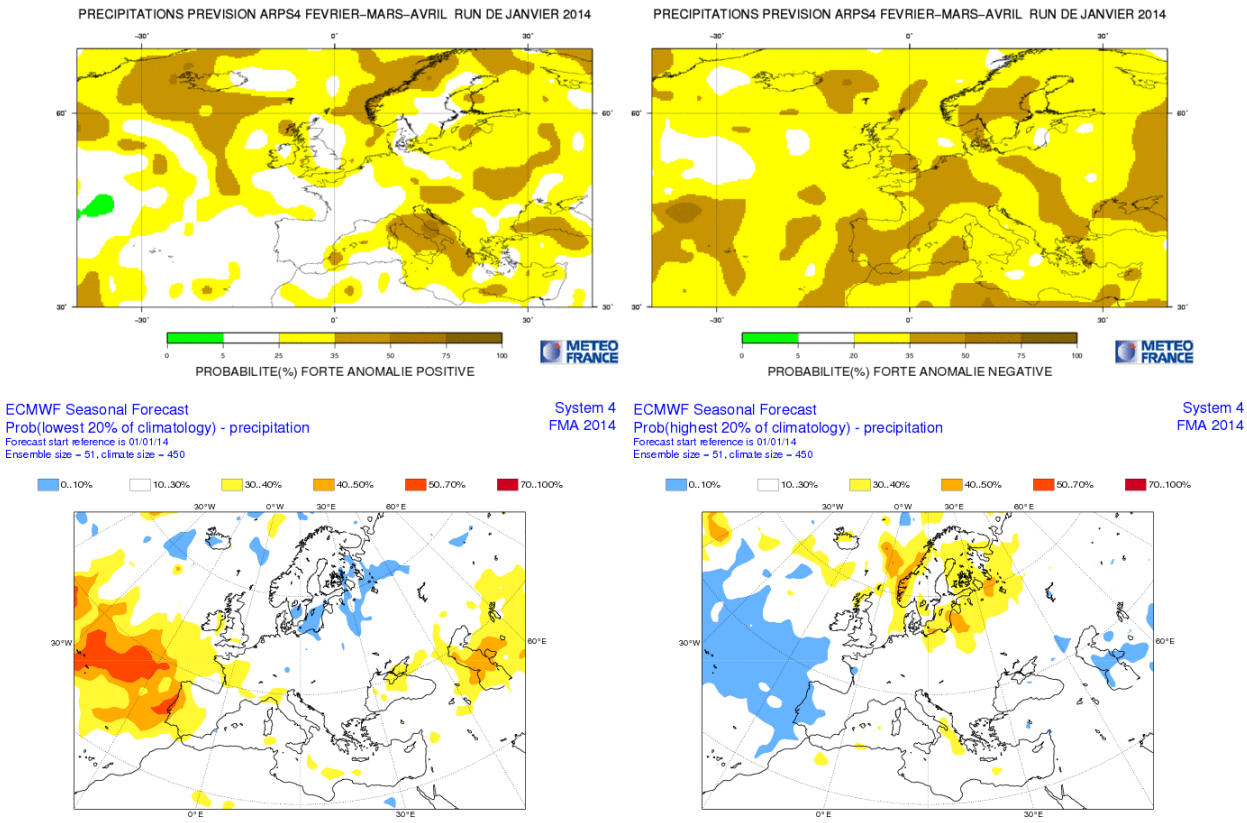


fig.39: Top : Probability of « extreme » above normal conditions for rainfall from Meteo-France (left - highest ~15% of the distribution and right lowest ~15% of the distribution)
Bottom : idem from ECMWF (left - highest 20% of the distribution and right lowest 20% of the distribution).).

Mostly No signal in ECMWF while there are traces of divergent scenarios in MF (enhanced probabilities for both categories over Central and Eastern Europe).
Nevertheless, the increased probabilities for Well Above conditions and close to Spain for Well Below conditions make sense with respect of the general circulation forecast of the 2 models (see geopotential height and circulation regimes discussion).
Note that there is little skill in MF ; only over some grid points (so likely only by chance).

II.8. DISCUSSION AND SUMMARY

Forecast over Europe

For this forecast the Pacific oceanic forcing remains quite low to the exception of the vicinity of the warm pool. However, the **current predictability** seems to be **reasonably good in the Tropics** (especially over the Pacific and Atlantic) **and the sub-tropics** to some extent. There is more uncertainty over the Indian Ocean (but good consistency for the Southern sub-tropics). **For Europe** there is a quite consistent signal in the General Circulation forecasts despite teleconnection patterns are not so evident. One could infer some weak but existing predictability at least for the General Circulation over the Atlantic which should lead to an **increased zonal circulation** across the Atlantic. But the impact in term of Temperature and Rainfall is more difficult to infer because of the model uncertainty and the mix between Winter and Spring (differences in term of location of the main anomalies and impacts of circulation regimes different at Spring vs Winter).
In such a context, the EuroSIP forecasts are likely a good synthesis of possible scenarios over European regions. **For rainfall, "No Privileged Scenario"** covers most of the European continent to the exception of **the most South West** and **most North West regions** where respectively Drier/Wetter than normal conditions could be privileged. **For temperature** : the **Above Normal scenario** could make sense for most of **Central and Eastern Europe**. There is more uncertainty over the Atlantic façade of Europe.
Obviously, some downscaled information could detail these scenarios for specific countries or sub-regions.

Tropical Cyclone activity

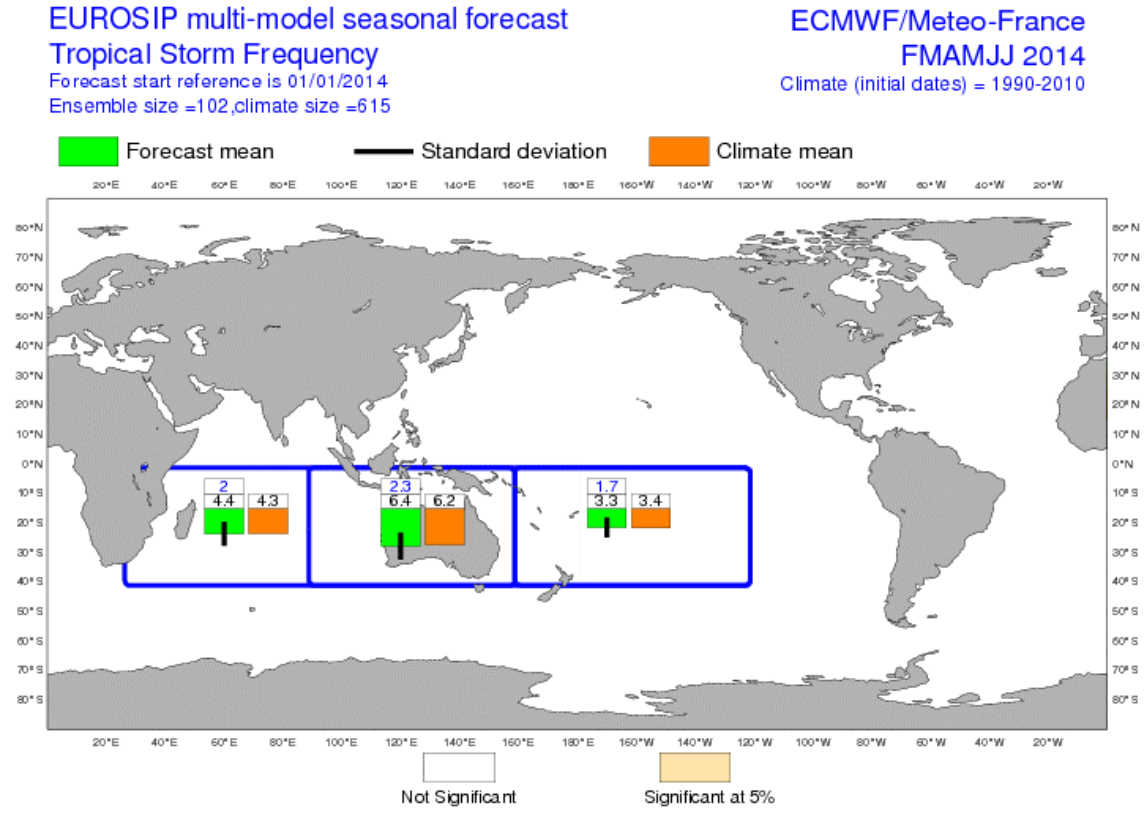


fig.40: Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro/eurosip_tropical_storm_frequency/

For the Tropical Cyclone season, Euro-Sip forecasts indicate close to normal Topical Cyclone activity elsewhere.

WMO RA VI
Pilot RCC-Network

Synthesis of Temperature forecasts for February-March-April 2014 for European regions

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

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

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

WMO RA VI
Pilot RCC-Network

Synthesis of Rainfall forecasts for February-March-April 2014 for European regions

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

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

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

III. ANNEX

III.1. SEASONAL FORECASTS

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

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

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

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

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

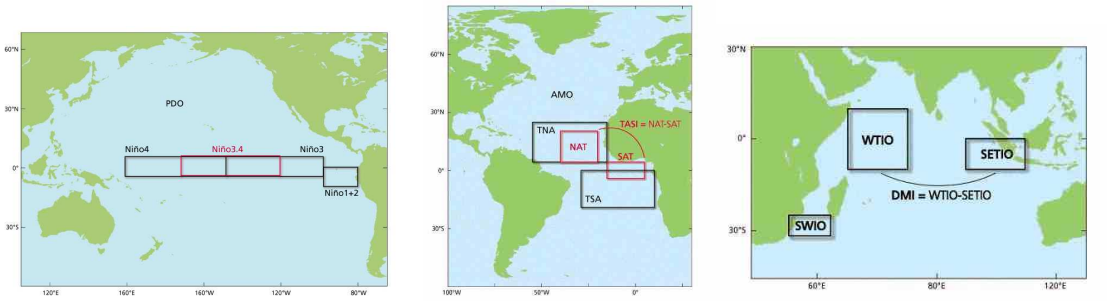
El Niño and La Niña events primarily affect tropical regions and are monitored by following the SST evolution in specific area of the equatorial Pacific.

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

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

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

Oceanic boxes used in this bulletin :



III.3.LAND BOXES

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