GLOBAL CLIMATE BULLETIN
n°177 - MARCH 2014

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I. DESCRIPTION OF THE CLIMATE SYSTEM (JANUARY 2014)

I.1. OCEANIC ANALYSIS

I.1.a Global Analysis

At the Surface (fig. 1) :

Some little evolutions in the equatorial waveguides ; a weakening of the anomalies in the Pacific and a strengthening in the Guinean Gulf. In the tropics, some cooling in Tropical North Atlantic and South-East Pacific.

In the mid latitudes of the Northern hemisphere little evolution across the Pacific and some cooling across the Atlantic.

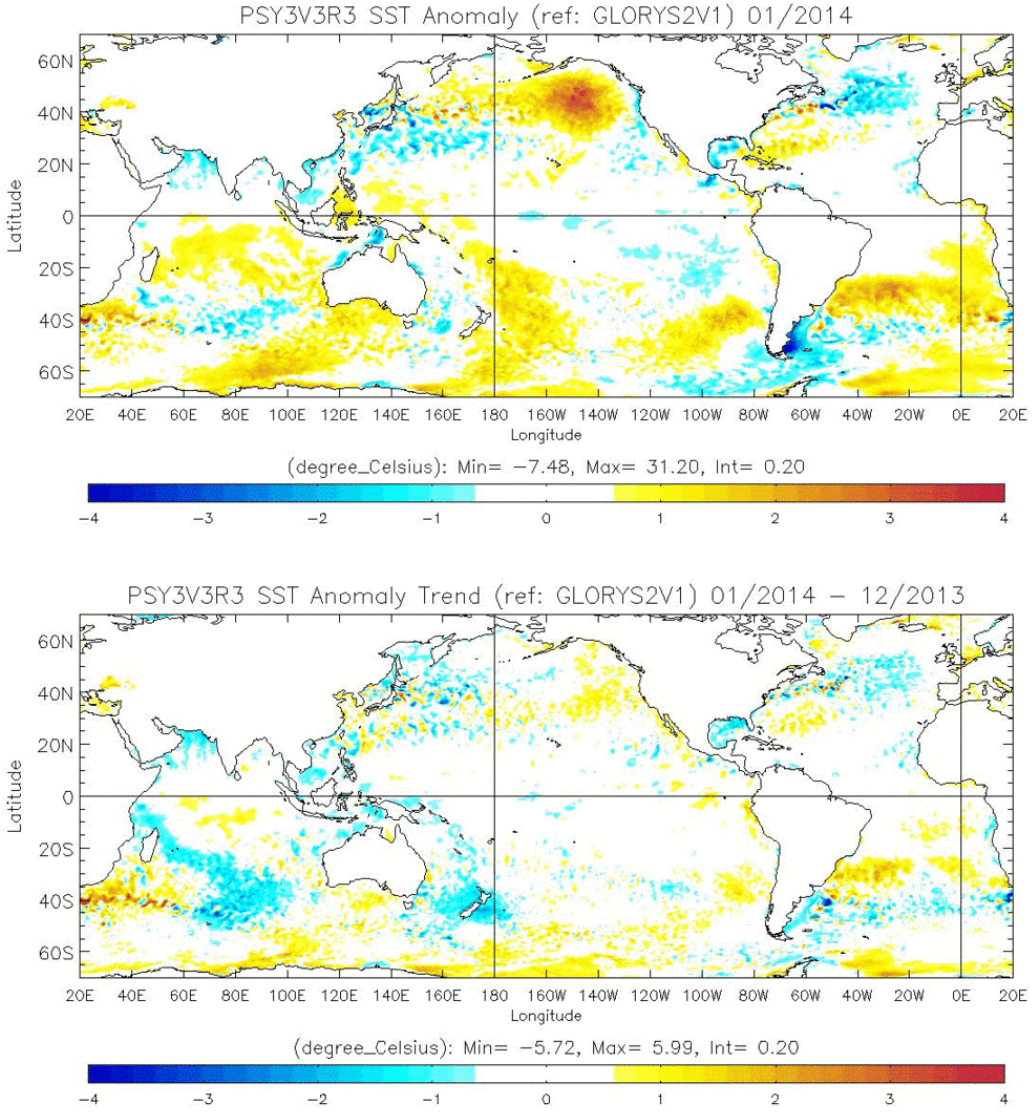


fig.1: top : SSTs Anomalies (°C) (reference Glorys 1993-2009); bottom : SST tendency (current – previous month) http://bcg.mercator-ocean.fr/

In subsurface (fig.2) :

In the Pacific : in the equatorial band (10°N-10°S), strengthening of the heat content anomalies contrast between West and East (mostly positive West to the dateline and negative over the Eastern part). Persistent strong positive anomalies in the Western part off equator (in the Northern hemisphere between 10°N and 20°N) consistently with the surface signal above the warm pool. In the SPCZ region slight positive anomaly which extends South-East toward mid-latitudes.

In the Atlantic : in the equatorial waveguide little anomalies to the exception of a negative anomaly in the Guinean Gulf. Persistence of slight and fragmented anomalies in the tropical part (Northern and Southern tropics).

In the Indian Ocean : Little anomalies in the equatorial waveguide signal. In most of the Southern part of the basin mostly warmer than normal conditions consistently with SSTs.

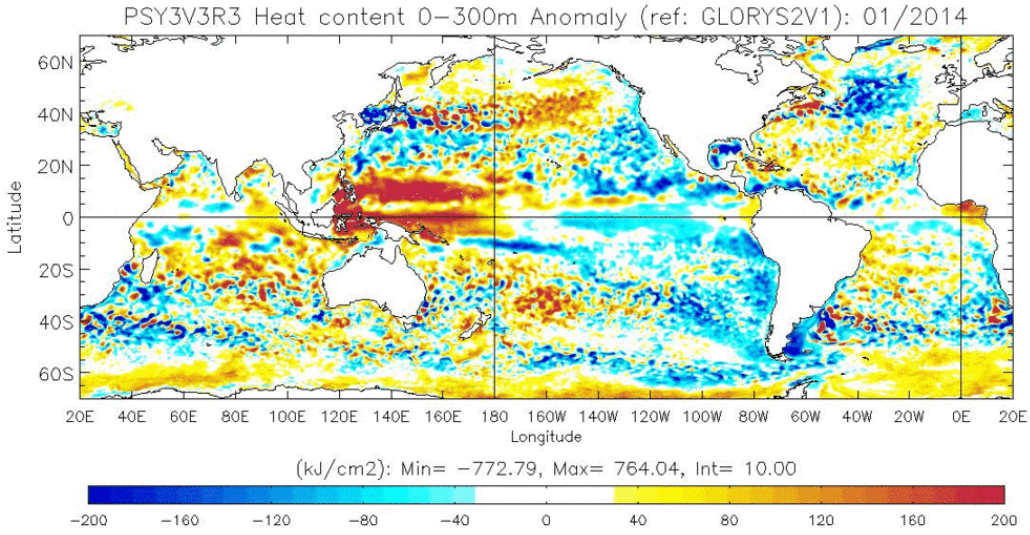


fig.2: map of Heat Content Anomalies (first 300m) (in kJ/cm^2). (reference Glorys 1992-2009)
http://bcg.mercator-ocean.fr/

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

A dipole like pattern between the Western and Eastern part of the basin consistently with the sub-surface signal. Note the Westward extension of the negative anomaly, and the trade wind anomalies in the western part of the basin which seems to be consistent with a Large Scale convection displacement closer to the dateline. This is quite consistent with a positive SOI (+1.4)

In the Niño boxes (4, 3.4, 3 et 1+2 ; see definition in Annex) the monthly averages are respectively -0.2°C, -0.5°C, -0.4°C to 0.3°C from West to East. In the Eastern equatorial Pacific, warmer than normal anomaly is likely due to the arrival of the warm sub-surface signal at the surface.

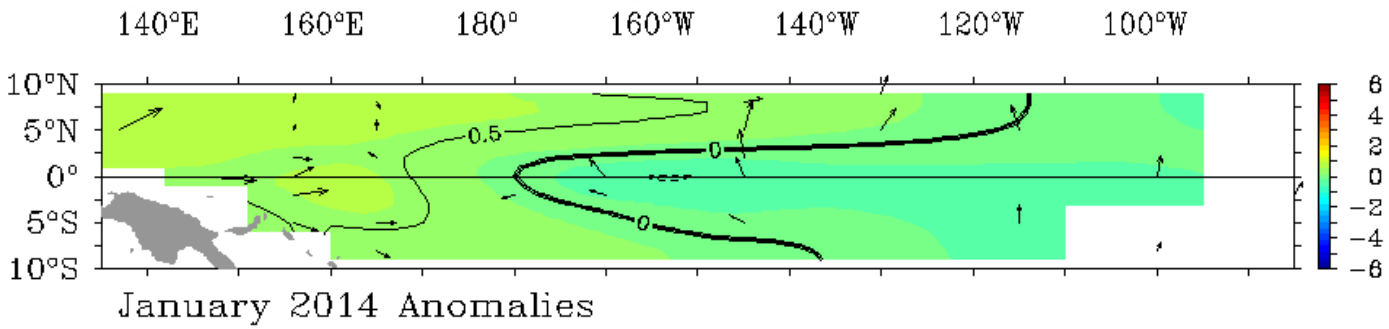


fig.3: SST and Wind anomalies over the Equatorial Pacific from TAO/TRITON.
http://www.pmel.noaa.gov/tao/jsdisplay/monthly-summary/monthly-summary.html

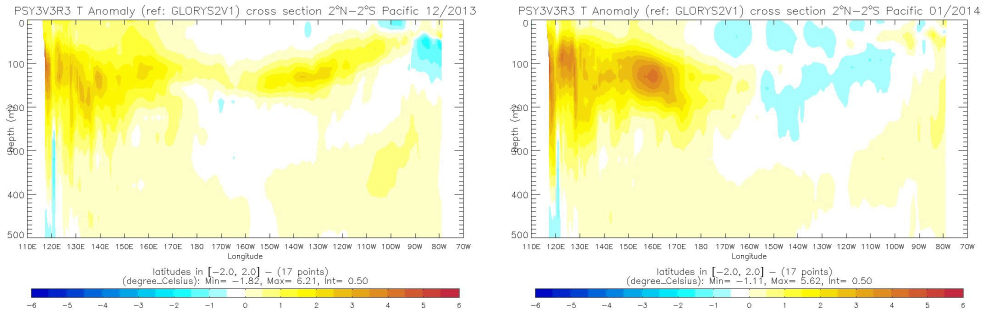


fig.4: Oceanic temperature anomaly in the first *500 metres* in the Equatorial Pacific, in previous month (left) and current month (right) http://bcg.mercator-ocean.fr/

In the equatorial waveguide (fig. 4) : still traces of propagation of Kelvin waves under the surface (fig.I.1.5). The warm reservoir dramatically increased in subsurface (Western part, around immersion 150m) and also the negative anomaly in the Central/Eastern part. It could be indicative of a strengthening of the ocean/atmosphere coupling.
The thermocline structure (fig. 5) : Traces of the growing phase of the warm reservoir and possibly of the start of a wave propagation of positive anomalies in the Western part.

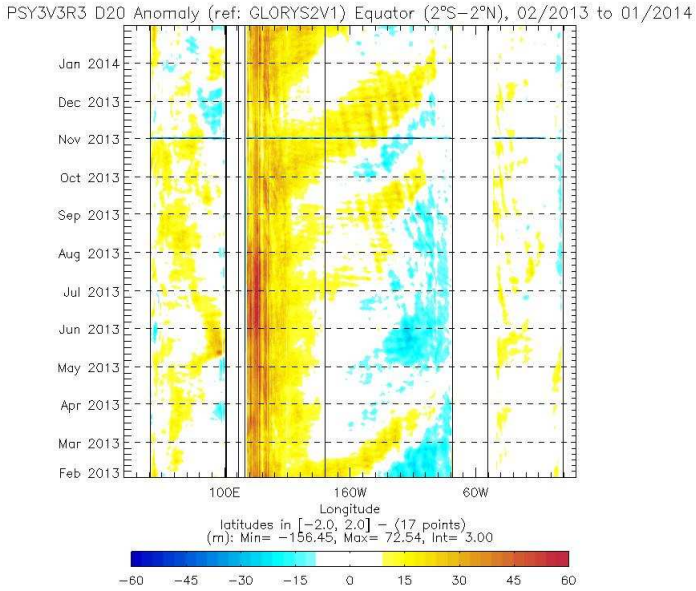


fig.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 24 month period. http://bcg.mercator-ocean.fr/

I.1.c Atlantic Basin

Northern Tropical Atlantic : slightly cooler than normal.
Equatorial waveguide : mostly cooler than normal especially in the Guinean Gulf (development of a negative anomaly).
The Southern Tropical Atlantic : slightly cooler than normal to the exception of the regions close to the African continent (close to Namibia/Angola).
The TASI index is now slightly negative and seems to decrease.

I.1.d Indian Basin

Southern Tropical Indian Ocean : warmer than normal over most of the basin.
Equatorial waveguide : close to normal conditions, the DMI is close to 0 (sligthly negative).

Northern Tropical Indian Ocean : little anomalies, some traces of negative anomaly close to the Arabic Peninsula.

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) : A quasi 3 wavenumber pattern on the equator. The MJO Index is significant and the phase is over the Western Pacific ; it is more in relationship with a strong large scale convection over the Western Pacific rather than with a "pure" MJO acvtivity.

On the Pacific : Strong Divergent circulation anomaly (upward anomaly motion) west to the dateline (likely related to the persistence of the SST forcing over the warm pool). Over the Central and Eastern Pacific some weak but discernable Convergent/Divergent cells linked with the sub-tropics (South/North).
On the Atlantic : Convergent circulation anomaly (downward anomaly motion) over the Southern Tropics/Sub-tropics and Divergent circulation anomaly over the Northern Tropics. To be quoted the strong convergent circulation anomaly over the West Africa. In relationship with these anomalies, there are convergent circulation anomalies over the North East coastal areas of South America and the North-Western Tropical Atlantic. There is a Divergent circulation anomaly which extends from Equatorial Africa up to Madagascar. Most of these patterns could be dynamically forced.
On the Indian Ocean : Convergent circulation anomalies (downward anomaly motion) over most of the basin. to the exception of the vicinity of Madagascar (see Above).

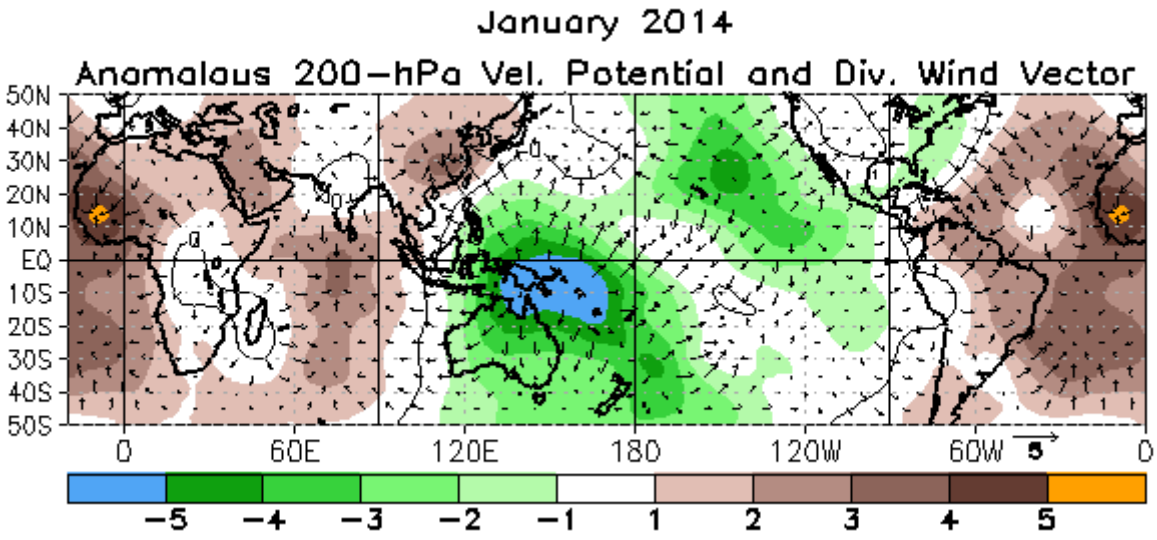


fig.6: Velocity Potential Anomalies at 200 hPa and associated divergent circulation. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly). http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

Stream Function anomalies in the high troposphere (fig. 7 – insight into teleconnection patterns tropically forced) : on average weak signal in the inter-tropical band to the exception of the latitudes from East Pacific to West Atlantic. In general, anomalies are possibly related to Mid/High-Latitude activity which are then influenced by the Tropics. There is some traces of possible tropical influence (especially the Tropical influence forcing the location of the cells related to the Mid-High latitudes activity).

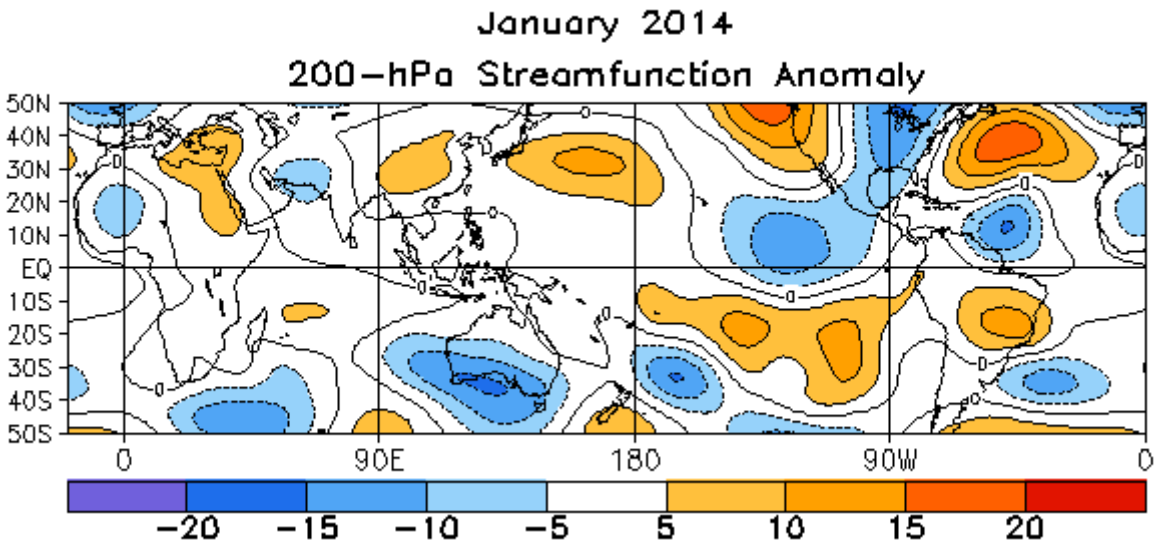


fig.7: Stream Function Anomalies at 200 hPa.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

Geopotential height at 500 hPa (fig. 8 – insight into mid-latitude general circulation) : Consistently with the previous analysis, some weak anomalies coming from the Tropics. Some anomalies observed in the mid/high latitudes of the North Pacific (East and West), across the Atlantic and Central Europe.
The atmospheric modes are quite active ; main active modes are found everywhere ; the Pacific with East-North Pacific (1.0), the Atlantic with EA (+1.4), over Europe with the Scandinavian mode (+17) and the WR/EA (-1.3) ; more global the TNH (+1.6) and to some extent the Polar-Eurasian mode (-0.8)

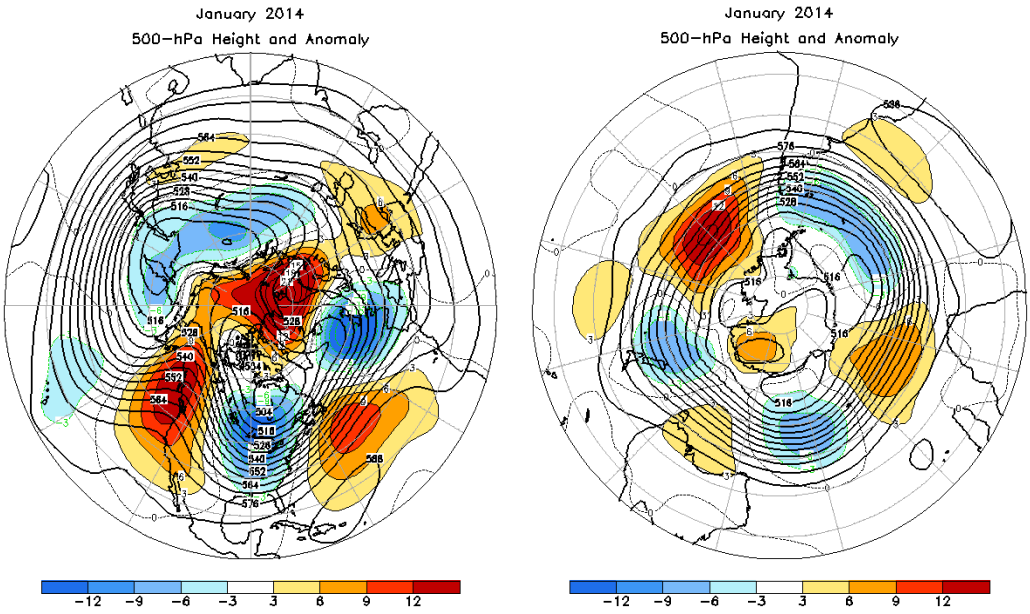


fig.8: Anomalies of Geopotential height at 500hPa (left North Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige9.shtml, and right South Hemisphere http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/fige15.shtml)

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
JAN 14	**-0.2**	**1.4**	**0.5**	**1.1**	**0.6**	**1.6**	**-1.3**	**1.7**	**-0.8**
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

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

I.2.b Precipitation

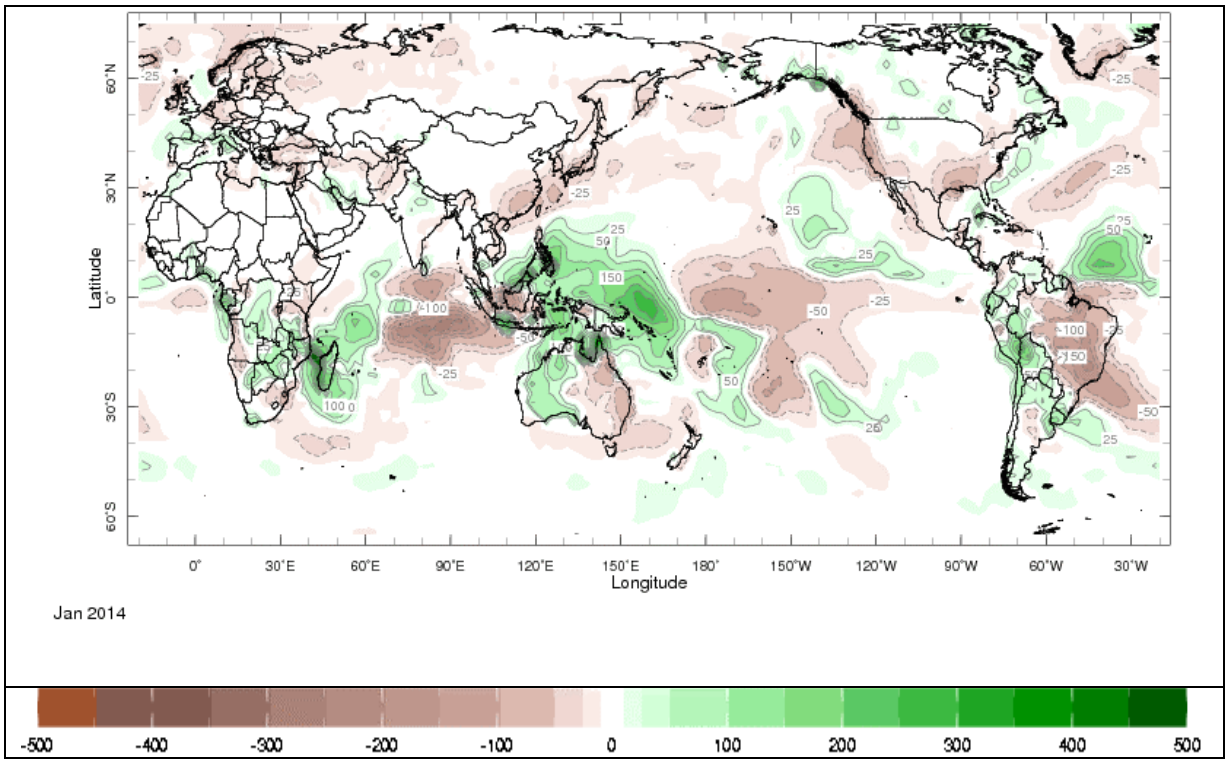


fig.9: Rainfall Anomalies (in mm) (departure to the 1979-2000 normal) – Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/

Intertropical zones (including sub-tropics) : good consistency with the Velocity Potential anomalies, especialy over the Indian Ocean (globally -), Western Pacific (+), Central Pacific (-). Good consistency on South America, with the East-West contrast in precipitation and in velocity potential. (between Brazil abd Bolivia). Also over the South-African regions, especially in the vicinity of Madagascar
Mid-latitudes : mostly drier than normal over Northern Europe and Eurasia. Drier than normal over the western coast of the North-American continent

I.2.cTemperature

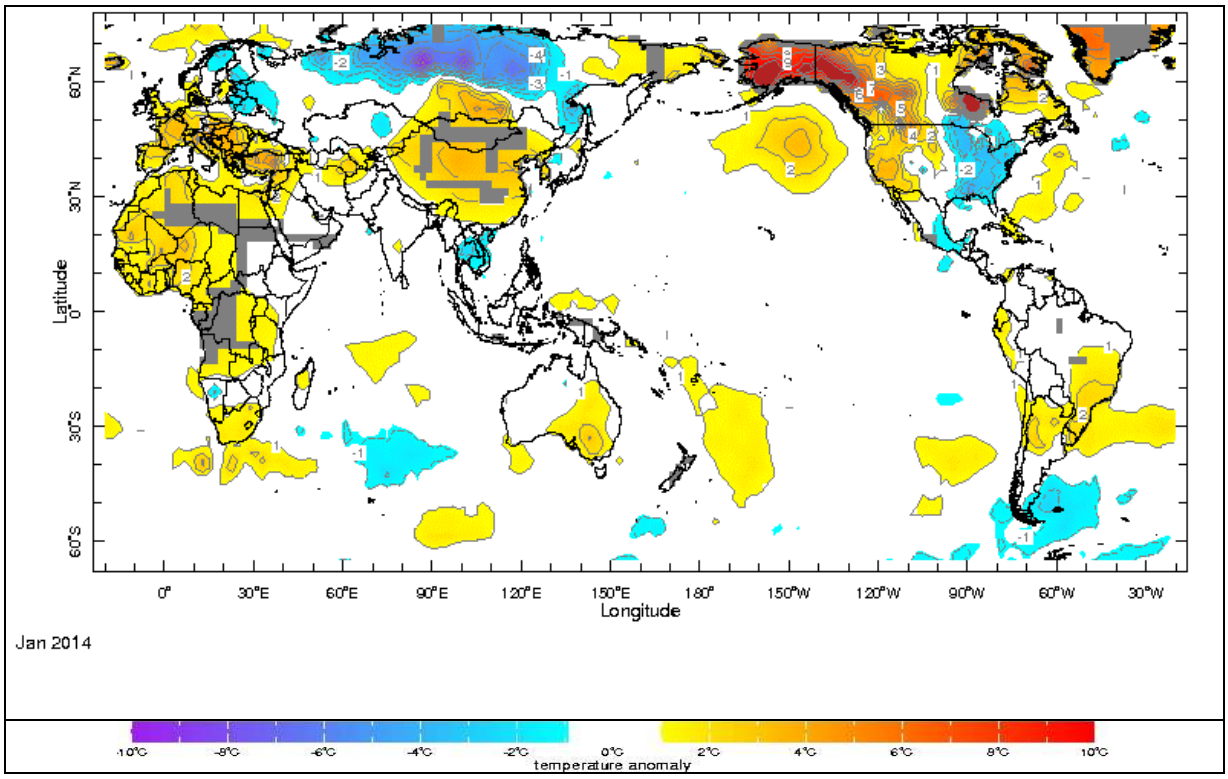


fig.10: Temperature Anomalies (in °C) (departure to the 1979-2000 normal)
http://iridl.ldeo.columbia.edu/maproom/.Global/.Atm_Temp/Anomaly.html

Strong warm anomalies over Alaska and West Canada consistently with the Z500 anomaly.
Mostly Warmer than normal conditions over Europe (consistent with positive EA indice) and Eurasia.
Also warmer than normal conditions over China, Mongolia and the Southern part of Siberia.
Negative anomaly over Eastern US and Northern Siberia.

I.2.d Sea Ice

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

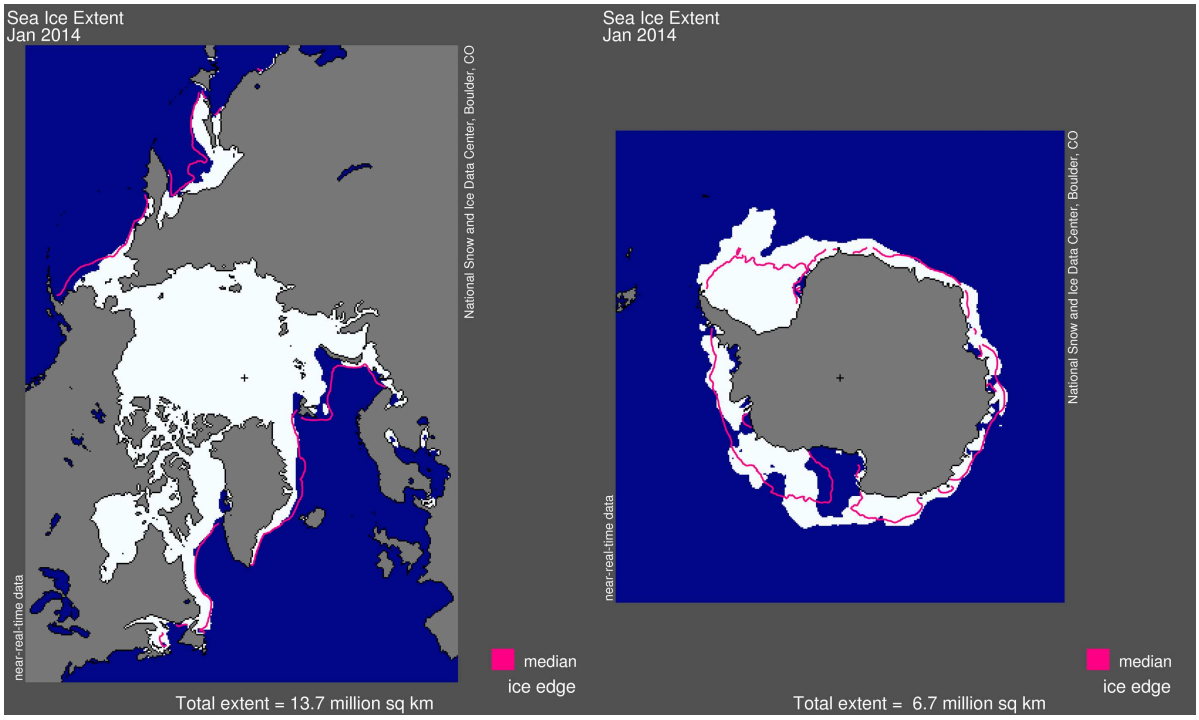


fig.11: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

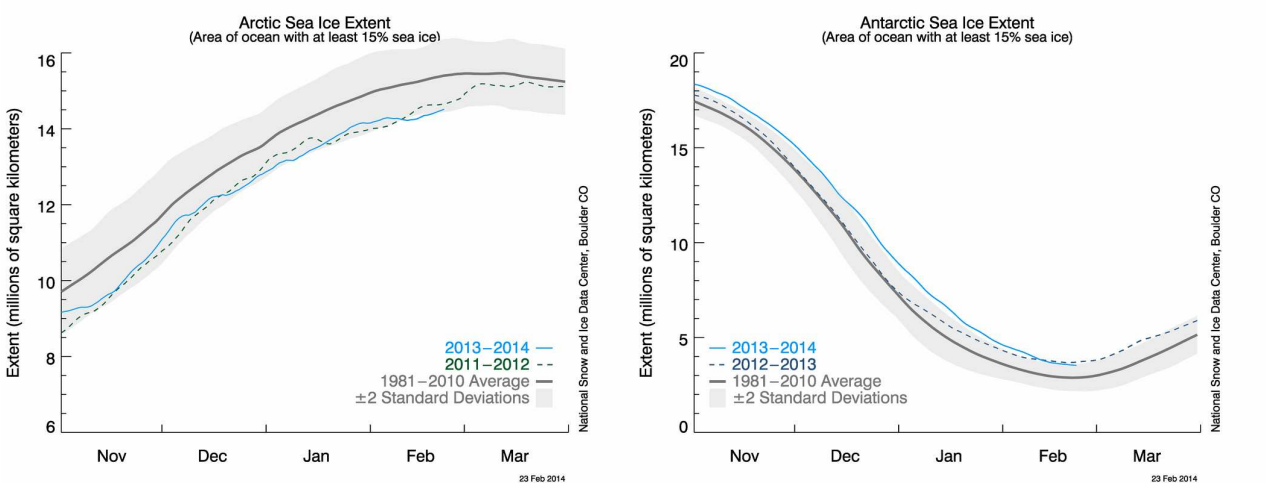


fig. 9bis : Sea-Ice extension evolution from NSIDC
http://nsidc.org/data/seaice_index/images/daily_images/N_stddev_timeseries.png

II. SEASONAL FORECASTS FOR MAM FROM DYNAMICAL MODELS

II.1. OCEANIC FORECASTS

II.1.a Sea Surface Temperature (SST)

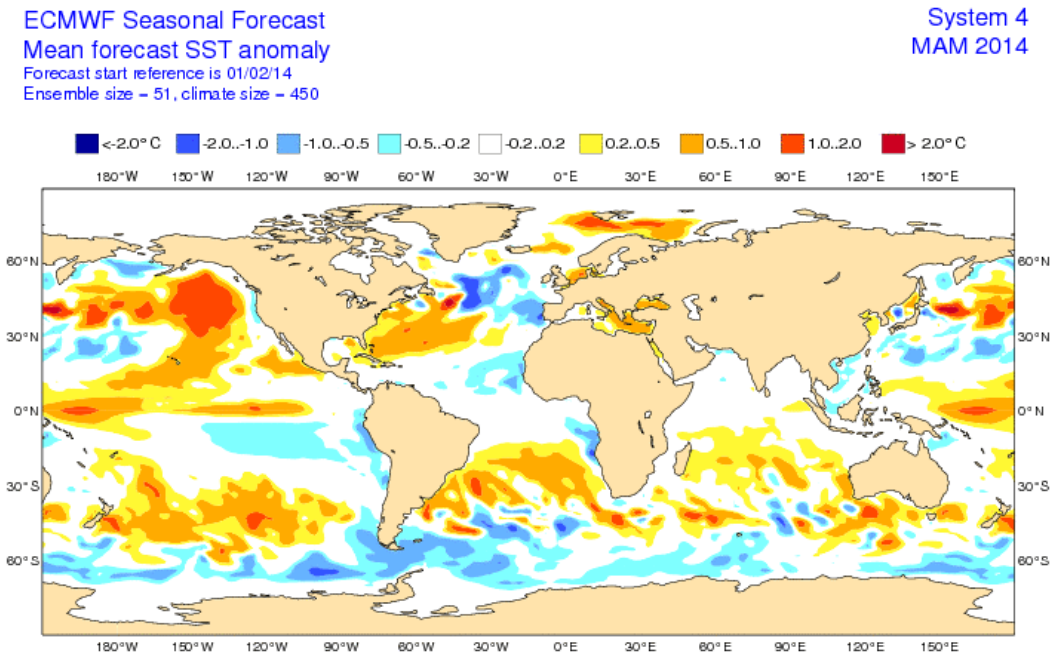


fig.12: SST anomaly forecast (in °C) from ECMWF.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

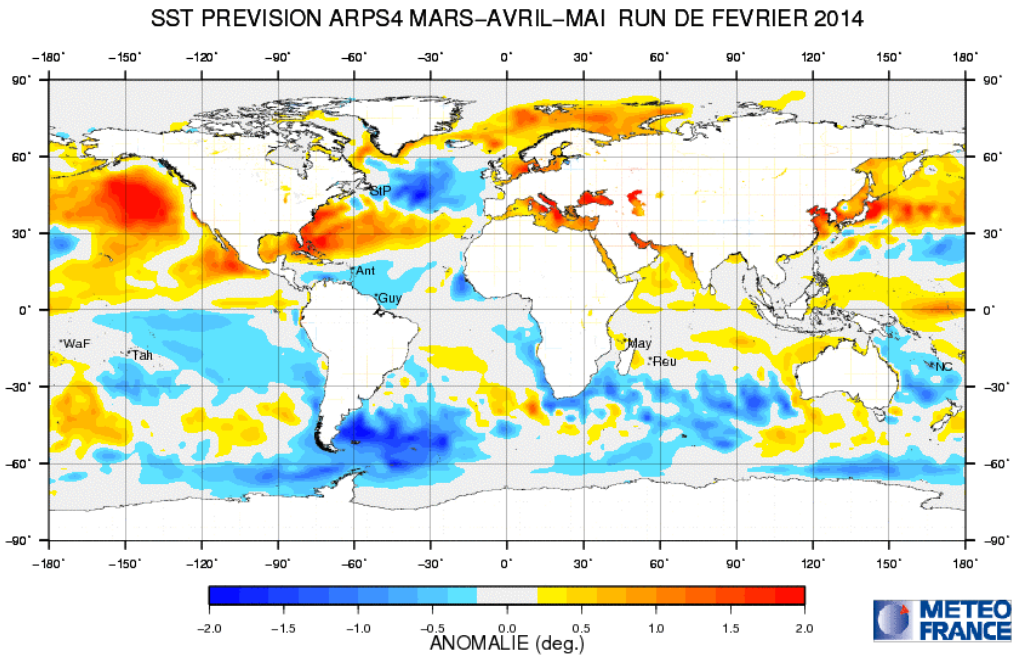


fig.13: SST Anomaly forecast (in°C - recalibrated with respect of observation) from Météo-France.
http://elaboration.seasonal.meteo.fr/

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), some consitent SST forecasts (taking into account the hindcast period differences), especially over the Northern Hemisphere.
Pacific : Still positive anomaly over warm pool extending toward the dateline. Consistent signal in both models for continuing neutral anomalies over central equatorial waveguide despite some extension of the warm signal along the equator. Still negative anomalies in the South-Eastern Tropics.
Atlantic : equatorial waveguide close to neutral in both models. Great consistency for positive anomalies in the Northern hemisphere on the western side extending to East (from Caribbean region to West of Iberian peninsula). Colder than normal conditions in the mid-latitudes likely related to a strengthenned zonal circulation.
Indian Ocean : less consistency in the two models. IOD close to zero. Warmer than normal conditions in the Southern Sub-Tropics (persistent signal) in ECMWf while MF is closer to neutral

In Euro-SIP :
Some robust patterns appear in the tropics everywhere to the exception of the Indian Ocean.
Pacific : The Western positive anomaly over equatorial waveguide region extending toward the dateline. Quite consistent patterns in the subtropics and the mid-latitudes of both hemispheres.
Atlantic : Weak signal over the Equatorial waveguide. Warmer/Colder than normal conditions in the North Tropical Atlantic are very similar to the ones describe for the two individual models. The Southern sub-tropics are warmer than normal.
Indian Ocean : weak signal over a large portion of the Tropical basin. Warmer than normal conditions on the Southern Sub-Tropics.

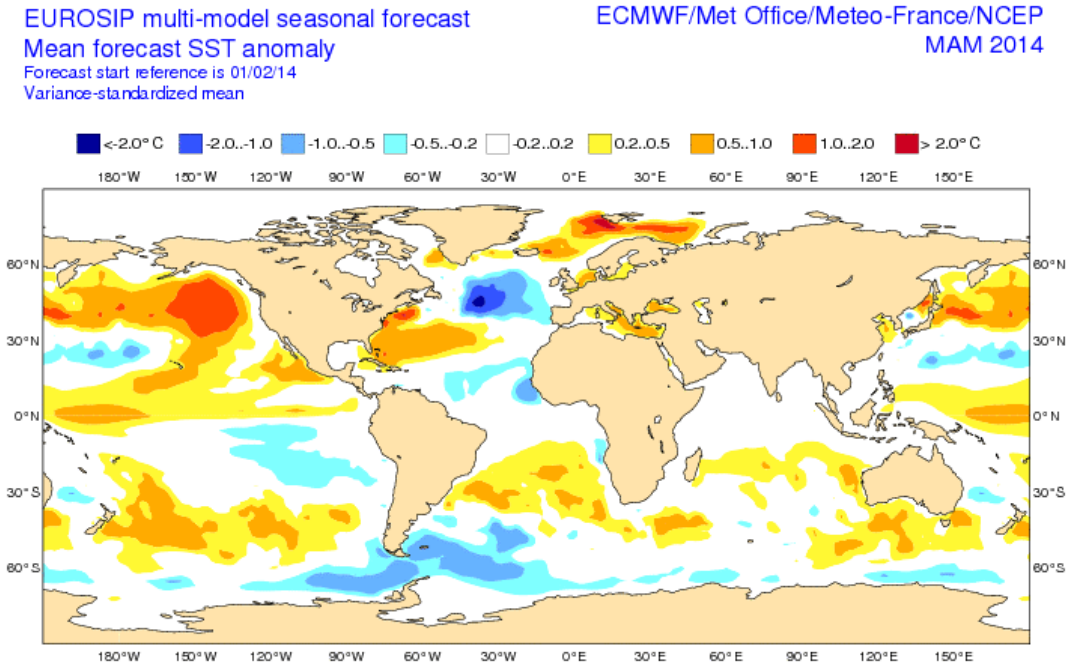


fig.14: SST Forecasted anomaly (in °C) from Euro-SIP. http://www.ecmwf.int/

II.1.b ENSO Forecast :

Forecasted Phase : Neutral, warming tendency on time

For MAM : the majority of the dynamical models stay in the range of neutral conditions for the targeted period (still quite large uncertainty). However, they are mostly indicating a warming on time in the Niño 3.4 area. Some of them are already reaching the Niño threshold.

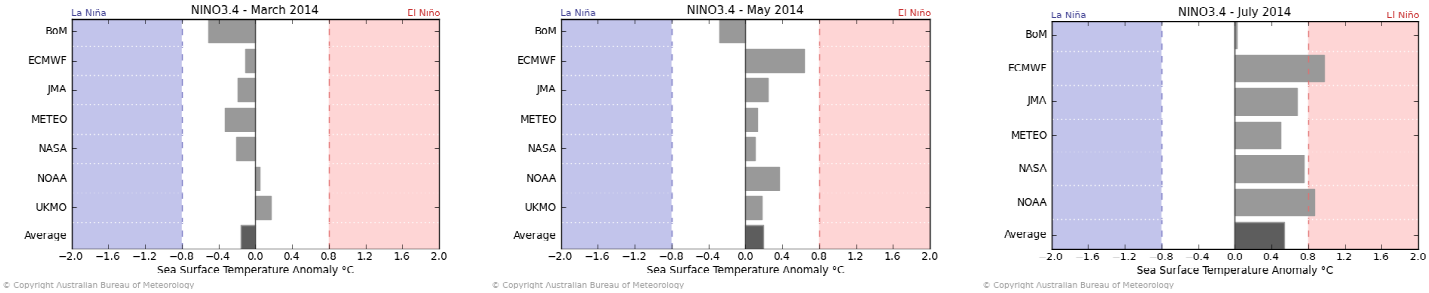
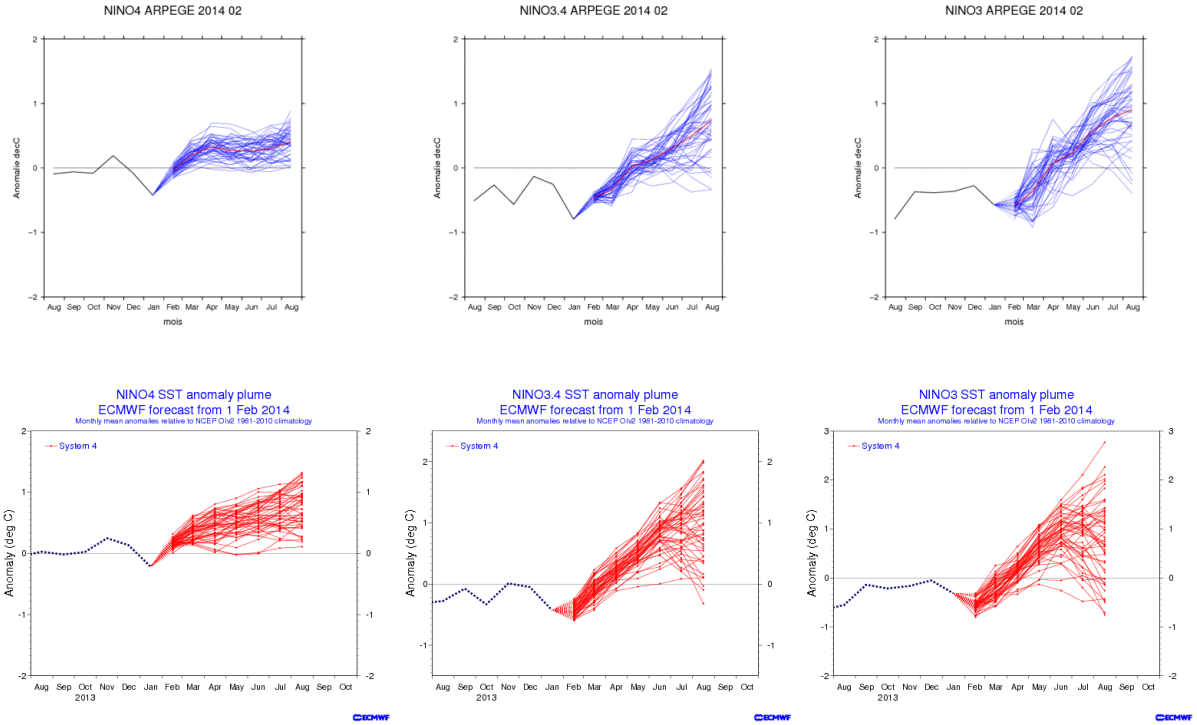


fig.15: Synthesis of Niño 3.4 forecasts from several GPC by BoM :
http://www.bom.gov.au/climate/ahead/model-summary.shtml#tabs=Pacific-Ocean

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 MAM. In both models the warming trend is conspicuous and the uncertainty dramatically increase at the end of Spring / beginning of Summer. In EuroSIP Plumes, close to normal conditions on average and quite large spread indicating a quite large uncertainty. Nevertheless a very weak probability of a negative phase of the ENSO (Niña event).



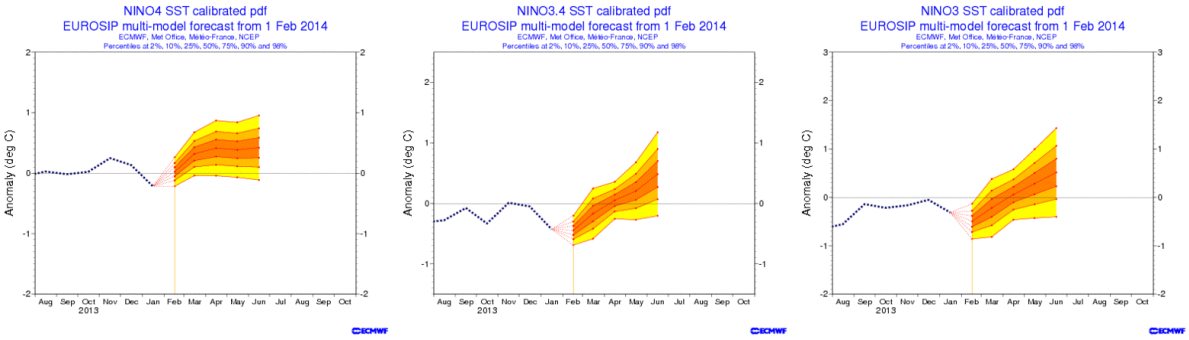


fig.16: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members - and EuroSIP (bottom) – recalibrated distributions.
(http://www.ecmwf.int/)

II.1.c Atlantic Ocean forecasts :

Forecasted Phase: Below Normal evolving close to normal in the Northern and Southern Tropics - TASI close to neutral

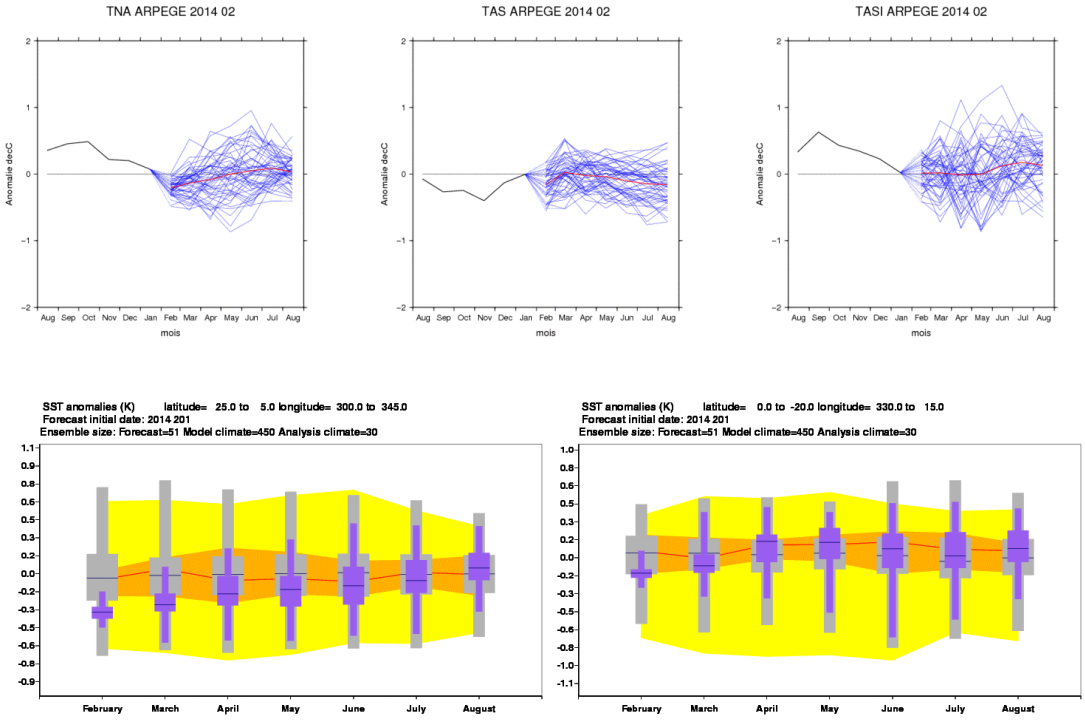


fig.17: SSTs anomaly forecasts in the Atlantic Ocean boxes from Météo-France (top) and ECMWF (bottom), plumes / climagrams correspond to 51 members and monthly means.

Consistent behaviour between the 2 models.
North Tropical Atlantic : Colder than normal conditions in both models with a progressive (weak) warming.
South Tropical Atlantic : Close to neutral conditions in both models.
TASI : the TASI index is close to neutral for MAM for MF. However the spread is large.

II.1.d Indian Ocean forecasts :

Forecasted Phase: West and East positive
IOD close to neutral

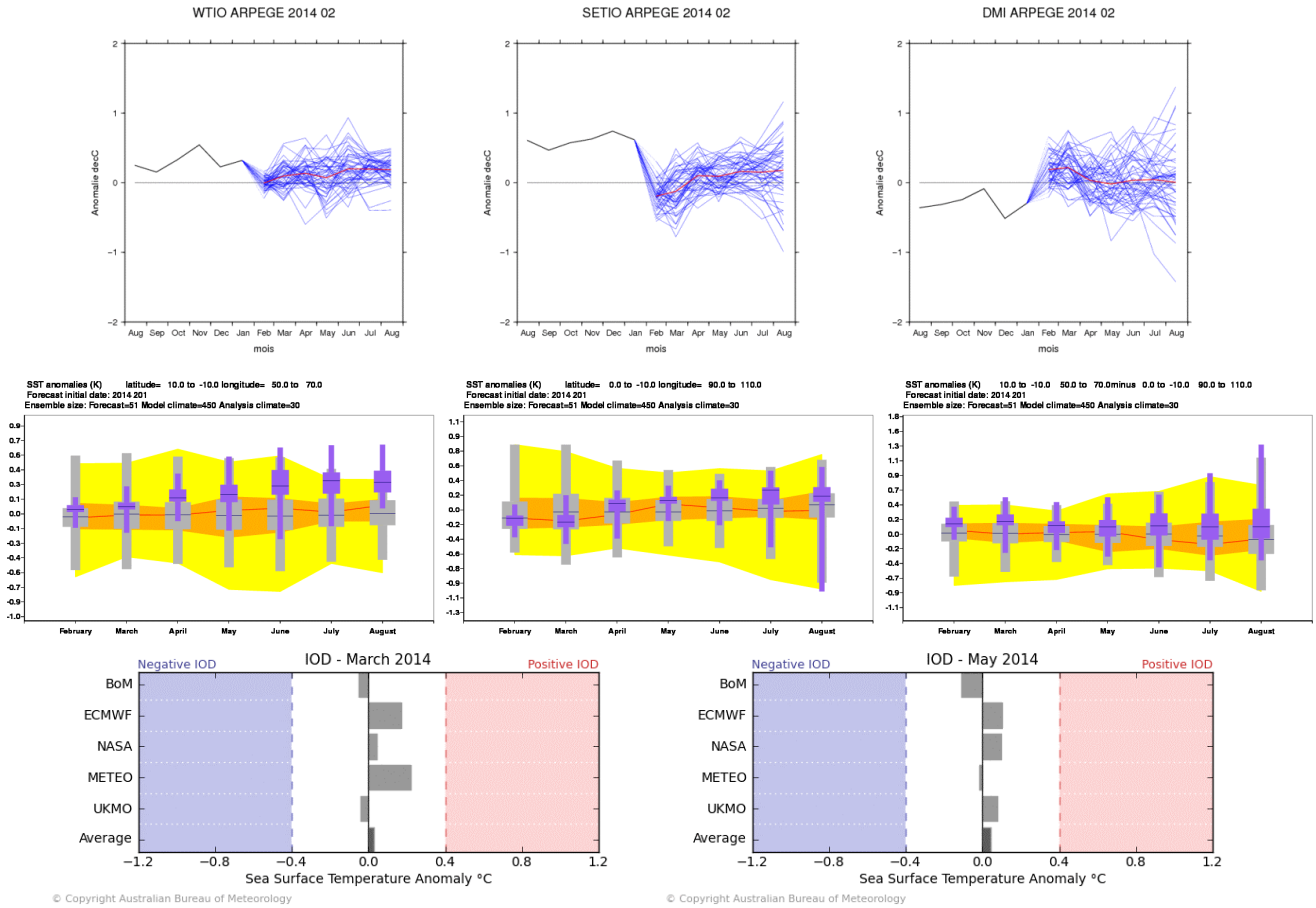


fig.18: SSTs anomaly forecasts in the Indian Ocean boxes from Météo-France (top), ECMWF (middle), plumes / climagrams correspond to 51 members and monthly means. Synthesis for IOD (bottom) for several GPCs from BoM http://www.bom.gov.au/climate/ahead/model-summary.shtml#tabs=Indian-Ocean

Consistent behaviour between the 2 models.
In WTIO : Mostly sligthly warmer than normal with a (weak) warming on time.
In SETIO : both models starting with Below normal conditions and then increase (Above normal). Little spread in ECMWF and larger spread in MF (especially end of Spring).
DMI (IOD) : moving on time closer to neutral in MF and slightly positive in ECMWF

II.2. GENERAL CIRCULATION FORECAST

II.2.a Global Forecast

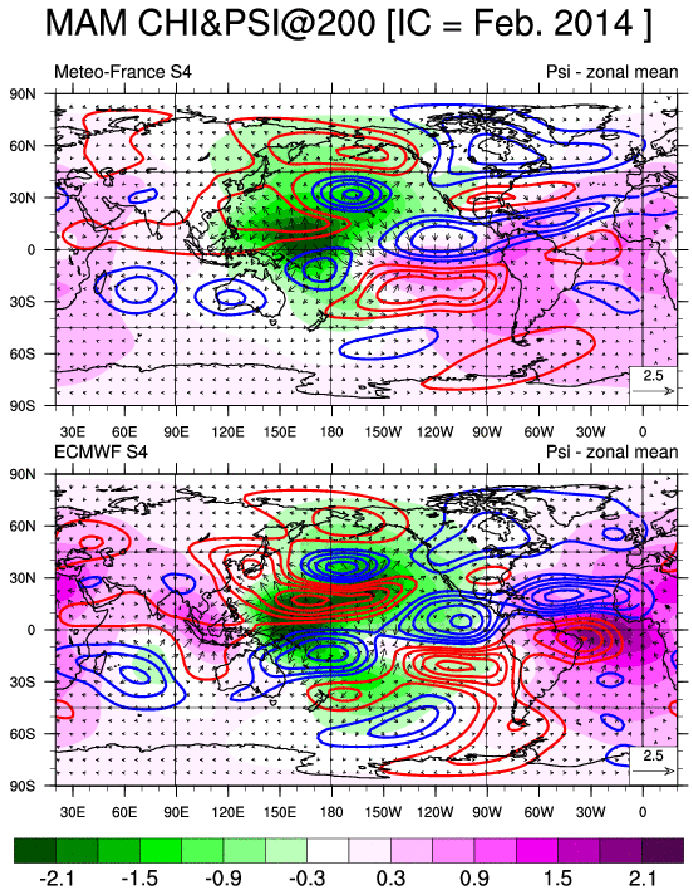


fig.19: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), associated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa by Météo-France (top) and ECMWF (bottom).

Velocity potential anomaly field (cf. fig. 19 – insight into Hadley-Walker circulation anomalies) : in the Tropics, good consistency between the 2 models.

Over the Pacific, good consistency between the 2 models on warm pool, with a strong negative anomaly just west to the dateline and its extension toward Hawaï and along the SCPZ ; The divergent circulation anomaly is quite consistent between the two models despite some differences in term of intensity (atmospheric response more intense in ECMWF. This response is consistent with SST forecast for its Pacific part.

Over the Atlantic, still positive anomalies (Convergent circulation anomaly - downward anomaly motion) in the vicinity of the Equator and over the African continent (West Africa and the Western side of South Africa).

Over the Indian Ocean : A convergent circulation anomaly in ECMWF over the maritime continent and a divergent circulation anomaly over the South-Western part of the basin. Little signal in MF.

To be quoted that the JMA forecast is very similar to the ones discussed for the 2 models.

Stream Function anomaly field (cf. fig. 19 – insight into teleconnection patterns tropically forced) : good consistency in the Tropics and the mid-latitudes despite the difference in term of intensity. The interpretation of these patterns could be related both to the mid-high latitude activity and to some influence of the Tropics onto the mid-latitude circulation. Nevertheless, some difficulties to link the influence with the SST forcing likely in relationship with close to neutral conditions in the Pacific SSTs. The JMA forecast is also quite consistent with ECMWF and MF forecasts even if it seems more influenced by the Mid-Latitude activity.

As a conclusion **the predictability** exists in the vicinity of the Pacific basin. More generally over mid-latitudes regions of the Northern Hemisphere, one could consider that the signal is mostly related to the high/mid latitudes activity but with some influence coming from the Tropics, especially over the Atlantic sector. One can infer only some predictability for the mid-latitude general circulation over the Atlantic.

II.2.b North hemisphere forecast and Europe

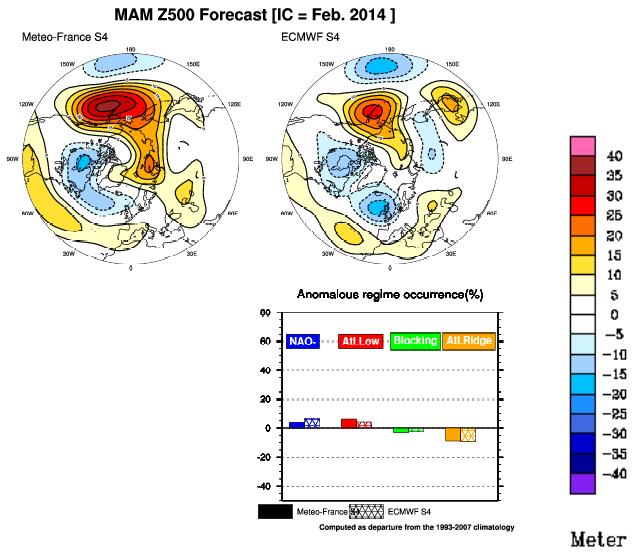


fig.20: Anomalies of Geopotential Height (top) at 500 hPa from Meteo-France (left) and ECMWF (right). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip and North Atlantic Regime occurrence anomalies (bottom) from Météo-France and ECMWF : vertical bars represent the excitation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

Geopotential height anomalies (fig. 20 – insight into mid-latitude general circulation anomalies) :
Over the Pacific : good consistency over most of the basin including the North-American continent. There is clear traces of the mid/high latitudes activity strengthened by the Tropics (especially the strong positive anomaly in the vicinity of the Bering Sea).
Over the Atlantic : a consistent signal for a strengthened zonal circulation across the Atlantic. Over Europe because of the "local" differences (e.g. over the Western part of the Mediterranean basin), models could give different signals in terms of temperature and precipitation.

North Atlantic Circulation Regimes (fig. 20) : As a consequence, consistent signal in the regimes forecast but the anomalies are weak. The only interpretable signal is the deficit of the Atlantic Ridge regimes (consistent with the increased zonal circulation already discussed in the Z500 section).

II.3. IMPACT : TEMPERATURE FORECASTS

II.3.a ECMWF

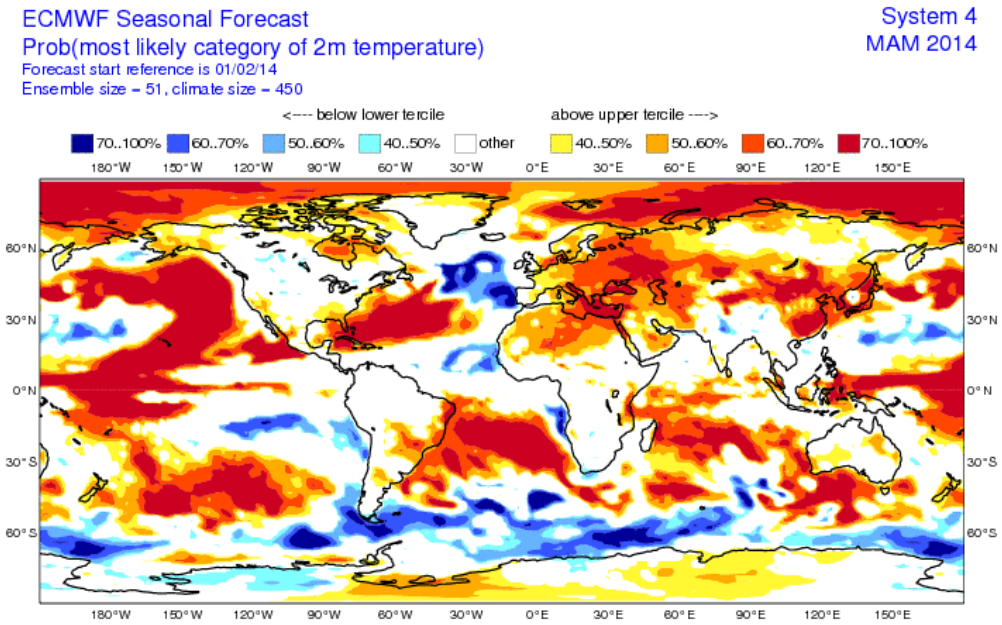


fig.21: Most likely category probability of T2m from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.3.b Météo-France

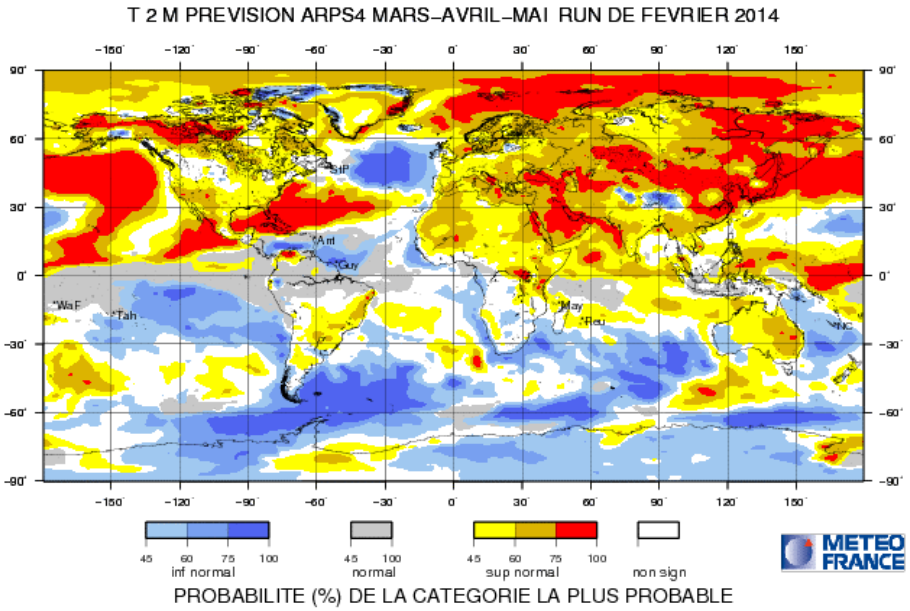


fig.22: Most likely category of T2m from Meteo-France. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.3.c Met Office (UKMO)

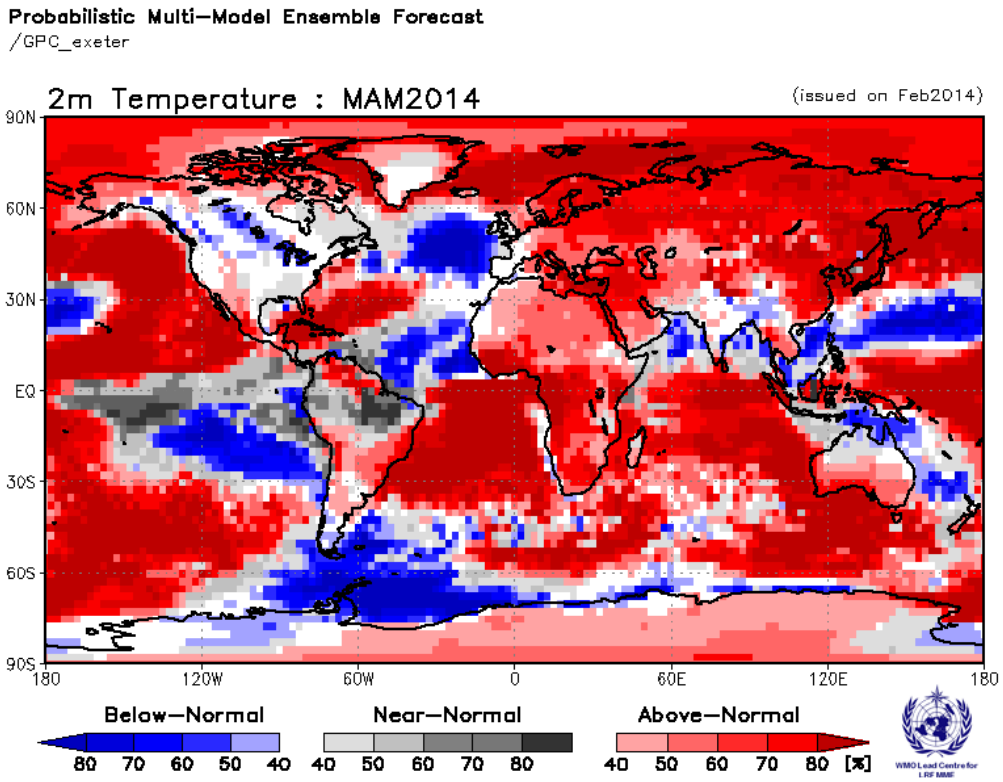


fig.23: **Most likely category of T2m Anomaly from UK Met Office.** **https://www.wmolc.org/**

II.3.d Climate Prediction Centre (CPC)

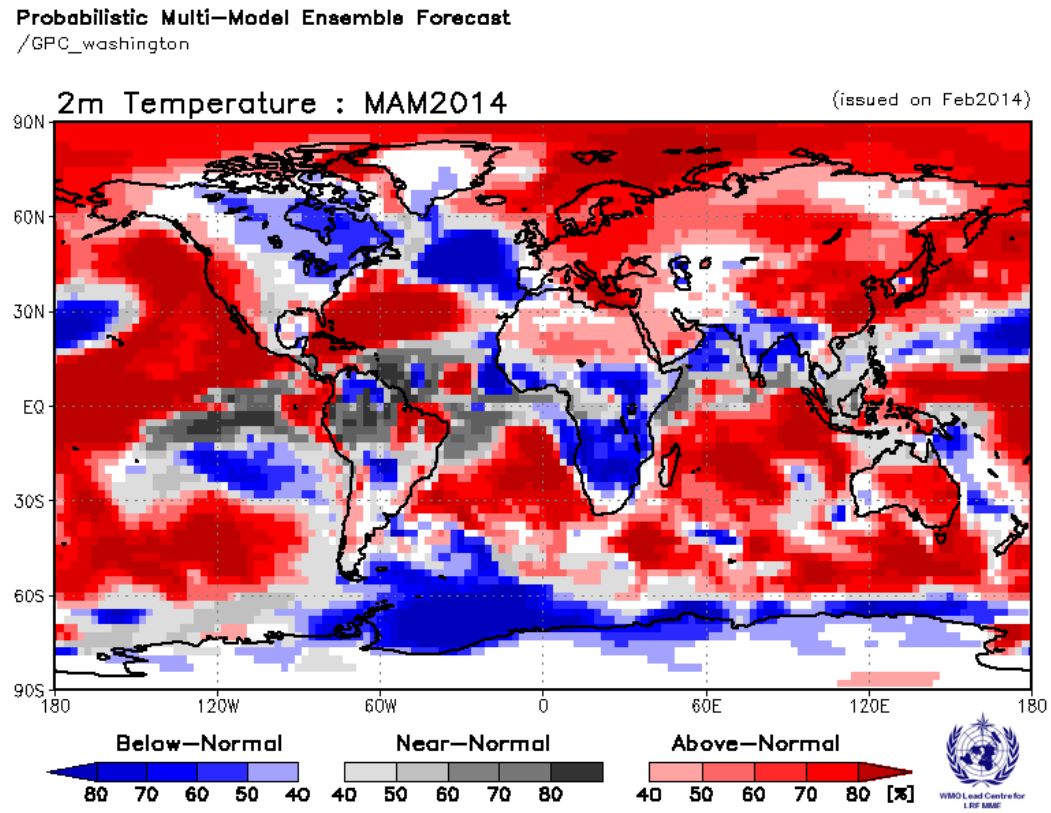


fig.24: **Most likely category of T2m Anomaly from CPC.** **https://www.wmolc.org/**

II.3.e Japan Meteorological Agency (JMA)

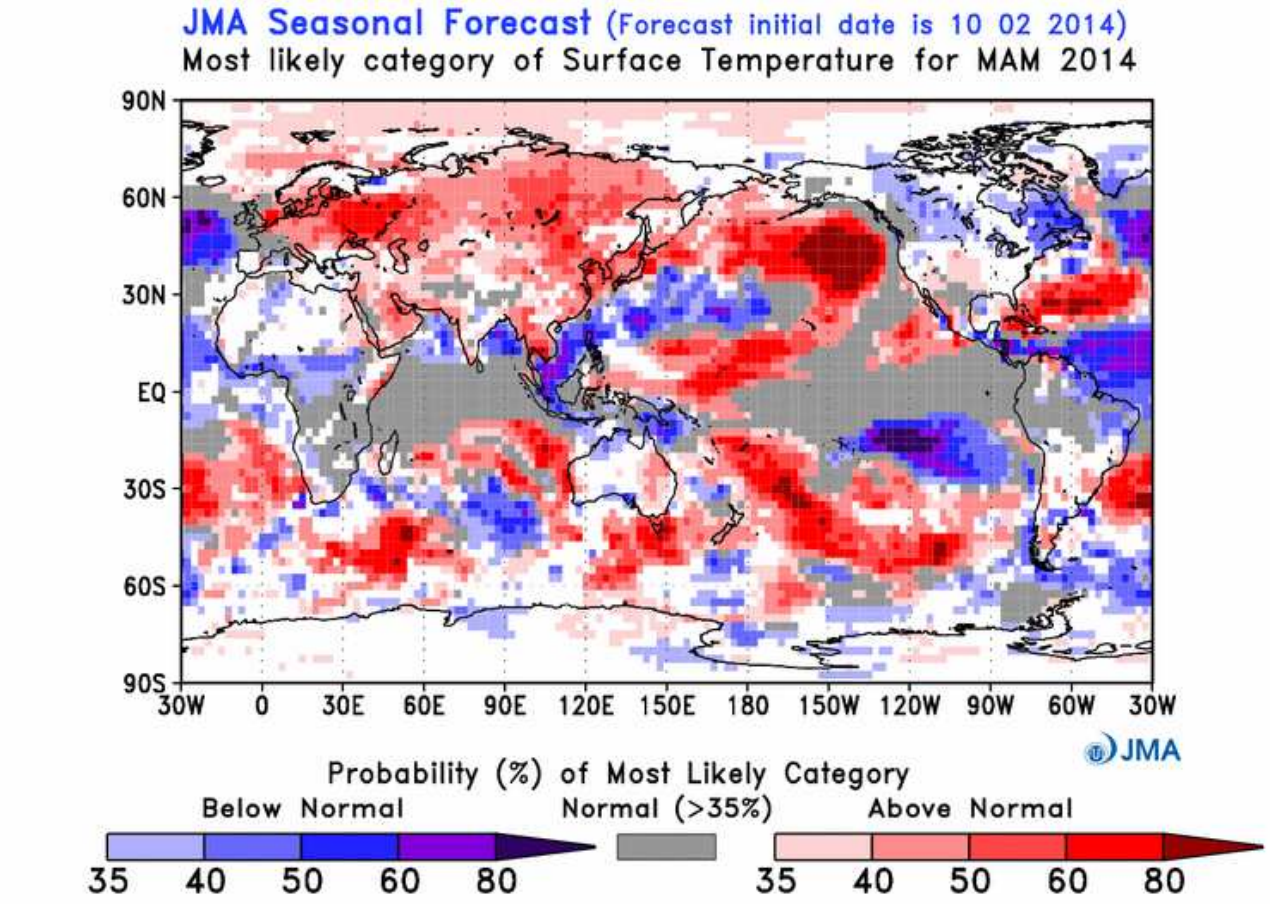


fig.25: Most likely category of T2m from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/

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

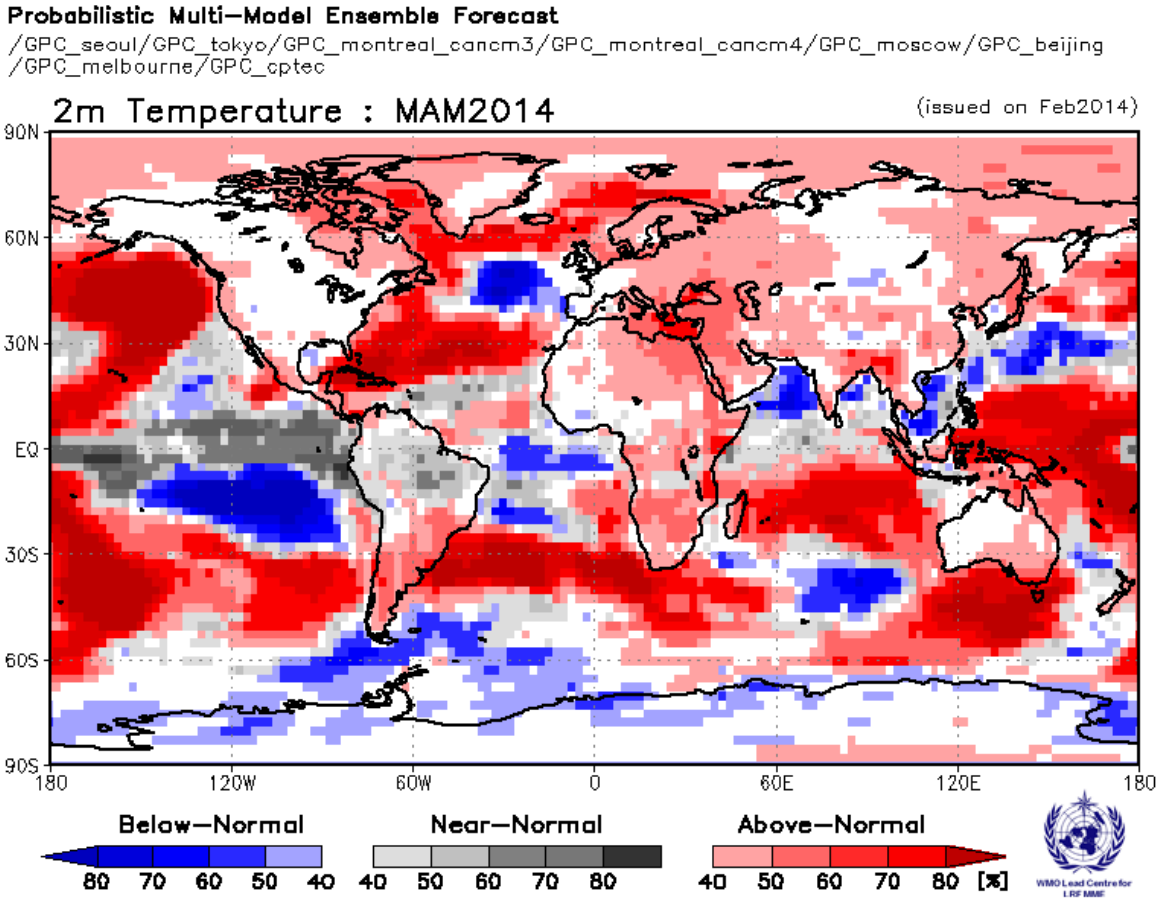


fig.26: MME most likely category of T2m from LC-MME. The MME composition corresponds to the GPCs not used in EuroSIP https://www.wmolc.org/

II.3.g Euro-SIP

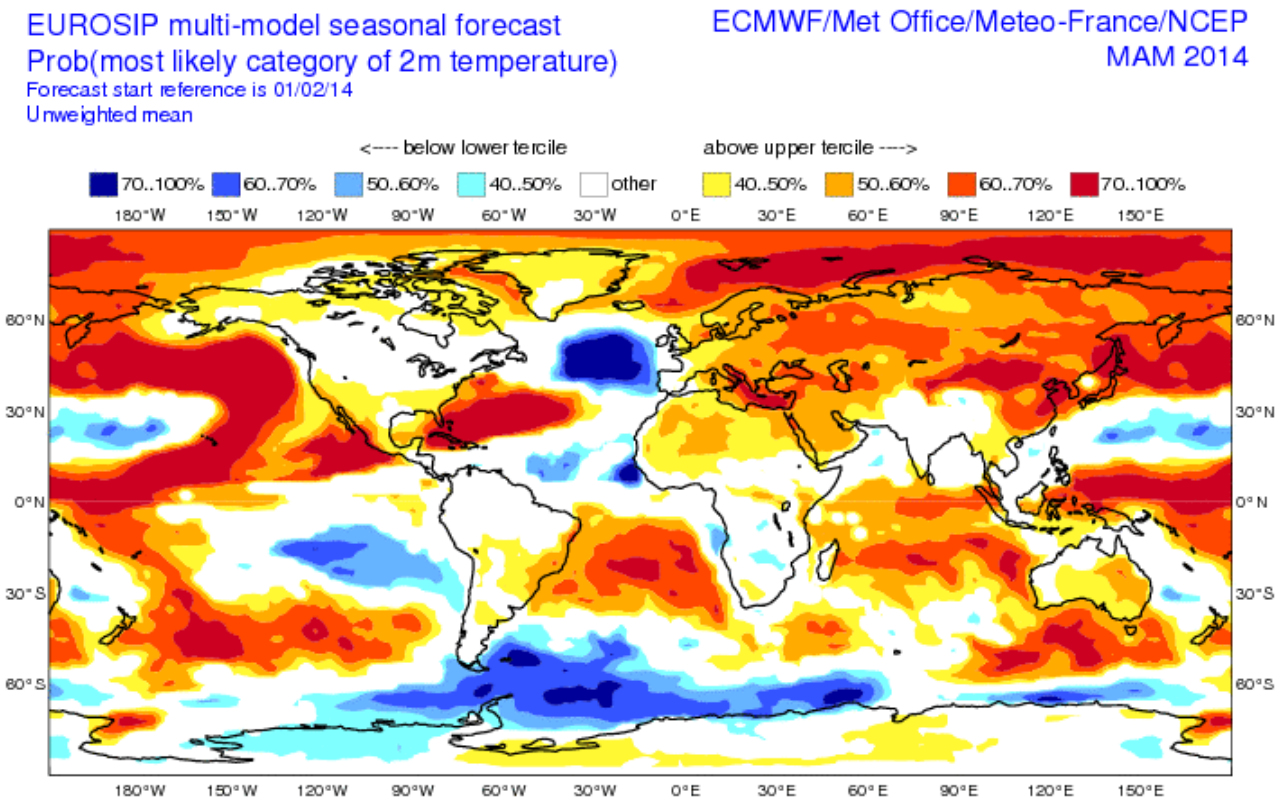


fig.27: Multi-Model Probabilistic forecasts for T2m from EuroSip.
(2 Categories, Below and Above normal – White zones correspond to No signal and Normal).

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

North-America : slightly enhanced probabilities for warm anomalies over a large portion of USA .
Central-America : globally warmer than normal extending toward the North Caribbean.
South-America : Some consistent signal over the South-Eastern part of the continent along the coastal areas (warmer than normal).
Australia : traces of warmer than normal especially over the Eastern part of the continent.
Asia : Mostly Warmer than normal conditions in the Eastern and Northern parts, with the strongest probability on the Eastward side.
Africa : Mostly warmer than normal North to the Equator and no consistent signal South to the Equator.
Europe : Warmer than normal conditions over most of the continent to the exception of the most South-Western regions (No Signal).

II.4. IMPACT : PRECIPITATION FORECAST

II.4.a ECMWF

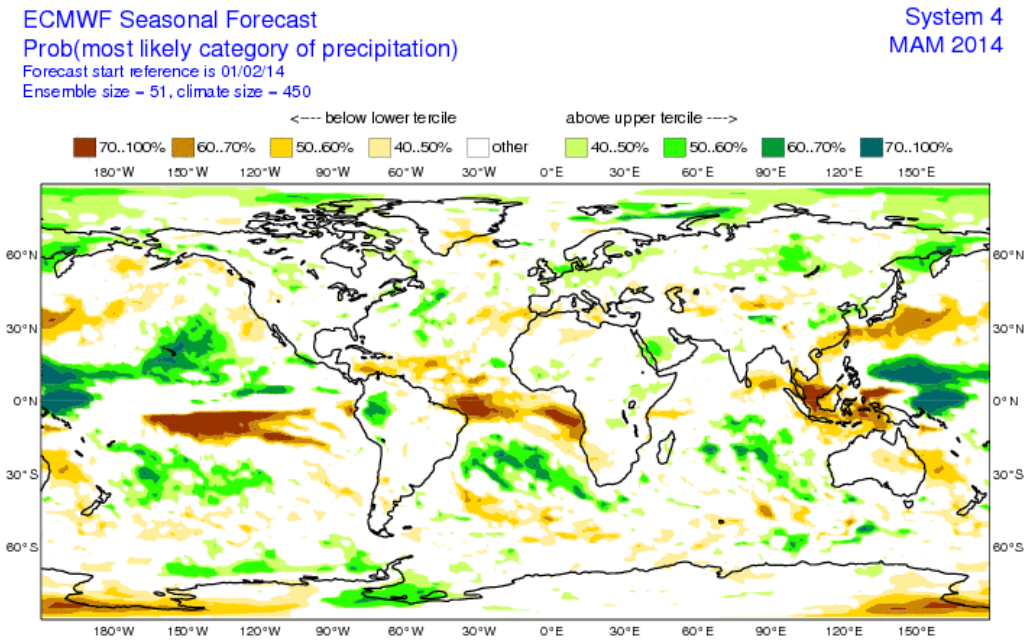


fig.28: Most likely category probability of rainfall from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/charts/seasonal_charts_s2/

II.4.b Météo-France

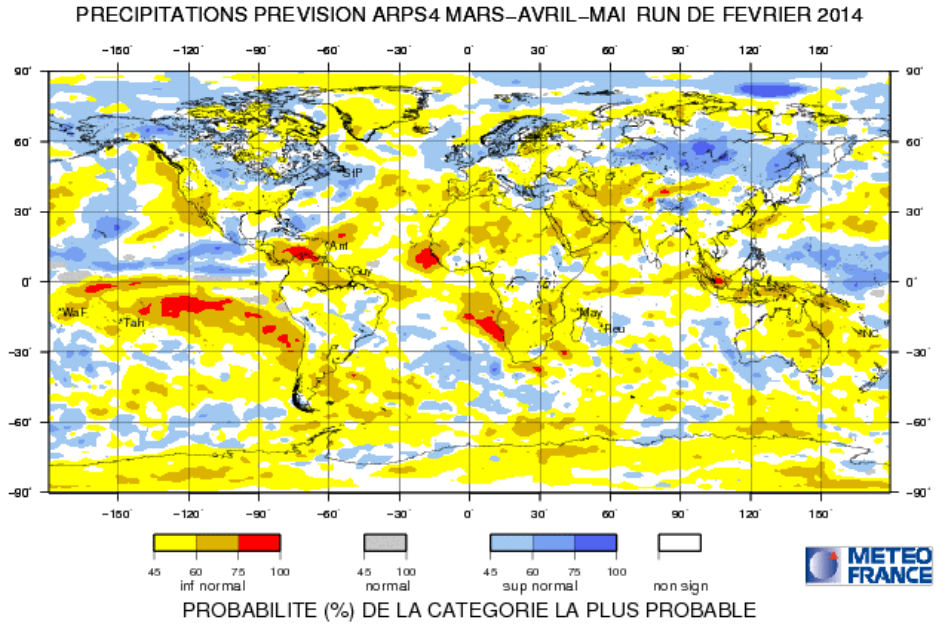


fig.29: Most likely category of Rainfall from Meteo-France. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.4.c Met office (UKMO)

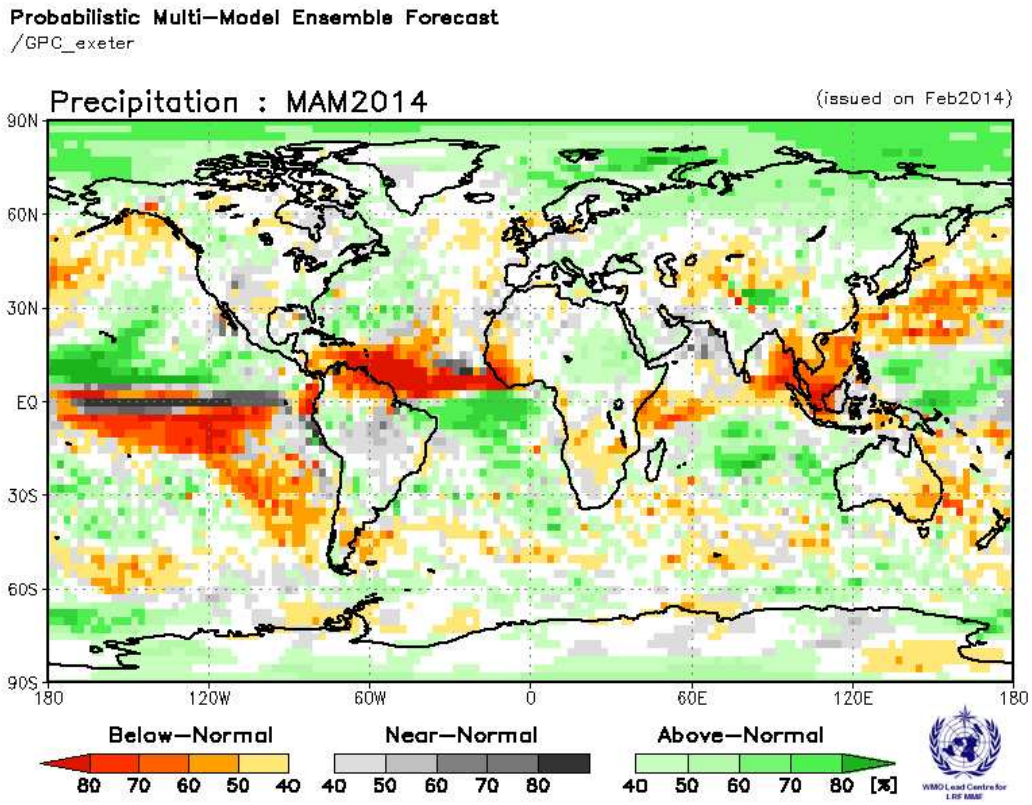


fig.30: Category probabilities of Rainfall from UK Met Office. https://www.wmolc.org/

II.4.d Climate Prediction Centre (CPC)

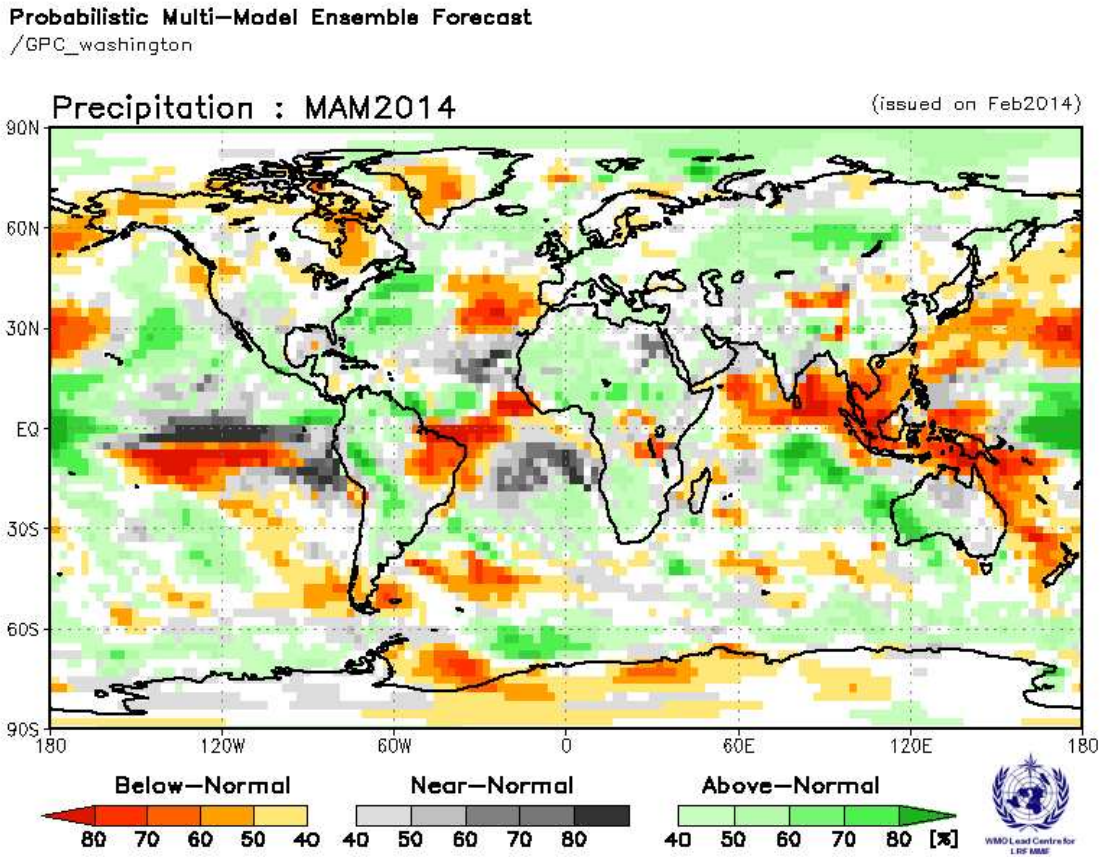


fig.31: Most likely category of Rainfall from CPC. https://www.wmolc.org/

II.4.e Japan Meteorological Agency (JMA)

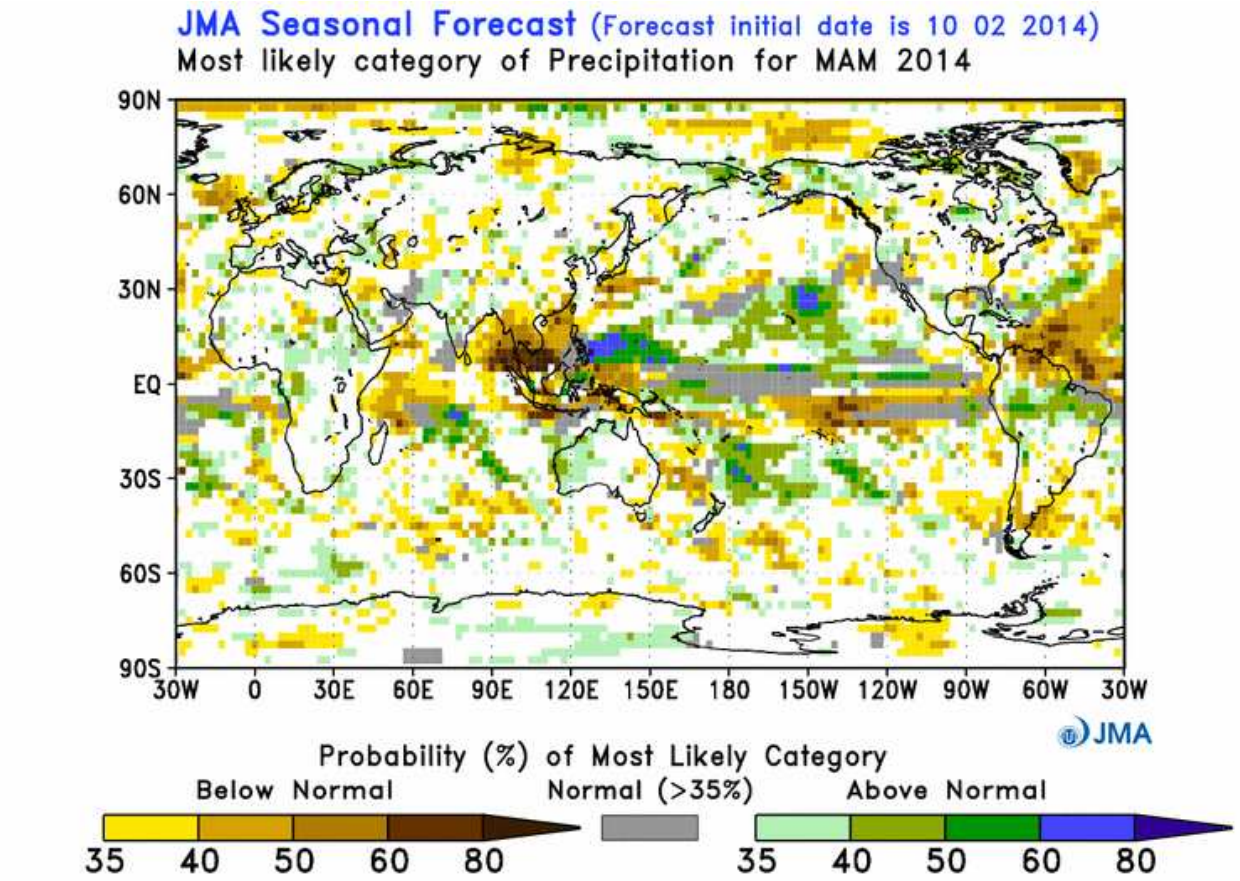


fig.32: Most likely category of Rainfall from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/

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

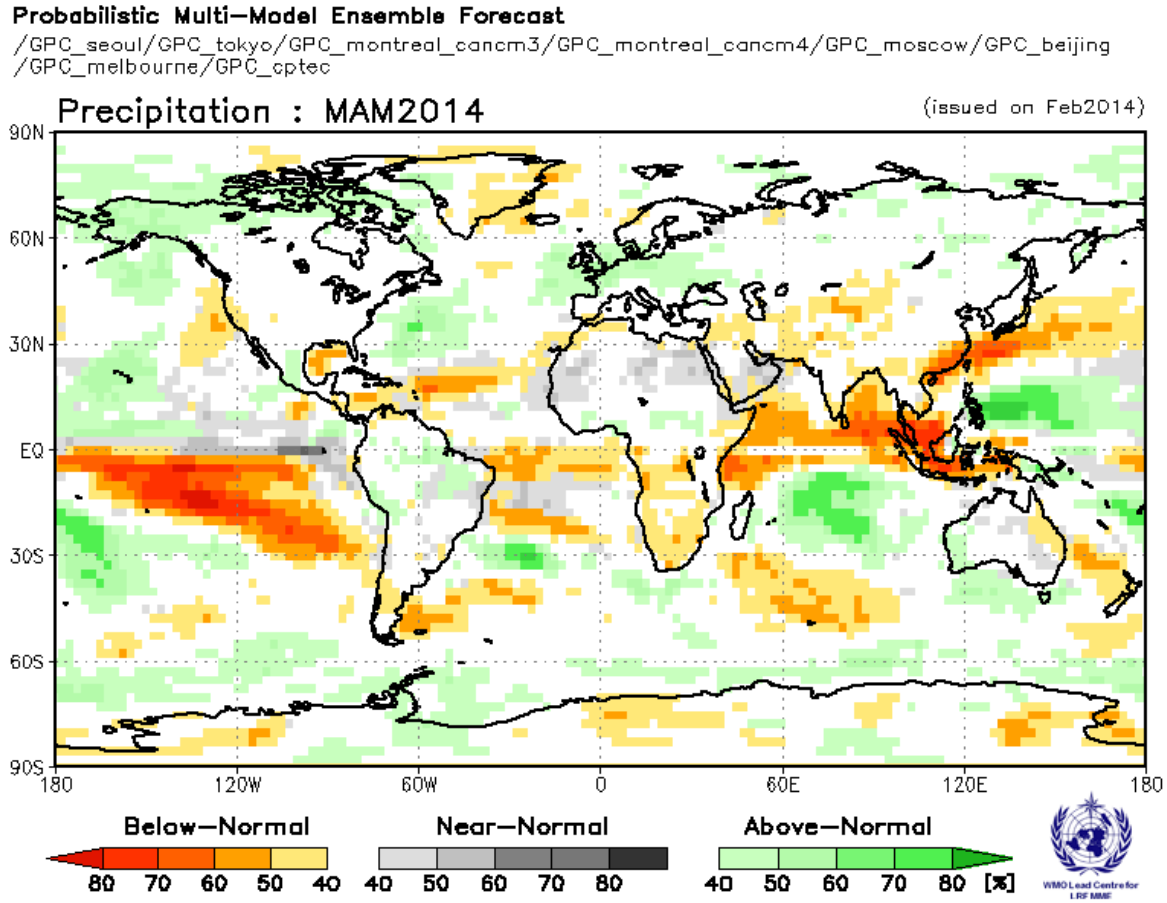


fig.33: **MME most likely category of Rainfall from LC-MME. The MME composition corresponds to the GPCs not used in EuroSIP. https://www.wmolc.org/**

II.4.g Euro-SIP

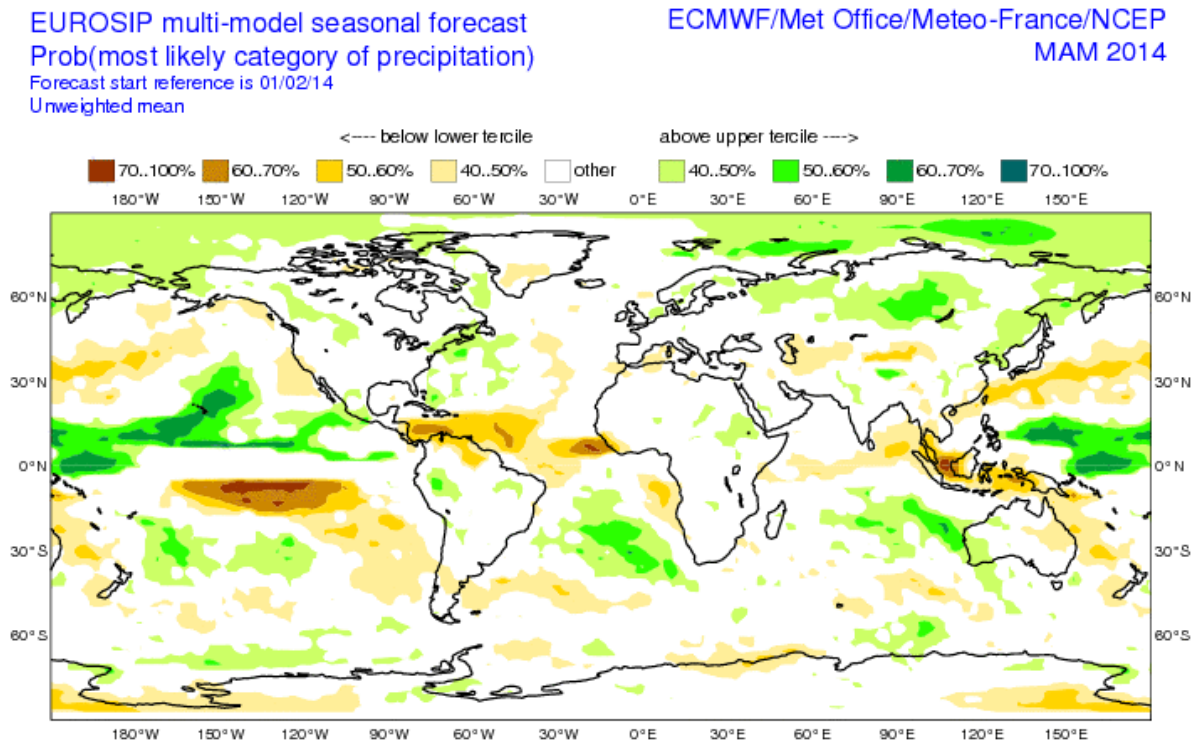


fig.34: Multi-Model Probabilistic forecasts for precipitation from EuroSip. (2 Categories, Below and Above normal – White zones correspond to No signal).

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

In the Tropics : some consistent signal. Enhanced probabilities for wet scenarios in the vicinity of the warm pool extending toward Hawaii (see previous discussions). Enhanced probabilities for dry scenario over the Northern coastal areas of South America and Southern Caribbean, over most of the Maritime continent and the most South-Western part of West Africa.

For Europe : No signal more or less everywhere to the exception of little traces of enhanced probabilities of Wet scenarios in the most Northern regions and for dry scenarios over the most South-Western regions of the Mediterranean basin..

II.5. REGIONAL TEMPERATURES

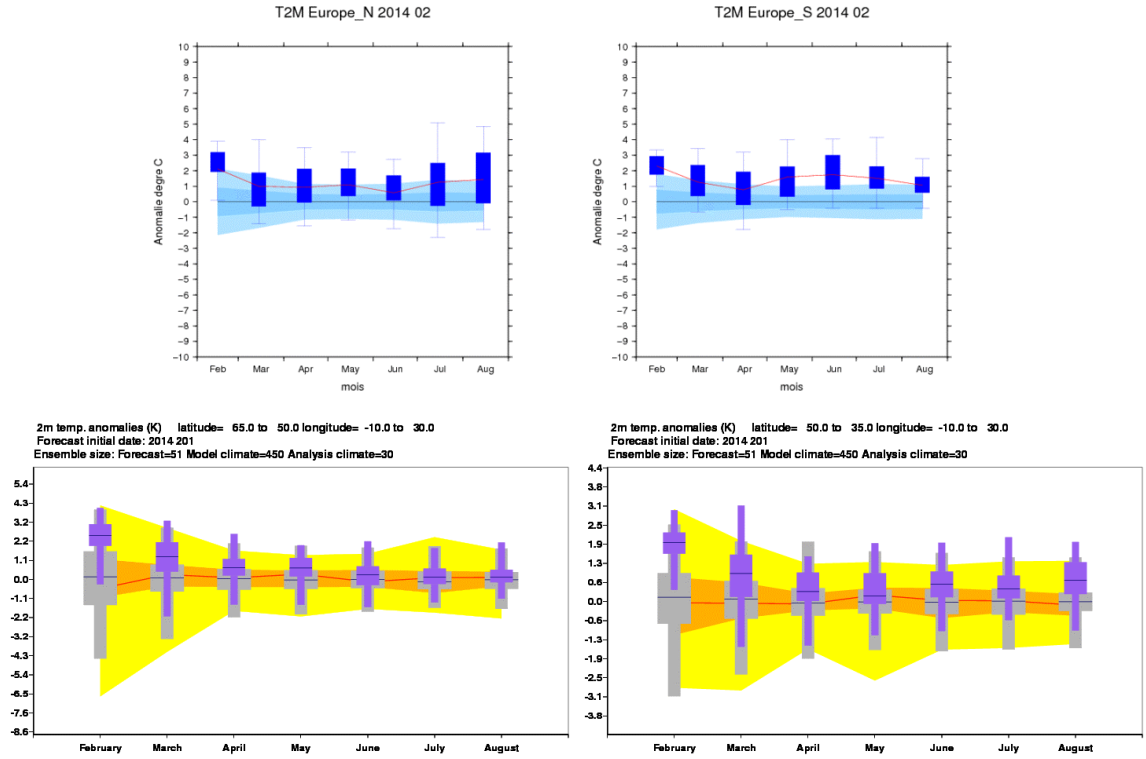


fig.35: Climagrams for T2m in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom - idem).

For Northern Europe : Consistent signal for warmer than normal conditions. On time a tendency to decreased temperature. Quite large spread (with respect of the climate reference) in both models.

For Southern Europe : Consistent signal for warmer than normal conditions. On time a tendency to decreased temperature up to the end of Spring. The spread is large in both models.

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

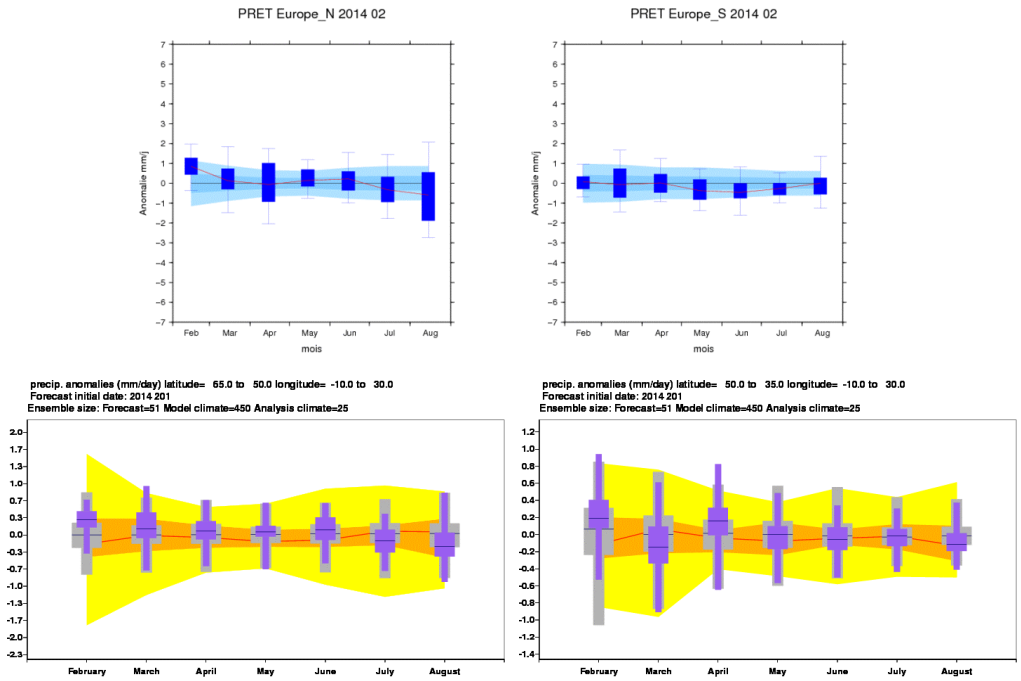


fig.36: Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom - idem).

Some consistency between the 2 models.

For Northern Europe : Starting with Above normal conditions, the signal move toward close to normal conditions on time in both models. the spread is very large.

For Southern Europe : Less consistency between the 2 models ; on average close to normal conditions. The spread is very large.

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

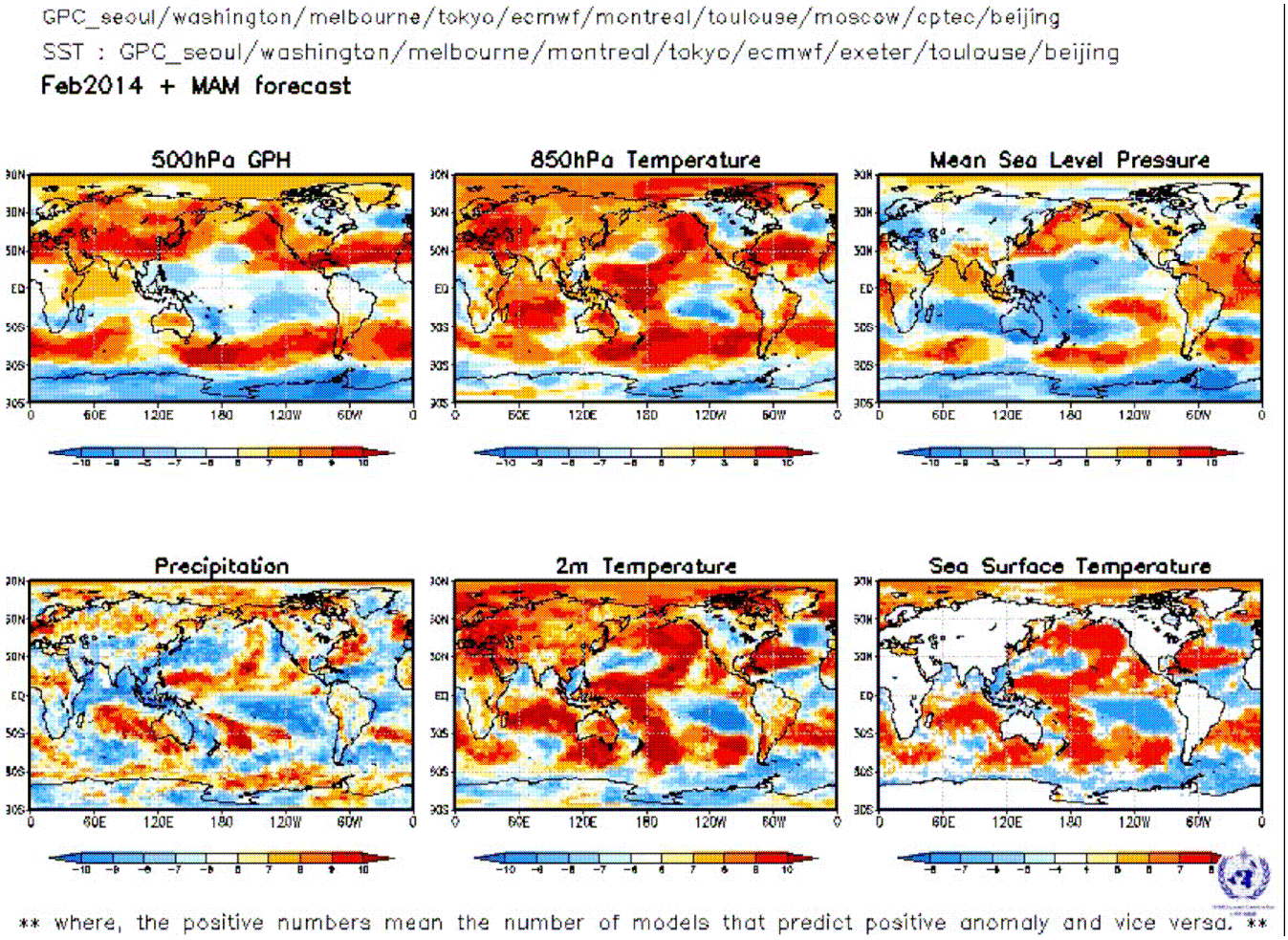


fig.37: ***GPCs Consistency maps from LC-MME*** *http://www.wmolc.org/*

For SST : Very consistent signal (warmer than normal) in the warm pool, along the SCPZ regions, and in general over most of the Pacific basin (especially in the Northern Hemisphere –warmer than normal- and the East-Southern Tropics –colder than normal-), over the Indian Ocean South to the Equator and in Sub-Tropical North Atlantic. Some consistency over the South Tropical Atlantic (warmer than normal).

For Z500 : Mostly Above normal consistent signal in the Sub-Tropics of the Northern Hemisphere. Across the Atlantic consistency for an increased zonal general circulation (consistent with a deficit of Atlantic Ridge regimes).

For T2m : Some very consistent signal (warmer than normal) mostly over regions with consistent Above normal conditions in Z500; especially a large portion of Central and Eastern Europe, North-West Africa and Asia, the Tropical/Subtropical part of the Indian Ocean, the regions in the vicinity of the Gulf of Mexico and the Warm Pool and a large part of Australia.

For Precipitation : Some consistent signal for drier conditions over the maritime continent, South part of the Caribbean and Eastern coast of South Asia. The Australian dipole seems to have some consistency (wetter on South-West and Drier on North-East). Wetter than normal conditions along the SPCZ, in the vicinity of Alaska, over a portion of North-Western façade of Europe (from UK to Danemark)

II.7. "EXTREME" SCENARIOS

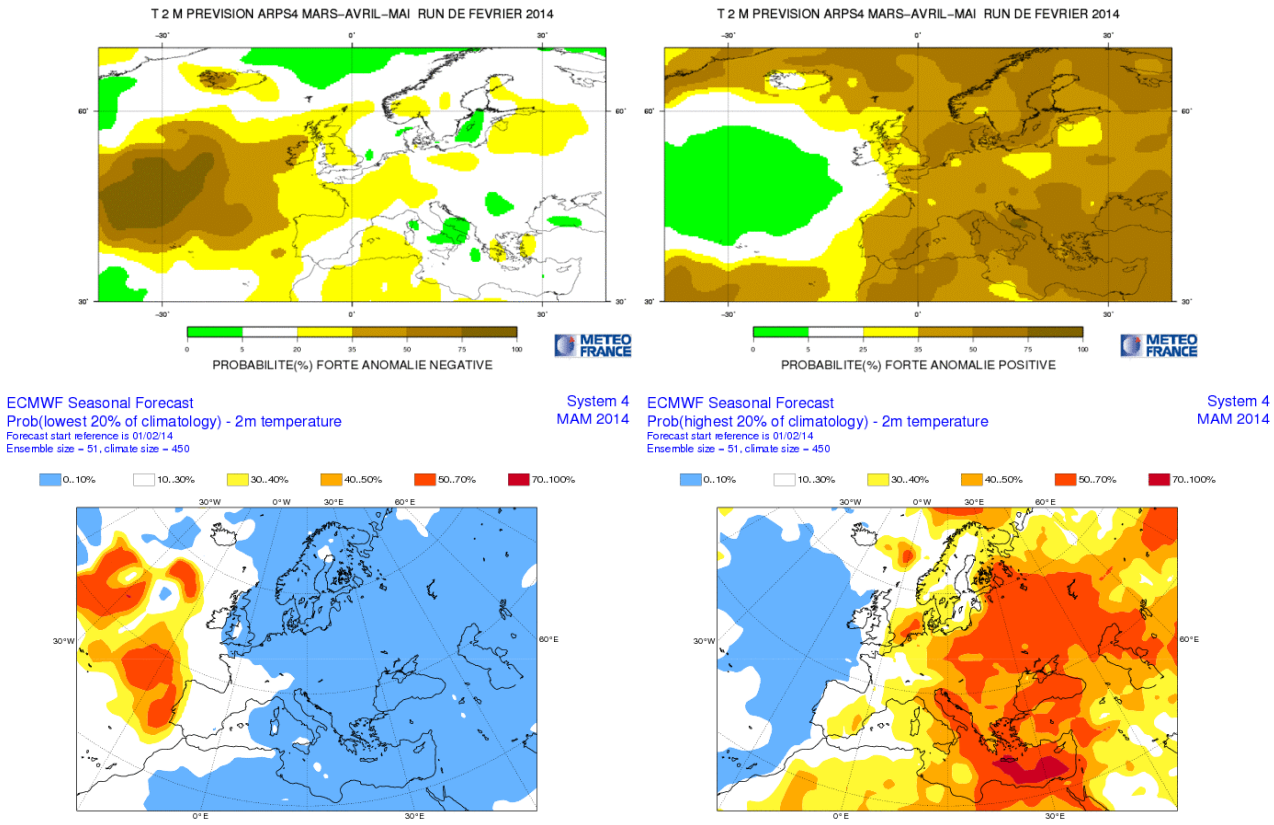


fig.38: Top : Probability of « extreme » above normal conditions from T2m for Meteo-France (left - highest ~15% of the distribution and right lowest ~15% of the distribution)
Bottom : idem from ECMWF (left - highest 20% of the distribution and right lowest 20% of the distribution).

Consistent signal between the 2 models.
The **Very below scenario** over the Eastern Atlantic is likely related to the increased zonal circulation. Enhanced probabilities over most of the European continent for the **Very Above normal** scenario, especially the Central and Eastern part. In MF, the ROC scores are between 0.55 and 0.75 over a large portion of the Mediterranean basin and Central Europe (up to Scandinavia). So some information could be inferred from these forecasts over the region with a significant score.

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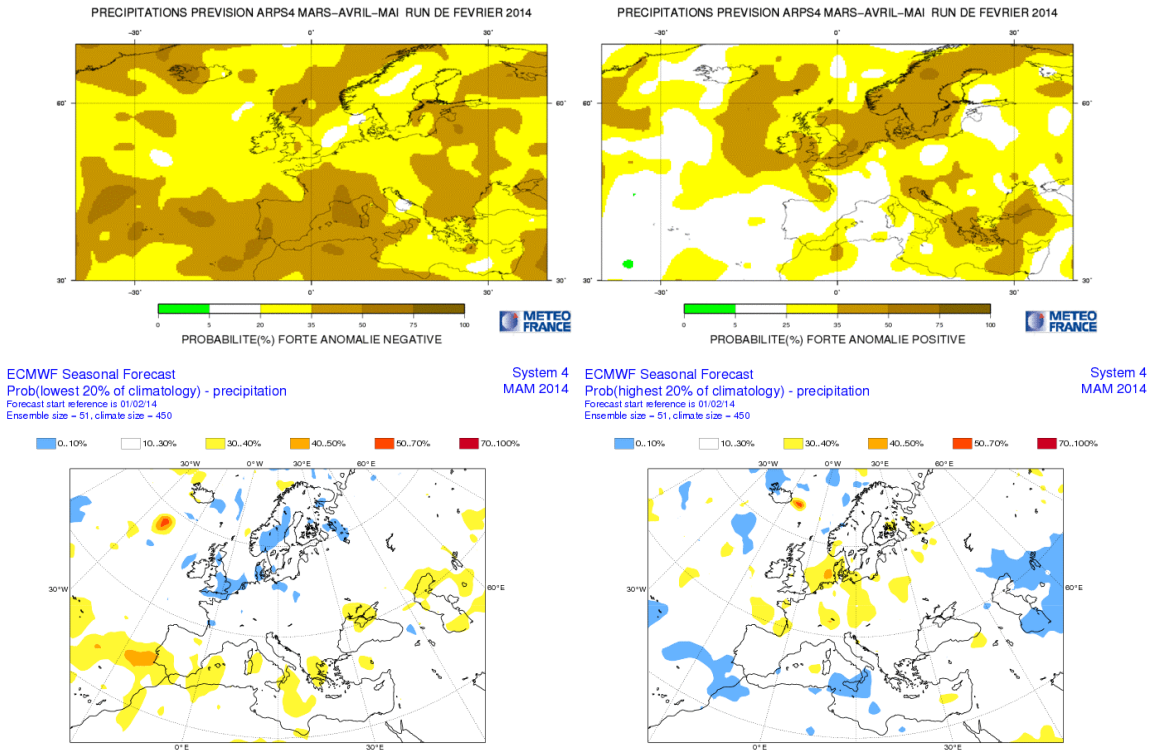


fig.39: Top : Probability of « extreme » above normal conditions for rainfall from Meteo-France (left - highest ~15% of the distribution and right lowest ~15% of the distribution)
Bottom : idem from ECMWF (left - highest 20% of the distribution and right lowest 20% of the distribution).).

Mostly No signal in ECMWF while there are a signal for extreme scenarios in MF. In MF Very Below scenarios possible over the South-West of Europe (with some similar -even weak- indication in ECMWF) and Very Above scenario possible over Scandinavia. To be quoted the divergent scenarios over Central and Eastern Europe. The ROC scores in MF are only better than climatology (0.55 to 0.7) over the South-West part of Europe for the Very Above normal scenario.
So in relationship with the current predictability and the model uncertainties, it seems **difficult to use these precipitation forecasts**.

II.8. DISCUSSION AND SUMMARY

Forecast over Europe

For this forecast the major comment is about the **current predictability** in the climate system. The oceanic forcing remains quite low to the exception of the vicinity of the warm pool. The current predictability seems to exists in the Tropics in the vicinity of the Pacific basin but also to some extent in the mid-latitudes due to the influence of the Tropics onto the mid-latitude activity which nevertheless should prevail. The **EuroSIP** forecasts are likely a **good synthesis** of possible scenarios across the planet and more specifically over European regions. **For rainfall**, "No Privileged Scenario" covers most of the European continent, at the exception of the Western part of Europe close to the Mediterranean basin with a slight drier than normal signal. **For temperature** : despite the weak predictability the Above normal scenario could be privileged for the most of Southern Europe and especially Central and Eastern Europe (including South-East Europe). For the South-Western façade, there is more uncertainty and so "No Privileged" scenario should be privileged.
Obviously, some downscaled information could detail these scenarios for specific countries or sub-regions.

Tropical Cyclone activity

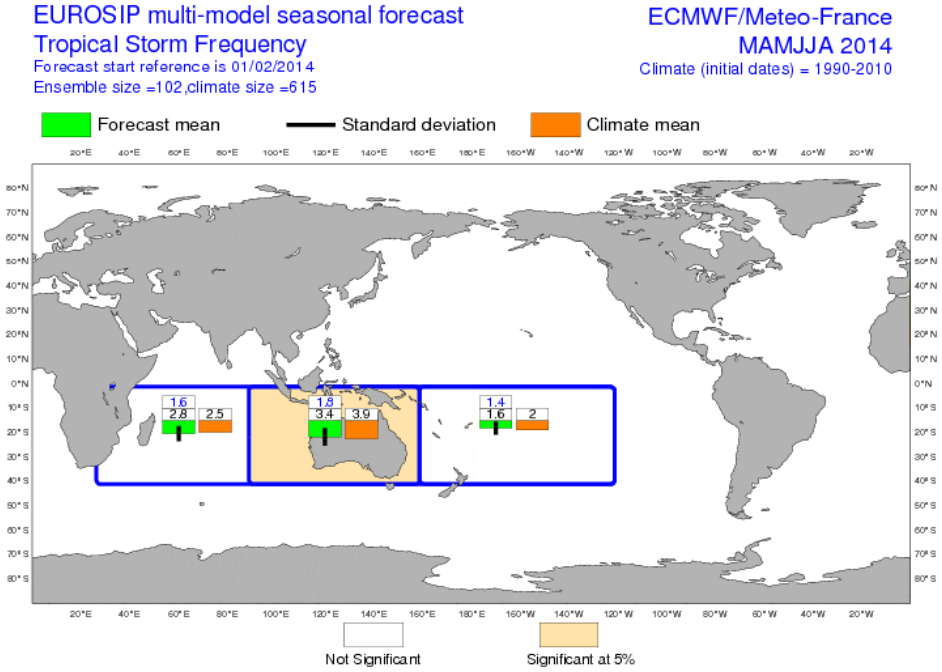


fig.40: Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro/eurosip_tropical_storm_frequency/

For the Tropical Cyclone season and in relationship with the SSTs scenarios, Euro-Sip forecasts indicate Close to Normal Topical Cyclone activity in the vicinity of Australia and Indonesia and No signal elsewhere.

WMO RA VI
Pilot RCC-Network

Synthesis of Temperature forecasts for March-April-May 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 March-April-May 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	*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, 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

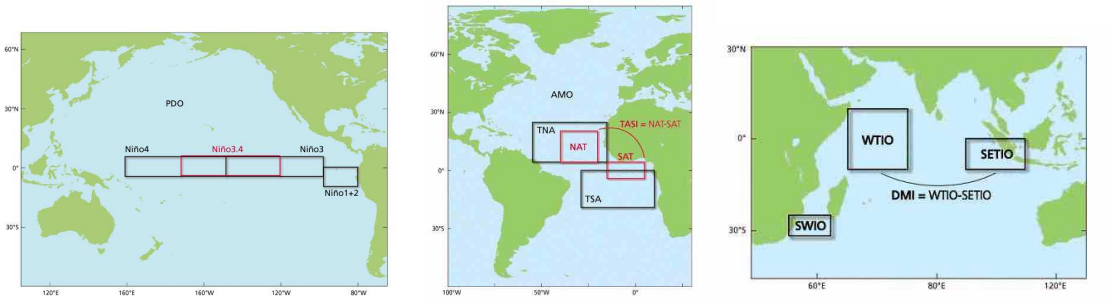
El Niño and La Niña events primarily affect tropical regions and are monitored by following the SST evolution in specific area of the equatorial Pacific.

- 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.