GLOBAL CLIMATE BULLETIN

n°214 – April 2017

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I. DESCRIPTION OF THE CLIMATE SYSTEM (February 2017)

I.1.Oceanic analysis

Over the Pacific ocean :

- Surface warming on the eastern part of the equatorial rail. Cooling just west of the International Date Line. Negative anomalies of STT between 170 ° E and 150 ° W. Very strong positive SST anomalies along the northern coasts of Peru. Nevertheless, SST decreases in February in the NINO1+2 zone (anomaly + 1.2 ° C, compared to +1.5 ° C in January). In the NINO3.4 zone, the SST anomaly is + 0.4 ° C (continuously increasing since December 2016).
- In subsurface, there was little change except on the extreme east of the equatorial rail, where the waters were heavily warmed (a probable landing of a Kelvin wave introduced in November 2016 in the western part following a western gale due to intense activity of the MJO). We also notice (not shown here, but see http://www.ciifen.org/index.php?option=com_content&view=category&layout=blog&id=64&Itemid=303&lang=es on page 2 of this bulletin) a very intense equatorial counter-current which had to play an important role in the emergence of strong positive heat content anomaly trends on the extreme east of the rail (and over Ecuadorian and northern Peruvian coasts). In the center of the basin, there is a slight tendency for cooling.

Over the Maritime Continent :

- Overall slightly warmer than normal. Strong cooling in the South China Sea.

Over the Indian Ocean :

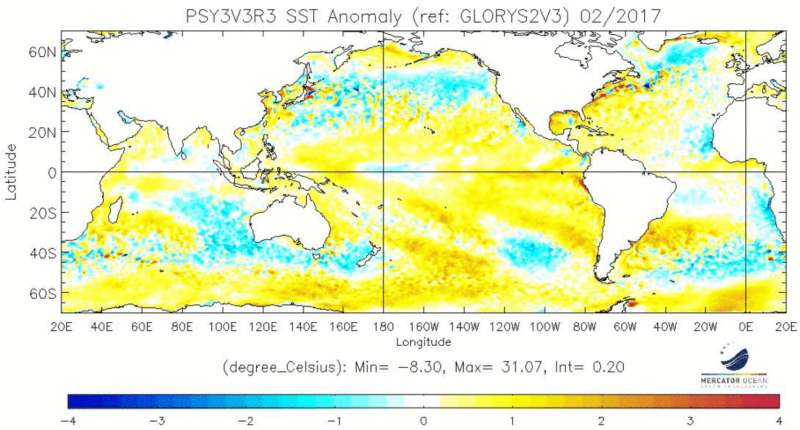
- In the southern part, strong contrast between east (cold) and west (warm). But the unusually warm area located south of the Mascarenes Islands tends to cool. The DMI is always close to 0.

Over the Atlantic:

- The equatorial rail remains warmer than normal, but the trend is cooling.
- Already cold SST along the Mauritanian coasts continue to cool. On the rest of the North Atlantic : little change. For the "cold blob", the trend is to warming.

Over the Mediterranean:

- SST close to normal.



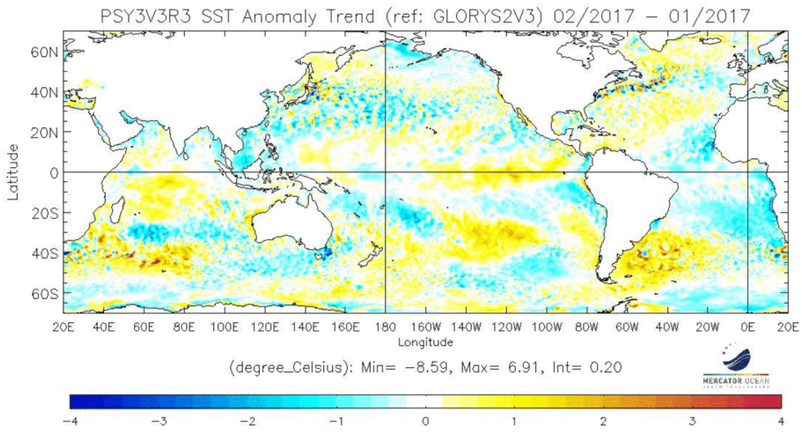


fig.I.1.1: top : SST Anomalies (°C) . Bottom : SST tendency (current – previous month), (reference Glorys 1992-2013).

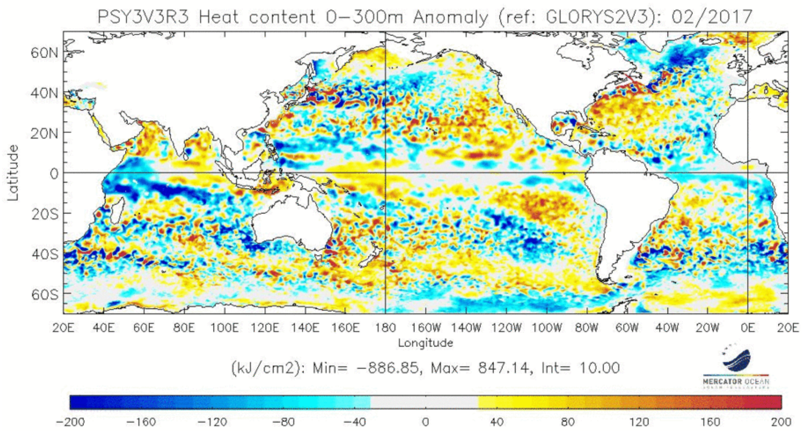


fig.I.1.2: map of Heat Content Anomalies (first 300m, kJ/cm2, reference Glorys 1992-2013)

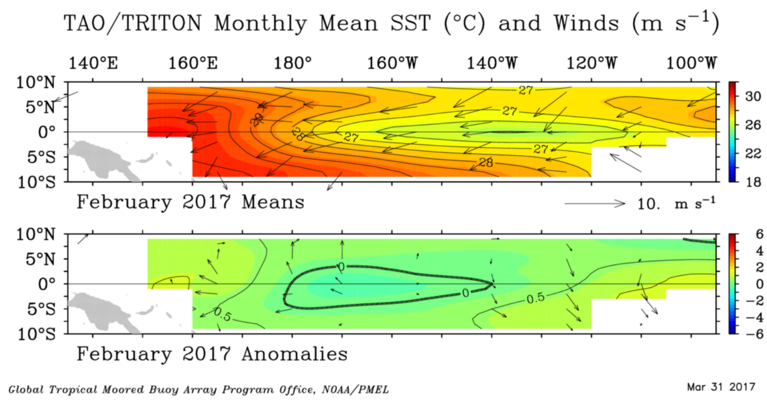


fig.I.1.3: SST Anomalies and Wind anomalies over the Equatorial Pacific from TAO/TRITON.http://www.pmel.noaa.gov/tao/drupal/assorted_plots/images/sst_wind_mon.png

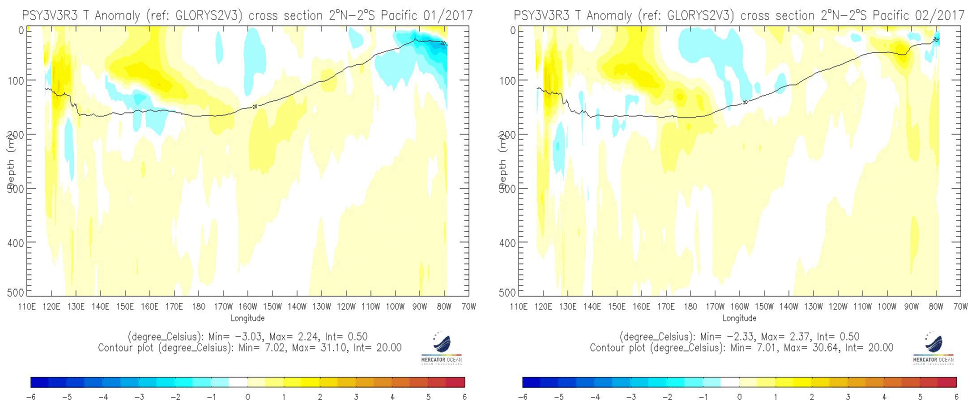


fig.I.1.4: Oceanic temperature anomaly in the first 500 meters in the Equatorial Pacific (previous and current month)

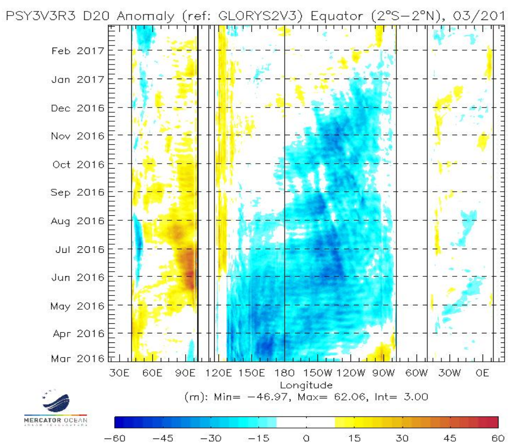


fig.I.1.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 6 month period

__**Sea surface temperature near Europe :**__

Arctic Sea and North Sea still warmer than normal but with partly weaker anomalies due to some temporary cold air advection into this area (whereas the rest of the Arctic was very mild). Southern Baltic Sea has a large small-scale spatial variability, but around normal on average. Northern Baltic Sea still frozen.

The cold blob located south of Greenland/Iceland has weakened without changing its position. On the other hand the previous warm anomaly close to Iberia and the Gulf of Biscay has disappeared; SST is now close to normal there.

Anomalies over the Mediterranean have not changed much from January to February. The western Mediterranean is still slightly warmer, the eastern basin close to normal or slightly cooler at some of the coasts.

Black Sea surface temperatures are around normal, slightly colder near the coasts with some freezing or due to snow-covered surrounding land surfaces.

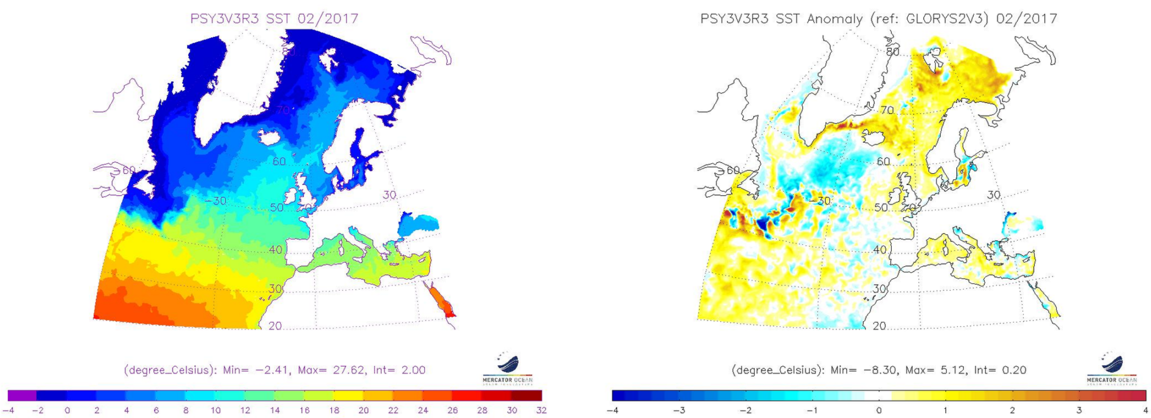


fig.I.1.6 : Mean sea surface temperature in the RA VI Region (Europe) and anomaly (reference Glorys 1992-2013).

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 on February : strong anomaly of upward motion over Amazonia, extending to Sahara and Persian Gulf. Strong anomalies of downward motion over the Indian Ocean (probably in relationship with cold SST) as well as on the south of China. On the rest of the North Pacific, an upward motion context.

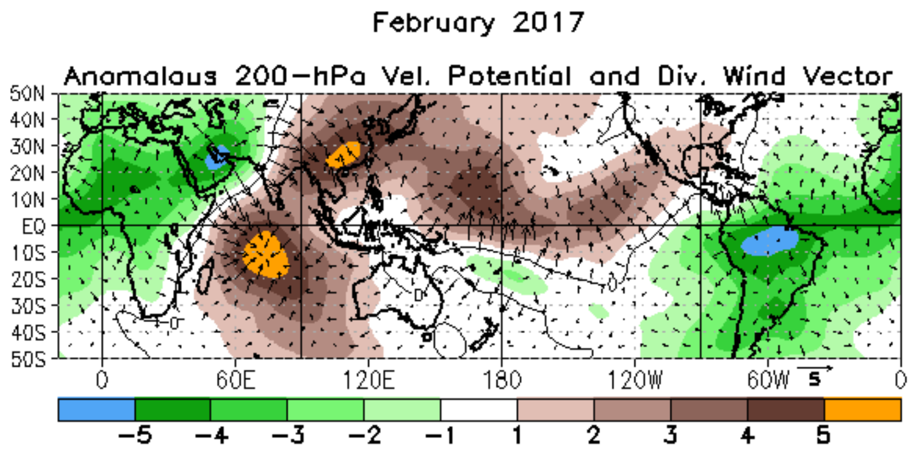


fig.I.2.1.a: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly). http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

SOI :

Near to 0 in February (-0.1 in standardized form ; see https://www.ncdc.noaa.gov/teleconnections/enso/indicators/soi/), consistent with neutral ENSO situation.

MJO (fig. I.2.1.b)

Strong activity of the MJO in February. This seems consistent with the strong negative anomalies of divergence observed over Amazonia and more eastward. Perhaps this strong activity of the MJO is related to the heavy precipitation in Peru (causing major floods).

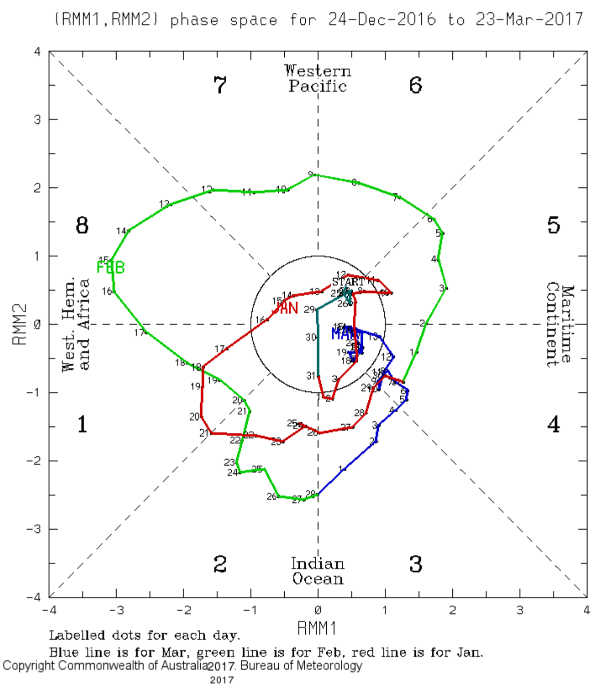


fig.I.2.1.b: indices MJO http://www.bom.gov.au/climate/mjo/

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

Nice anticyclonic circulation anomaly on the southern US (in relationship with the above subsidence context).

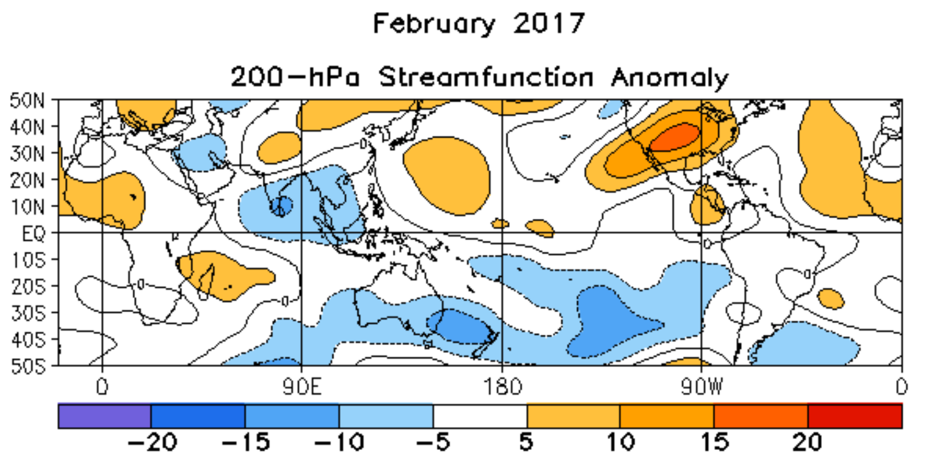


fig.I.2.2: Stream Function Anomalies at 200 hPa. http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

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

Beautiful pattern look liking negative PNA from the Aleutian Islands to Florida. Beautiful positive anomaly of GPH over Fenno-Scandinavia, extending to the Balkans. Negative anomalies of GPH on both sides.

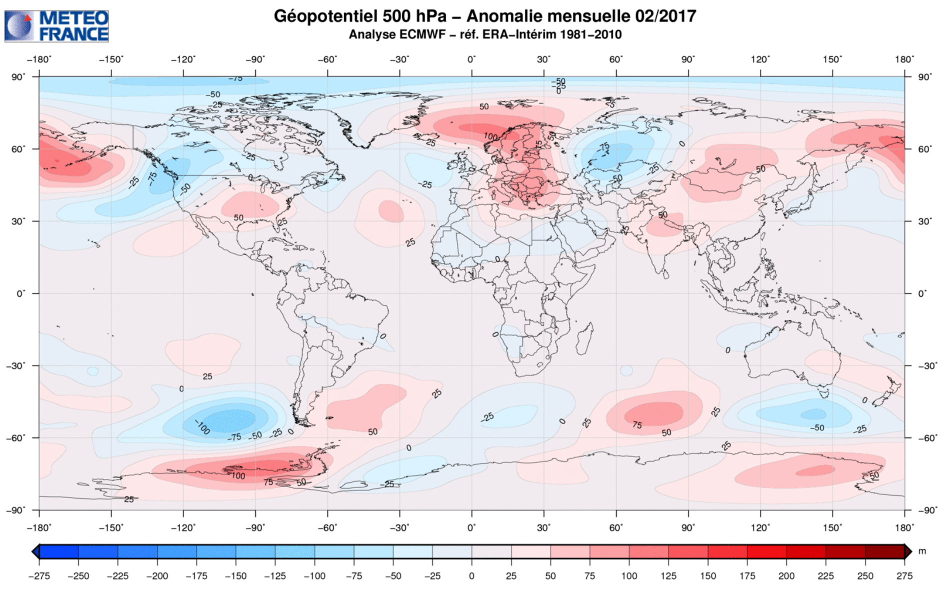


fig.I.2.3: Anomalies of Geopotential height at 500hPa (Meteo-France)

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
FEB 17	0.7	0.6	-0.1	0.2	-0.1	-0.1	1.1	0.7	-0.4
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

Sea level pressure and circulation types over Europe

Remarkable ridge over Europe in the lower and upper atmosphere and some cyclonic activity at its flanks in westernmost and easternmost Europe. The positive geopotential anomaly extended from the Mediterranean up to Scandinavia and beyond, forming a slight SCAND pattern, but the negative part of this dipole pattern was largely missing (index therefore only +0.7).

Over the North Atlantic, airflow was more zonal. Both Icelandic Low and Azores High were more intense than normal, resulting in slightly positive NAO and also EA (due to a clearly negative geopotential anomaly west of Ireland). This anomaly forms a dipole together with another centre of positive anomalies over parts of eastern/southeastern Europe, resulting in a fairly intense EATL/WRUS pattern (+1.1).

According to MF weather type classification, blocking types dominated nearly half of the month (13 days), followed by NAO+ situations (10 days). Blocking types occurred mainly in the first half, westerly types (mostly cyclonic) mainly in the second half of the month (similarly in DWD GWL classification).

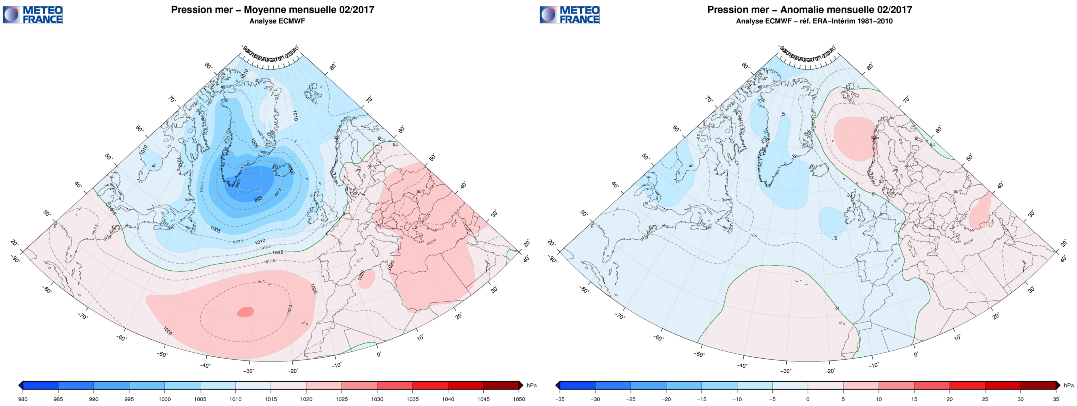


fig.I.2.4: Mean sea level pressure in the RA VI Region (Europe) (top) and 1981-2010 anomalies (bottom).

Circulation indices: NAO and AO

NAO was positive during the whole month, ranging from close to zero to fair values around +1. There were two peaks, one in the first half, the other one (more efficient for Europe) in the second half of February.

AO had a negative phase in the first half of February and a longer and more intense positive phase in the second half. This points to a hemispheric switch of circulation in the middle of the month. While the first half of the month was more meridional with more air mass exchange between polar and middle latitudes, the second half was more zonal, though with some cyclonic disturbances.

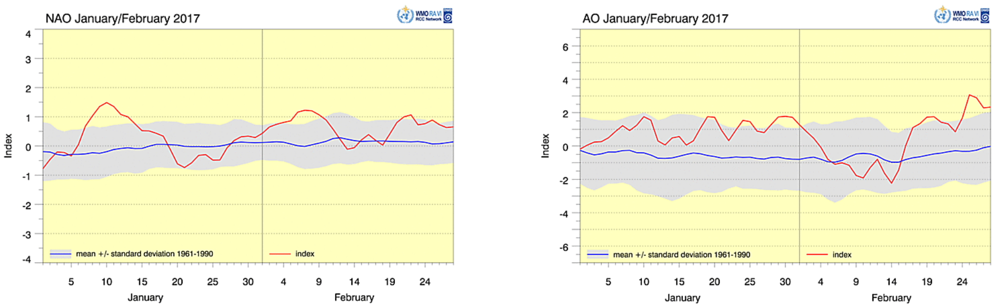


fig.I.2.5: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices with 1961-1990 mean standard deviation (shading). http://www.dwd.de/rcc-cm , data from NOAA CPC: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

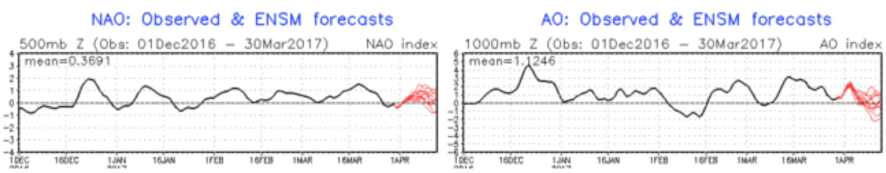


fig. I.2.5a: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices for the last 4 months and forecasts for the following weeks. Source: NOAA CPC, http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

I.2.b Precipitation

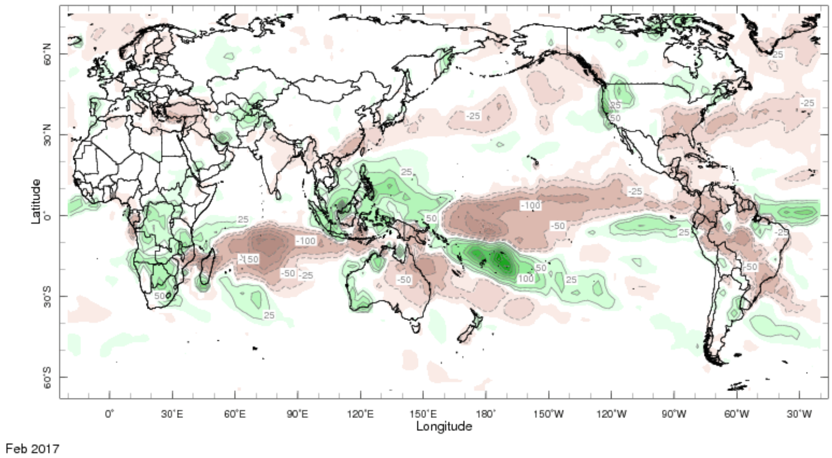


fig.I.2.6: Rainfall Anomalies (mm) (departure to the 1979-2000 normal) – Green corresponds to above normal rainfall while brown indicates below normal rainfall. http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/Anomaly.html

Precipitation anomalies in Europe:

Due to the change of weather types during the month, monthly precipitation totals averaged either close to normal or show a very patchy spatial distribution dependent on occurrence of individual cyclonic patterns. However, it was outstandingly dry over the Mediterranean, large parts of eastern France and southern Germany (the latter due to some Foehn situations north of the Alps). It was wetter in parts of Western Europe (mostly reached by Atlantic cyclonic patterns), northern Central Europe (during westerly weather types), south of the Alps / northern Adriatic Sea (orographically affected by the Alps) and over Russia (located east of the ridge).

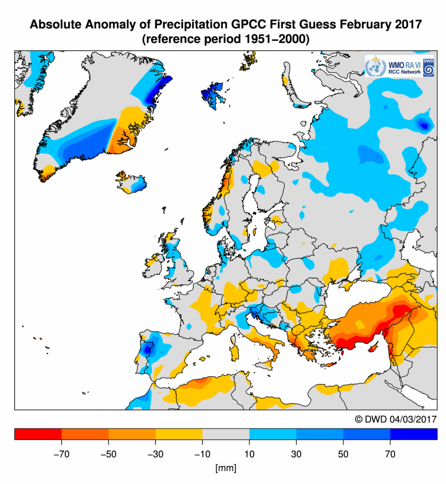


fig.I.2.7.a : Absolute anomaly (1951-2000 reference) of precipitation in the RA VI Region (Europe), data from GPCC (Global Precipitation Climatology Centre), http://www.dwd.de/rcc-cm.

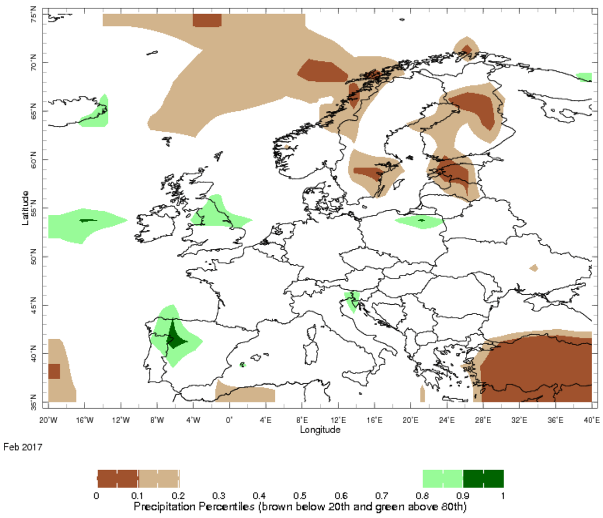


fig.I.2.7.b : Percentiles of precipitation, 1981-2010 reference. Data from NOAA Climate Prediction Center, http://iridl.ldeo.columbia.edu/maproom/Global/Precipitation/Percentiles.html

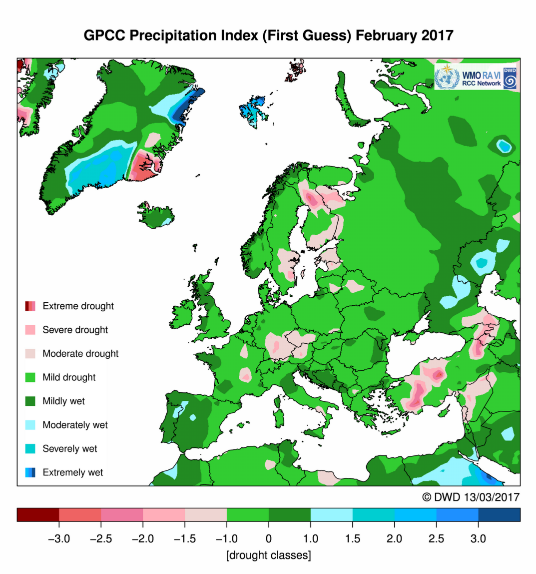


fig. I.2.8: GPCC Precipitation Index, http://www.dwd.de/rcc-cm .

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	+ 2.1 mm	- 0.486
Southern Europe	- 10.2 mm	- 0.244

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 positive anomaly over the Arctic area, northeastern US, eastern Siberia. Negative anomaly on the far west of Canada.

Over Europe : generally positive anomalies.

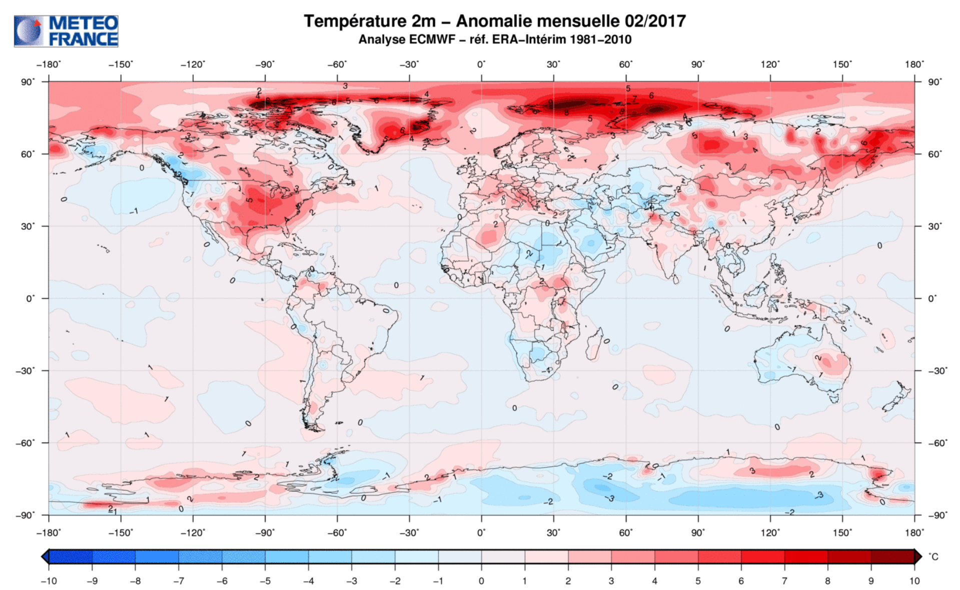


fig.I.2.9: Temperature Anomalies (°C) (Meteo-France)

Temperature anomalies in Europe:

Much of Europe warmer than normal due to southerly advection or high pressure subsidence. Some cold airflow over the North Atlantic touching also westernmost parts of Europe and an area from Denmark southeastwards to Turkey / Middle East. Especially eastern Turkey had low temperatures particularly in the mountains and much snow.

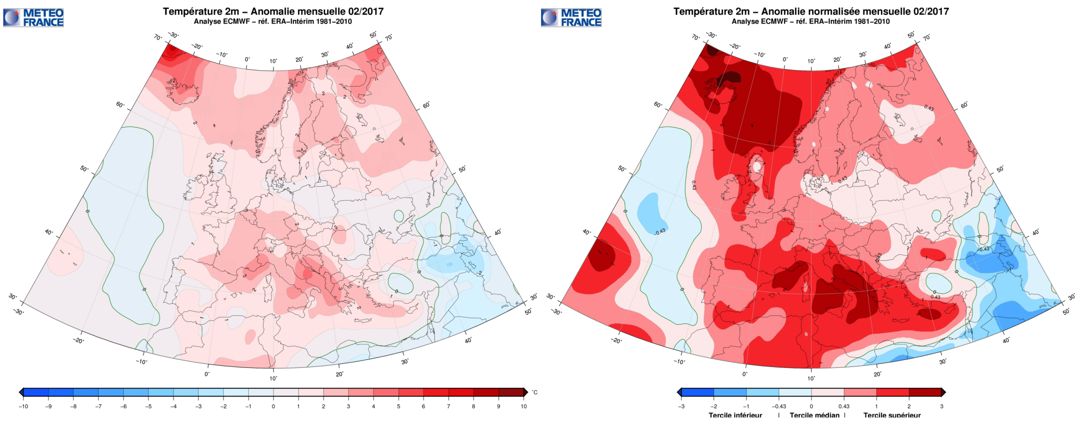


fig.I.2.10: Left graph: Absolute anomaly of temperature in the RA VI Region (Europe). Right graph: Standardized temperature anomalies

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	+ 2.2 °C
Southern Europe	+ 1.7 °C

I.2.d Sea ice

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

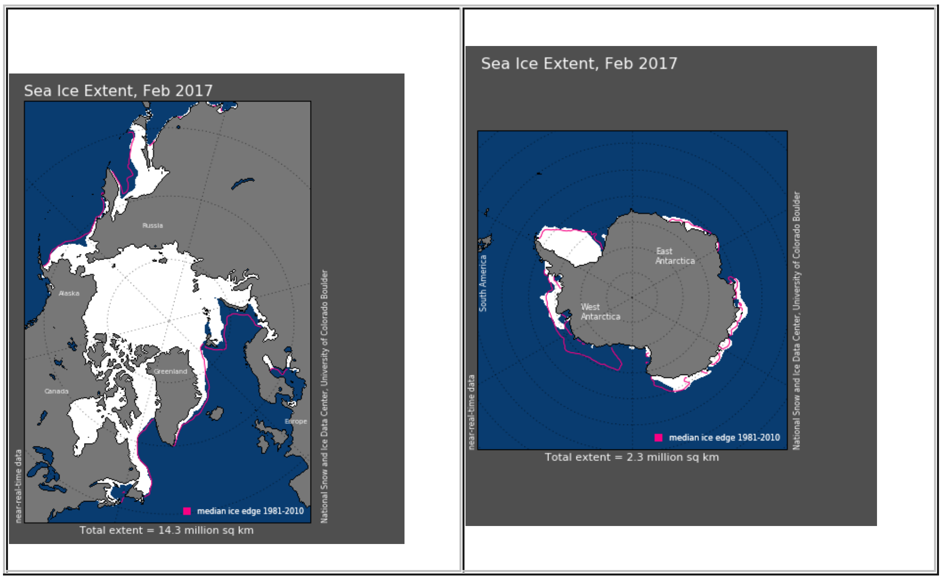


fig.I.2.11: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

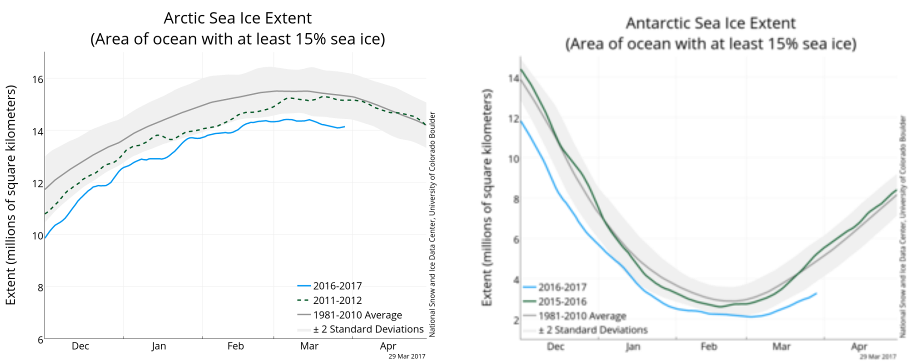
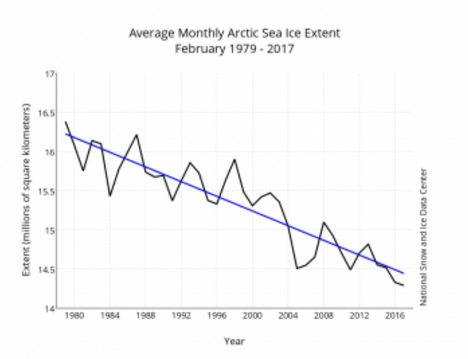


fig. I.2.12 : Sea-Ice extension evolution from NSIDC. https://nsidc.org/data/seaice_index/images/daily_images/N_stddev_timeseries.png



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 very good agreement (although the JMA model is a little less warm on the eastern part of the equatorial rail - but the spirit remains the same): they maintain the structures described in the February analysis and forecast the continuing warming of the entire intertropical band. The strongest positive SST anomalies are expected on the eastern part of the equatorial rail towards the Peruvian coast. On the northern Pacific (PDO area), models tend to warm.
- Indian Ocean: models forecast persistence of the current structures : a beautiful positive anomaly of SST from Madagascar to the Mascarenes Islands and the region of Amsterdam Island. The cold anomalies present in the east and north of this area seem to persist next quarter. The Indian dipole (IOD) is expected to go into positive phase (the DMI is expected to return to positive

values).

- Atlantic Ocean:
  - Over 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, which then extends to the coasts of Western Europe (although there are fewer SST anomalies).
  - Most of the models provide for a neutral intertropical band (except for the aforementioned area) and the pursuit of negative SST anomalies in the areas under Canary and Benguela currents (ECMWF already proposes the development of the cold tongue over the Gulf of Guinea).

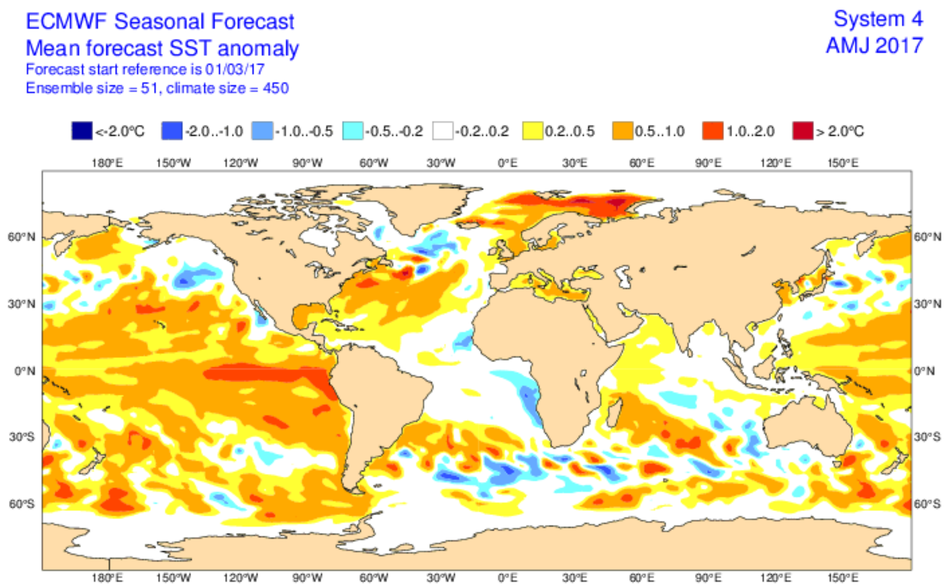


fig.II.1.1: SST anomaly forecast from ECMWF http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

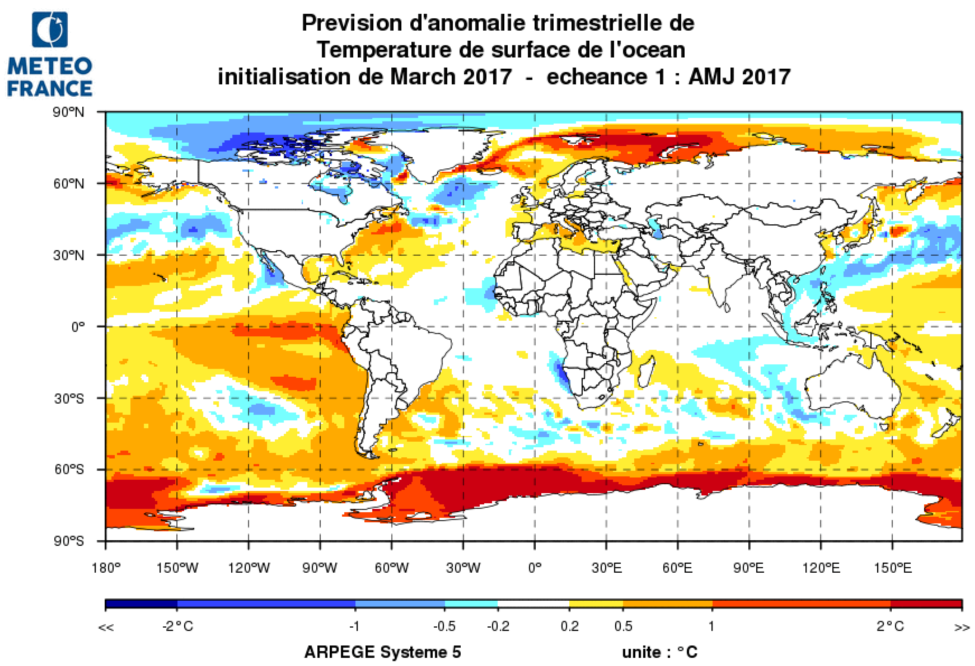


fig.II.1.2: SST Anomaly forecast from Meteo-France (recalibrated with respect of observation). http://seasonal.meteo.fr

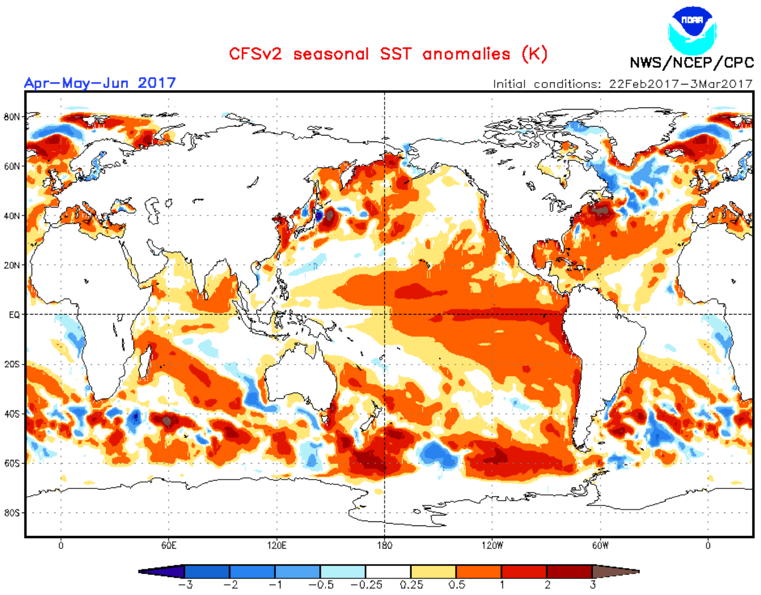


fig.II.1.3: SST Anomaly forecast from NCEP. http://www.cpc.ncep.noaa.gov/products/people/wwang/cfsv2fcst/imagesInd1/glbSSTSeaInd1.gif

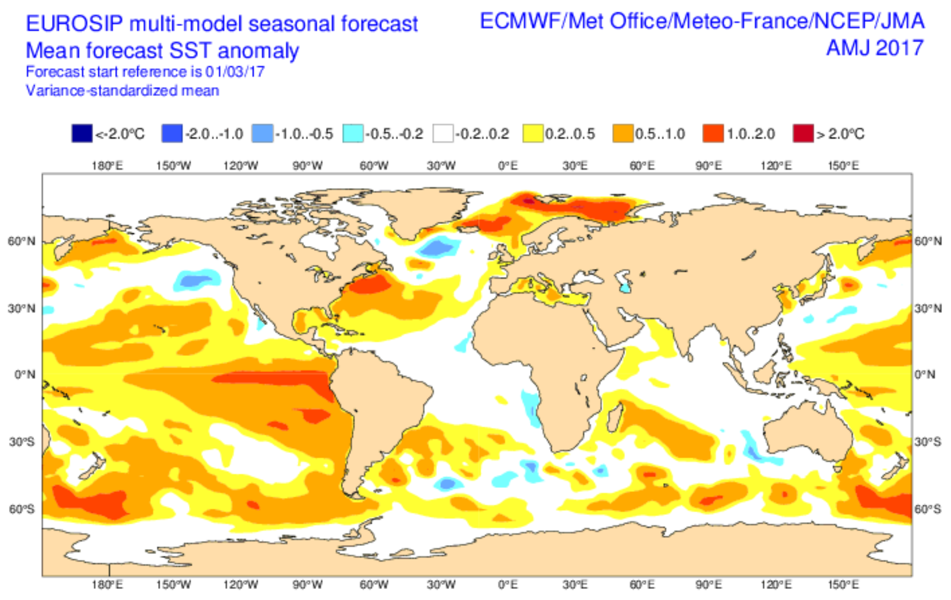


fig.II.1.4: SST Forecasted anomaly from Euro-SIP

<u>II.1.b ENSO forecast :</u>

Forecast Phase: Neutral evolving towards Niño?

In Niño boxes, SST anomalies will grow during the next quarter. Neutral conditions for the next quarter but models suggest the beginning of an El Niño phenomenon during the boreal summer. Spring being the most delicate period for this forecast, it is necessary to remain cautious for this forecast range.

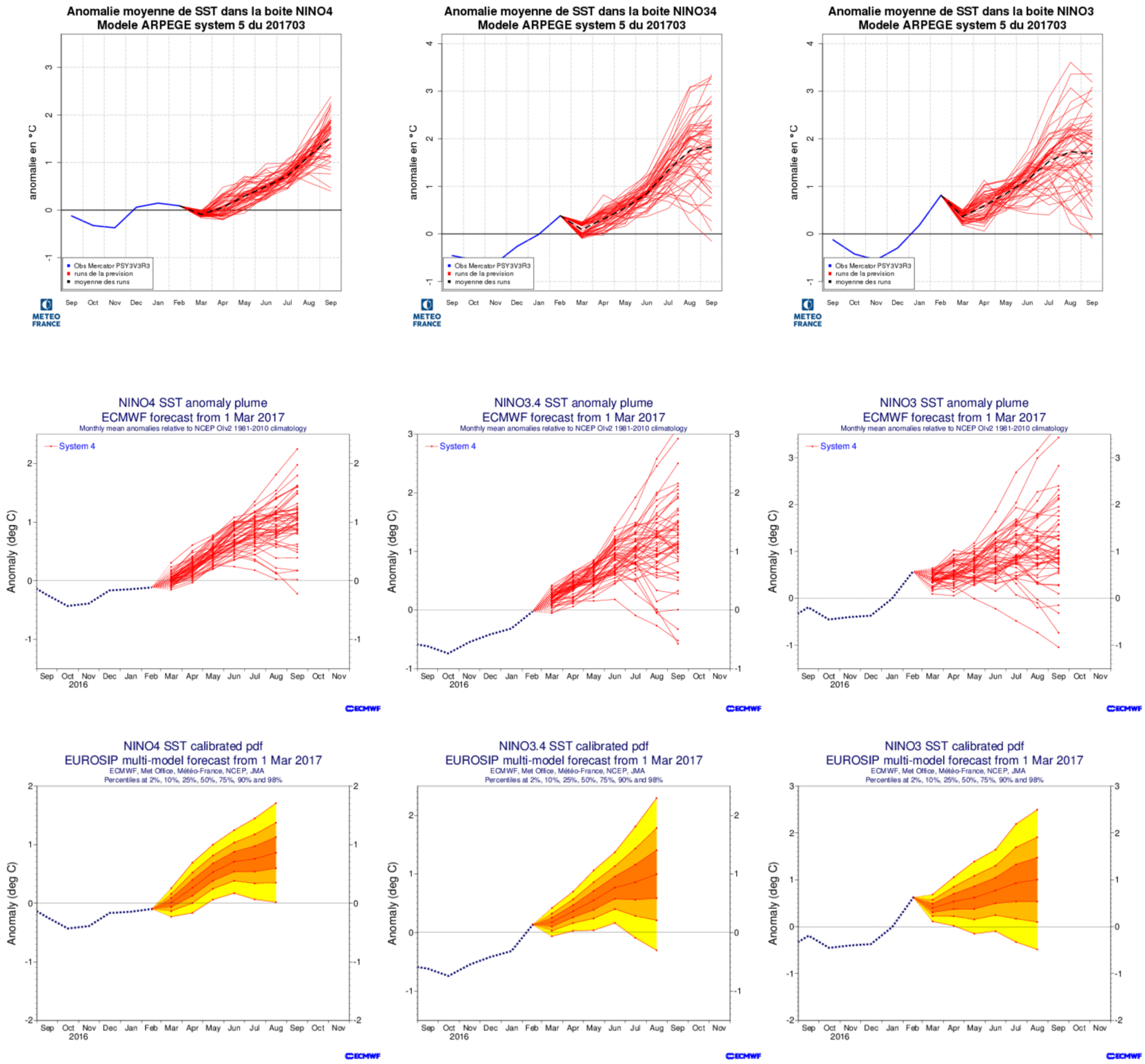
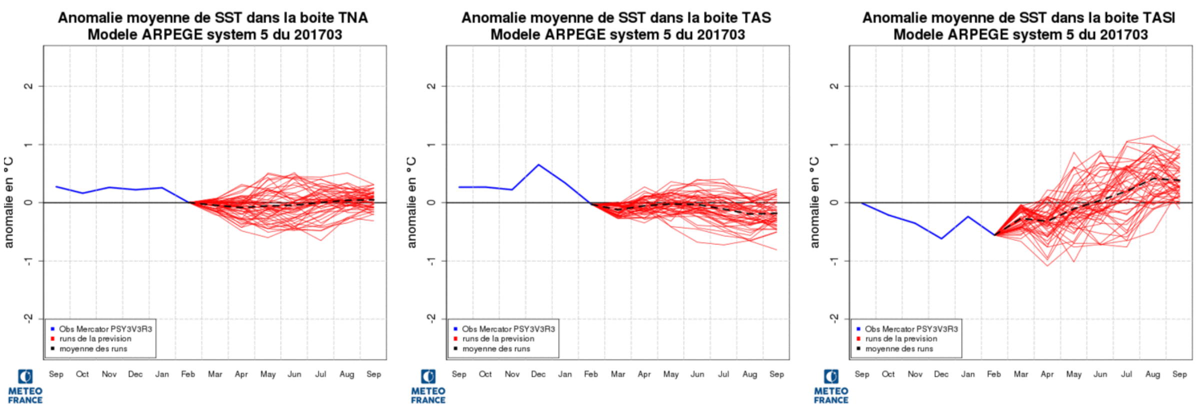


fig.II.1.5: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members - and EUROSIP (bottom) – recalibrated distributions - (http://seasonal.meteo.fr , http://www.ecmwf.int/)

<u>I.1.c Atlantic ocean forecasts</u>



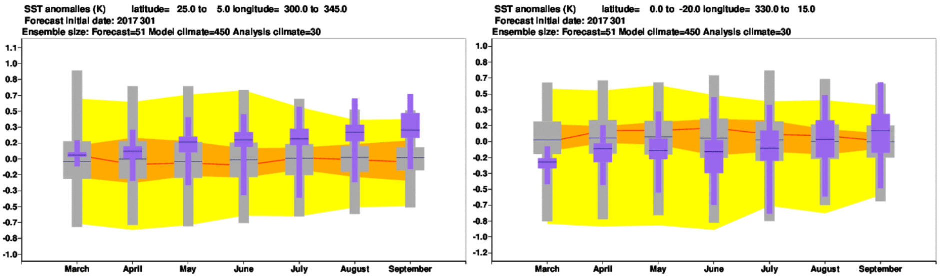


fig.II.1.6: SSTs anomaly forecasts in the Atlantic Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

I.1.d Indian ocean forecasts

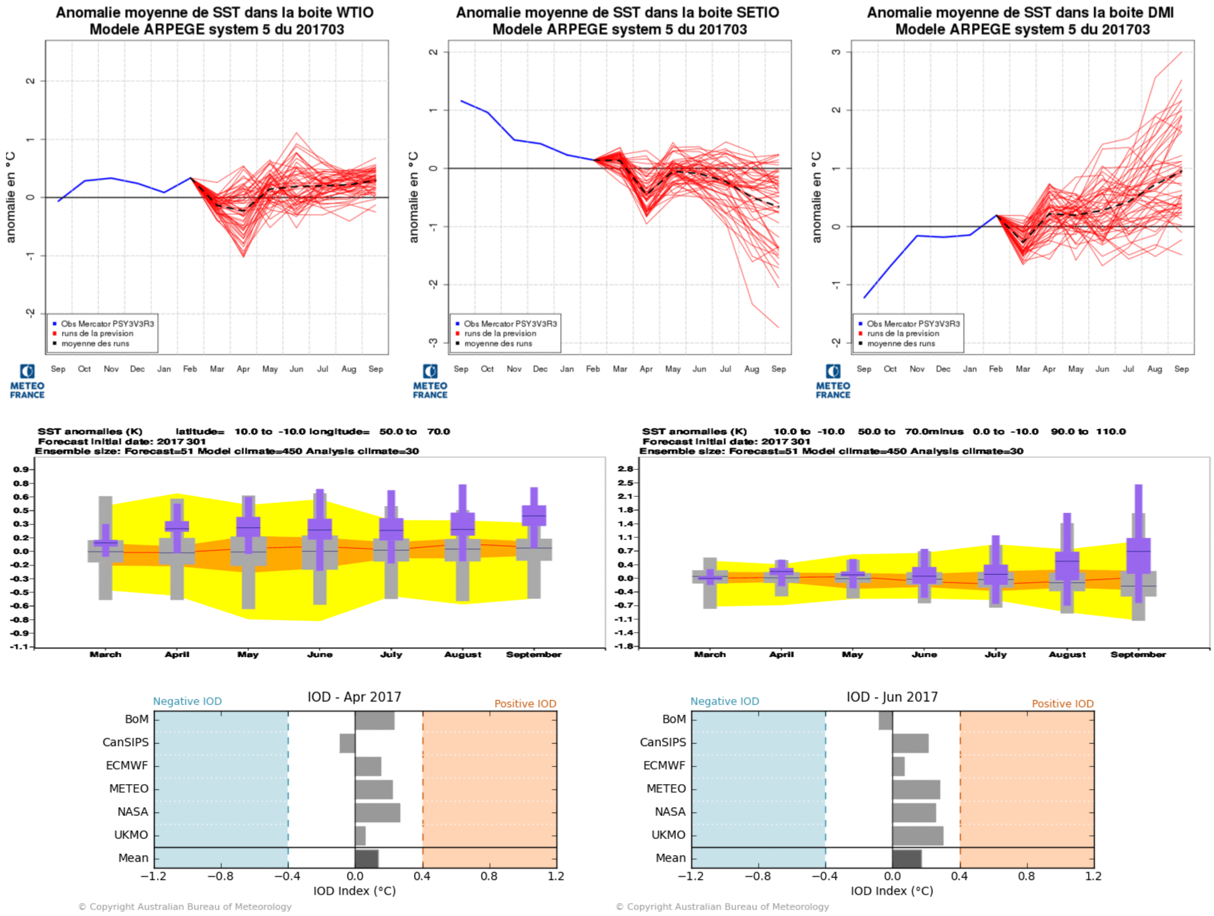


fig.II.1.7: SST anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

II.2. GENERAL CIRCULATION FORECAST

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

- Velocity potential : models show discrepancies, particularly on the intensity of the anomalies. But the philosophy remains broadly the same. ARP is more reactive than CEP and JMA. ARP favors a configuration where the Indian Ocean and the Central Pacific exert a beautiful forcing. On the other hand, it is less reactive than CEP on the Atlantic. Positive SST anomalies in the tropical Pacific and negative SST anomalies in the Indian ocean appear to drive the whole.
- Stream Function : Very good consistency of the structures between the different models in the intertropical zone, but few teleconnections towards the extra-tropical latitudes (except on the North-West Pacific, where a cyclonic anomaly is observed in the southwest of the Aleutians Islands). For Europe and the North Atlantic, models split significantly. ARP provide an anticyclonic anomaly structure, while CEP places an area of cyclonic anomaly between Iceland and the British Isles.

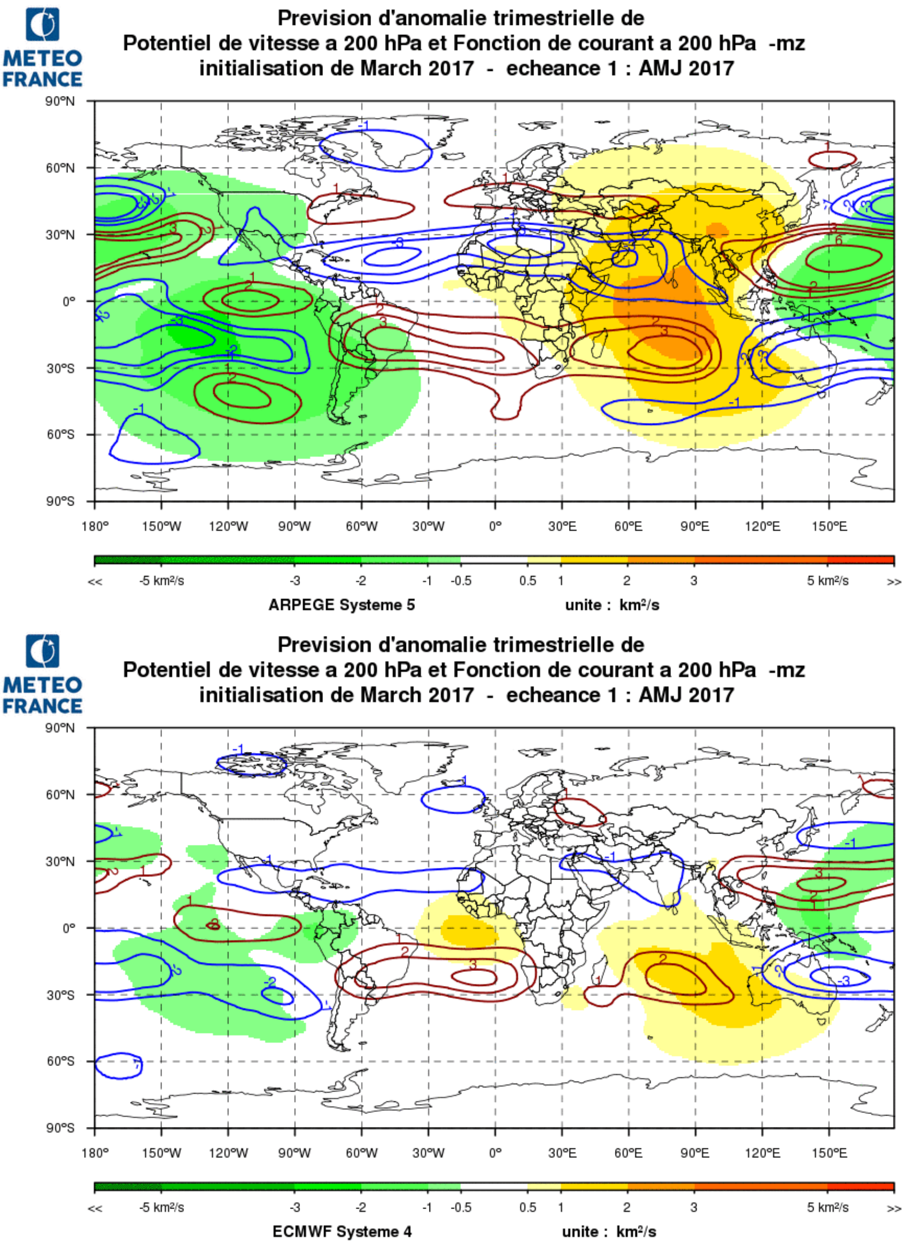


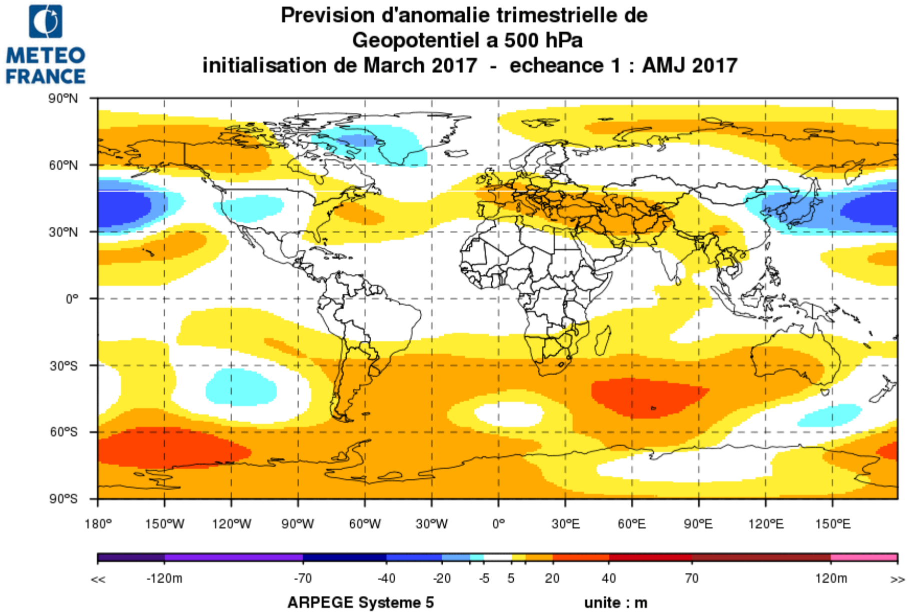
fig.II.2.1: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), associated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa by Météo-France (top) and ECMWF (bottom).

II.2.b Geopotential height anomalies

ARP and CEP models split in particular on the northern hemisphere. ARP expects, on a quarterly average of runs, an area of high geopotentials from the east coast of the USA to Europe and extending to Pakistan. The CEP option is quite different, at least on Western Europe with a minimum on the North-East Atlantic between Greenland and France.

The ARP skill scores on the western façade of Europe and for this season are very limited. No info on CEP skill scores.

The review of the Z500hPa forecasts of the 12 GPCs does not reach consensus on the North Atlantic and Europe.



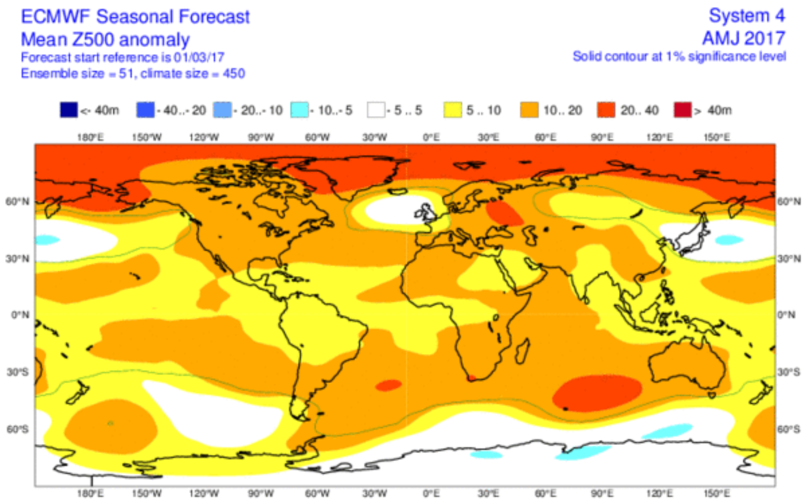


fig.II.2.2: Anomalies of Geopotential Height at 500 hPa from Météo-France and ECMWF. http://www.ecmwf.int/products/forecasts /d/charts/seasonal/forecast

<u>II.2.c. weather regimes</u>

ARP (MF model) gives no information on the forecasted weather regime (either for winter or summer regime): it sticks to its climatology.

The Z500hPa weather regime (not shown here) do not give any information either.

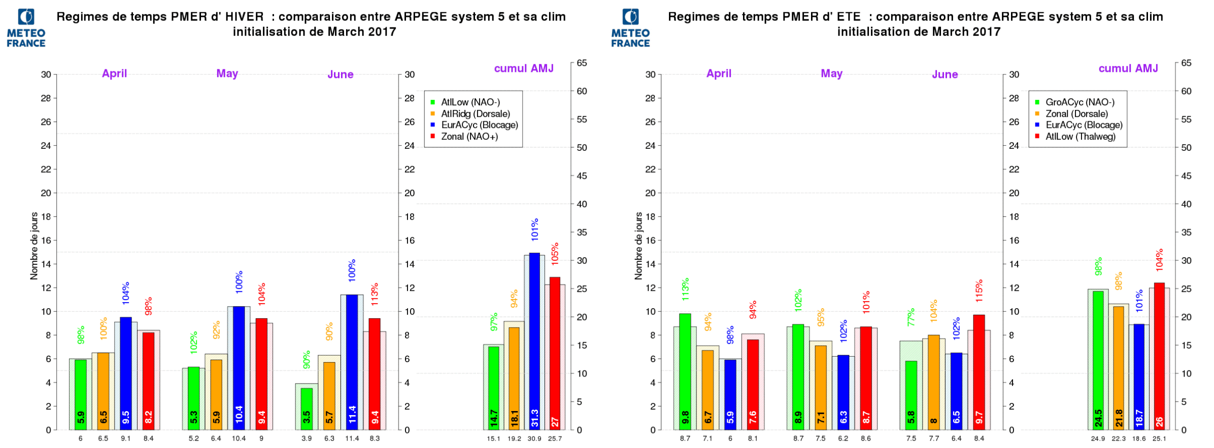


fig.II.2.3bis: North Atlantic Regime occurrence anomalies from Meteo-France ARPEGE-S5 : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

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

Over continents, there is a generally warm signal, but without strong probabilities (except over Brazil, the Andes Cordillera and Madagascar where the probabilities of being in a warm scenario are very high).

Europe is no exception to this rule, and we can therefore rely on a rather warm scenario, but without very strong probabilities. It seems that the probability of having a warm scenario is slightly higher on Iceland and Norway (visible in EUROSIP and also in the MME grouping the 12 GPCs).

II.3.a ECMWF

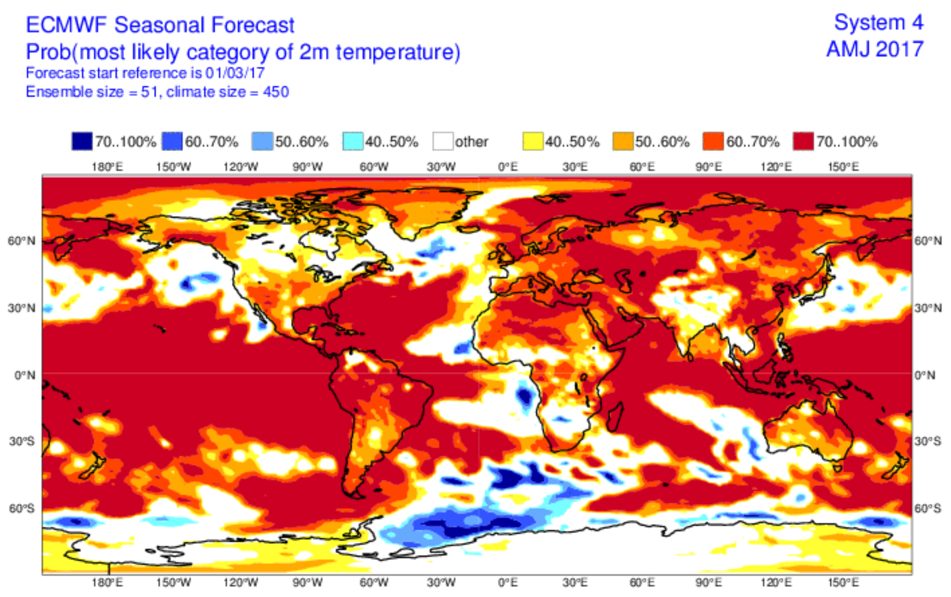


fig.II.3.1: Most likely category probability of T2m from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.3.b Météo-France

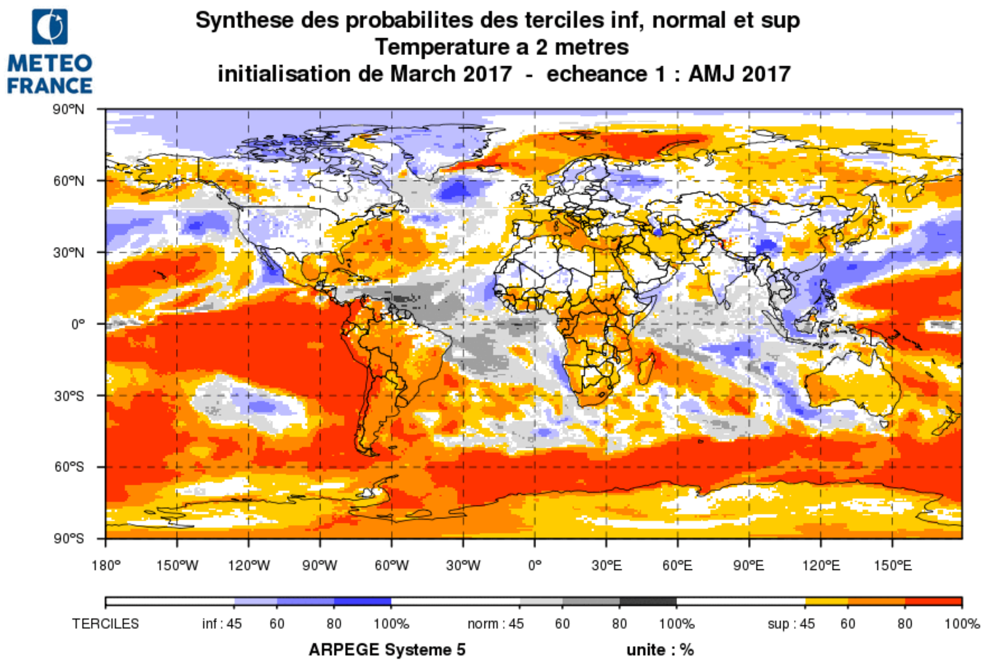


fig.II.3.2: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://seasonal.meteo.fr/

II.3.e Japan Meteorological Agency (JMA)

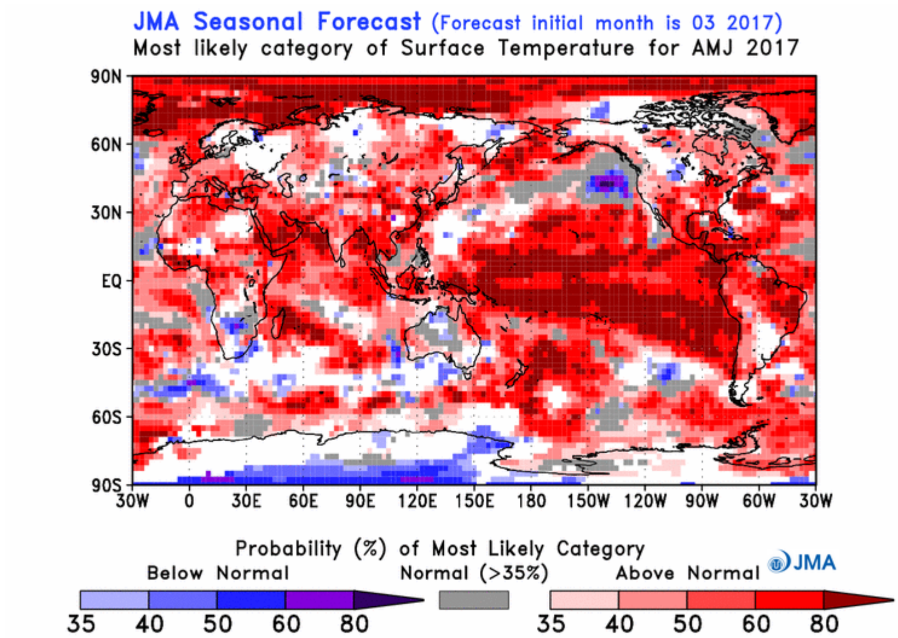


fig.II.3.3: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst_gl.php

II.3.g EUROSIP

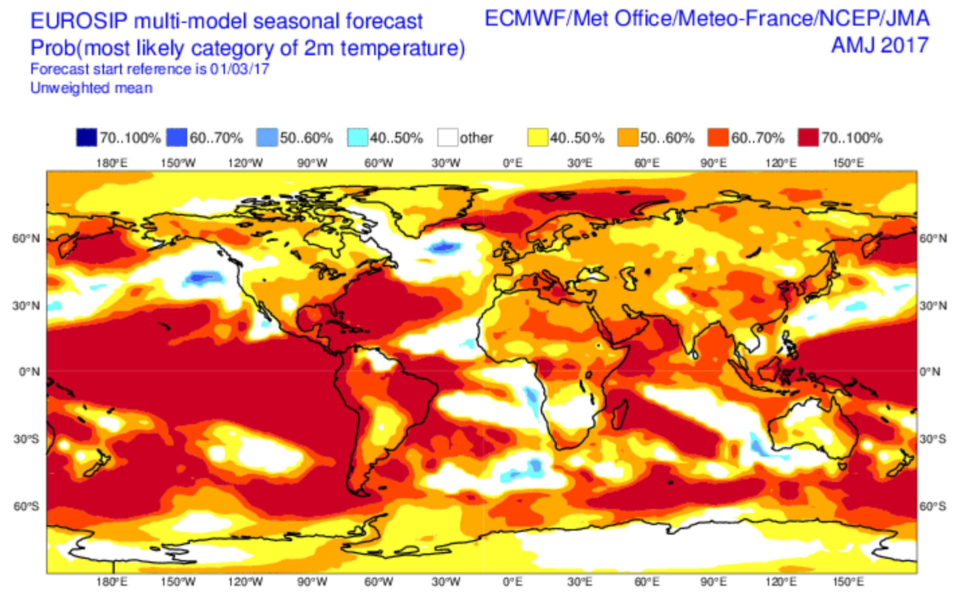


fig.II.3.4: Multi-Model Probabilistic forecasts for T2m from EuroSip (2 Categories, Below and Above normal – White zones correspond to No signal and Normal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

II.4. IMPACT : PRECIPITATION FORECAST

In consistency with the large-scale dynamics, precipitation patterns look liking in a Niño episode.
For Europe, there is no signal from the models, except perhaps on Finland where a wet scenario seems to emerge (visible in EUROSIP and also in the MME grouping the 12 GPCs).

II.4.a ECMWF

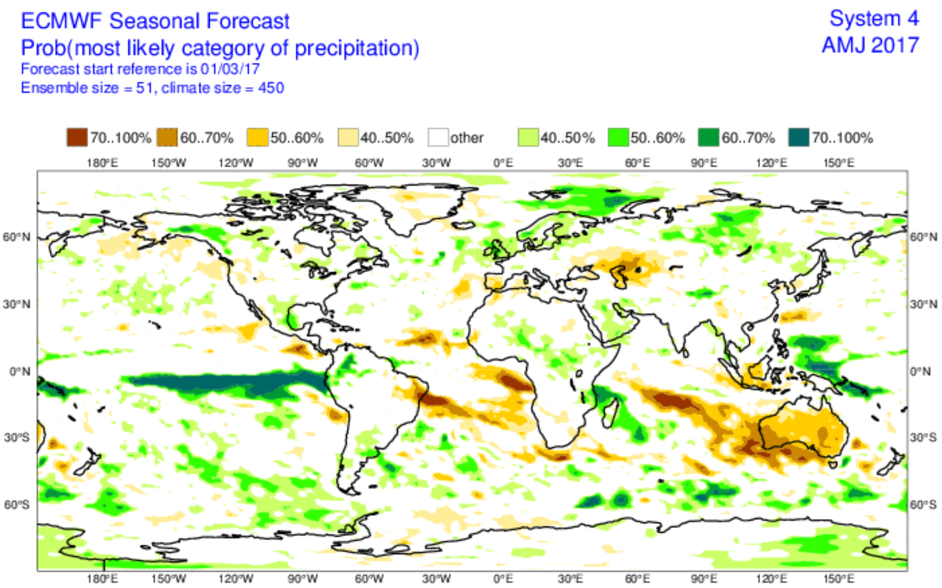


fig.II.4.1: Most likely category probability of rainfall from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.4.b Météo-France

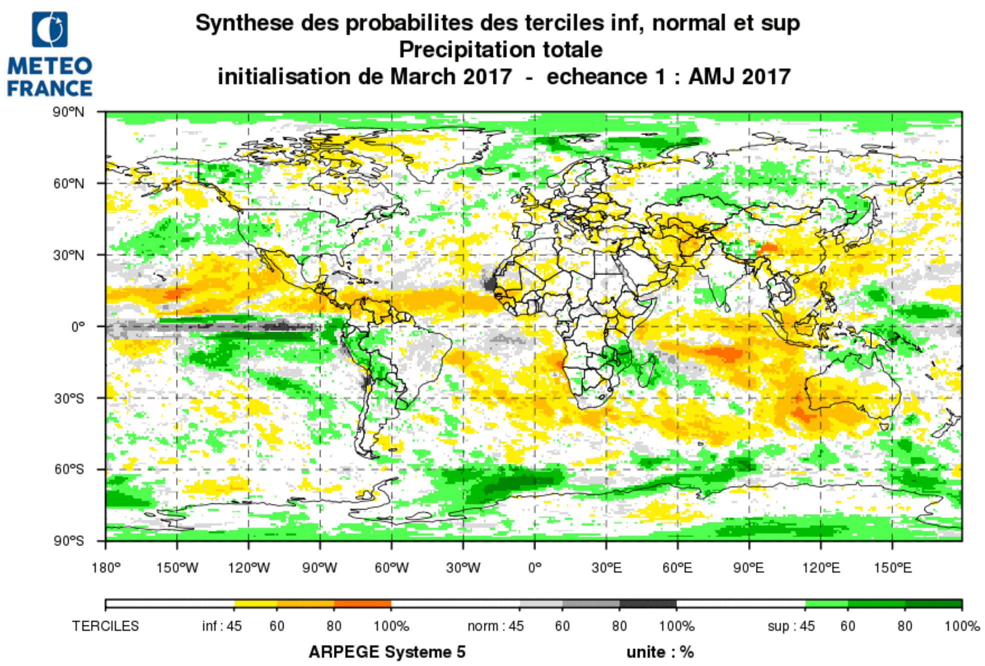


fig.II.4.2: Most likely category of Rainfall. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.4.e Japan Meteorological Agency (JMA)

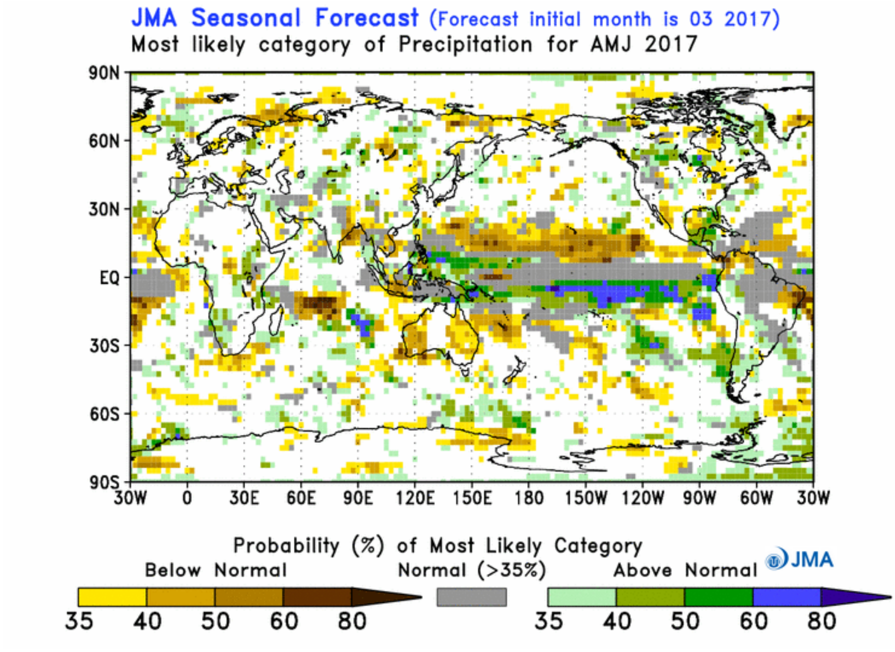


fig.II.4.5: Most likely category of Rainfall from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst_gl.php

II.4.g EUROSIP

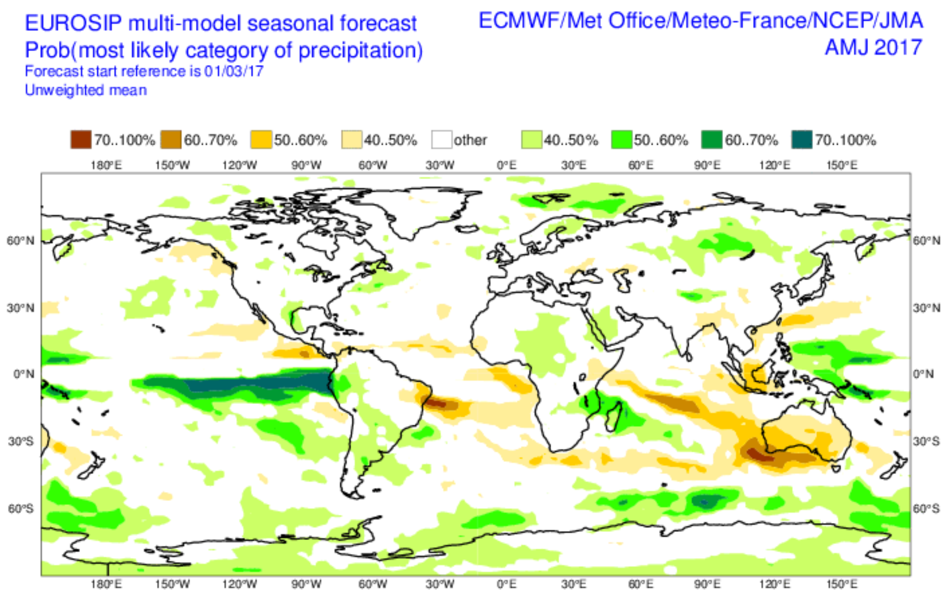


fig.II.4.7: Multi-Model Probabilistic forecasts for precipitation from EuroSip (2 Categories, Below and Above normal – White zones correspond to No signal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

II.5. REGIONAL TEMPERATURES and PRECIPITATION

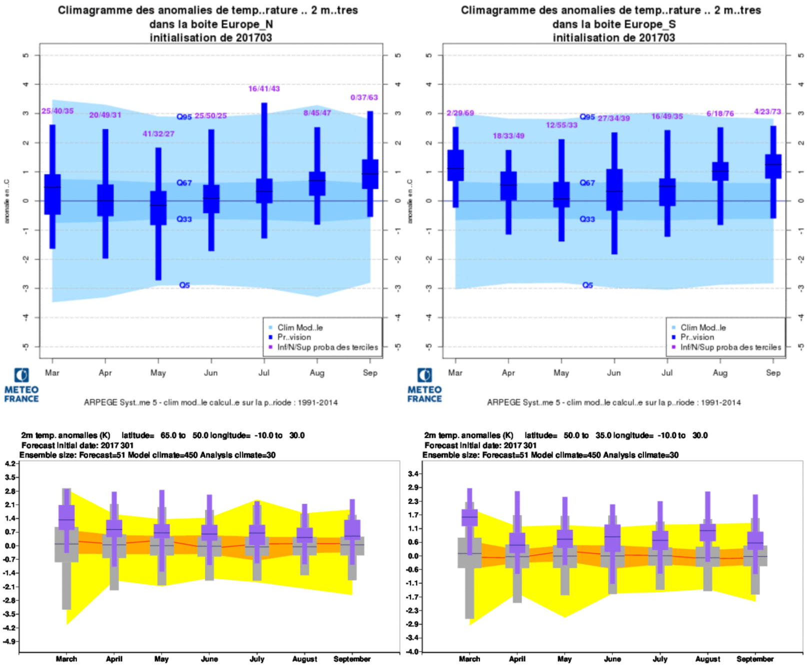


fig.II.5.1 : Climagrams for Temperature in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

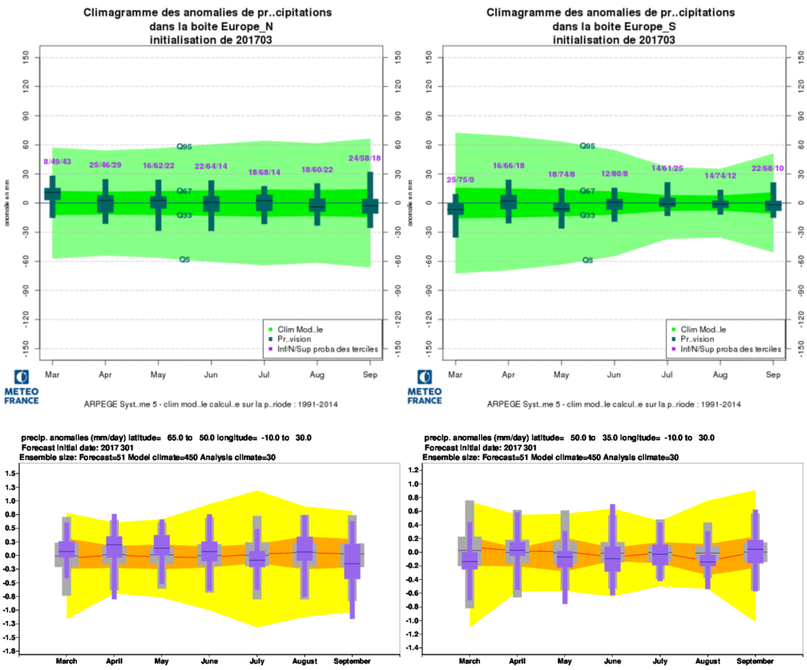


fig.II.5.2 : Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

<u>II.7. "EXTREME" SCENARIOS</u>

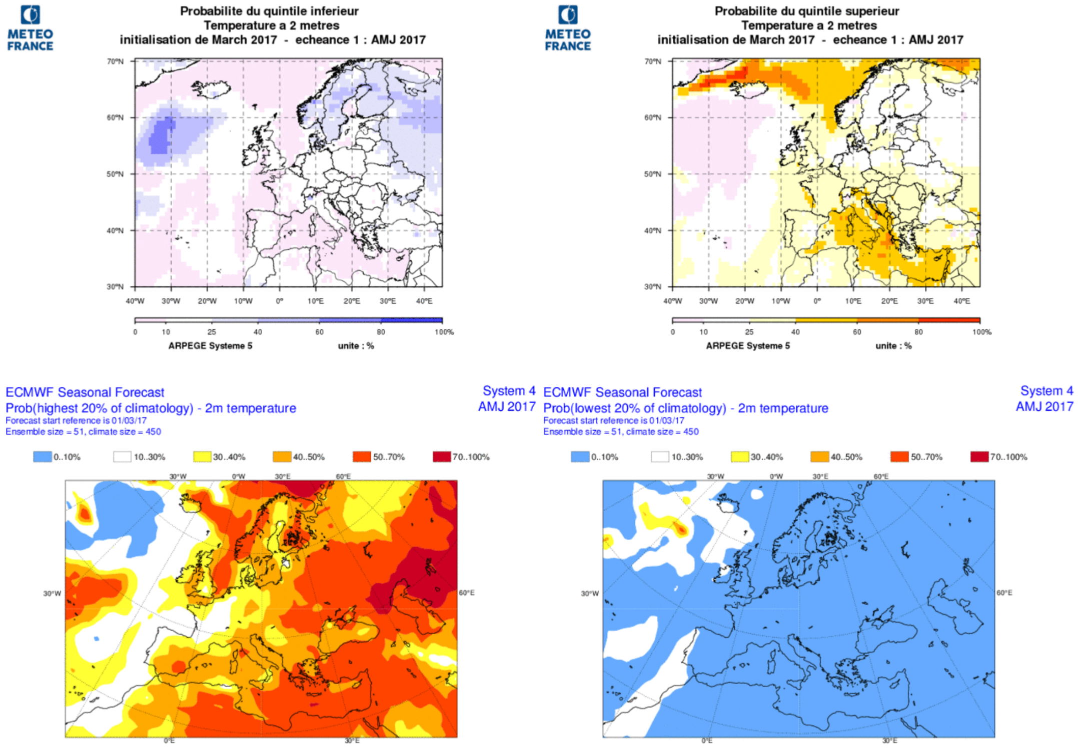


fig.II.7.1 : Top : Meteo-France T2m probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution). Bottom : ECMWF T2m probability of « extreme » below normal conditions (left - highest ~20%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

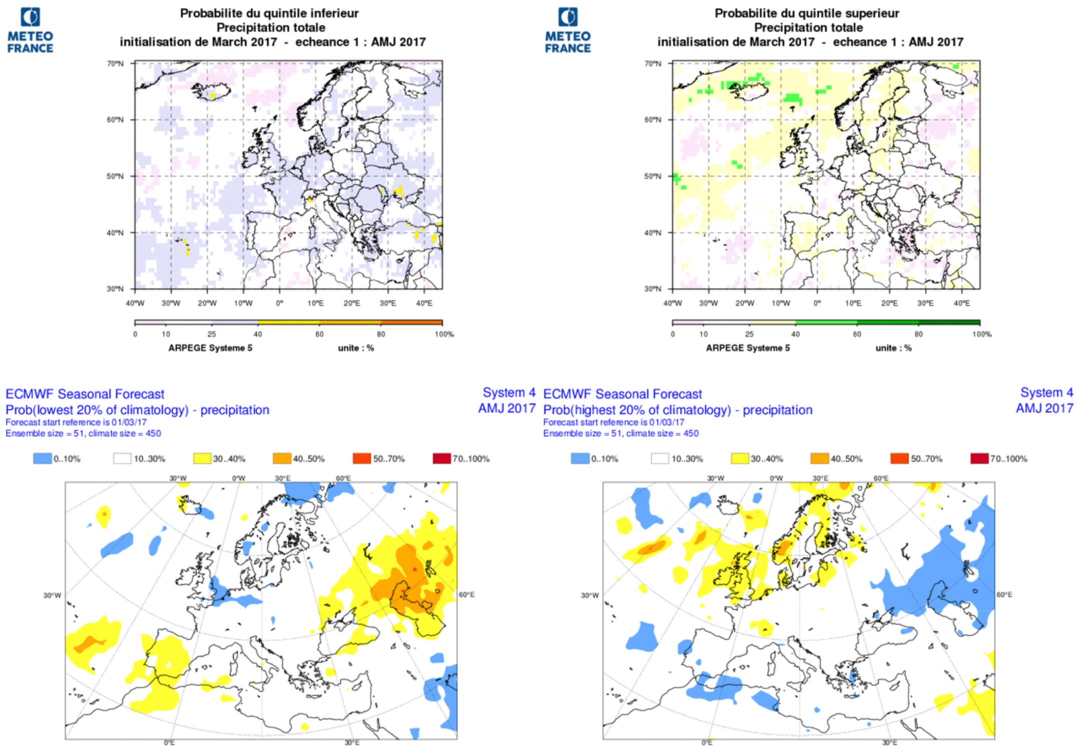
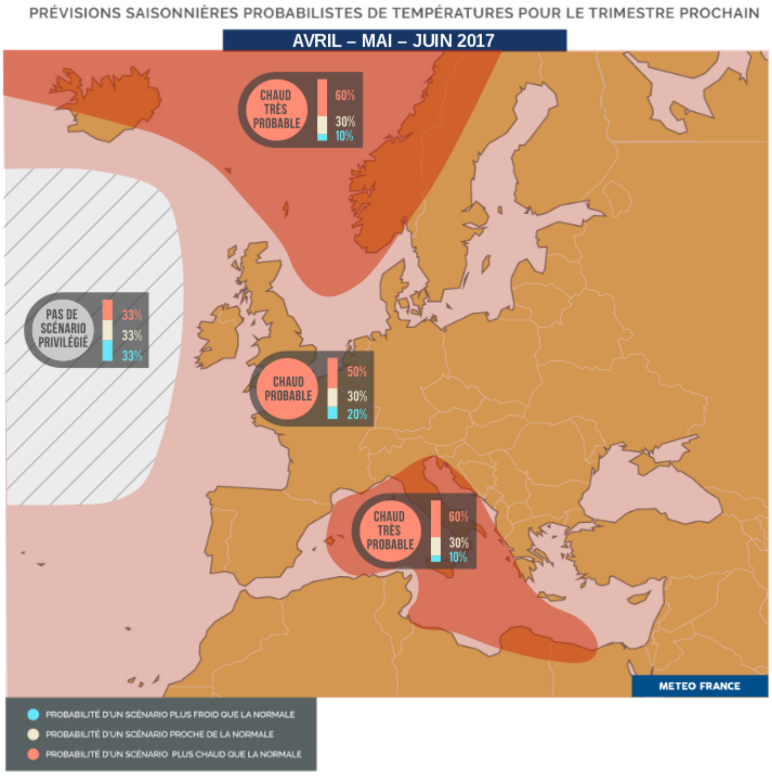


fig.II.7.2 : Top : Meteo-France rainfall probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution).
Bottom : ECMWF rainfall probability of « extreme » below normal conditions (left - lowest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

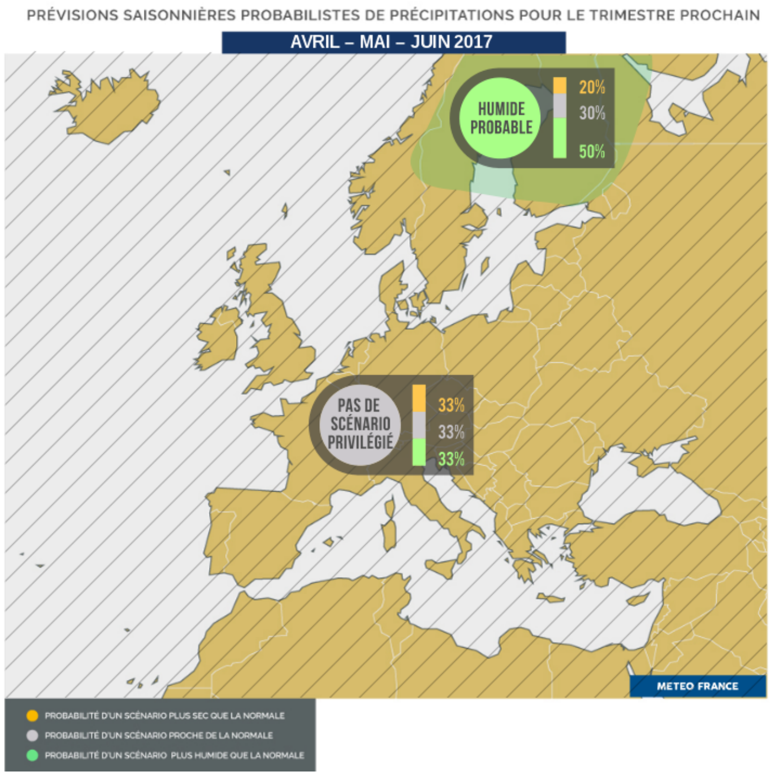
II.8. DISCUSSION AND SUMMARY

II.8.a Forecast over Europe

Temperatures: Scenario rather warm, but without very strong probabilities. It would seem that the likelihood of having a warm scenario is somewhat higher on Iceland and Norway and the Mediterranean.



Precipitation: No scenario is preferred on Europe, except on Fennoscandia where a moist scenario seems to take shape.



II.8.b Tropical cyclone activity

Above-normal activity expected on the Pacific Northwest. Below normal on the East Pacific and North Atlantic.

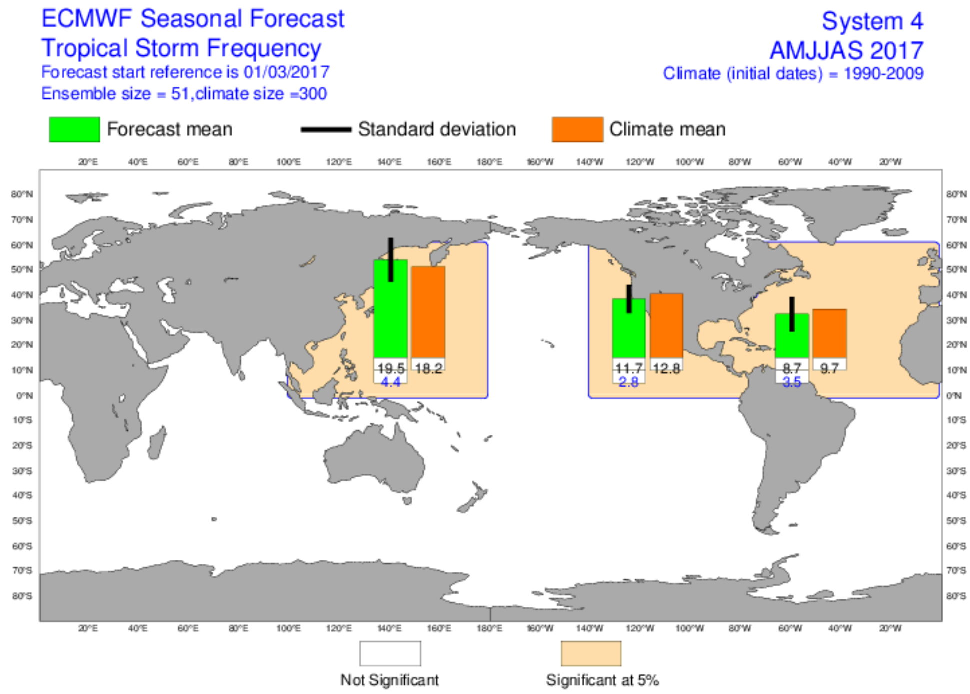


fig.II.8.1 : Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro/eurosip_tropical_storm_frequency/

III. 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).

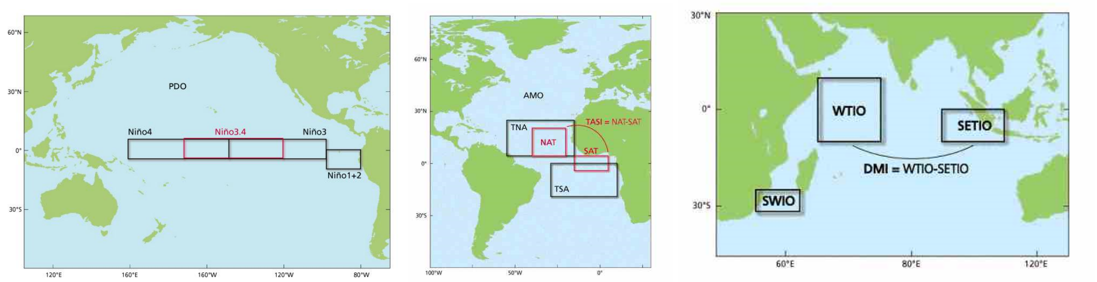
- Niño 3 : 5°S/5°N 90W-150W ; it is the region where the interanual variability of SST is the greatest.

- 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).

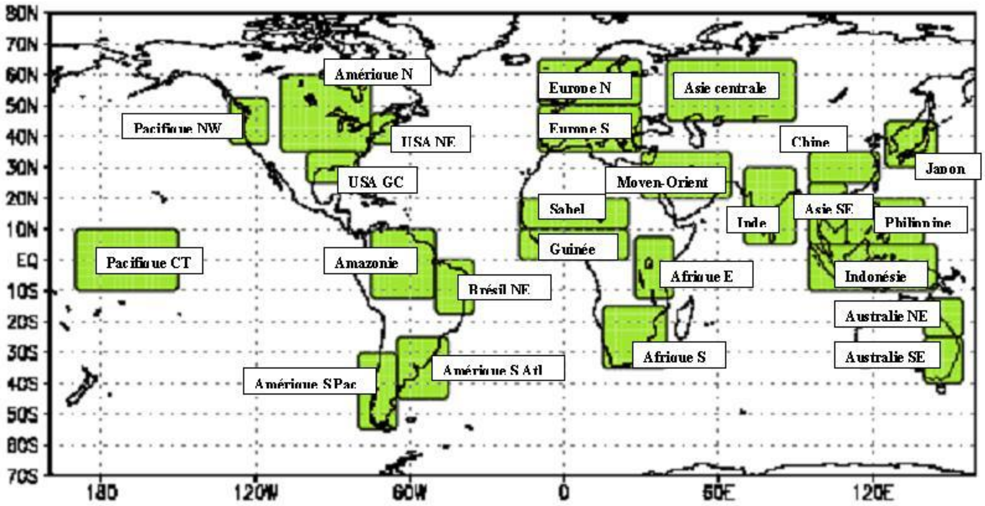
Associated to the oceanic « El Niño / La Niña » events, and taking into account the strong ocean/atmopshere coupling, the atmosphere shows also interanual variability associated to these events. It is monitored using the SOI (Southern Oscillation Index). This indice is calculated using standardized sea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