WMO RA VI
RCC Network

METEO FRANCE

GLOBAL CLIMATE BULLETIN

n°213 – March 2017

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I. DESCRIPTION OF THE CLIMATE SYSTEM (January 2017)

I.1.Oceanic analysis

In the Pacific ocean :

- Along the equator and at the surface : anomalies are weak (around 0 in the NINO3, NINO3.4, NINO4 boxes). There is still trace of negative anomaly in the center of the basin, whereas the anomalies are rather hot to the west of the date line and especially along the coasts of South America (+1.5°C of anomaly in NINO1+2 box).
- In subsurface, also few anomalies.
- On the North Pacific: Zonal structure with strong positive anomaly near the Bering Strait, an abnormally cold strip further south and a vast warmer than normal area from China sea to American coast. In this configuration, the PDO index is weak (+0.21 see NOAA site http://www.ncdc.noaa.gov/teleconnections/pdo/).
- On the South Pacific: anomalies are stronger with a cold anomaly around New Zealand and an other one very strong in the center of the basin. Elsewhere, warm anomalies dominate with a strong anomaly area near South American coast and from Polynesia to Fidji.

around the Maritime Continent :

warmer than normal

In the Indian Ocean :

The center of the basin and the area near Australia cooled off sharply in January. The area is now in strong cold anomaly.
The areas close to the African coasts, the Arabian Sea and the Gulf of Bengal are warmer than normal.
Note a very strong warm anomaly in southeast Madagascar. IOD index near 0.

In the Atlantic:

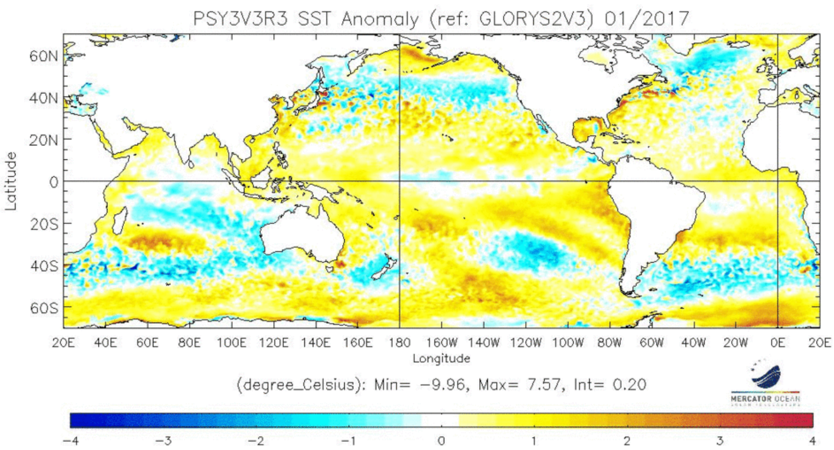
- On the equator : warmer than normal.
- On the South Atlantic : the south tropic strip is warmer than normal with a cooling in the East and a warming in the West. More to the south, an abnormally cold area extend from Argentina to the south of the Cape of Good Hope and beyond in the South of the Indian Ocean.
- On the North Atlantic : weak warm anomaly except between the Canada, Greenland and Island where the cold blob anomaly remain.

In the Mediterranean:

- the cooling in January take SST back to near normal.

Antarctic :

- The Antarctic continent is surrounded by strong warm anomalies.



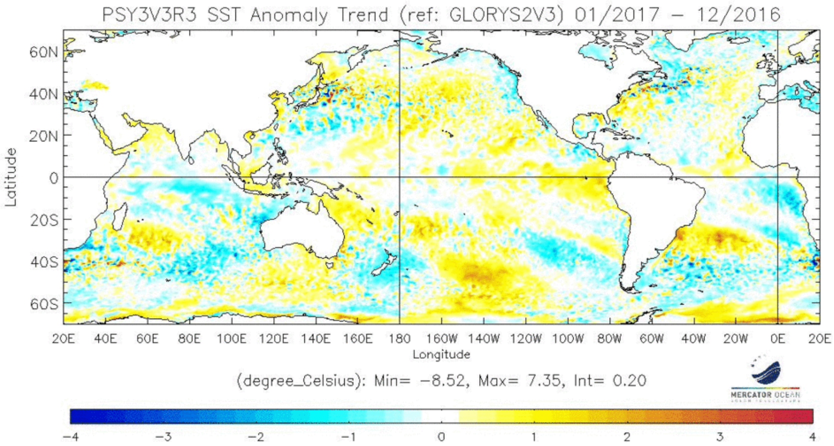


fig.I.1.1: top : SST Anomalies (°C) . Bottom : SST tendency (current – previous month), (reference Glorys 1992-2013).

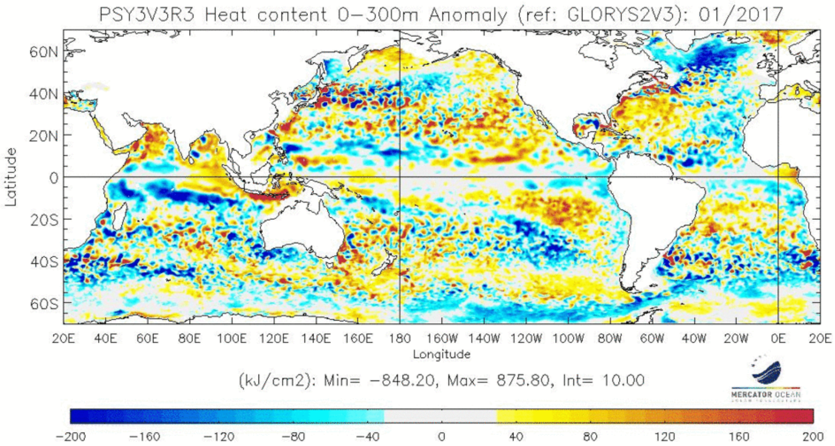


fig.I.1.2: map of Heat Content Anomalies (first 300m, kJ/cm2, reference Glorys 1992-2013)

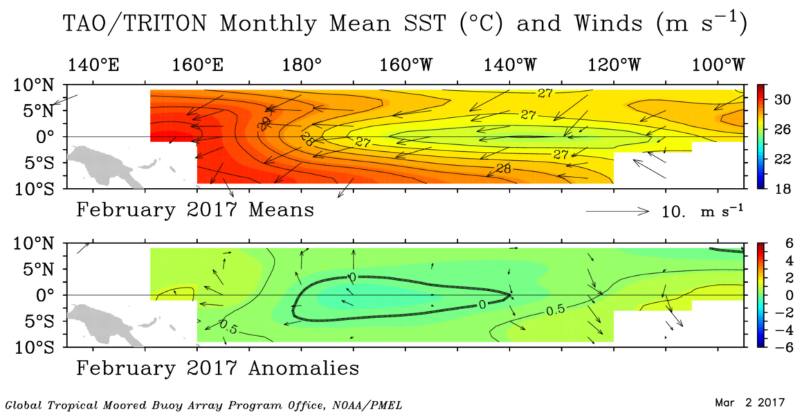


fig.I.1.3: SST Anomalies and Wind anomalies over the Equatorial Pacific from TAO/TRITON.http://www.pmel.noaa.gov/tao/drupal/assorted_plots/images/sst_wind_mon.png

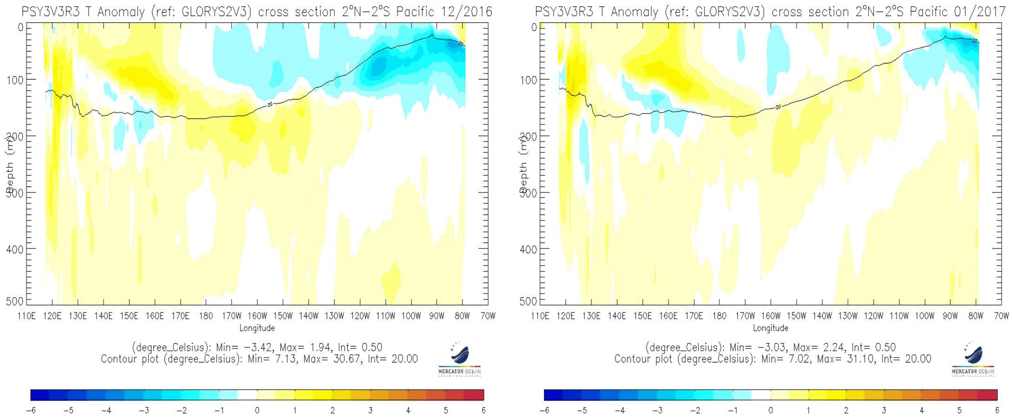


fig.I.1.4: Oceanic temperature anomaly in the first 500 meters in the Equatorial Pacific (previous and current month)

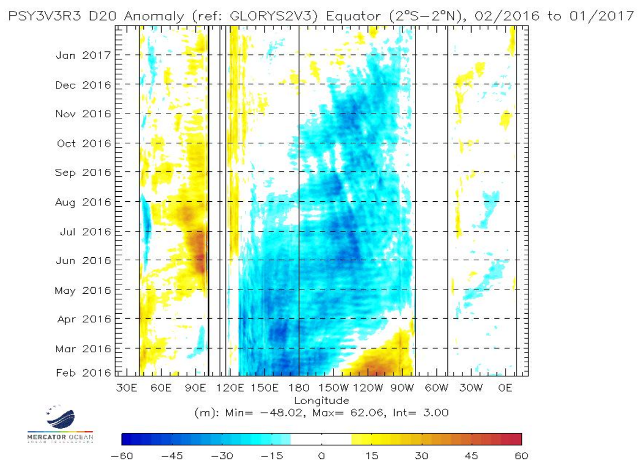


fig.I.1.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 6 month period

Sea surface temperature near Europe :

The Arctic Sea in January 2017 was warmer than normal, but the anomalies decreased in comparison to December 2016. The anomalies around Svalbard were above +2°C .

Slight warming of North Sea, Baltic Sea and Biscay in comparison to December 2016.

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

Western and central Mediterranean was warmer than normal in January 2017, eastern Mediterranean SST below normal. The SST anomalies of the Mediterranean Sea decreased in comparison to December 2016.

Black Sea still colder than normal, but most negative anomalies became normal.

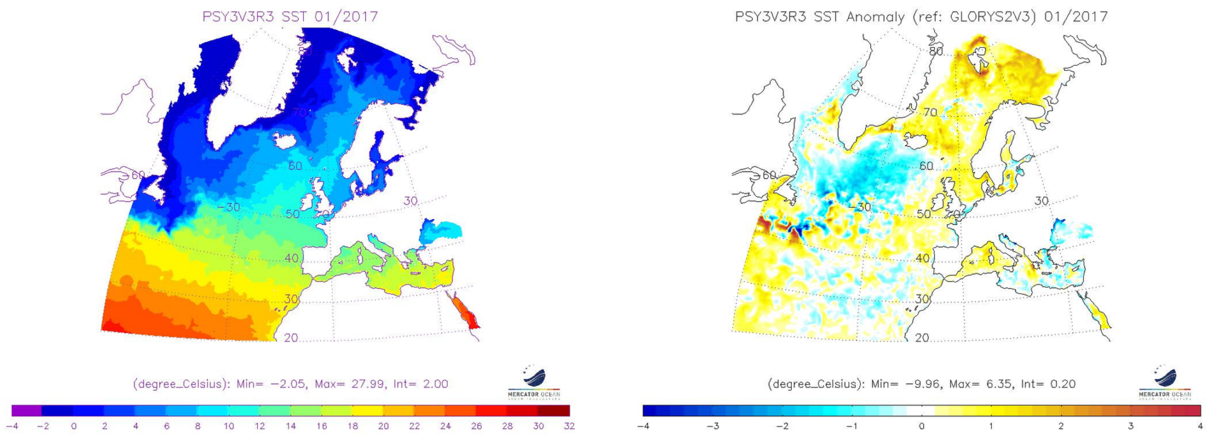


fig.I.1.6 : Mean sea surface temperature in the RA VI Region (Europe) and anomaly (reference Glorys 1992-2013).

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) :

On average over the month of January : strong anomaly of upward motion over Maritime Continent and anomaly of downward motion on both sides, a very strong one on Indian Ocean linked with cold SST and a weaker one on Central Pacific.

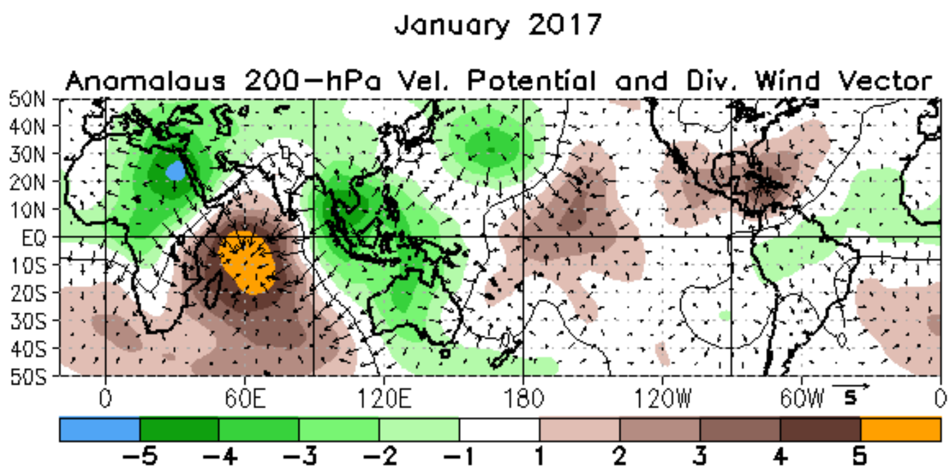


fig.I.2.1.a: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly).
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

SOI :

near 0 in January (+0.2 see https://www.ncdc.noaa.gov/teleconnections/enso/indicators/soi/), consistent with neutral ENSO situation.

MJO (fig. I.2.1.b)

strong activity in the middle of the month over Africa then over Indian Ocean with progressive attenuation to the end of the month.

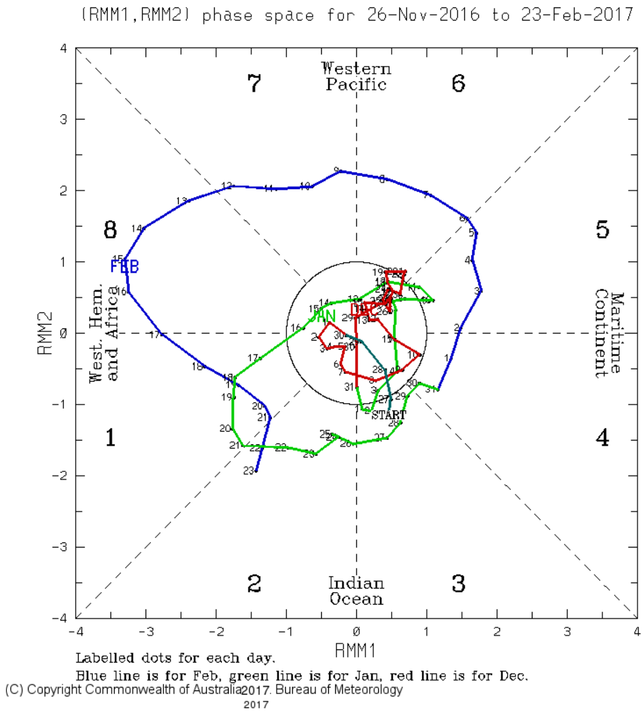


fig.I.2.1.b: indices MJO http://www.bom.gov.au/climate/mjo/

Stream Function anomalies in the high troposphere (fig. 1.2.2 – insight into teleconnection patterns tropically forced):

Few activity linked with tropical dynamics, except the kernels of anticyclonic anomalies over China and Australia, which could be the downward branch of the strong convection over Maritime Continent.

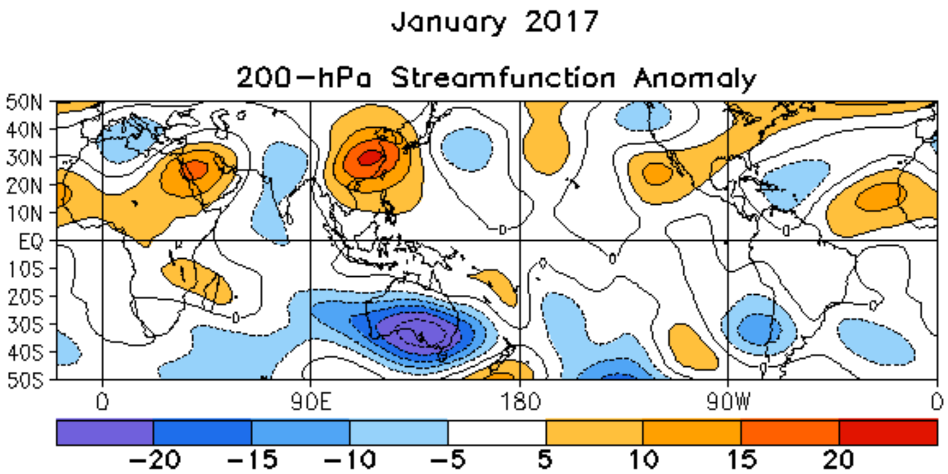


fig.I.2.2: Stream Function Anomalies at 200 hPa. http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

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

Positive anomaly centered in the northwest of the British Isles, extended from Northern Atlantic to Southern Scandinavia. Negative anomaly over the Azores and the Mediterranean sea. Few NOA regimes this month.

Negative anomaly on Western US and positive on the Quebec and the Aleutian Islands .

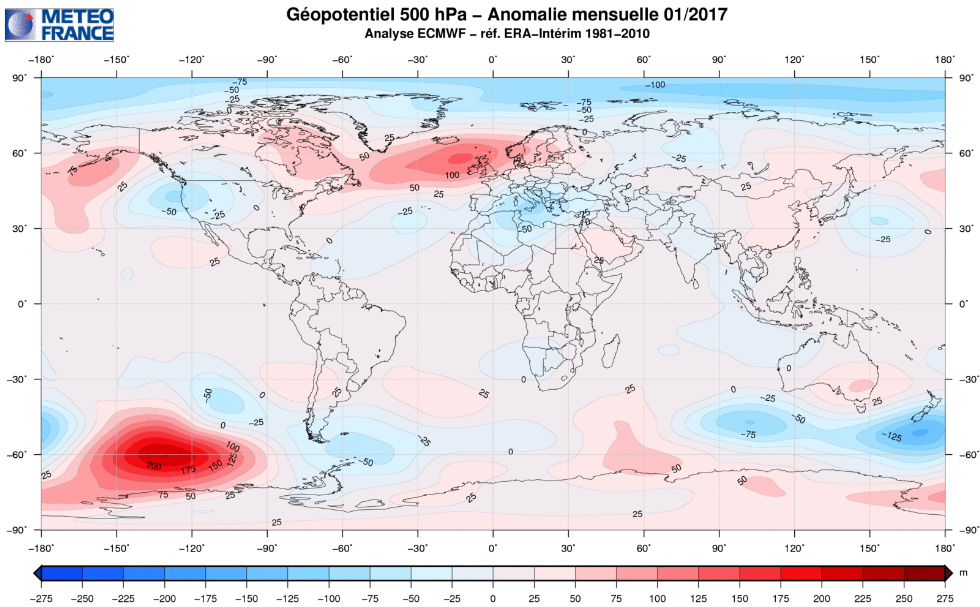


fig.I.2.3: Anomalies of Geopotential height at 500hPa (Meteo-France)

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
JAN 17	0.1	-1.2	0.6	0.4	-0.3	-0.3	0.6	0.2	1.0
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
JUN 16	-0.1	0.4	-0.6	1.3	-0.6	---	-1.9	-1.0	-1.1
MAY 16	-0.7	0.2	0.6	0.1	-0.9	---	-2.0	1.1	-0.4

Evolution of the main atmospheric indices for the Northern Hemisphere for the last 10 months :
http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/table3.shtml

<u>Sea level pressure and circulation types over Europe</u>

High pressure extended from the eastern North Atlantic to the middle and subtropical latitudes of Europe, especially further than normal over northwestern Europe, causing a blocking situation. The main frontal zone thus was relocated to Scotland and extended to southern Scandinavia.

Low pressure over the Arctic regions as usual, but with a more intense negative anomaly northeast of Svalbard; POLEUR switched to a positive phase, pointing to a recovery of the polar vortex.

The Icelandic Low was close to normal in position and intensity (only slightly weaker), Azores High similar, resulting in an almost neutral NAO phase, but due to a clear anomaly dipole over the East Atlantic a quite intense negative EA phase. EATL/WRUS and SCAND patterns no longer dominant due to relatively small anomalies over eastern and northern Europe.

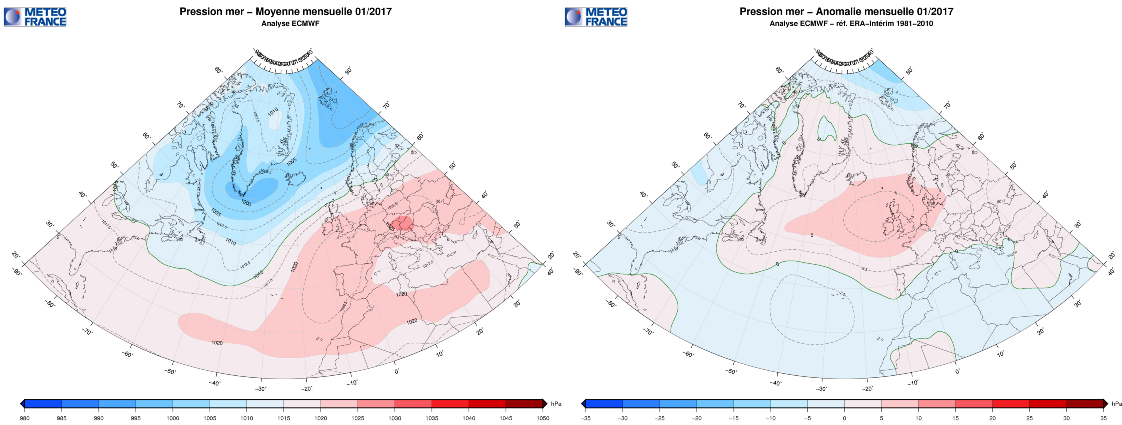


fig.I.2.4: Mean sea level pressure in the RA VI Region (Europe) (top) and 1981-2010 anomalies (bottom).

Circulation indices: NAO and AO

NAO had a positive phase in the first half of January, but was close to normal most of the month. The positive NAO phase corresponds with a trough situation over Central Europe of about one week duration combined with a storm near surface. The rest of the month was mostly anticyclonic over much of Europe.

AO slightly positive during the whole month, showing again the recovery of the polar vortex confirmed by the positive POLEUR pattern.

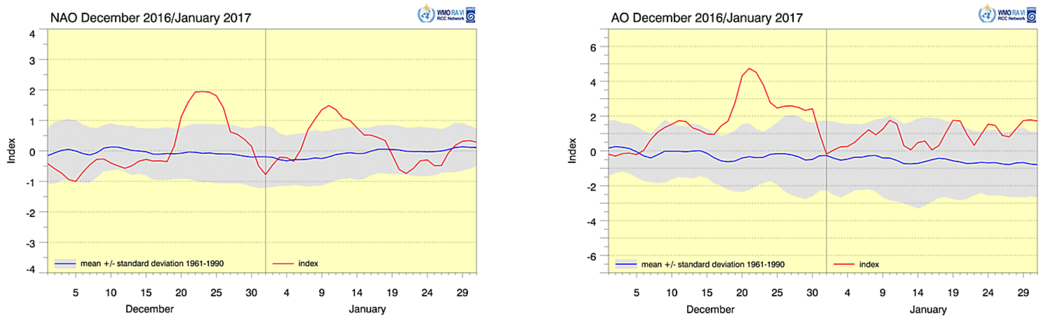


fig.I.2.5: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices with 1961-1990 mean standard deviation (shading). http://www.dwd.de/rcc-cm , data from NOAA CPC: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

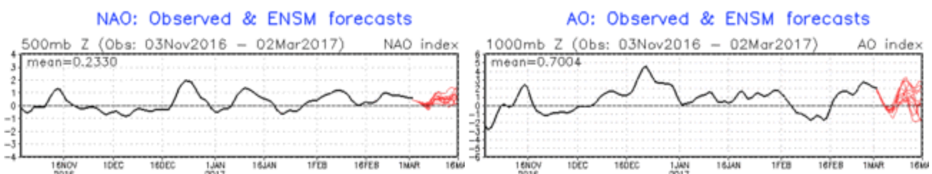


fig. I.2.5a: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices for the last 4 months and forecasts for the following weeks. Source: NOAA CPC, http://www.cpc.ncep.noaa.gov/products/precip

/CWlink/daily_ao_index/teleconnections.shtml

I.2.b Precipitation

In connection with the convection anomalies, precipitation strongly surplus on the Maritime Continent and deficit on both sides on the Indian Ocean and the equatorial rail of the Pacific.

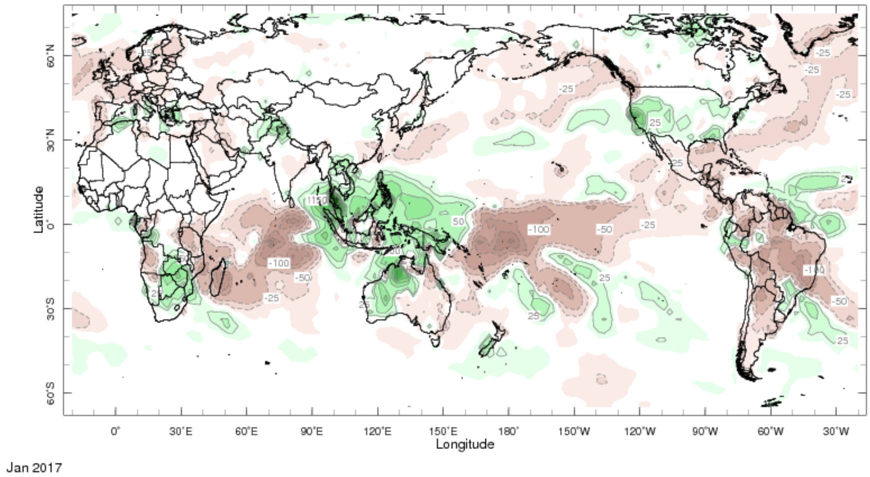


fig.I.2.6: Rainfall Anomalies (mm) (departure to the 1979-2000 normal) – Green corresponds to above normal rainfall while brown indicates below normal rainfall. http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/Anomaly.html

Precipitation anomalies in Europe:

Dry conditions over much of Europe due to prevailing anticyclonic circulation. Especially Western Europe had large deficits due to negative EA phase. Parts of Scandinavia and some more various areas in Europe had drought conditions, continued after an already dry December 2016. Main exceptions at the west coast of Norway (cyclonic westerly flow) and the Mediterranean (due to temporary cut-off lows with heavy precipitation).

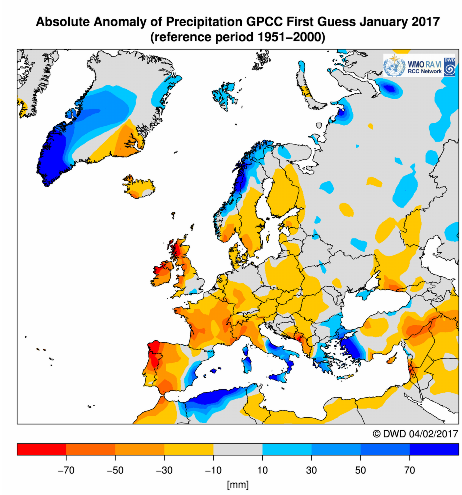


fig.I.2.7.a : Absolute anomaly (1951-2000 reference) of precipitation in the RA VI Region (Europe), data from GPCC (Global Precipitation Climatology Centre), http://www.dwd.de/rcc-cm.

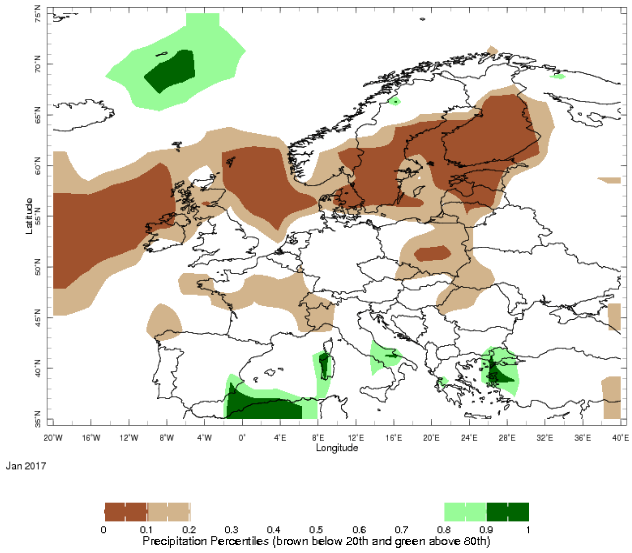


fig.I.2.7.b : Percentiles of precipitation, 1981-2010 reference. Data from NOAA Climate Prediction Center, http://iridl.ldeo.columbia.edu/maproom/Global/Precipitation/Percentiles.html

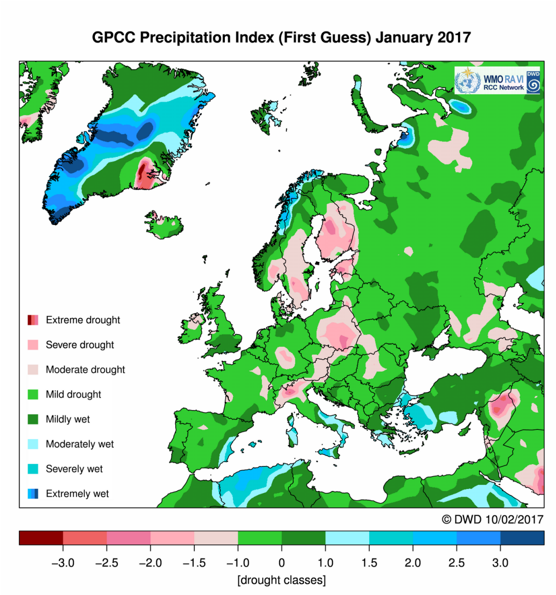


fig. I.2.8: GPCC Precipitation Index, http://www.dwd.de/rcc-cm .

<u>Monthly mean precipitation anomalies in European subregions</u>. 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	-17.8 mm	- 0.741
Southern Europe	- 1.8 mm	+ 0.046

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

Very strong warm anomaly on the Arctic and Canada, positive anomaly on Eastern Siberia and China. Warm anomaly on Eastern USA, cold anomaly on western USA.
Warm anomaly on Equatorial Africa but cold anomaly on North Africa and South Africa.

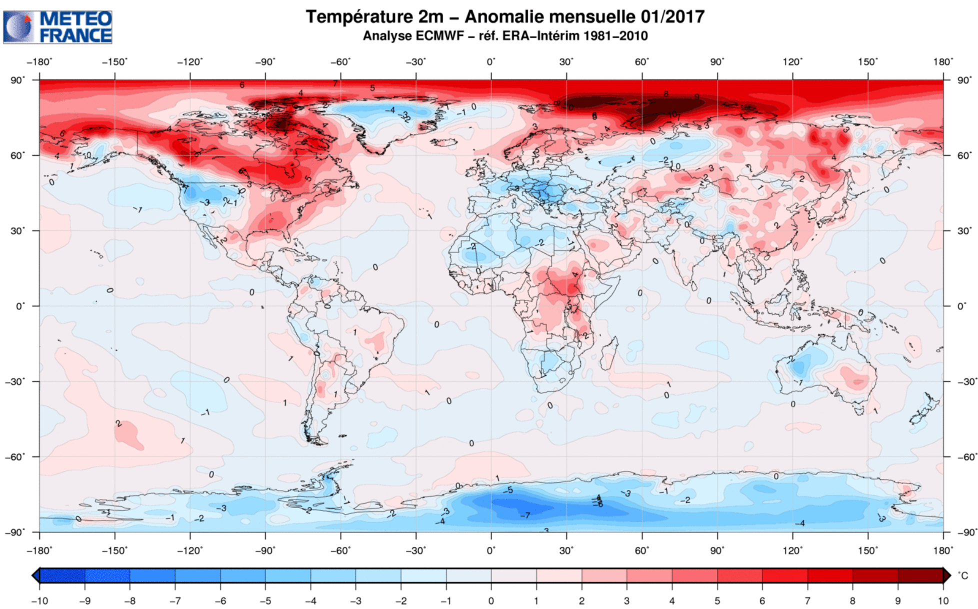


fig.I.2.9: Temperature Anomalies (°C) (Meteo-France)

Temperature anomalies in Europe:

Mild over northern Europe due to warm air flow from the North Atlantic to northern regions north of the blocking high. The rest of Europe mostly colder than normal due to anticyclonic conditions and cooling from the surface especially during the nights (negative anomalies of cloud cover in much of Europe) or due to snow-covered surface, but also due to some cold polar outbreaks reaching central and southern Europe.

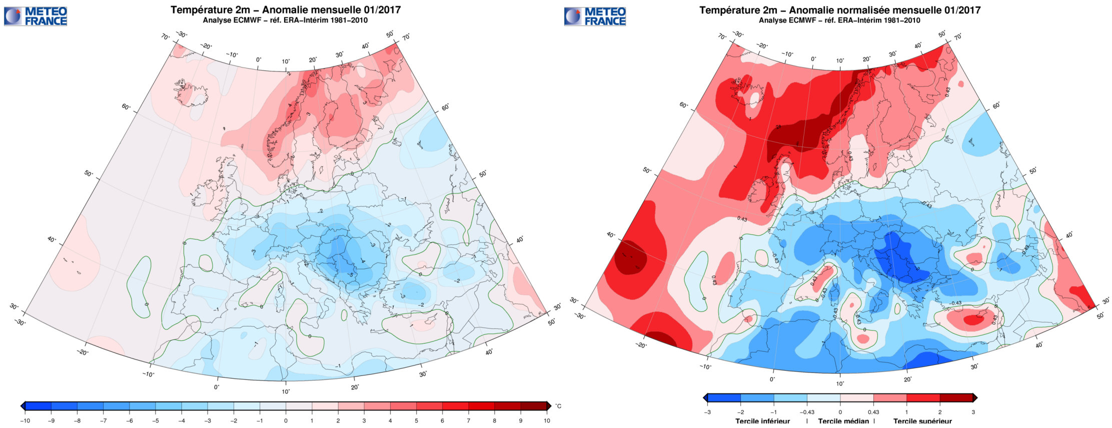


fig.I.2.10: Left graph: Absolute anomaly of temperature in the RA VI Region (Europe). Right graph: Standardized temperature anomalies

<u>Monthly mean temperature anomalies in European subregions</u>: 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	+ 1.9 °C
Southern Europe	-1.4 °C

<u>I.2.d Sea ice</u>

Record levels of low ice extent continue to be recorded in both the Arctic and the Antarctic.

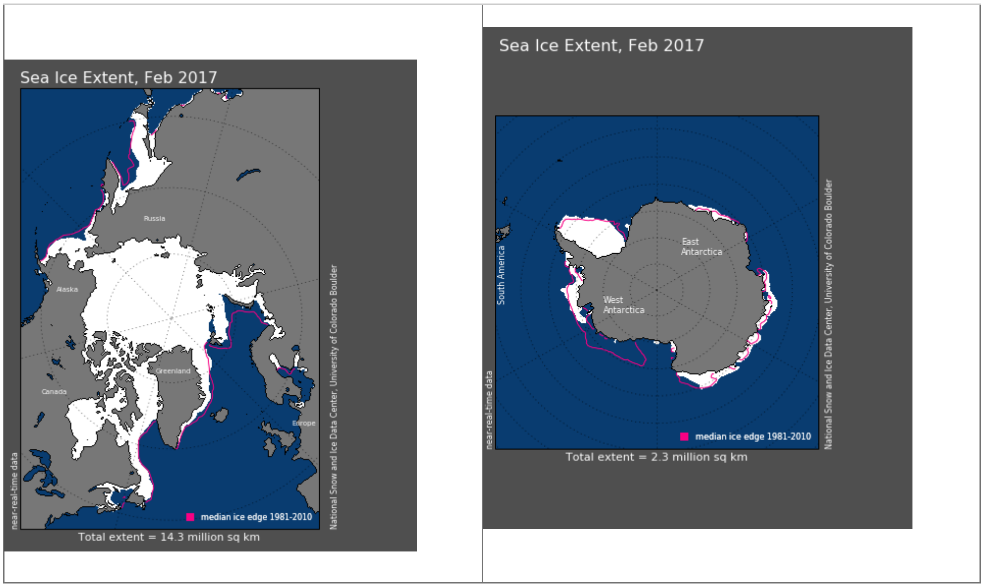


fig.I.2.11: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

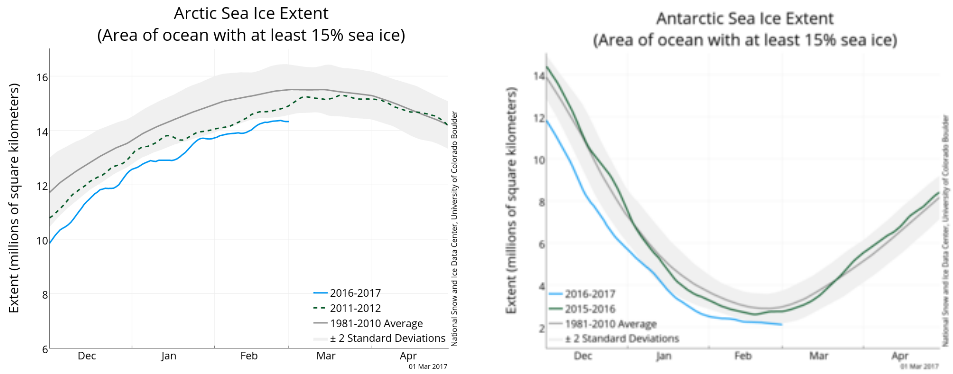


fig. I.2.12 : Sea-Ice extension evolution from NSIDC. https://nsidc.org/data/seaice_index/images /daily_images/N_stddev_timeseries.png

II. SEASONAL FORECAST FROM DYNAMICAL MODELS

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 the structures described in the January analysis. They provide taht warming will continue on the entire inter tropical strip. The positive anomalies will become quite strong between 0° and 30° south, from American coast to Polynesia.
- Indian Ocean: The models provide for a slight general warming. The strongest cold anomalies will only concern the southeast of the basin during next 3 months. IOD near 0.
- Atlantic Ocean:
  - For the North Atlantic, persistence of the "cold blob" negative anomaly. The models predict a fairly strong positive anomaly from the Gulf of Mexico to Bermuda and Newfoundland.
  - Most models provide a neutral inter tropical band except the MetOffice model which is warmer than normal in this area.

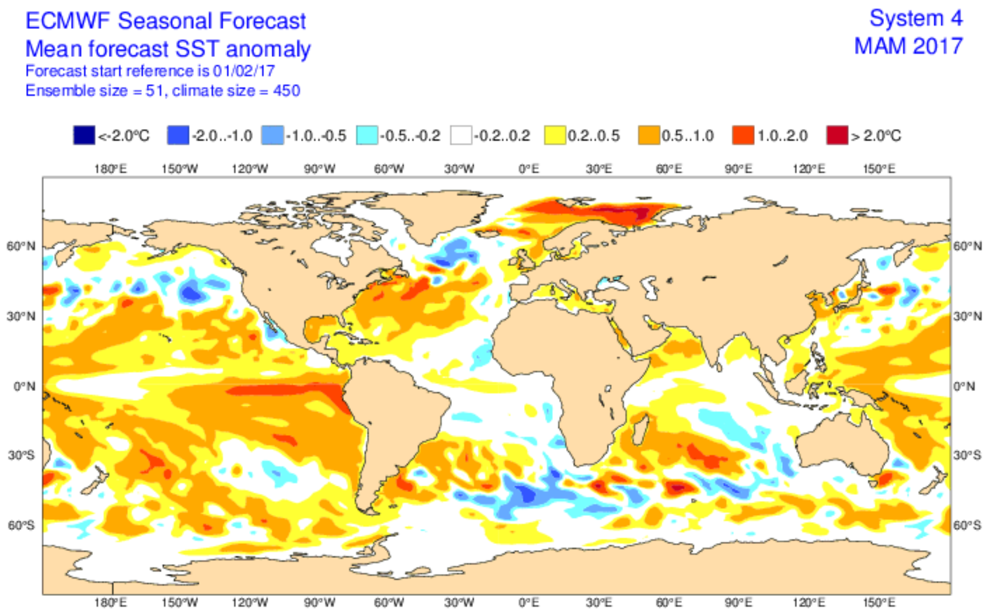


fig.II.1.1: SST anomaly forecast from ECMWF http://www.ecmwf.int/products/forecasts/d/charts/seasonal /forecast/seasonal_range_forecast/group/

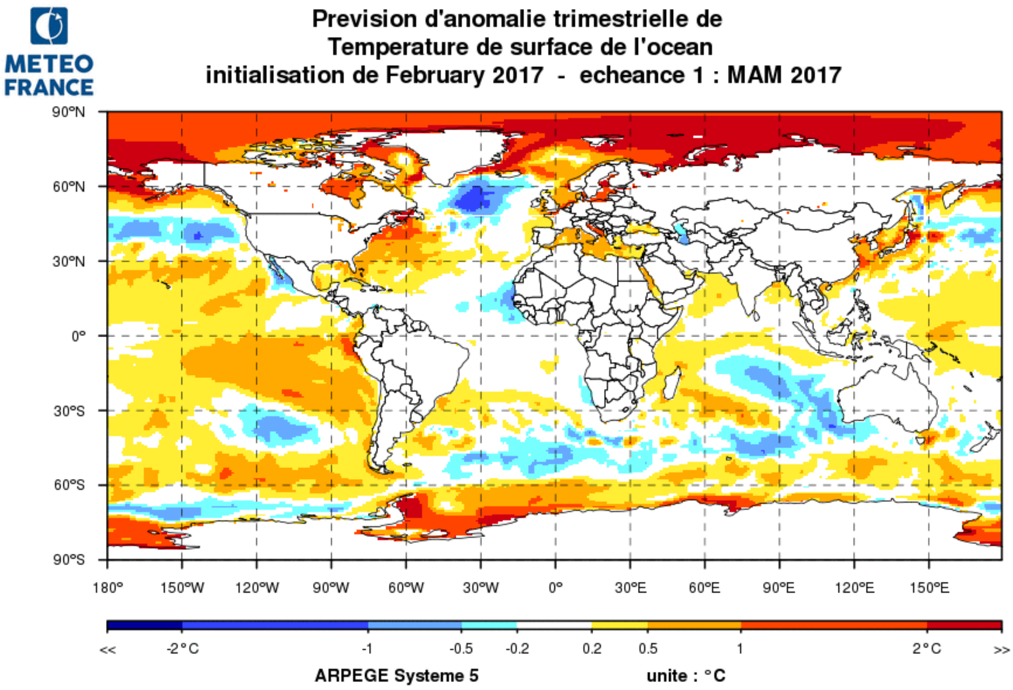


fig.II.1.2: SST Anomaly forecast from Meteo-France (recalibrated with respect of observation). http://seasonal.meteo.fr

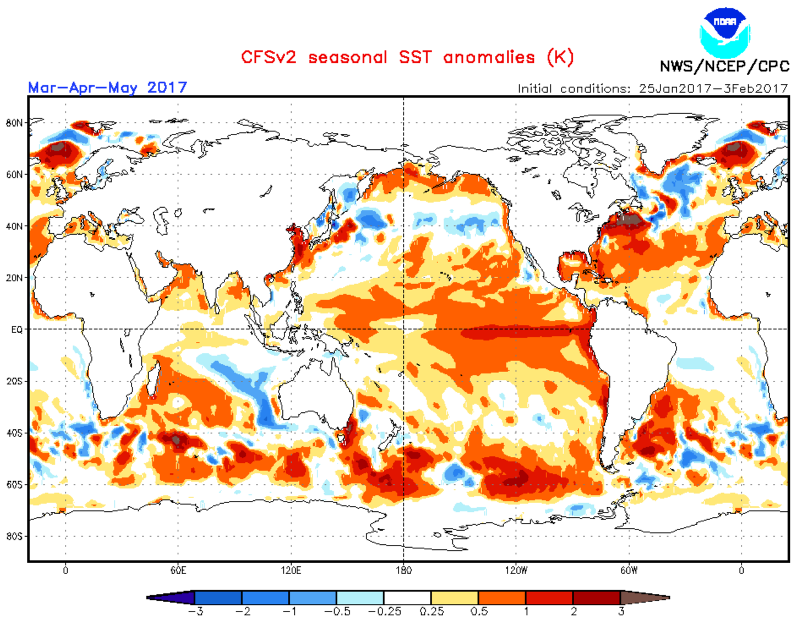


fig.II.1.3: SST Anomaly forecast from NCEP. http://www.cpc.ncep.noaa.gov/products/people/wwang/cfsv2fcst /imagesInd1/glbSSTSeaInd1.gif

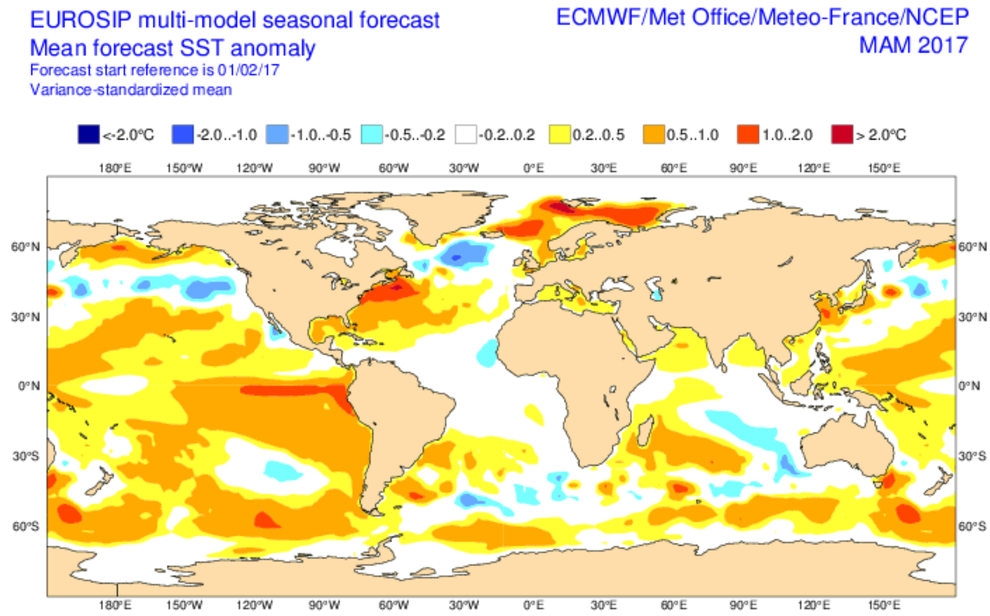


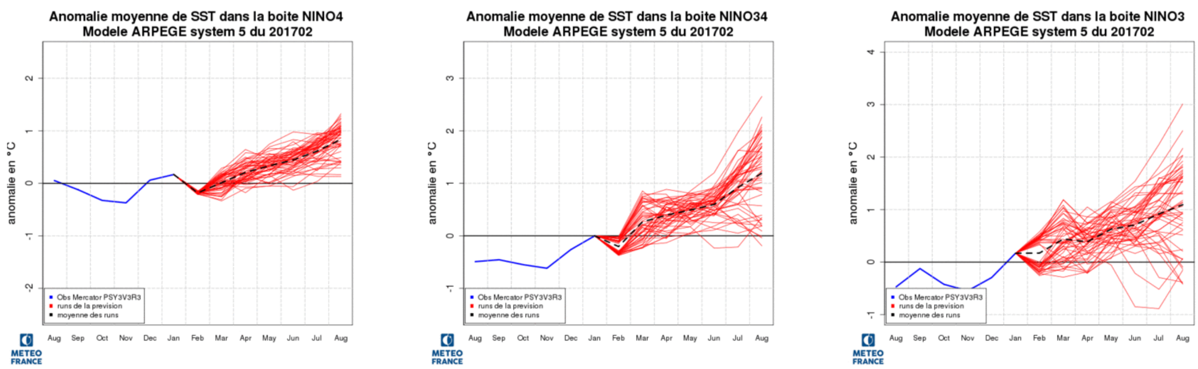
fig.II.1.4: SST Forecasted anomaly from Euro-SIP

II.1.b ENSO forecast :

Forecast Phase: neutral.

The anomalies in the Nino boxes will grow during the next 3 months but they will still stay weak.

The long rang forecast tend towards to El Nino phenomenon, but seasonal forecast in the spring is tricky. It will be necessary to wait for the next forecast to confirm this trend.



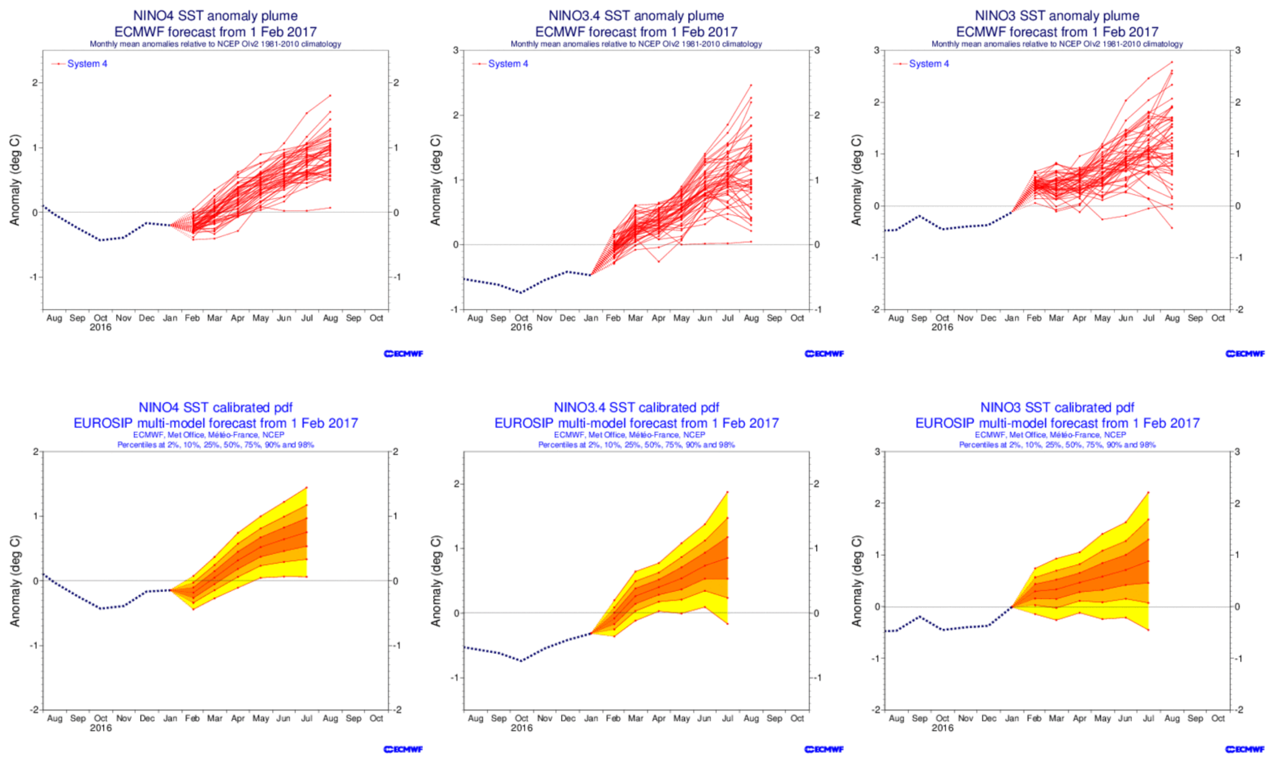


fig.II.1.5: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members - and EUROSIP (bottom) – recalibrated distributions - (http://seasonal.meteo.fr , http://www.ecmwf.int/)

I.1.c Atlantic ocean forecasts

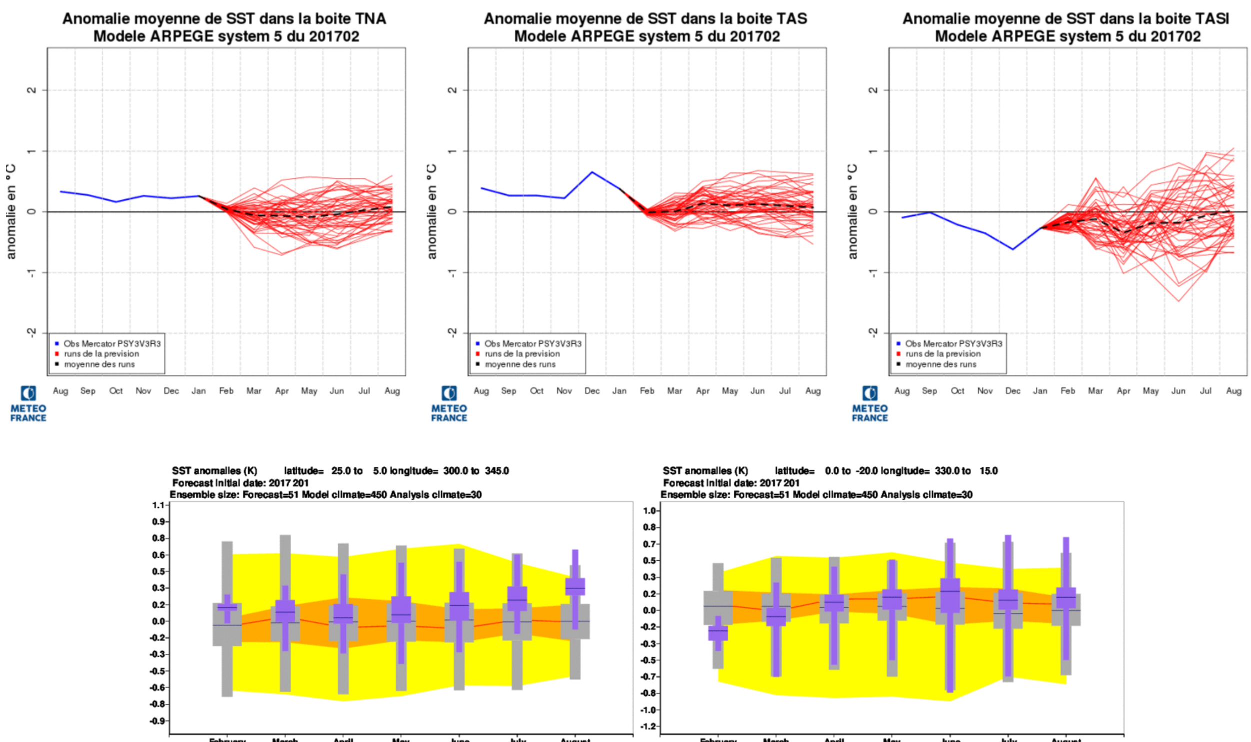


fig.II.1.6: SSTs anomaly forecasts in the Atlantic Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

I.1.d Indian ocean forecasts

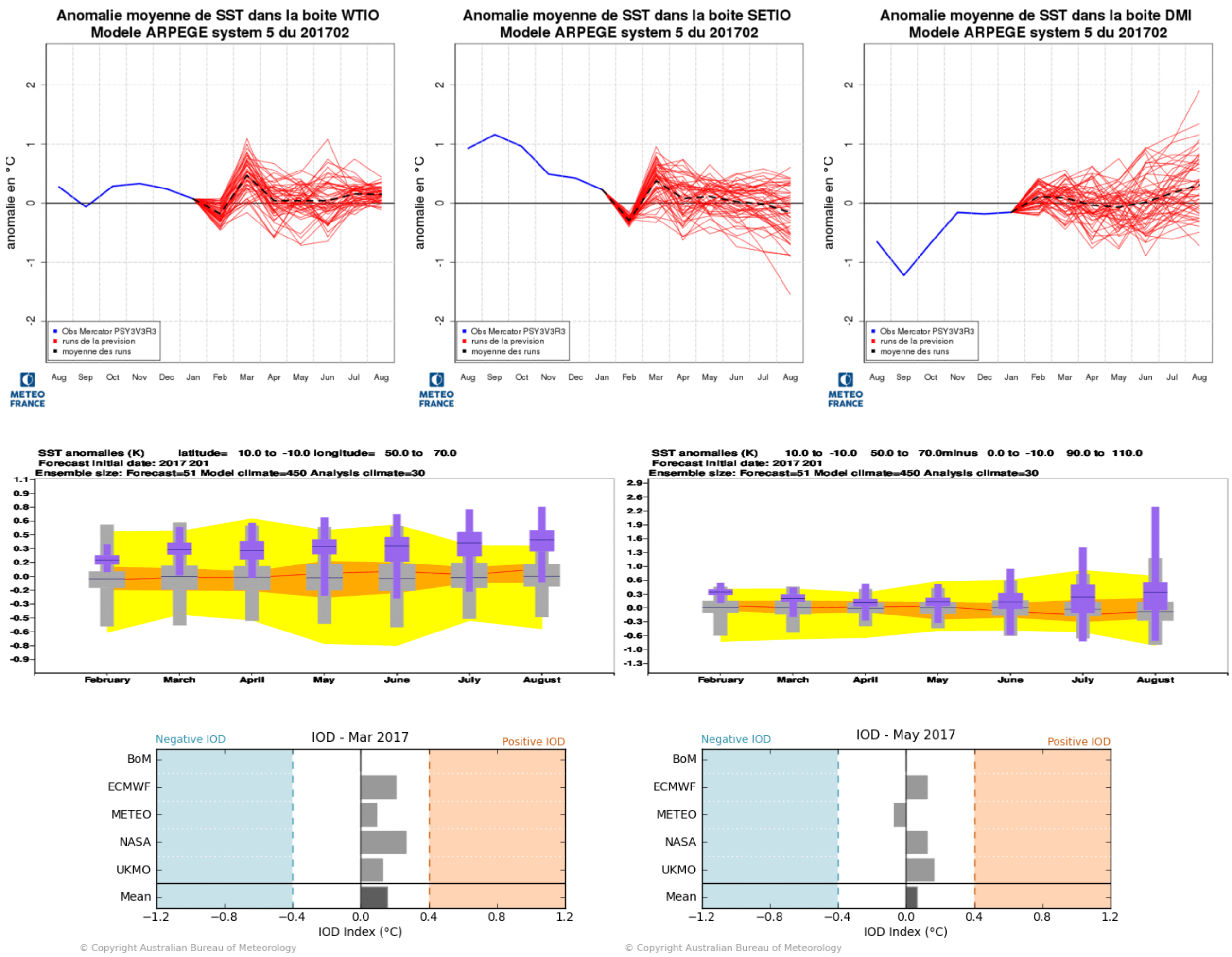


fig.II.1.7: SST anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

II.2. GENERAL CIRCULATION FORECAST

II.2.a Velocity potential anomaly field and Stream Function anomaly field

- Velocity potential : no strong forcing, forecasted anomalies are weak. The most significant area concerns the Indian Ocean and the Maritime Continent. In consistency The strongest upward motion kernels are over Africa and over the Warm Pool. The main downward motion kernels are over Maritime Continent and on the date line. ECMWF model is more active than Meteo-France model on the Warm Pool but less active on Africa. Over East Pacific, linked with SST anomalies, MF model suggest a strongest upward motion area than ECMWF. The JMA model is quite different from MF and ECMWF model on Indian Ocean were it doesn't forecast downward motion anomaly.
- Stream Function : weak anomalies and no middle latitudes teleconnections. The strongest area Models react quite strongly to divergent circulation anomalies over the Indian Ocean and Maritime Continent. In agreement with the velocity potential, ECMWF model is stronger than MF model over Maritime Continent. On the other hand MF is stronger on East Pacific where ECMWF is very weak.
  For Europe, models are very different, Mf model is close to a East-Atlantic variability mode while ECMWF forecast a cyclonic anomaly area over Mediterranean Sea and an anticyclonic one over the British Isles.

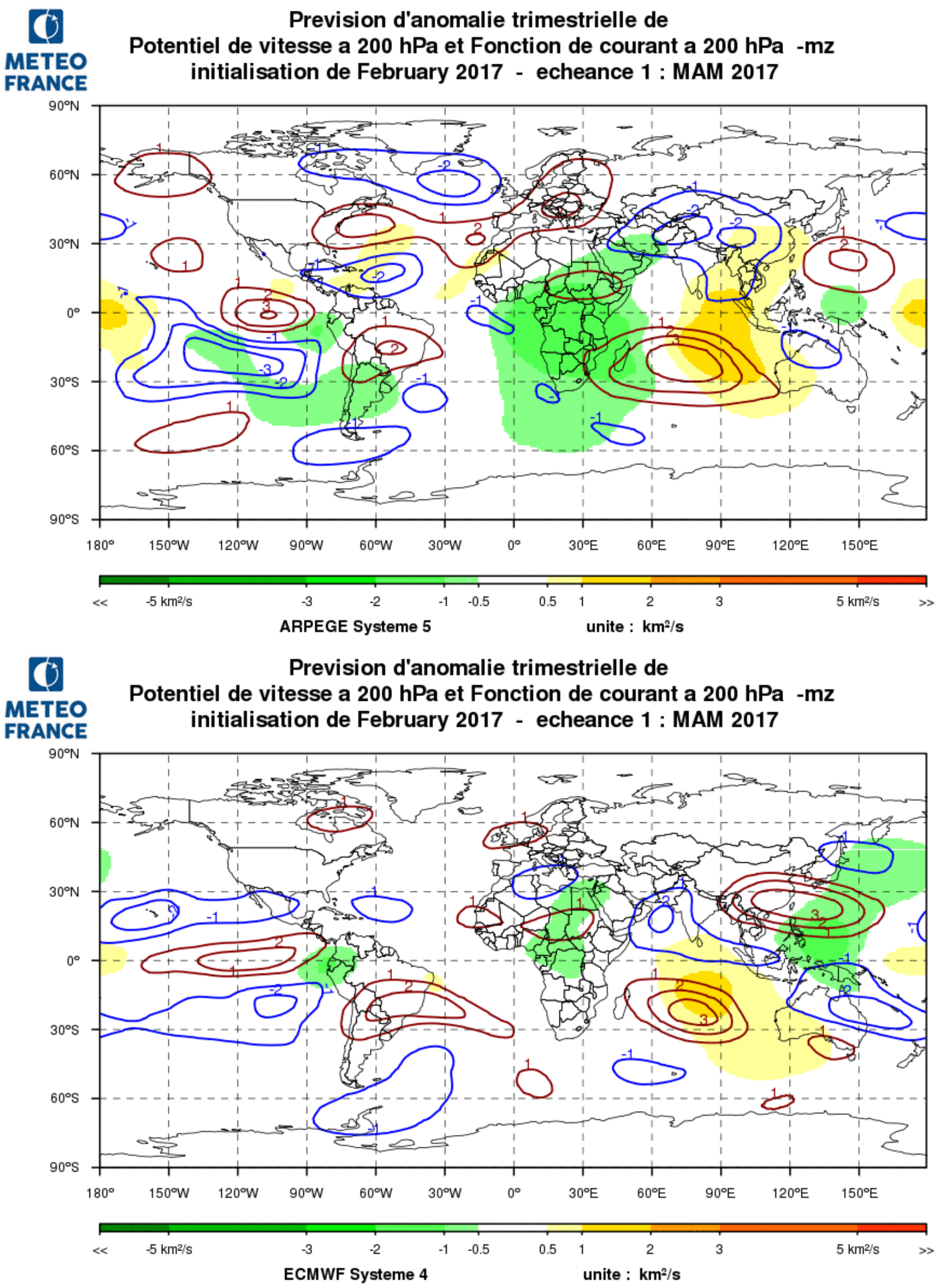
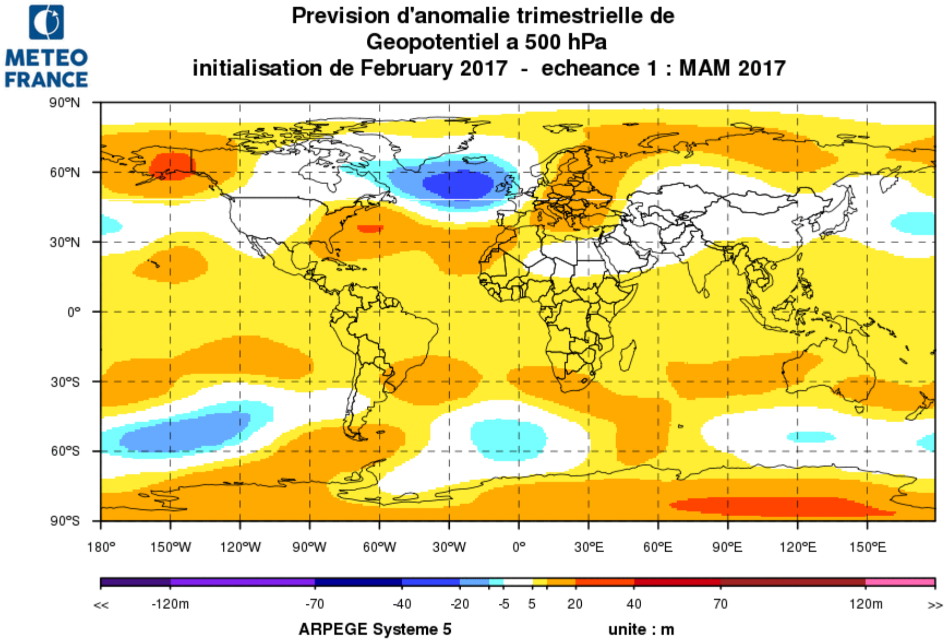


fig.II.2.1: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), associated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa by Météo-France (top) and ECMWF (bottom).

II.2.b Geopotential height anomalies

MF and ECMWF models disagree for north hemisphere. MF forecast in average a low geopotential area on North Atlantic and a high geopotential area more to the south accross the Atlantic to the Mediterranean sea and Eastern Europe (East-Atlantic mode of variability). ECMWF is very different with a low over Mediterranean Sea and a high geopotential area over the North Sea.



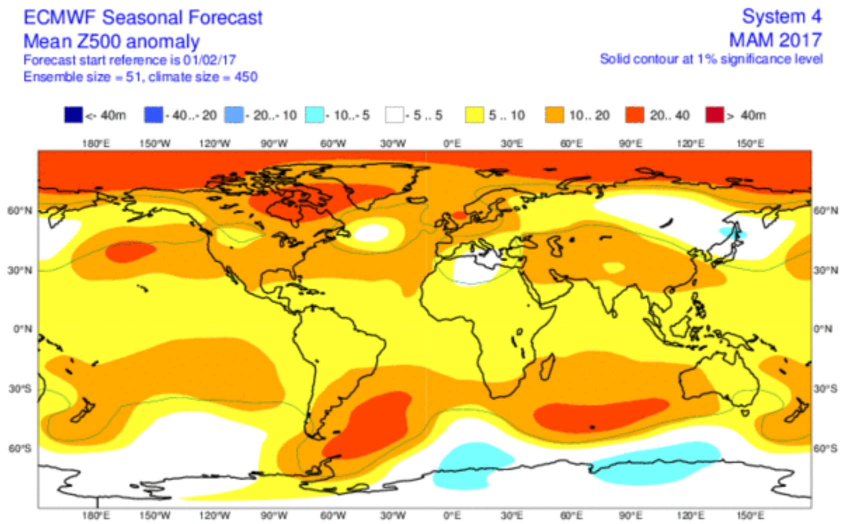


fig.II.2.2: Anomalies of Geopotential Height at 500 hPa from Météo-France and ECMWF.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast

II.2.c. weather regimes

MF model enforce the NAO weather regime, to the detriment of the Blocking and Atlantic Ridge weather regimes (winter regimes). At the begging, it forecast an excess of NAO- regime then an excess of NOA+ for the last 2 months. In average it forecast an excess of NAO+. In that case, the western Europe could have a warmer and wetter weather than normal, and the Mediterranean regions would stay away from the disturbance flow.

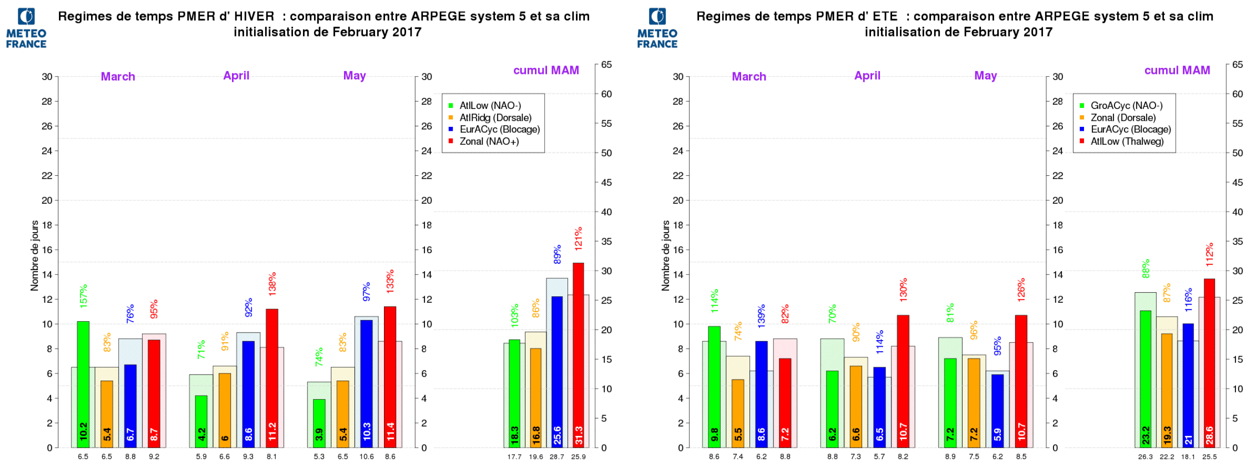


fig.II.2.3bis: North Atlantic Regime occurrence anomalies from Meteo-France ARPEGE-S5 : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

II.3. IMPACT: TEMPERATURE FORECASTS (figure II.3.1 to II.3.4)

JMA model and IDI multi-models are consistent with MF and ECMWF models.

- High probability of having a tropical area globally warmer than normal, MF is less warm than EUROSIP on the Atlantic and Brazil, and also around the date line.
- High latitudes should also continue at temperatures well above normal
- On the North Atlantic, models agree on an area of positive anomaly from Quebec to the Gulf of Mexico and Bermuda and a colder than normal zone in southern Greenland and Iceland.
- For Europe, despite the general circulation differences between models, the probability of a warmer than normal quarter remains high, especially with MF (between 60 and 80% on the continent and more than 80% in the Mediterranean).

II.3.a ECMWF

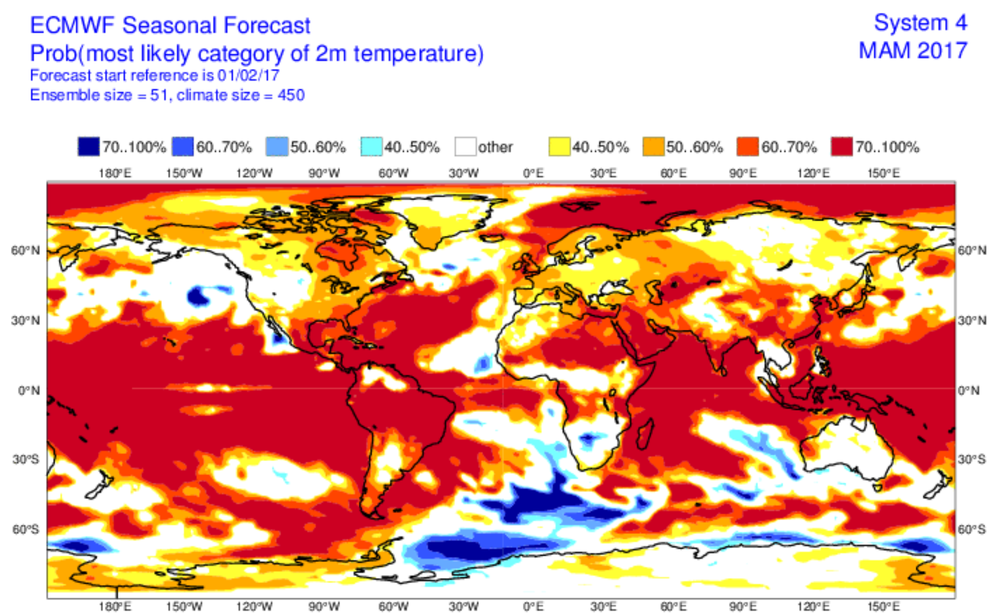


fig.II.3.1: Most likely category probability of T2m from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal /forecast/seaso...

II.3.b Météo-France

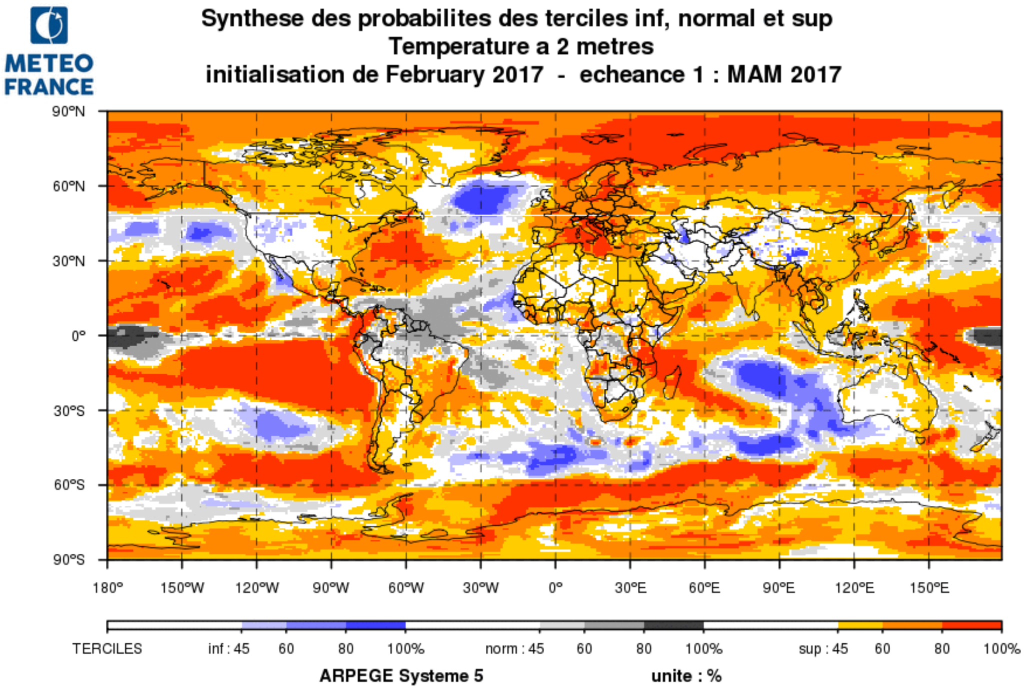


fig.II.3.2: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.3.e Japan Meteorological Agency (JMA)

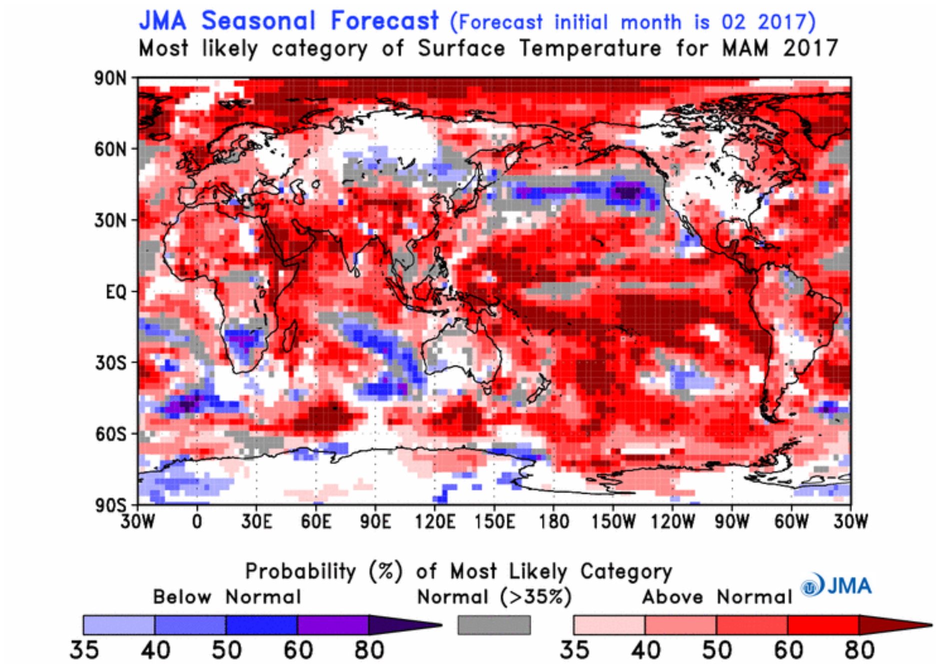


fig.II.3.3: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst_gl.php

II.3.g EUROSIP

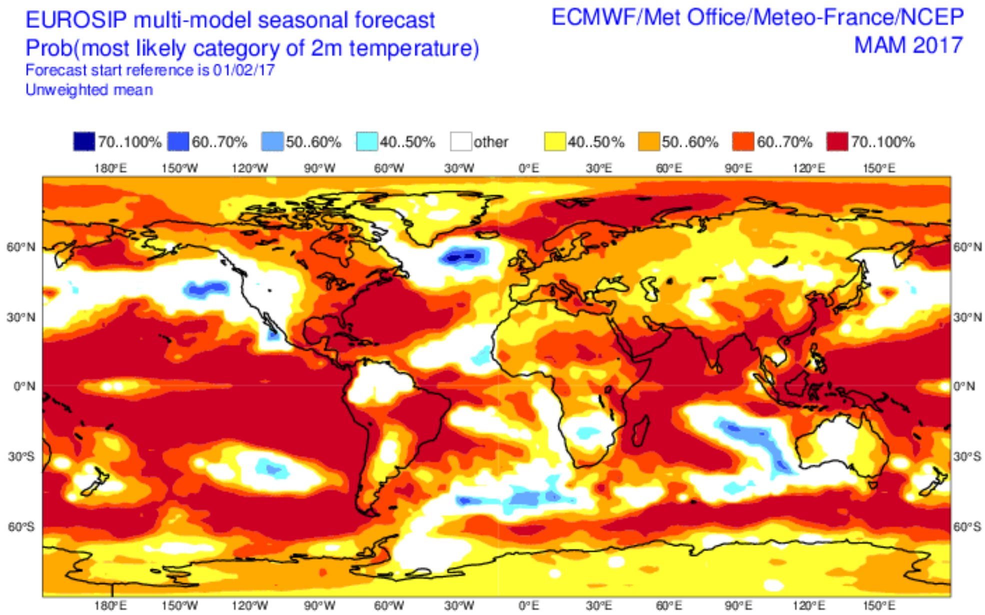


fig.II.3.4: Multi-Model Probabilistic forecasts for T2m from EuroSip (2 Categories, Below and Above normal – White zones correspond to No signal and Normal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal /forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

II.4. IMPACT : PRECIPITATION FORECAST

- In agreement with the large scale, high probability for an excess of precipitation on Central Africa and Madagascar, on East of Maritime Continent, on half eastern Equatorial Pacific rail and the South American Pacific coast regions. Conversely, strong probability of rainfall deficit over the eastern Indian Ocean including the western half of Australia and over Brazil.
- For Europe, models are not consistent. MF has a wet option but EUROSIP does not. However, a drier than normal scenario is unlikely.

II.4.a ECMWF

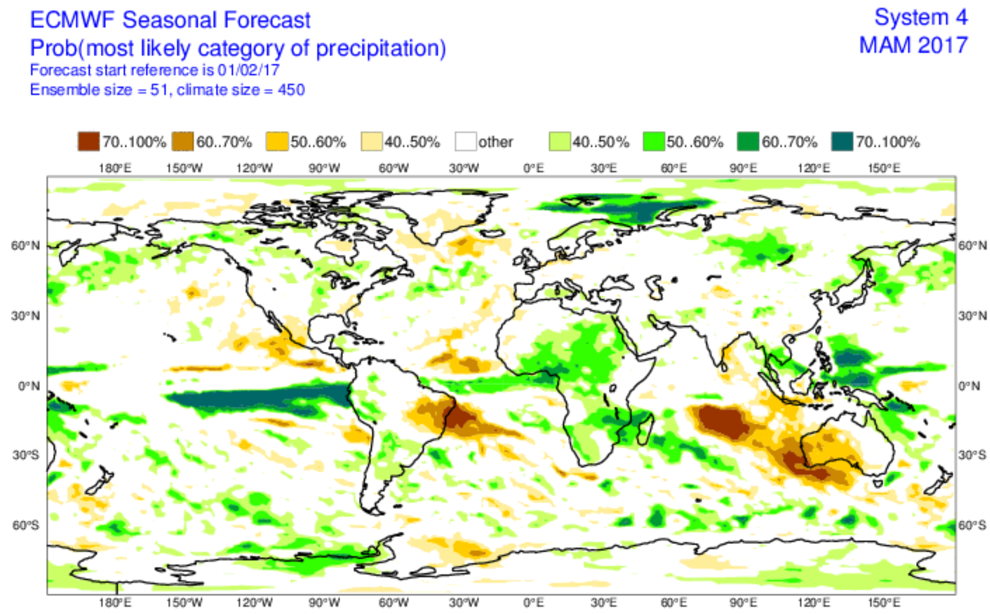


fig.II.4.1: Most likely category probability of rainfall from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal). http://www.ecmwf.int/products/forecasts/d/charts /seasonal/forecast/seasonal_range_forecast/group/

II.4.b Météo-France

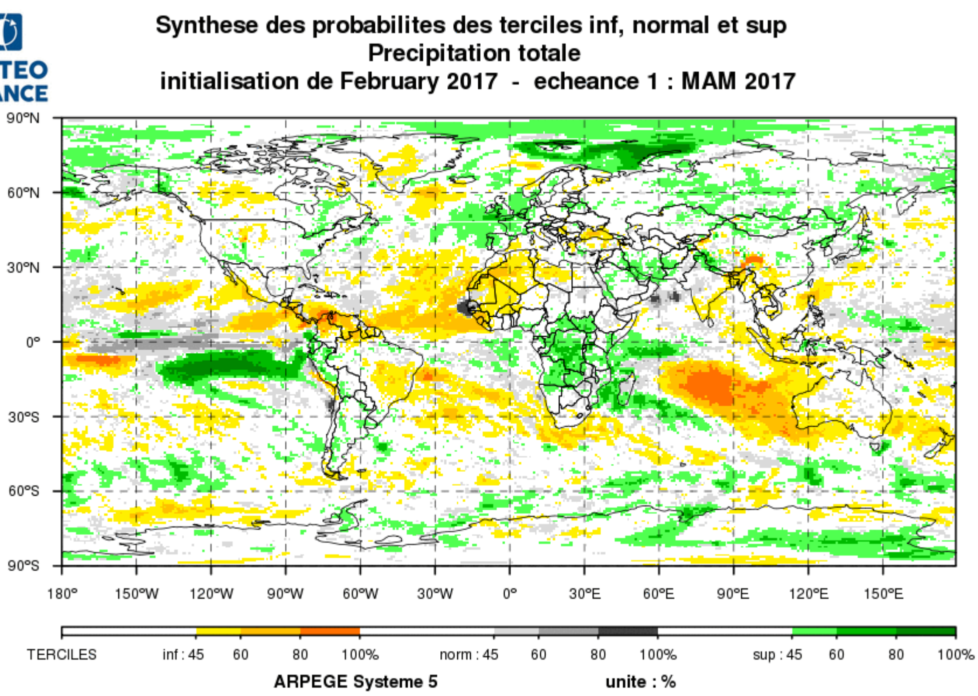


fig.II.4.2: Most likely category of Rainfall. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.4.e Japan Meteorological Agency (JMA)

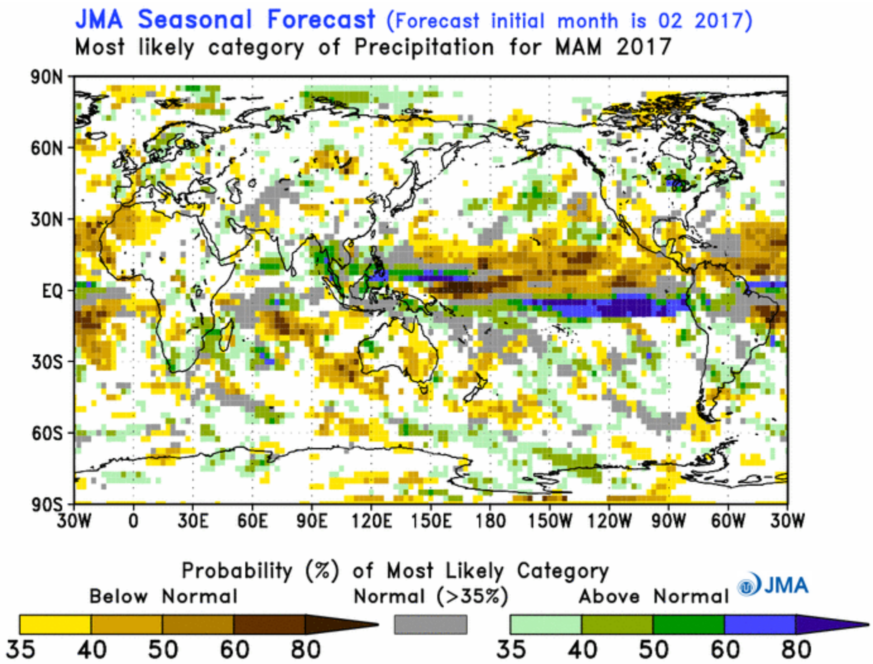


fig.II.4.5: Most likely category of Rainfall from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst_gl.php

II.4.g EUROSIP

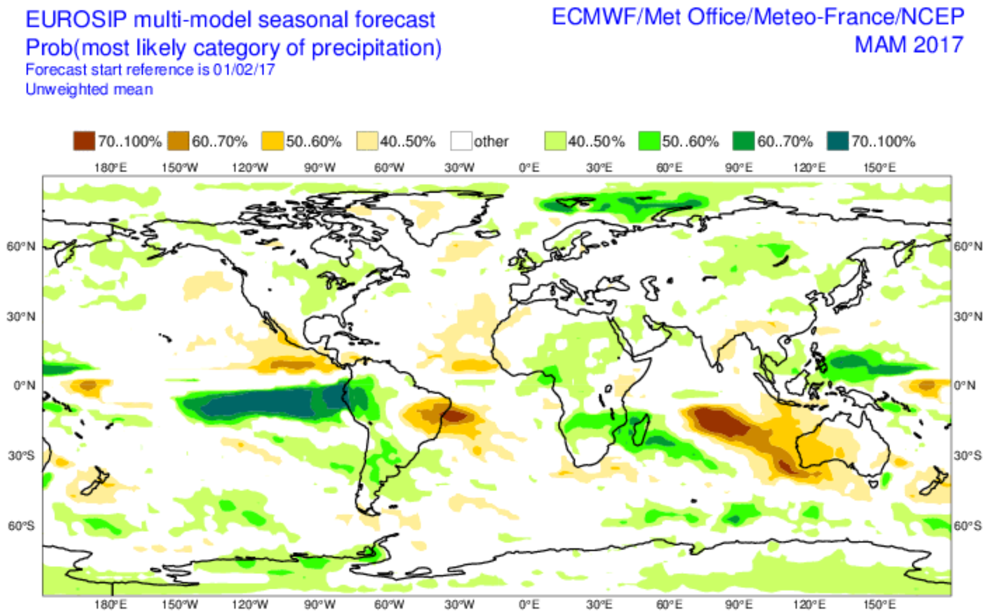


fig.II.4.7: Multi-Model Probabilistic forecasts for precipitation from EuroSip (2 Categories, Below and Above normal – White zones correspond to No signal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal /forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

II.5. REGIONAL TEMPERATURES and PRECIPITATION

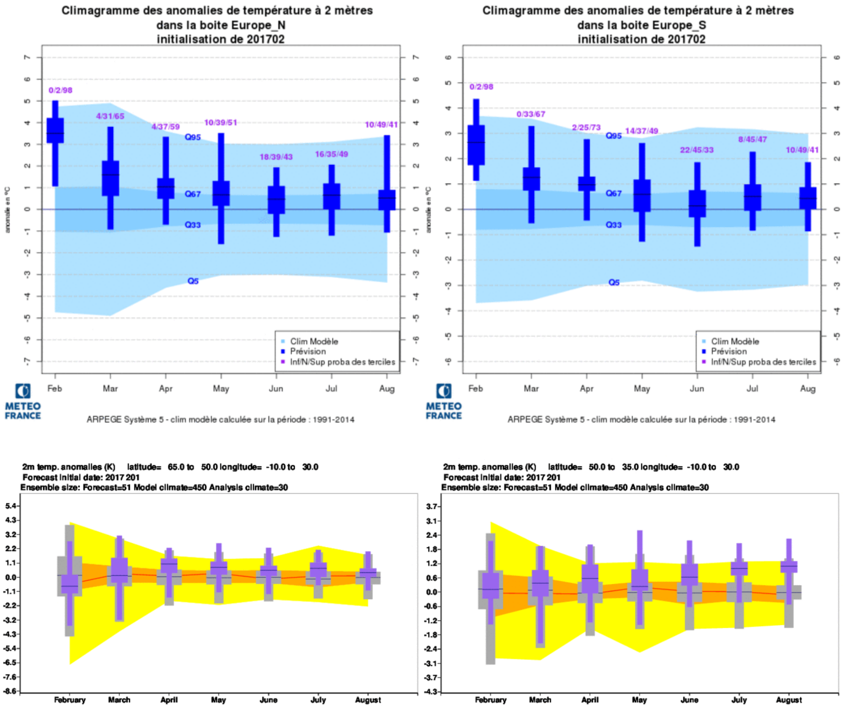


fig.II.5.1 : Climagrams for Temperature in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

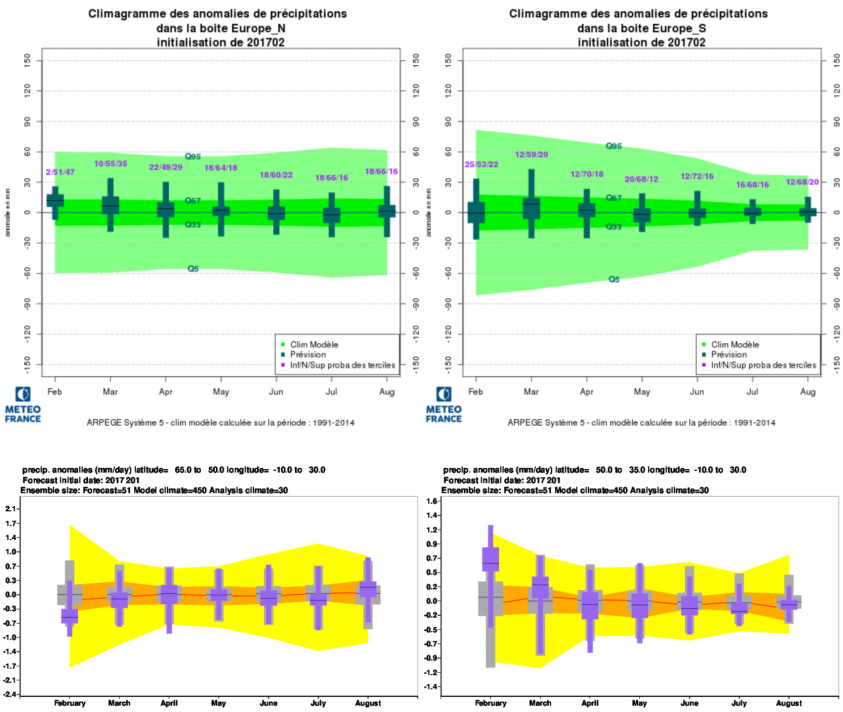


fig.II.5.2 : Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

II.7. "EXTREME" SCENARIOS

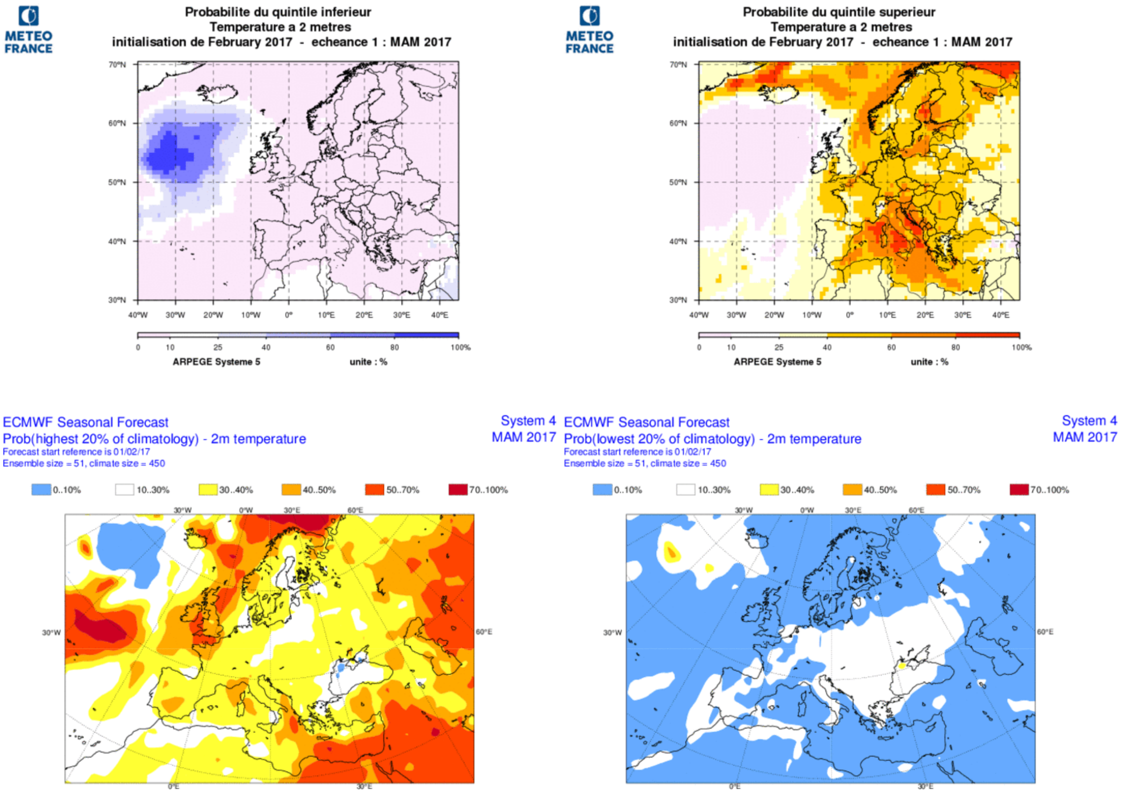


fig.II.7.1 : Top : Meteo-France T2m probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution). Bottom : ECMWF T2m probability of « extreme » below normal conditions (left - highest ~20%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

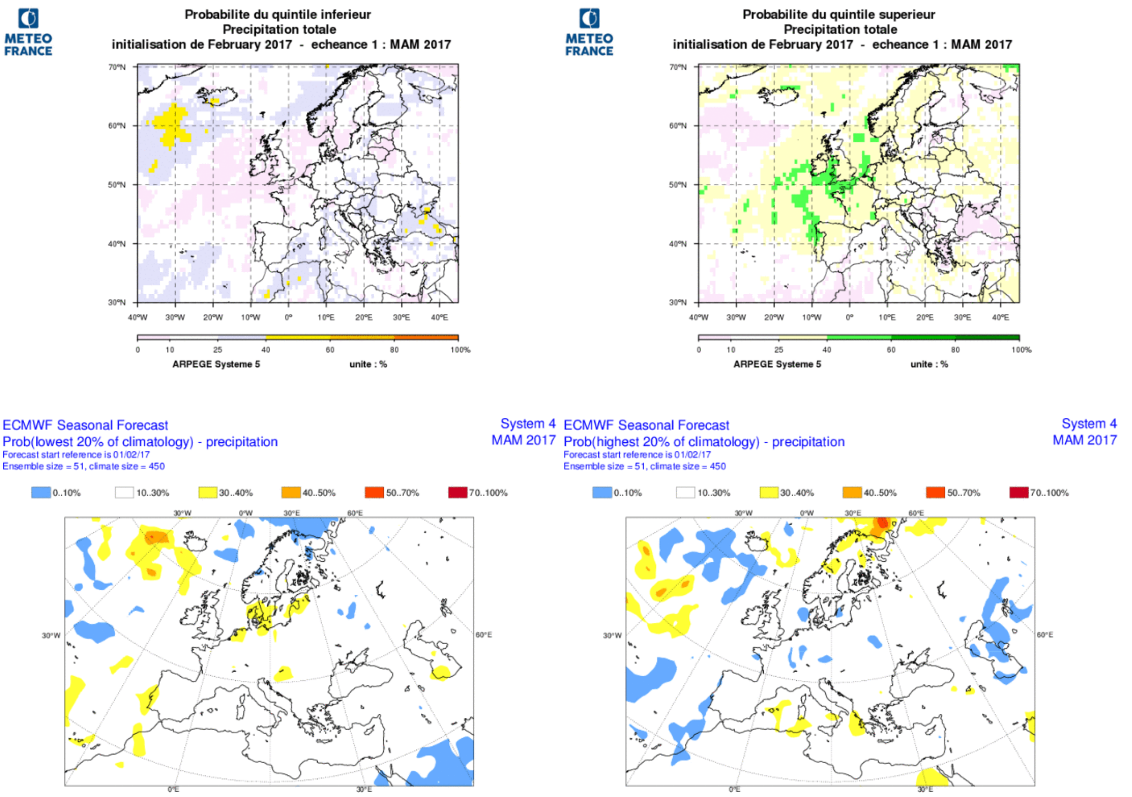


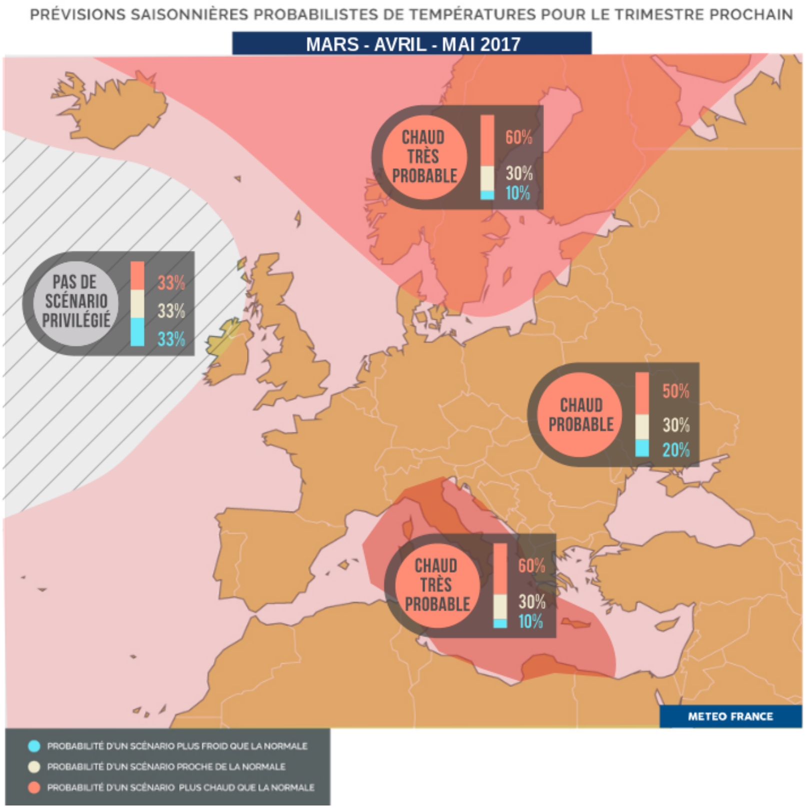
fig.II.7.2 : Top : Meteo-France rainfall probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution).

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).

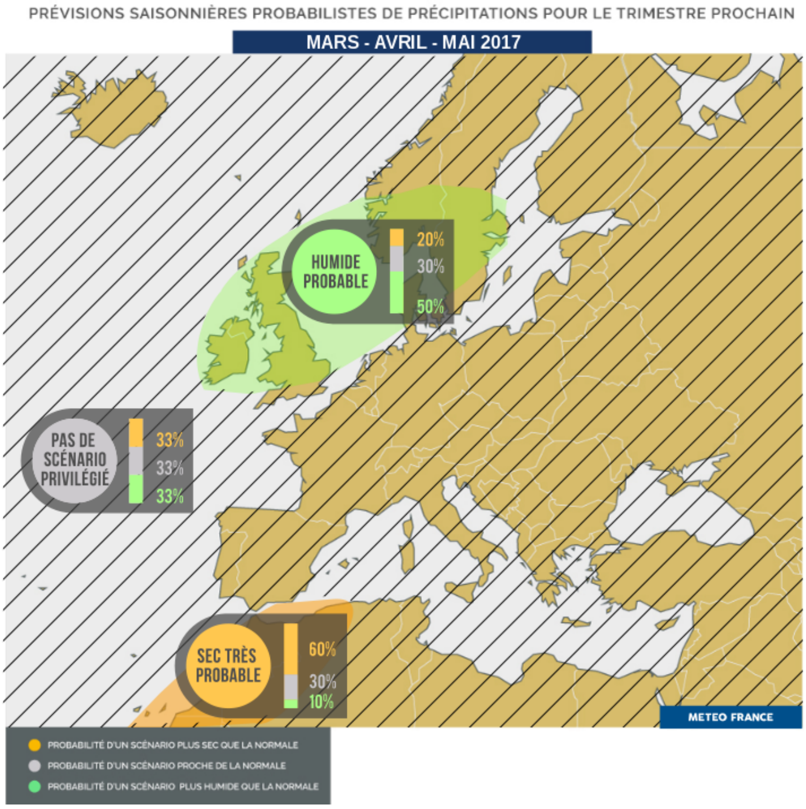
II.8. DISCUSSION AND SUMMARY

II.8.a Forecast over Europe

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



Precipitation: Scenario rather wet over northern Europe (British Isles, South of Scandinavia) and dry over the northwestern Africa. No scenario elsewhere.



II.8.b Tropical cyclone activity

Below-normal activity expected on the South-West Indian Ocean, in agreement with the downward motion anomaly over Indian Ocean. Upper than normal activity around Australia, probably due to more activity than normal in the Northeastern part of this area. Normal activity forecast on South Pacific.

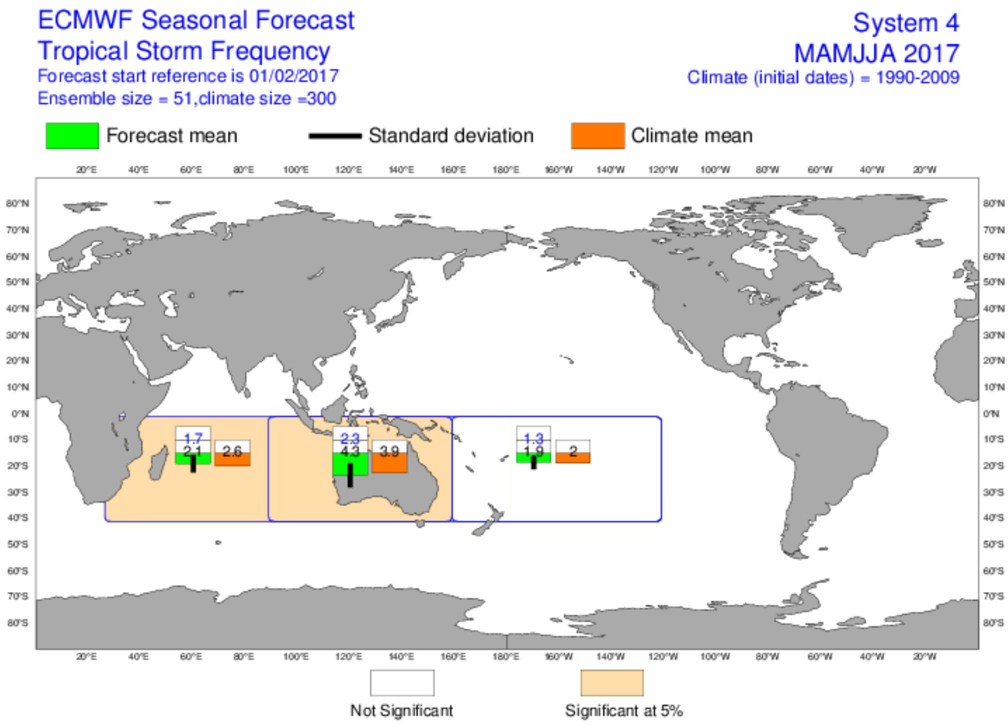


fig.II.8.1 : Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro/eurosip_tropical_storm_frequency/

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).

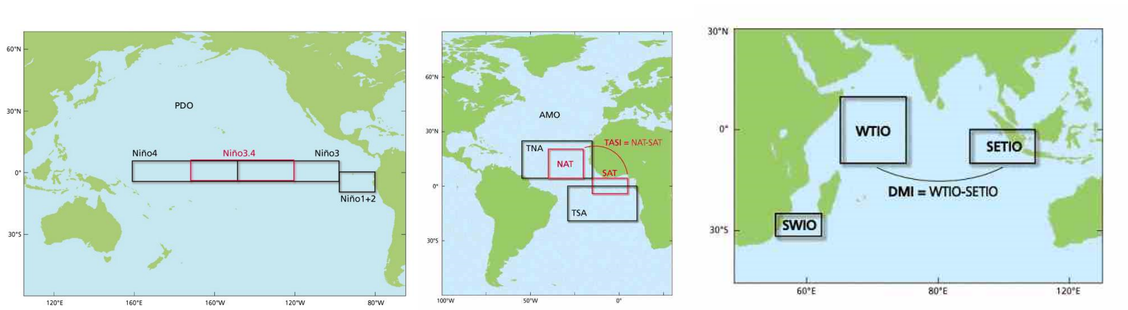
- Niño 3 : 5°S/5°N 90W-150W ; it is the region where the interanual variability of SST is the greatest.

- Niño 4 : 5°S/5°N 160E- 150W ; 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).

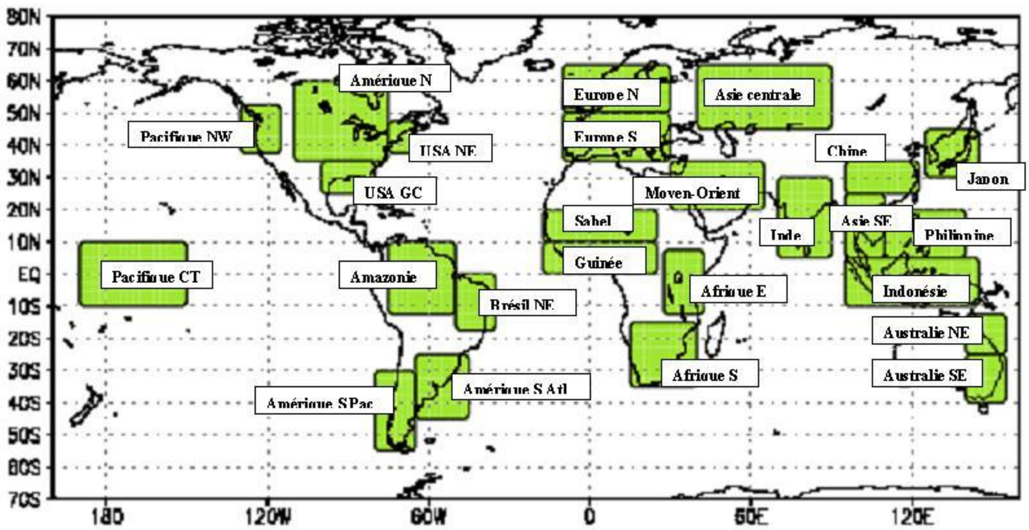
Associated to the oceanic « El Niño / La Niña » events, and taking into account the strong ocean/atmopshere coupling, the atmosphere shows also interanual variability associated to these events. It is monitored using the SOI (Southern Oscillation Index). This indice is calculated using standardized sea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