GLOBAL CLIMATE BULLETIN

n°216 – June 2017

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I. DESCRIPTION OF THE CLIMATE SYSTEM (April 2017)

I.1.Oceanic analysis

Over the Pacific ocean :

- uniformly warmer than normal except over inter-tropical area. No significant East-West contrast in the equatorial railway.
- "El Niño costero" along Peru and Equator coast ended due to a strong cooling during April on south American coast
- In subsurface, a cold Kelvin wave had strengthened during April entering East part of the basin.
- Elsewhere in the Pacific : 2 zones of cold anomalies : the first one between 30°N and 40°N (weak posit ive PDO index of +0.52) and the second around 40°S.

Over the Maritime Continent :

- warmer than normal on the East part, neutral on the West part

Over the Indian Ocean :

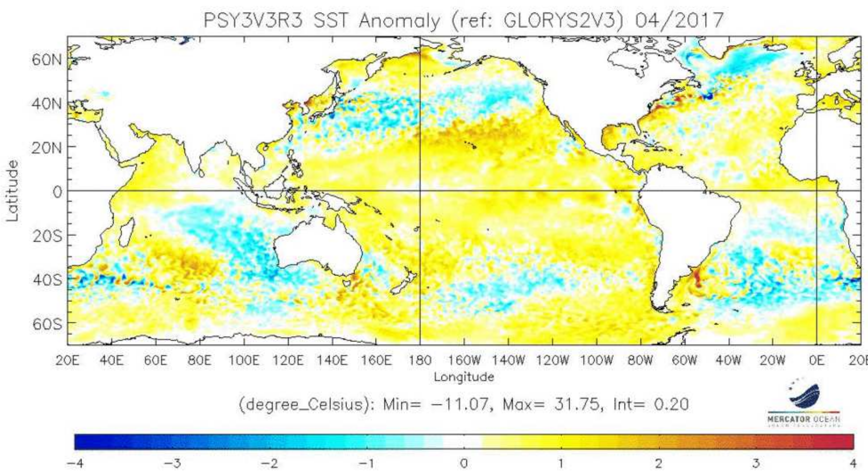
- In the southern hemisphere, still strong contrast between East (cold) and West (warm). More to the north the DMI is still close to 0.
- DMI close to +0.6°C

Over the Atlantic:

- Weak warm anomalies around equator and up to 40°N. Dominant cold anomalies in South Atlantic especially around 40°S where they are quite strong. Strong col d anomaly from Labrador to Newfoundland and south of Iceland ("cold-blob").

Over the Mediterranean:

- SSTs uniformly warmer than normal.



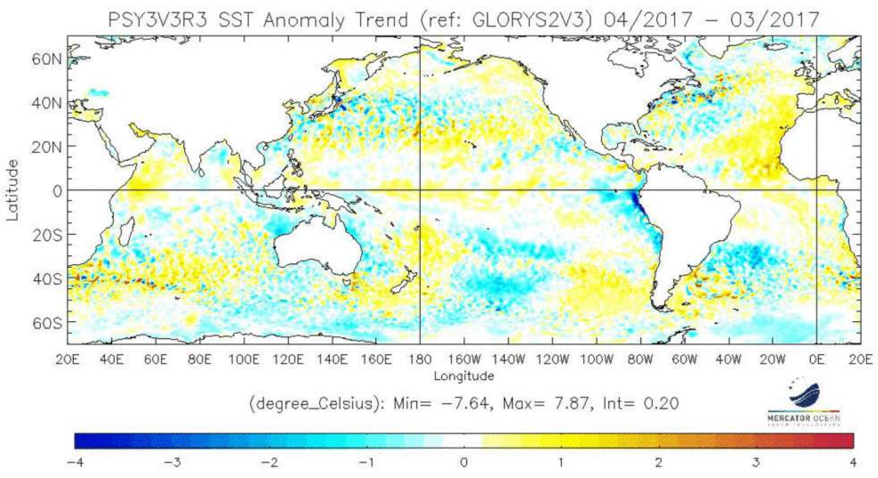


fig.I.1.1: top : SST Anomalies (℃) . Bottom : SST tendency (current – previous month), (reference Glorys 1992-2013).

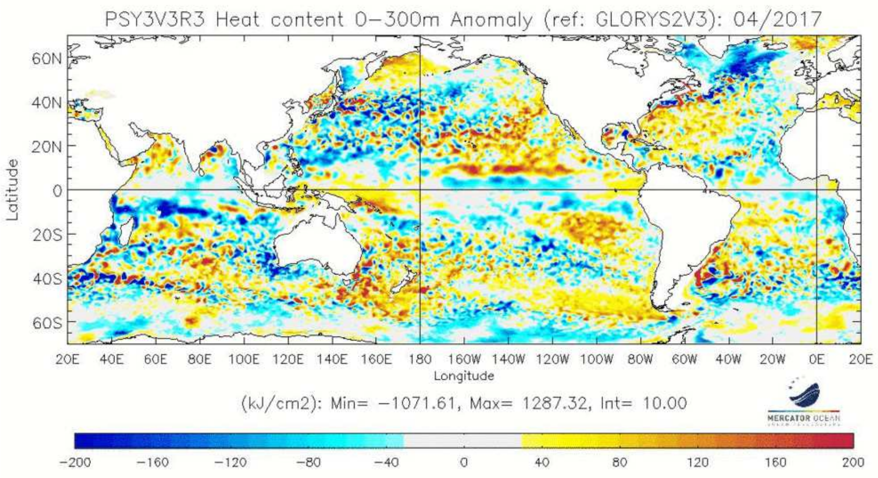


fig.I.1.2: map of Heat Content Anomalies (first 300m, kJ/cm2, reference Glorys 1992-2013)

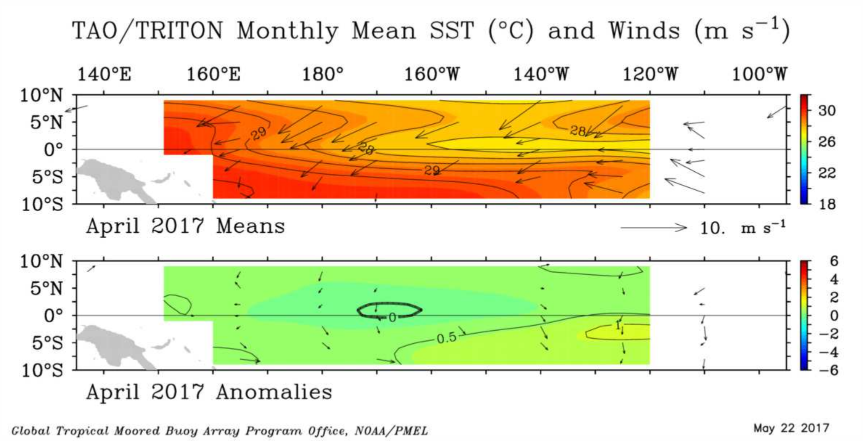


fig.I.1.3: SST Anomalies and Wind anomalies over the Equatorial Pacific from TAO/TRITON.http: //www.pmel.noaa.gov/tao/drupal/assorted_plots/images/sst_wind_mon.png

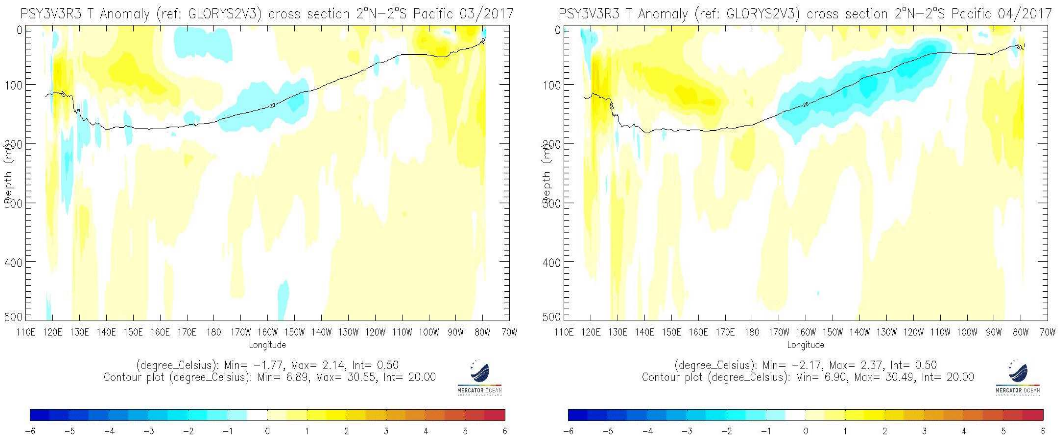


fig.I.1.4: Oceanic temperature anomaly in the first 500 meters in the Equatorial Pacific (previous and current month)

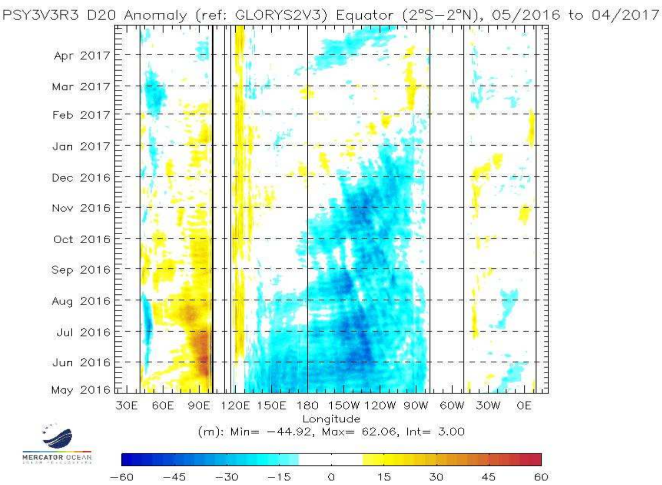


fig.I.1.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20℃ isotherm) along the equator for all oceanic basins over a 6 month period

<u>Sea surface temperature near Europe :</u>

Arctic Sea (north auf Iceland), North Sea and Baltic Sea again mostly warmer than normal, except frozen parts east of Greenland and around Svalbard, no significant change to the previous month. Northernmost part of the Baltic Sea still frozen.

Cold blob south of Greenland/Iceland: no change, neither in position, nor in intensity.

Warming of the eastern North Atlantic also affected areas near Western Europe, which are now slightly warmer than normal.

Mediterranean Sea warmer than normal, not much change.

Black Sea had a cooling like most of Eastern Europe, but SST anomalies are around normal except the east which was slightly colder.

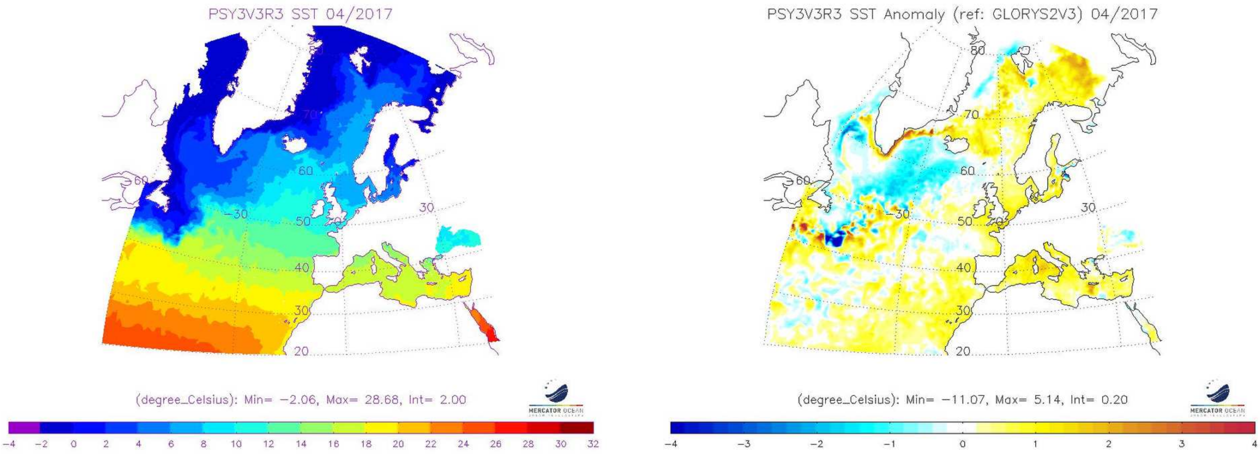


fig.I.1.6 : Mean sea surface temperature in the RA VI Region (Europe) and anomaly (reference Glorys 1992-2013).

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) :

- Vast kernel of strong downward motion anomaly over Indian Ocean in step with the cold SST anomaly.
- Upward motion anomaly over East of Maritime Continent.
- Elsewhere over Pacific Ocean, moderate downward anomaly in the Northern tropical part, moderate upward anomaly in the Southern tropical part to South America.
- In North Atlantic, weak East-West dipole.

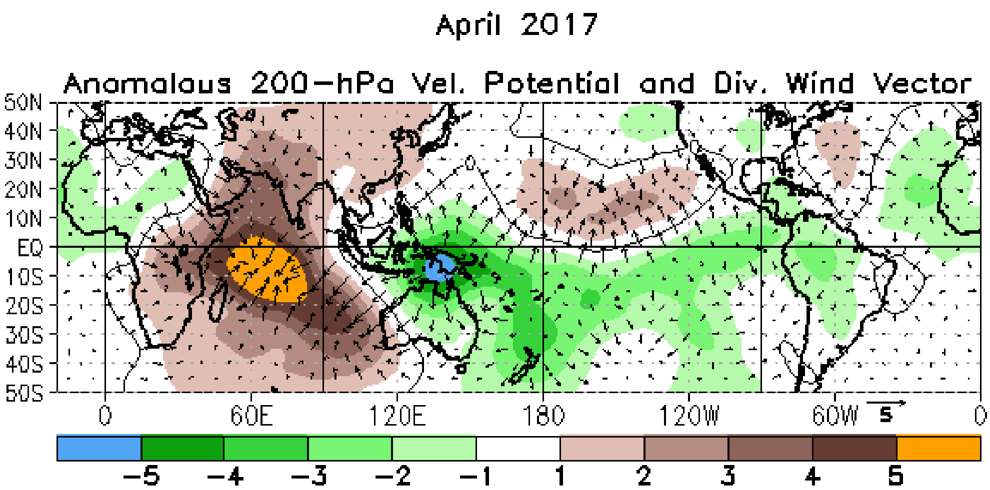


fig.I.2.1.a: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly). http://www.cpc.ncep.noaa.gov /products/CDB/Tropics/figt24.shtml

SOI :

- Since ENSO phase is neutral, the SOI index continue to swing around 0 from one month to another. It was negative in April (-6.3) while it has been slightly positive +5.1 in March (see the Bureau Of Meteorology bulletin).

MJO (fig. I.2.1.b)

- Weak MJO activity in April. Temporary weak activity in Western and Central Pacific

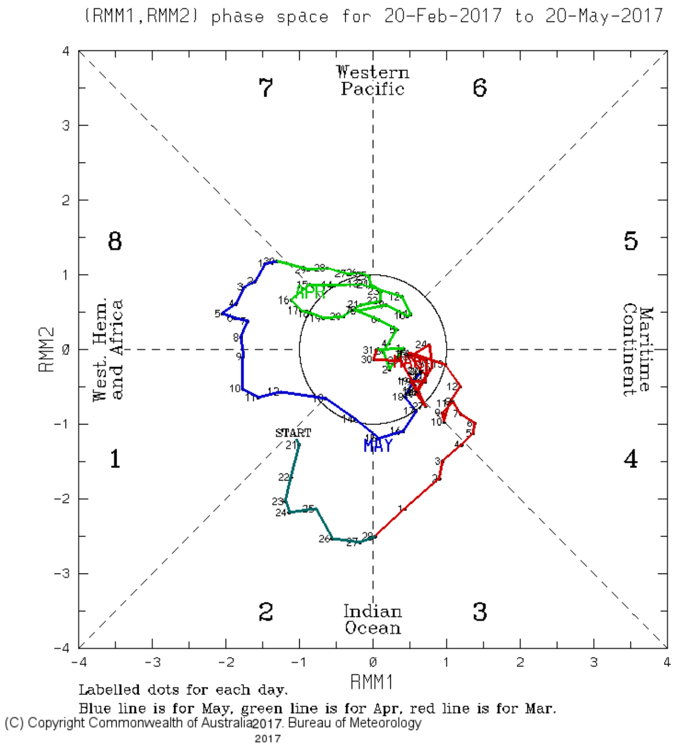


fig.I.2.1.b: indices MJO http://www.bom.gov.au/climate/mjo/

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

- Since there is no forcing in the equatorial railway, there is no organized structure near equator in April. The stronger kernels near tropics are due to mid-latitude circulation influence.

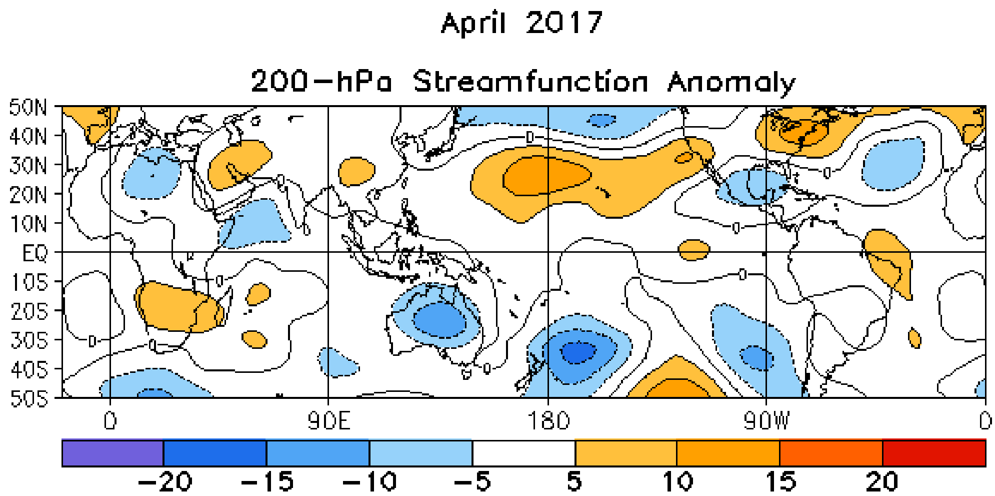


fig.I.2.2: Stream Function Anomalies at 200 hPa. http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

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

- Unusual conditions over Europe in April. Strong positive anomaly area center off the coast of Ireland and extended to the Near Atlantic and Western Europe. Conversely, negative anomaly area Southwest of the Azores and from Scandinavia to Russia. In this situation, the Atlantic Ridge weather regime was very favored in April to the detriment of NAO weather regimes (NAO- and NAO+).
- Negative anomaly in Northern Pacific and positive to the North of the Strait of Bering.
- Positive anomaly in Northeastern USA and Southern of Quebec, and negative on the Northern Canada.

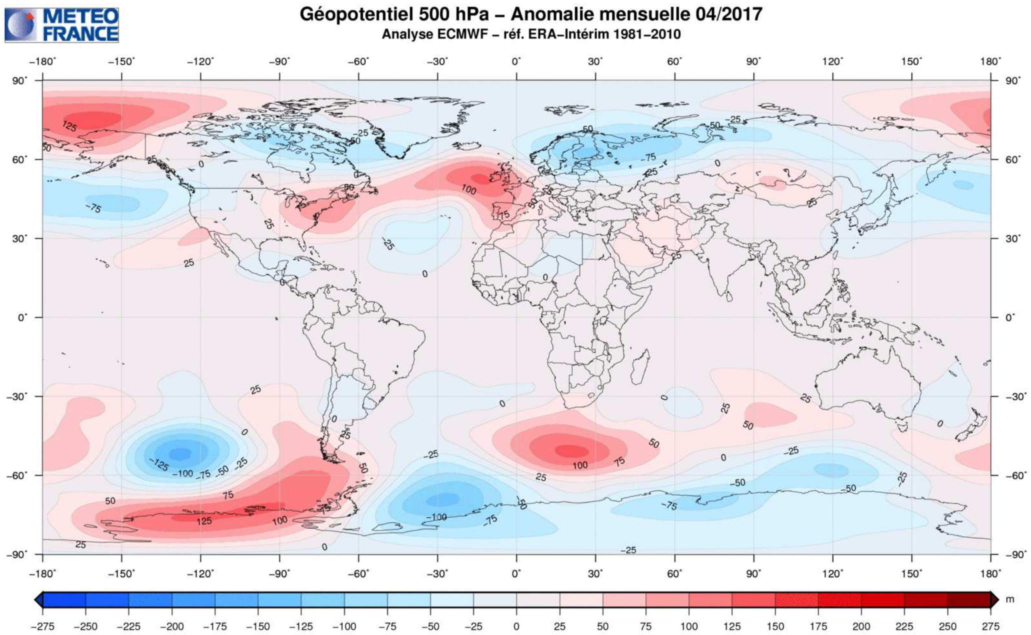


fig.I.2.3: Anomalies of Geopotential height at 500hPa (Meteo-France)

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
APR 17	1.7	-0.6	-0.4	1.0	0.1	---	0.7	-1.5	-1.4
MAR 17	0.4	1.0	-2.1	-1.0	-0.0	---	-1.0	-1.0	0.7
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

The Icelandic Low had its usual position and was slightly more intense than normal, but the Azores High was shifted far to the north with its core close to Ireland. This caused a switch to a negative EA pattern, whereas NAO was still in a positive phase, but only by contribution of the western North Atlantic. Furthermore, the Arctic polar vortex extended to northern Europe, strengthening also the negative SCAND phase. The resulting high-reaching low pressure area extended from Scandinavia far into northern Russia (with positive EATL/WRUS phase). This constellation fostered cold polar outbreaks reaching particularly northeastern Europe, but temporarily also other parts in northern, central, eastern and even southeastern Europe. Moisture uptake over relatively warm water surfaces partly caused heavy snowfall. On the other hand, large parts of Western Europe were influenced by warm and dry high pressure conditions.

This weather type situation dominated most of the month. According to Météo France weather type classification, 20 days of the month had the weather type “Atlantic ridge”.

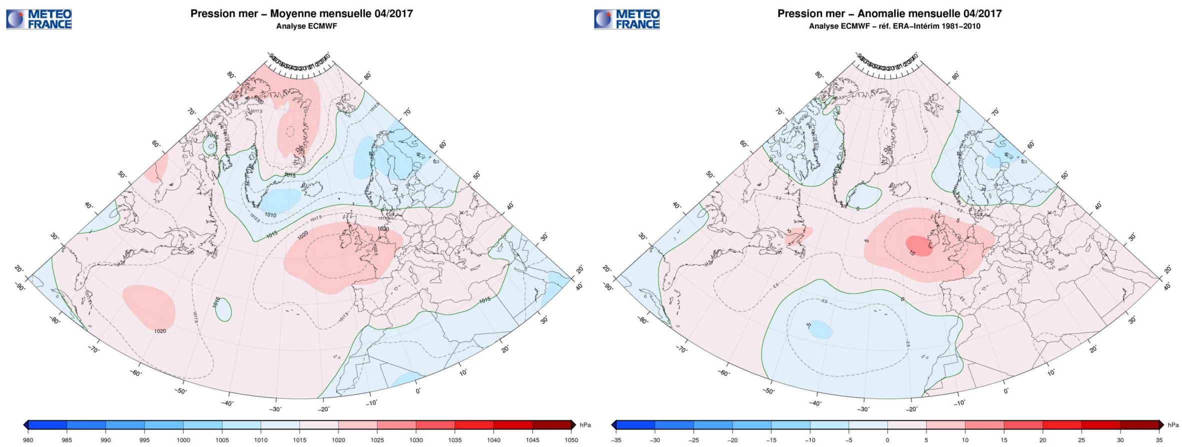


fig.I.2.4: Mean sea level pressure in the RA VI Region (Europe) (top) and 1981-2010 anomalies (bottom).

Circulation indices: NAO and AO

NAO was in a positive phase during the whole month, but without much impact in Europe due to the East Atlantic High. The AO did not follow the NAO fluctuations and had relatively low variability.

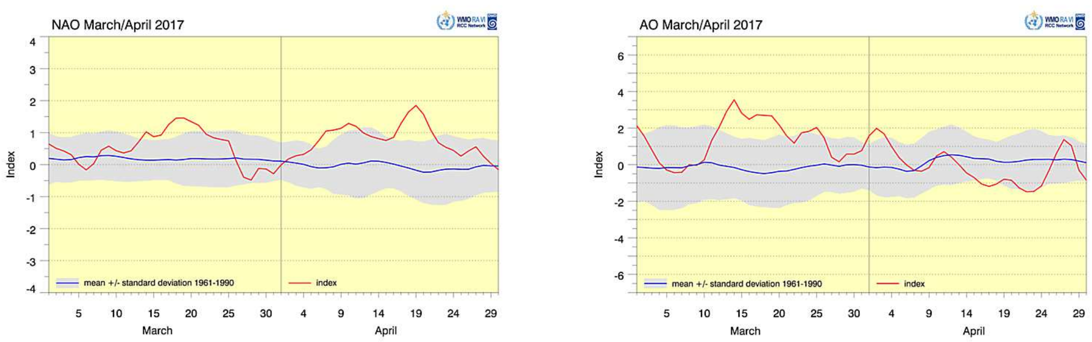


fig.I.2.5: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices with 1961-1990 mean standard deviation (shading). http://www.dwd.de/rcc-cm , data from NOAA CPC: http://www.cpc.ncep.noaa.gov /products/precip/CWlink/daily_ao_index/teleconnections.shtml

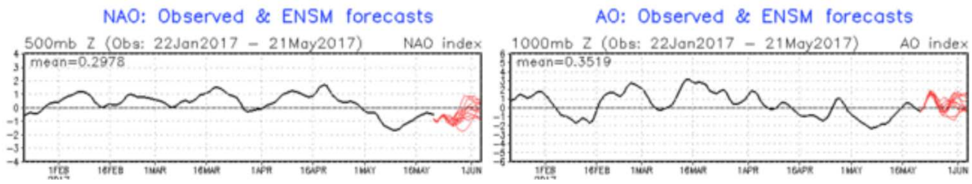


fig. I.2.5a: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices for the last 4 months and forecasts for the following weeks. Source: NOAA CPC, http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

I.2.b Precipitation

- In connection with the velocity potential anomalies mentioned above, deficit of precipitation on Indian Ocean, excess over Maritime Continent. Deficit in the Pacific in the North of equator and excess of precipitation in the South.
- A new dry month in Brazil and Northern South-America, except locally on Equator and Peru coast.
- Wetter than normal in the USA.
- For Europe, dry to the West, wetter than normal on Eastern Europe and Russia.

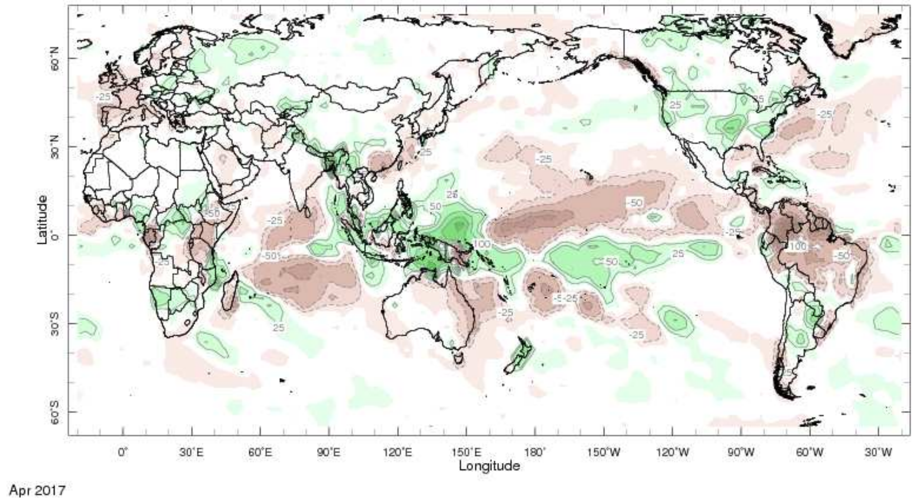


fig.I.2.6: Rainfall Anomalies (mm) (departure to the 1979-2000 normal) – Green corresponds to above normal rainfall while brown indicates below normal rainfall. http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/Anomaly.html

Precipitation anomalies in Europe:

Clearly below-normal precipitation in western and southwestern parts of Europe, partly drought conditions, reflecting high pressure influence. In contrast, much precipitation in other parts of Europe, especially in some exposed areas such as western Norway, the Alps and northern coasts of the Black Sea. Particularly in northeastern Europe often as snow.

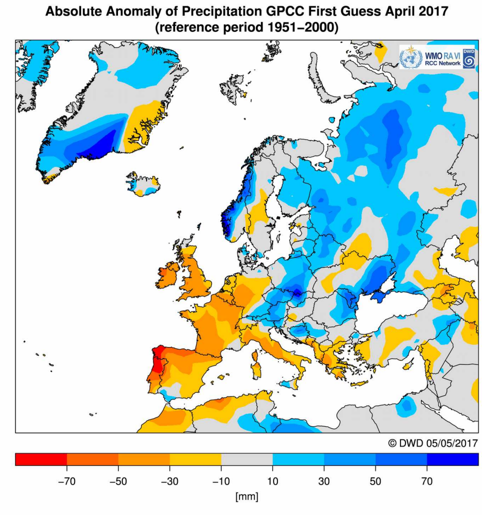


fig.I.2.7.a : Absolute anomaly (1951-2000 reference) of precipitation in the RA VI Region (Europe), data from GPCC (Global Precipitation Climatology Centre), http://www.dwd.de/rcc-cm.

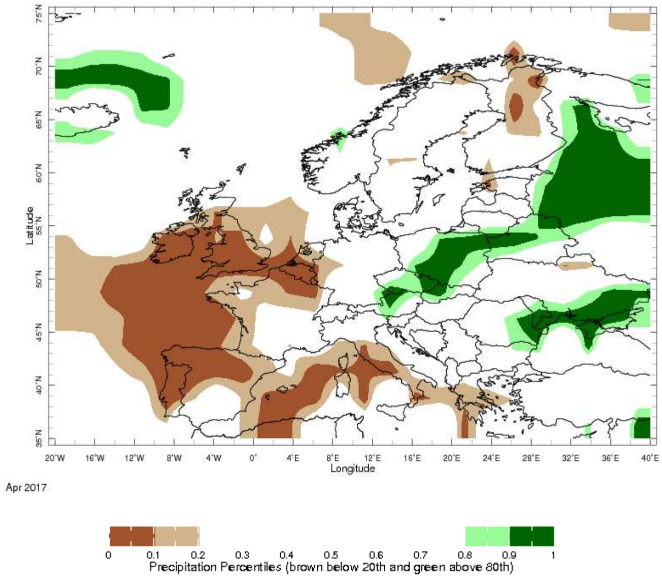


fig.I.2.7.b : Percentiles of precipitation, 1981-2010 reference. Data from NOAA Climate Prediction Center, http://iridl.ldeo.columbia.edu/maproom/Global/Precipitation/Percentiles.html

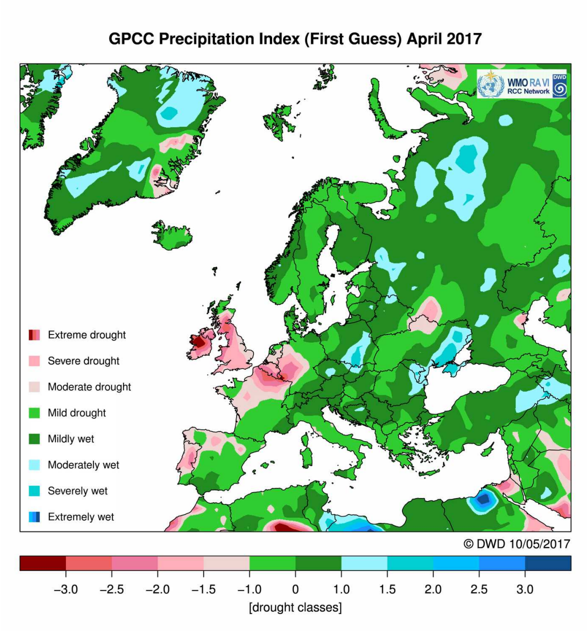


fig. I.2.8: GPCC Precipitation Index, http://www.dwd.de/rcc-cm .

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	+ 0.7 mm	- 0.357
Southern Europe	- 15.7 mm	- 0.326

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

- Globally April was warmer than 1981-2010 normal of 0.51°C. According to Copernicus, that is the second highest value behind 2016. (https://climate.copernicus.eu/resources/data-analysis/average-surface-air-temperature-analysis/monthly-maps/april-2017)
- Warm anomalies on the North Pole, on Siberia, Mongolia and a part of China. And from India to Iran and Eastern Africa. Warm anomaly on Est of USA.
- Cold anomalies on Greenland, Canada and Western USA, on Southern South-America and Australia.

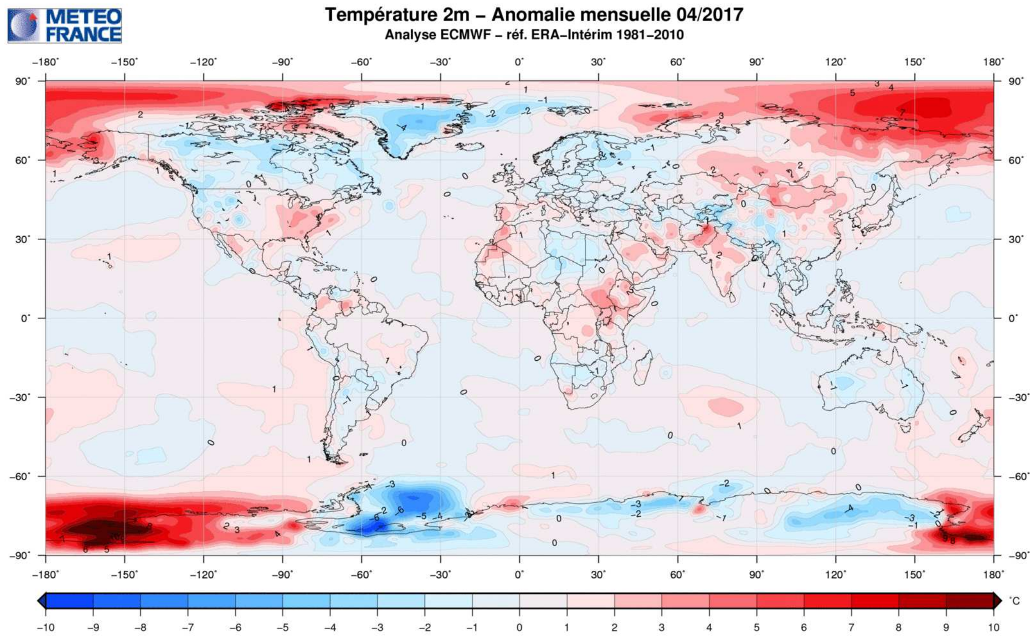


fig.I.2.9: Temperature Anomalies (℃) (Meteo-France)

Temperature anomalies in Europe:

Due to the cold polar outbreaks, much of Europe was colder than normal and even parts of Turkey and the Middle East. Strongest anomalies in northeastern Europe. In contrast, warm conditions in western and especially southwestern Europe due to high pressure influence and subtropical warming.

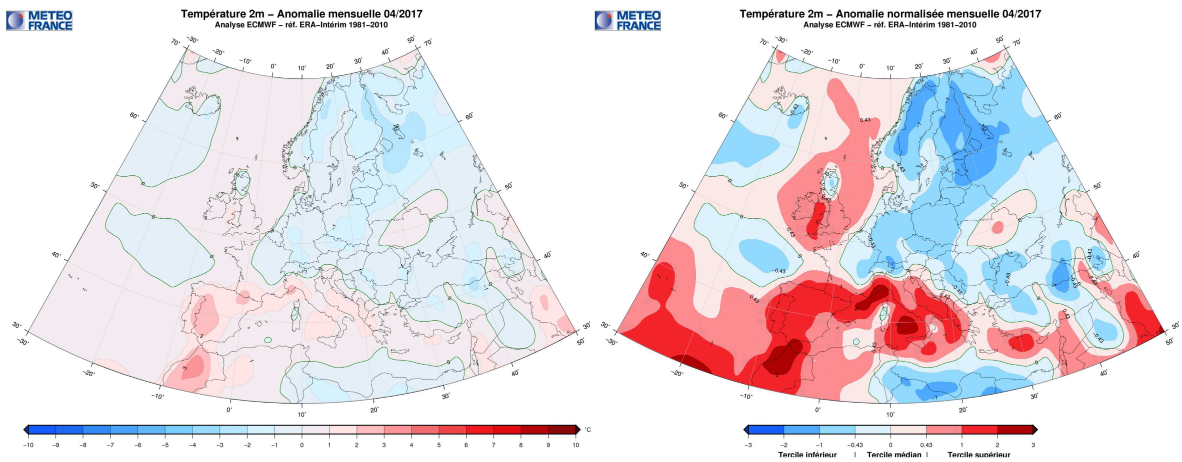


fig.I.2.10: Left graph: Absolute anomaly of temperature in the RA VI Region (Europe). Right graph: Standardized temperature anomalies

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	+ 0.4 ℃

Southern Europe	+ 1.1 ℃

I.2.d Sea ice

In April, sea ice extent in Arctic, stay at record level of 2016, while in Antarctic, there is a downfall in the extent with a very low level in a context which suddenly change two years ago (see figure 1.2.13).

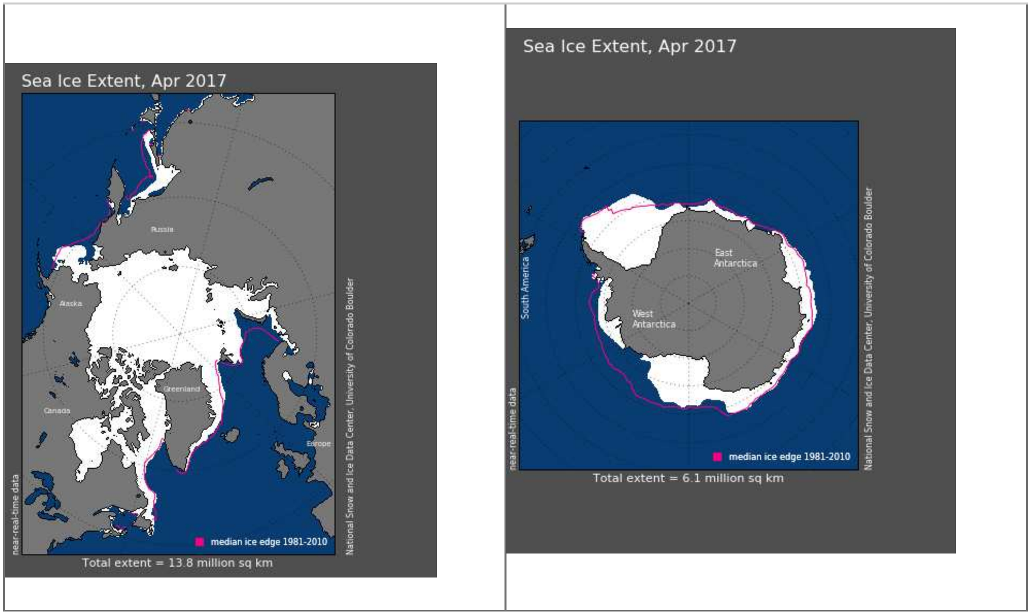


fig.I.2.11: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

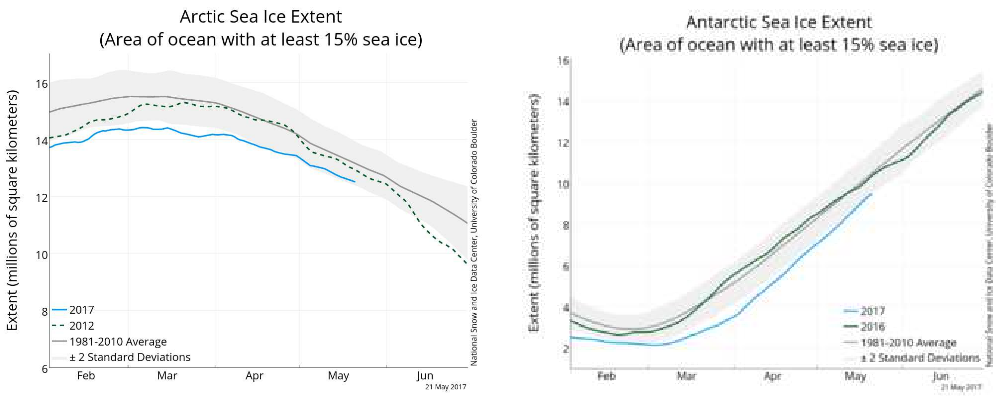


fig. I.2.12 : Sea-Ice extension evolution from NSIDC. https://nsidc.org/data/seaice_index/images/daily_images /N_stddev_timeseries.png

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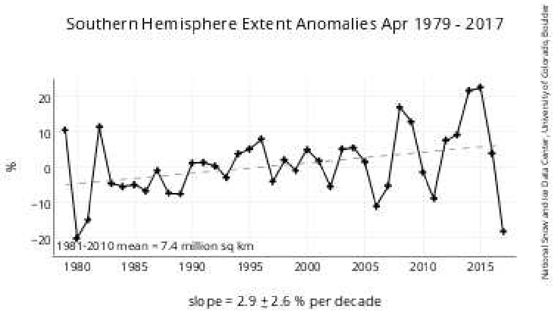


fig 1.2.13 : Monthly Sea Ice Extent Anomaly Graph in Antarctic for the month of analysis (http://nsidc.org /data/seaice_index/)

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)

the Météo-France model's SST anomalies are doubtful this month outside tropical regions (unusual values, very different from other models). We advice ARPEGE-S5 to be used with caution in mid and high latitudes.

- Pacific Ocean: models are continuing the warm anomaly in the inter-tropical zone. A maximum will grow along the equator in the center of the basin. This anomalies should stay under El Nino threshold during the next 3 months. A further intensification should be monitored.
  In Northern hemisphere, no dynamic around the cold anomaly which is expected to persist or mitigate slightly
- Indian Ocean: cold anomaly in the southeast of the basin will probably reduce and the warm anomaly will strengthen in the southwest. Along the equator, the East-West contrast should continue to strengthen. DMI index, above 0 in April, should logically increase during the next 3 months.
- Atlantic Ocean:
  - no consistent synthesis for the equatorial area where models are divergent.
  - in the North Atlantic, even if there is some detail differences in the models, the general structure should remain, with a cold anomaly in the south of Greenland ("cold blob") in contrast with a warm anomaly along US and Canadian coast. The east of the basin, near Europe, should remain in a weak positive anomaly
- Mediterranean Sea : warmer than normal SSTs should remain.

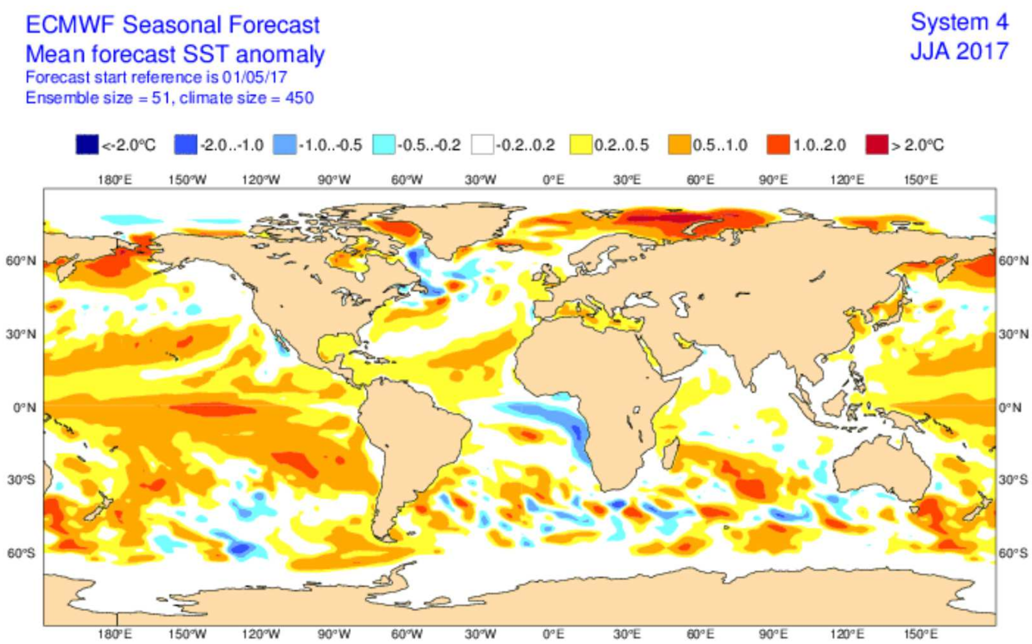


fig.II.1.1: SST anomaly forecast from ECMWF http://www.ecmwf.int/products/forecasts/d/charts/seasonal /forecast/seasonal_range_forecast/group/

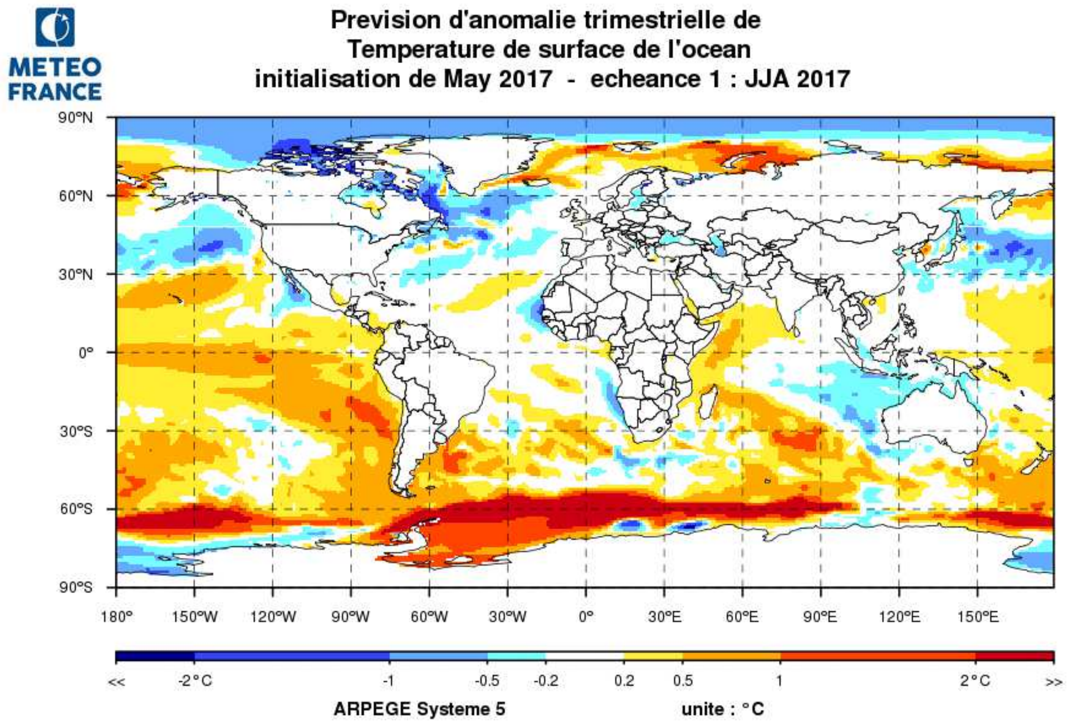


fig.II.1.2: SST Anomaly forecast from Meteo-France (recalibrated with respect of observation). http://seasonal.meteo.fr

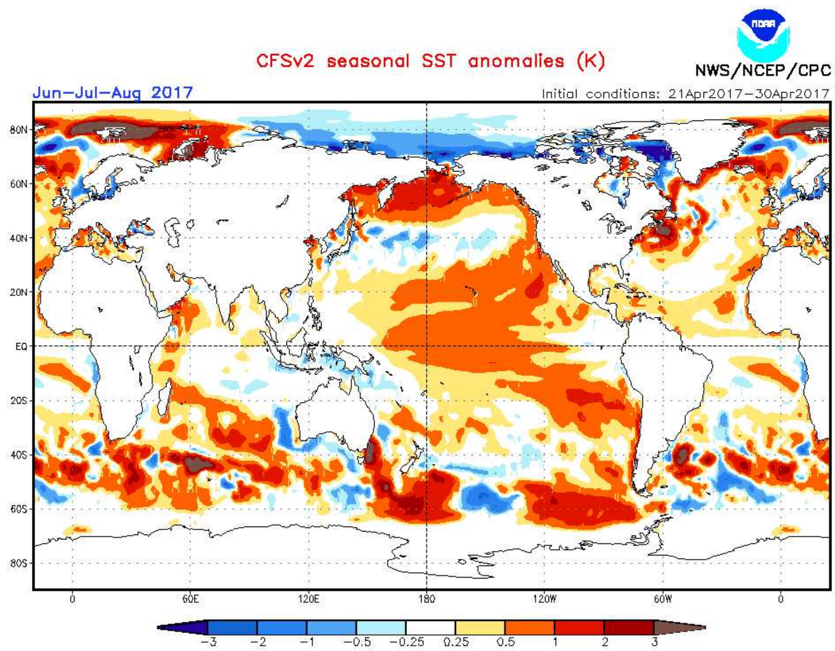


fig.II.1.3: SST Anomaly forecast from NCEP. http://www.cpc.ncep.noaa.gov/products/people/wwang/cfsv2fcst /imagesInd1/glbSSTSeaInd1.gif

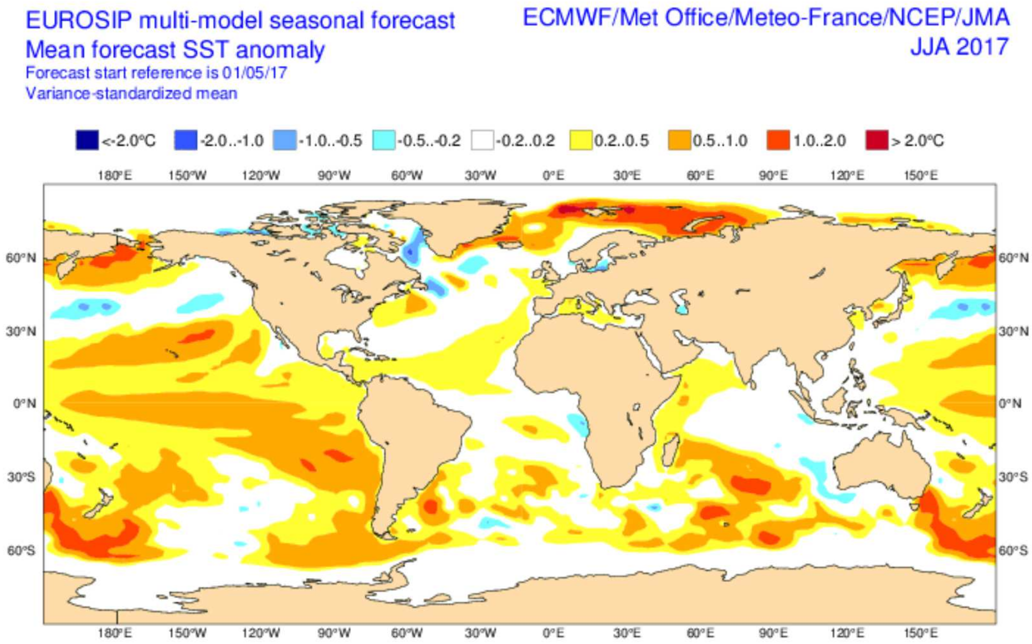
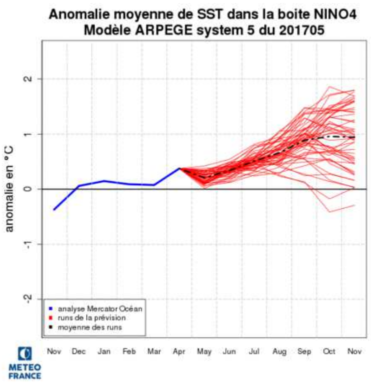


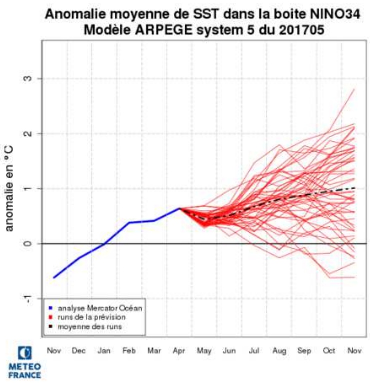
fig.II.1.4: SST Forecasted anomaly from Euro-SIP

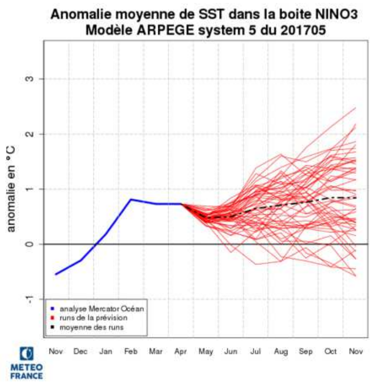
II.1.b ENSO forecast :

***Forecast Phase*: probably neutral during the next three months. Could evolve towards a weak Niño later**

Most of the simulations forecast anomalies between 0 and 1°C. In the IRI synthesis of the middle of May http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/ the probability of neutral phase and weak El Nino are at similar level. A La Nina phase is very unlikely.







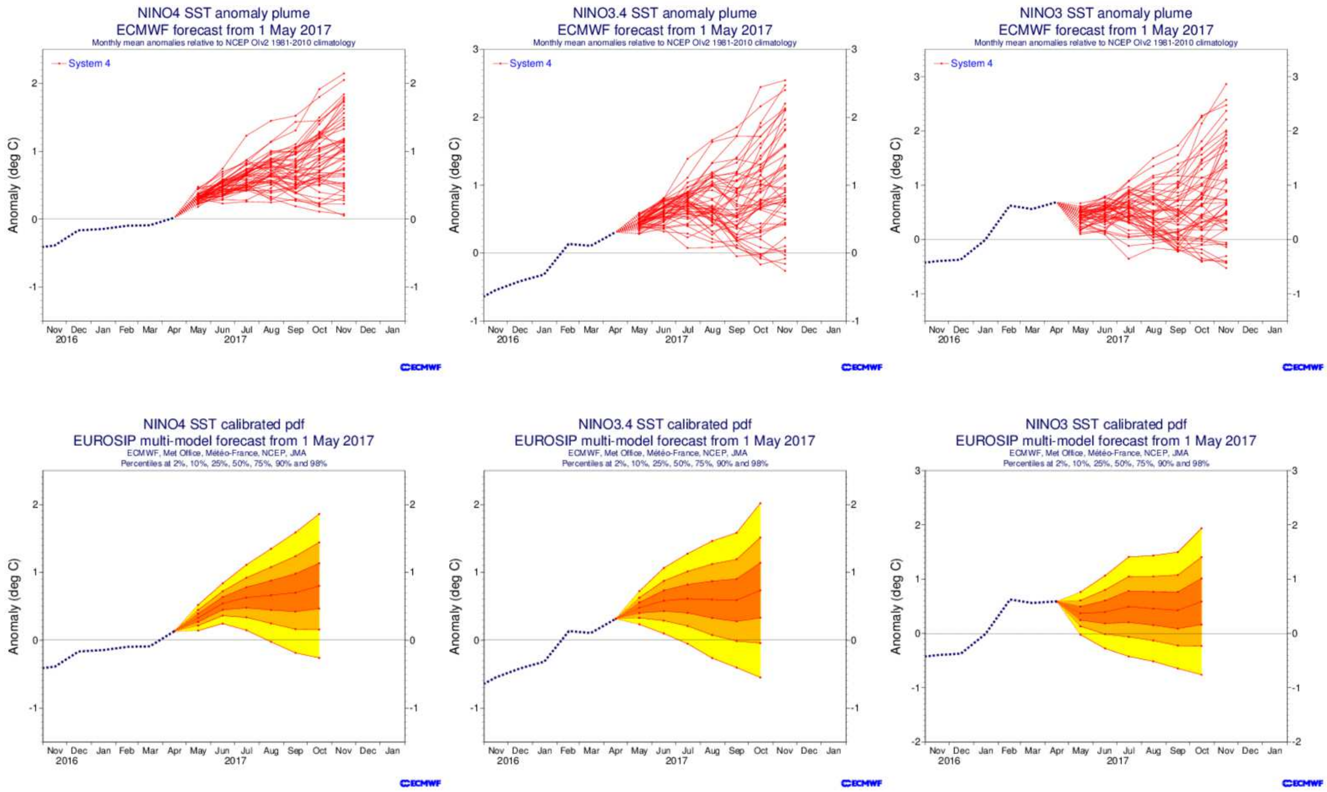


fig.II.1.5: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members - and EUROSIP (bottom) – recalibrated distributions - (http://seasonal.meteo.fr , http://www.ecmwf.int/)

I.1.c Atlantic ocean forecasts

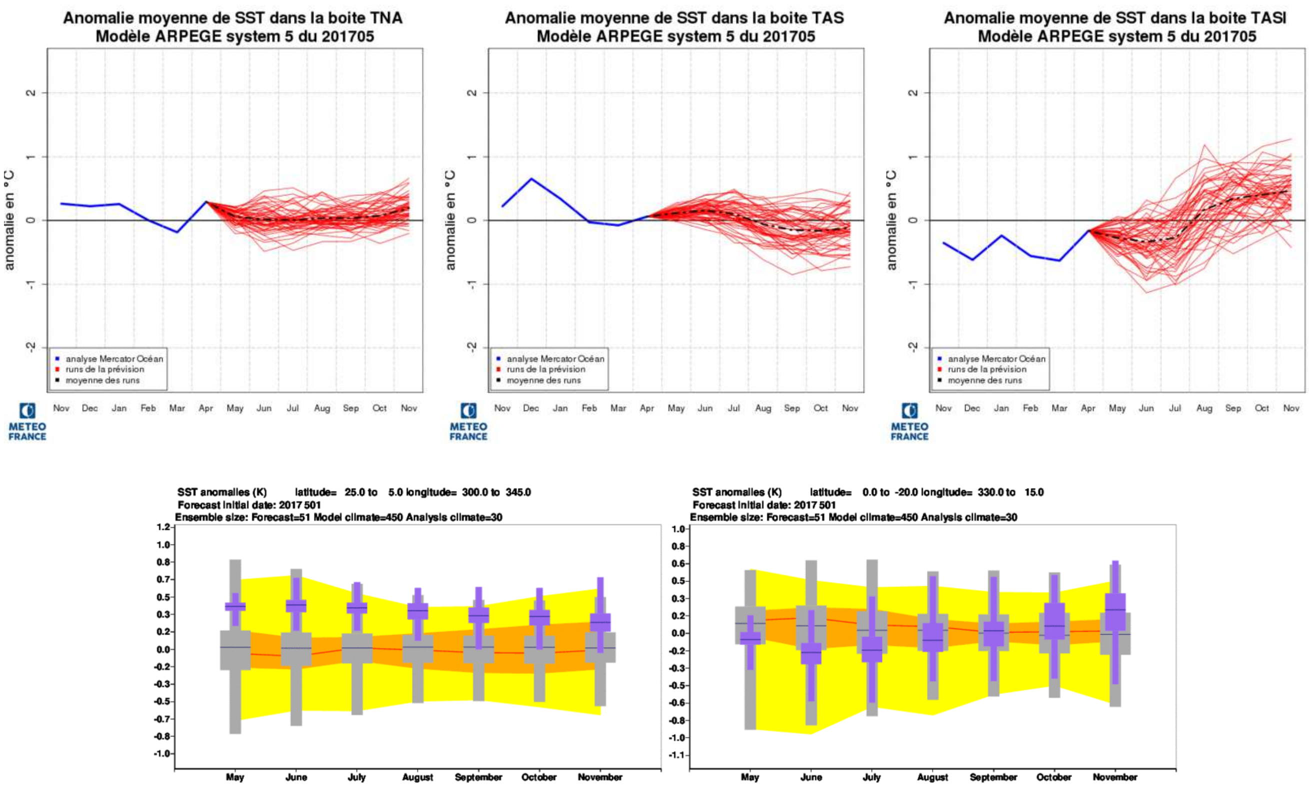


fig.II.1.6: SSTs anomaly forecasts in the Atlantic Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

I.1.d Indian ocean forecasts

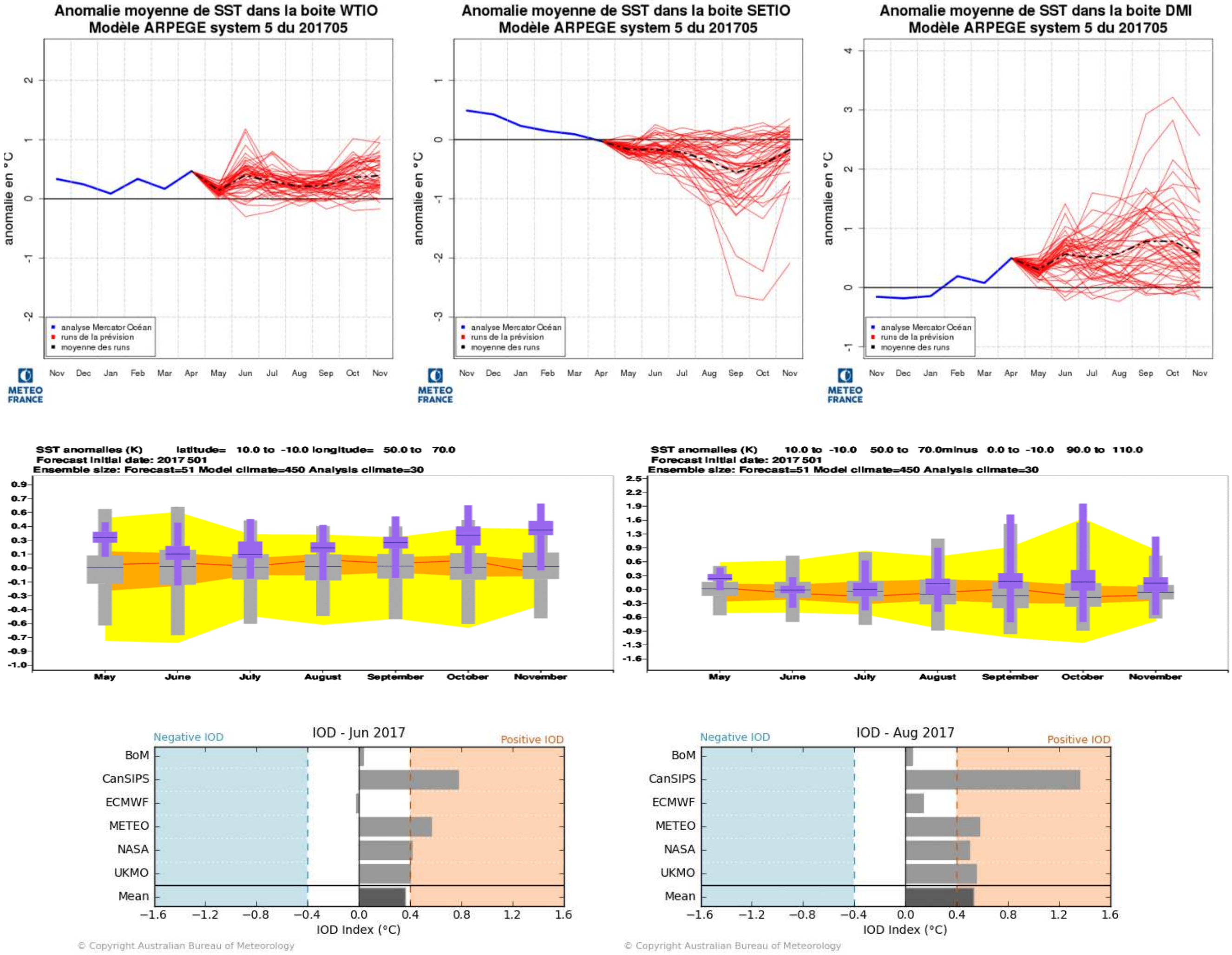
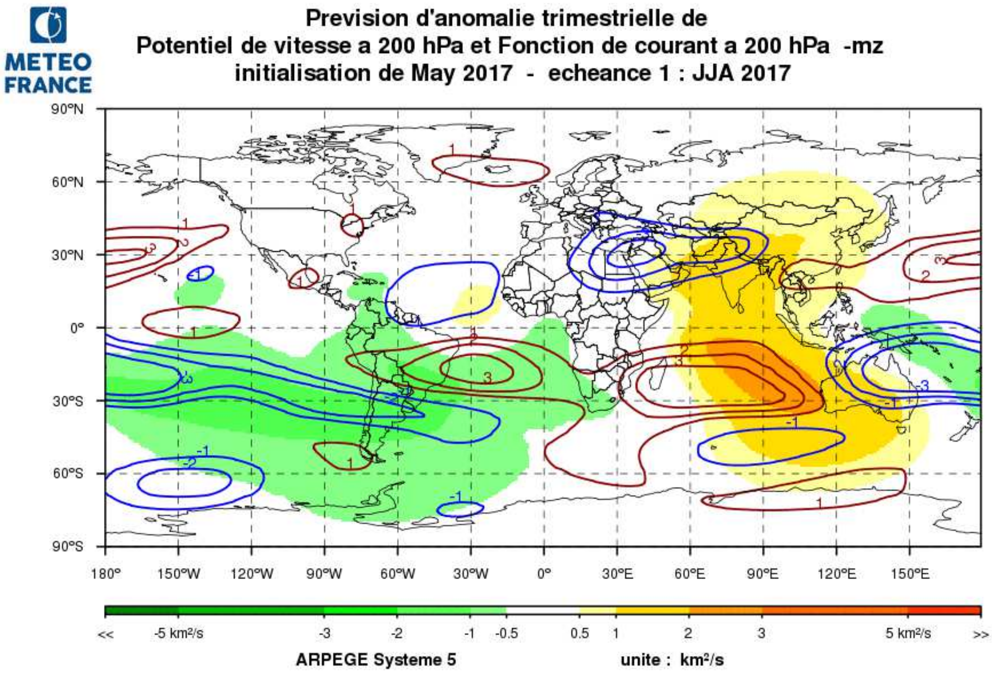


fig.II.1.7: SST anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

II.2. GENERAL CIRCULATION FORECAST

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

- Velocity potential : models disagree in the kernel intensity of vertical motion. MF model makes a stronger positive anomaly kernel over Indian Ocean than ECMWF. Conversely it makes a weaker upward motion kernel in the East of Maritime Continent. ECMWF seems more consistent with the reduction of cold SST anomaly in the Southeast of the basin.
  Elsewhere, the agreement is not better. In South hemisphere, from Pacific to Atlantic, MF model makes stronger upward motion anomalies than ECMWF which stay neutral. Along the equator in the Atlantic, ECMWF model forecast a quite strong anomaly while it is very weak with MF model.
- Stream Function : The disagreement of the models is even more obvious.



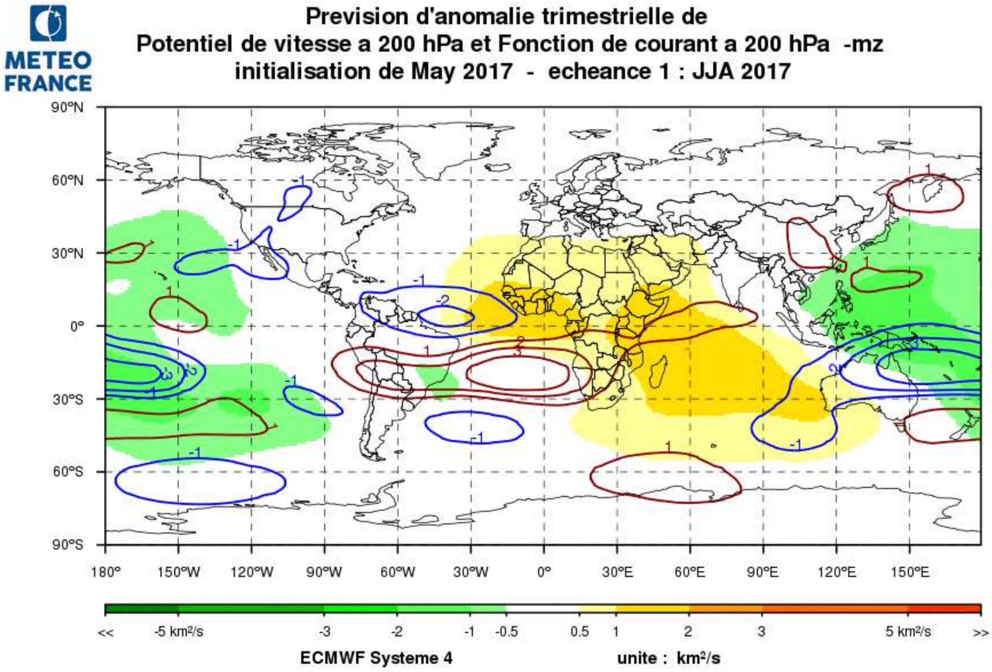
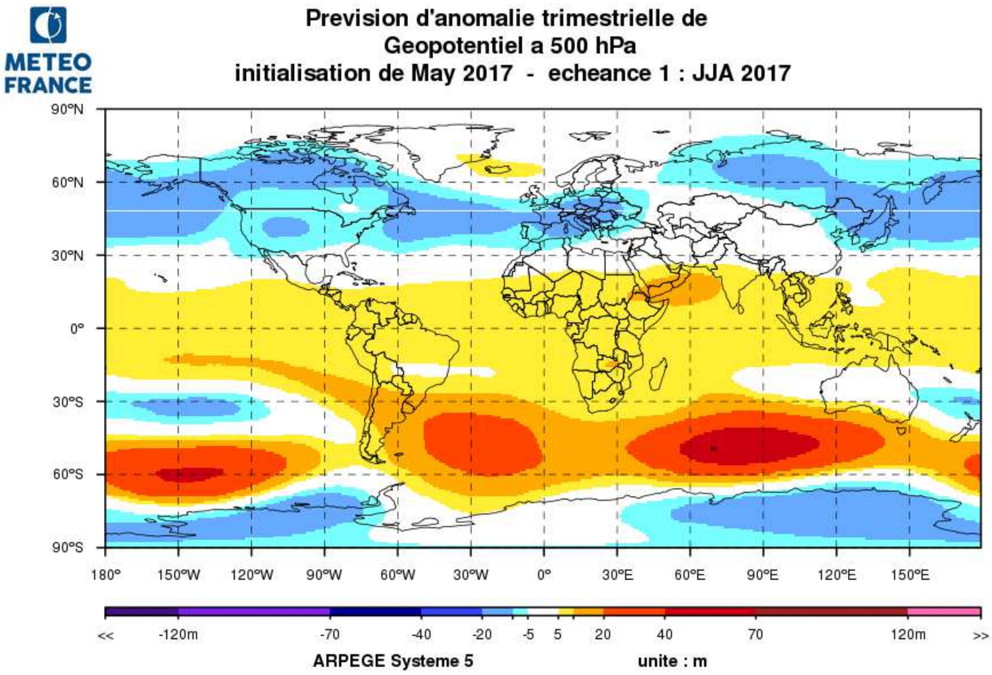


fig.II.2.1: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), associated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa by Météo-France (top) and ECMWF (bottom).

II.2.b Geopotential height anomalies

the Météo-France model anomalies seem to be biased this month outside tropical regions (see the dominant negative above 30°N, not consistent with other models and with the climate trend). We advice ARPEGE-S5 not to be used in mid and high latitudes.

For Europe-Atlantic area, the geopotential high in ECMWF is higher than normal but poorly structured. this can be only the effect the atmosphere expansion due to climate change.
Probable relative weakness in central Canada and Alaska.



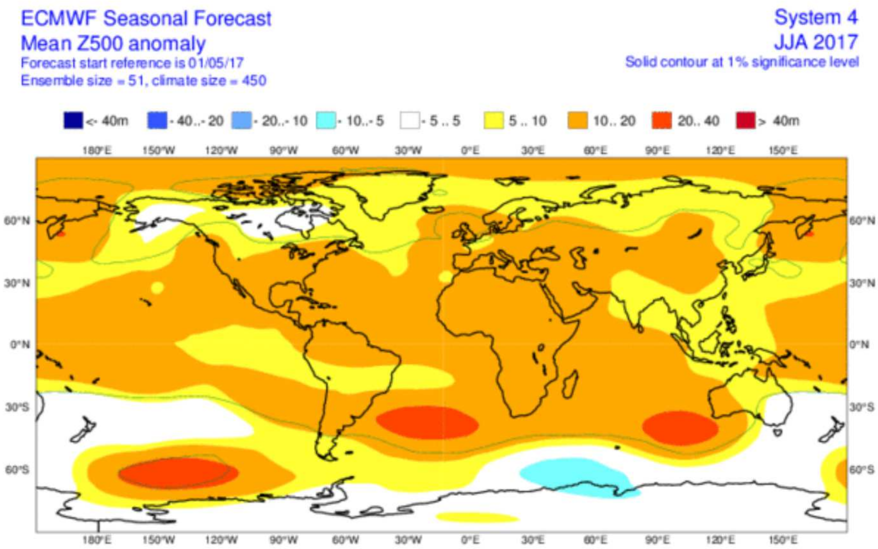


fig.II.2.2: Anomalies of Geopotential Height at 500 hPa from Météo-France and ECMWF. http://www.ecmwf.int /products/forecasts/d/charts/seasonal/forecast

II.2.c. weather regimes

MF model forecast a higher than normal mean sea level pressure field in the north of 60°N and weaker a round 45°N which make more NAO- weather regimes than usua l. We have not a great confidence in this option because of the current bias of the model and the poor score of weather regimes in the summer.

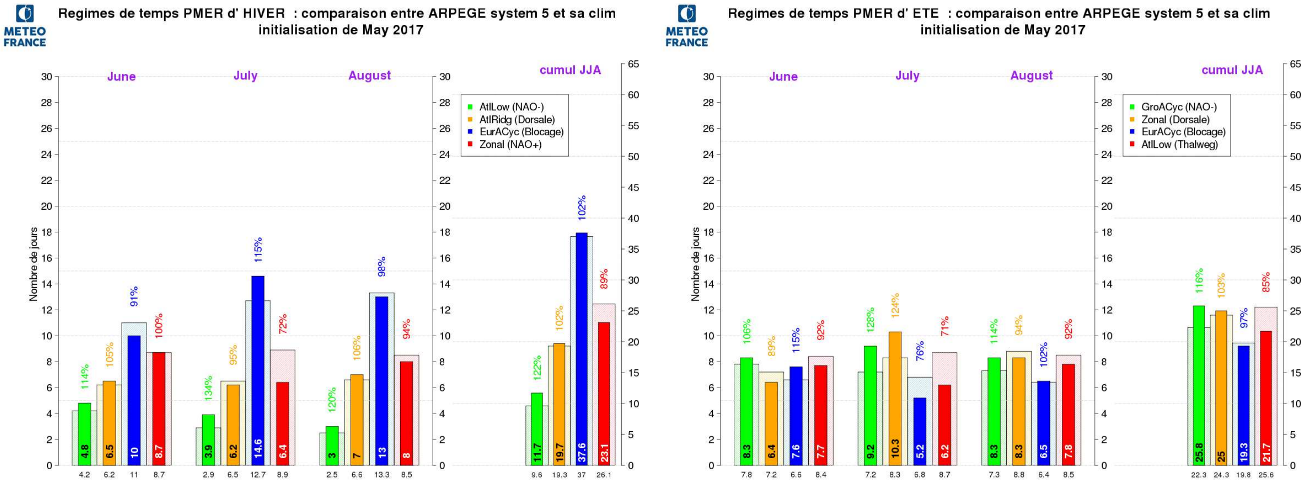


fig.II.2.3bis: North Atlantic Regime occurrence anomalies from Meteo-France ARPEGE-S5 : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

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

the Météo-France model anomalies seem to be biased this month outside tropical regions (see the dominant negative above 30°N, not consistent with other models and with the climate trend). We advice ARPEGE-S5 not to be used in mid and high latitudes.

Warm anomalies prevail over the globe, tracing the effects of global warming. In the South hemisphere and the tropical part of North hemisphere (south of 30°N), warm anomaly are even very likely except around Australia and Southeast of Indian Ocean.
Over continental areas, north of 30°N, warm anomalies also prevail but with lower probability.
No signal in North-east Europe and inside of the Canada.

II.3.a ECMWF

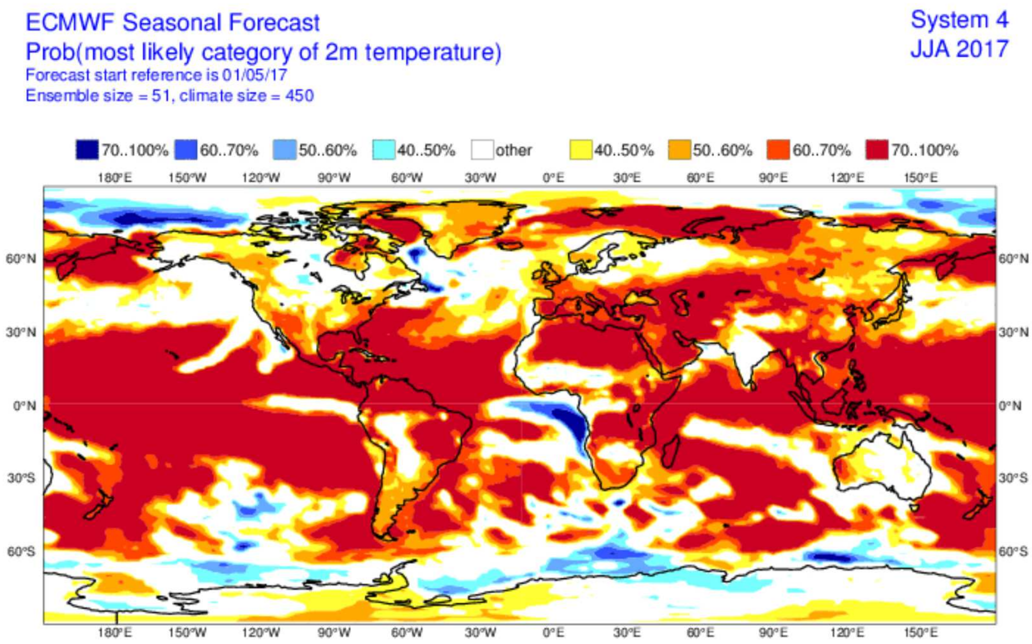


fig.II.3.1: Most likely category probability of T2m from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal /forecast/seaso...

II.3.b Météo-France

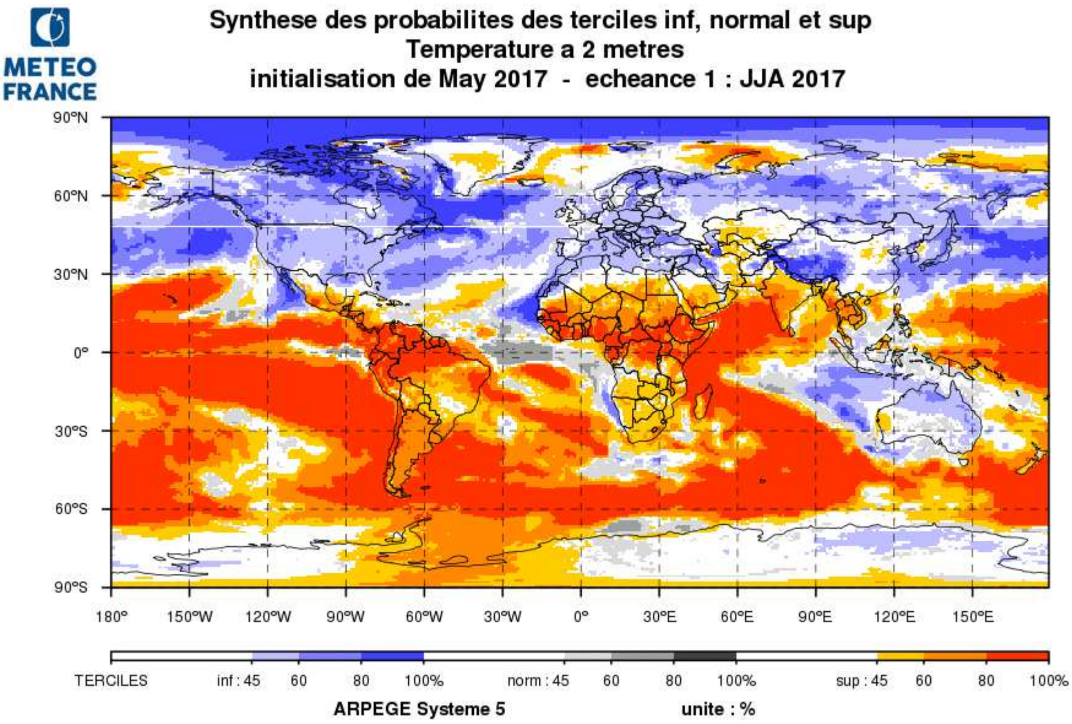


fig.II.3.2: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.3.e Japan Meteorological Agency (JMA)

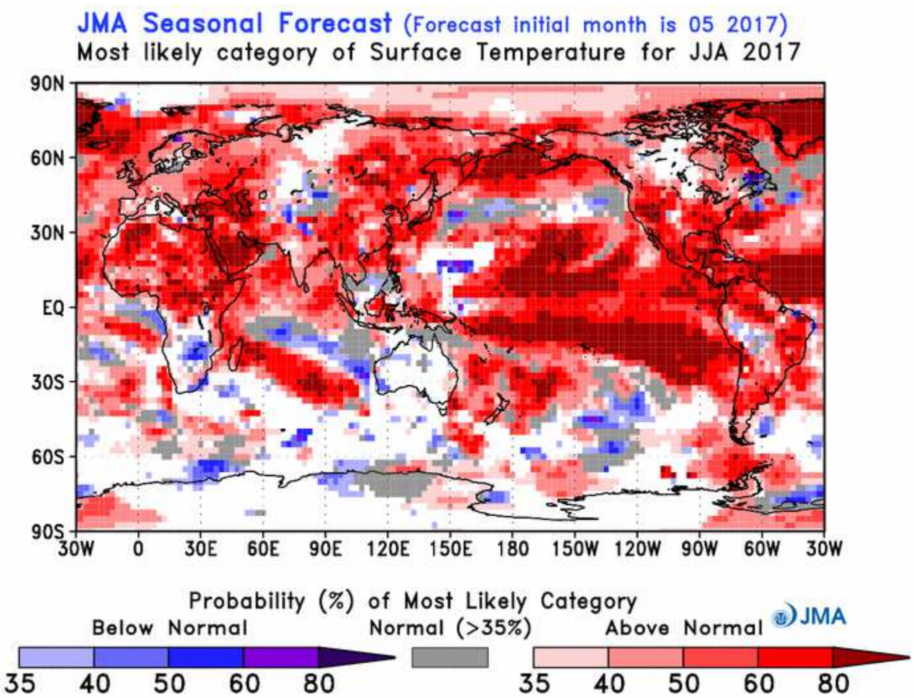


fig.II.3.3: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst_gl.php

II.3.g EUROSIP

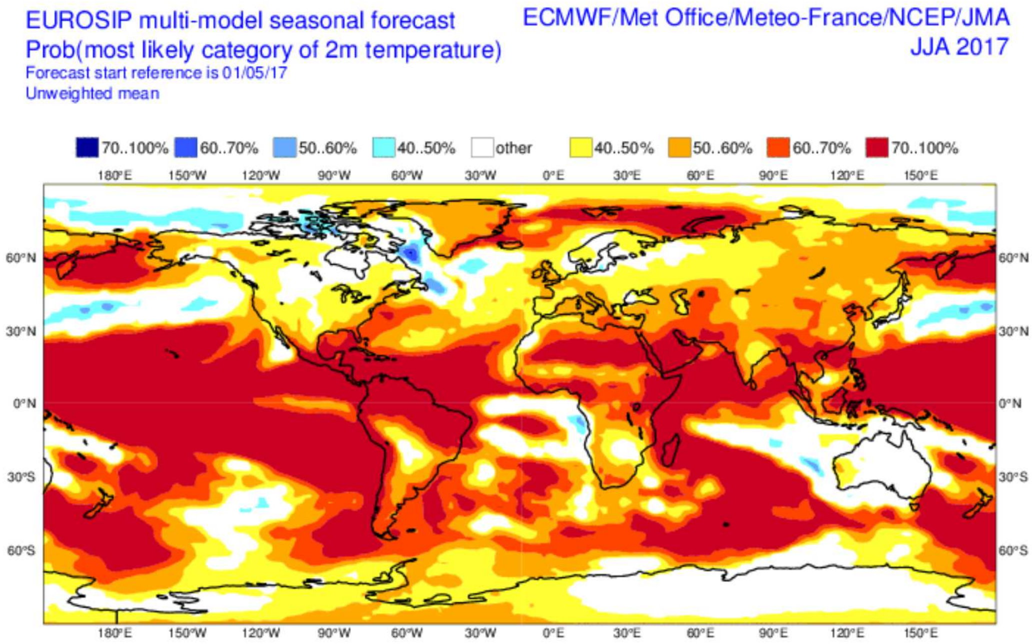


fig.II.3.4: Multi-Model Probabilistic forecasts for T2m from EuroSip (2 Categories, Below and Above normal – White zones correspond to No signal and Normal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

II.4. IMPACT : PRECIPITATION FORECAST

- In agreement with large scale dynamic, dry conditions are forecast in Australia area. Conversely, above normal wet anomaly is expected in the north-east of Maritime Continent. A wet anomaly is aslo forecast arround Madagascar but this area will be in dry season.
- For South America, wet anomaly expected in the south, and dry anomaly forecast from Northeast of Brazil to Guiana
- According to ECMWF model, African monsoon should be above normal in Sahelian area.
- No signal for Europe. ECMWF forecast a high probability drier than normal zone from Black Sea to Kazakhstan.

II.4.a ECMWF

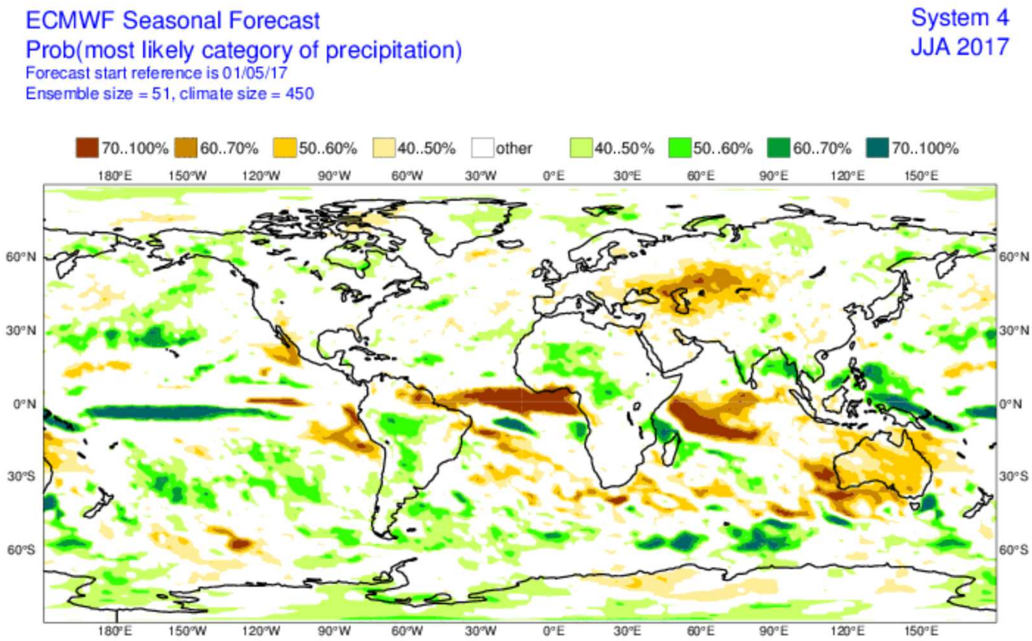


fig.II.4.1: Most likely category probability of rainfall from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.4.b Météo-France

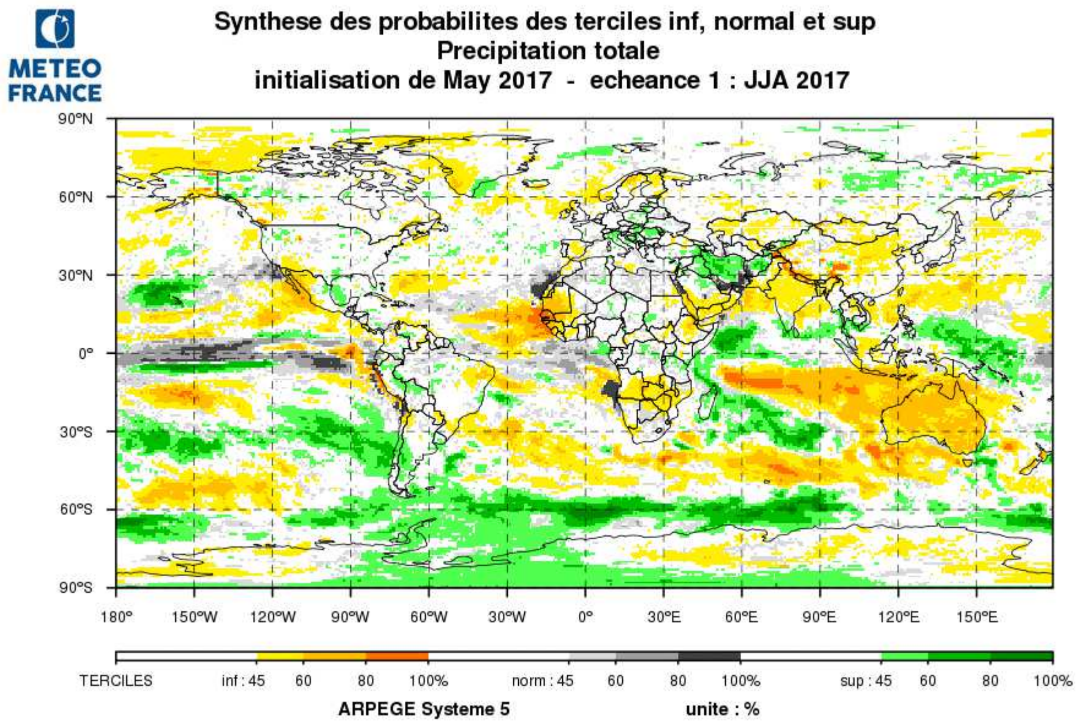


fig.II.4.2: Most likely category of Rainfall. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.4.e Japan Meteorological Agency (JMA)

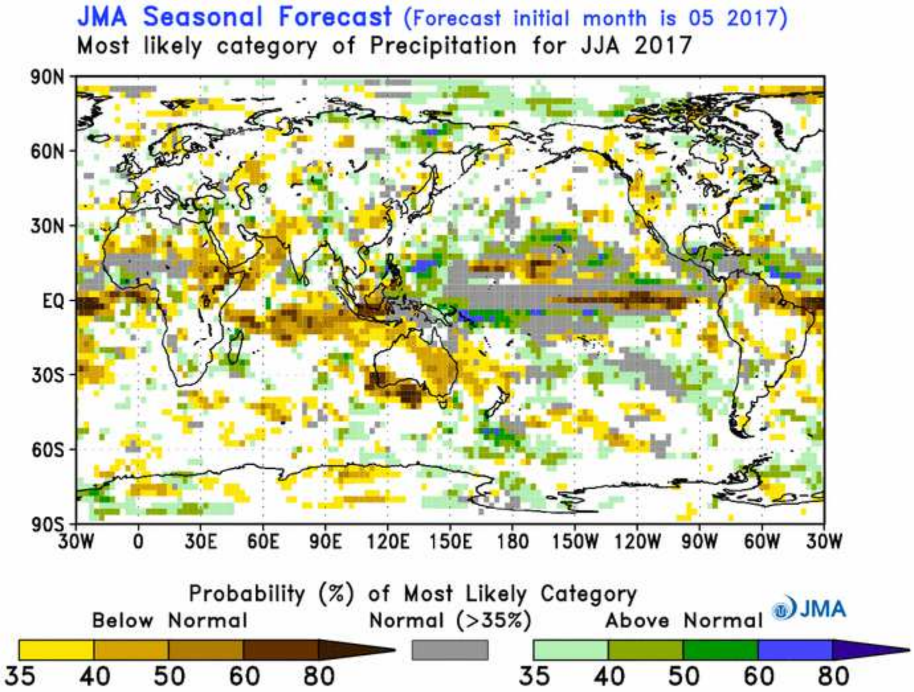


fig.II.4.5: Most likely category of Rainfall from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst_gl.php

II.4.g EUROSIP

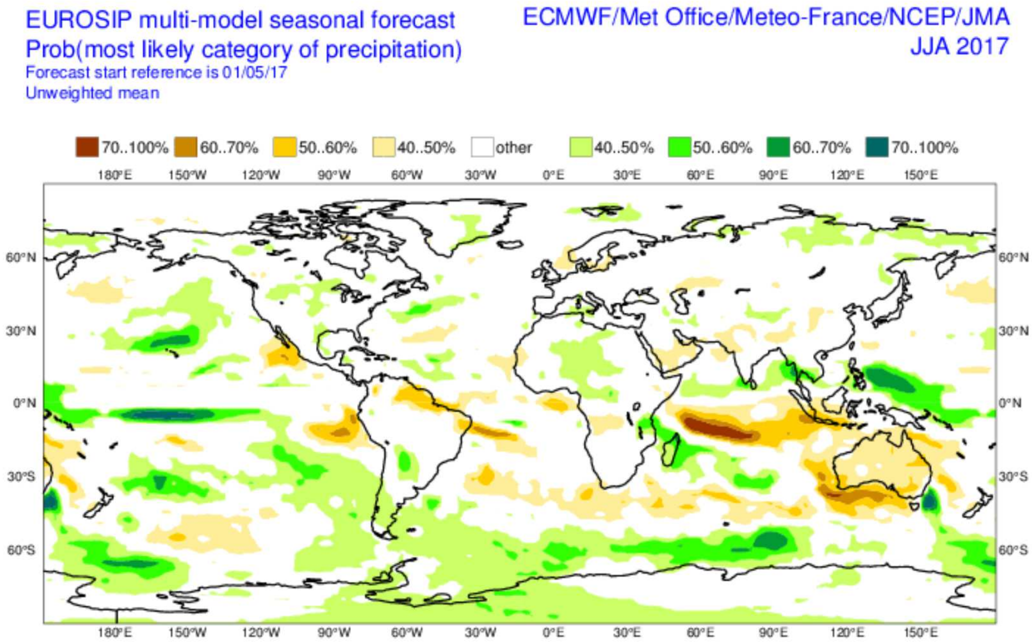


fig.II.4.7: Multi-Model Probabilistic forecasts for precipitation from EuroSip (2 Categories, Below and Above normal – White zones correspond to No signal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal /forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

II.5. REGIONAL TEMPERATURES and PRECIPITATION

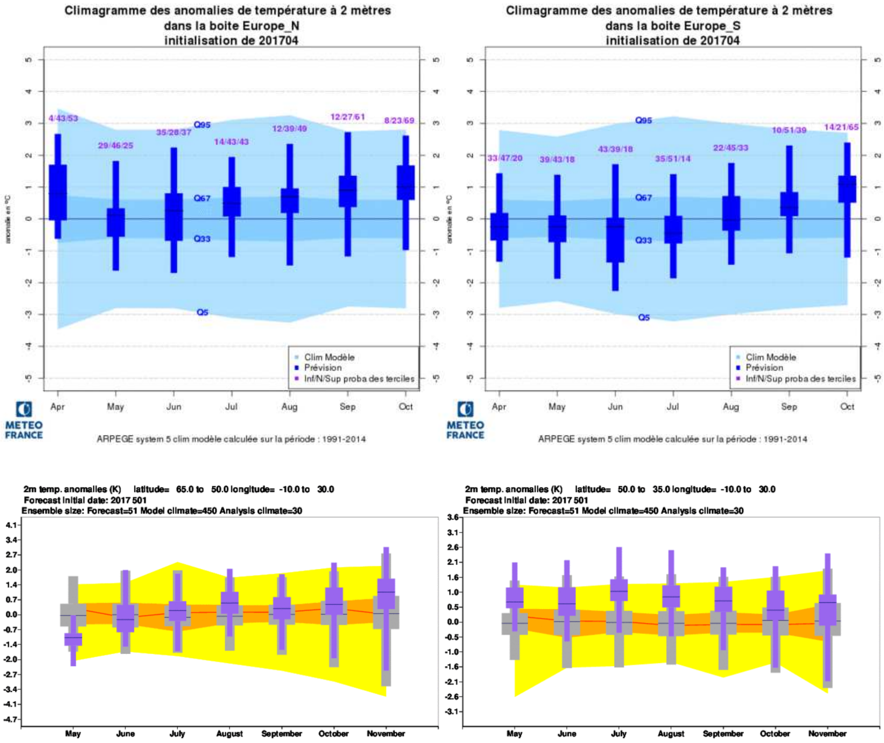


fig.II.5.1 : Climagrams for Temperature in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

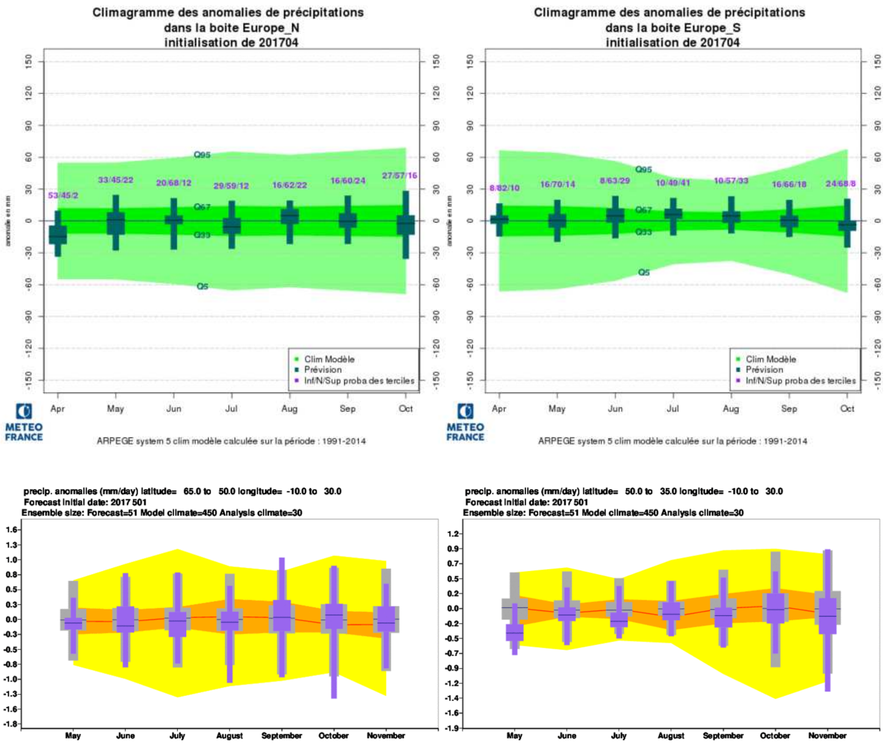


fig.II.5.2 : Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

II.7. "EXTREME" SCENARIOS

Warning : there is a cold bias in the 2m temperature Météo-France maps this month.

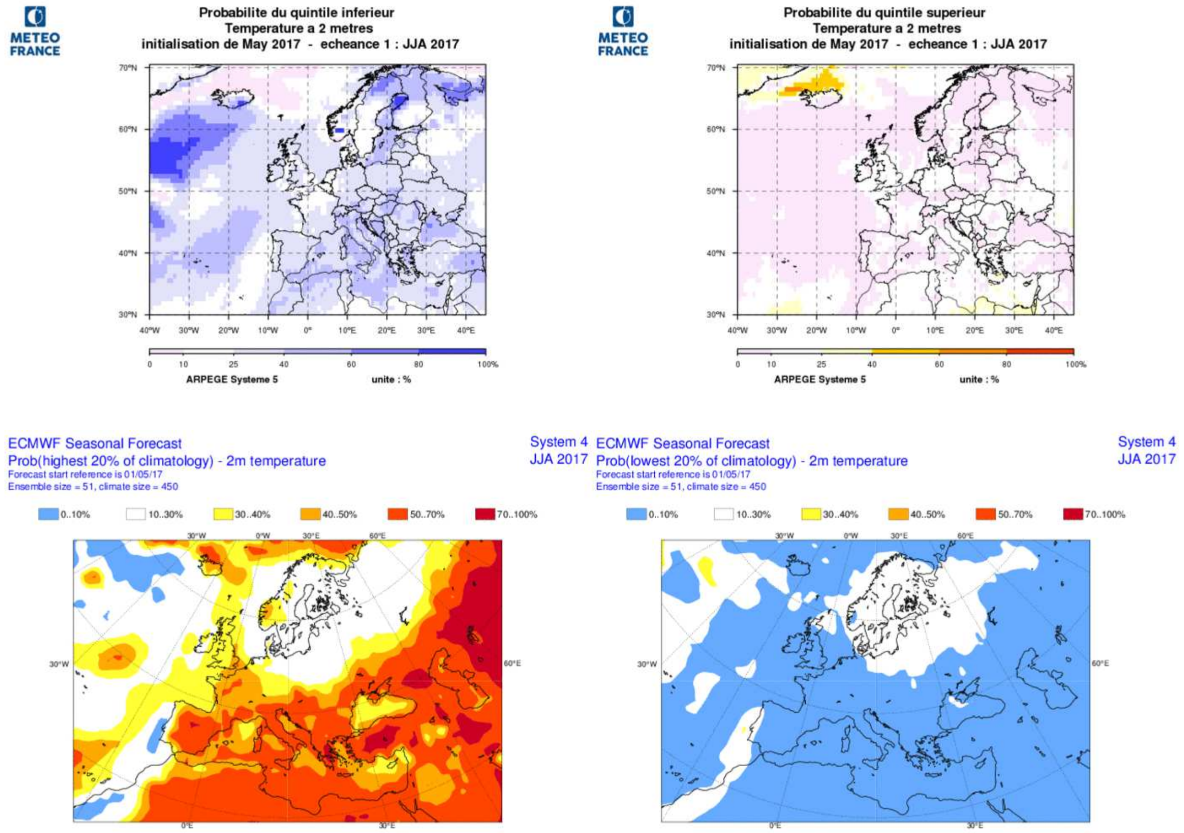
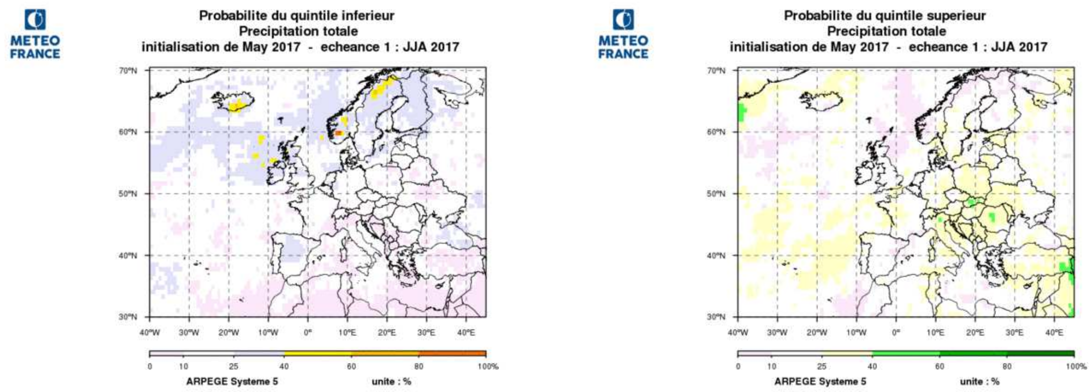


fig.II.7.1 : Top : Meteo-France T2m probability of « extreme » below normal conditions (left **-** lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution). Bottom : ECMWF T2m probability of « extreme » below normal conditions (left - highest ~20%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



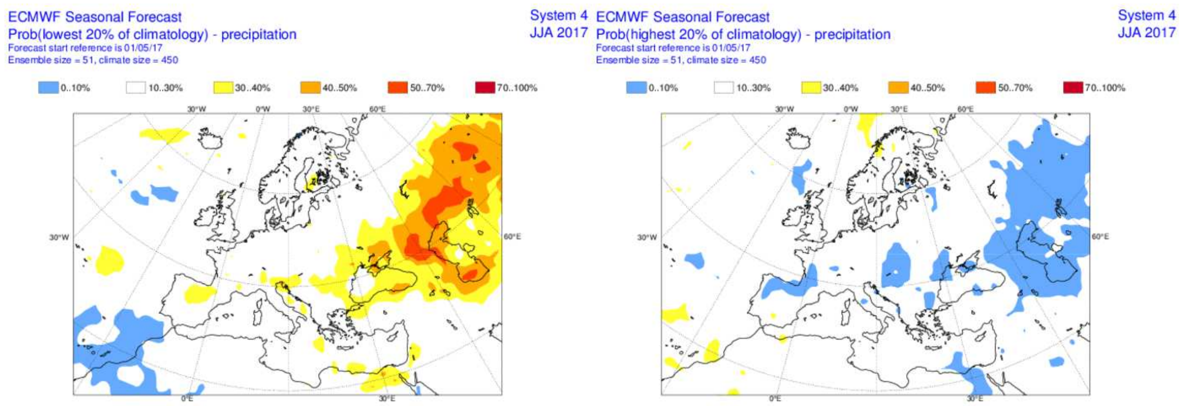
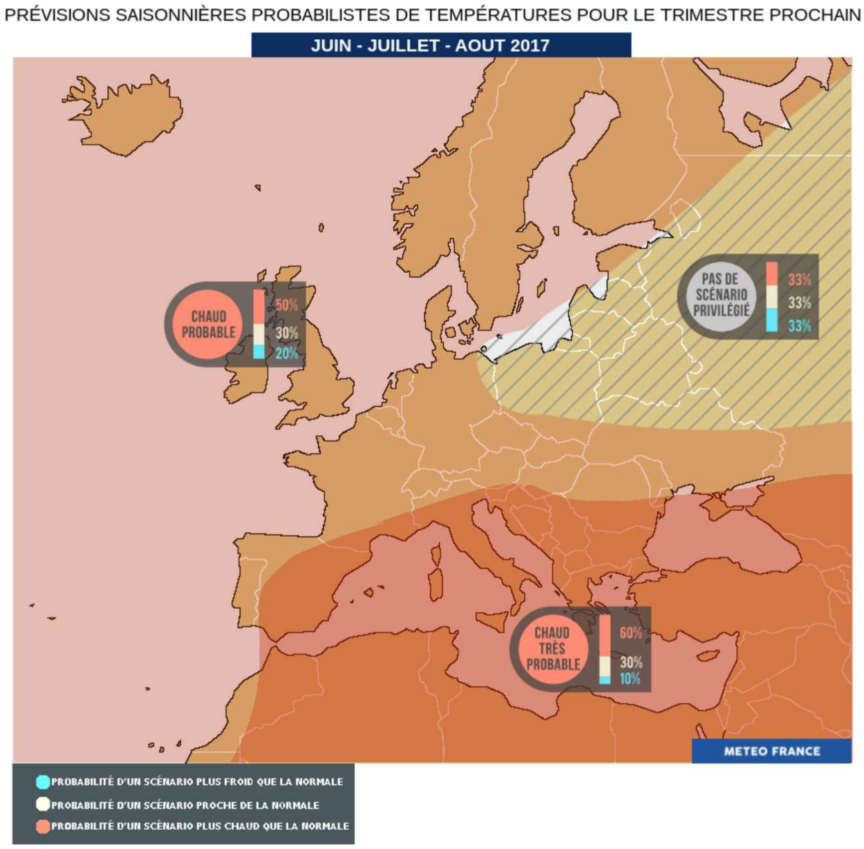


fig.II.7.2 : Top : Meteo-France rainfall probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution).
Bottom : ECMWF rainfall probability of « extreme » below normal conditions (left - lowest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

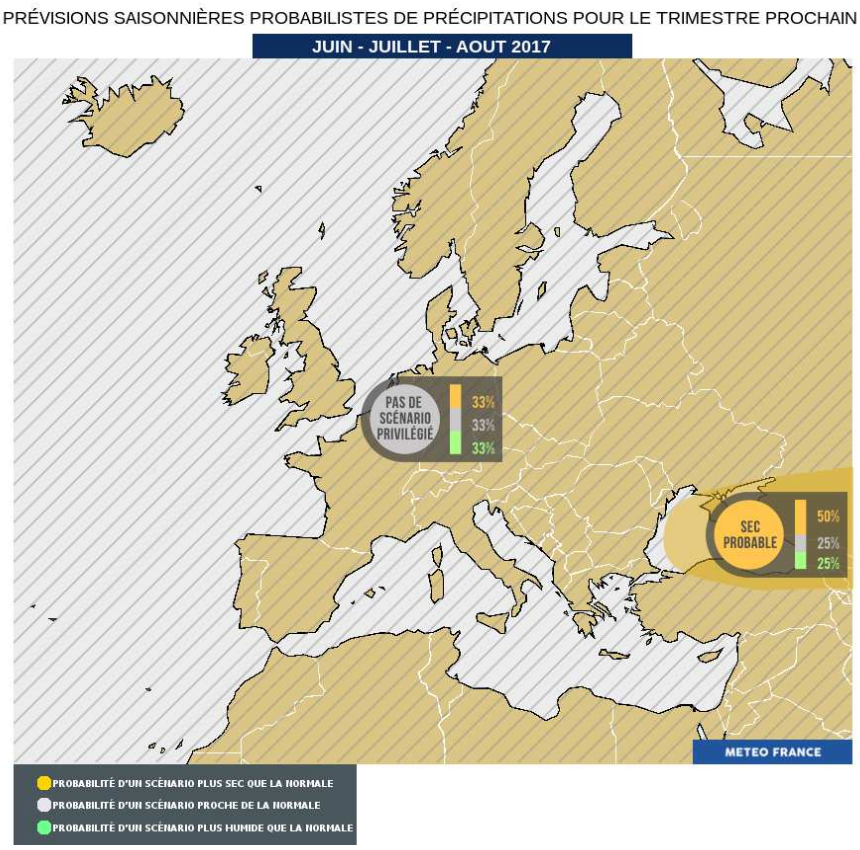
II.8. DISCUSSION AND SUMMARY

II.8.a Forecast over Europe

Temperatures: probably warmer than normal over the main part of Europe, with more confidence in the south. No signal in Northeast part of the continent.



Precipitation: no signal can be found.



II.8.b Tropical cyclone activity

No significant difference to the normal for all cyclonic zones for the summer 2017.

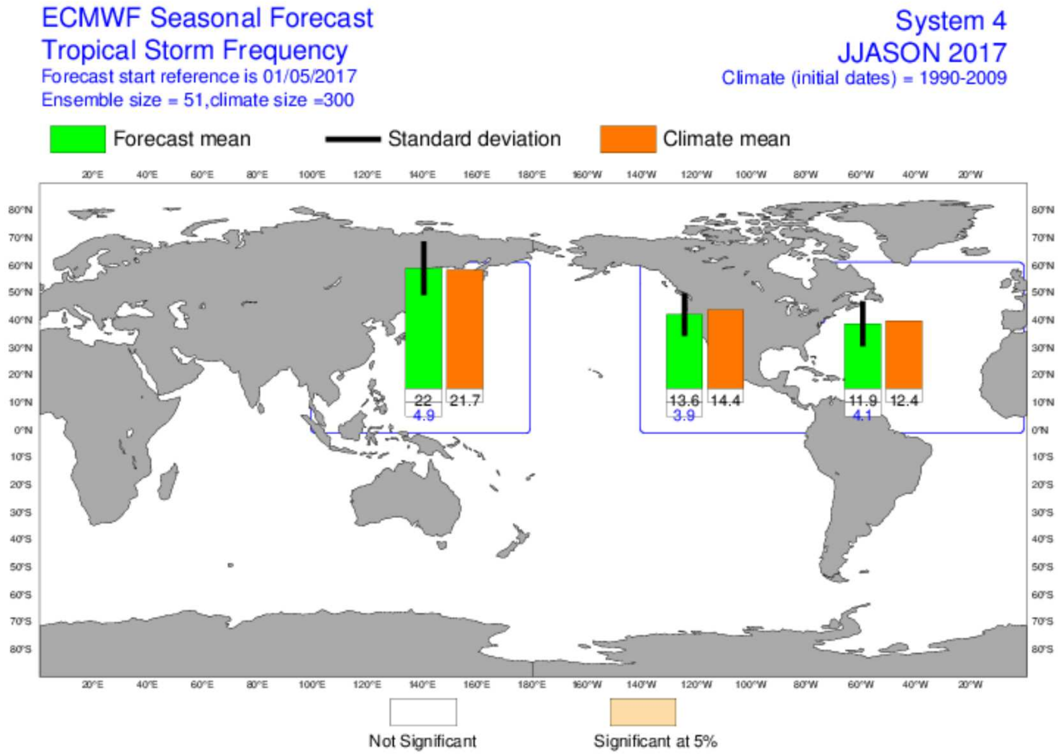


fig.II.8.1 : Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF).

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 whe re the SST warming is developing first at the surface (especially for coastal events).

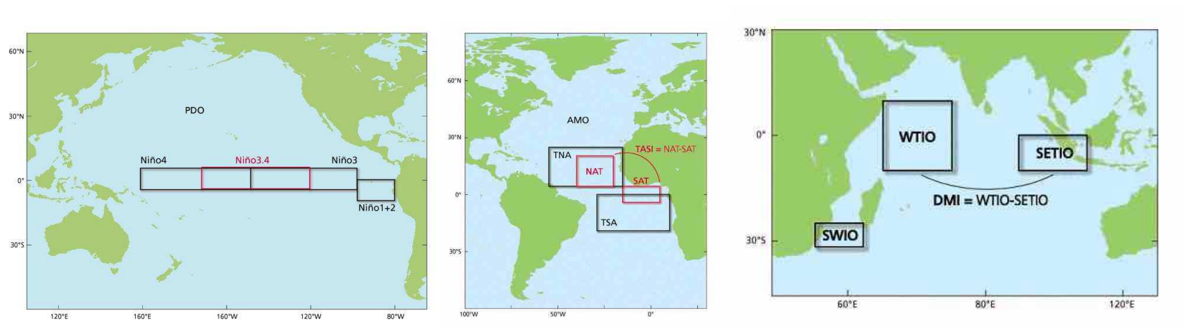
- Niño 3 : 5°S/5°N 90W-150W ; it is the region wher e the interanual variability of SST is the greatest.

- Niño 4 : 5°S/5°N 160E- 150W ; it is the region wh ere 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).

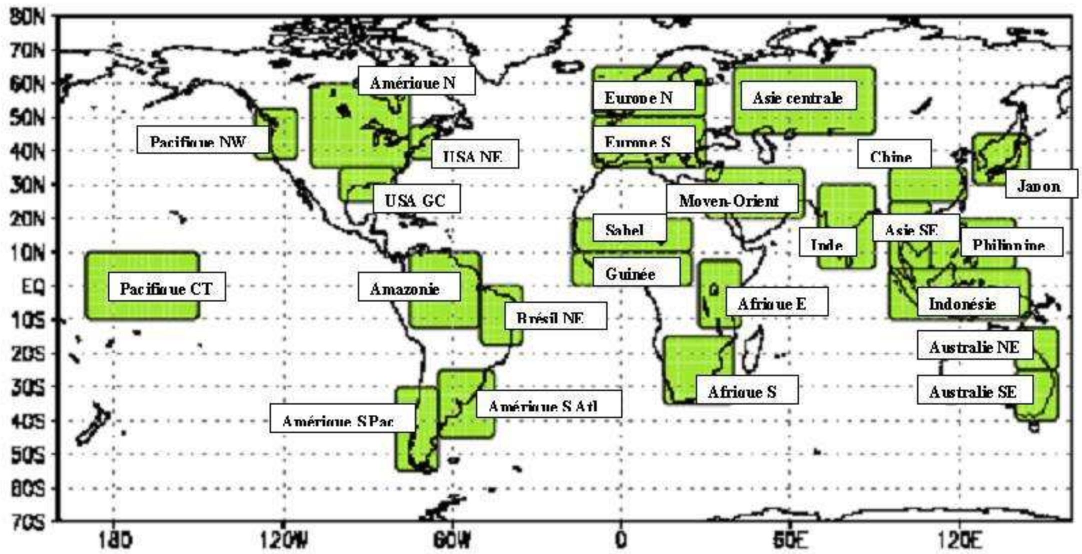
Associated to the oceanic « El Niño / La Niña » events, and taking into account the strong ocean/atmopshere coupling, the atmosphere shows also interanual variability associated to these events. It is monitored using the SOI (Southern Oscillation Index). This indice is calculated using standardized sea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