GLOBAL CLIMATE BULLETIN
n°212 – February 2017

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I. DESCRIPTION OF THE CLIMATE SYSTEM (DECEMBER 2016)

I.1. OCEANIC ANALYSIS

I.1.a Global analysis

In the Pacific ocean and around the Maritime Continent :

Along the equator and at the surface: trace of La Niña still visible (but the trend is to warm over the whole zone). Monthly average SST anomaly of ~ -0.3 ° C in the Niño 3.4 zone : consistent with the probable end of the Niña. Strongest warming for the Niño 4 zone (SST anomaly now positive at + 0.1 ° C in December (against -0.4 ° C in November)).

In subsurface and December, positive heat content anomaly west of the date change line, and negative heat content anomaly east of 120 ° W. Between November and December, the heat content increased on the center and east of the basin (between 180 ° and 100 ° W) and decreased in the extreme western part of the basin. The equatorial vertical section of ocean temperature anomalies over the first 500 meters shows a gradual return towards neutral conditions. All these elements evoke the evanescence of the Niña phenomenon. Note that the warm pool in the west of the basin does not strengthen (it tends to weaken slightly in December).

On the North Pacific: positive PDO (+0.45 in December 2016 according to NOAA http://www.ncdc.noaa.gov/teleconnections/pdo/) but the structure is more and more distant from the canonical structure (the trends on SST go in the direction of the reduction of the positive phase).

In the Indian Ocean :

Little evolution on the equatorial part : the IOD remains in very slightly negative phase (stable DMI at -0,2 in December according to MERCATOR-Ocean data). Cooling between southern Indonesia and Australia and accentuation of positive SST anomalies in the vicinity of the 30 ° S parallel.

In the Atlantic:

The small Atlantic El Niño is still present on the equatorial ocean.

On the North Atlantic, there is no major evolution : the trend is rather warming (except in southern Newfoundland: linked to the position of the Gulf Stream?).

Small cooling from Senegal to the coasts of South America (on the side of the Guianas).

In the Mediterranean:

Overall positive SST anomalies (mostly on the west part) ; Cooling on the east of the basin, and rather warming to the west.

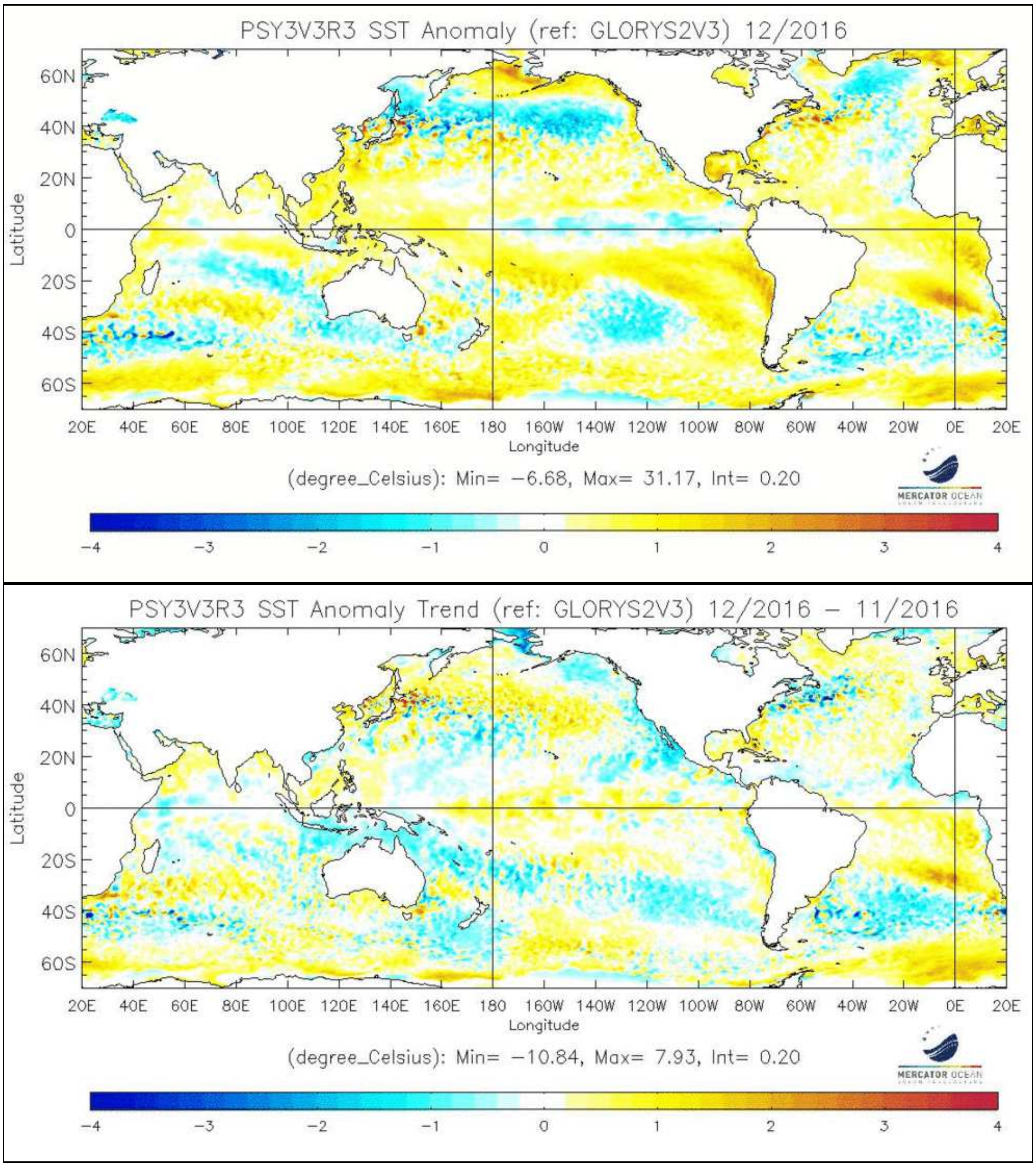


fig.I.1.1: top : SSTs Anomalies (°C) . Bottom : SST tendency (current – previous month), (reference Glorys 1992-2009). http://bcg.mercator-ocean.fr/

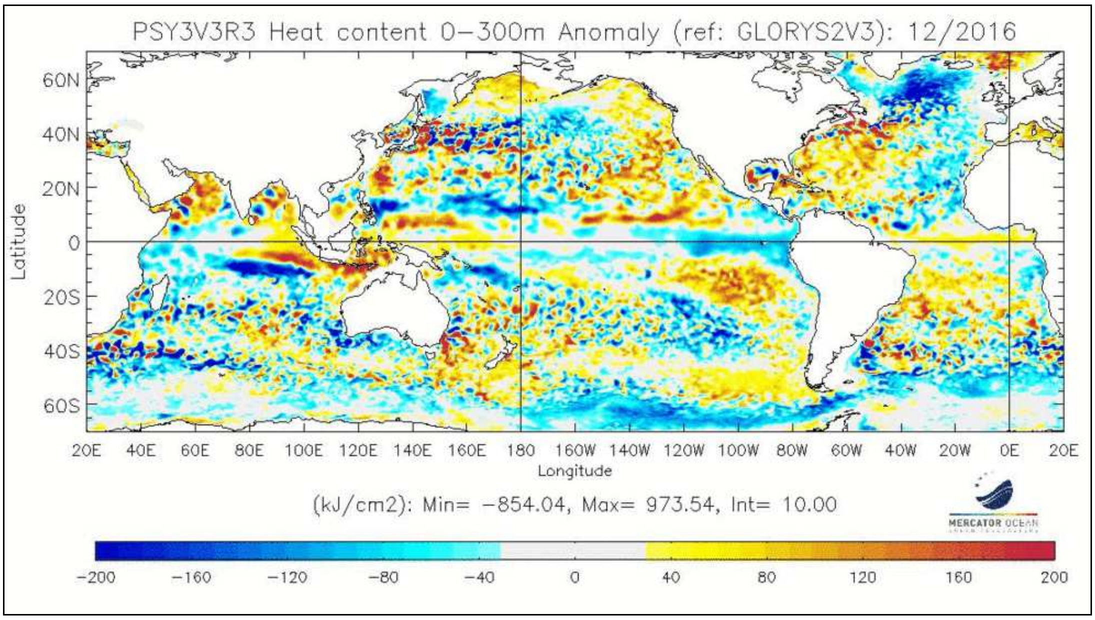


fig.I.1.2: map of Heat Content Anomalies (first 300m, kJ/cm2, reference Glorys 1992-2009)

http://bcg.mercator-ocean.fr/

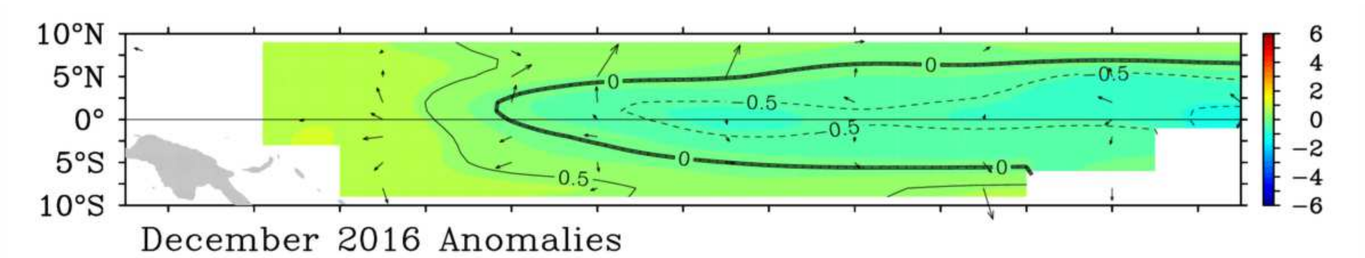


fig.I.1.3: SST Anomalies and Wind anomalies over the Equatorial Pacific from TAO/TRITON.

http://www.pmel.noaa.gov/tao/drupal/assorted_plots/images/sst_wind_mon.png

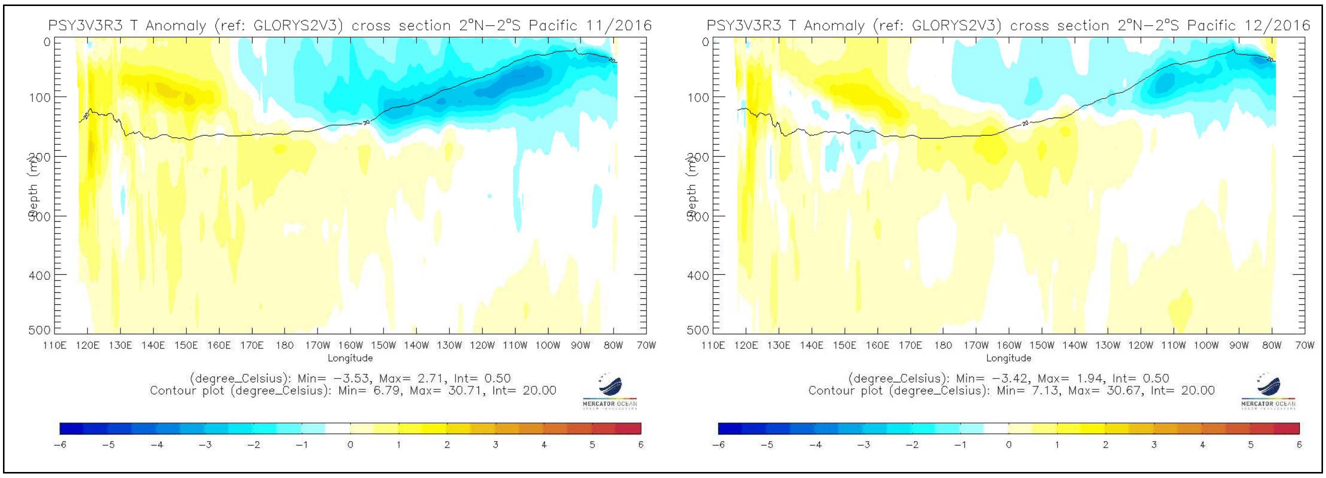


fig.I.1.4: Oceanic temperature anomaly in the first 500 meters in the Equatorial Pacific (previous and current month), http://bcg.mercator-ocean.fr

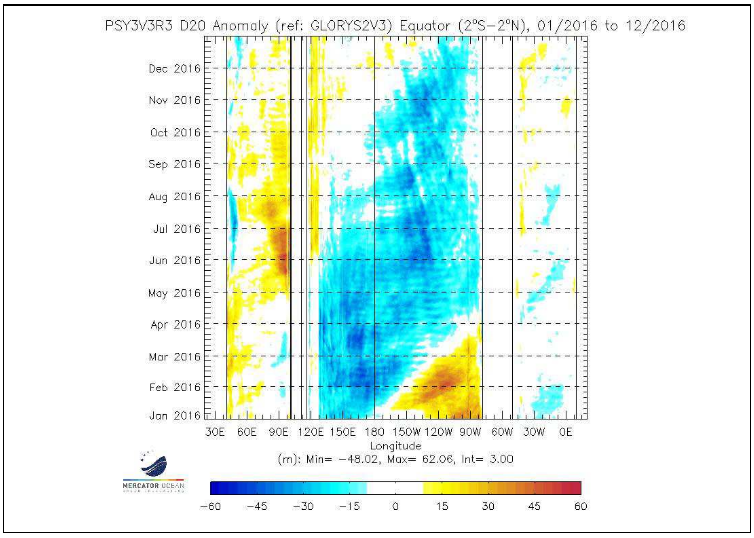


fig.I.1.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 6 month period http://bcg.mercator-ocean.fr/

I.1.b Sea surface temperature Near Europe

The Arctic Sea is still very warm, though positive anomalies decreased compared to November 2016, but still above +3°C around Svalbard.

Slight warming of North Sea, Baltic Sea and Biscay.

The cold blob on the North Atlantic has not changed its position from November to December 2016, and also not much change of intensity.

Western and central Mediterranean still warmer than normal, eastern Mediterranean SST around normal. Anomalies on the Mediterranean increased in the west, but decreased in the east, which means the western Mediterranean cooled less than usual for the season, the eastern Mediterranean more.

Black Sea still colder than normal, negative anomalies slightly stronger than in November.

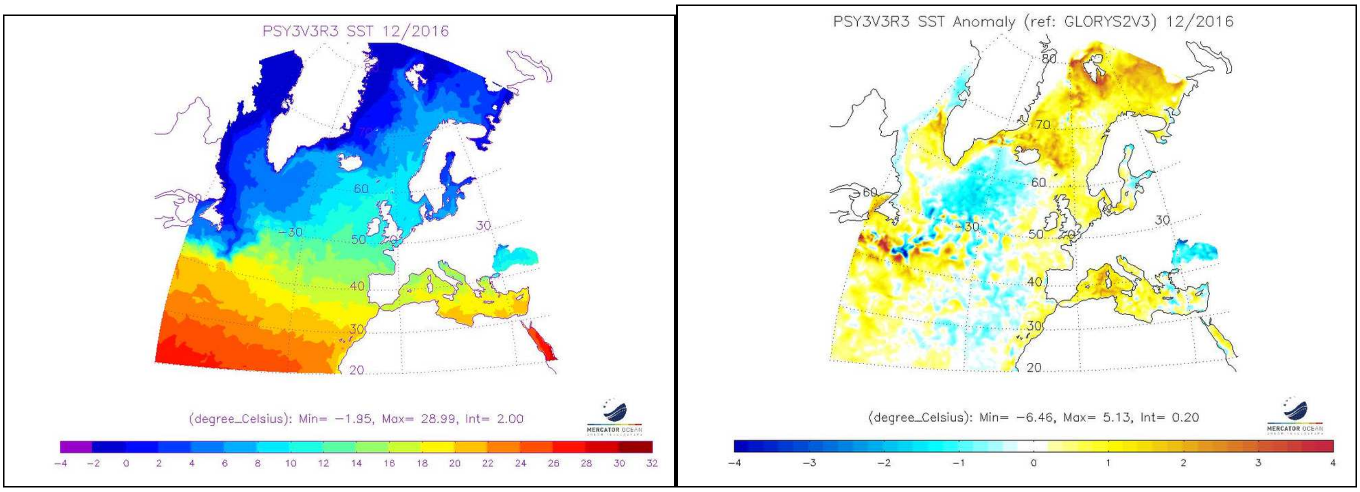


fig.I.1.6 : Mean sea surface temperature in the RA VI Region (Europe) and anomaly (reference Glorys 1992-2009). http://bcg.mercator-ocean.fr/

I.2.ATMOSPHERE

I.2.a General Circulation

Velocity Potential Anomaly field in the high troposphere (fig. 1.2.1 – insight into Hadley-Walker circulation anomalies) :
Strong anomaly of downward motion on the Indian Ocean and strong anomaly of upward motion from the maritime continent to Australia (probably related ; Niña effect + negative IOD?). Elsewhere anomalies are weak. An anomaly of downward motion in the north of the West Indies (towards the Sargasso Sea).

SOI :

Positive value in December (+0.3 standardized, see https://www.ncdc.noaa.gov/teleconnections/enso/indicators/soi/), which is compatible with Niña. The trade winds are reinforced in the western Pacific (see http://www.pmel.noaa.gov/tao/drupal/assorted_plots/images/sst_wind_mon.png around 165 ° E). Overall, this Niña has low impacts on the Pacific atmospheric circulation.

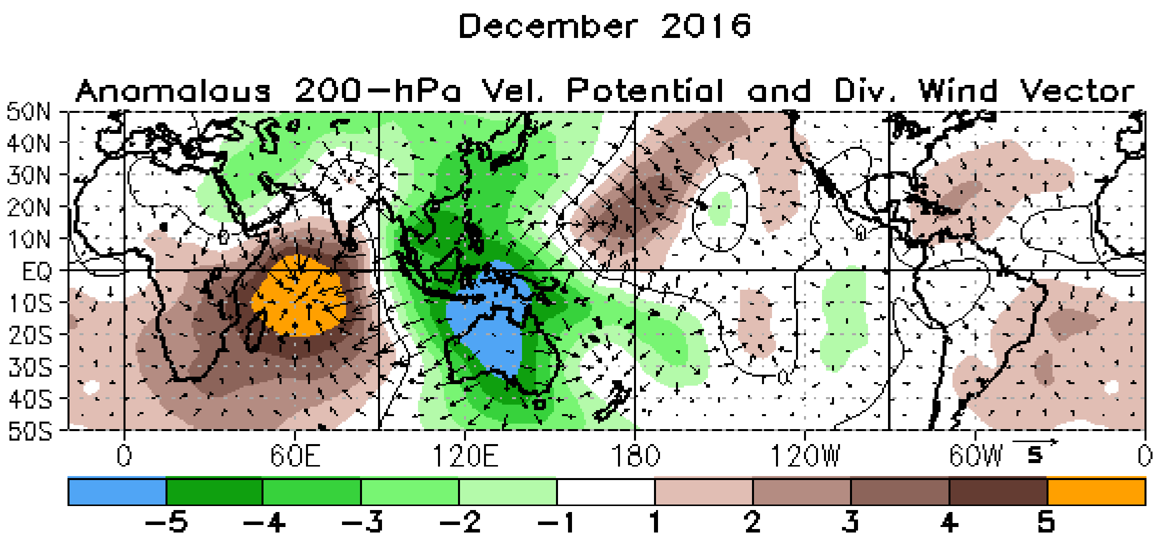


fig.I.2.1: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly).
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

MJO (fig. I.2.1.b)

Not active in December.

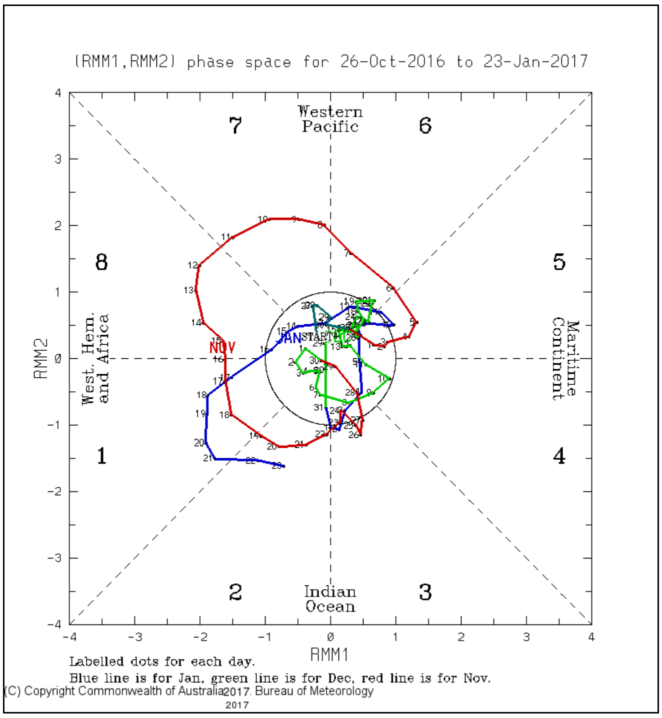


fig.I.2.b: MJO index http://cawcr.gov.au/staff/mwheeler/maproom/RMM/phase.Last90days.gif

Stream Function anomalies in the high troposphere (fig. 1.2.2 – insight into teleconnection patterns tropically forced):
Possibly trace of a PNA- teleconnection (with landing on the south of the United States).

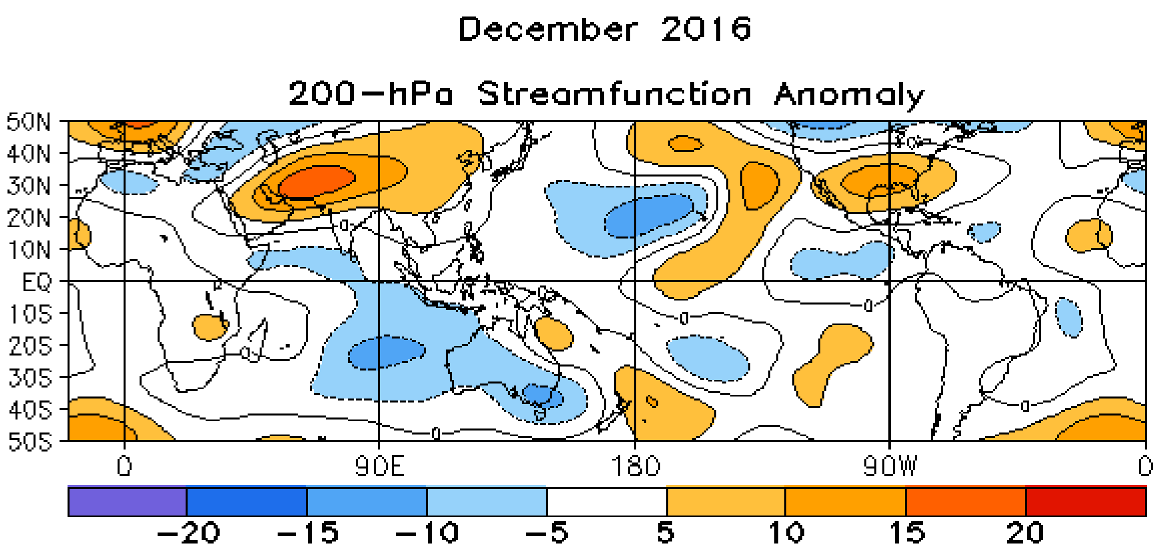


fig.I.2.2: Stream Function Anomalies at 200 hPa.

http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

Geopotential height at 500 hPa (fig.1.2.3 – insight into mid-latitude general circulation):

3 poles of anomalies of Z500hPa strong enough : one + over the northern Pacific, one + over Western Europe and one - over Siberia. The PNA- teleconnection is found on the North Pacific and the USA: PNA = -0.7 (which is compatible Niña), NA0 = +0.4, EA = +0.9.

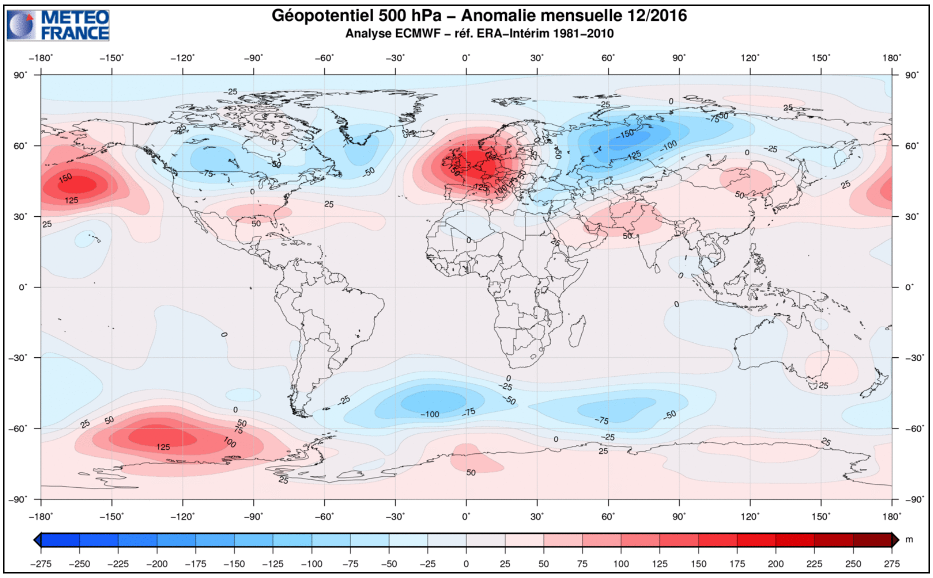


fig.I.2.3: Anomalies of Geopotential height at 500hPa (Meteo-France)

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
DEC 16	0.4	0.9	1.0	---	-0.7	0.9	1.5	-1.2	-1.1
NOV 16	-0,3	-0,4	1,0	-1,4	1,4	---	-0,9	-0,1	-2,8
OCT 16	1.0	0.4	0.5	-0.8	1.5	---	-1.3	1.1	-2.9
SEP 16	0.7	3.5	-1.8	-1.4	0.1	---	0.1	-1.0	-1.3
AUG 16	-2.2	2.1	-0.4	-0.4	-0.9	---	-3.3	-0.4	2.4
JUL 16	-1.7	1.8	-1.4	-0.4	0.5	---	-1.0	-0.7	-0.2

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

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

Sea level pressure and circulation types over Europe

Icelandic Low was more intense than normal, and also the subtropical North Atlantic high pressure zone had a slight positive anomaly, causing a slight positive phase of both NAO and EA and thus an above-normal westerly flow over the North Atlantic, which is a change compared to November 2016.

Most of Europe was under high pressure influence in December 2016, blocking the North Atlantic flow. Blocking over Europe occurred on most (18) days of the month according to MF weather regimes classification, almost twice than normal. The DWD Grosswetterlagen classification shows only anticyclonic types for whole December. Only northern Europe was frequently cyclonic with very mild and humid air masses resulting in a negative SCAND pattern (-1.2). Cyclonic conditions extended to the North

Pole, causing a weakening of the negative POLEUR phase (-1.1). Relatively low pressure over western Russia and high pressure extending to the East Atlantic form a moderately positive EATL/WRUS pattern (index value +1.5).

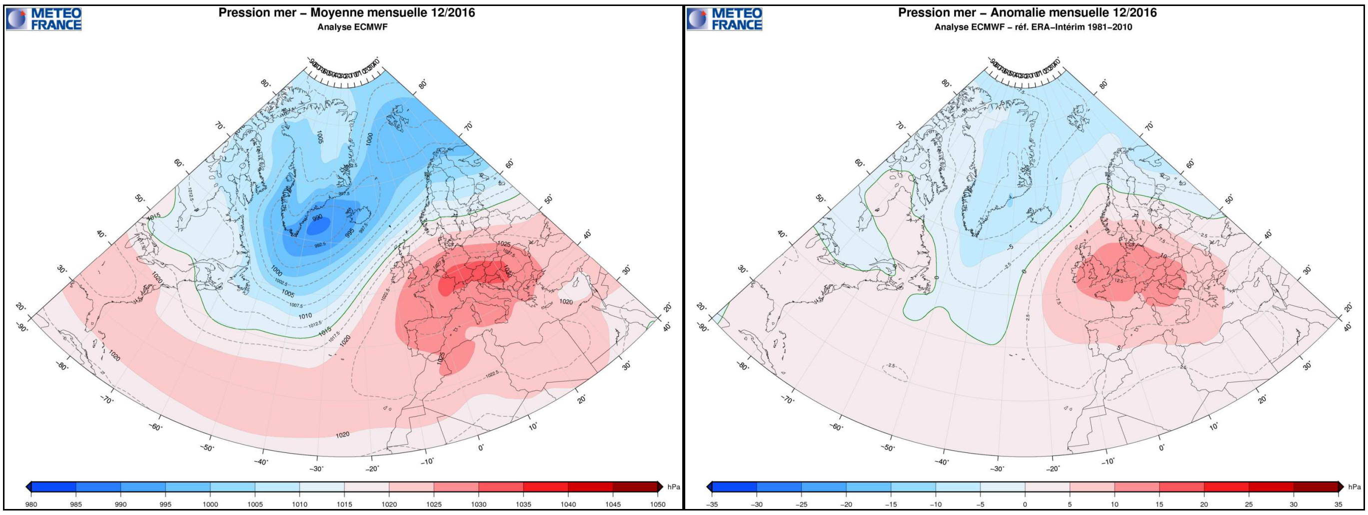


fig.I.2.4: Mean sea level pressure in the RA VI Region (Europe) (left) and 1981-2010 anomalies (right).

Circulation indices: NAO and AO

NAO was slightly below normal during the first half of the month, but had a distinct positive phase during the second half, particularly between 21 and 26 December. A westerly but anticyclonic weather type occurred during that period, with high surface pressure gradients over northern central Europe.

AO was mainly clearly positive with a peak around 21 December. This means a relatively strong polar vortex on a hemispheric scale despite a quite meridional pattern over the middle latitudes.

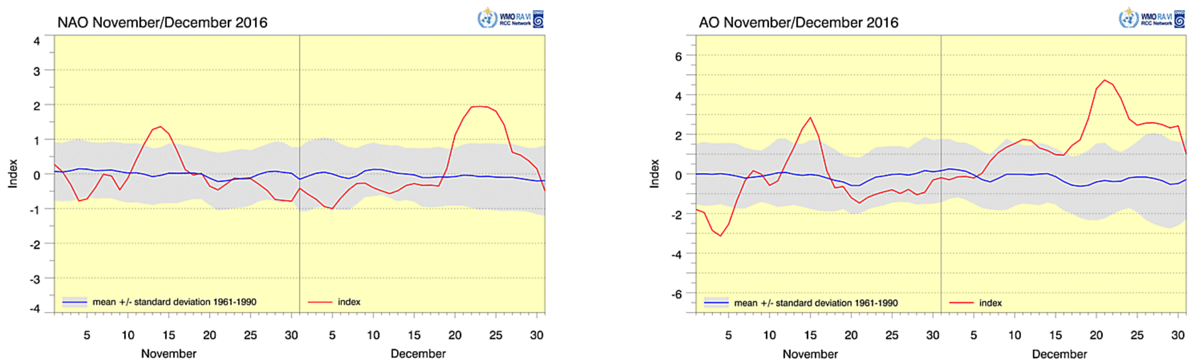


fig.I.2.5: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices with 1961-1990 mean standard deviation (shading). http://www.dwd.de/rcc-cm , data from NOAA CPC: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

I.2.b Precipitation

See map below. Fairly compatible Niña anomalies. Very dry on Europe.

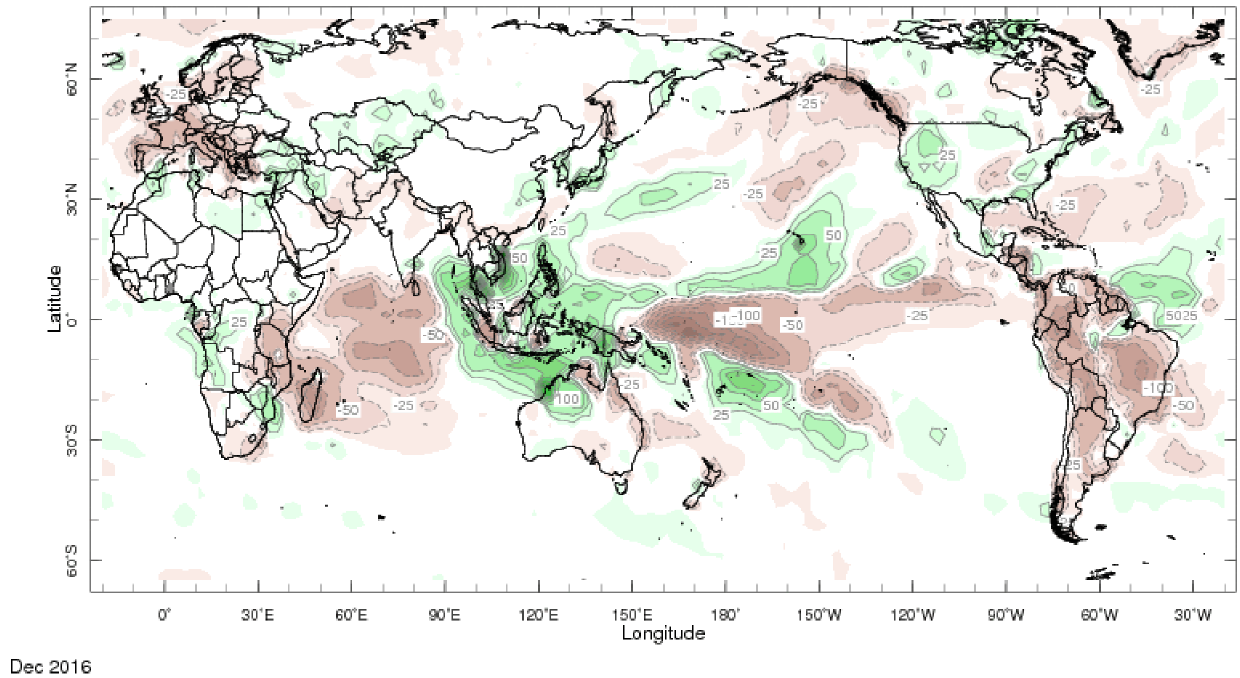


fig.I.2.6: Rainfall Anomalies (mm) (departure to the 1979-2000 normal) – Green corresponds to above normal rainfall while brown indicates below normal rainfall.

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

Precipitation anomalies in Europe:

Due to anticyclonic conditions, much of Europe was very dry. Above-normal precipitation occurred particularly at the west coasts of Norway, which were very exposed to the cyclonic flow over northern Europe, but also over the western and eastern Mediterranean, Turkey, and the eastern Black Sea, partly heavy and due to some cut-off lows coming either from the North Atlantic to the western Mediterranean or from Russia to the eastern Mediterranean. In Scandinavia, but also especially in Turkey and Caucasus region, precipitation fell mostly as snow with partly heavy snowload.

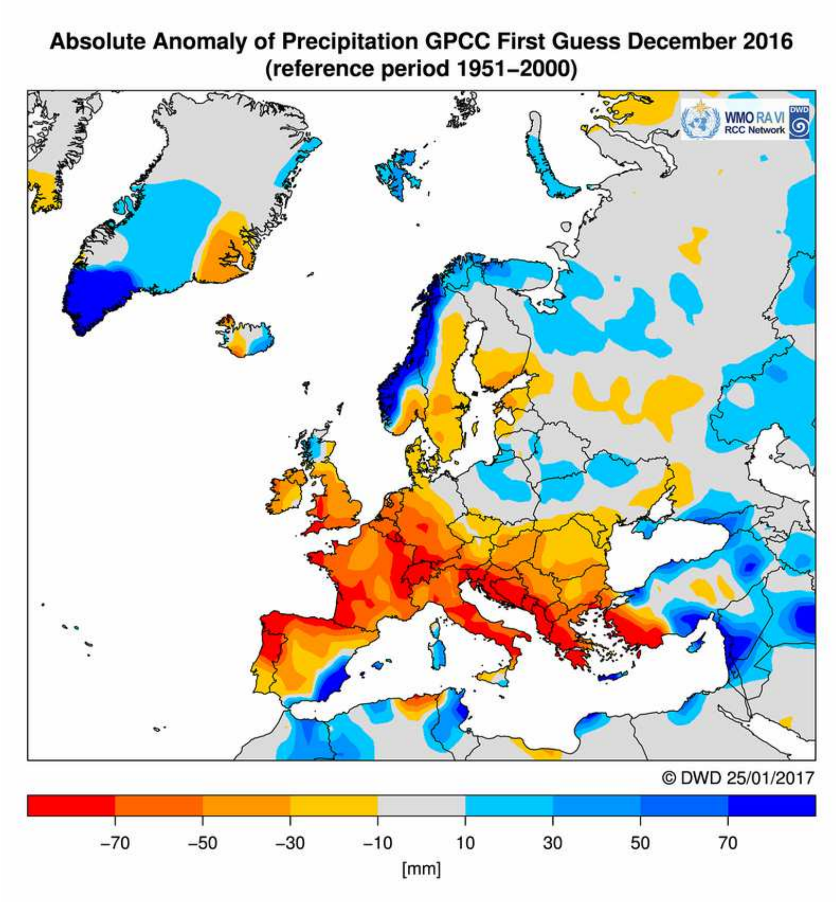


fig.I.2.7: Absolute anomaly (1951-2000 reference) of precipitation in the RA VI Region (Europe), data from GPCC (Global Precipitation Climatology Centre), http://www.dwd.de/rcc-cm.

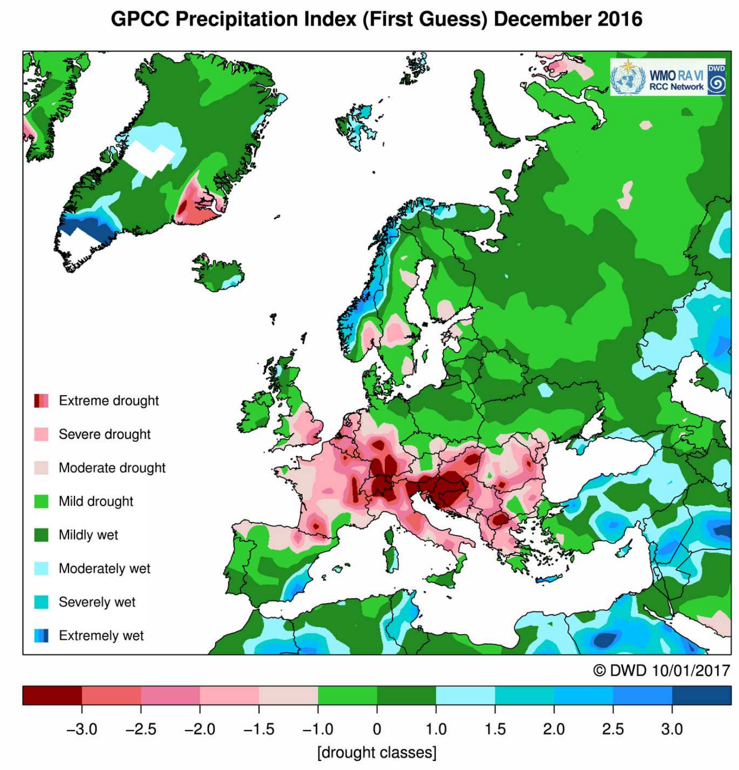


fig. I.2.8: GPCC Precipitation Index http://www.dwd.de/rcc-cm .

Monthly mean precipitation anomalies in European subregions. Subregions refer to ECMWF land boxes defined in Annex III.3. Anomalies are based on gridded data from GPCC First Guess Product, ftp://ftp-anon.dwd.de/pub/data/gpcc/PDF/GPCC_intro_products_2008.pdf, 1951-2000 reference.

Subregion	Absolute anomaly	GPCC Drought Index
Northern Europe	-9,6 mm	-0,333
Southern Europe	-38,2 mm	-1,005

Please note: new drought index since January 2016. The GPCC drought index, which also considers evaporation in addition to precipitation replaces the former SPI-DWD.

I.2.c Temperature

See map below. Temperature anomalies consistent with a Niña event on the North American continent. Beautiful negative anomaly from Siberia to the eastern Mediterranean. Positive anomaly at the front of the latter. Always strong anomalies on the Arctic regions.

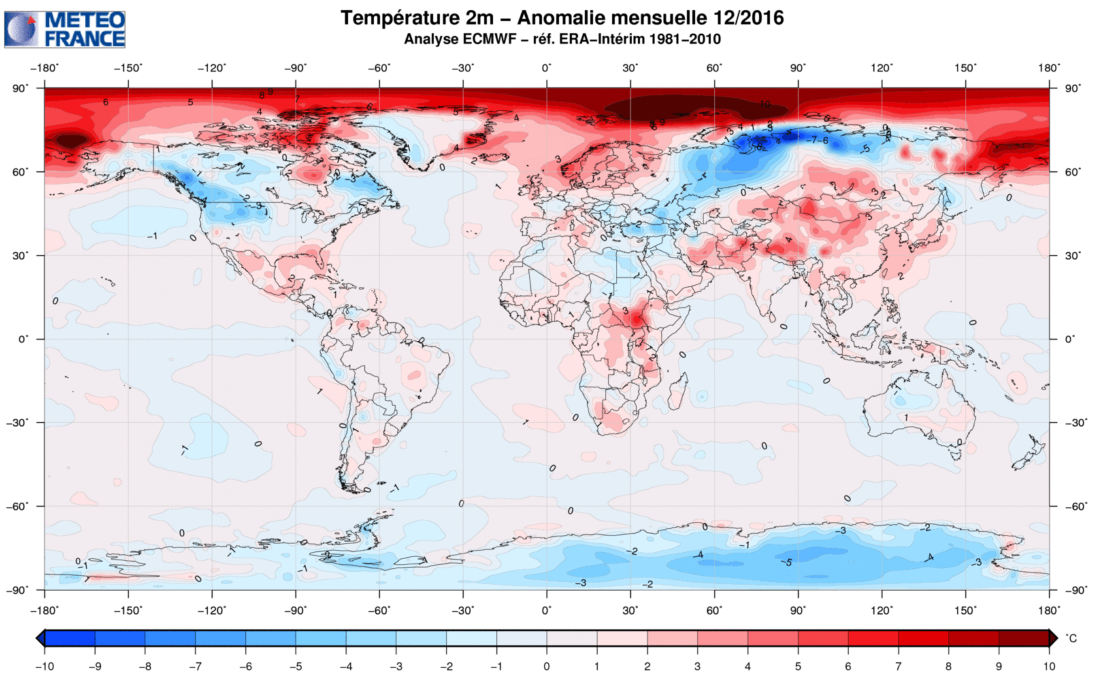


fig.I.2.9: Temperature Anomalies (°C) (Meteo-France)

Temperature anomalies in Europe:

Due to blocking over Europe mild air was led to northern Europe with well-above-normal temperatures in these areas. A cold airflow at the eastern flank of the European high resulted in cold conditions over Eastern Europe; the cold air advanced quite far to the south down to the Eastern Mediterranean and the Middle East with frost. Most of the rest of Europe had temperatures around normal or slightly above.

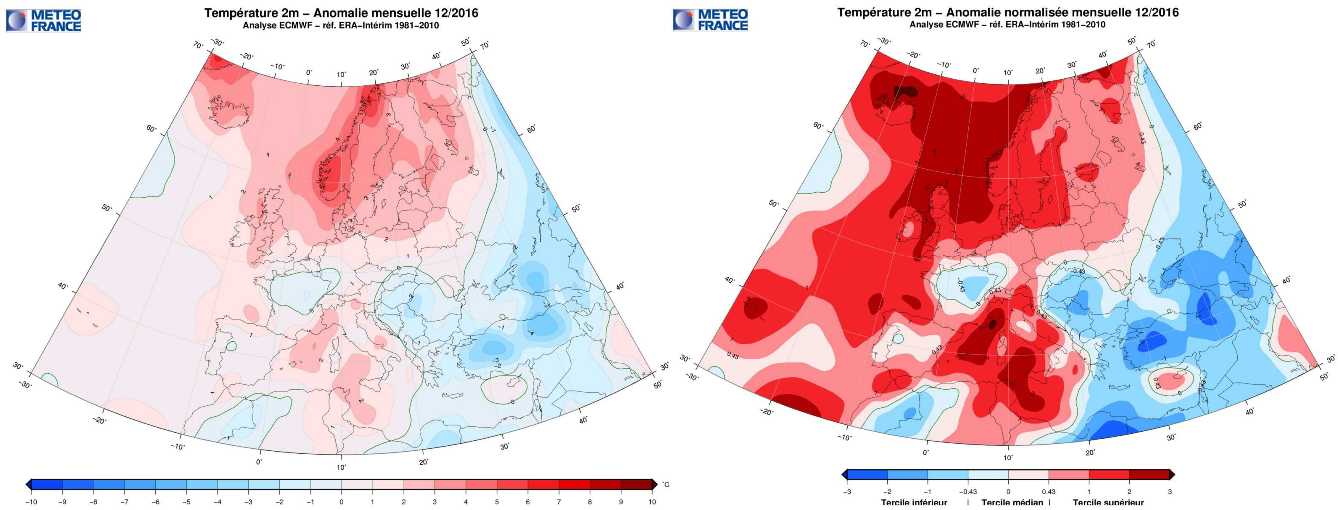


fig.I.2.10: Left graph: Absolute anomaly of temperature in the RA VI Region (Europe). Right graph: Standardized temperature anomalies

Monthly mean temperature anomalies in European subregions: Subregions refer to ECMWF land boxes defined in Annex III.3. Anomalies are based on gridded CLIMAT data from DWD, http://www.dwd.de/rcc-cm, 1961-1990 reference.

Subregion	Anomaly
Northern Europe	+2,8 °C
Southern Europe	+0,2 °C

I.2.d Sea ice

From NSIDC : "Sea ice in the Arctic and the Antarctic set record low extents every day in December, continuing the pattern that began in November."

In the Arctic (fig. 1.2.11 and 1.2.12 - left) : Still in lack be getting close to records: December 2016 is the second month of December of least extent since 1978 (after December 2010, see http://nsidc.org/arcticseaicenews/files/2017/01/Figure3.png). Especially, the lack comes mainly from the Barents Sea, the Kara Sea and the Bering Sea.
In the Antarctic (fig. 1.2.11 and 1.2.12 - right) : Also with high lack.

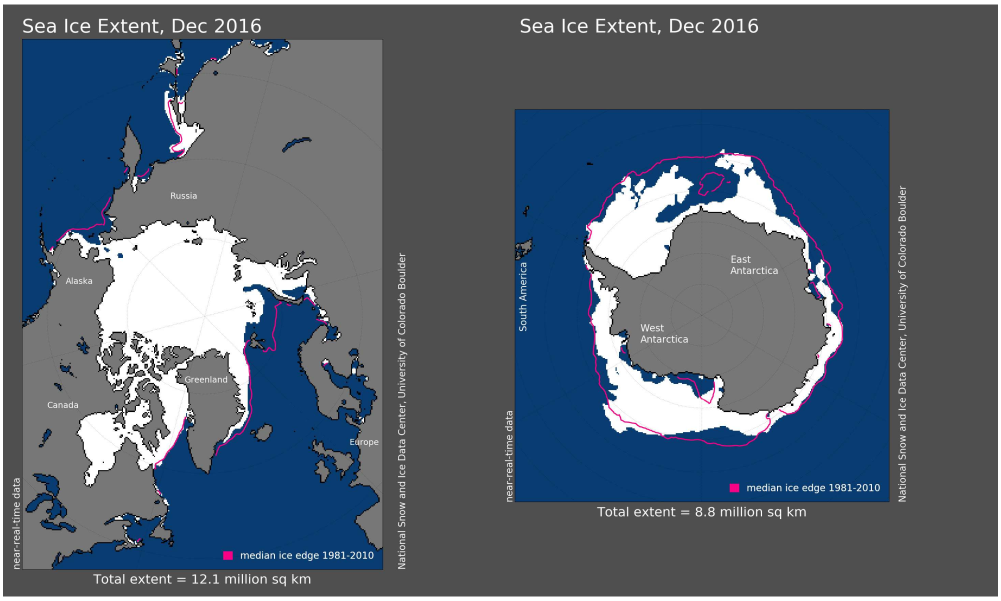


fig.I.2.11: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

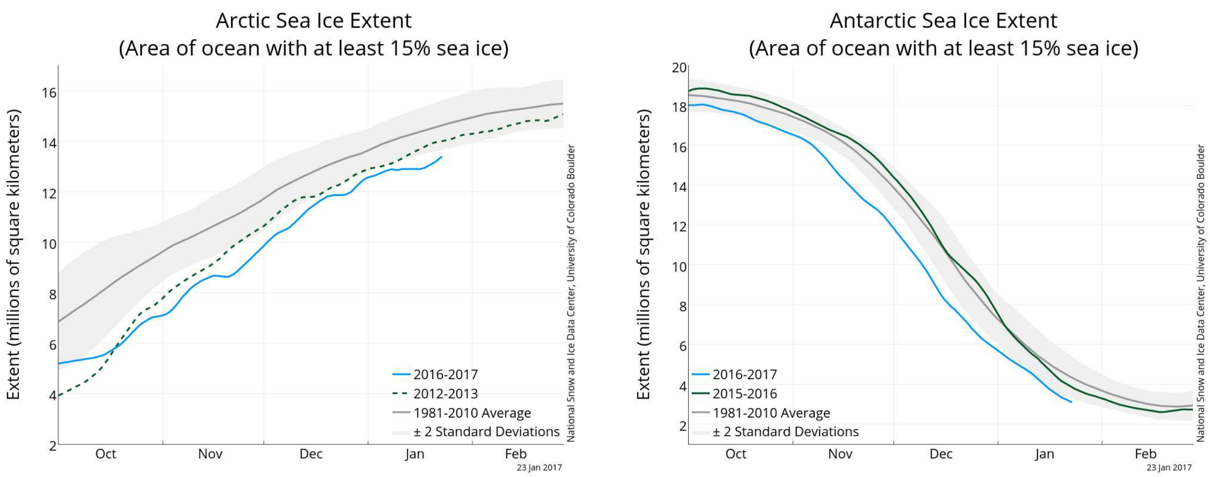


fig. I.2.12 : Sea-Ice extension evolution from NSIDC.

http://nsidc.org/data/seaice_index/images/daily_images/N_stddev_timeseries.png

II. SEASONAL FORECAST FROM DYNAMICAL MODELS

Note : the new ARPEGE System 5 model contributes now to the EUROSIP consensus.

II.1. OCEANIC FORECASTS

II.1.a Sea surface temperature (SST, figure II.1.1 to II.1.4)

- Pacific Ocean: Models are in good agreement with the continuation of a gradual return to a neutral state in the equatorial rail. At the end of this FMA quarter we will no longer speak of La Niña. About PDO, it would also appear that it will break down in the coming months: we have a zonal structure of SST anomalies.
- Indian Ocean: DMI index (differences between SST anomalies in the west and east of the tropical Indian Ocean) should be slightly positive; No clear phase of the IOD.
- Atlantic Ocean: For the North Atlantic, persistence of the negative anomaly over the central basin north of 50 ° N (known as "cold blob"). From the Greater Antilles to Newfoundland (and south of the cold blob), beautiful positive SST anomalies proposed by the 3 models looked at. The equatorial Atlantic should be warmer than normal: the small Atlantic Niño.

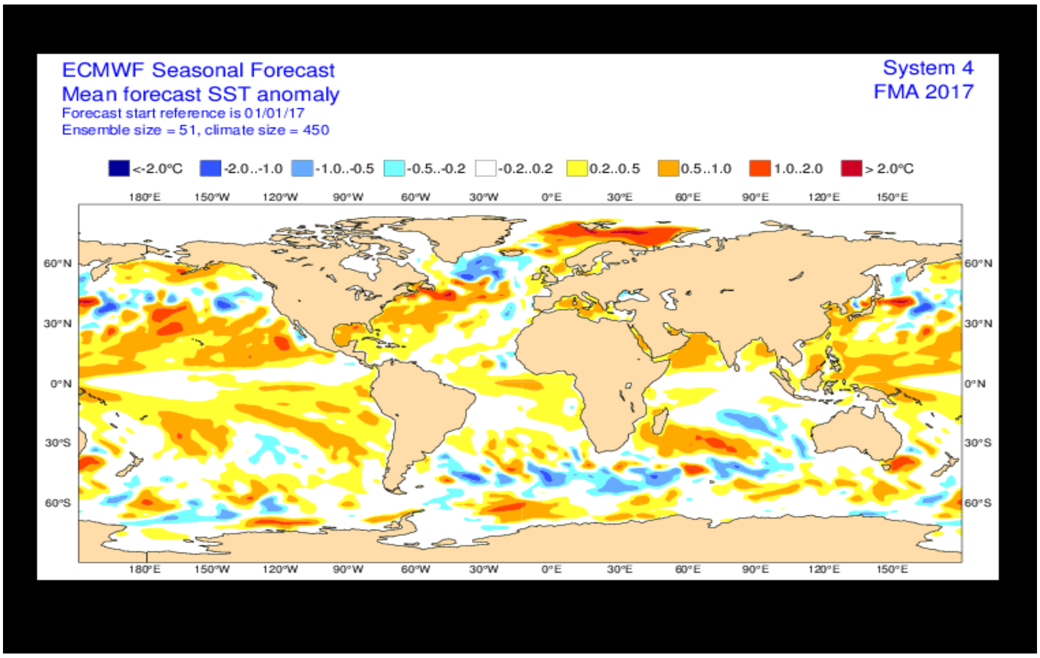


fig.II.1.1: SST anomaly forecast from ECMWF

http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

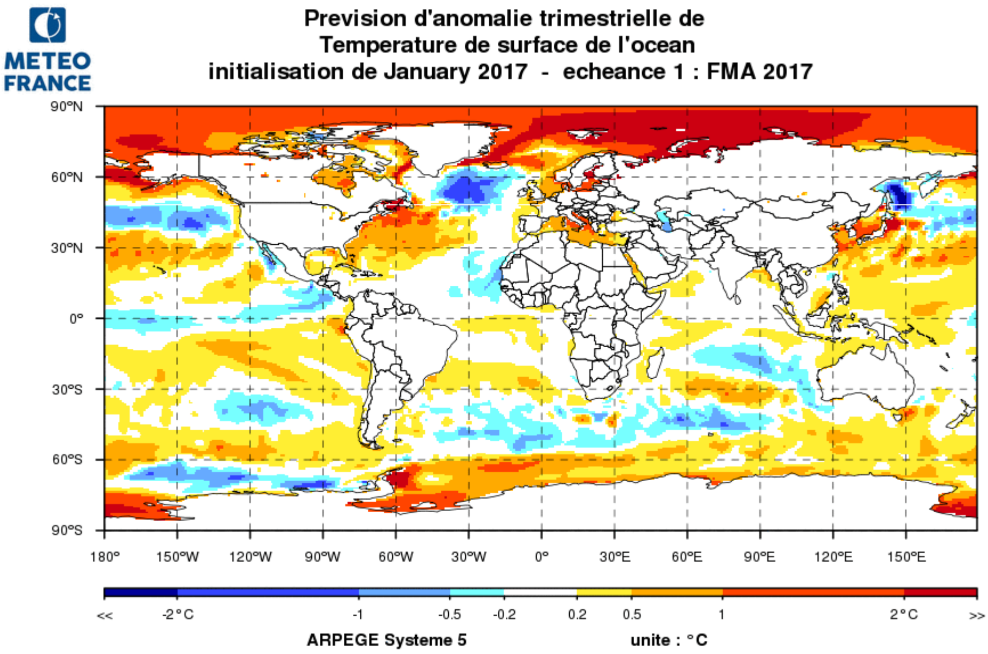


fig.II.1.2: SST Anomaly forecast from Meteo-France (recalibrated with respect of observation).

http://elaboration.seasonal.meteo.fr

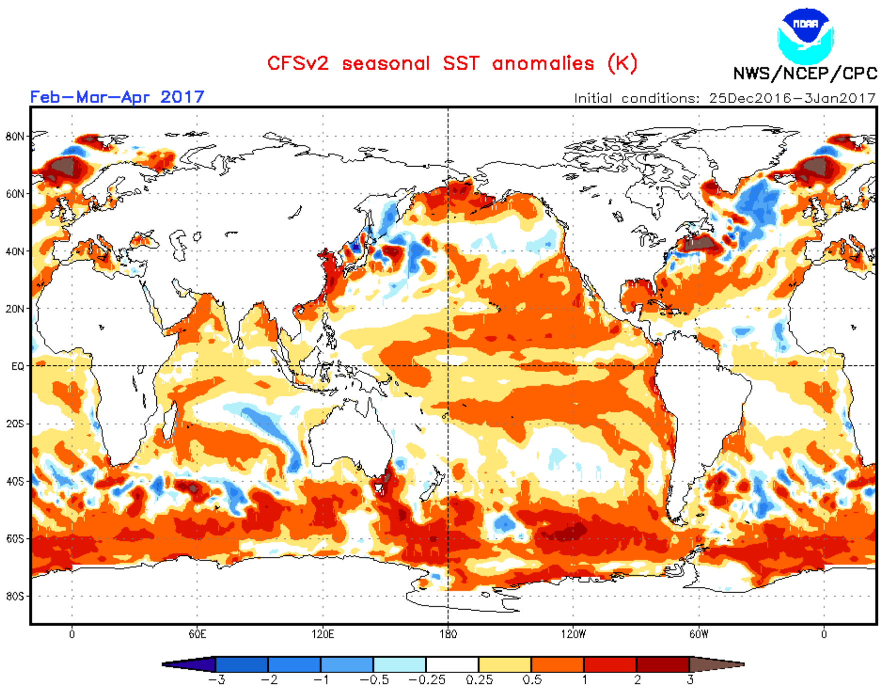


fig.II.1.3: SST anomaly forecast from NCEP.

http://www.cpc.ncep.noaa.gov/products/people/wwang/cfsv2fcst/imagesInd1/glbSSTSeaInd1.gif

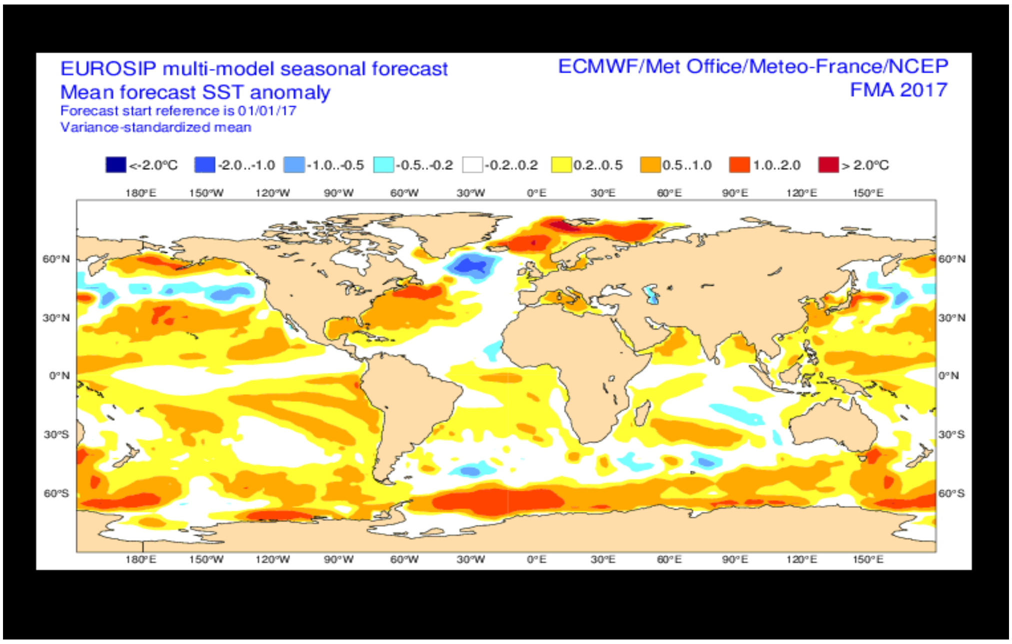


fig.II.1.4: SST Forecasted anomaly from Euro-SIP

II.1.b ENSO forecast :

Forecast Phase: Neutral

The trend during FMA 2017 is gradually returning to neutral conditions (75% of the runs of the EUROSIP multi-model forecast a Nino3.4 SST anomaly > 0 ° C at the end of the quarter).

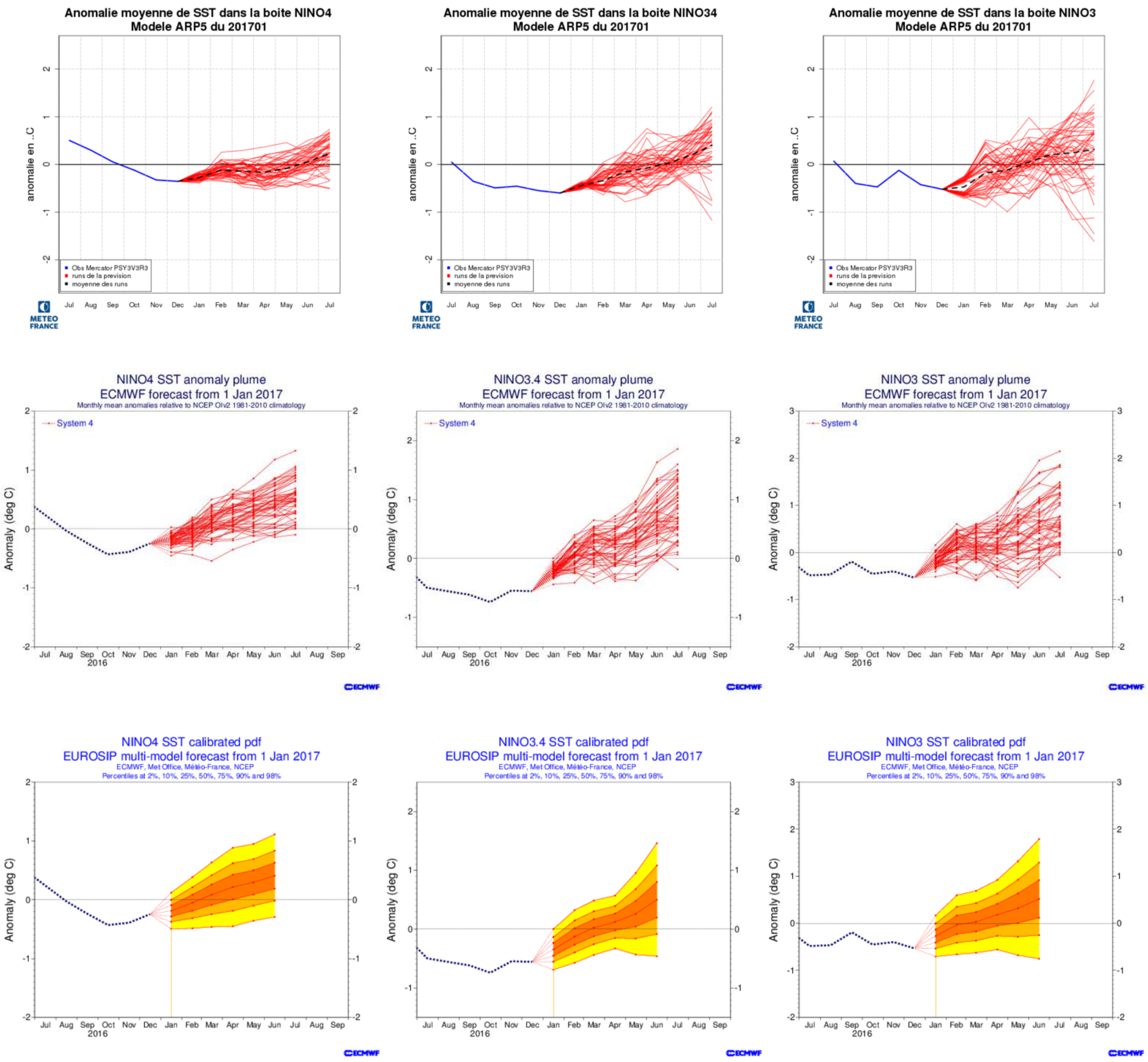


fig.II.1.5: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members - and EuroSIP (bottom) – recalibrated distributions - (http://elaboration.seasonal.meteo.fr , http://www.ecmwf.int/)

II.1.c Atlantic ocean forecasts

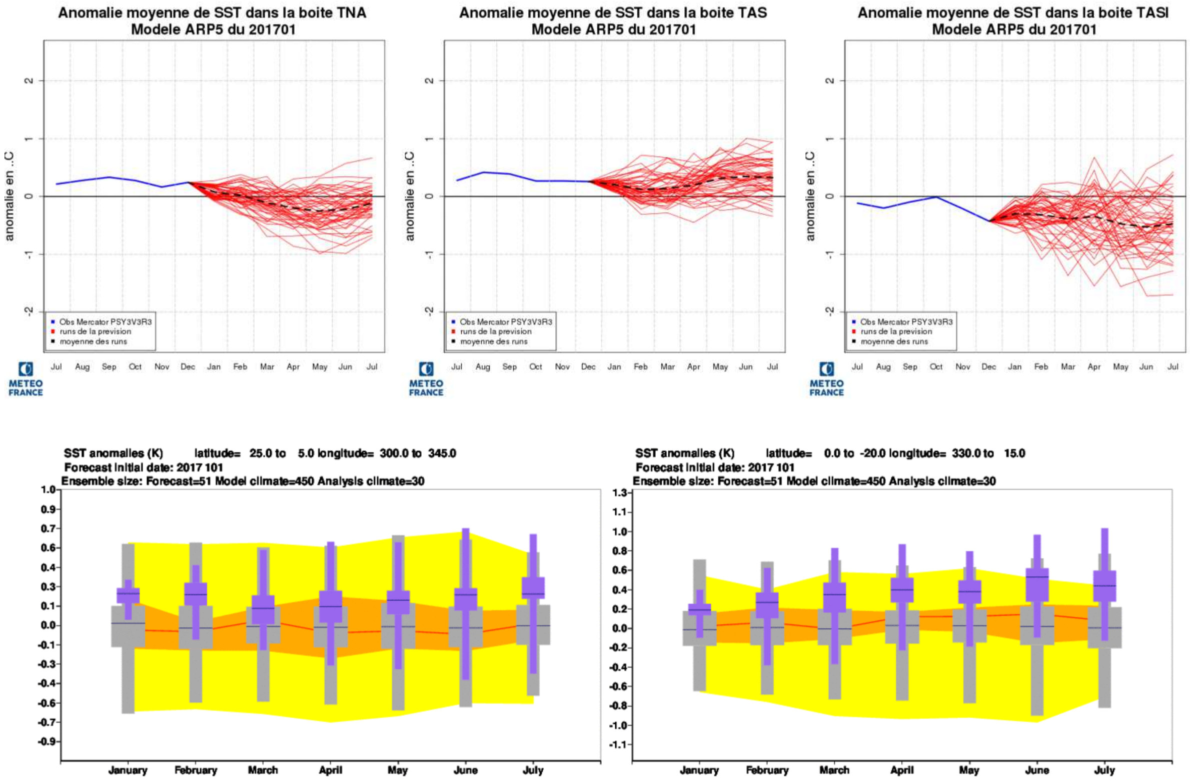
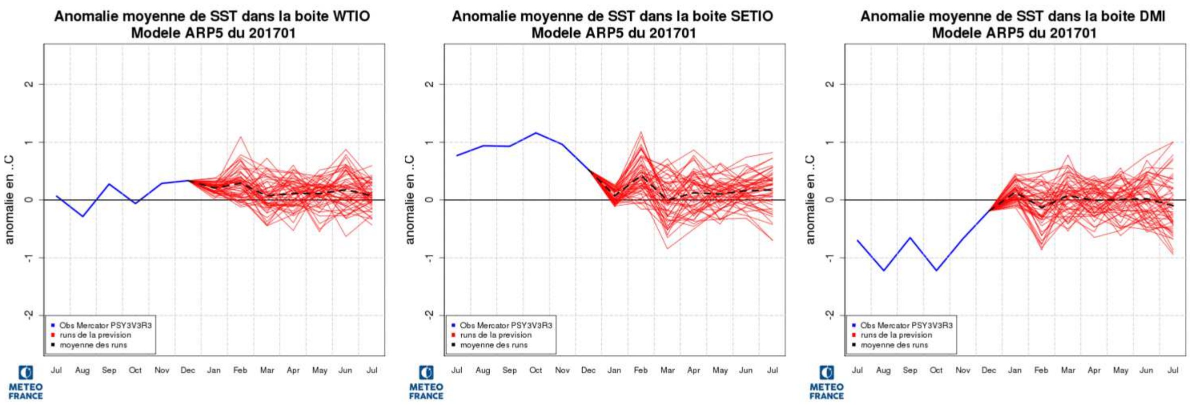


fig.II.1.6: SSTs anomaly forecasts in the Atlantic Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

II.1.d Indian ocean forecasts



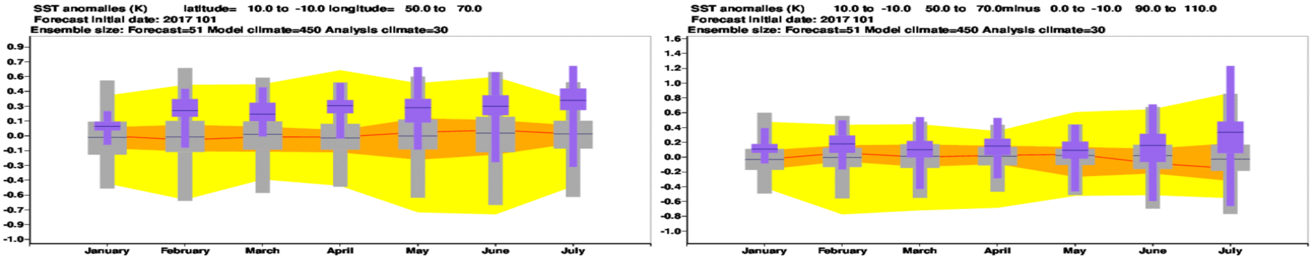


fig.II.1.7: SSTs anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

II.2. GENERAL CIRCULATION FORECAST

II.2.a Global forecast

Velocity potential anomaly field (cf. fig. II.2.1 – insight into Hadley-Walker circulation anomalies) and **Stream Function anomaly field** (cf. fig. II.2.1 – insight into teleconnection patterns tropically forced):

Velocity potential : Good consistency of the models over the Pacific : a pole of negative anomalies (therefore of upward motion) on the extreme west (towards the Philippines) a second pole of negative anomalies southwest of the Aleutians, and a pole of positive anomalies (therefore of downward motion) over the equatorial rail (then extending towards Mexico and the south of the USA). On the other hand, there are divergences of scenarios over the Indian Ocean, South America and Africa (ARPEGE S5 is isolated compared to ECMWF and JMA which are consistent).

Stream Function anomaly : Models react quite strongly to divergent circulation anomalies over the Indian Ocean and maritime continent. Especially, the upward motion anomaly in the vicinity of the Philippines generates a negative PNA response. Over the Atlantic, there is some consensus for anomalies of anticyclonic circulation from the Sargasso Sea to northern Europe. Between northern Europe and the anticyclonic anomaly over West Africa, we can guess a cyclonic weakness. But its position varies according to the models (CEPMMT locate this structure over the south of Spain and the north of the Maghreb).

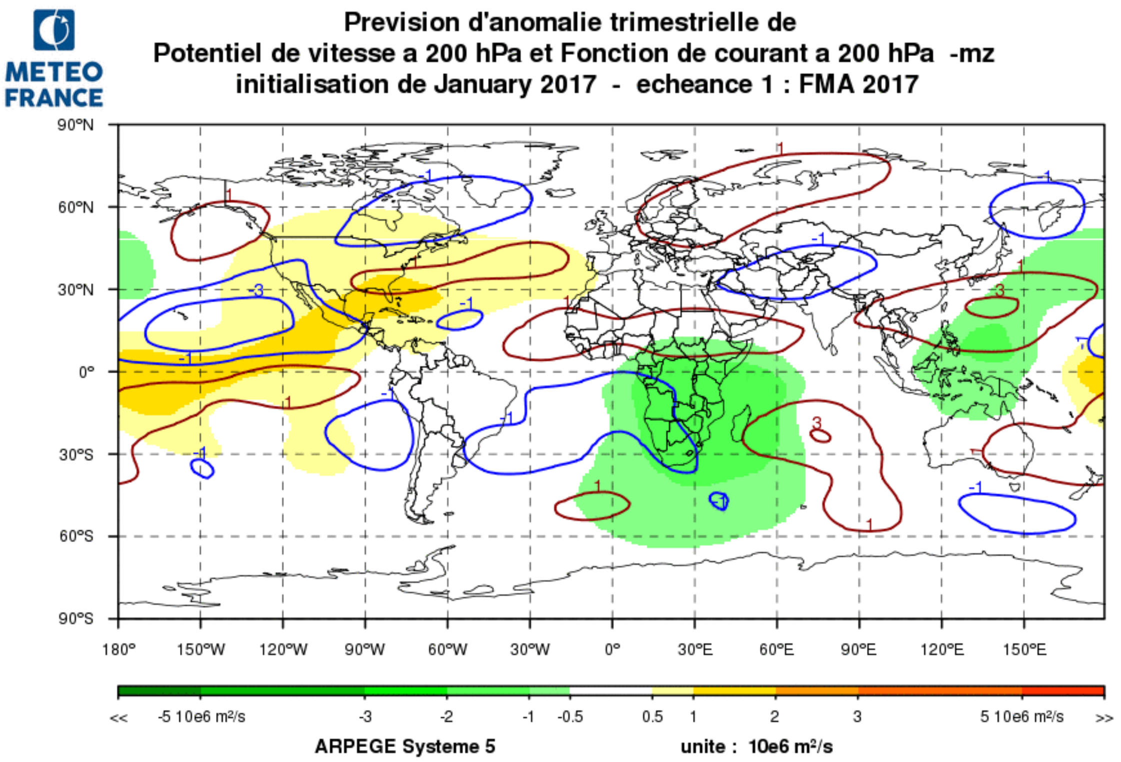
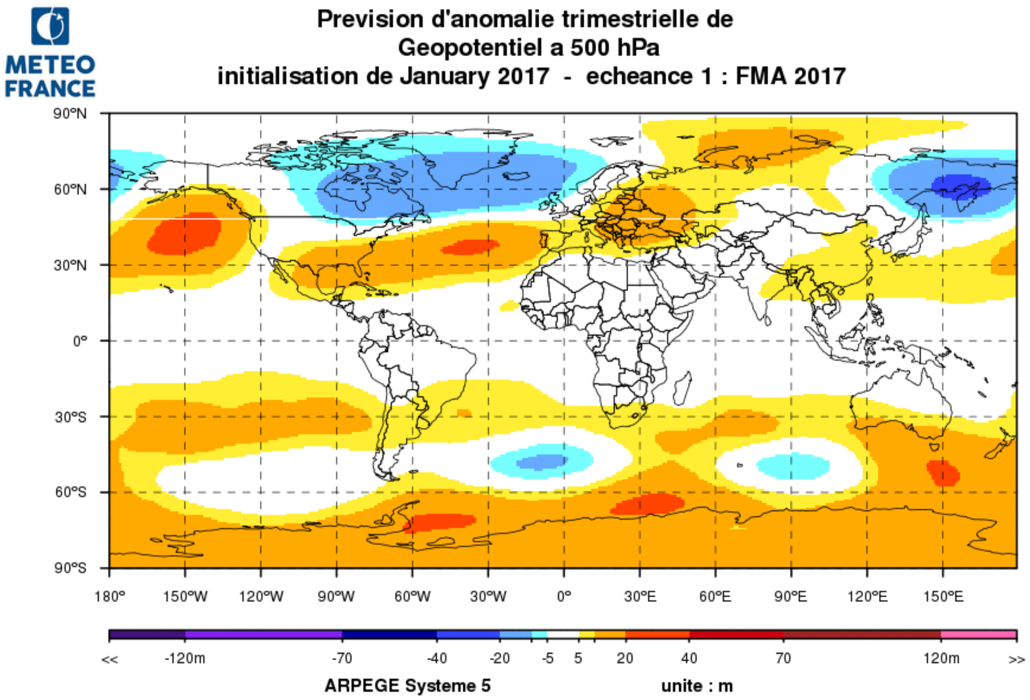


fig.II.2.1: Velocity Potential anomaly field χ (shaded area – green negative anomaly and yellow positive anomaly) and Stream Function anomaly ψ (isolines – red positive and blue negative in NH) at 200 hPa by Météo-France ARPEGE-S5.

II.2.b Northern hemisphere and Europe forecast

Geopotential height anomalies (fig. II.2.2 and II.2.3 – insight into mid-latitude general circulation anomalies) :

ARPEGE and CEP models disagree : ARPEGE favours a NAO+ scenario whereas CEPMMT predicts a Scandinavian blocking and (ensuring consistency with the previous circulation analysis) a negative geopotential anomaly on Spain, Morocco and Algeria. The review of the GPC Z500 forecasts available so far shows consensus on a NAO+ configuration in Z500hPa. This is also the scenario proposed by EUROSIP. This configuration seems credible, consistent with what has been explained above. It seems therefore logical to follow this proposal.



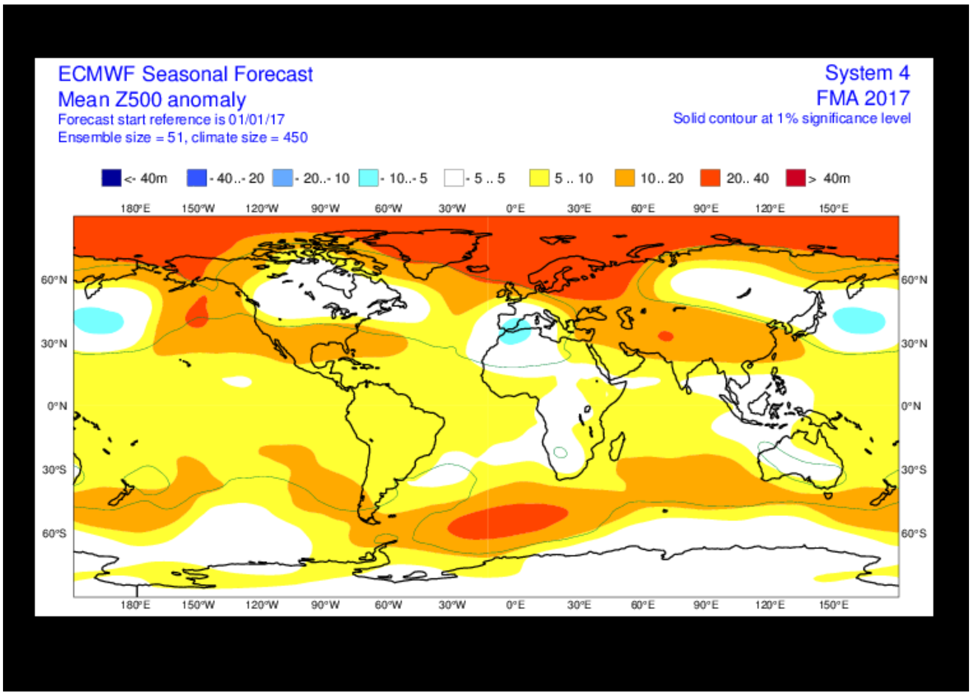
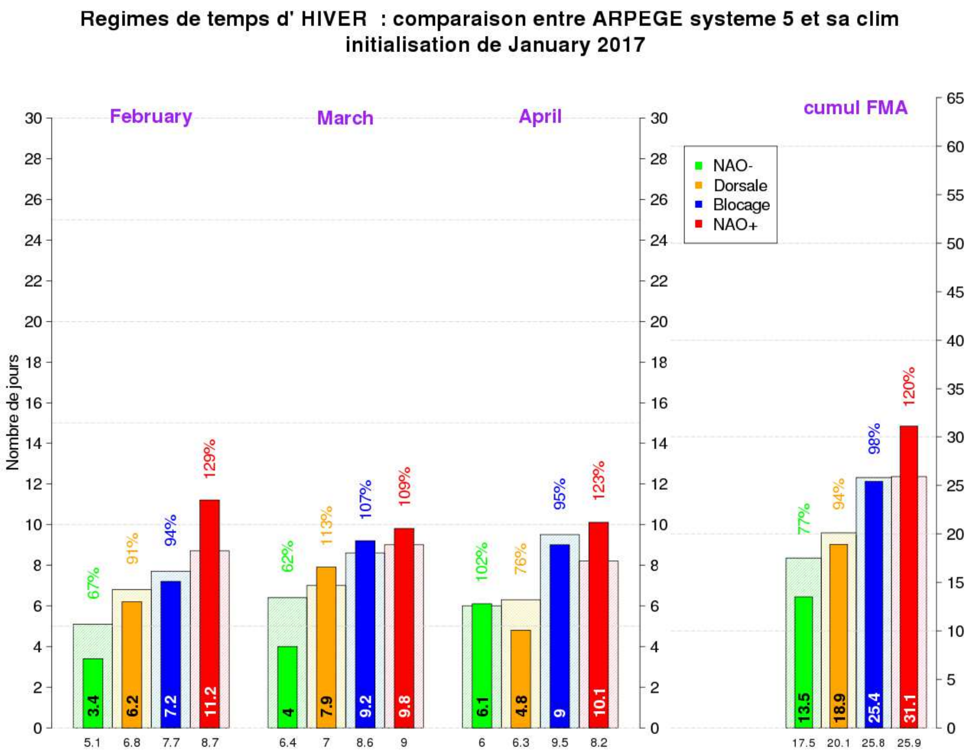
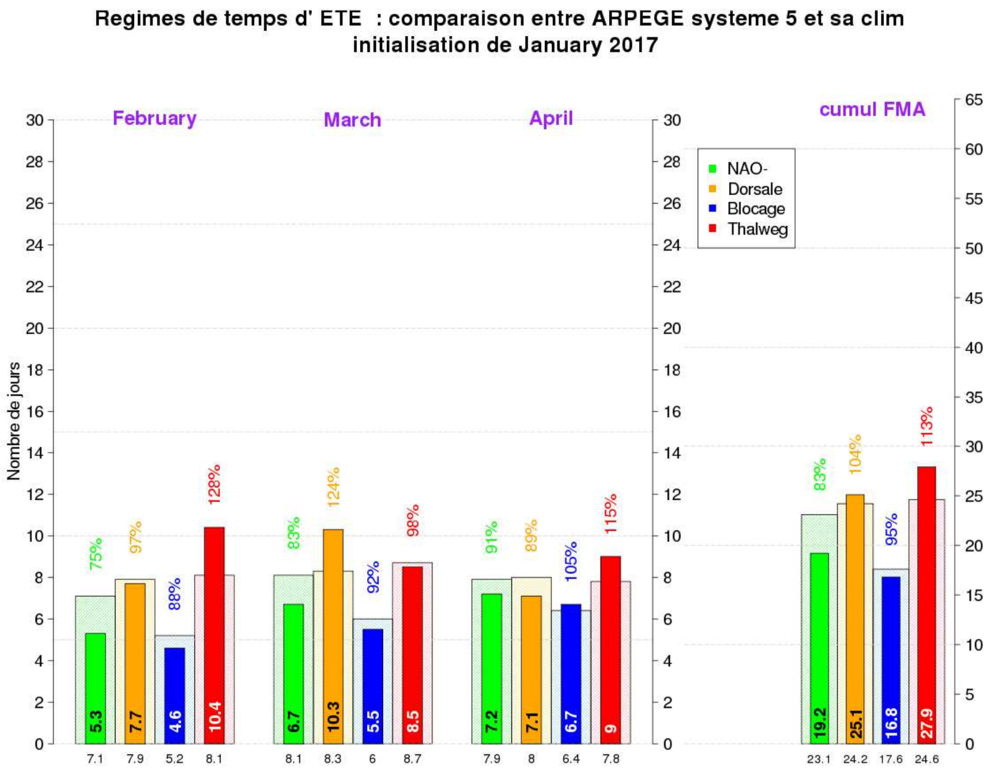


fig.II.2.2: Anomalies of Geopotential Height at 500 hPa from Météo-France (top) and ECMWF (bottom).



METEO FRANCE



METEO FRANCE

fig.II.2.3: North Atlantic Regime occurrence anomalies from Meteo-France ARPEGE-S5 : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes (winter regimes at the top, summer regimes at the bottom).

II.3. IMPACT: TEMPERATURE FORECASTS (FIGURE II.3.1 TO II.3.4)

For Europe, T2M forecasts are fairly consensual. Warm signal, especially over the western Mediterranean and the extreme north of Europe. For France, we can count on a scenario rather warm (20/30/50).

II.3.a ECMWF

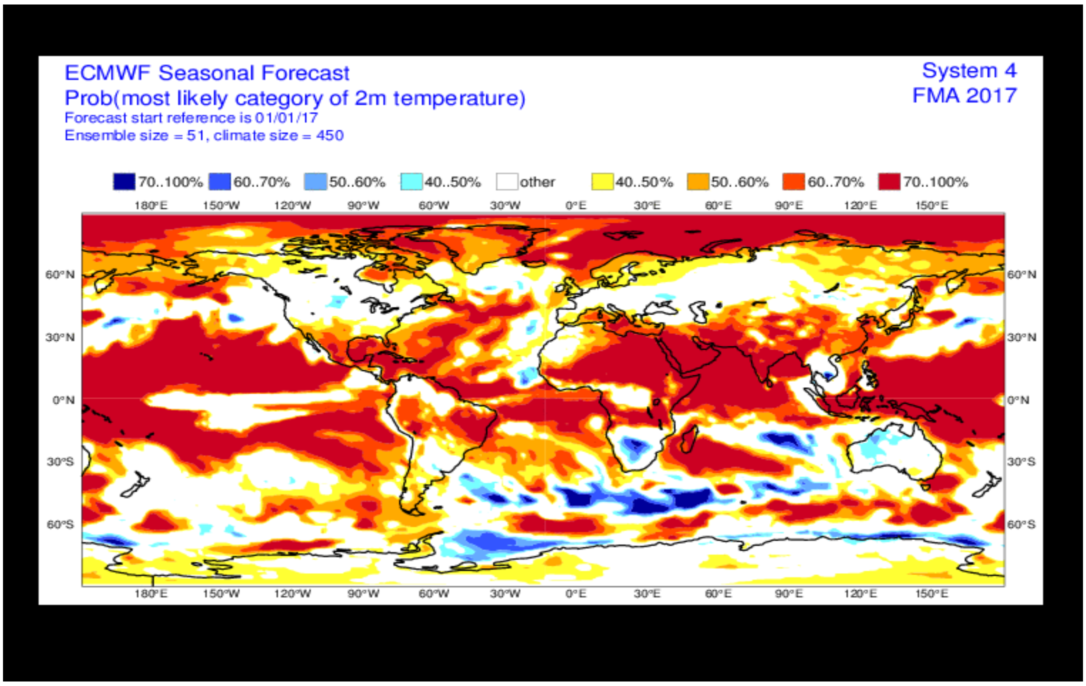


fig.II.3.1: Most likely category probability of T2m from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/

II.3.b Météo-France

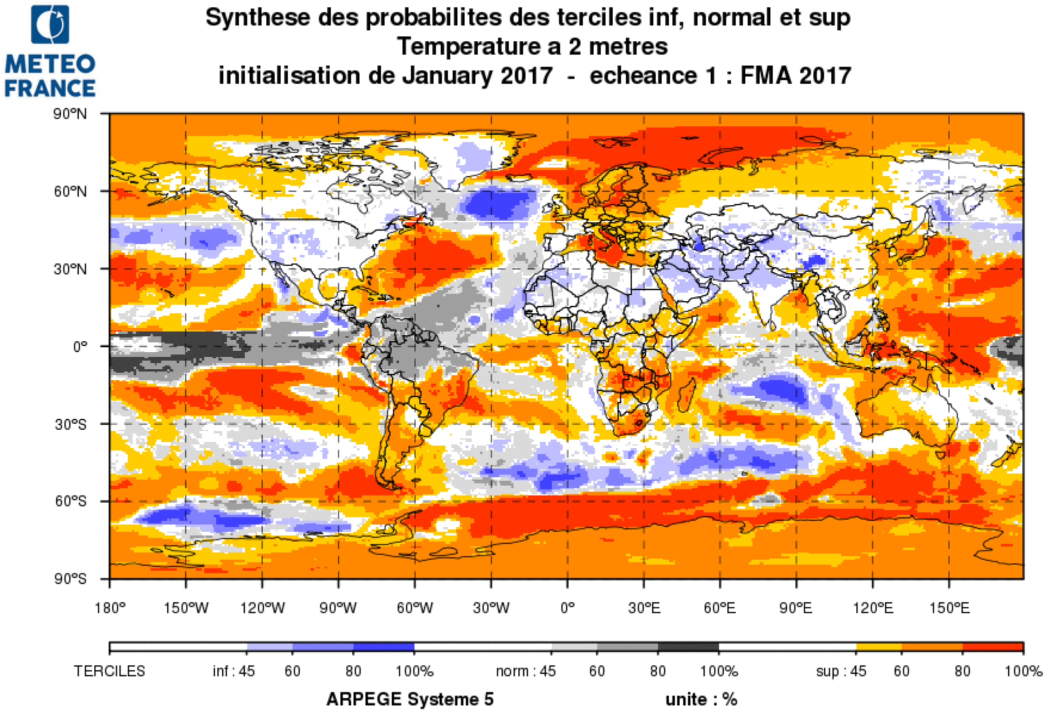


fig.II.3.2: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.3.c Japan Meteorological Agency (JMA)

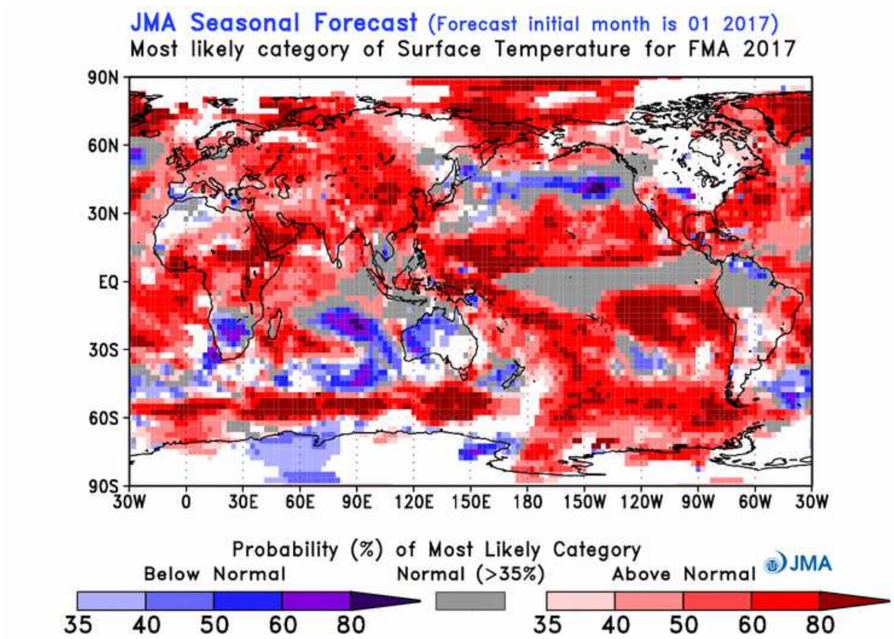


fig.II.3.3: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/4mE/fcst/fcst_gl.php

II.3.d EUROSIP

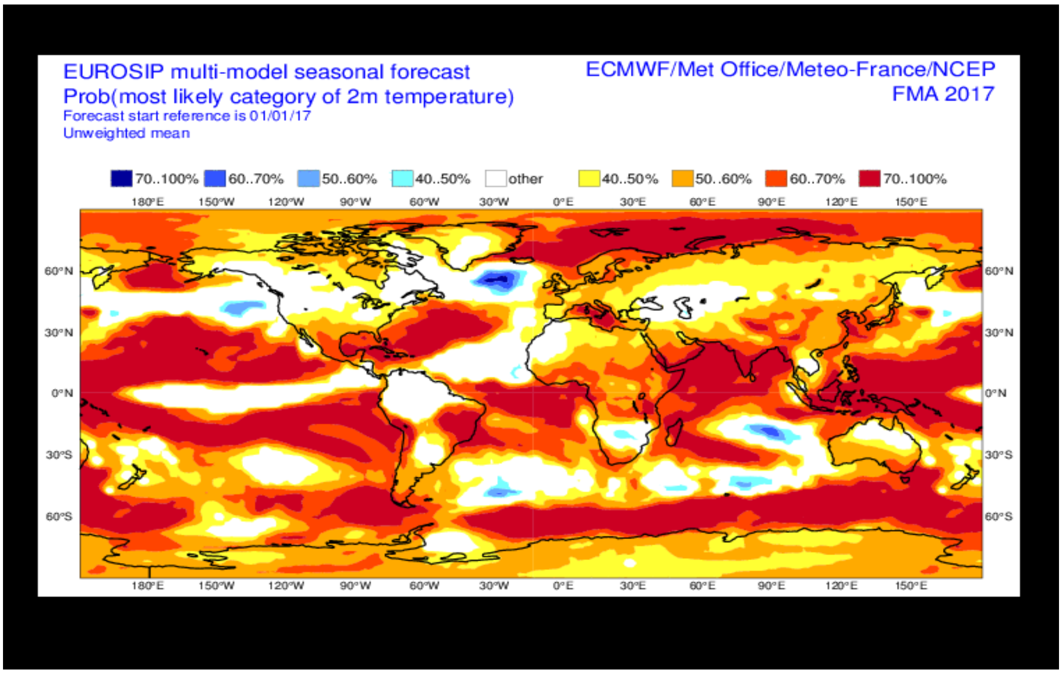


fig.II.3.4: Multi-Model Probabilistic forecasts for T2m from EUROSIP (2 Categories, Below and Above normal – White zones correspond to No signal and Normal).

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

II.4. IMPACT : PRECIPITATION FORECAST

For Europe, the NAO+ effect should give a little more precipitation on the northern part. For France, no scenario.

II.4.a ECMWF

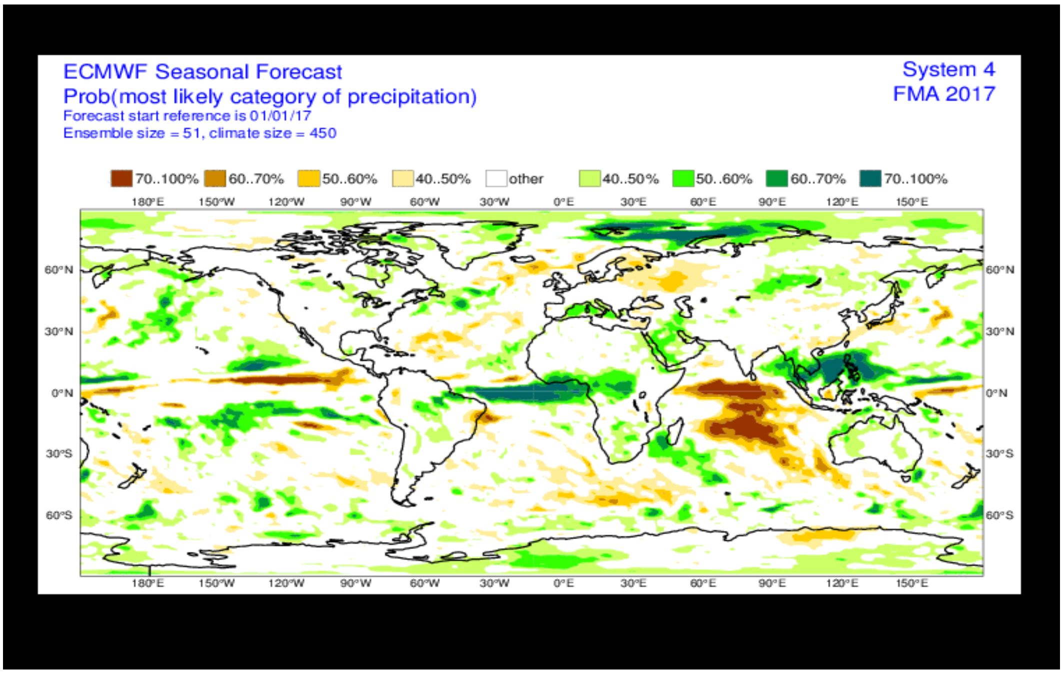


fig.II.4.1: Most likely category probability of rainfall from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/

II.4.b Météo-France

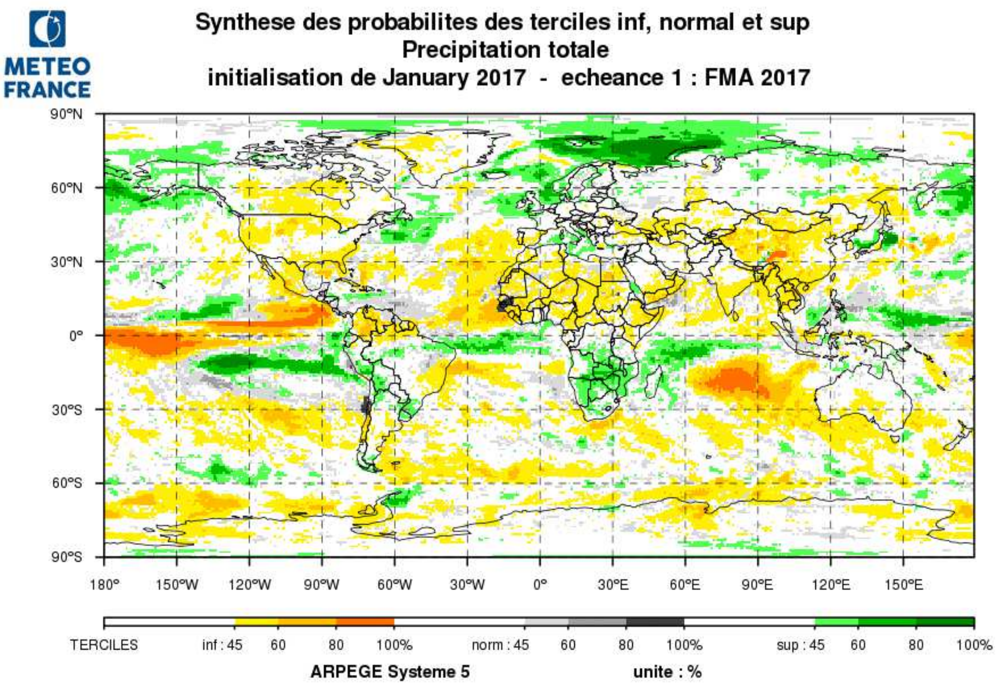


fig.II.4.2: Most likely category of Rainfall. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://elaboration.seasonal.meteo.fr/

II.4.c Japan Meteorological Agency (JMA)

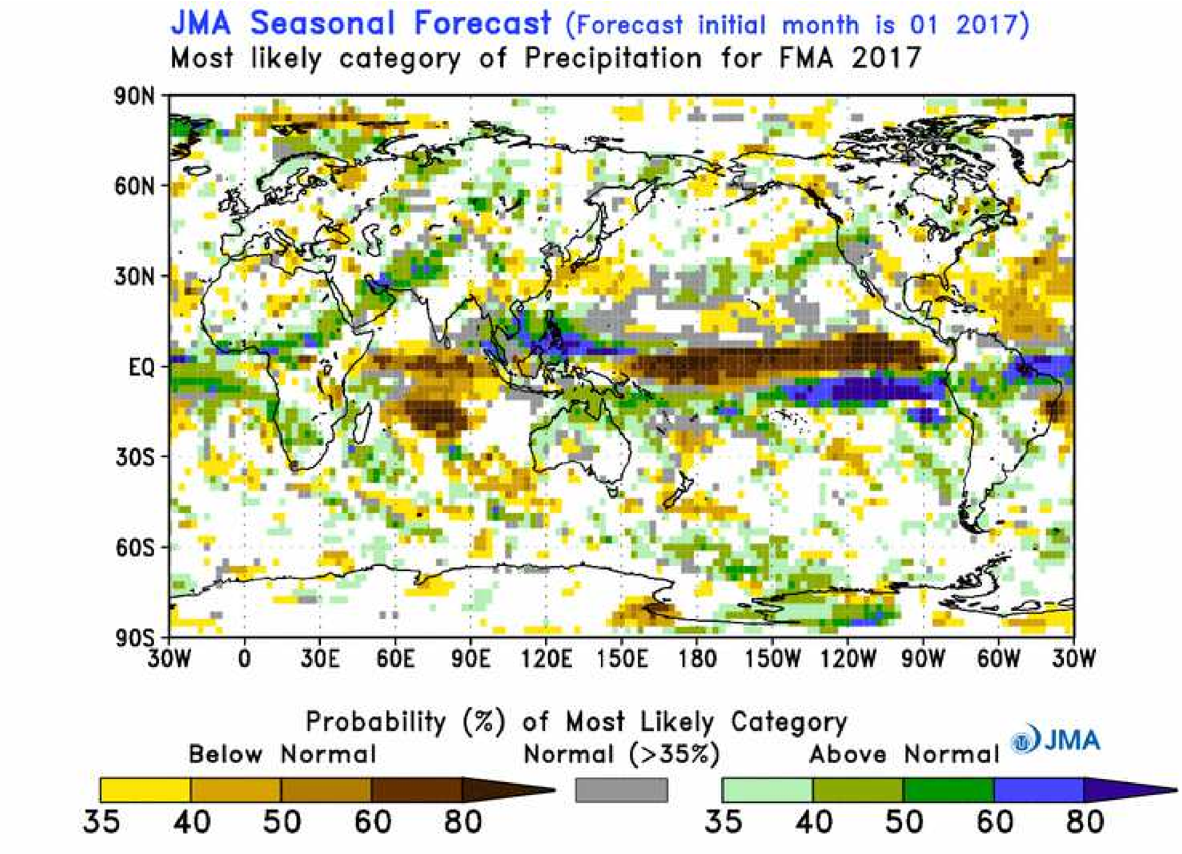


fig.II.4.5: Most likely category of Rainfall from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/4mE/fcst/fcst_gl.php

II.4.d EUROSIP

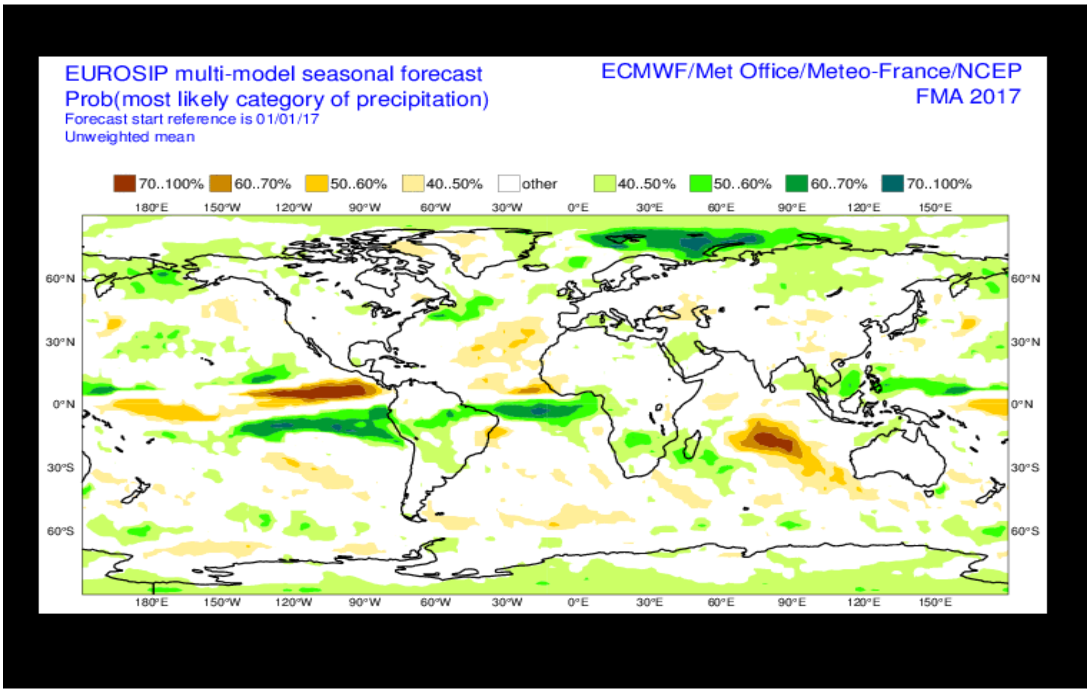
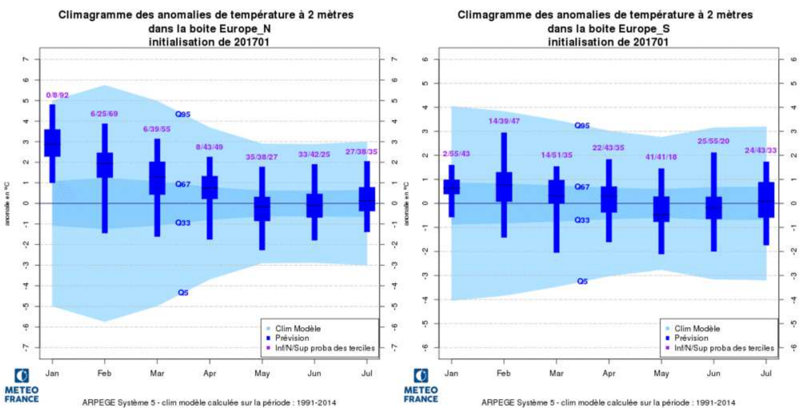


fig.II.4.7: Multi-Model Probabilistic forecasts for precipitation from EUROSIP (2 Categories, Below and Above normal – White zones correspond to No signal).

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

II.5. REGIONAL TEMPERATURES AND PRECIPITATIONS



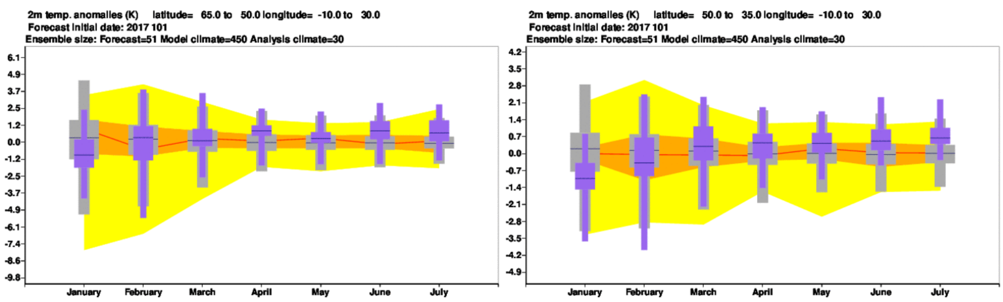
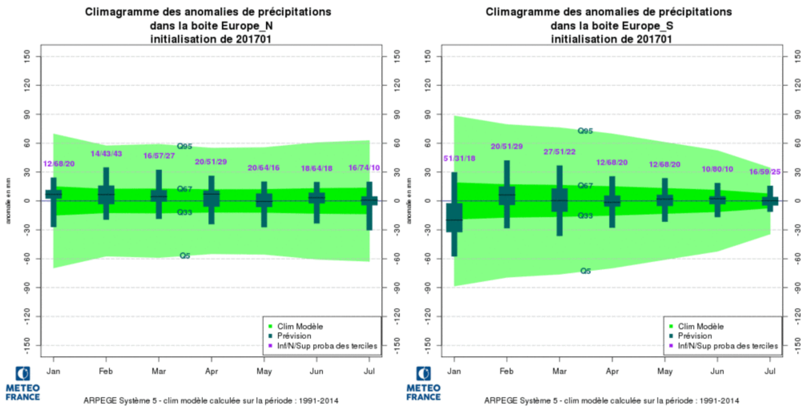


fig.II.5.1 : Climagrams for Temperature in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).



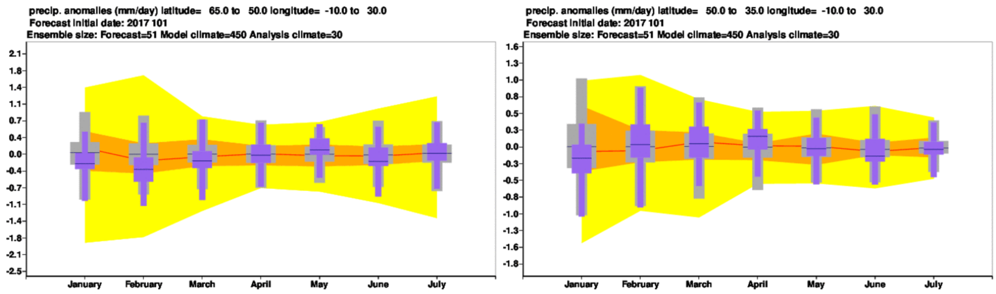
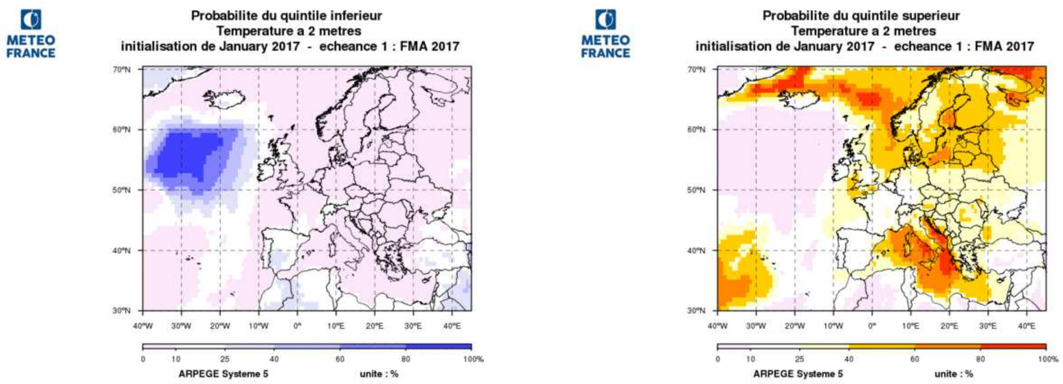


fig.II.5.2 : Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

II.6. MODEL'S CONSISTENCY

Not available

II.7. "EXTREME" SCENARIOS



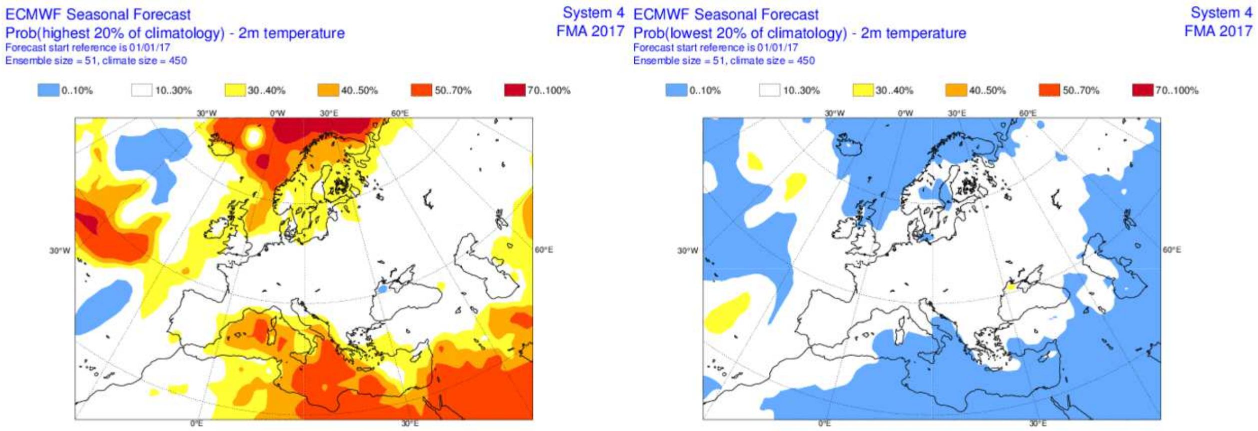


fig.II.7.1 : Top : Meteo-France T2m probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution). Bottom : ECMWF T2m probability of « extreme » below normal conditions (left - lowest ~20% of the distribution) and "extreme" above normal conditions (right – highest ~20% of the distribution).

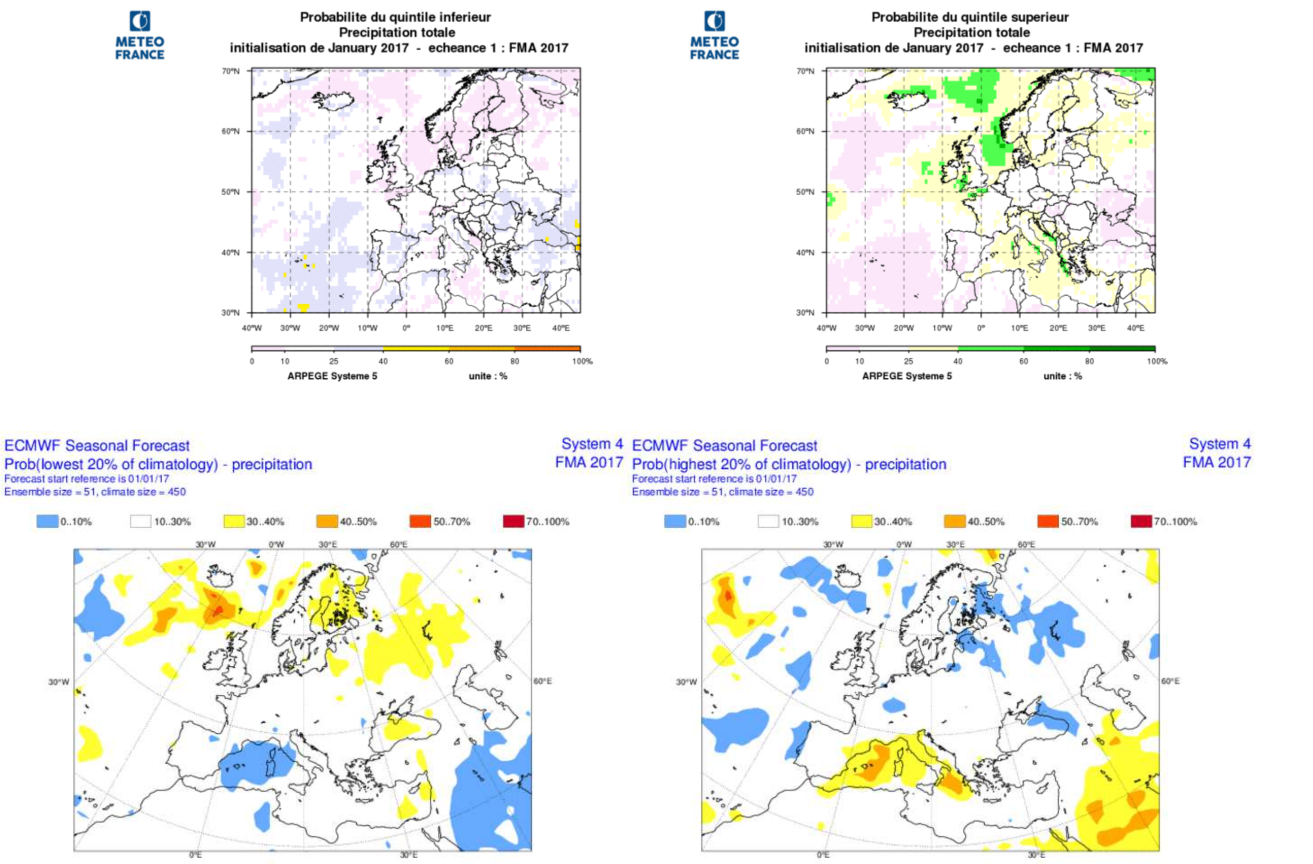
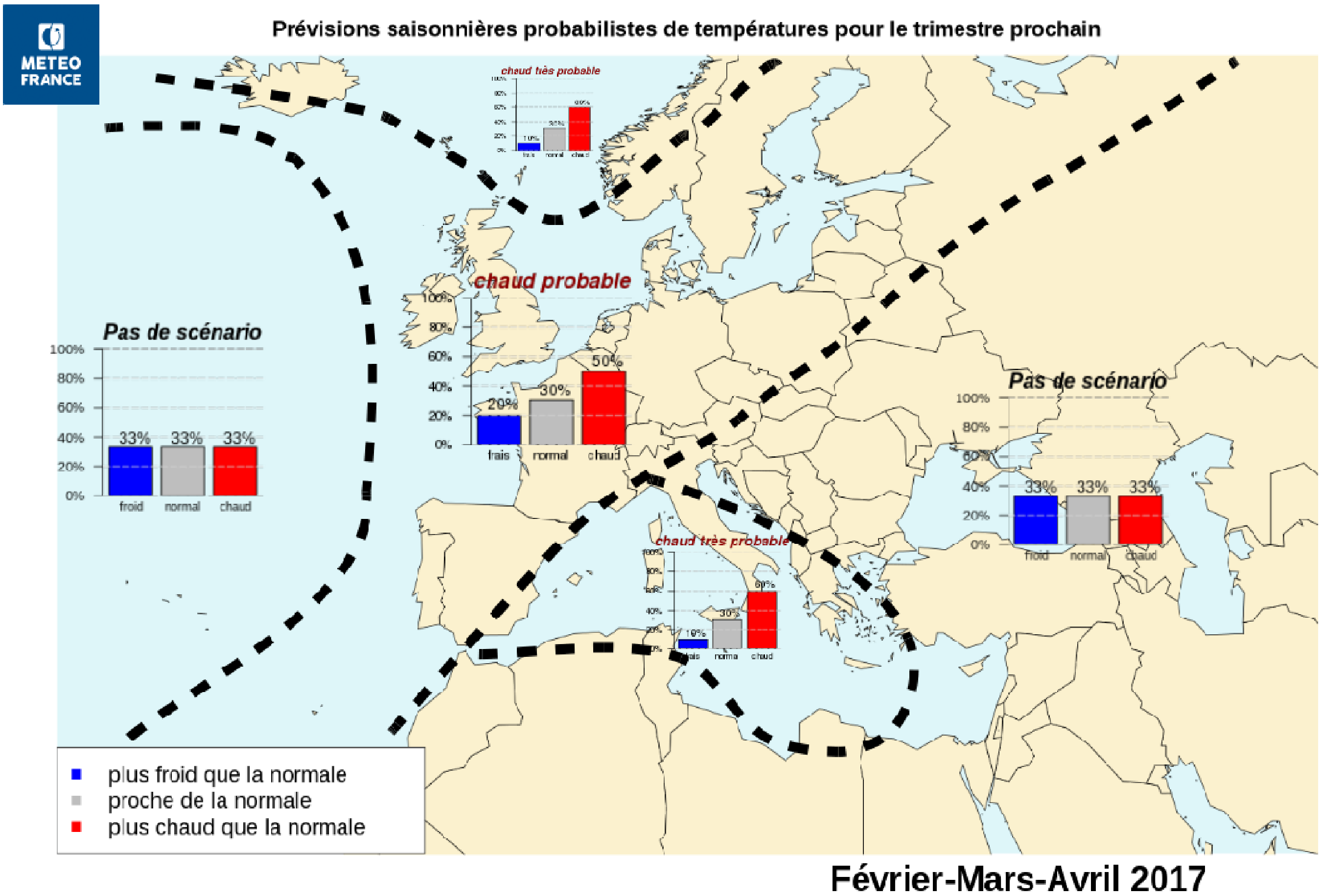


fig.II.7.2 : Top : Meteo-France rainfall probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution).
Bottom : ECMWF rainfall probability of « extreme » below normal conditions (left - lowest ~20% of the distribution) and "extreme" above normal conditions (right – highest ~20% of the distribution).

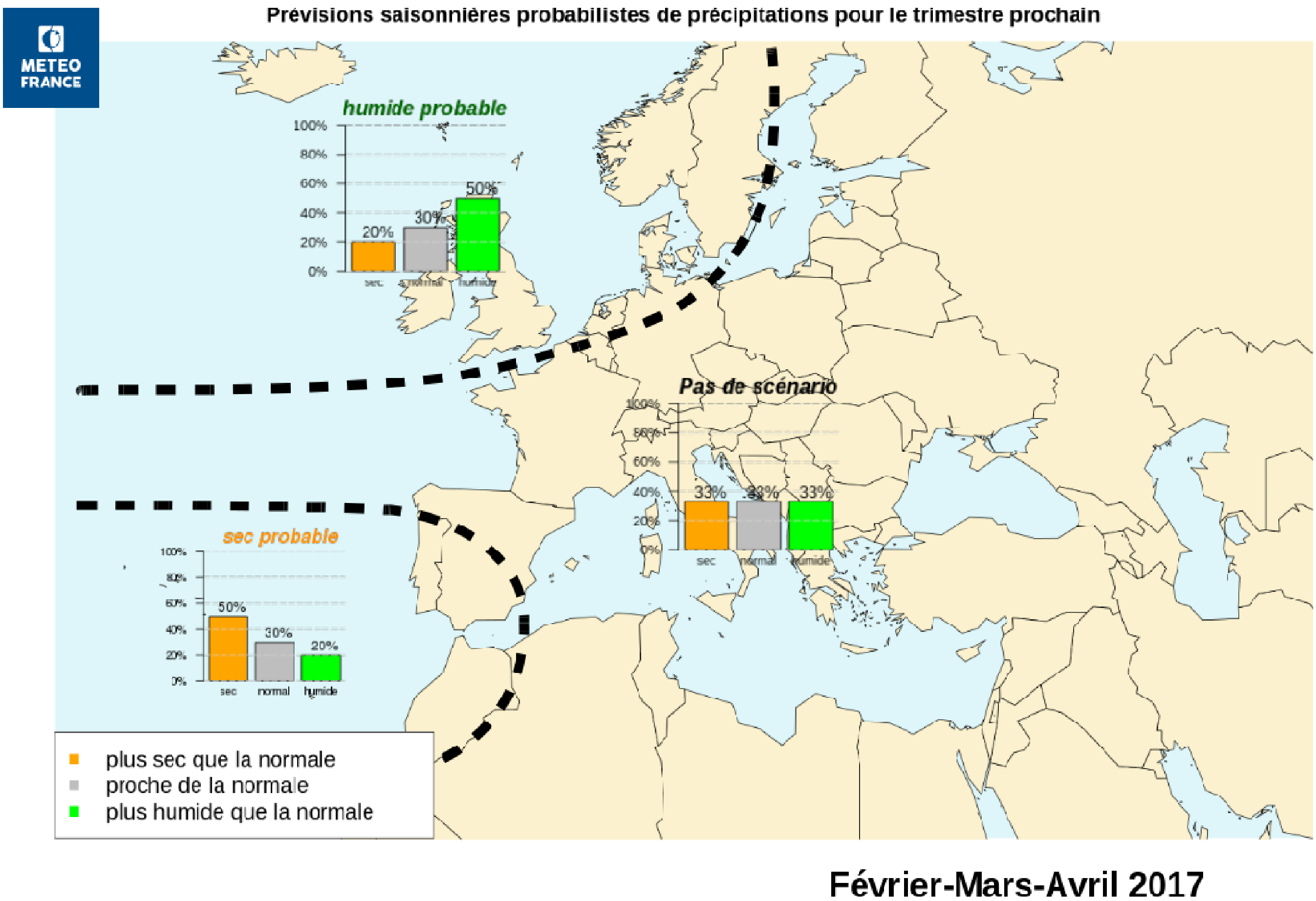
II.8. DISCUSSION AND SUMMARY

II.8.a Forecast over Europe

Temperatures: A privileged warm scenario with a stronger probability over northern Europe and the western Mediterranean.



Precipitation: Scenario rather wet over northern Europe (British Isles, Scandinavia) and dry over the extreme south-west of Europe.



II.8.b Tropical cyclone activity

Below-normal activity expected on the South-West Indian Ocean (Réunion, Mayotte), in agreement with the downward motion anomaly.

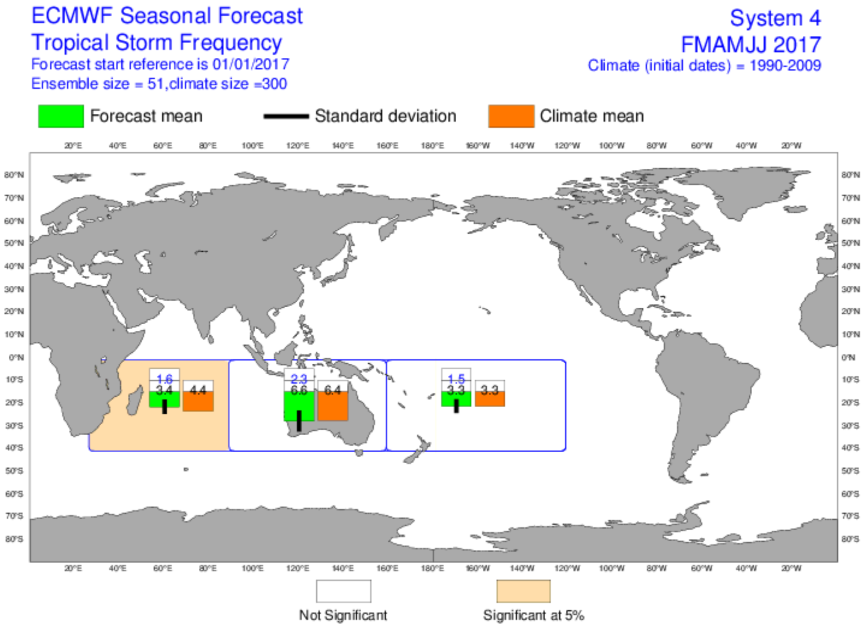


fig.II.8.1: Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/

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.

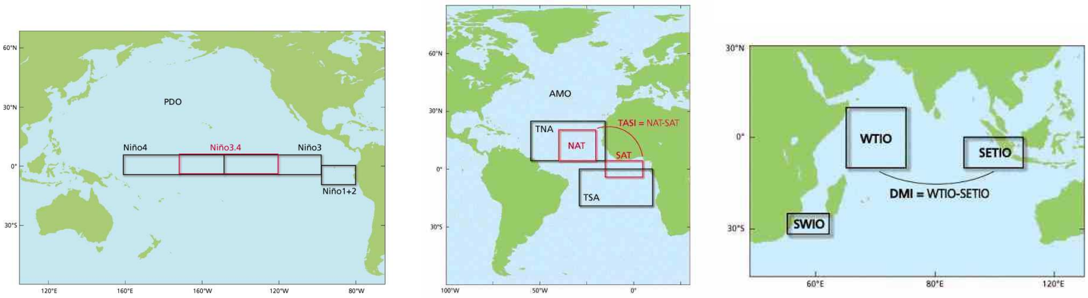
III.2. « NINO », SOI indices and Oceanic boxes

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).

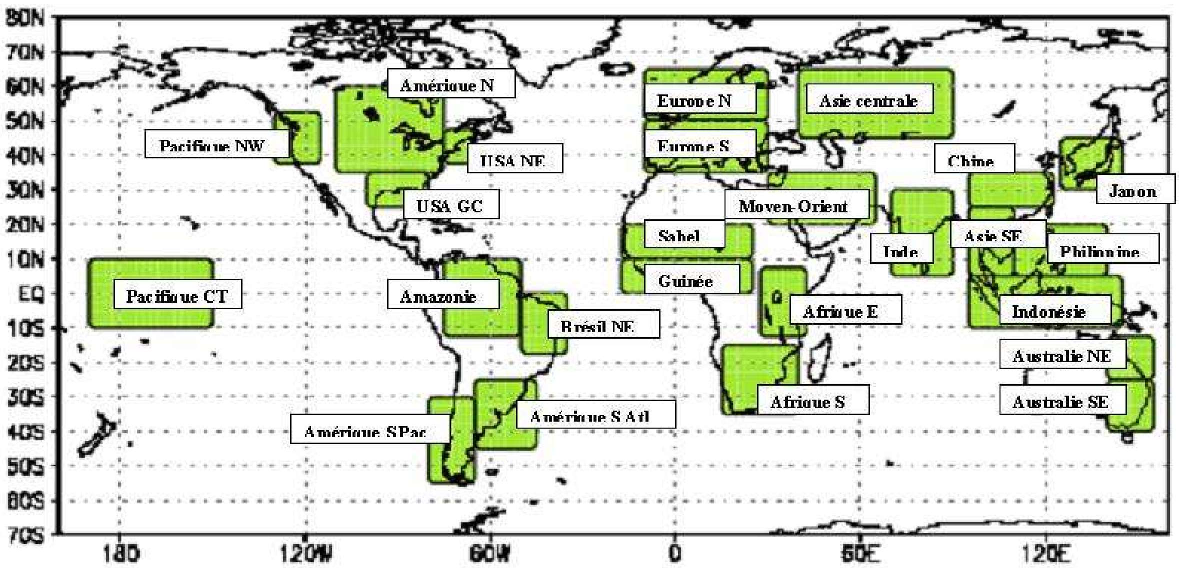
Associated to the oceanic « El Niño / La Niña » events, and taking into account the strong ocean/atmopshere coupling, the atmosphere shows also interanual variability associated to these events. It is monitored using the SOI (Southern Oscillation Index). This indice is calculated using standardized sea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



III.4. Acknowledgement

This bulletin is edited by the RCC-LRF Node of the RCC Network in Toulouse for the RA VI. It is a joint effort of the RCC-Climate Monitoring Node (led by DWD) and the RCC-LRF Node (Co-Led by Météo-France).