WMO RA VI
RCC Network

METEO FRANCE

GLOBAL CLIMATE BULLETIN

n°226 – April 2018

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I. DESCRIPTION OF THE CLIMATE SYSTEM (February 2018)

I.1.Oceanic analysis

Over the Pacific ocean :

The weakening of La Niña has continued in February :

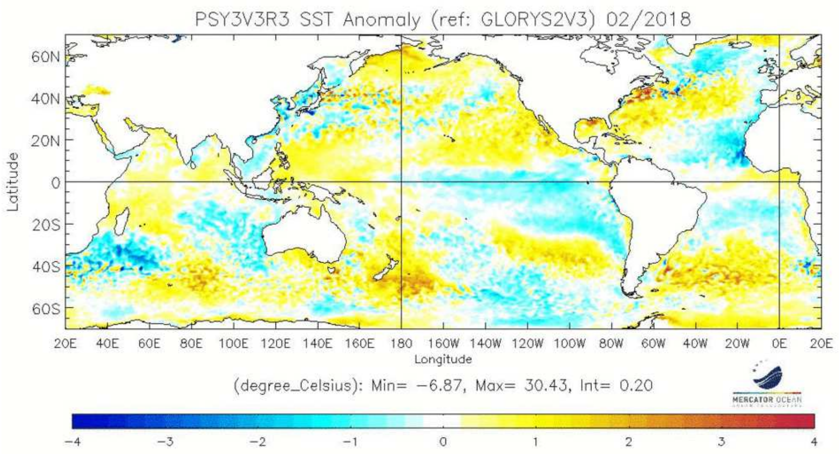
- Along the equator, the anomaly pattern, typical of "La Niña", is still visible but weakened compared to January. One still distinguishes cold anomalies East of the dateline and weak warm anomalies on the Western Pacific. There are now positive anomalies at the extreme East of the equatorial band, (Ecuador coasts) .
  Nino3.4 index : -0.5°C (GLORYS 1992-2009, MERCATOR -Océan)
  In sub-surface, clear evolution with almost disappearance of deep cold reservoir in the Eastern part of the basin, due to the propagation of a Kelvin Wave (see fig. I.1.5).
- In the northern hemisphere, mainly positive anomalies No clear PDO pattern visible, the NOAA PDO index is neutral (-0.1 https://www.ncdc.noaa.gov/teleconnections/pdo/)
- In the southern hemisphere, warm anomalies in the Western part of the basin. Stilll strong positive anomaly around New Zealand.

Over the Indian Ocean :

- warm anomalies (<1°C) in the Northern hemisphere, W est (positive anomalies) / East (negative anomalies) contrast South of 20°S. Strong negative anomalies South of Madagascar.
- DMI slightly positive (source : MERCATOR-Ocean)

Over the Atlantic:

- In the North Atlantic,horseshoe anomaly pattern, with cold anomalies along West Africa coasts and South-East of Greenland (cold blob). Positive anomaly in the Gulf of Guinea, extending along the equator.



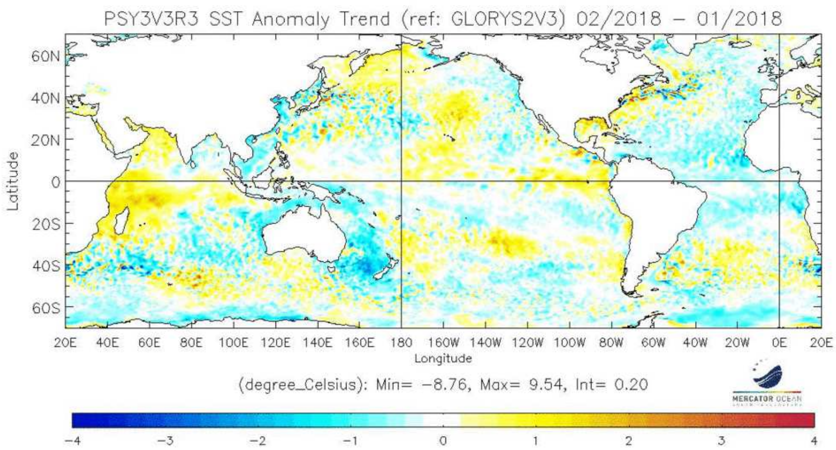


fig.I.1.1: top : SST Anomalies (℃) . Bottom : SST tendency (current – previous month), (reference Glorys 1992-2013).

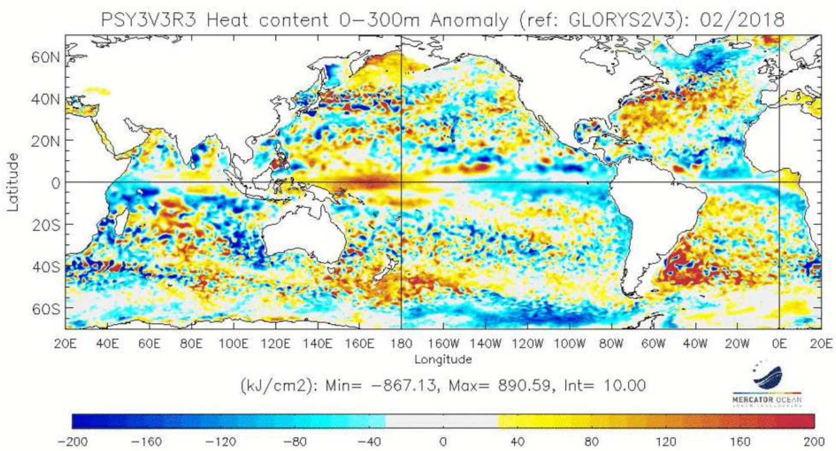


fig.I.1.2: map of Heat Content Anomalies (first 300m, kJ/cm2, reference Glorys 1992-2013)

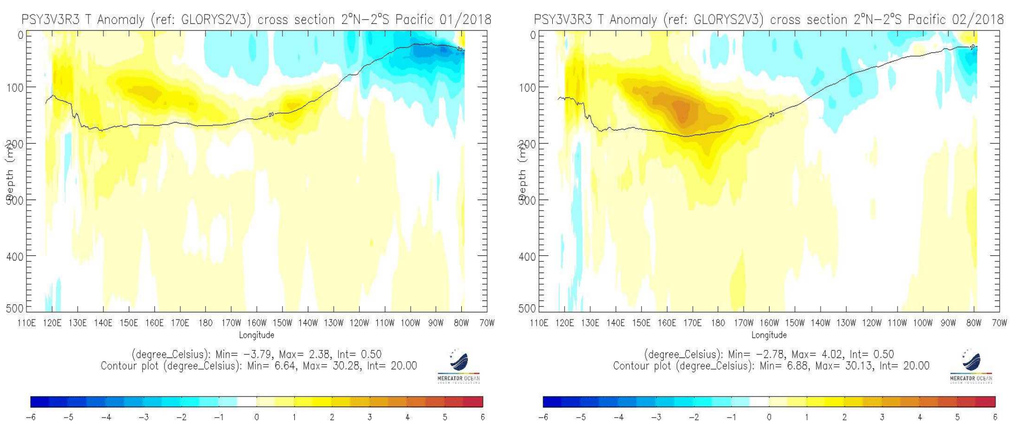


fig.I.1.4: Oceanic temperature anomaly in the first 500 meters in the Equatorial Pacific (previous and current month)

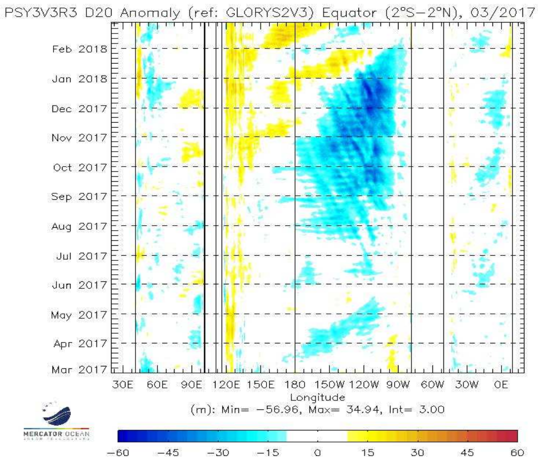


fig.I.1.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20℃ isotherm) along the equator for all oceanic basins over a 6 month period

Sea surface temperature near Europe :

European Arctic Sea: Still very warm, no significant change of anomalies

North Sea: close to normal, no significant change.

Baltic Sea: only frozen in the north and east, in the south above normal, not much change of anomalies.

Cold blob south of Greenland/Iceland: some slight intensification and extension to the north and east, even in the subsurface. On the other hand, some SST cooling around Ireland/UK might also be due to the cold wave over Europe end of February.

Subtropical East Atlantic: Cooling close to Iberia/Biscay, SST anomalies turned to negative values, but only slightly in the subsurface. At least partly affected by the cold wave in Europe end of February.

Mediterranean: Mostly slightly warmer than normal, some central parts around normal. No significant change compared to January.

Black Sea: still warmer than normal, especially in the east, no significant change compared to January.

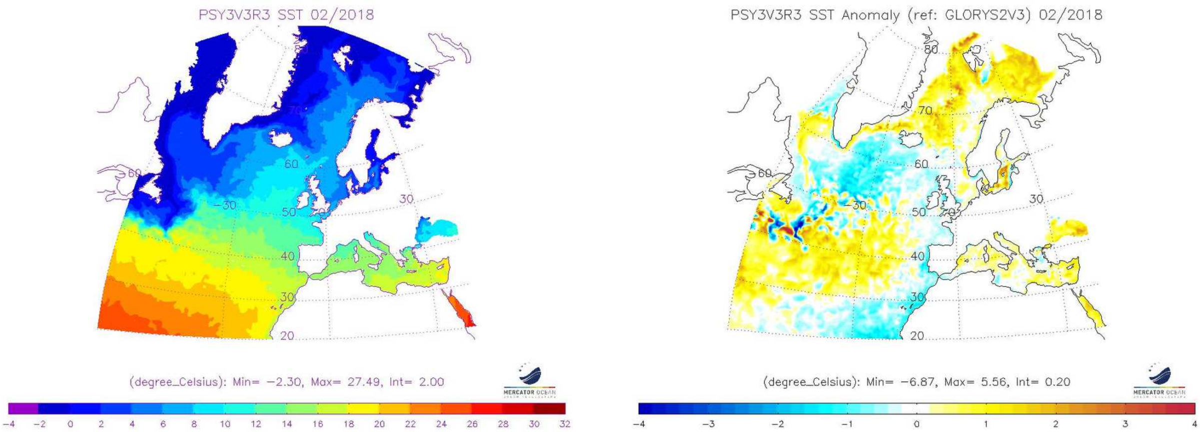


fig.I.1.6 : Mean sea surface temperature in the RA VI Region (Europe) and anomaly (reference Glorys 1992-2013).

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) :

- major changes compared to January, mainly sue to MJO
- the main anomaly poles are located on Africa (upward motion anom.) and Indian Ocean (downward motion anom.), consistent with usual consequences of phases 7,8 and 1 of MJO.
- over the equatorial Pacific and the Maritime Continent, weak anomalies : La Niña impacts disturbed by MJO
- on far East Pacific and the Carribean region, strong positive anomaly (downward motion anom.) not attribuated to MJO : possibly a trace of negative PNA ?

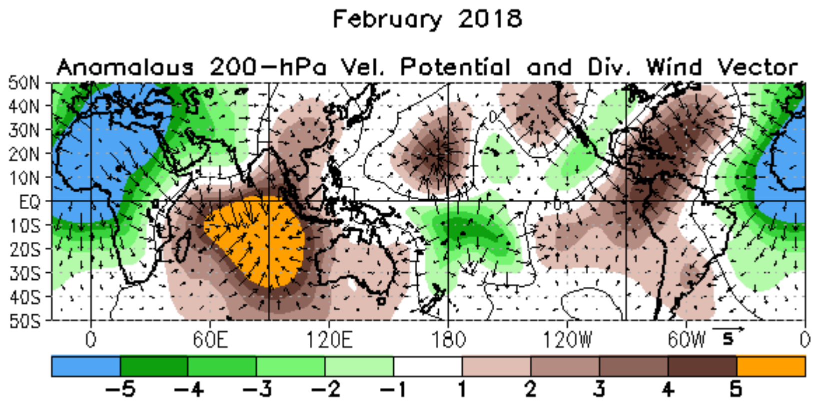


fig.I.2.1.a: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly). http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

SOI :

- SOI index : -0.5 (NOAA Standardized SOI: https://www.ncdc.noaa.gov/teleconnections/enso/indicators/soi/ .) The "La Niña" impact has been probably overtaken by MJO
  MJO (fig. I.2.1.b)

- remarkably active MJO during last February

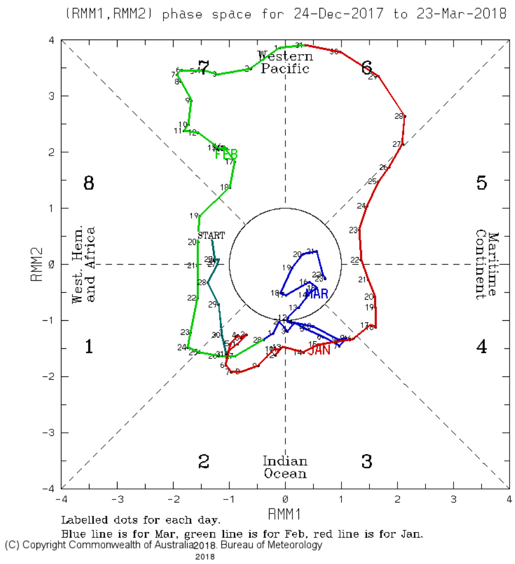


fig.I.2.1.b: indices MJO http://www.bom.gov.au/climate/mjo/

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

- Indian Basin : on both side of the equator, large cyclonic anomalies, likely linked to the strong downward motion anomaly that has persisted all along the month. But no trace of teleconnection toward mid-latitudes.
- similar configuration on the East Pacific (North hemisphere), linked to downward motion anomaly over Central America.
- PNA index : -1.5 (source Météo-France), but no obvious cause has been identified in the Velocity potential anomaly fied.

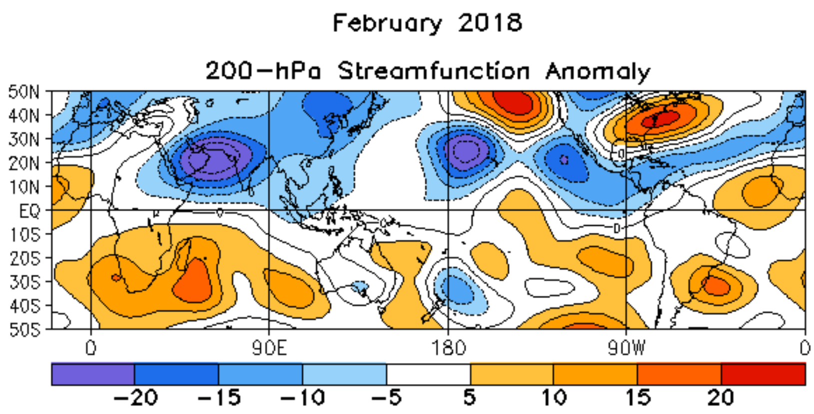


fig.I.2.2: Stream Function Anomalies at 200 hPa.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

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

- clear negative PNA pattern (-1.5 , source Météo-France, -1.7 source NOAA), usual consequence of La Niña
- On Eastern Atlantic (North hemisphere) and Europe, North-South gradient with a negative anomaly on Western Europe (extending up to Morrocco and Algeria) and a postive anomaly North of Scandinavia. There is a projection on the positive phase of NAO (true over the Atlantic Ocean, but not over Europe) : this is directly linked to the negative PNA pattern. There is also a good projection on the negative phase of EA (East Atlantic) with a shift in longitude and on the positive phase of Scandinavian Blocking.
- over the Mediterranean Basin, West (negative anom.) / East (positive anom.) contrast.

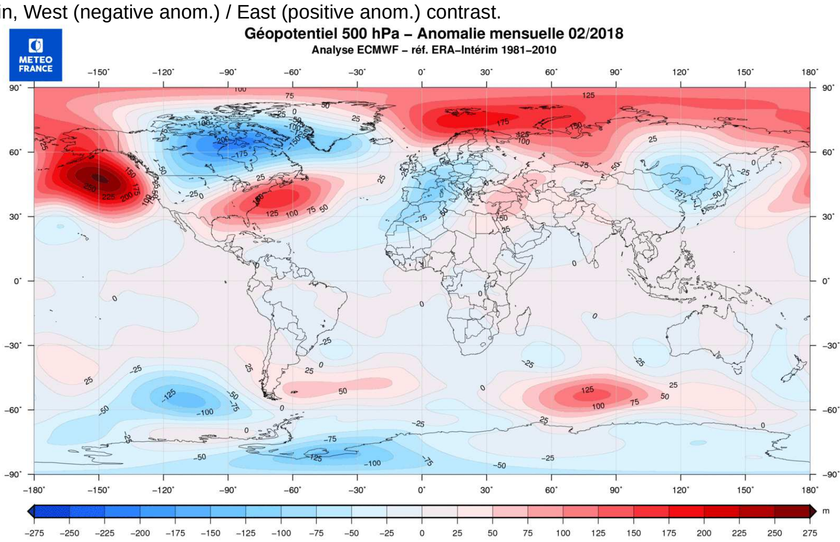


fig.I.2.3: Anomalies of Geopotential height at 500hPa (Meteo-France)

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
FEB 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).

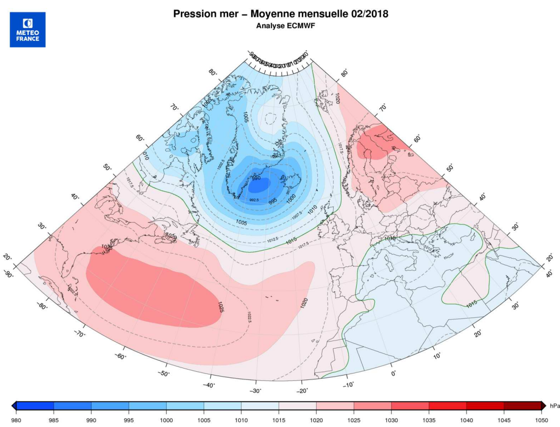
Sea level pressure and circulation types over Europe

SLP pattern over North Atlantic / Europe is characterized by four distinct pressure centres, all more intense than normal. This pattern also is visible in 500hPa – quite outstanding for that season and implying quite intense vertical circulation. The Icelandic Low – Azores High dipole over the North Atlantic caused a notable NAO+ phase, which intensified during this winter (from +0.7 in December 2017 to +1.3 in February 2018).

However, the European continent was mostly influenced by the second dipole (Siberian High with extension to northern Europe – Mediterranean Low), particularly by cold air advection from the east. In terms of NOAA CPC circulation indices, several indices contributed to that pattern, mainly EA- (-1.4), SCAND+ (+0.4, weaker because high pressure was mainly confined to the north of Scandinavia), and POLEUR (-2.2, due to weak polar vortex).

In addition, a west-east dipole particularly over the Mediterranean region can be identified near surface as well as in 500 hPa, reflecting an EATL/WRUS- pattern (-1.4).

MF weather type classification shows highest contributions from Scandinavian Blocking (11 days) and NAO+ (10 days), which means that the monthly mean SLP distribution was a result of mainly two competing patterns. NAO+ dominated in mid-February, Scandinavian Blocking rather in the later days of the month. This is also confirmed by Hess/Brezowsky classification (westerly types in mid-February during one week, northeasterly/easterly types in late February).



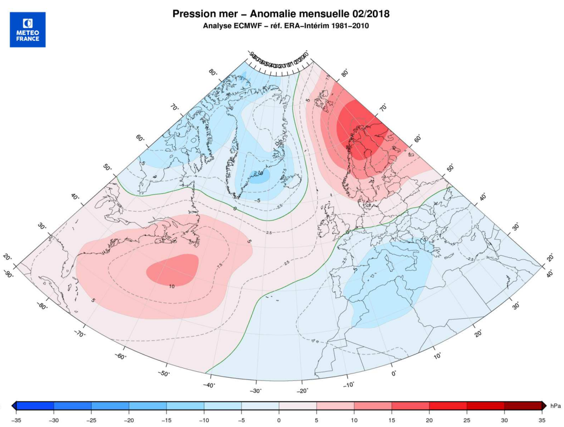


fig.I.2.4: Mean sea level pressure in the RA VI Region (Europe) (top) and 1981-2010 anomalies (bottom).

Circulation indices: NAO and AO

NAO was in positive phase most of the month, in continuation from January. Only on the very last days there was a sharp switch to a negative phase, in accordance with daily weather type classification results.

AO mainly follows the NAO pattern, though with higher variability, but the sharp switch to negative values at the end of month can also be identified here. This means that this was a hemispheric circulation change to a more intense meridionalisation.

As a reason assumed for this circulation change, a sudden stratospheric warming took place at the end of February, which splitted the polar vortex. RCC issued two Climate Watch Advisories (cold wave in Europe and precipitation over the Mediterranean). See WMO publication for more information:

https://public.wmo.int/en/media/news/arctic-warmth-contrasts-europe-wide-chill

Stratospheric temperature (NASA): https://acd-ext.gsfc.nasa.gov/Data_services/met/ann_data.html

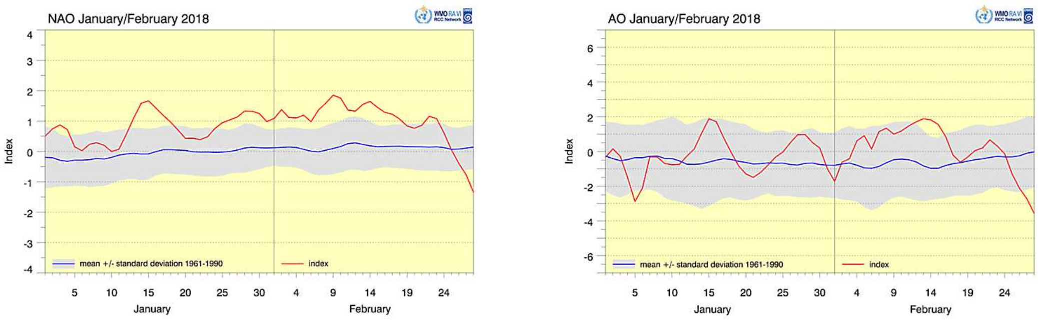


fig.I.2.5: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices with 1961-1990 mean standard deviation (shading). http://www.dwd.de/rcc-cm , data from NOAA CPC: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

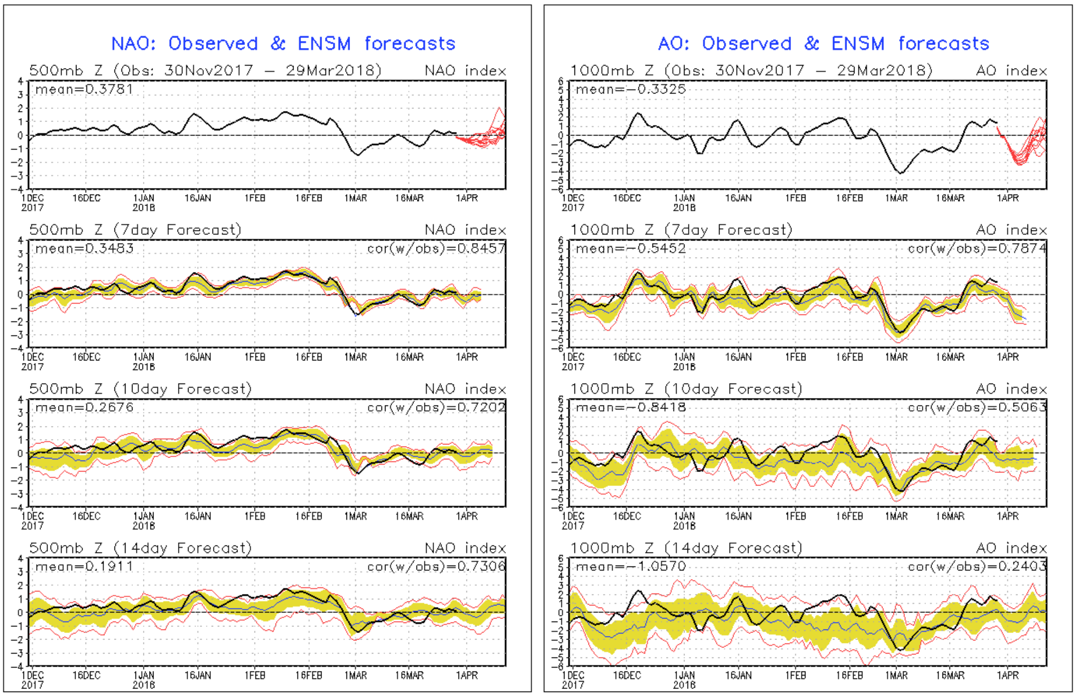


fig. I.2.5a: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices for the last 4 months and forecasts for the following weeks. Source: NOAA CPC, http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

I.2.b Precipitation

- In the equatorial band, very different response from usual La Niña consequence. However good correaltion with 200hPa velocity potential anomalies, which were directly influenced by MJO in February. In particular :
  - the only region with strong positive anomaly in the equatorial Pacific is located around the dateline, under the negative 200hPa VP anomaly (upward motion anomaly)*
  - strong precipitation deficit over the Indian Ocean
  - positive anomaly over Equatorial Africa.
- over Europe, North-South contrast. Strong positive anomaly from Italy to Balkans. Globally over Europe, quite good consistency with usual impacts of the negative phase of the East-Atlantic mode of variability (http://seasonal.meteo.fr/fr/content/suivi-clim-modes-impacts).

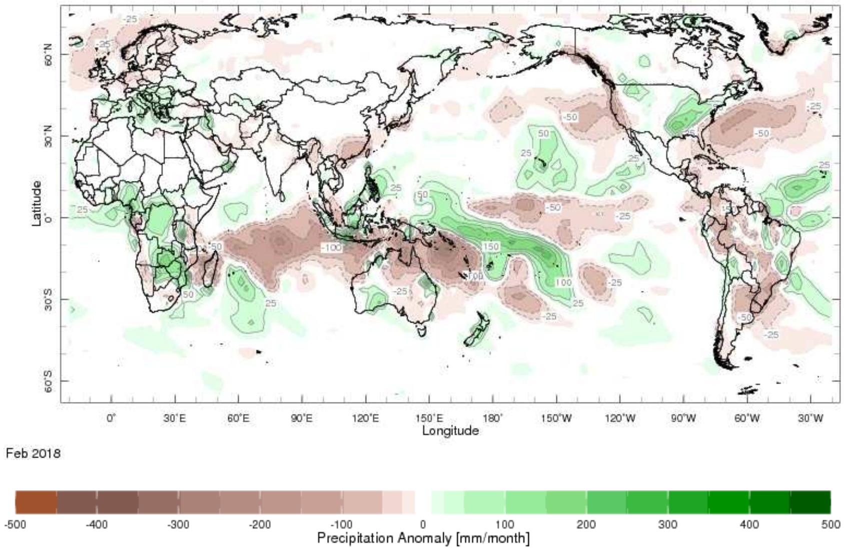


fig.I.2.6: Rainfall Anomalies (mm) (departure to the 1979-2000 normal).
Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/Anomaly.html

Precipitation anomalies in Europe:

Well-below precipitation in much of western, northern and central Europe, mainly due to dominating high pressure influence, although there was wide-spread snow in these areas, but obviously with low snow water equivalent. Even extreme drought conditions over central Europe, but with only little impact due to vegetation dormancy.

In contrast, heavy precipitation particularly over the western/central Mediterranean/Balkans in the low pressure area, but relatively dry over Turkey/Georgia (EATL/WRUS- dipole).

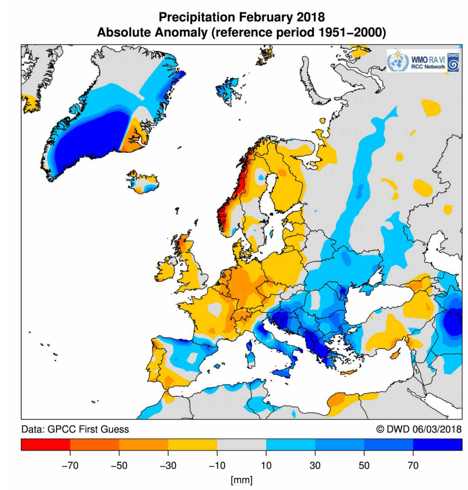


fig.I.2.7.a : Absolute anomaly (1951-2000 reference) of precipitation in the RA VI Region (Europe), data from GPCC (Global Precipitation Climatology Centre), http://www.dwd.de/rcc-cm.

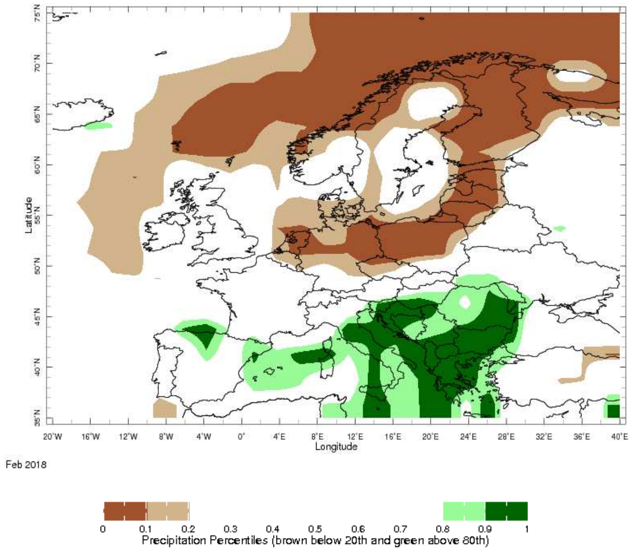


fig.I.2.7.b : Percentiles of precipitation, 1981-2010 reference. Data from NOAA Climate Prediction Center, http://iridl.ldeo.columbia.edu/maproom/Global/Precipitation/Percentiles.html

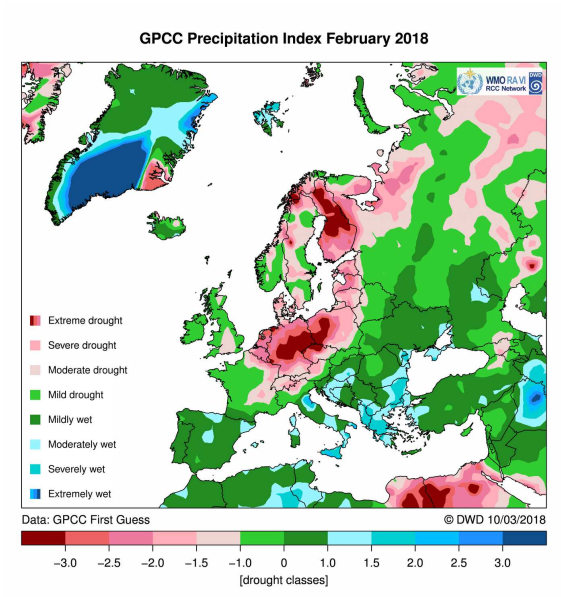


fig. I.2.8: GPCC Precipitation Index, http://www.dwd.de/rcc-cm .

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

Subregion	**Absolute anomaly**	**GPCC Drought Index**
Northern Europe	- 17.9 mm	- 1.467
Southern Europe	+ 16.6 mm	+ 0.357

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

- still very strong positive anomalies on the Arctic, and northern Siberia
- over Europe, large negative anomaly (~-2℃), in con trast with strong positive anomalies on the Middle East region (~+3℃). This is consistent with the usual impacts of the negative phase of the East-Atlantic mode of variability, and with of the Scandinavian Blocking (http://seasonal.meteo.fr /fr/content/suivi-clim-modes-impacts).
- Over North America, classical impact of negative PNA.

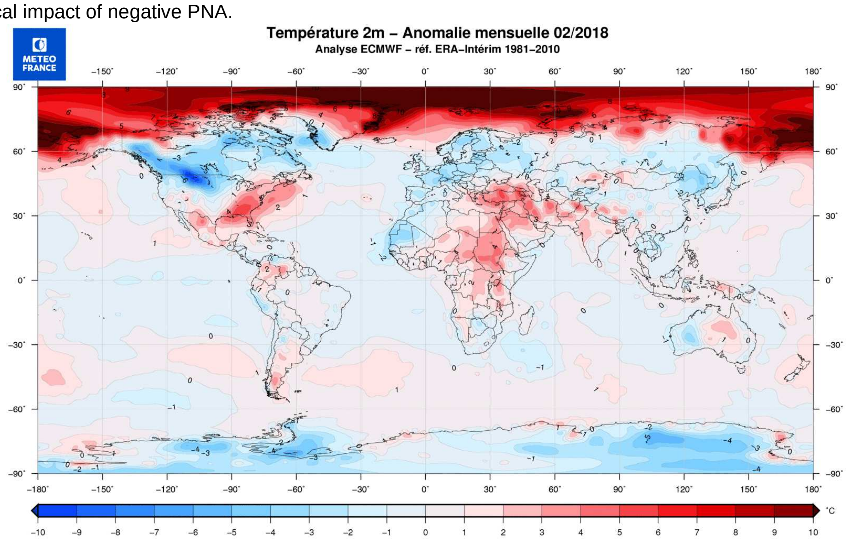


fig.I.2.9: Temperature Anomalies (℃) (Meteo-France)

Temperature anomalies in Europe:

February was a cold month in Europe except the northeast. Mainly contributed by a cold wave in the last week of the month during the easterly weather type phase, especially at the end of the month, when polar air advanced at the beginning of AO- phase. Cold air spread even to western and southwestern Europe within EA- phase.

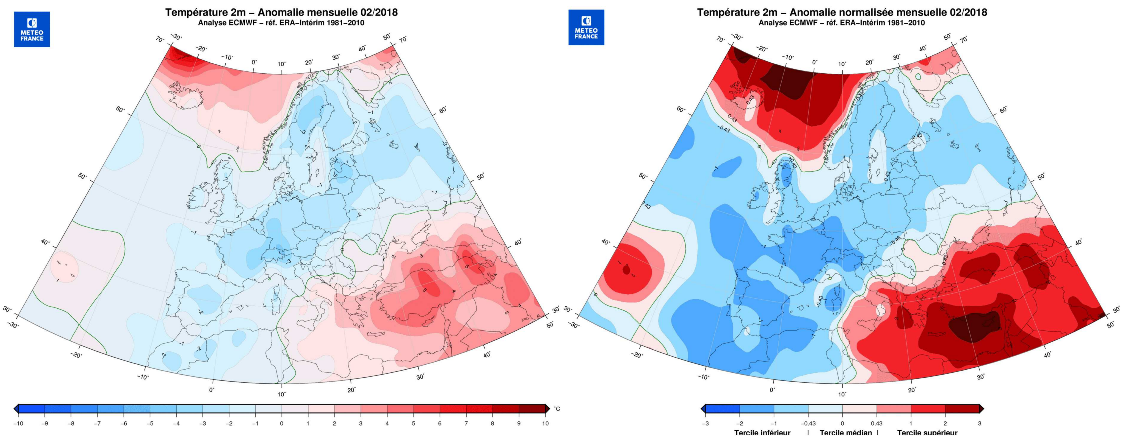


fig.I.2.10: Left graph: Absolute anomaly of temperature in the RA VI Region (Europe). Right graph: Standardized temperature anomalies

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	- 0.7 ℃
Southern Europe	- 0.6 ℃

I.2.d Sea ice

- In the Arctic :still at a record level of weak expansion in February
- In Antarctica the deficit is also still very important, with values near -2 SD.

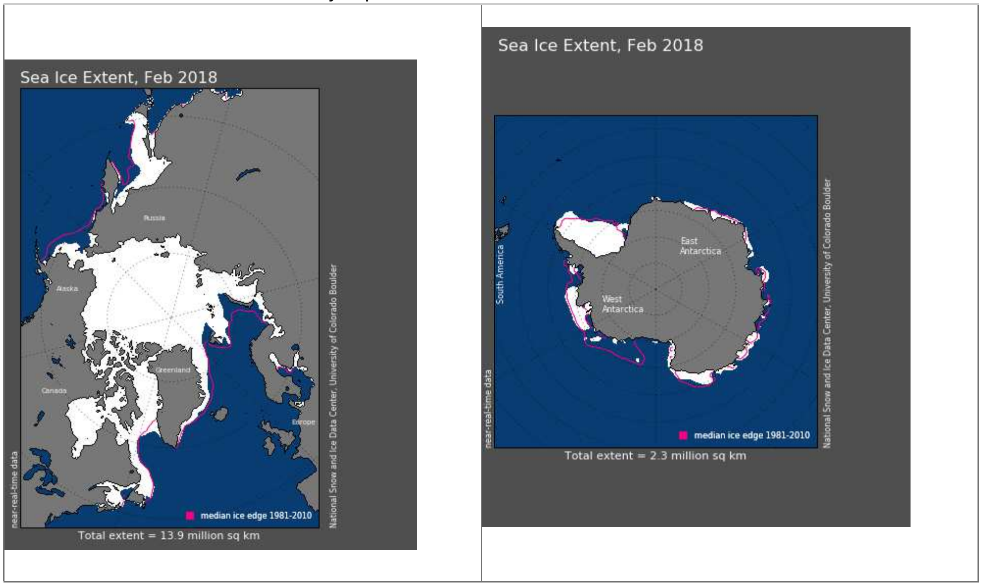


fig.I.2.11: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

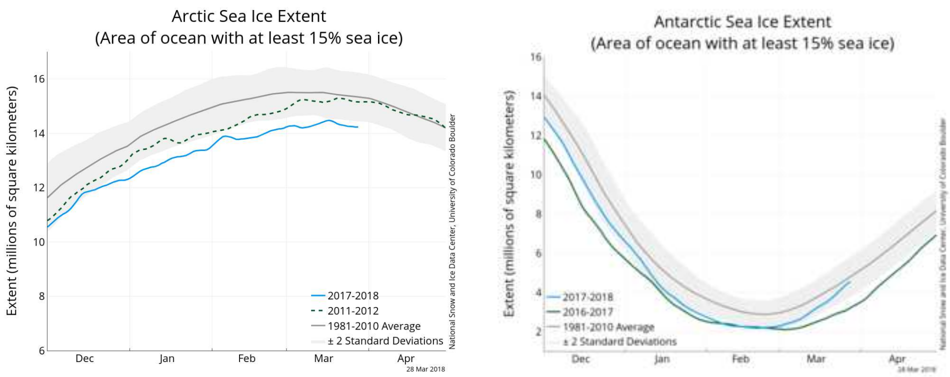
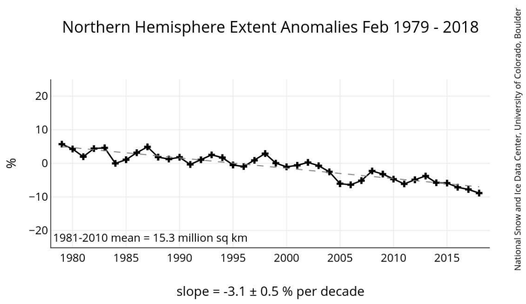


fig. I.2.12 : Sea-Ice extension evolution from NSIDC. https://nsidc.org/data/seaice_index/images/daily_images /N_stddev_timeseries.png



Monthly Sea Ice Extent Anomaly Graph in Arctic for the month of analysis.
http://nsidc.org/data/seaice_index/images/n_plot_hires.png

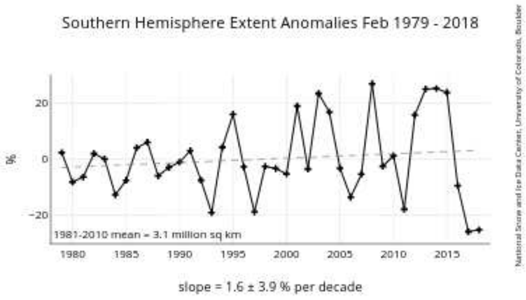


fig 1.2.13 : Monthly Sea Ice Extent Anomaly Graph in Antarctic for the month of analysis (http://nsidc.org/data/seaice_index/)

II. SEASONAL FORECAST FROM DYNAMICAL MODELS

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

II.1. OCEANIC FORECASTS

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

MF-S5 is struggling to trigger the end of the La Nina phenomenon, it remains colder than all other models in the equatorial Pacific zone. We will choose the more consensual scenario of a frank mitigation of the phenomenon during the next 3 months.

- Pacific Ocean: On average along the equator, the SST anomaly in the next 3 months will remain negative but significantly reduced. Similarly, the eastern part of the southern intertropical zone will remain abnormally cold.
- The North Pacific is expected to be warmer than normal with strong anomalies near the Bering Strait, in the central basin and off the coast of California. No more visible PDO structure in the forecast.
- In the southern hemisphere, the hot anomaly will remain very strong around New Zealand
- Indian Ocean: Neutral conditions in the northern hemisphere. Some differences between models concerning the evolution of the cold anomaly in the South-Eastern part of the basin : MF-S6 is colder than the other models. the index DMI may stay neutral.
- Atlantic Ocean: the equatorial band is predicted neutral by most of the models, with cold anomalies on both sides in the north and south inter-tropical bands. However MF-system 6 is developing a warm anomaly along the equator (like last month).
  No change expected in the northern hemisphere with still hot anomalies between 30 °N and 45 °N, a co ld anomaly zone further north, especially in the Cold Blob area, still well marked. Strong warm anomaly expected in the high latitudes.
  In the southern hemisphere, hot anomaly predicted south of 30 °S.
- Mediterranean Sea : Positive anomalies are mainly predicted by the models, especially in the eastern part of the basin.

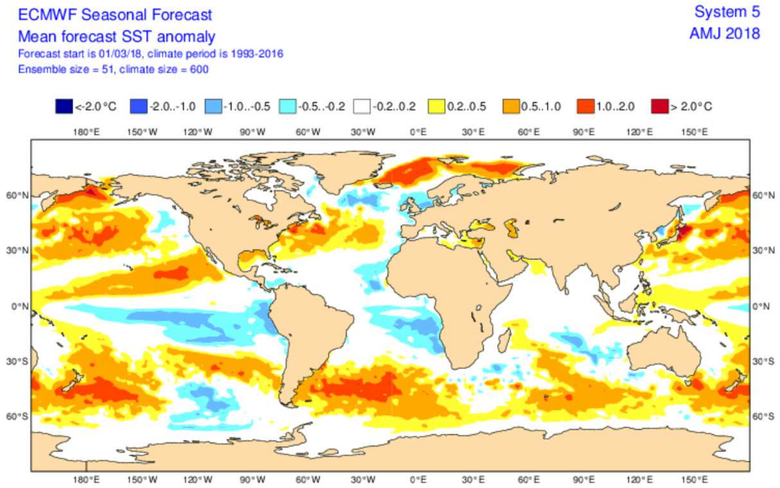


fig.II.1.1: SST anomaly forecast from ECMWF
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

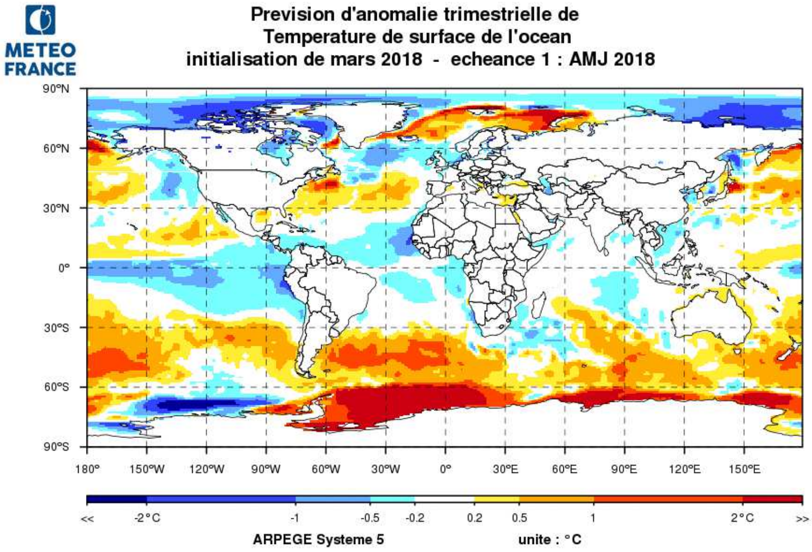
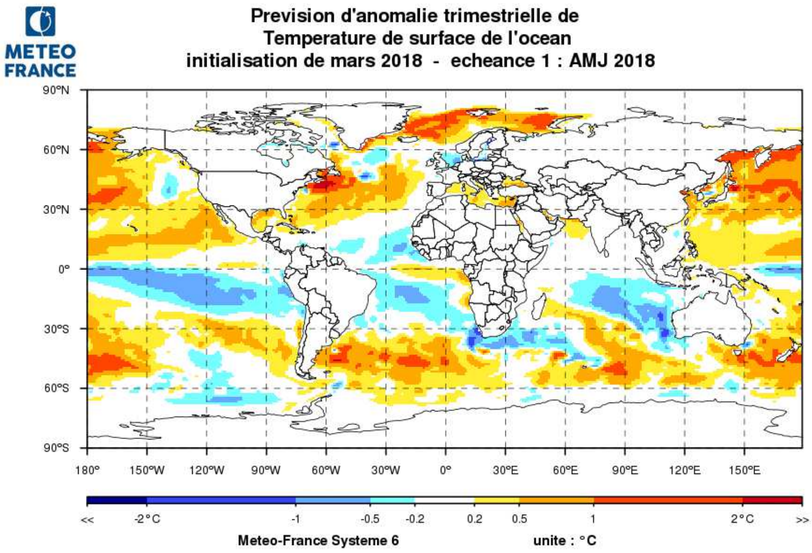


fig.II.1.2: SST Anomaly forecast from Meteo-France (recalibrated with respect of observation).
http://seasonal.meteo.fr



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http://seasonal.meteo.fr

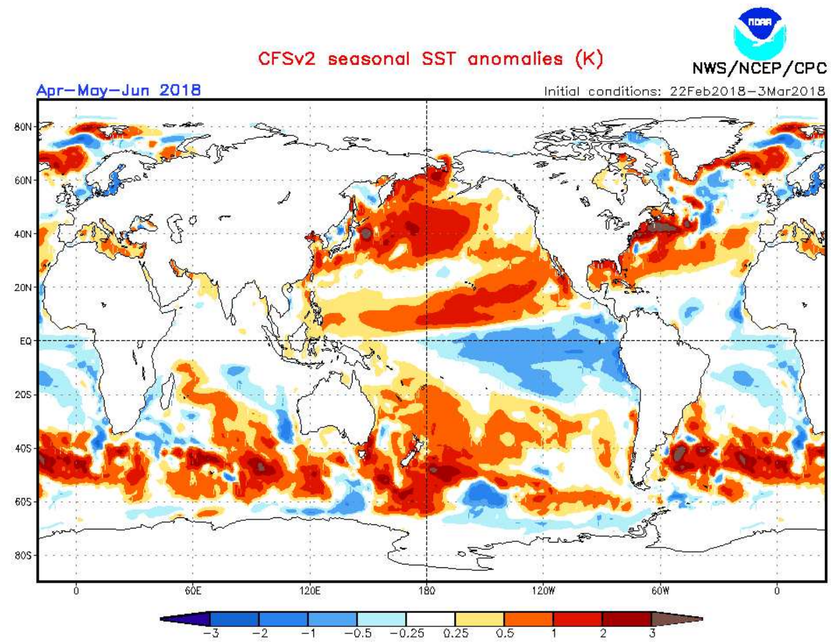


fig.II.1.3: SST Anomaly forecast from NCEP.
http://www.cpc.ncep.noaa.gov/products/people/wwang/cfsv2fcst/imagesInd1/glbSSTSeaInd1.gif

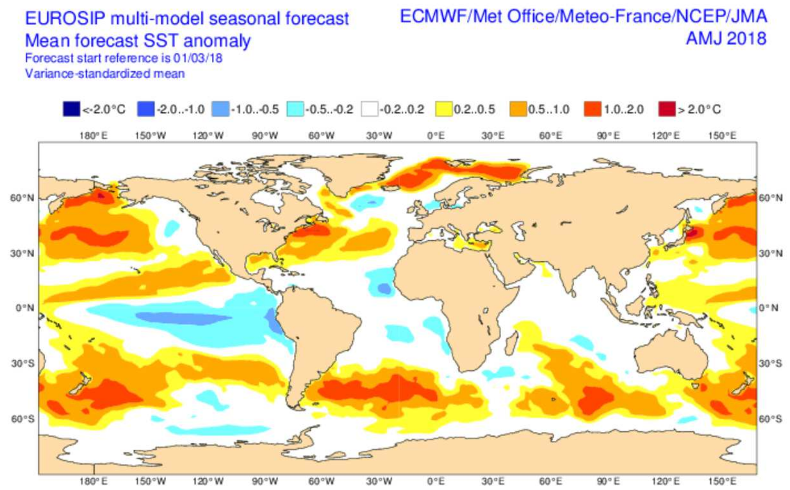


fig.II.1.4: SST Forecasted anomaly from Euro-SIP

II.1.b ENSO forecast :

***Forecast Phase*: back to a neutral phase during the next 3 months.** The synthesis of the IRI predicts a neutral phase with a probability of more than 75%.

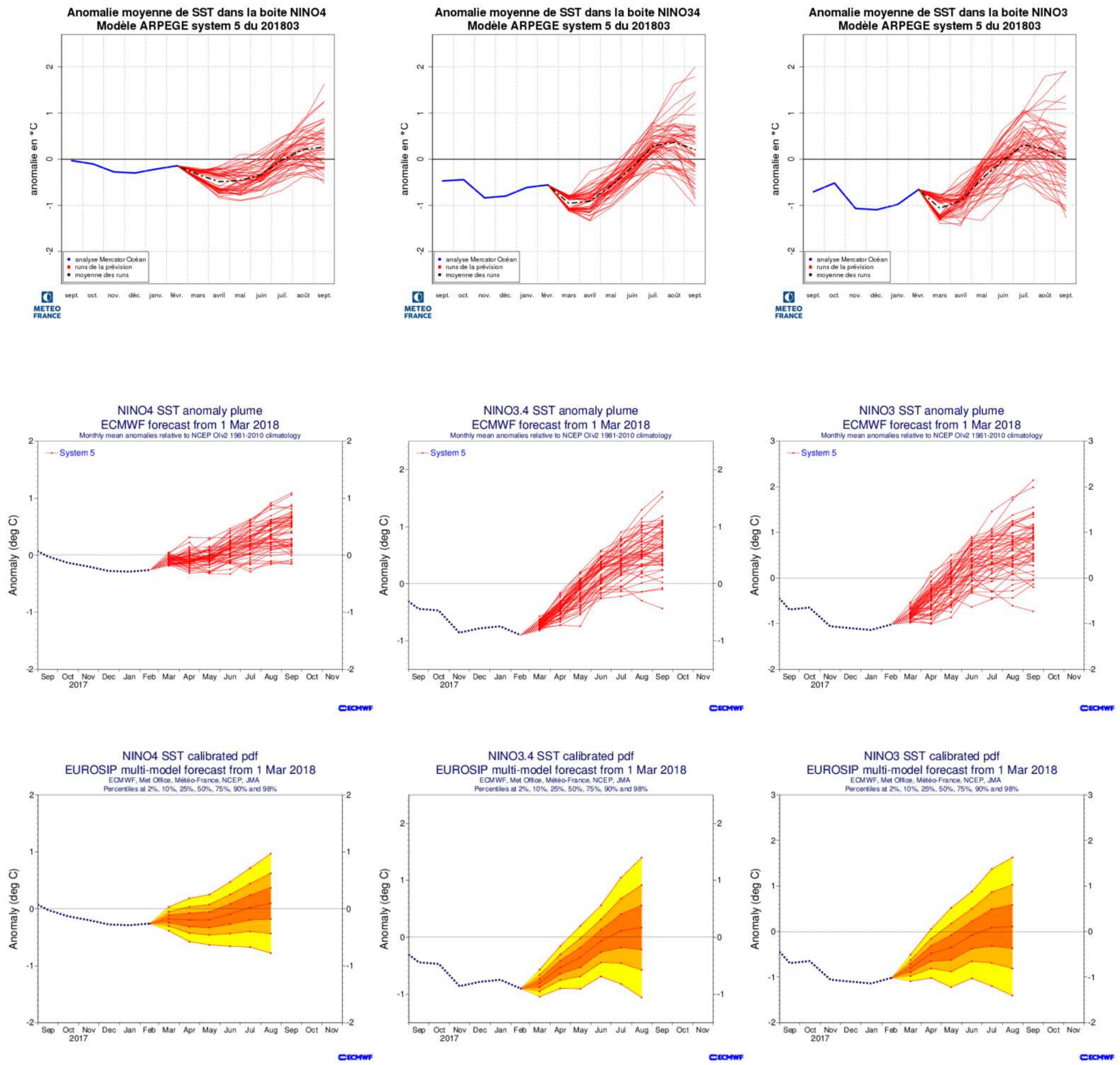
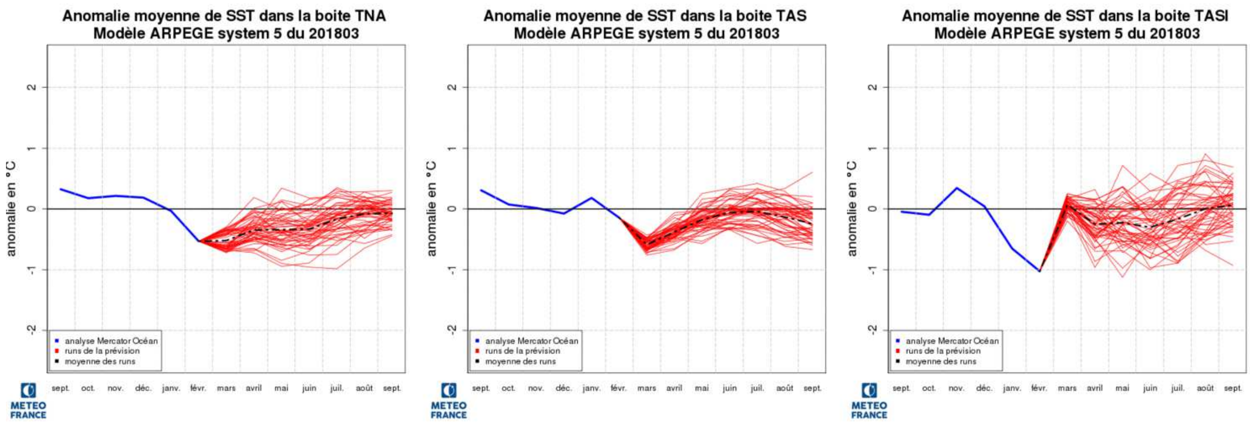


fig.II.1.5: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members -
and EUROSIP (bottom) – recalibrated distributions -
(http://seasonal.meteo.fr , http://www.ecmwf.int/)

I.1.c Atlantic ocean forecasts



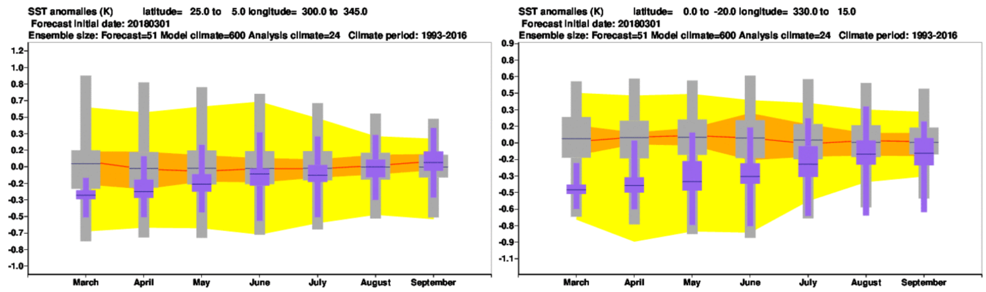


fig.II.1.6: SSTs anomaly forecasts in the Atlantic Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

I.1.d Indian ocean forecasts

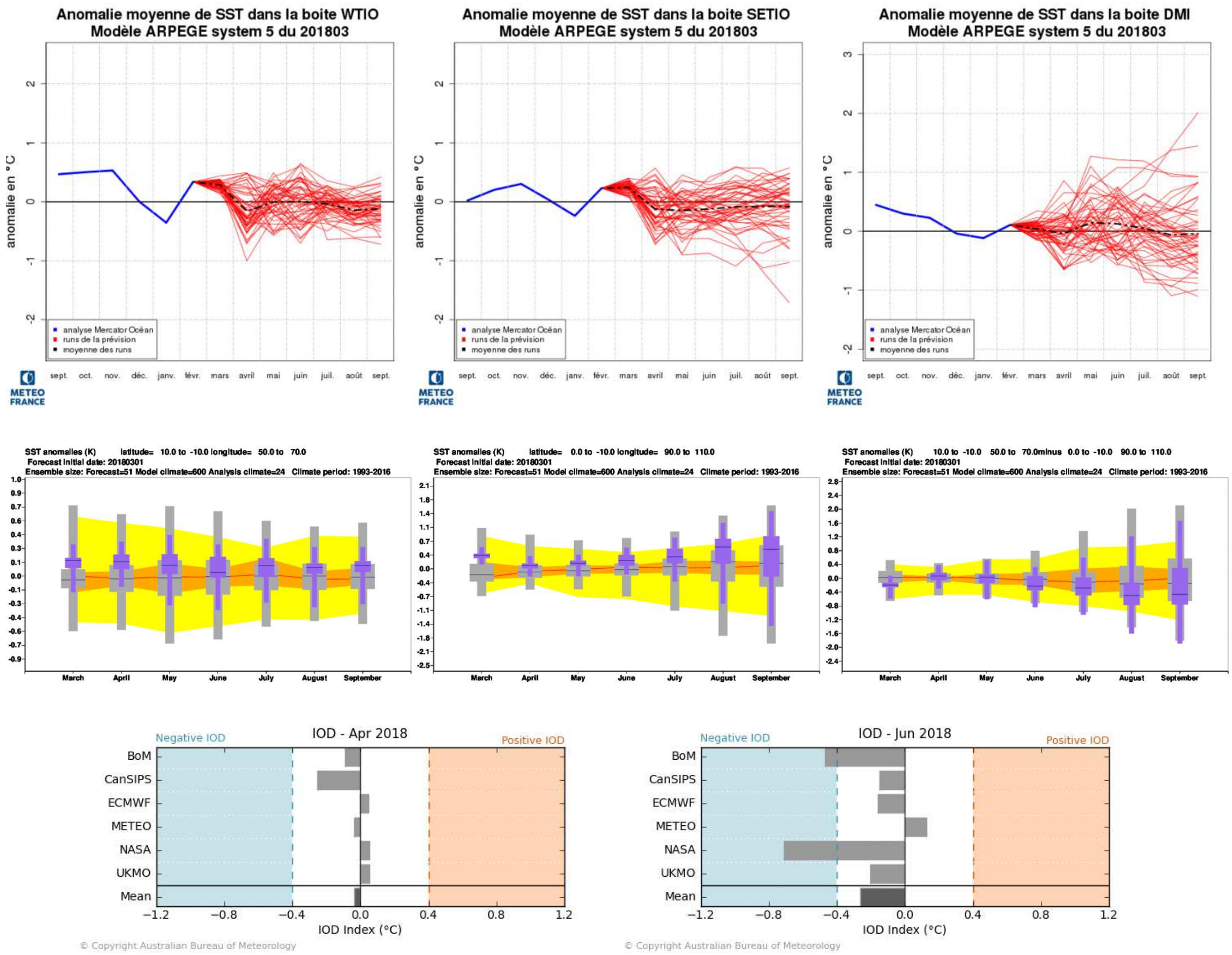


fig.II.1.7: SST anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

II.2. GENERAL CIRCULATION FORECAST

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

In all models, weak anomalies in the inter-tropical band, probably to large spread in their ensemble. There is only one area of noticeable anomaly in the models, on VP200hPa anomaly map : a positive one (downward motion anomaly) around the dateline

- Velocity potential :
  - the positive anomaly centered around the dateline seems sonsistent with the negative SST anomaly in Central Pacific. It is present in all the models and seems robust.
  - The only consensual negative anomaly is located around South-East Asia, but with variable strength and position from one model to another.
  - And finally, over the Gulf of Guinea, MF-S6 is the only one to forecast a negative anomaly (upward motion anom.), very likely due to its positive SST anomaly.
- Stream Function :
  - anomalies are limited to the inter-tropical band, very weak signal at mid-latitudes.
  - over Central-East Pacific, the cyclonic anomaly dipole on both side of the Eqautor (visible on the February analysis) is still forecasted by models for AMJ (more or less strong). In the Northern hemisphere it extends up to Western Atlantic (cf ECMWF or MF-S6). But no signal toward Europe.

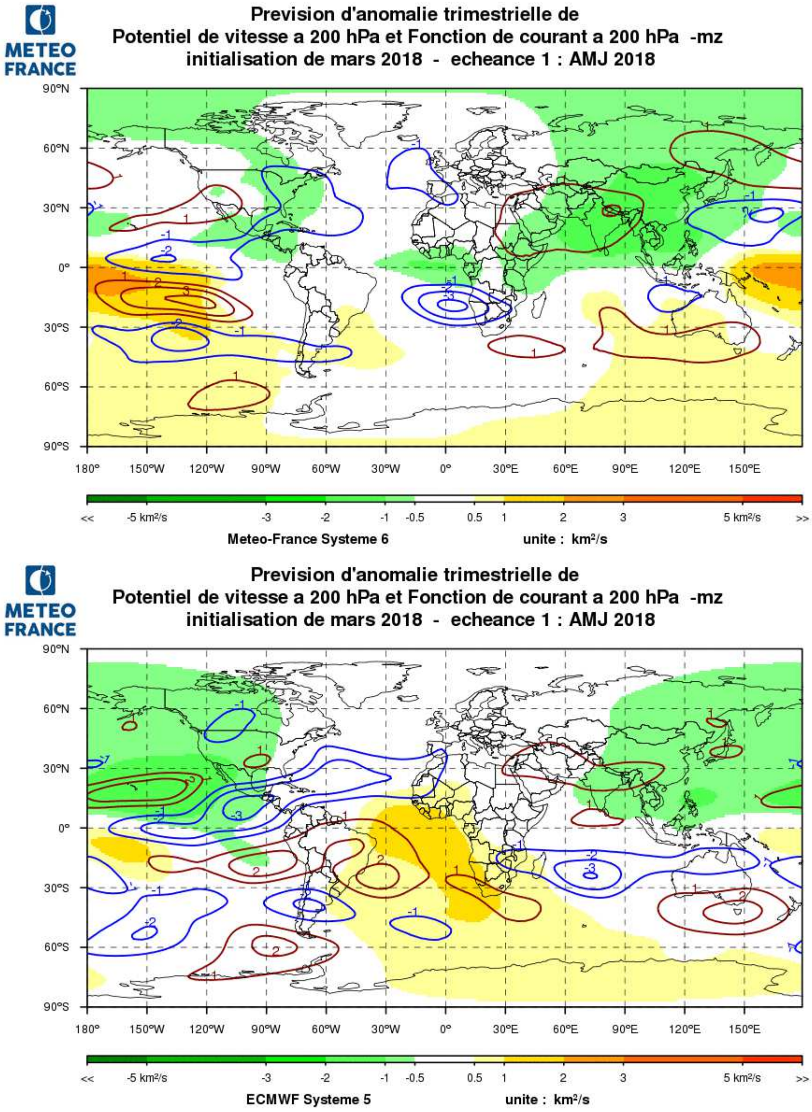


fig.II.2.a: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), associated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa by Météo-France (top) and ECMWF (bottom). http://seasonal.meteo.fr

II.2.b Geopotential height anomalies

MF-S5 Z500hPa anomaly field is doubtfull this. We'll used MF-S6 instead.

Strong divergence over the North Atlantic basin and Europe between MF, ECMWF and UKMO. looking at the other GPC, it confirms the very large spread in forecasts. The only information we could try to use is the phase of the NAO : the positive phase is priviledged by a short majority of models.

Over North America, the positive anomaly over the USA (consistent with MF and ECMWF streamfunction anomaly map) is present in several GPC models.

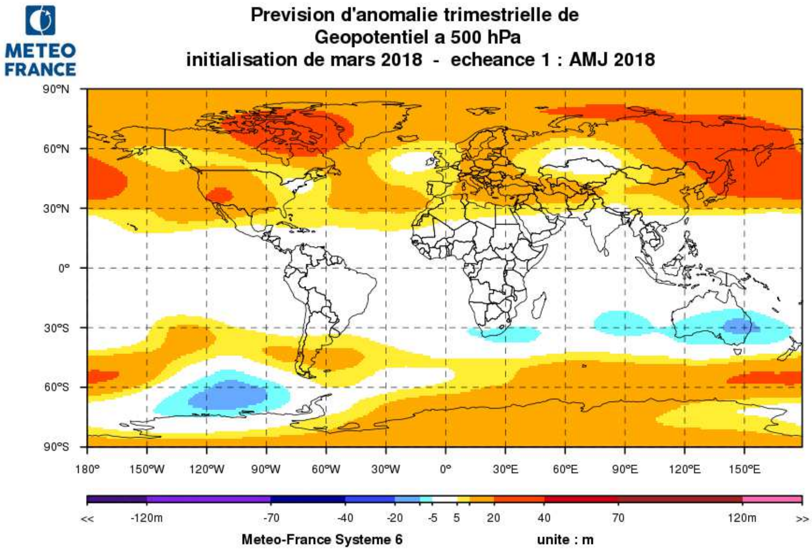


fig.II.2.b.1: Anomalies of Geopotential Height at 500 hPa from Météo-France.
http://seasonal.meteo.fr

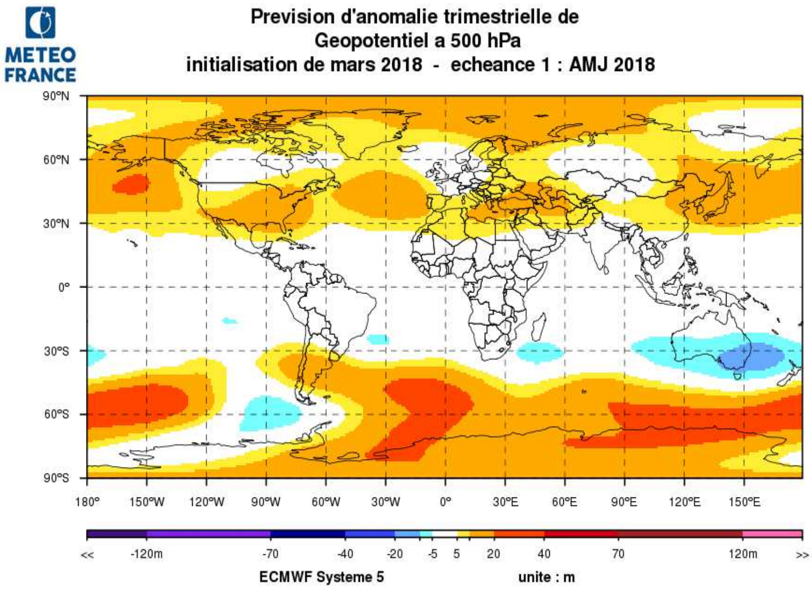


fig.II.2.b.2: Anomalies of Geopotential Height at 500 hPa from ECMWF.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast

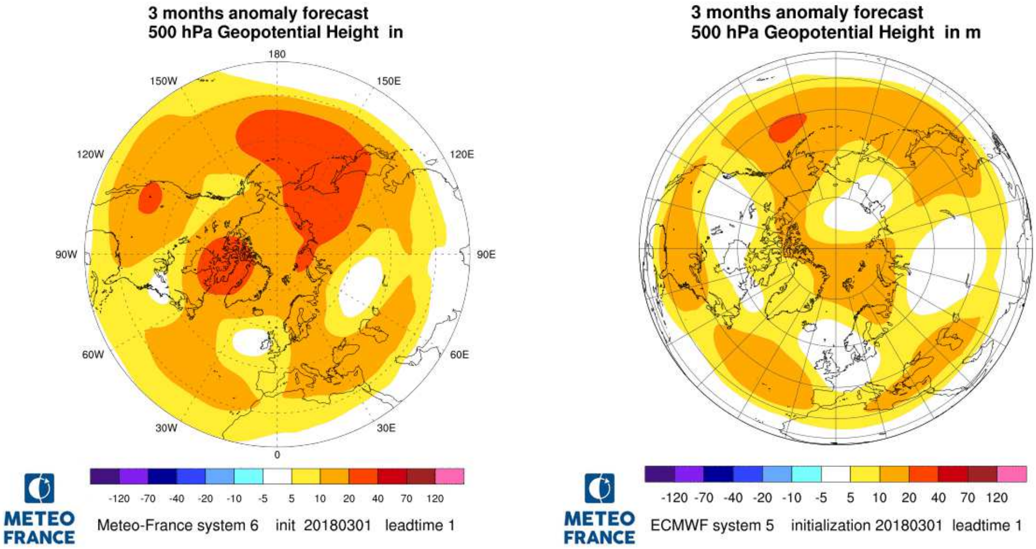


fig.II.2.b.1: Anomalies of Geopotential Height at 500 hPa from Météo-France.
http://seasonal.meteo.fr

II.2.c. modes of variability

MF-S5 forecast is not used this month (cf Z500 paragraph)

MF-S6 and ECMWF-S5 : positive phase of NAO priviledged (slightly). At the contrary, they disagree on EA and SCAN phase.

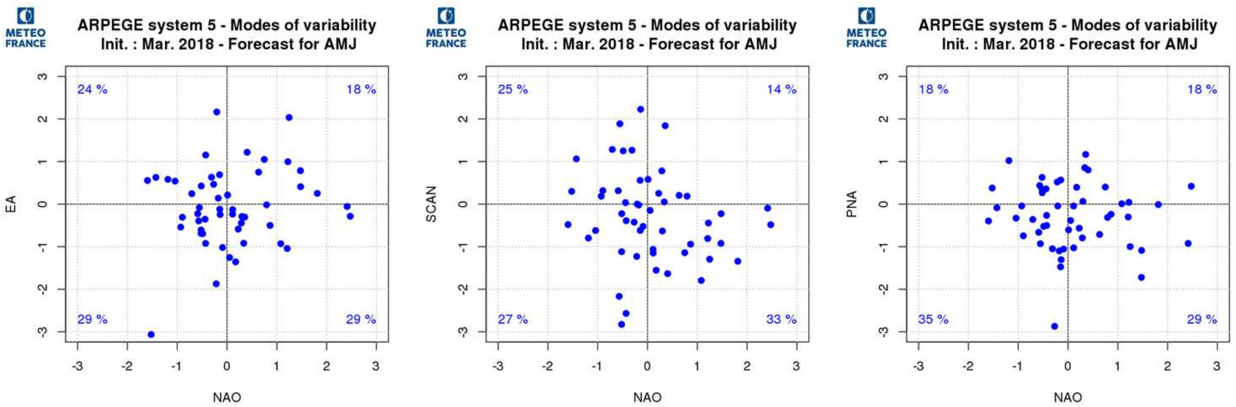


fig.II.2.c.1 : modes of variability forcasts over the Northern hemisphere with Meteo-France MF-S5

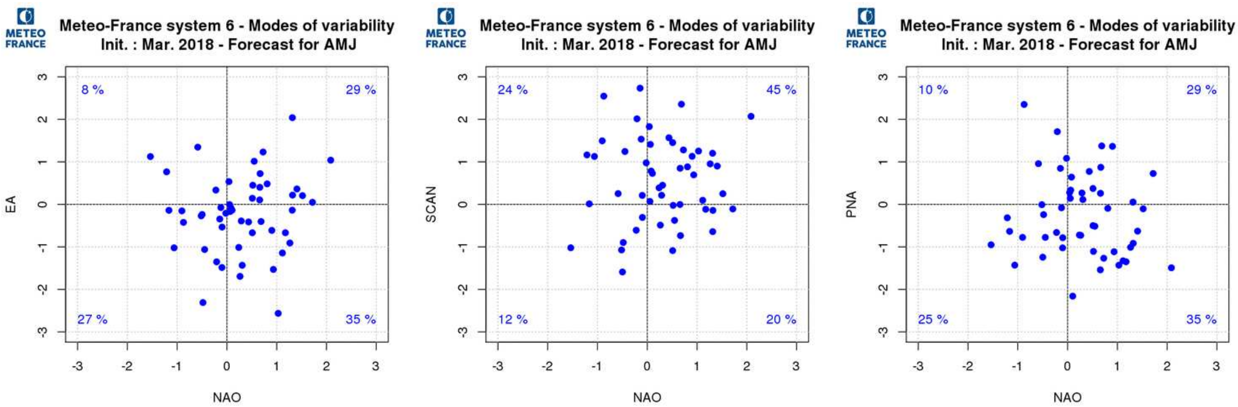


fig.II.2.c.2 : modes of variability forcasts over the Northern hemisphere with Meteo-France MF-S6

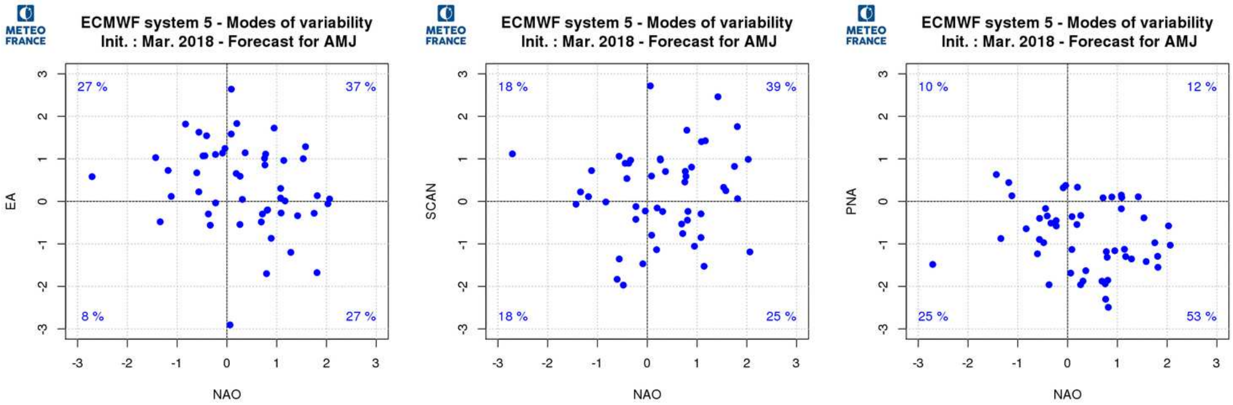


fig.II.2.c.3 : modes of variability forcasts over the Northern hemisphere with ECMWF-S5

II.2.d. weather regimes

MF-S5 forecast is not used this month (cf Z500 paragraph)

No signal in MF-S6.

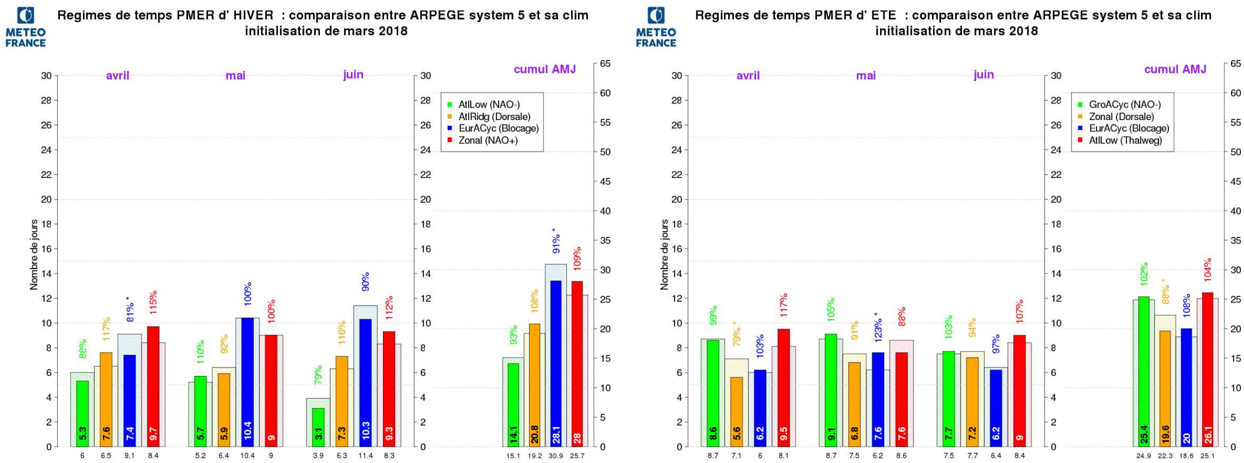


fig.II.2.d: North Atlantic Regime occurrence anomalies from Meteo-France MF-S5 : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

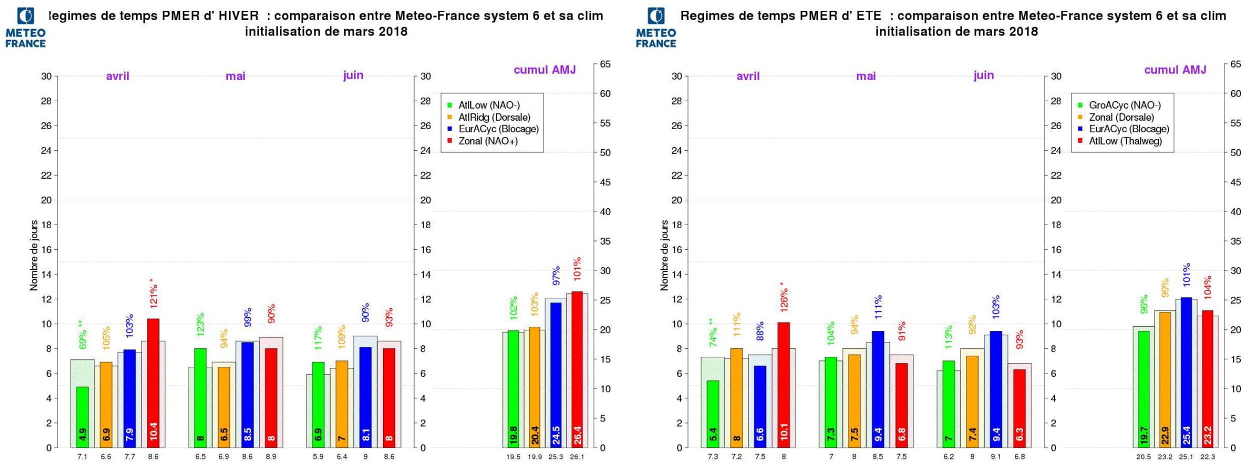


fig.II.2.d: North Atlantic Regime occurrence anomalies from Meteo-France MF-S6 : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

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

MF-S5 is not used here.

A lot of differences between models, to be linked to the great uncertainty on general circulation (cf Z500).

Some consistency in some regions : USA (+), extreme North Atlantic (+, between Greenland ans Scandinavia) linked to SST anomalies, over Middle-East and Central Asia (+) linked to positive Z500 anomaly and stream-function anomaly but its origin is not well understood).

No consistent signal over Europe.

II.3.a Météo-France

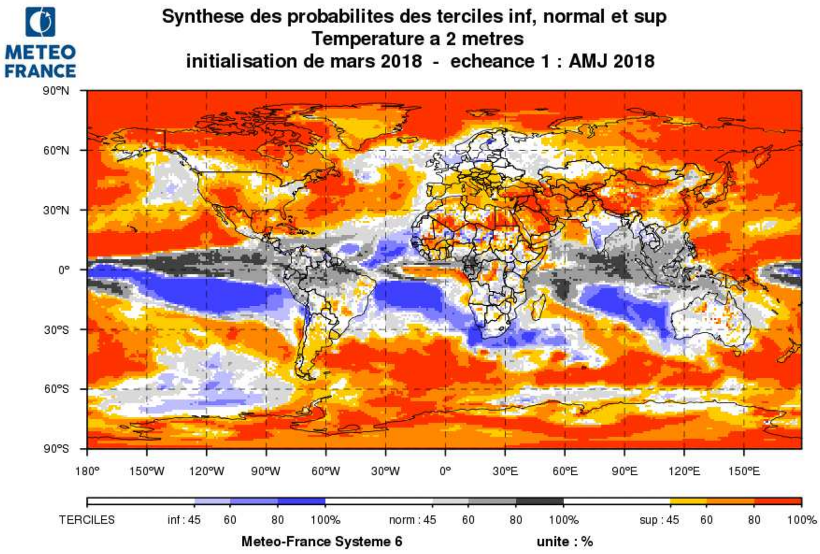


fig.II.3.1: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.3.b ECMWF

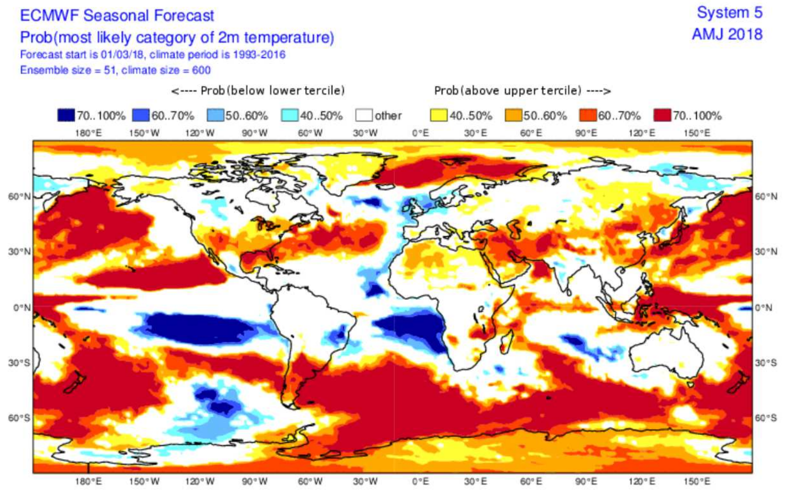


fig.II.3.2: Most likely category probability of T2m from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seaso...

II.3.c Japan Meteorological Agency (JMA)

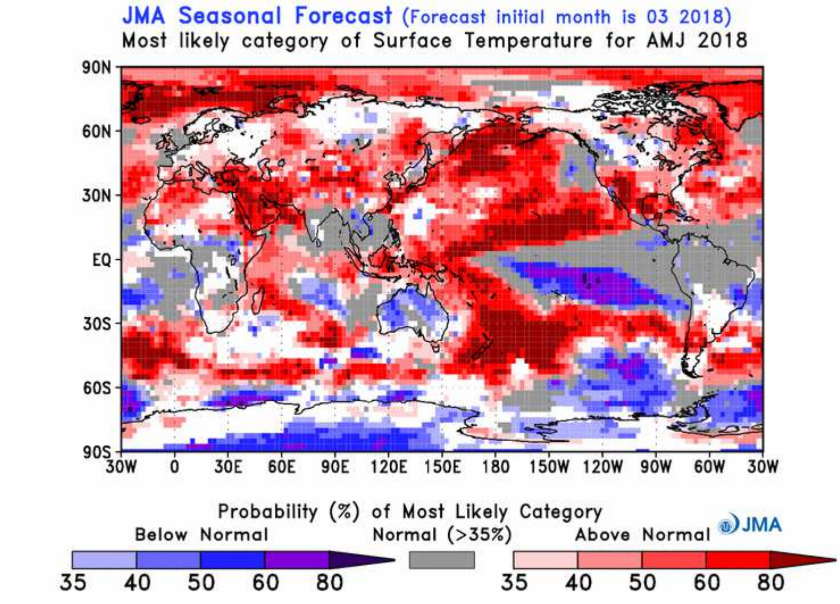


fig.II.3.3: Most likely category of T2m. Categories are Above, Below and Close to Normal.
White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst_gl.php

II.3.d EUROSIP

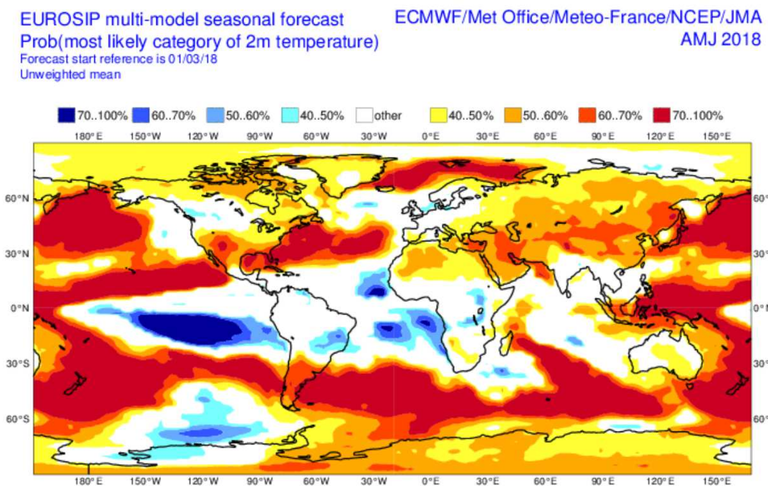


fig.II.3.4: Multi-Model Probabilistic forecasts for T2m from EUROSIP (2 Categories, Below and Above normal – White zones correspond to No signal and Normal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

II.4. IMPACT : PRECIPITATION FORECAST

- inter-tropical regions :
  - except on Pacific, very few consistent signal between models
  - over the Atlantic, MF-S6 is the only one that forecasts a wet anomaly (linked to SST) along the equator. Over the Carribean region, dry signal in many models
  - no signal over the Indian Ocean
- Mid-latitudes :
  - dry signal over the USA (mainly Western regions), consistent with Z500 anomaly field/stream-function
  - dry signal over the Middle-East
  - no signal over Europe

II.4.a Météo-France

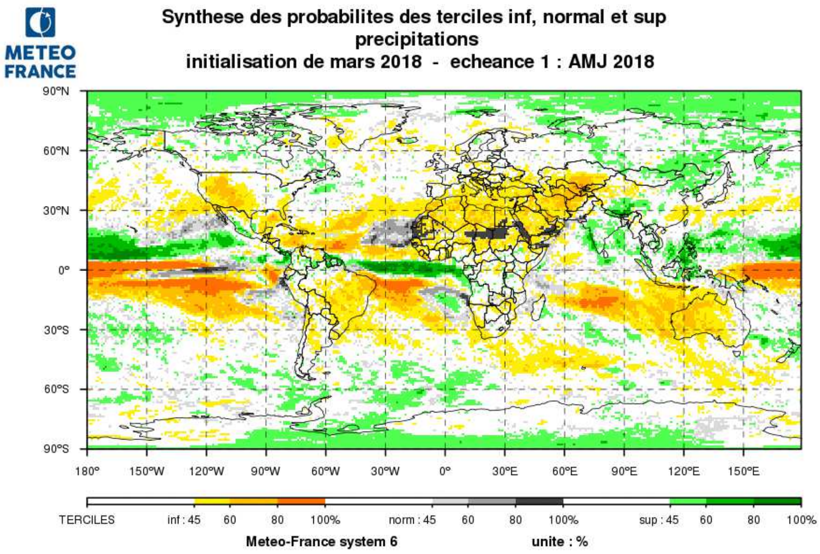


fig.II.4.1: Most likely category of Rainfall. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.4.b ECMWF

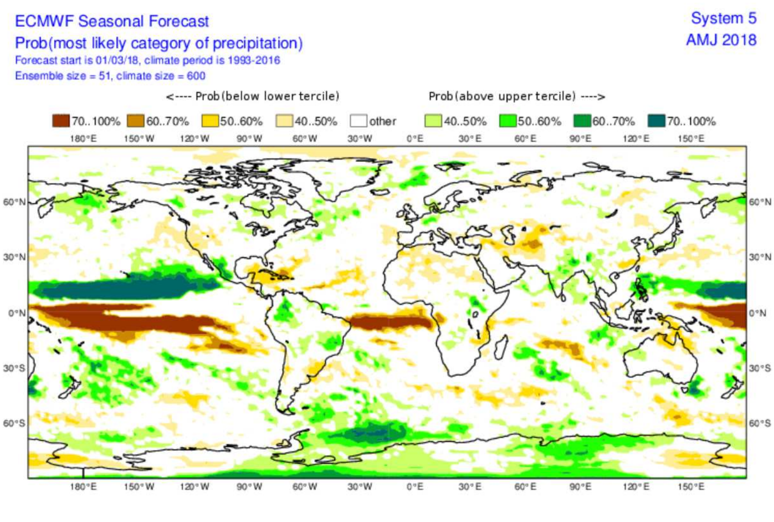


fig.II.4.2: Most likely category probability of rainfall from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.4.c Japan Meteorological Agency (JMA)

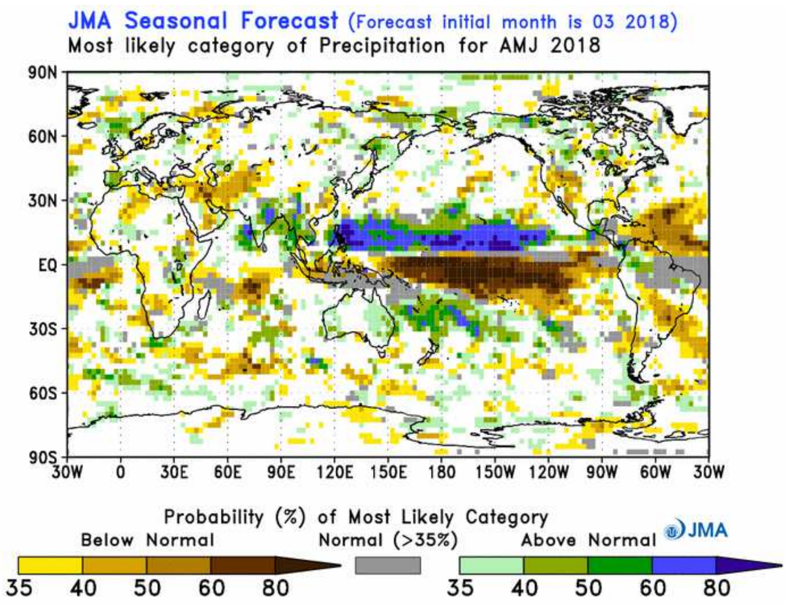


fig.II.4.3: Most likely category of Rainfall from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst_gl.php

II.4.d EUROSIP

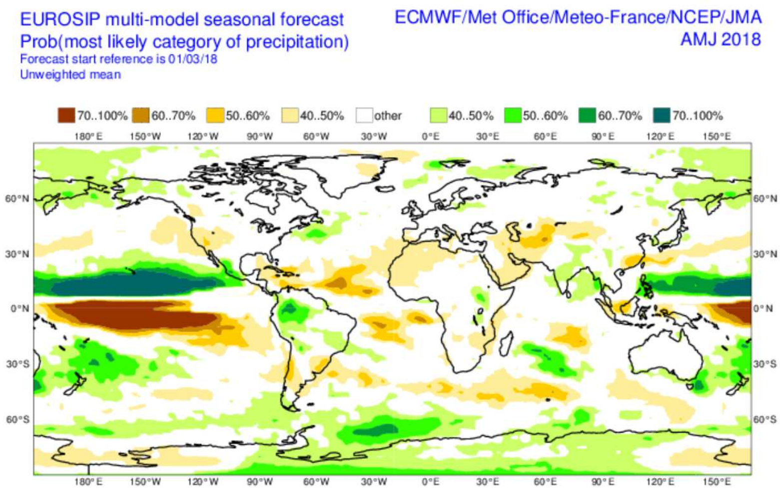


fig.II.4.4: Multi-Model Probabilistic forecasts for precipitation from EUROSIP (2 Categories, Below and Above normal – White zones correspond to No signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

II.5. REGIONAL TEMPERATURES and PRECIPITATION

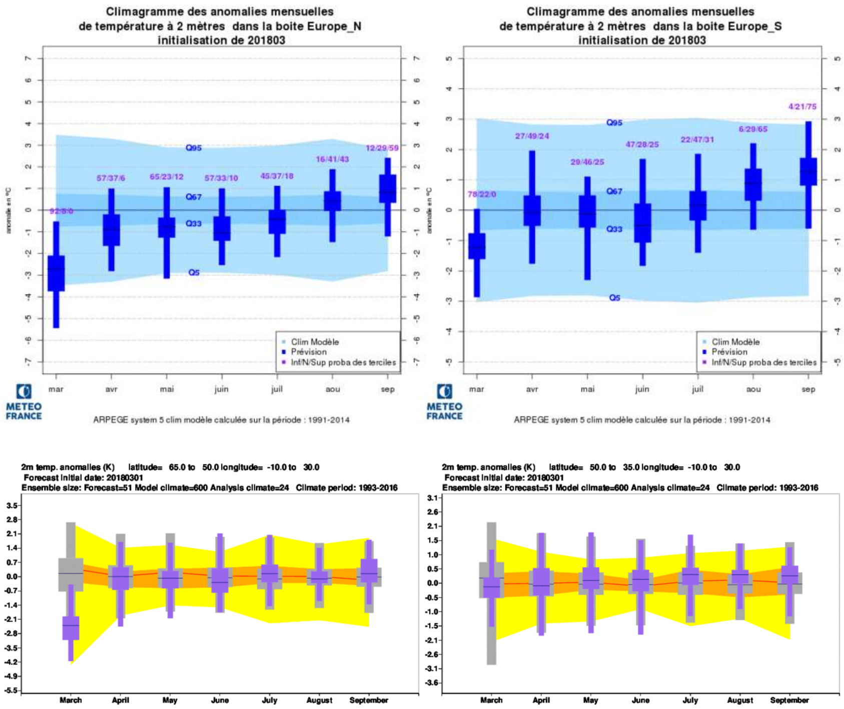


fig.II.5.1 : Climagrams for Temperature in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

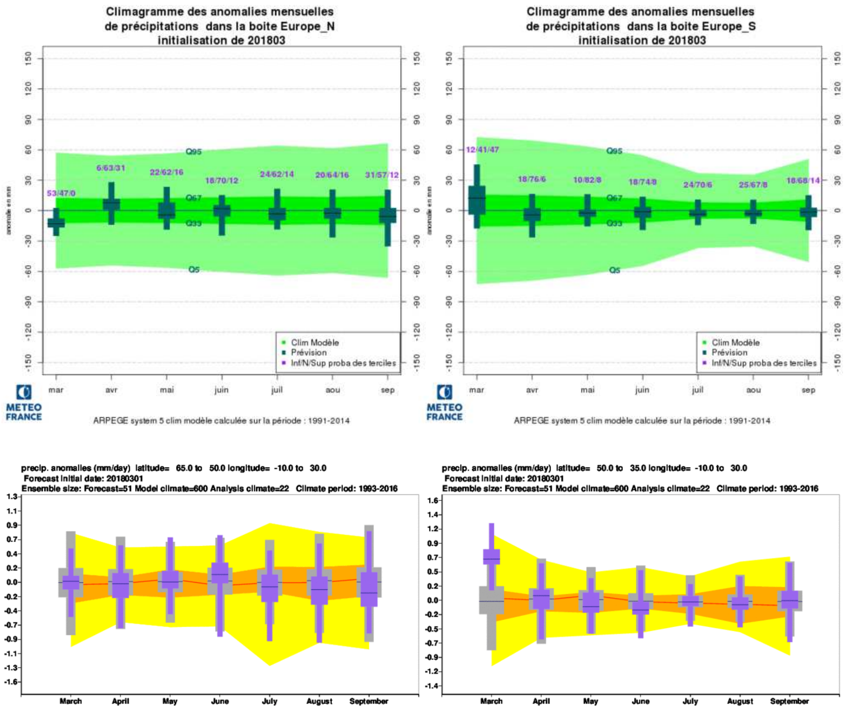


fig.II.5.2 : Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

II.6. "EXTREME" SCENARIOS

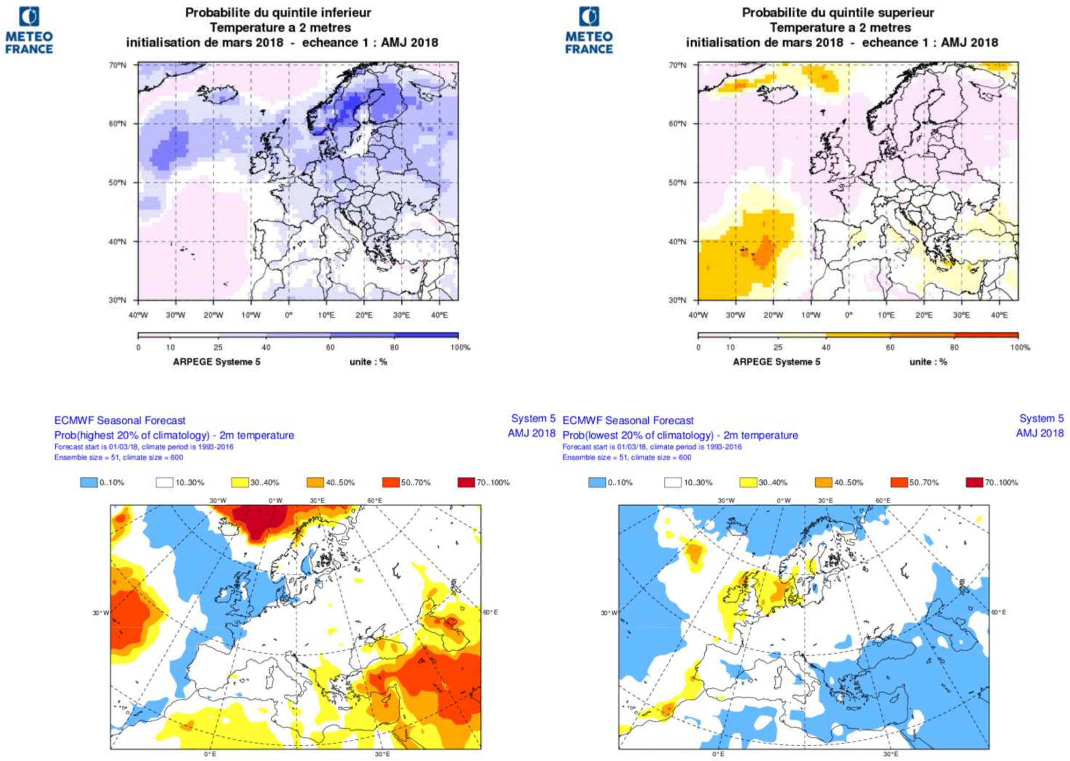


fig.II.6.1 : Top : Meteo-France T2m probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution). Bottom : ECMWF T2m probability of « extreme » below normal conditions (left - highest ~20%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

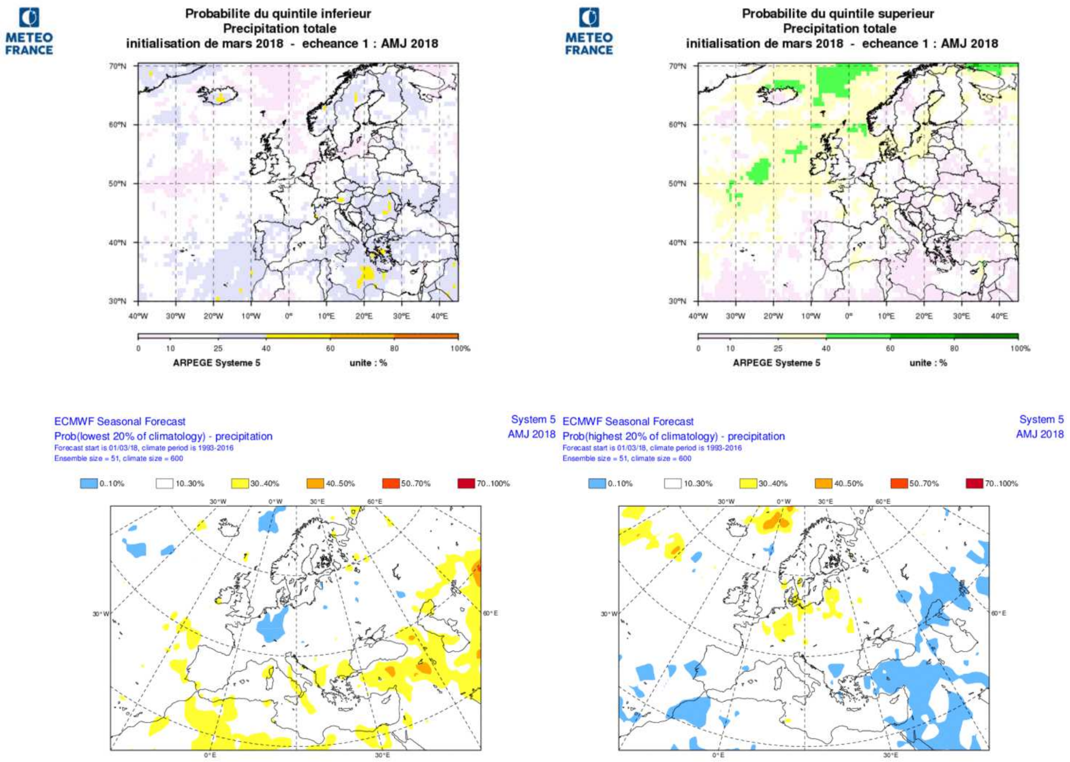


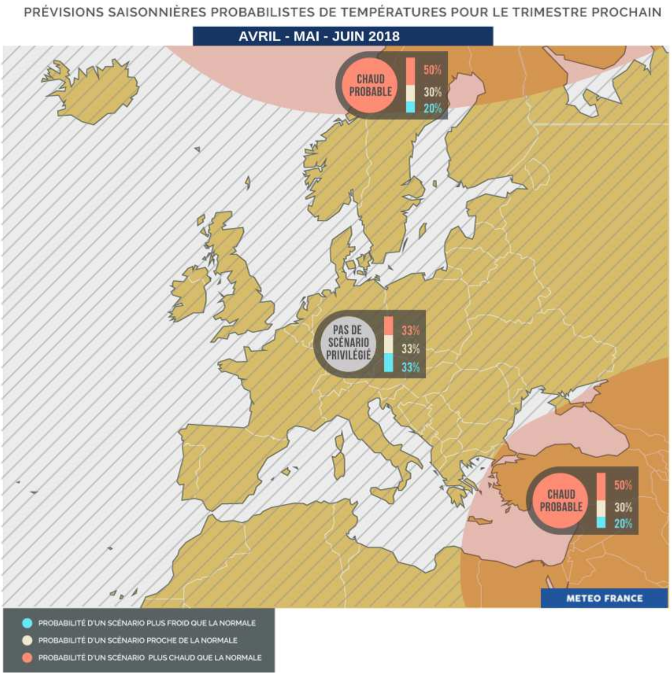
fig.II.6.2 : Top : Meteo-France rainfall probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution).
Bottom : ECMWF rainfall probability of « extreme » below normal conditions (left - lowest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

<u>II.7. DISCUSSION AND SUMMARY</u>

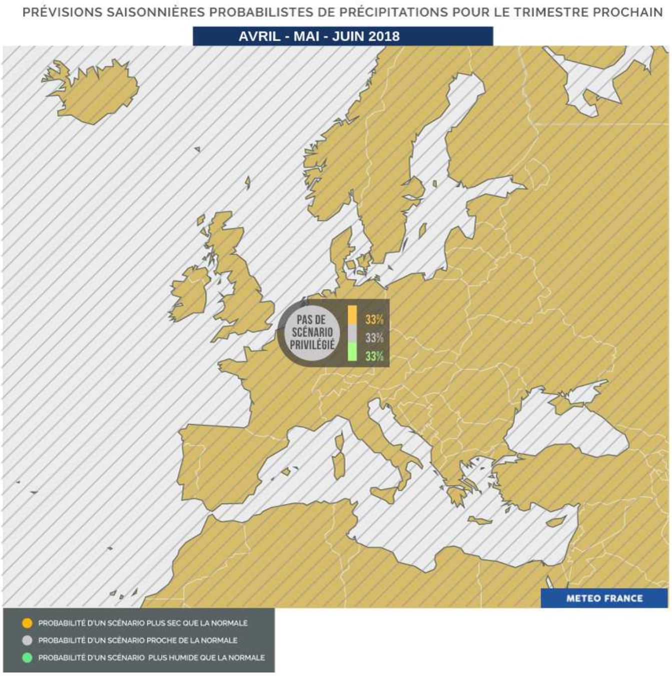
<u>II.7.a Forecast over Europe</u>

Very weak predictability. The "La Niña" event may disappear during the period. The associated circulation anomalies over the Pacific are weakening. Model's forecasts are very different; and inside each ensemble, there is a large spread (see the plots of modes of variability, paragraph II.2.c). We don't detect any teleconnection from the tropics.

<u>Temperature</u> : very weak signals in the models, and often contradictory (general circulation different from one model to another). We only point out enhanced probabilities for a warm scenario over the North of Scandinavia (linked to SST anomalies), and over Middle-East (a majority of models is predicting this signal).



<u>Precipitations</u> : No priviledged scenario. The positive NAO signal (see Z500 paragraph)is quite uncertain, and its impact on precipitation is vey changeable on this AMJ season : we choose to not take it into account, considering the poor predictability.



II.7.b Tropical cyclone activity

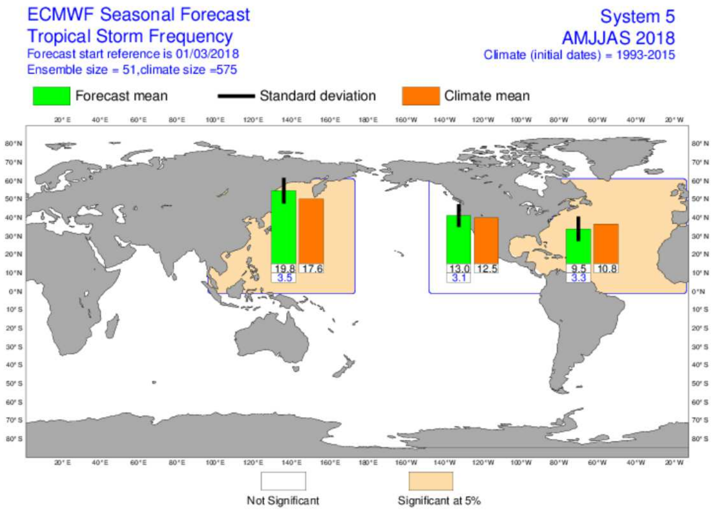


fig.II.7.1 : Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro /eurosip_tropical_storm_frequency/

III.1. Seasonal Forecasts

Presently several centers provide seasonal forecasts, especially those designated as Global Producing Centers 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 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 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 whe re the SST warming is developing first at the surface (especially for coastal events).

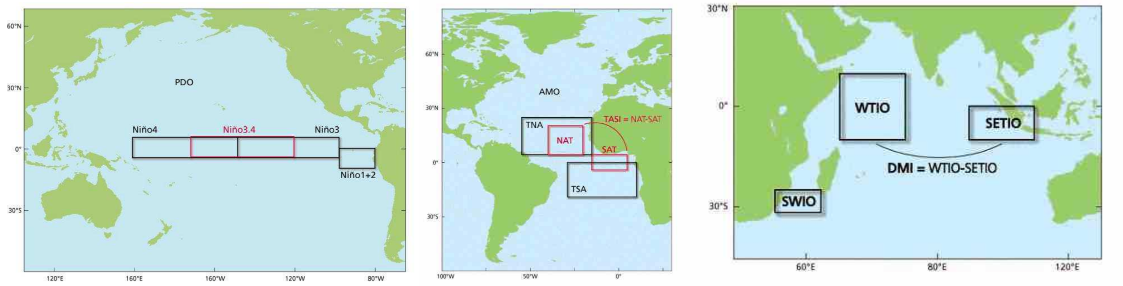
- Niño 3 : 5°S/5°N 90W-150W ; it is the region wher e the interanual variability of SST is the greatest.

- 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).

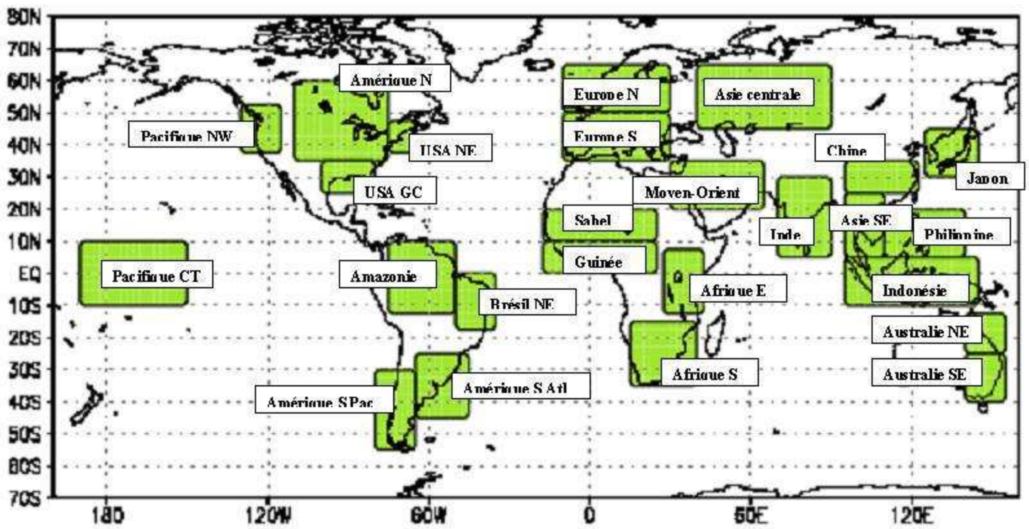
Associated to the oceanic « El Niño / La Niña » events, and taking into account the strong ocean/atmopshere coupling, the atmosphere shows also interanual variability associated to these events. It is monitored using the SOI (Southern Oscillation Index). This indice is calculated using standardized sea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