WMO RA VI
RCC Network

METEO FRANCE

GLOBAL CLIMATE BULLETIN

n°227 – May 2018

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I. DESCRIPTION OF THE CLIMATE SYSTEM (March 2018)

I.1.Oceanic analysis

Over the Pacific ocean :

Weak La Niña still lingering in March :

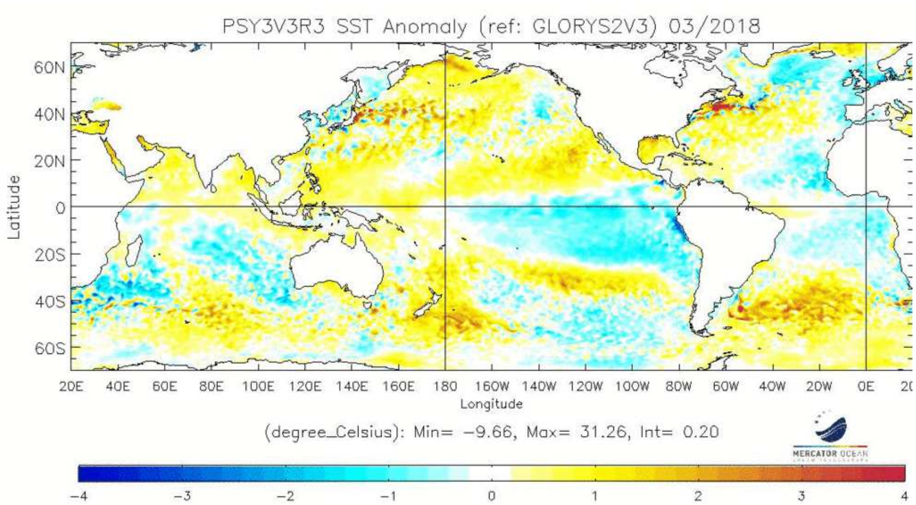
- Along the equator, little change in SSTs with negative anomalies east of the date line (Niño 3.4 index of -0.5℃, no change since February) and warm anomalies to the west.
  (GLORYS 1992-2009, MERCATOR-Océan). In sub-surface, Kelvin wave spreading towards the east up to 130 W, bringing significant warming. (see fig. I.I.4. and I.1.5).
- In the northern hemisphere, mainly positive anomalies. Slight negative PDO pattern visible, the index reaching -0.51 for this month (https://www.ncdc.noaa.gov/teleconnections/pdo/)
- In the southern hemisphere, warm anomalies remaining in the Western part of the basin, especially around New Zealand.

Over the Indian Ocean :

- weak warm anomalies (<1℃) in the Northern hemisphe re. To the South (up to 20℃S), weakening contrast b etween a warm western part and a cool eastern part of the basin.
- DMI close to zero (source : MERCATOR-Ocean)

Over the Atlantic:

- In the North Atlantic, warm anomalies to the West, and cold anomalies to the East. Despite a relative warming since February (see fig I.1.1), SSTs remain colder than normal off the western coast of Africa. Positive anomalies over the north-eastern arctic part of the basin.
- Cooling trend over the gulf of Guinea.



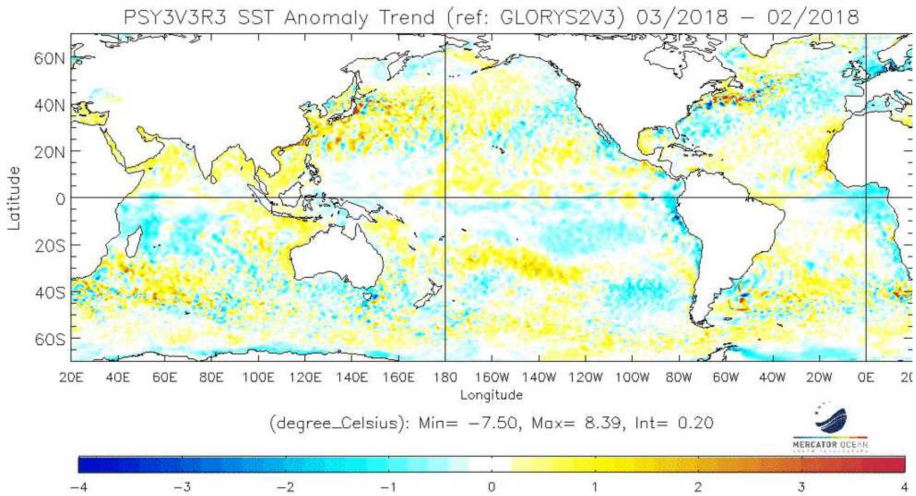


fig.I.1.1: top : SST Anomalies (℃) . Bottom : SST tendency (cur rent – previous month), (reference Glorys 1992-2013).

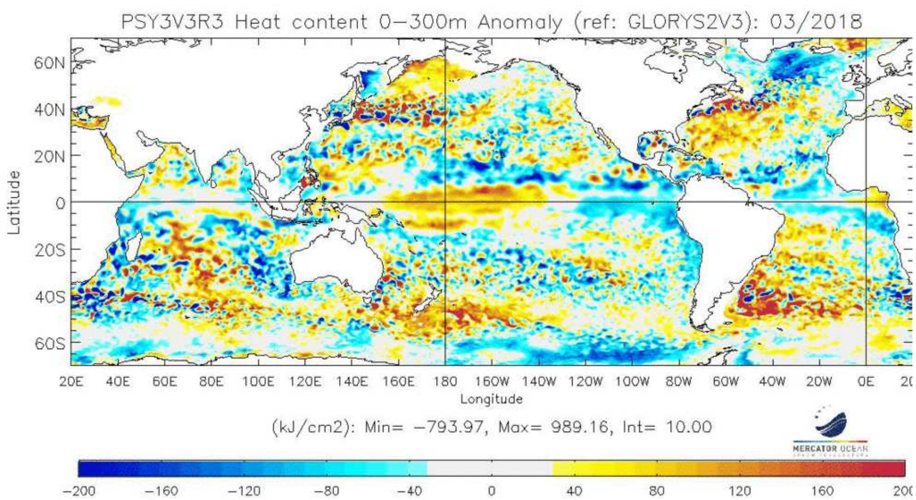


fig.I.1.2: map of Heat Content Anomalies (first 300m, kJ/cm2, reference Glorys 1992-2013)

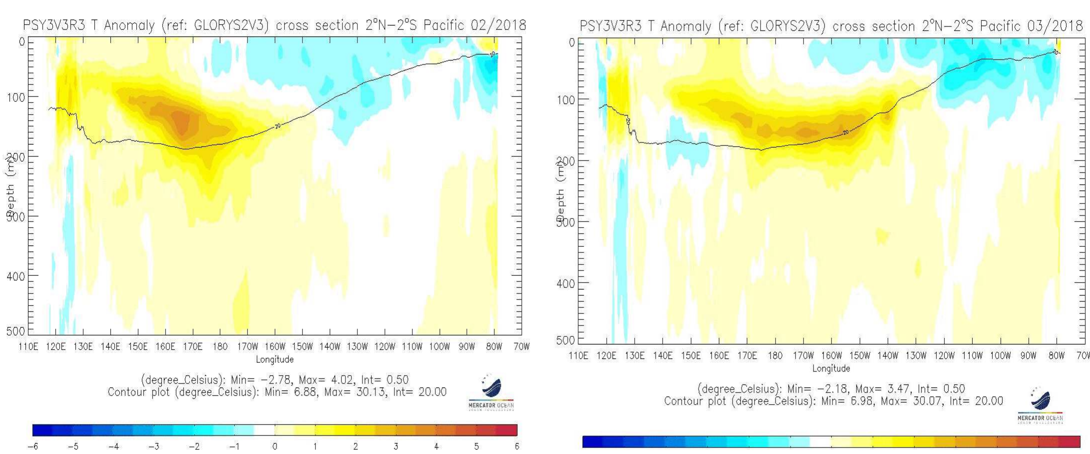


fig.I.1.4: Oceanic temperature anomaly in the first 500 meters in the Equatorial Pacific (previous and current month)

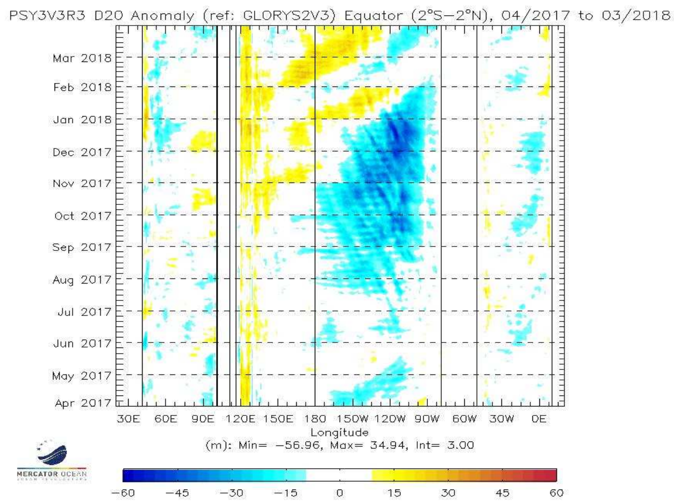


fig.I.1.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20℃ isotherm) along the equator for all oceanic basins over a 6 month period

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

European Arctic Sea: Still warmer than normal, slightly weaker anomalies than in February over Barents Sea.

North Sea: Significantly colder than normal

Baltic Sea: only frozen in the north and east, in the south still above normal with slightly weaker anomalies than in February.

Cold blob south of Greenland/Iceland: Still persisting, no significant change, colder than normal also close to Ireland/UK.

Subtropical East Atlantic: Still colder than normal close to Iberia/Biscay, cooling has extended further offshore.

Mediterranean: Cooling in the western Mediterranean and the Adriatic Sea, warming in the eastern Mediterranean.

Black Sea: Cooling in the western part, still well above normal in the east.

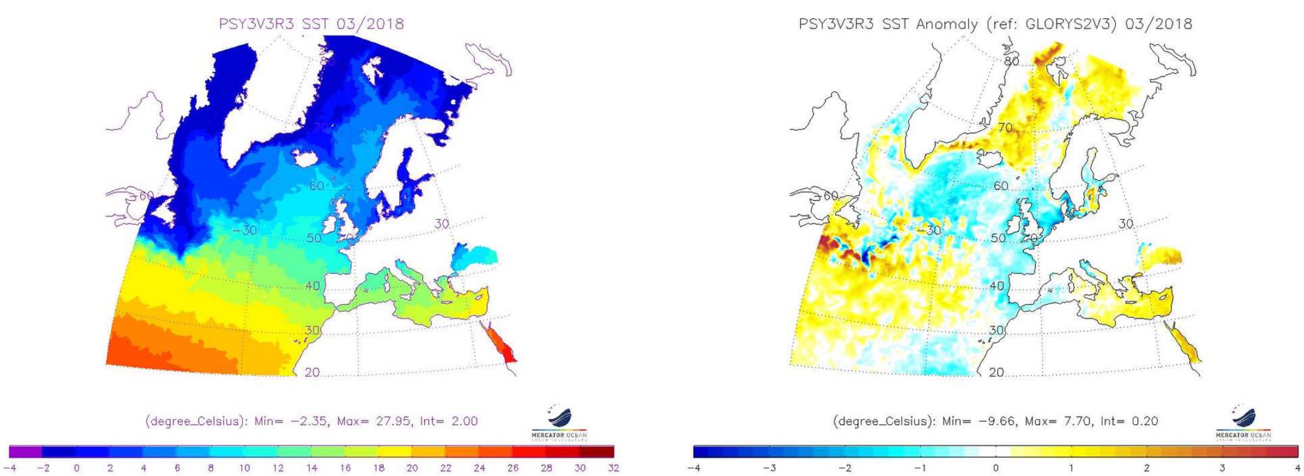


fig.I.1.6 : Mean sea surface temperature in the RA VI Region (Europe) and anomaly (reference Glorys

1992-2013).

I.2. ATMOSPHERE

I.2.a General Circulation

Velocity Potential Anomaly field in the high troposphere (fig. 1.2.1. a – insight into Hadley-Walker circulation anomalies) :

- no active MJO during March, as opposed to February. The contribution to the vertical velocities anomalies may have been weak.
- the tropical circulation looks like a response to the remaining La Niña oceanic pattern : strong upward motion anomaly over the western Pacific and the Maritime Continent, and strong downward motion anomaly over the eastern Pacific and Latin America. See also SOI paragraph.

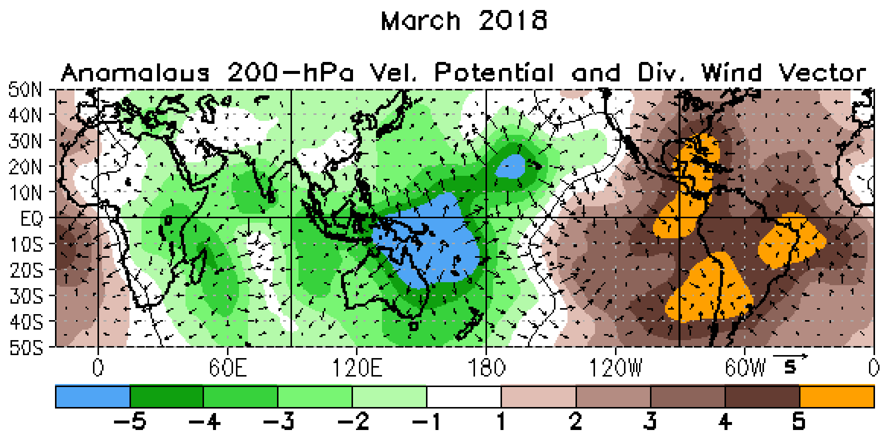


fig.I.2.1.a: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly). http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

SOI :

- SOI index rose to +1.5 in March (NOAA Standardized SOI: https://www.ncdc.noaa.gov/teleconnections/enso/indicators/soi/ .), showing the return to a "La Niña"-type atmospheric response.

MJO (fig. I.2.1.b)

- no significant MJO activity during the main part of the month.

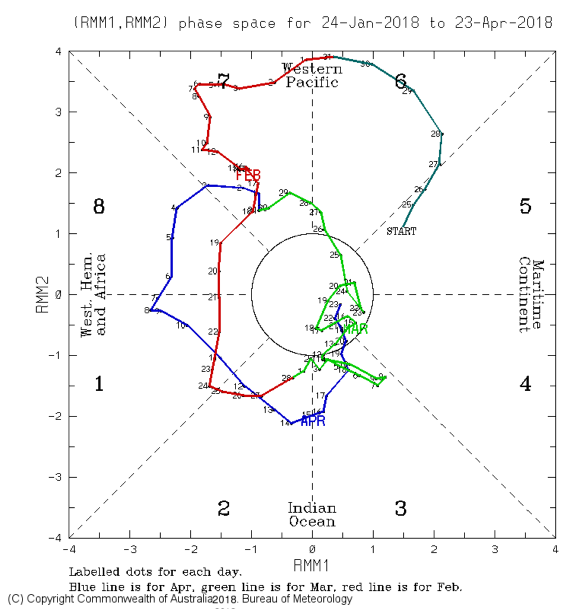


fig.I.2.1.b: indices MJO http://www.bom.gov.au/climate/mjo/

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

- Cyclonic anomalies over the eastern Pacific, due to the strong downward motion anomaly. No significant propagation towards the mid-latitudes.
- Strong anticyclonic anomalies from Sahara to central Asia eastern Pacific may have extratropical origins.

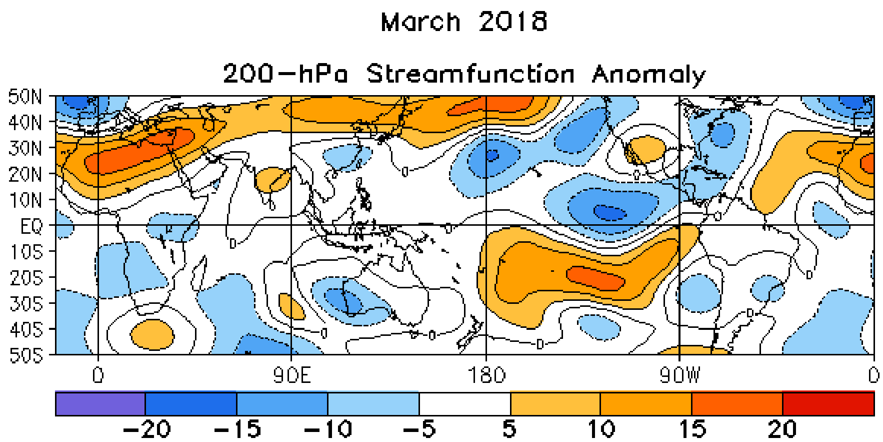


fig.I.2.2: Stream Function Anomalies at 200 hPa.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

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

- strong negative PNA index again for this month with a value of -19.4 (source Météo-France), which is consistent with La Niña conditions, even though the signal does not seem to originate from the tropics!
- For North Atlantic and western Europe, strongly negative NAO (-1.85 source Météo-France) in March, as opposed to February. This configuration may have been triggered by strong phases 7 and 8 of the MJO during February combined with a Sudden Stratospheric Warming (SSW) around mid-February.
- East Atlantic / Western Russia index (EAWR) highly positive this month (+4.03 source NOAA, with a strong Middle East/Siberia dipole) => enhanced zonal flow from the Black Sea to the Bering strait.

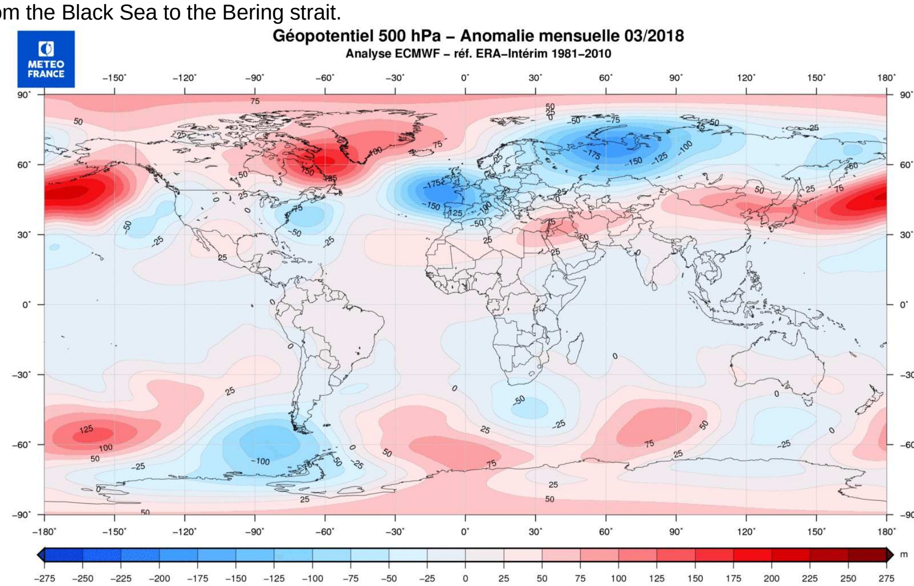


fig.I.2.3: Anomalies of Geopotential height at 500hPa (Meteo-France)

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
MAR 18	-1.4	-0.6	0.8	0.3	-1.2	---	4.0	-0.8	0.1
FEB 18	1.3	-1.4	0.4	0.2	-1.7	2.2	-1.4	0.4	-2.2
JAN 18	1.2	0.6	0.4	0.7	-0.1	-0.3	-1.6	0.4	-1.5
DEC 17	0.7	-0.5	0.3	---	0.6	1.0	-1.6	-0.5	-2.0
NOV 17	-0.1	0.1	0.7	0.4	-2.0	---	-1.2	-0.1	-2.2
OCT 17	0.7	0.6	0.7	-0.6	-0.3	---	0.0	0.3	-1.2
SEP 17	-0.5	1.6	-1.2	-0.5	-0.3	---	-2.5	0.5	-1.7
AUG 17	-1.5	2.0	-1.4	-1.6	0.2	---	-2.9	-1.6	1.8

Evolution of the main atmospheric indices for the Northern Hemisphere for the last 6 months. (see http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/table3.shtml for the most recent 13 months).

Sea level pressure and circulation types over Europe

Significant large and intense low pressure zone extending from USA over the whole central North Atlantic and also to large parts of Europe. The Azores High is relocated to the south, instead a large high pressure zone extended over Greenland. This is a typical NAO- pattern, which did not appear the whole winter before. An additional but weaker contribution comes from EA-.

Extremely strong EATL/WRUS+ pattern due to a relatively weak Siberian High and an intense low pressure core close to Western Europe. A large low pressure system (near surface and in the upper atmosphere) formed over northern Russia at the expense of the Siberian High. The Low even extended temporarily over Scandinavia, which is expressed by a weak SCAND- pattern. The constellation Greenland High – North Russian Low caused advection of cold Arctic air to Europe. Since there was no persistent anticyclonic blocking over Europe, cold air could spread over Europe and on the other hand Atlantic low pressure systems passed over the continent.

The MF weather type classification shows consequently a high number of NAO- patterns (22, which means about two thirds of the month). The remaining days mainly had an Atlantic ridge pattern, especially on 21-26 March, when cold air spread particularly to southwestern Europe. Scandinavian Blocking did not occur at all.

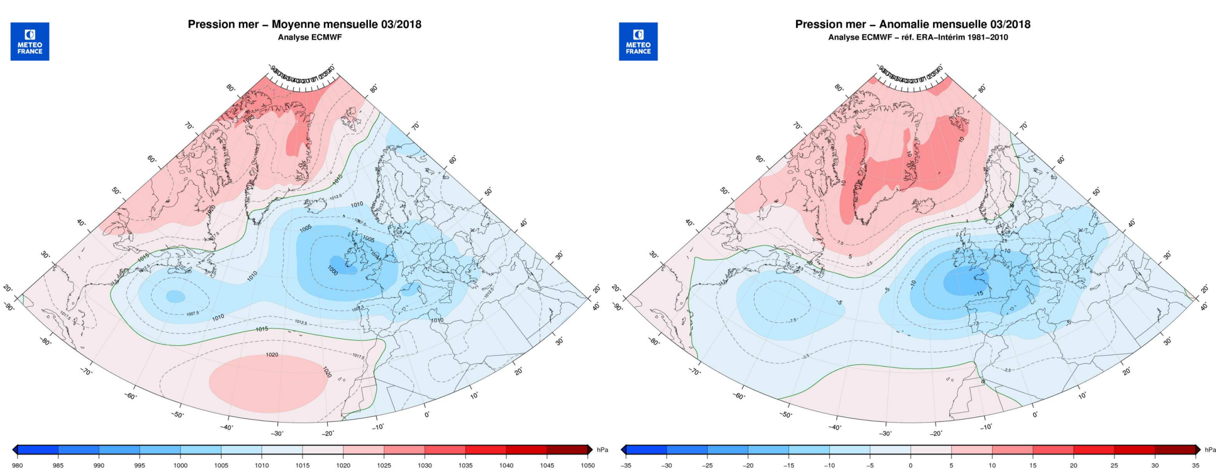


fig.I.2.4: Mean sea level pressure in the RA VI Region (Europe) (top) and 1981-2010 anomalies (bottom).

Circulation indices: NAO and AO

Duration of the NAO- phase was during the first two thirds of the month, consistent with MF weather type classification. In the last third, NAO was neutral.

AO mainly followed the NAO, similarly negative phase in the first two thirds and only slightly positive in the last third. The polar low was quite asymmetric with large extension of intensity to northern Russia, while getting weaker over Greenland. This means that these patterns were largely a part of a hemispheric anomaly.

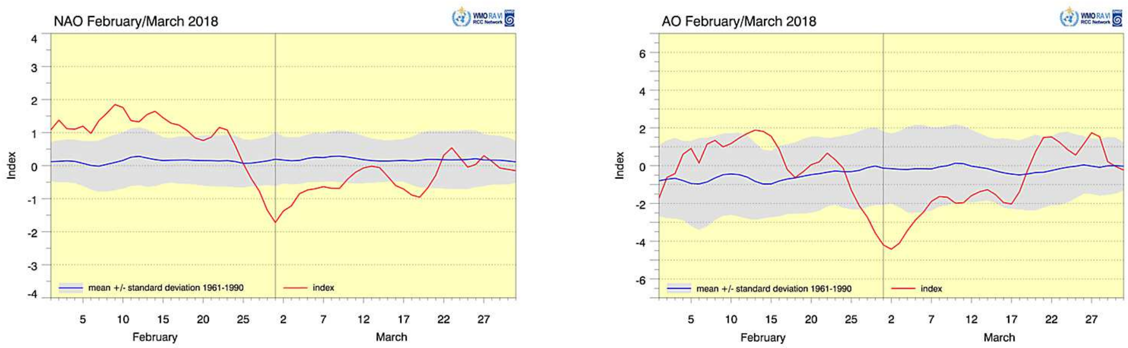


fig.I.2.5: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices with 1961-1990 mean standard deviation (shading). http://www.dwd.de/rcc-cm , data from NOAA CPC: http://www.cpc.ncep.noaa.gov /products/precip/CWlink/daily_ao_index/teleconnections.shtml

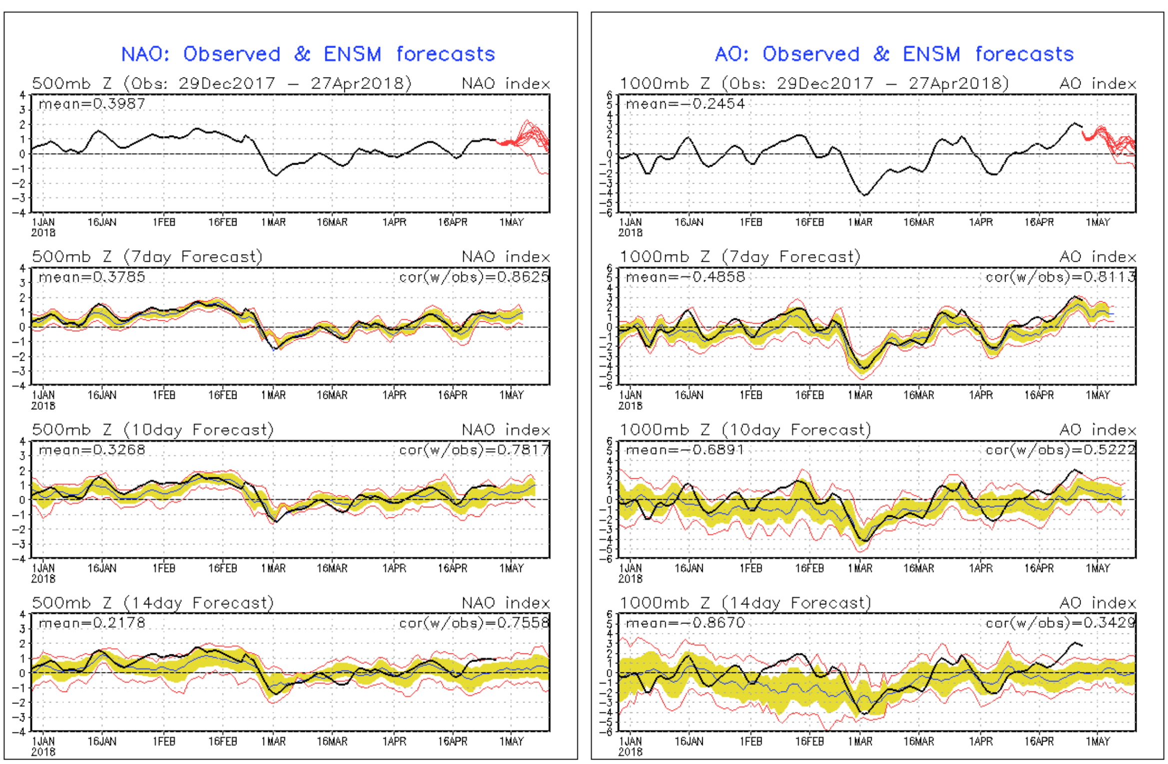


fig. I.2.5a: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices for the last 4 months and forecasts for the following weeks. Source: NOAA CPC, http://www.cpc.ncep.noaa.gov/products/precip/CWlink

/daily_ao_index/teleconnections.shtml

I.2.b Precipitation

- In the equatorial band, consistent response to the La Niña conditions and to the 200 hPa Velocity Potential Anomaly patterns (see paragraph I.2.a).

- over Europe, sharp meridional contrast, typical of a negative NAO (http://seasonal.meteo.fr/fr/content/suivi-clim-modes-impacts). Huge amounts of rain (and snow !) from Iberic Peninsula to the Balkans : 2nd rainiest March in Spain (highest : March 2013). In Portugal, with an average of 270 mm statewide, March 2018 is the 2nd rainiest March since 1931 just behind March 2001 (see also next paragraph) !

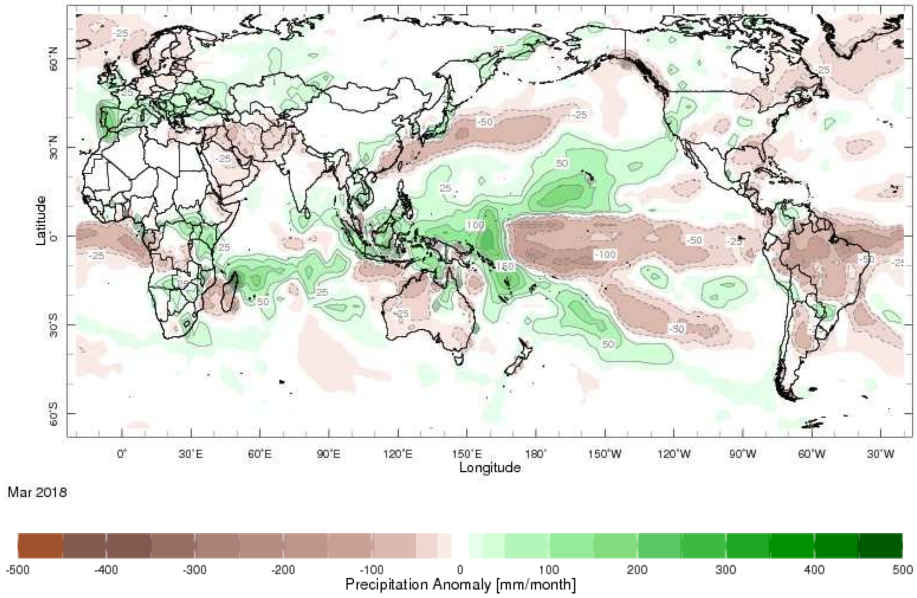


fig.I.2.6: Rainfall Anomalies (mm) (departure to the 1979-2000 normal).
Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/Anomaly.html

Precipitation anomalies in Europe:

Well-above-normal precipitation over southern Europe and relatively dry in the north. This is the result of an NAO- pattern (particularly the precipitation in the south), while the dryness in the north also comes from cold and dry air advection from the Arctic region (west of the Low over northern Russia) and temporary extensions of Atlantic ridge to Europe.

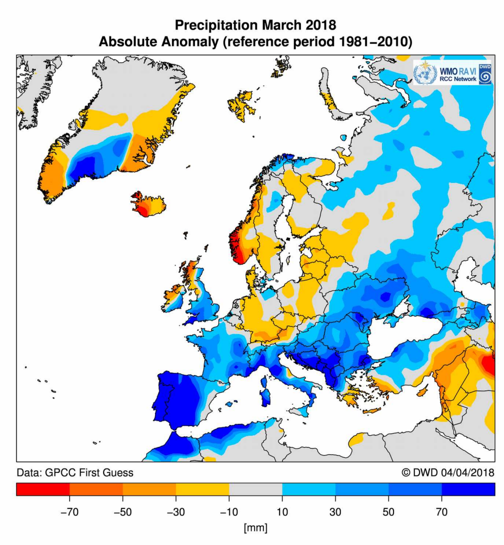


fig.I.2.7.a : Absolute anomaly (1951-2000 reference) of precipitation in the RA VI Region (Europe), data from GPCC (Global Precipitation Climatology Centre), http://www.dwd.de/rcc-cm.

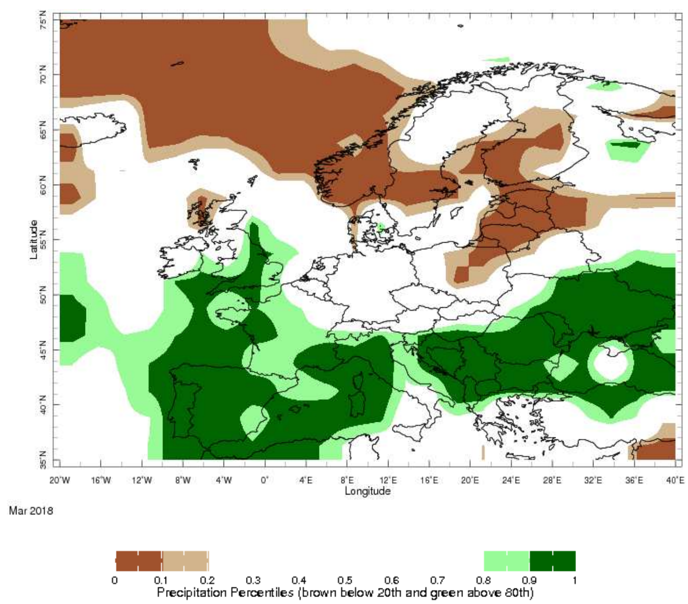


fig.I.2.7.b : Percentiles of precipitation, 1981-2010 reference. Data from NOAA Climate Prediction Center, http://iridl.ldeo.columbia.edu/maproom/Global/Precipitation/Percentiles.html

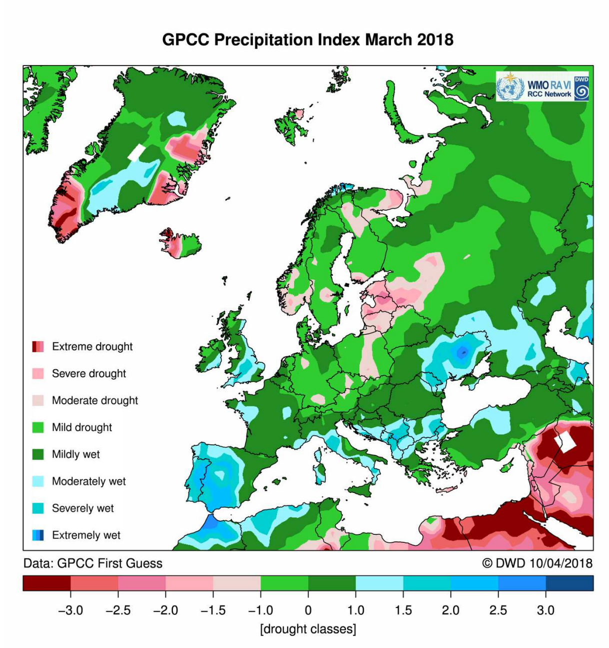


fig. I.2.8: GPCC Precipitation Index, http://www.dwd.de/rcc-cm .

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	- 5.6 mm	- 0.445
Southern Europe	+ 41.0 mm	+ 0.713

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

- Strong negative anomaly from western Europe to Siberia (consistent with negative NAO and positive EAWR indices), along with a strong positive anomaly from the Middle-East to Central Asia, several countries experiencing either record March high temperatures or their warmest March on record (Bahrain, Qatar, Iran, Pakistan...). See https://www.ncdc.noaa.gov/sotc/global/201803 for more details.
- Negative PNA brought cold weather to northern US and very mild conditions to the Canadian arctic and to Alaska.
-

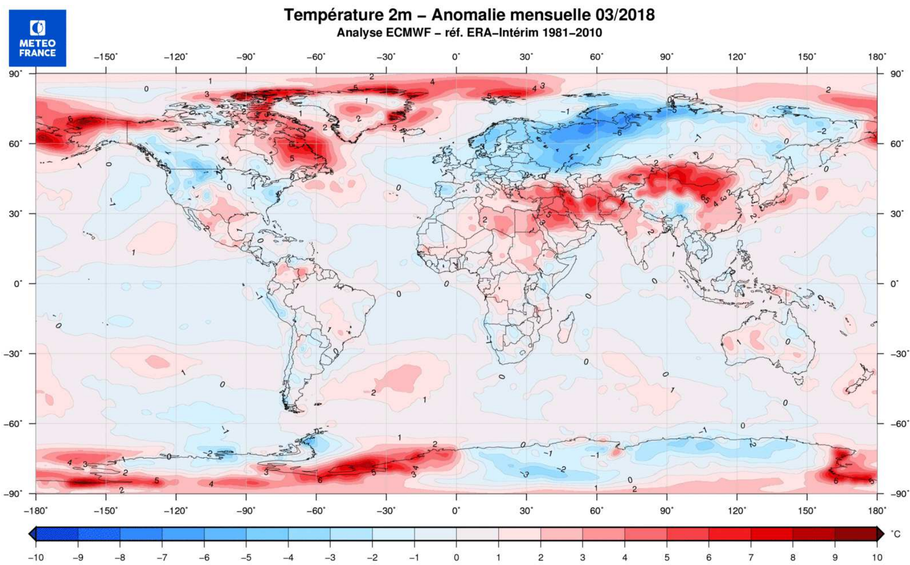


fig.I.2.9: Temperature Anomalies (℃) (Meteo-France)

Temperature anomalies in Europe:

Again a colder-than-normal month over large parts of Europe like the previous month. Negative anomalies decreasing from northeast to southwest (cold air advection from north/northeast in combination with NAO-). Warmer than normal in the southeast (Greece, Turkey, Middle East) due to subtropical High over that area (positive geopotential anomalies).

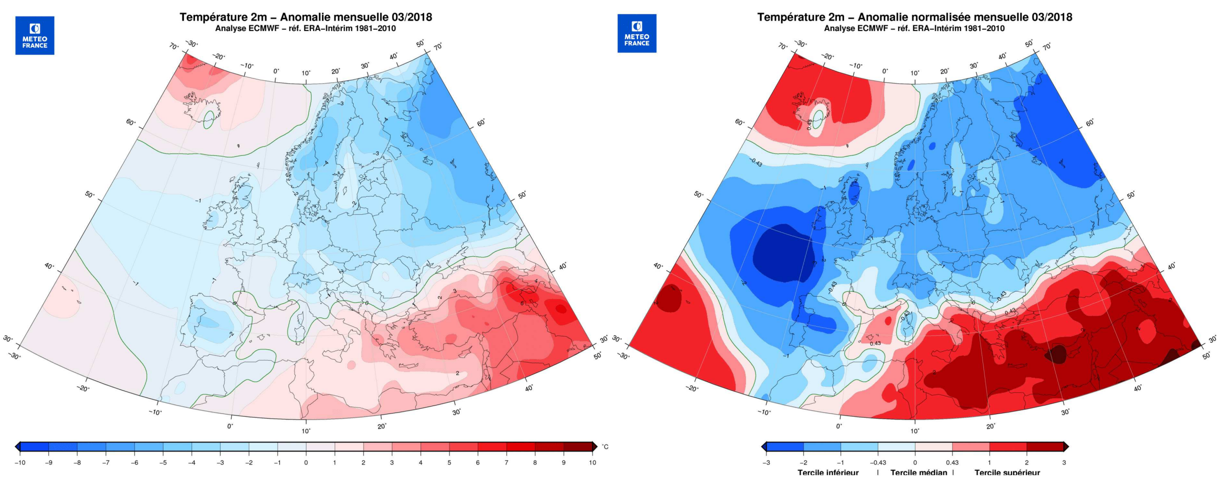


fig.I.2.10: Left graph: Absolute anomaly of temperature in the RA VI Region (Europe). Right graph: Standardized temperature anomalies

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	- 1.4 ℃
Southern Europe	+ 0.4 ℃

I.2.d Sea ice

- In the Arctic : remaining close to record-low extent (2nd lowest, behind 2017). Record low for the Bering Sea.
- In Antarctica, fast ice growth during March : the deficit is still important, but now within the -2 SD plume.

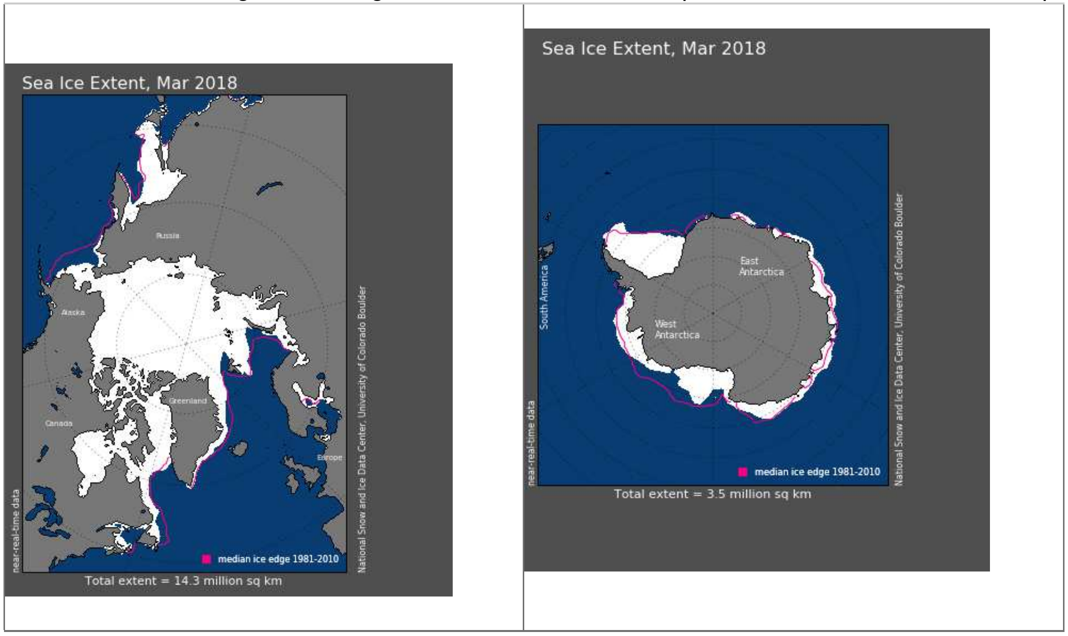


fig.I.2.11: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

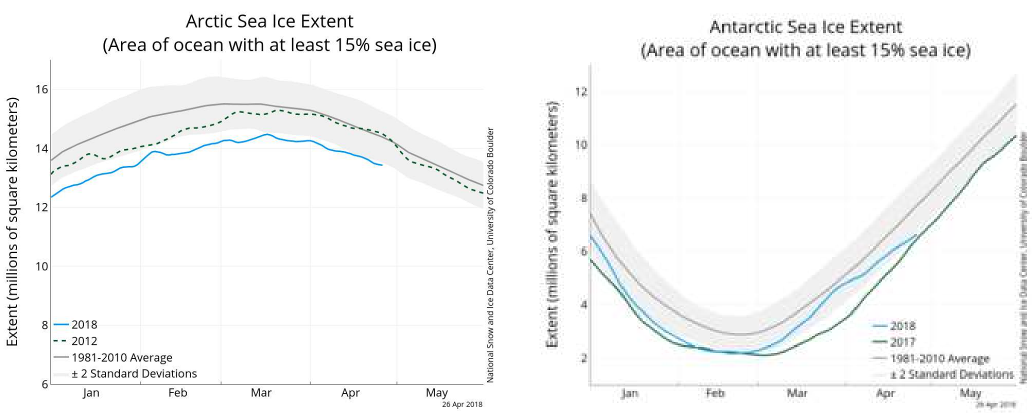
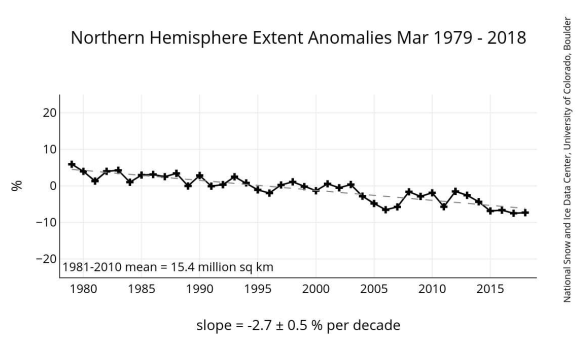


fig. I.2.12 : Sea-Ice extension evolution from NSIDC. https://nsidc.org/data/seaice_index/images/daily_images /N_stddev_timeseries.png



Monthly Sea Ice Extent Anomaly Graph in Arctic for the month of analysis.

http://nsidc.org/data/seaice_index/images/n_plot_hires.png

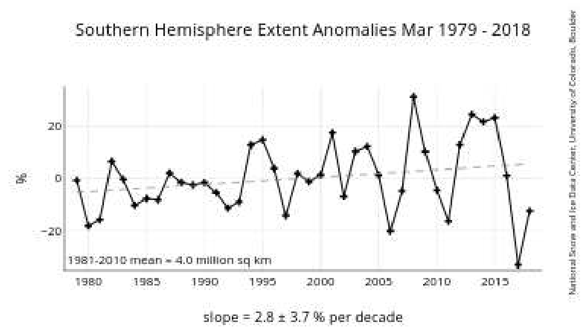


fig 1.2.13 : Monthly Sea Ice Extent Anomaly Graph in Antarctic for the month of analysis (http://nsidc.org/data/seaice_index/)

II. SEASONAL FORECAST FROM DYNAMICAL MODELS

The La Niña phenomenon will significantly decline in the next 3 months.

II.1. OCEANIC FORECASTS

La Niña conditions vanishing during April (http://www.bom.gov.au/climate/enso/) and neutral conditions expected for the coming months.

In this bulletin, only the new MF-S6 model is used for illustrations. But please note that the Eurosip system shown in this bulletin still uses the MF-S5 outputs, which may differ from the MF-S6 forcasts (see http://seasonal.meteo.fr/fr/content/ARP5 for more details).

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

- Pacific Ocean: Return to neutral conditions expected along the equator. Persisting cold anomaly forecast over the southern tropical basin, and warm anomaly over the northern tropical basin. Northern Pacific globally forecast warmer than normal, especially in the Bering region and over the western half of the basin. No significant PDO structure over the period.
- Indian Ocean: Neutral conditions forecast in the northern hemisphere. The DMI should therefore remain close to zero (see figure II.1.7.). In the tropical southern hemisphere, good agreement between models, suggesting a warmer than normal south-western basin and a colder than normal north-eastern basin.
- Atlantic Ocean: Most models forecast cooler than normal SSTs over the Tropical Atlantic. MF-S6 alone suggest a warm area extending along the equator. We will not take this suggestion into account in this bulletin. Cooler than normal conditions expected off the western coasts of Africa. TASI index, which is slightly negative in April, should return to more neutral values (see ECMWF forecast on figure II.1.6)
- Mediterranean Sea : No significant signal.

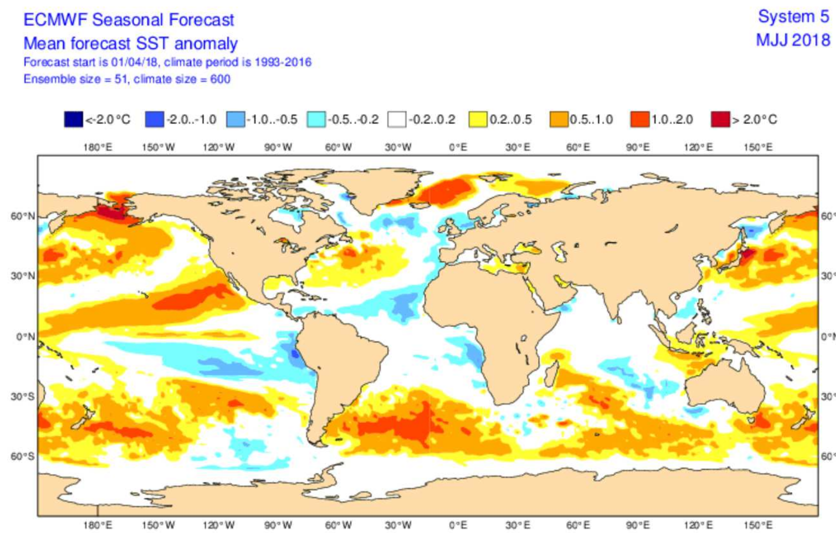


fig.II.1.1: SST anomaly forecast from ECMWF
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

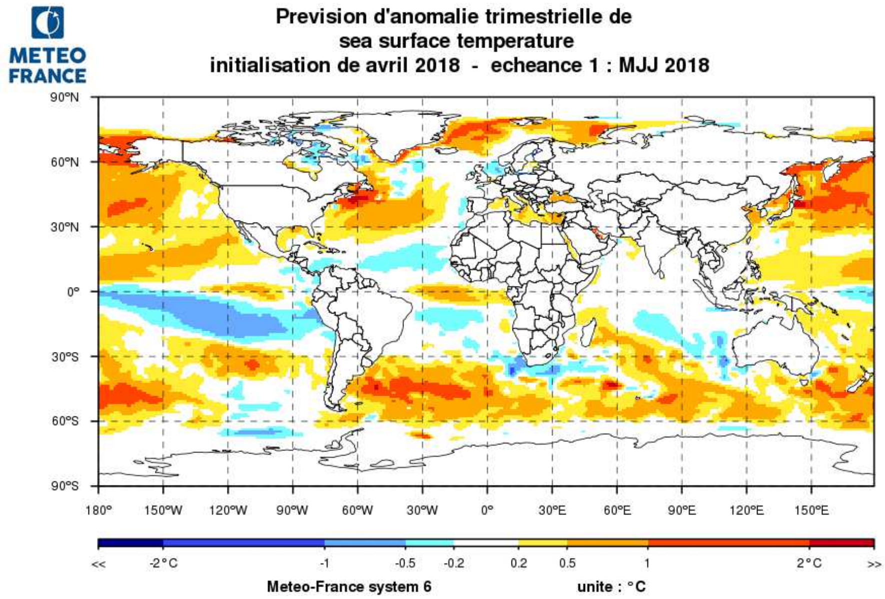


fig.II.1.2: SST Anomaly forecast from Meteo-France (recalibrated with respect of observation).
http://seasonal.meteo.fr

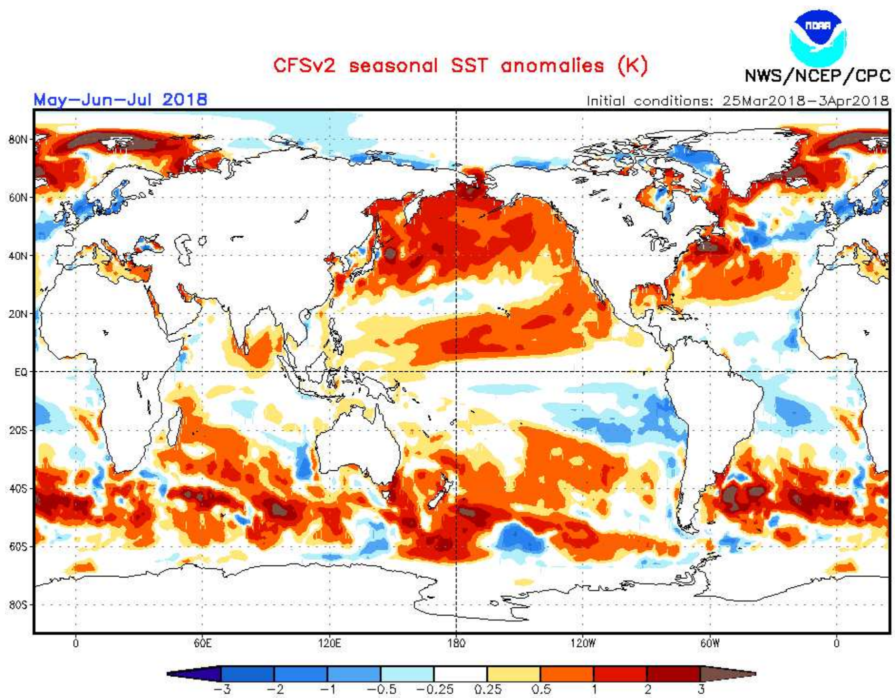


fig.II.1.3: SST Anomaly forecast from NCEP.
http://www.cpc.ncep.noaa.gov/products/people/wwang/cfsv2fcst/imagesInd1/glbSSTSeaInd1.gif

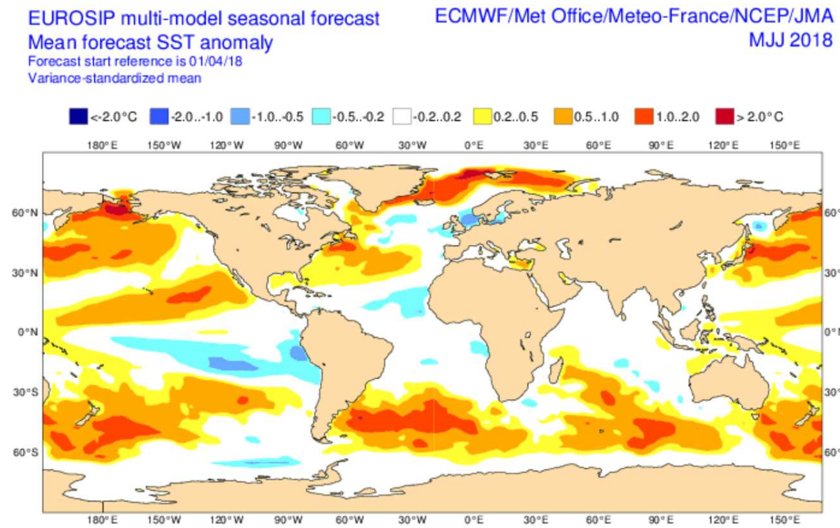
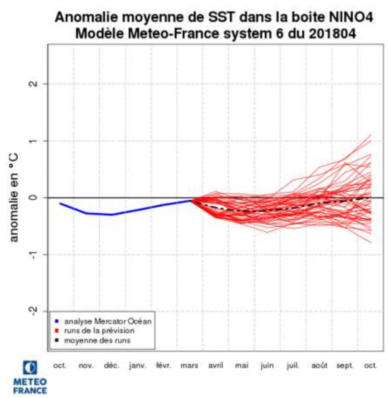
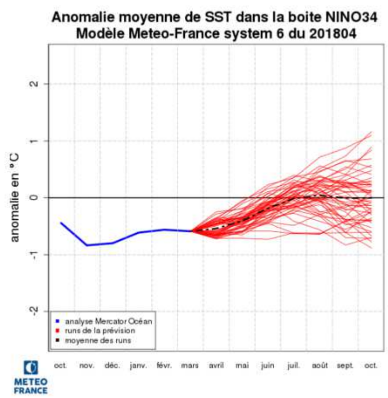


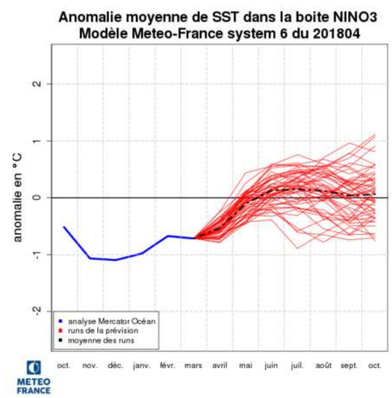
fig.II.1.4: SST Forecasted anomaly from Euro-SIP

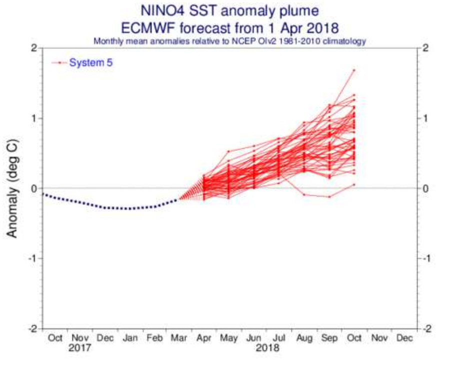
II.1.b ENSO forecast :

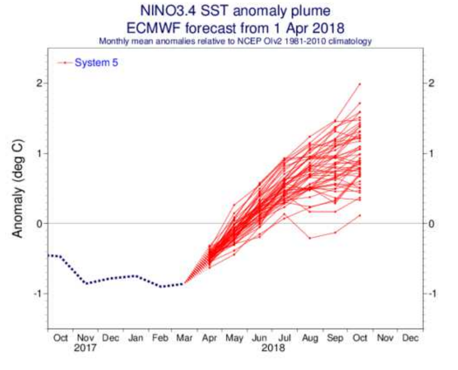
***Forecast Phase*: back to a neutral phase as of late April.** Model outputs suggest neutral conditions for the next three months.

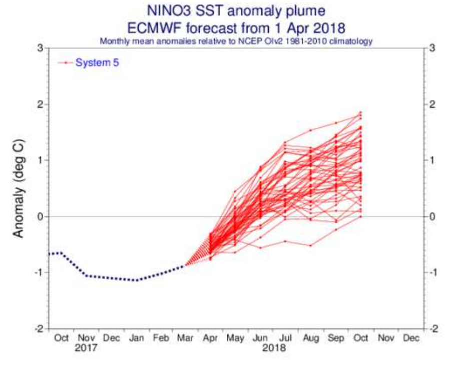












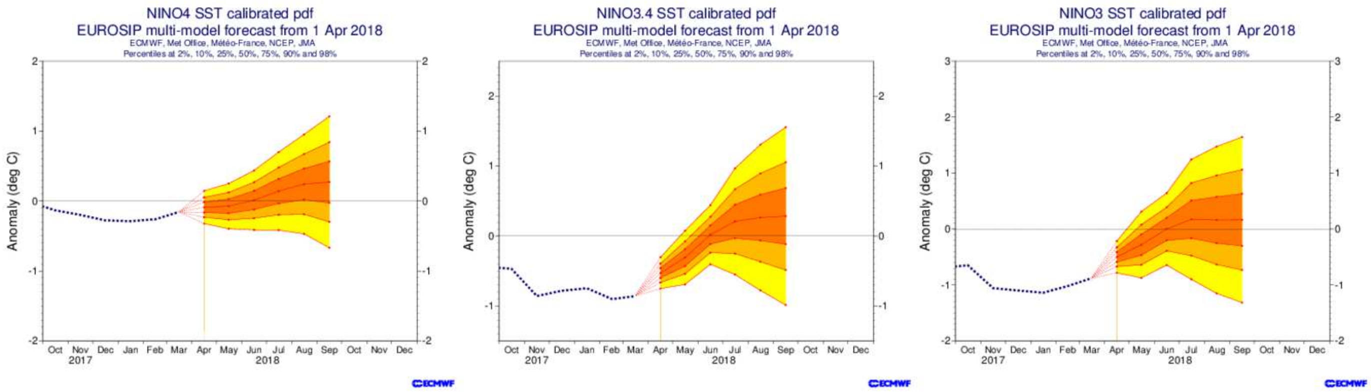


fig.II.1.5: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members -
and EUROSIP (bottom) – recalibrated distributions -
(http://seasonal.meteo.fr , http://www.ecmwf.int/)

I.1.c Atlantic ocean forecasts

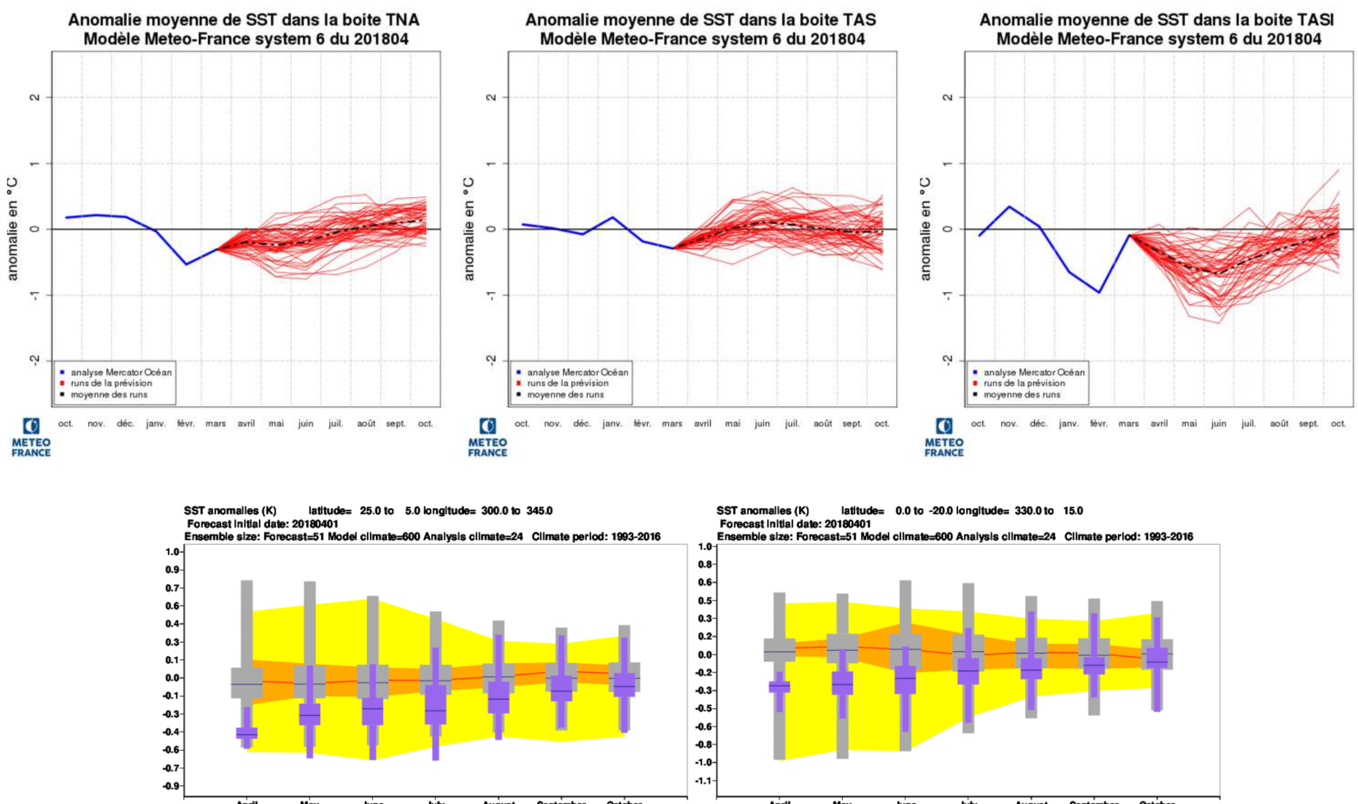


fig.II.1.6: SSTs anomaly forecasts in the Atlantic Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

I.1.d Indian ocean forecasts

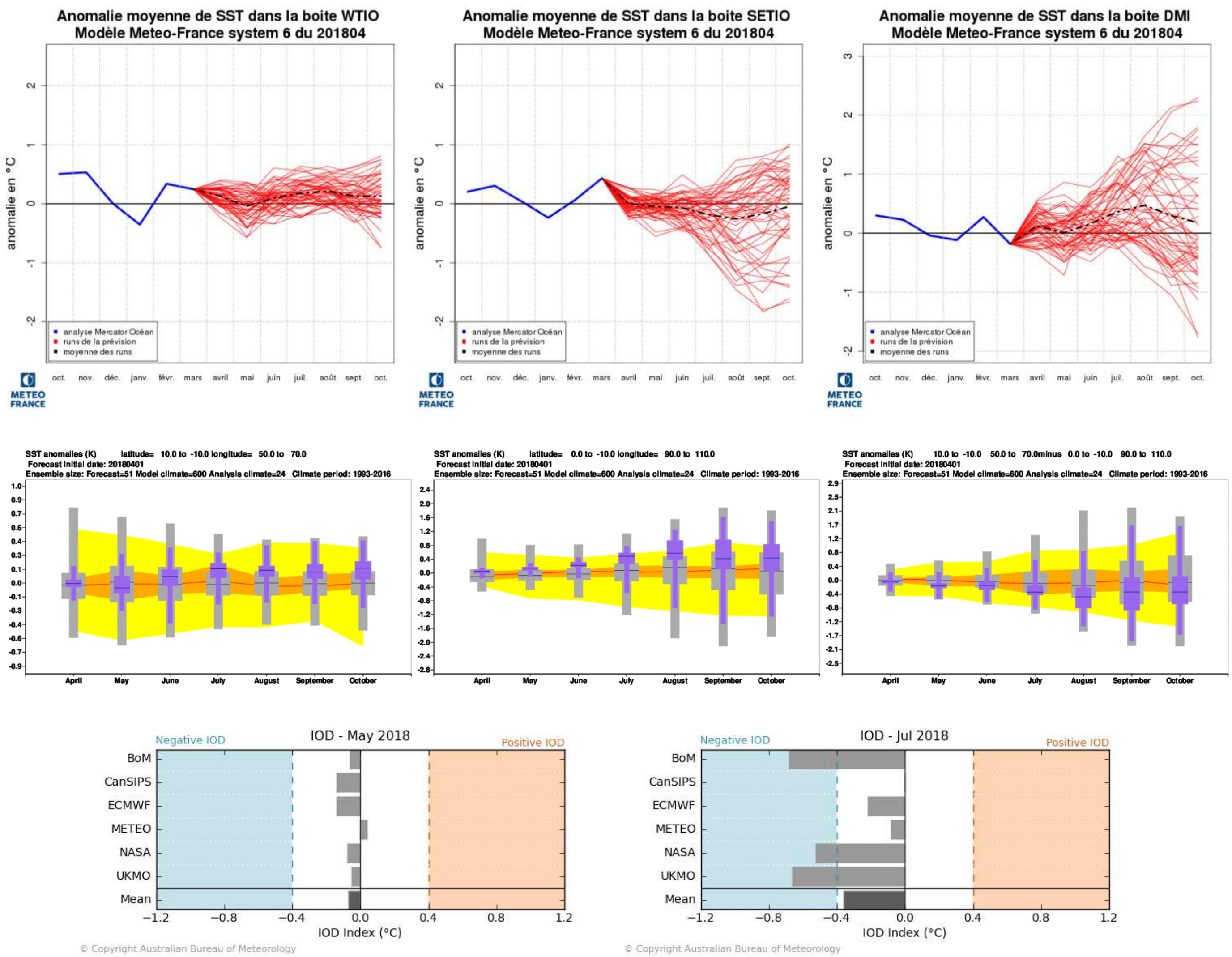
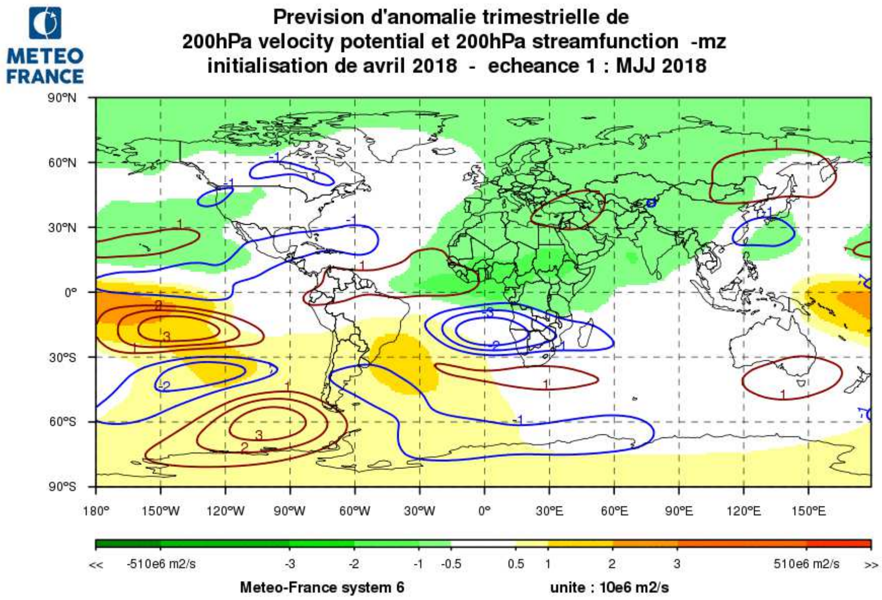


fig.II.1.7: SST anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

II.2. GENERAL CIRCULATION FORECAST

II.2.a Velocity potential anomaly field and Stream Function anomaly field at 200 hPa

- Velocity potential :
  - No agreement between models for the next three months, except over the central tropical Pacific, with negative values to the north (enhanced convection) and positive to the south (inhibited convection), which is consistent with forecast SST anomalies
- Stream fonction : no signal for mid-latitudes in the Northern Hemispere.



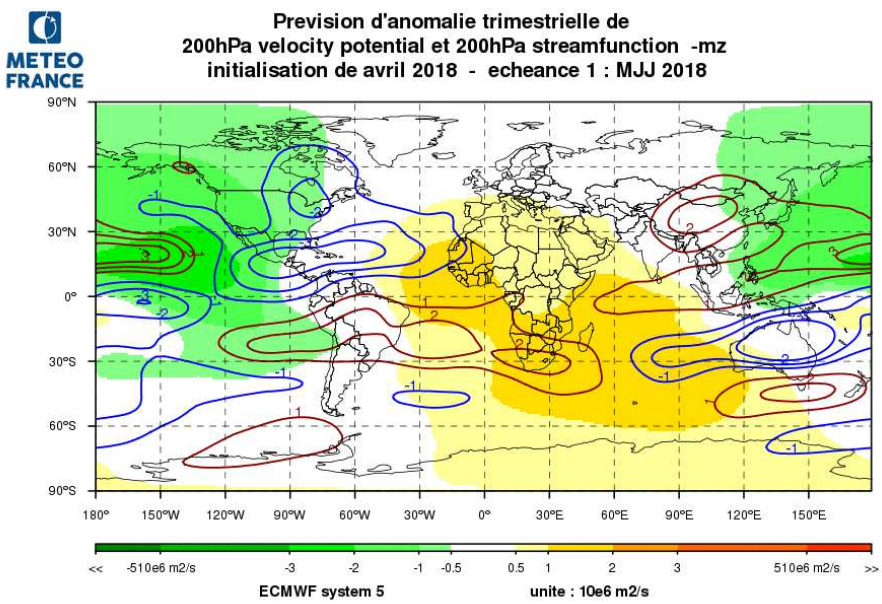


fig.II.2.a: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), associated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa by Météo-France (top) and ECMWF (bottom). http://seasonal.meteo.fr

II.2.b Geopotential height anomalies

MF-S6 Z500 raw anomalies (figure II.2.b.1) show a positive bias this month compared to other models. We will rather focus on its normalized anomalies (figure II.2.b.5), which are close to the Eurosip and to the Lead-Centre mean (figure II.2.b.4)

Which would mean enhanced high over the Azores on one hand, and over the Mediterranean Basin on the other hand.

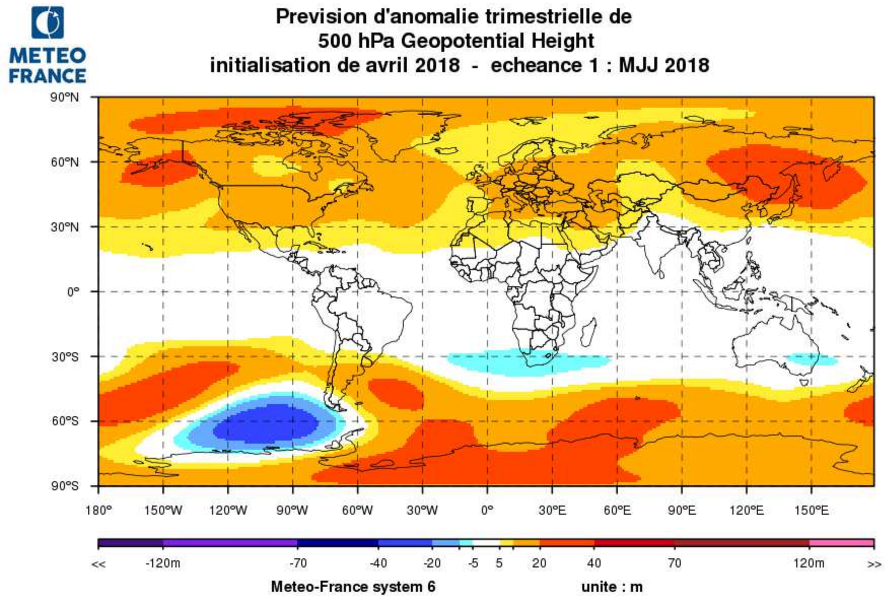


fig.II.2.b.1: Anomalies of Geopotential Height at 500 hPa from Météo-France.
http://seasonal.meteo.fr

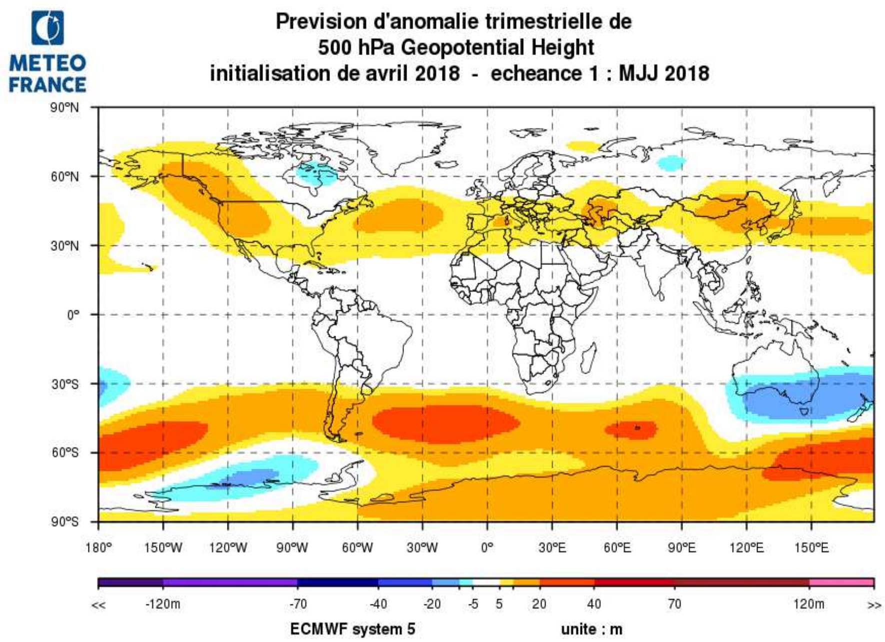


fig.II.2.b.2: Anomalies of Geopotential Height at 500 hPa from ECMWF.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast

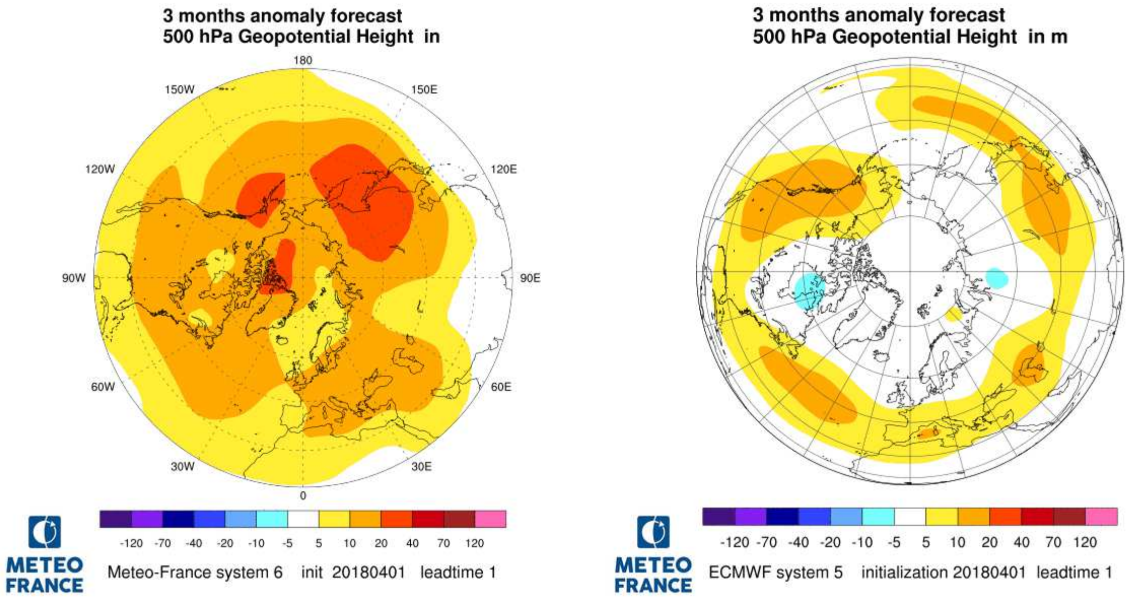


fig.II.2.b.3: Anomalies of Geopotential Height at 500 hPa from Météo-France.
http://seasonal.meteo.fr

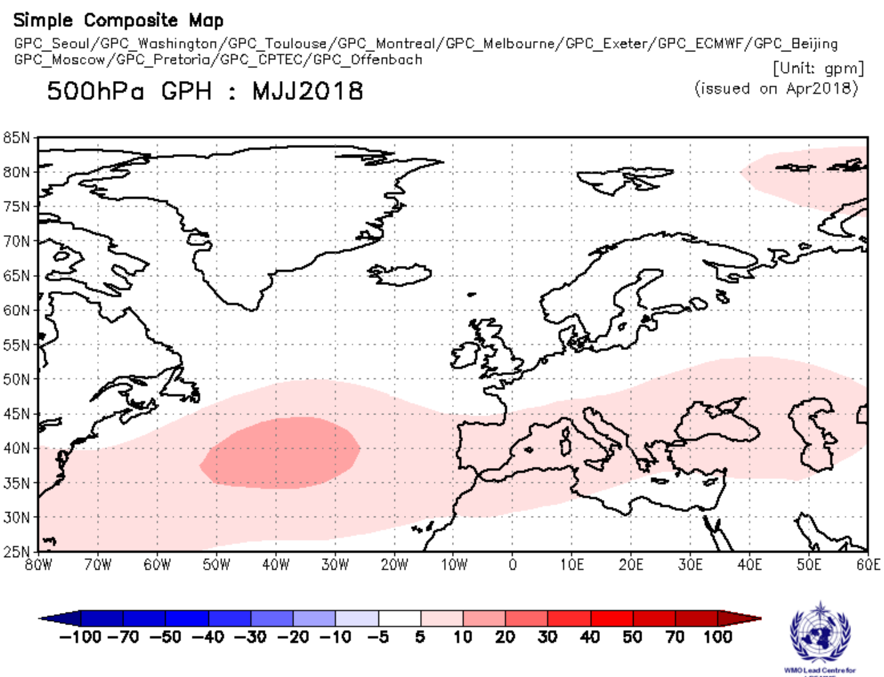


fig.II.2.b.4: Anomalies of Geopotential Height at 500 hPa from wmo lead centre.
https://www.wmolc.org

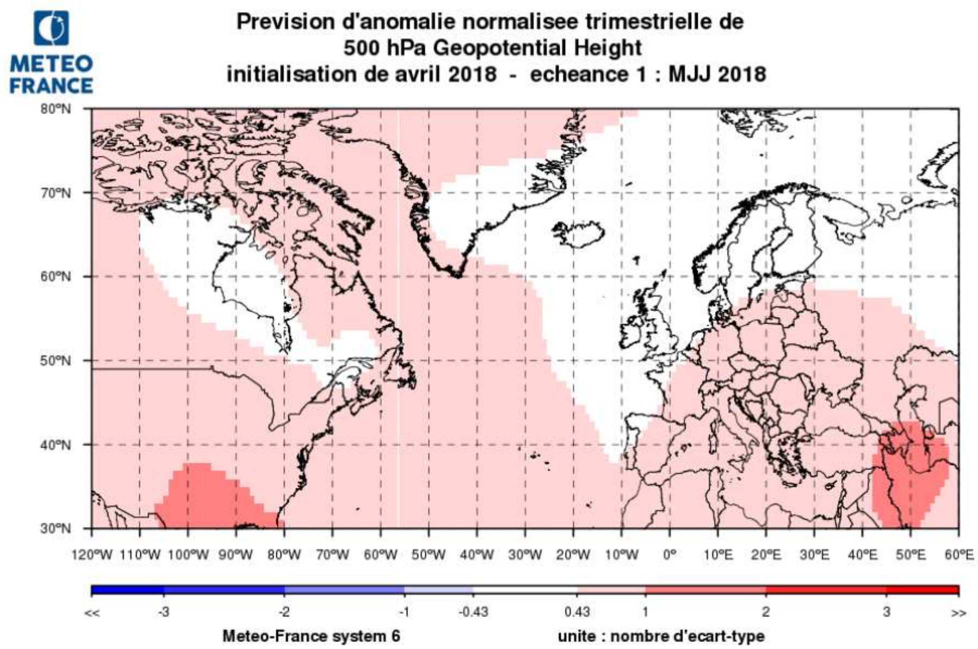


fig.II.2.b.5: Normalized Anomaly of Geopotential Height at 500 hPa from MF-S6
http://seasonal.meteo.fr/">http://seasonal.meteo.fr

II.2.c. modes of variability

MF-S6 and ECMWF-S5 are clearly in favour of a positive EA mode, which would mean hot and dry conditions for much of southern Europe, and cool and wet conditions for north-western Europe.

http://seasonal.meteo.fr/sites/imabul/MODES_MF6.gif" width="900" />
fig.II.2.c.1 : modes of variability forcasts over the Northern hemisphere with Meteo-France MF-S6

http://seasonal.meteo.fr/sites/imabul/MODES_CEP5.gif" width="900" />
fig.II.2.c.2 : modes of variability forcasts over the Northern hemisphere with ECMWF-S5

II.2.d. weather regimes

MF-S6 : no regime favoured, but reduced chances of summer Scandinavian blocking.

ECMWF-S5 : slightly enhanced chances of Atlantic low regime (consistent with EA+ mode)

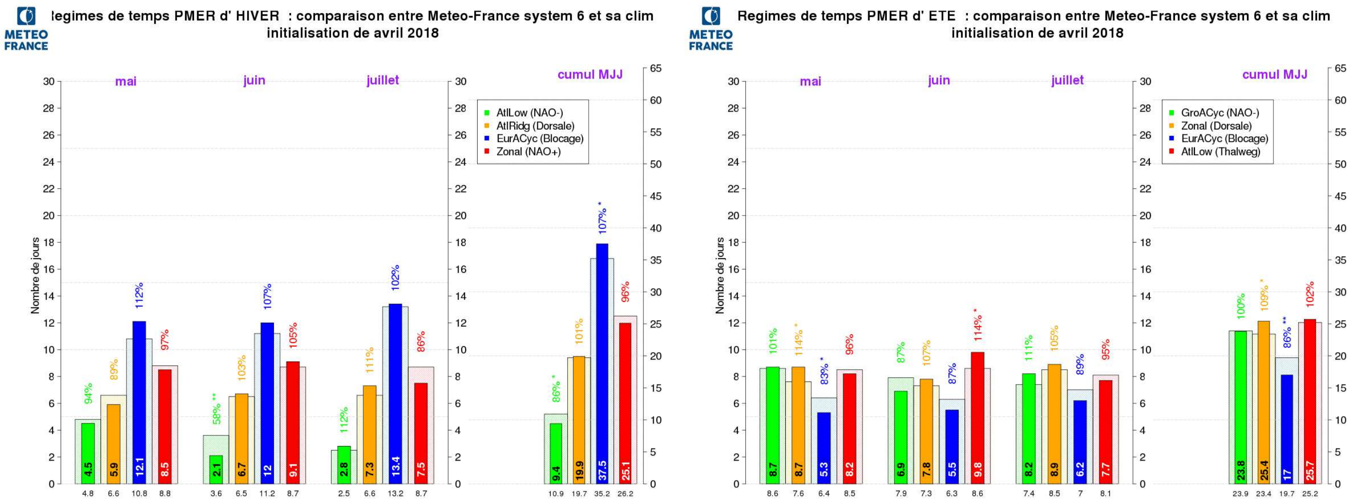


fig.II.2.d.1: North Atlantic Regime occurrence anomalies from Meteo-France MF-S6 : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.
Left : winter regimes; Right : summer regimes

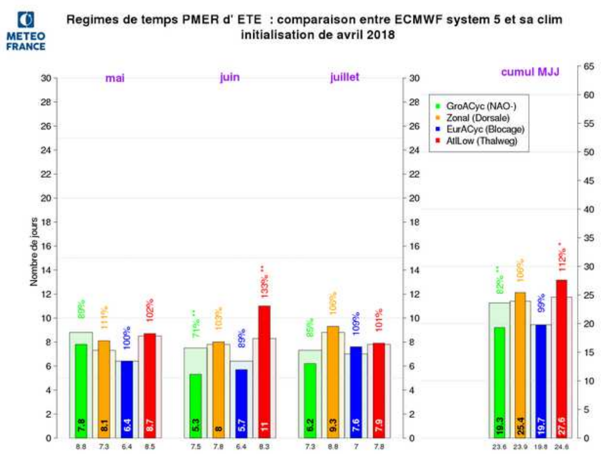


fig.II.2.d.2 : North Atlantic Summer Regime occurrence anomalies from ECMWF-S5 : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes

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

MF-S6 and ECMWF-S5 both favour weather regimes or modes usually associated with warmer than normal conditions over the main part of Europe (except over Atlantic regions). However, the warm signal is not that prominent on the Eurosip and Lead Centre means.

Following this multi-model consensus we will go for a warm anomaly from Greece to the Black Sea and the Middle East, and we will expect cool conditions for the British Isles, western France, northern Spain, and Portugal (mainly due to lingering negative SST anomalies).

Warm signal for Western US and Canada, cool signal for the Eastern parts of these countries, and also over the Indian subcontinent (see monsoon activity below)

II.3.a Météo-France

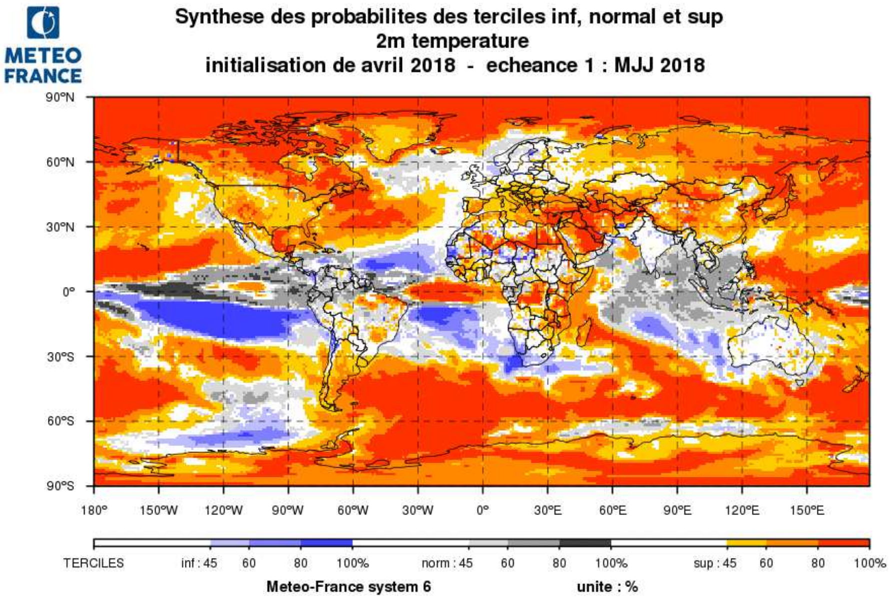


fig.II.3.1: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.3.b ECMWF

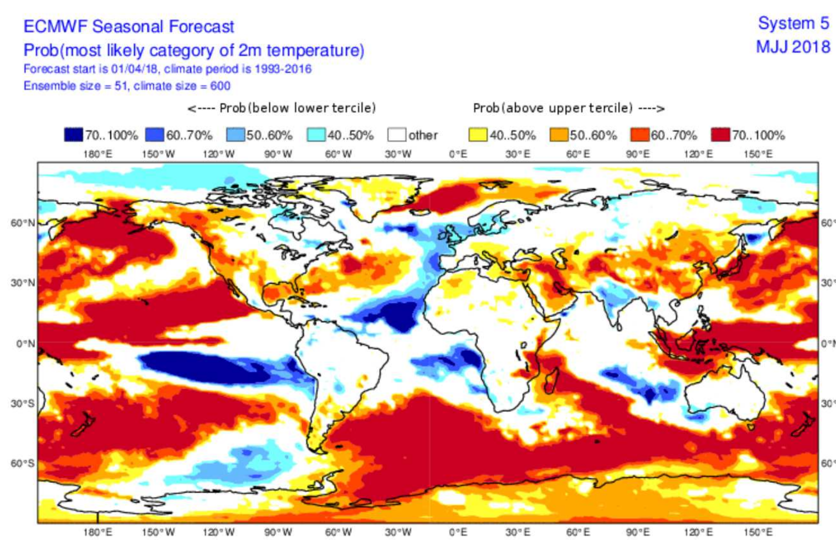


fig.II.3.2: Most likely category probability of T2m from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_ran...">http://www.ecmwf.int/products
/forecasts/d/charts/seasonal/forecast/seaso...

II.3.c Japan Meteorological Agency (JMA)

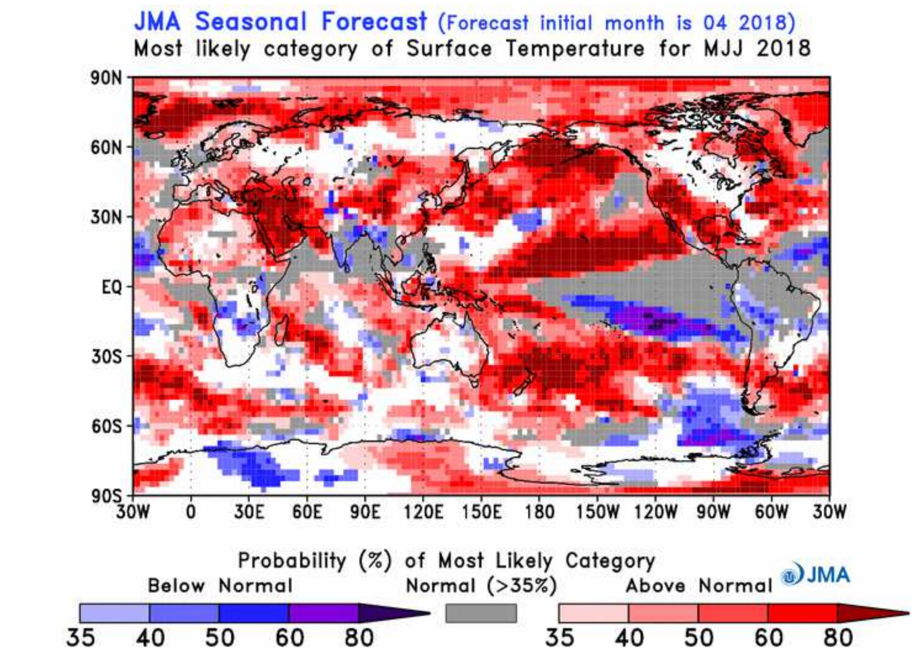


fig.II.3.3: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst...">http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst...

II.3.d EUROSIP

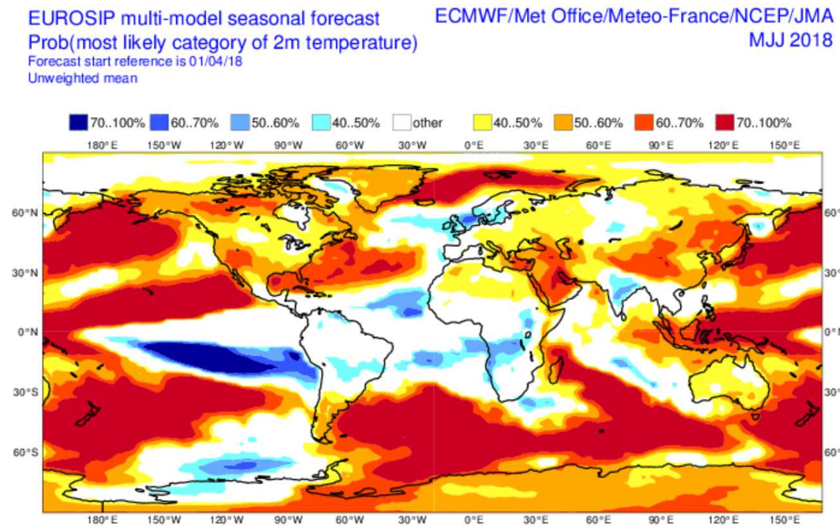


fig.II.3.4: Multi-Model Probabilistic forecasts for T2m from EUROSIP (2 Categories, Below and Above normal – White zones correspond to No signal and Normal).
www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2...">http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/euros...">www.ecmwf.int/products/forecasts/d/charts/seasonal/f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

II.4. IMPACT : PRECIPITATION FORECAST

- inter-tropical regions :
  - For the Pacific basin, wet to the north (incl. Hawai), dry to the south, in agreement with SST anomalies.
  - For the Atlantic, MF-S6 and CFS (not shown) are the only models that forecast wet conditions along the equator. We won't give much credit to this scenario. Over the Carribean region, enhanced dry signal, consistent with cooler than normal SSTs (though there is no atmospheric signal in terms of velocity potential anomalies).
  - For the Indian Ocean, wet conditions expected over the Indian subcontinent, which would account for an active monsoon there.
  - Over Africa, drier than normal conditions expected to the west (especially over Sahelian areas), and wetter than normal conditions for the easternmost countries (Ethiopia, Sudan). These signals are not clearly linked to Velocity Potential anomalies. The colder than normal SSTs off the western coasts of Africa could however partly be responsible for the dry signal over Senegal and Guinea.

- Mid-latitudes :
  - dry signal from Turkey to central Asia (Kasakhstan), and to a lesser extent over the Mediterranean Basin.
  - humid for Alaska and dry for western US and western Canada.

II.4.a Météo-France

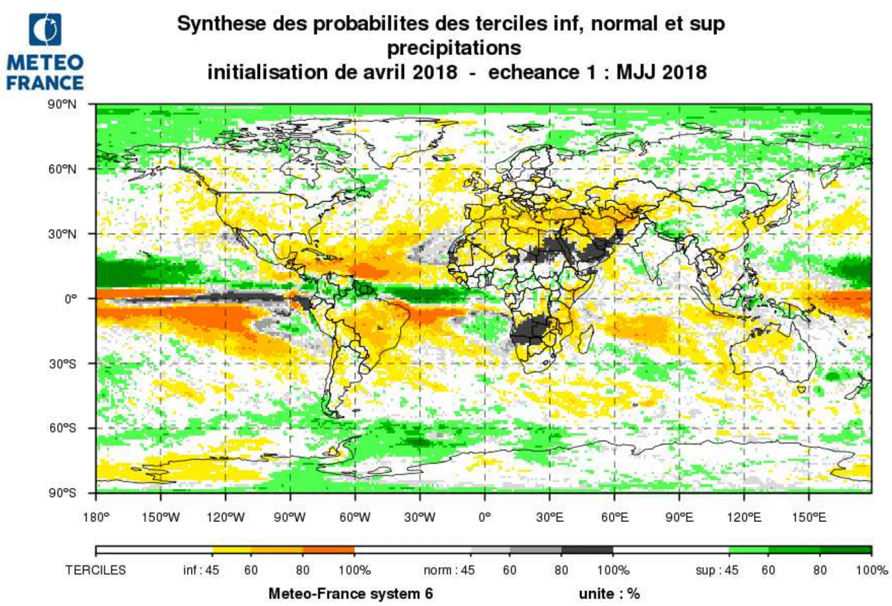


fig.II.4.1: Most likely category of Rainfall. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/">http://seasonal.meteo.fr/

II.4.b ECMWF

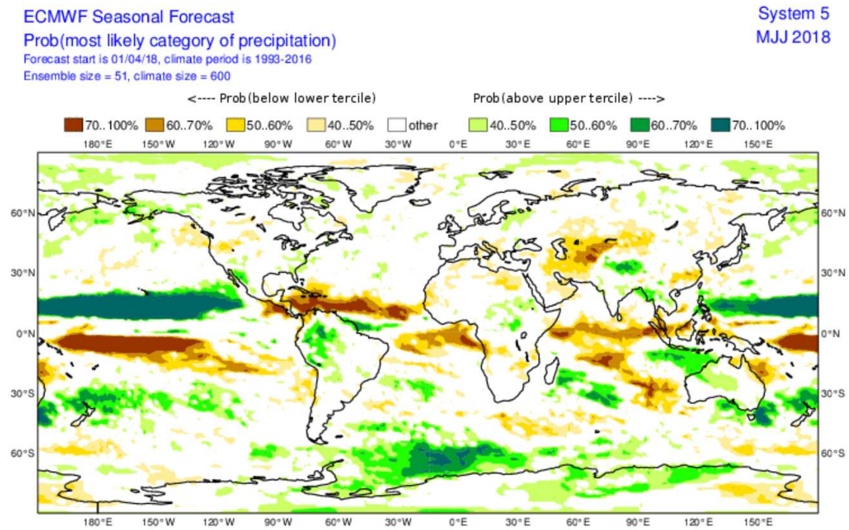


fig.II.4.2: Most likely category probability of rainfall from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal). www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_ran...">http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seaso...">www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_ran...">http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seaso...

II.4.c Japan Meteorological Agency (JMA)

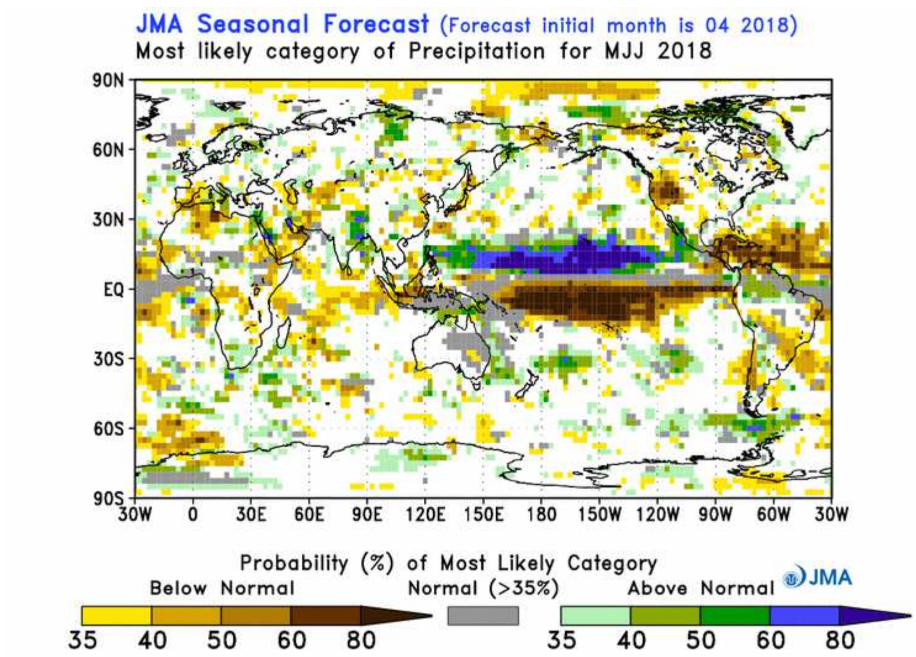


fig.II.4.3: Most likely category of Rainfall from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst...">http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst...

II.4.d EUROSIP

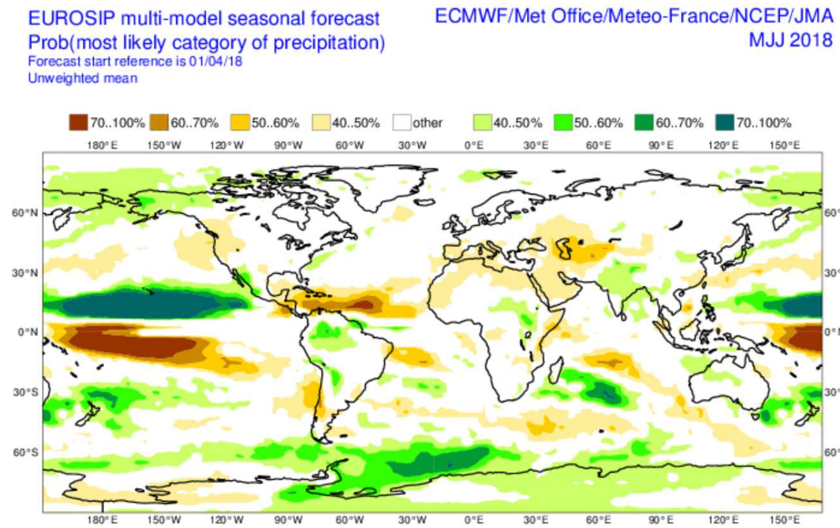


fig.II.4.4: Multi-Model Probabilistic forecasts for precipitation from EUROSIP (2 Categories, Below and Above normal – White zones correspond to No signal).
www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2...">http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/euros...">www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2...">http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/euros...

II.5. REGIONAL TEMPERATURES and PRECIPITATION

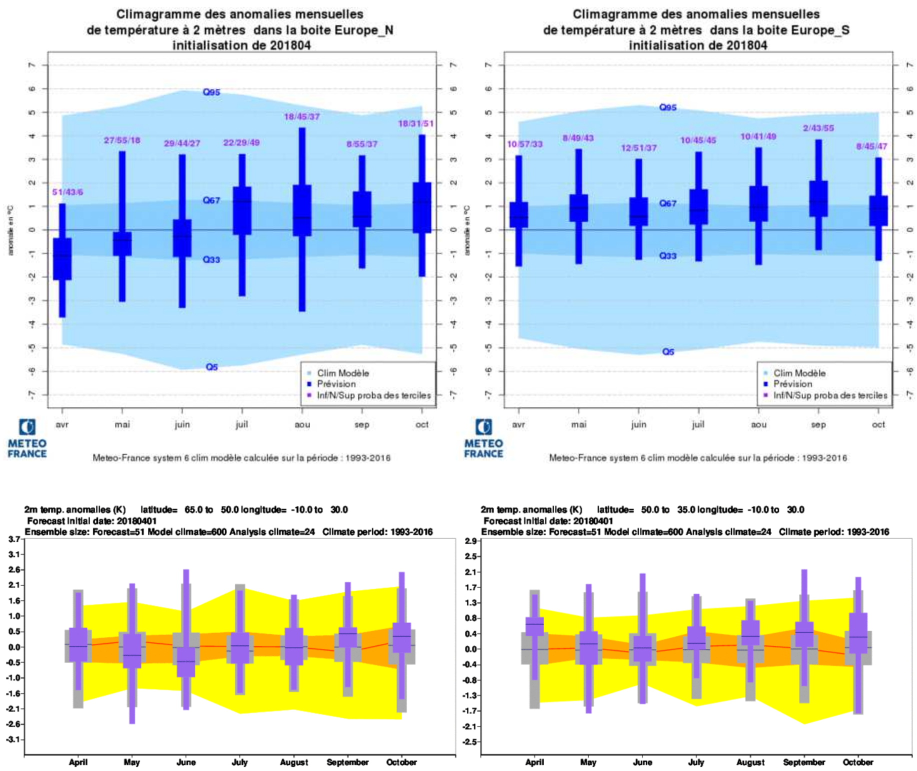


fig.II.5.1 : Climagrams for Temperature in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

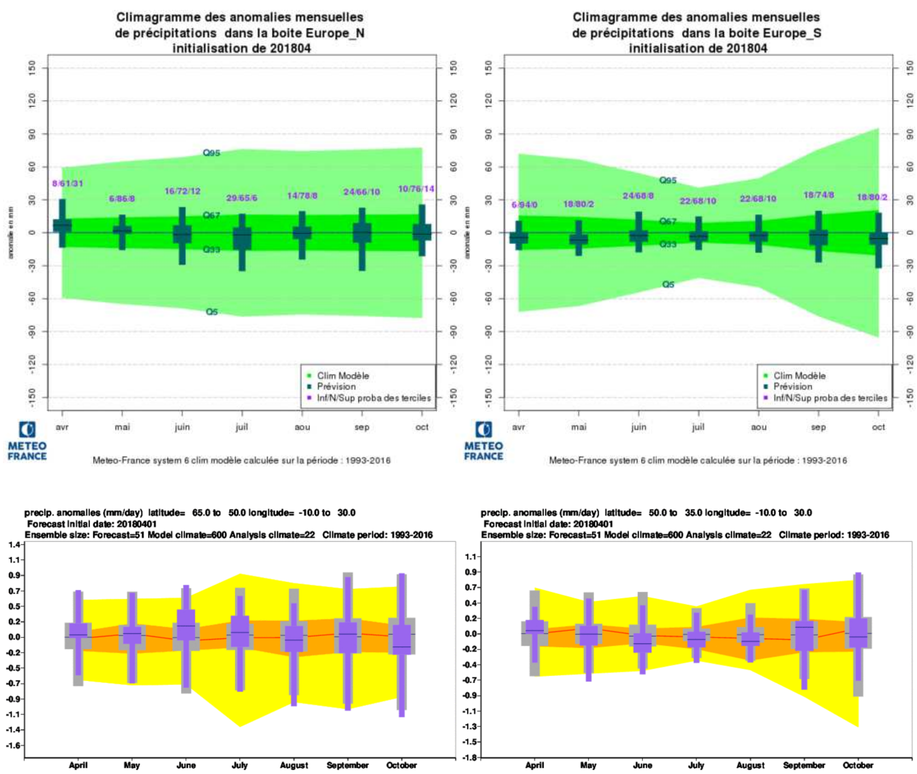


fig.II.5.2 : Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

II.6. "EXTREME" SCENARIOS

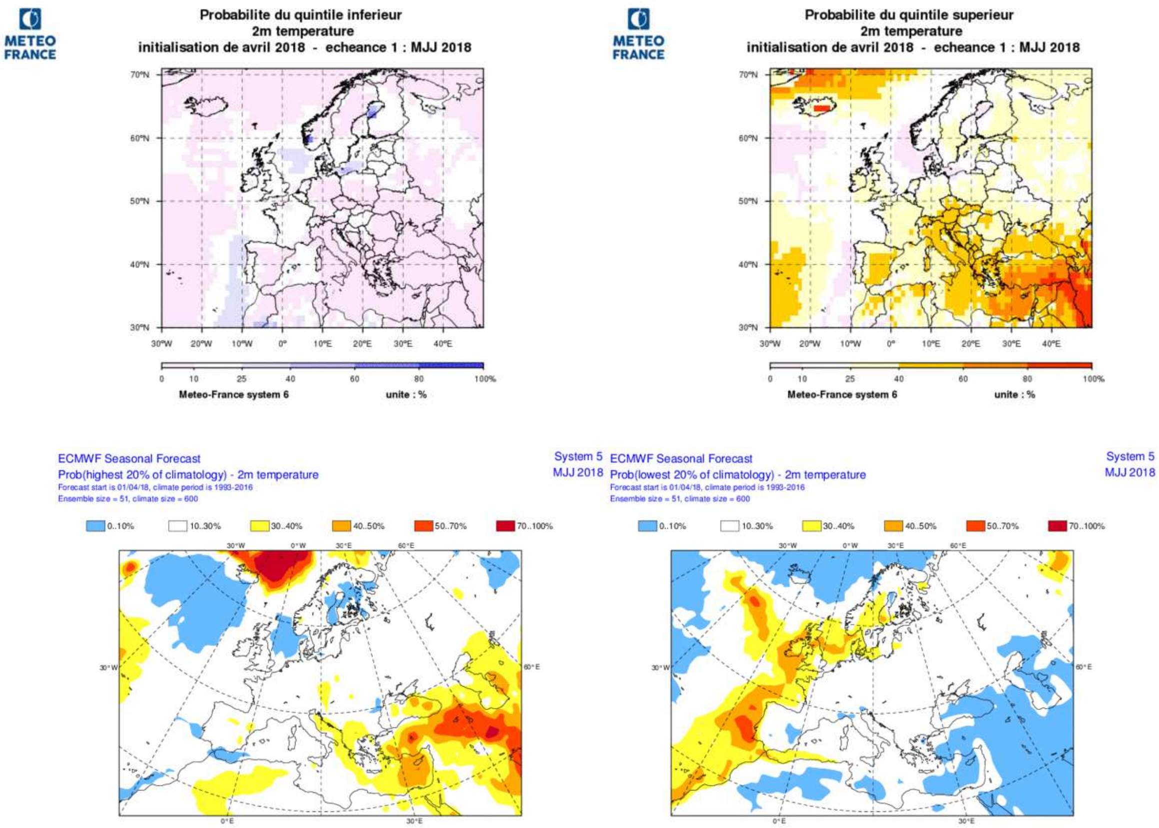
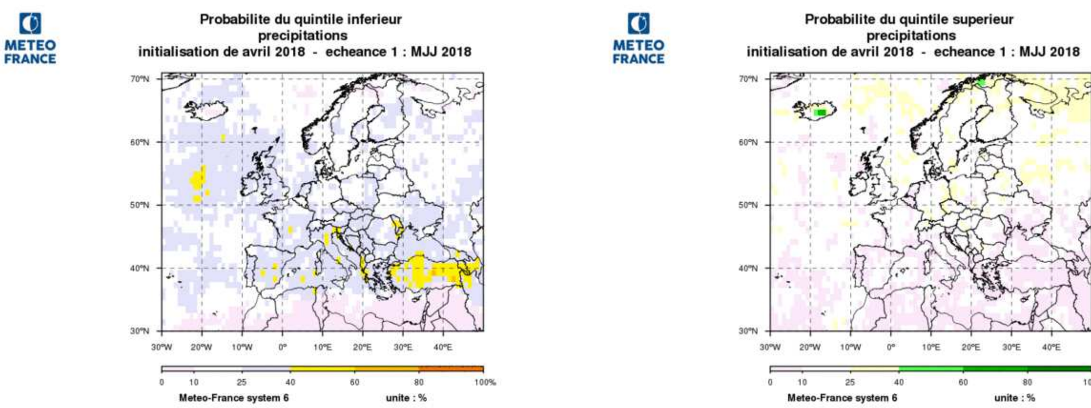


fig.II.6.1 : Top : Meteo-France T2m probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution). Bottom : ECMWF T2m probability of « extreme » below normal conditions (left - highest ~20% of the distribution) and "extreme" above normal conditions (right – lowest ~20% of the distribution).



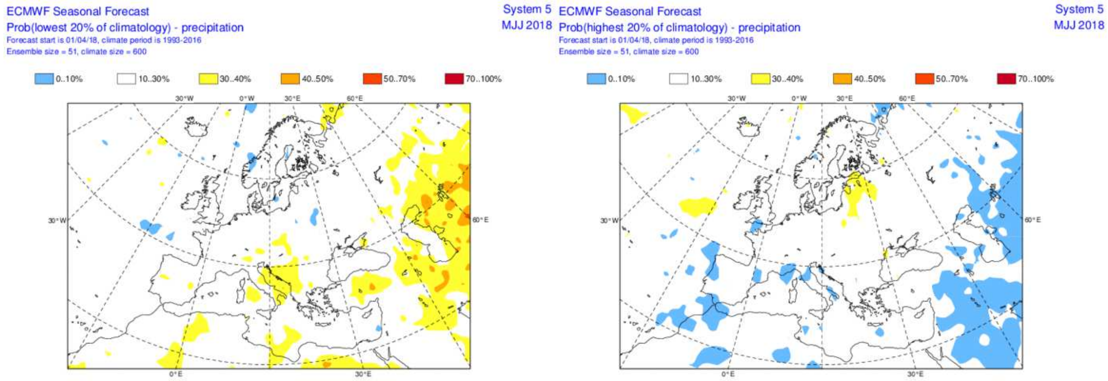


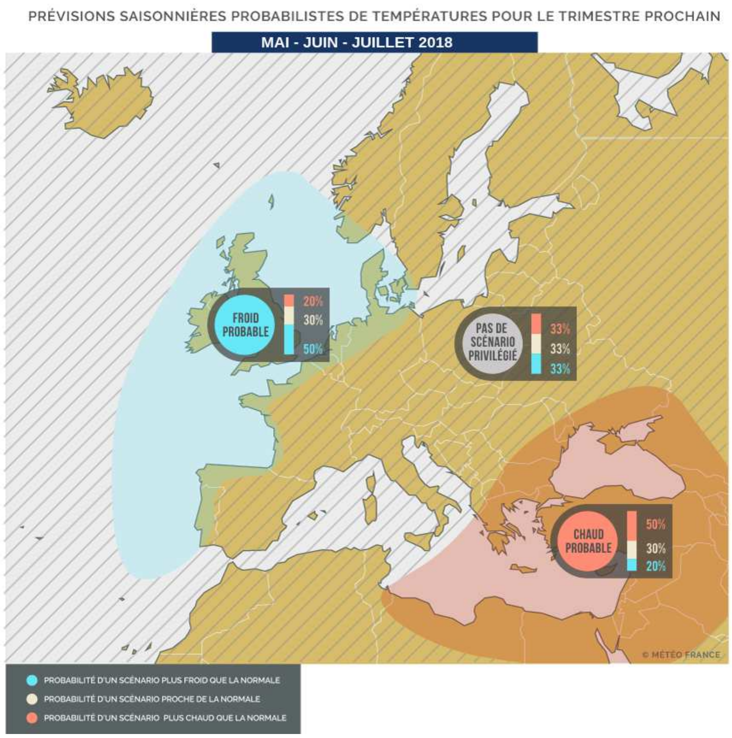
fig.II.6.2 : Top : Meteo-France rainfall probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution).
Bottom : ECMWF rainfall probability of « extreme » below normal conditions (left - lowest ~20% of the distribution) and "extreme" above normal conditions (right – highest ~20% of the distribution).

II.7. DISCUSSION AND SUMMARY

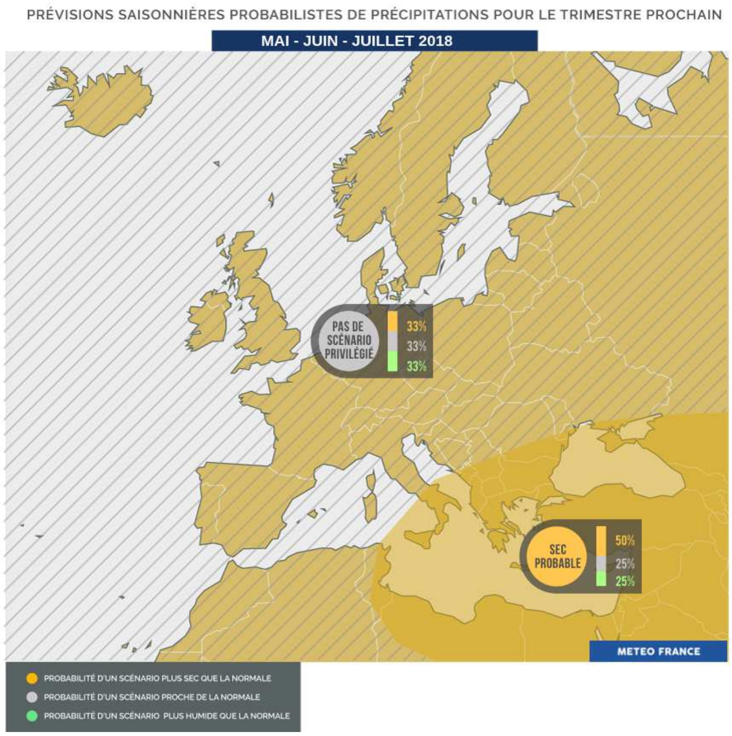
II.7.a Forecast over Europe

Low predictability. As of late April, the "La Niña" event is over, and no signal emerges in terms of atmospheric circulation over the Pacific basin for the next three months. There are no teleconnections with the midlatitudes. However, the models show a slight signal over some parts of Europe for the coming months. For the month of May alone, subseasonal models suggest that the western mediterranean could be wet and cool. Therefore we will exclude this area from the dry signal emerging from the multi-model seasonal consensus.

Temperature : Warm signal for the Eastern Mediterranean and the Middle East, while a cooler signal, largely due to low SSTs, could affect the British Isles, North-western Europe, Western France, Northern Spain and Portugal. Only a blocking regime, which would reduce incoming Atlantic flows, could prevent this cool signal for continental Europe. But this regime is not favoured by the models (see fig II.2.d.1).



Precipitations : Drier than normal conditions likely for the eastern Mediterranean basin and Middle East. No signal elsewhere.



II.7.b Tropical cyclone activity

North Atlantic : in connection with lower than normal SSTs, fewer than normal hurricanes are forecast by ECMWF-S5. However it has to be noticed that this model is one of the most extreme in terms of negative SSTs anomalies. Besides, there is no clear signal in the velocity potential anomalies over this region (at least for next three months). Therefore we will somehow mitigate the ECMWF forecast and go for a normal to slightly less than normal hurricane season.

North Pacific : no significant signal.

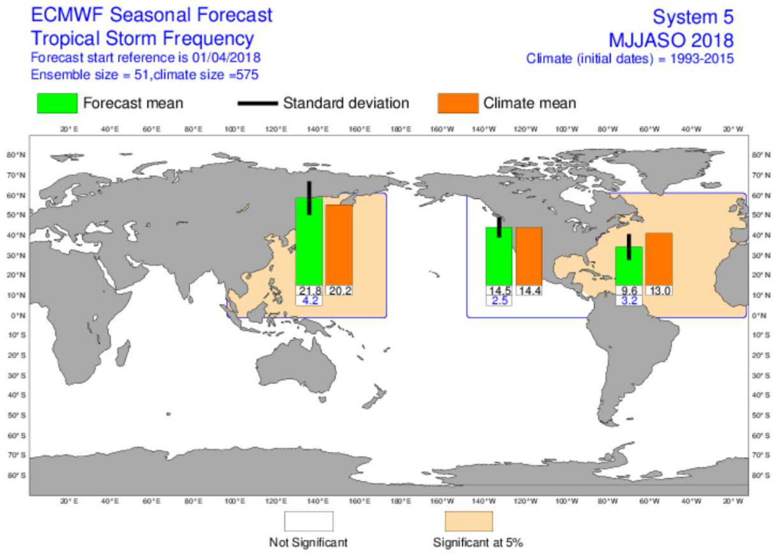


fig.II.7.1 : Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF). www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtr...">http://www.ecmwf.int/products /forecasts/d/charts/seasonal/forecast/euros...">www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast /eurosip/mmtr...">http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/euros...

III.1. Seasonal Forecasts

Presently several centers provide seasonal forecasts, especially those designated as Global Producing Centers by WMO (see www.wmo.int/pages/prog/wcp/wcasp/clips/producers_forecasts.html">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 centers 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 5 models (ECMWF, MF, NCEP, UK Met Office and JMA). 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 interpret 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 www.bom.gov.au/wmo/lrfvs/">http://www.bom.gov.au/wmo/lrfvs/">www.bom.gov.au/wmo/lrfvs/">http://www.bom.gov.au/wmo/lrfvs/) ; scores are also available at the specific web site of each centers.

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 wher e the SST warming is developing first at the surface (especially for coastal events).

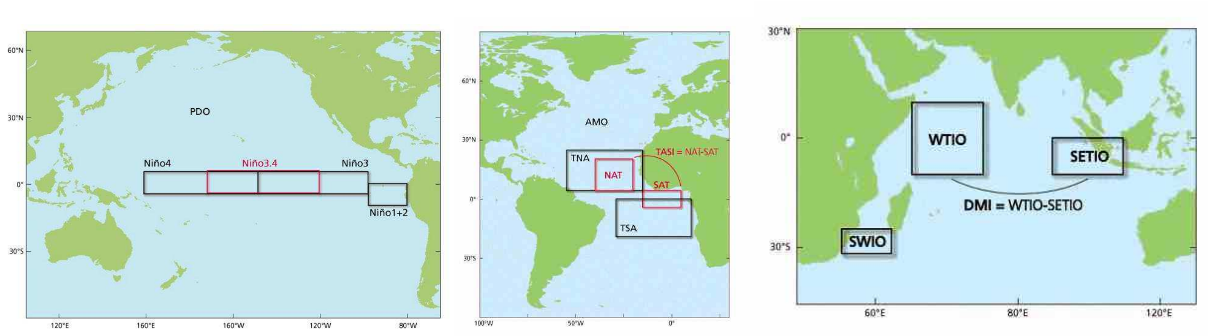
- Niño 3 : 5°S/5°N 90W-150W ; it is the region where the interanual variability of SST is the greatest.

- Niño 4 : 5°S/5°N 160E- 150W ; it is the region 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 be tween Niño 3 and Niño 4 boxes (SST variability and Rainfall impact).

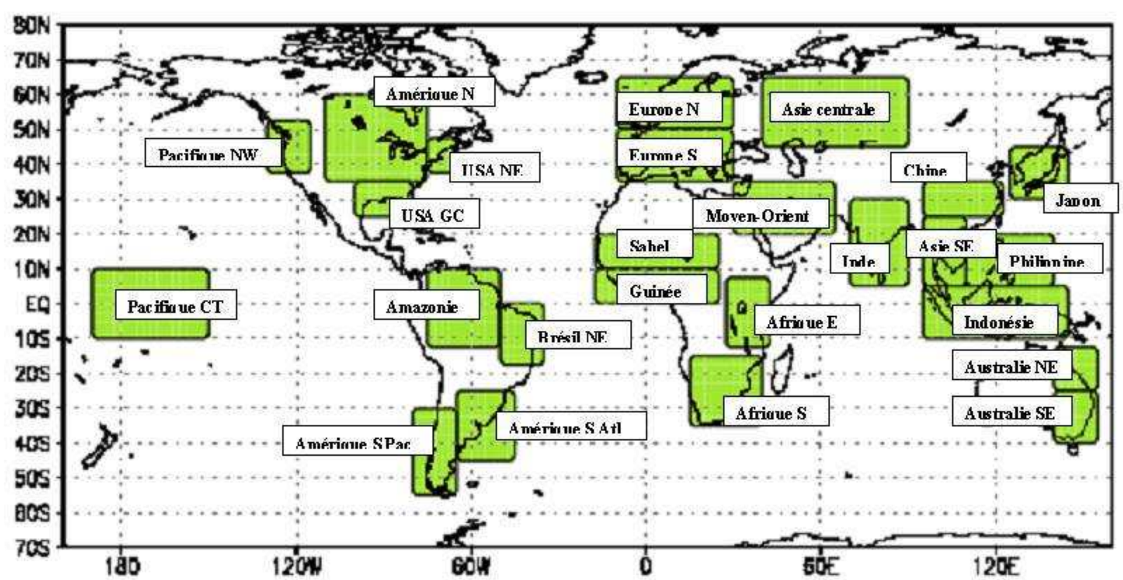
Associated to the oceanic « El Niño / La Niña » events, and taking into account the strong ocean/atmopshere coupling, the atmosphere shows also interanual variability associated to these events. It is monitored using the SOI (Southern Oscillation Index). This indice is calculated using standardized sea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