GLOBAL CLIMATE BULLETIN

n°235 – January 2019

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I. DESCRIPTION OF THE CLIMATE SYSTEM (November 2018)

I.1.Oceanic analysis

Over the Pacific Ocean :

- Along the equator a warm anomaly is maintained with a warming tendancy on the extreme east (box Nino12) in connection with the end of Kelvin wave propagation in subsurface (see Fig I.1.5). SSTs in the Niño 3.4 reaches 0.8℃
- In the Northern Hemisphere, warmer than normal in Gulf of Alsaka and we notice cooling off the Mexican coast .No significant PDO signal (see https://www.ncdc.noaa.gov/teleconnections/pdo/)
- In the Southern Hemisphere a warm anomaly was formed off the Chilean coast in November

Over the Maritime Continent :

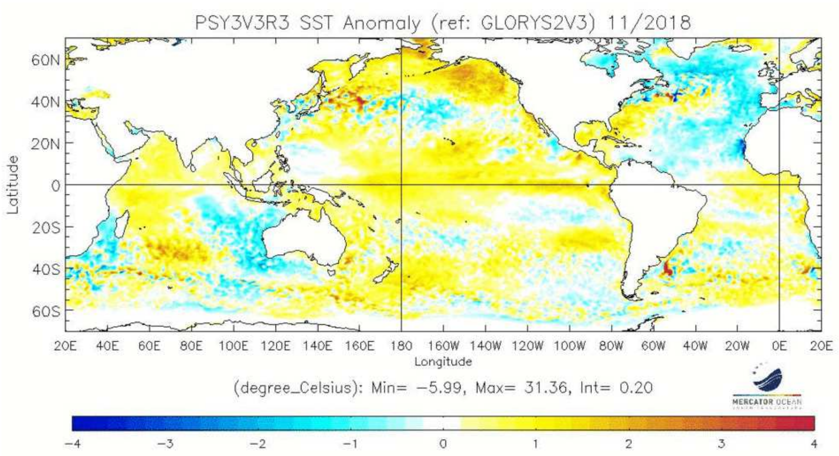
- neutral conditions.

Over the Indian Ocean :

- in the Northern hemisphere little change in temperature anomalies, DMI index still positive.
- In the Southern hemisphere, cold anomalies to the East and warm anomalies to the West.

Over the Atlantic:

- In the North Atlantic, the horseshoe structure fades a little. Persistance a cold anomaly from Canada to South Greenland, Iceland and the British Isles, extending southward to Portugal. From the Canary islands to the Antilles, the cold anomaly was reconstitued in November. In-between, a warm area is spreading from the Caribbean to the Azores.
- Northern tropics : neutral to negative TNA index
- Warmer than normal along the Equator, especially over the gulf of Guinea.



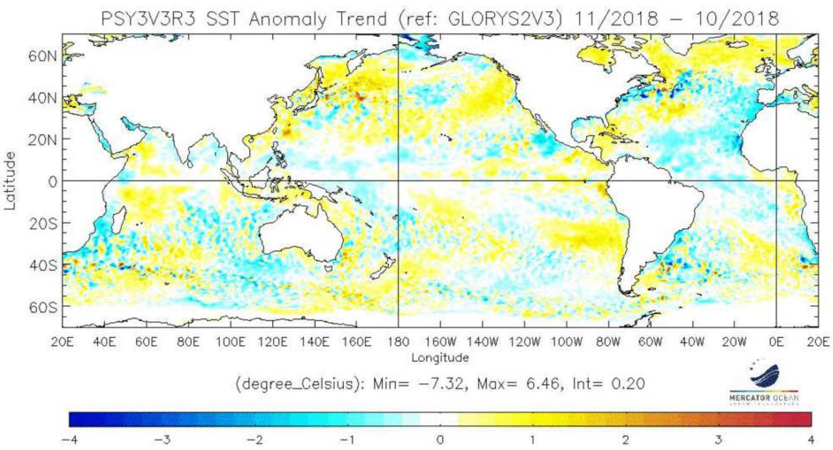


fig.I.1.1: top : SST Anomalies (℃) . Bottom : SST tendency (current – previous month), (reference Glorys 1992-2013).

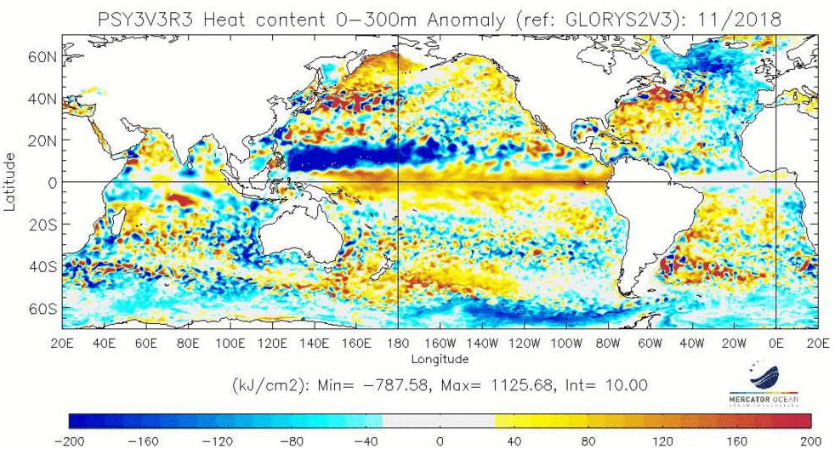


fig.I.1.2: map of Heat Content Anomalies (first 300m, kJ/cm2, reference Glorys 1992-2013)

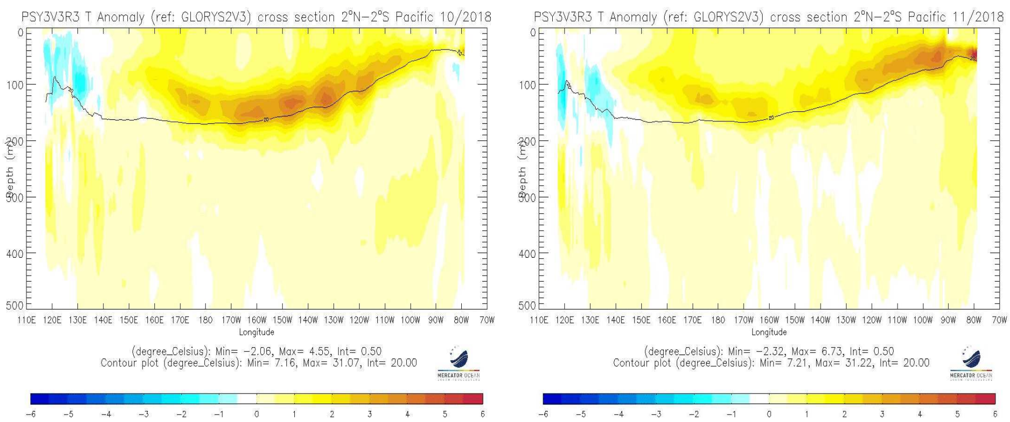


fig.I.1.4: Oceanic temperature anomaly in the first 500 meters in the Equatorial Pacific (previous and current month)

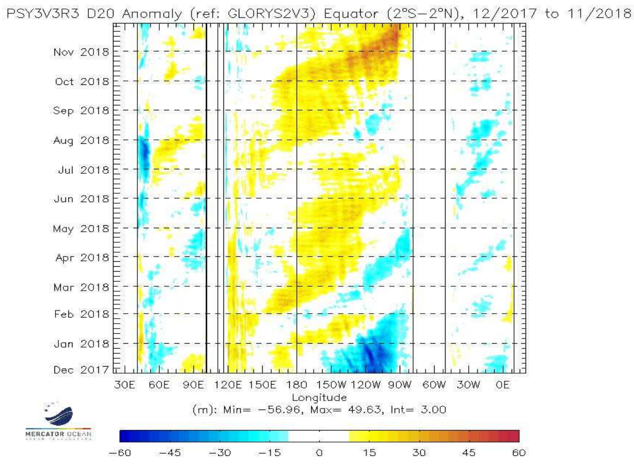


fig.I.1.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 6 month period

Sea surface temperature near Europe :

European Arctic Sea: Still warmer than normal in Barents Sea and Greenland Sea particulary in North of Svalbard. In Norvegian Sea return to neutral conditions due to warming in November. Sea ice extension very low (see fig. I.2.11) in Barents Sea.

North Sea: Close to normal.

Baltic Sea: Rather warmer than normal, no freezing.

Cold blob south of Greenland/Iceland: more or less same extension, but anomalies became weaker in the north near Iceland, but stronger in the south around 50°N

Subtropical East Atlantic: Colder than normal near Biscay/Iberia, cooling tendency from October to November. However, no significant change in the subsurface.

Mediterranean: Generally warmer than normal, except for the Aegean and South of Balearic Islands where anomalies are negative.

Black Sea: more or less around normal, colder in the north, warmer in the southeast.

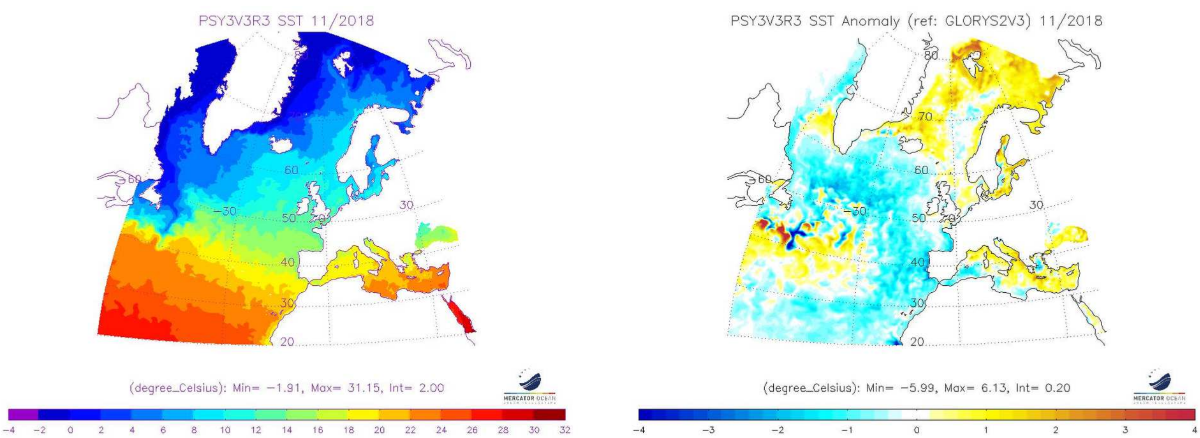


fig.I.1.6 : Mean sea surface temperature in the RA VI Region (Europe) and anomaly (reference Glorys 1992-2013).

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) :

- Main anomalies : upward around the Gulf of Guinea and Western Pacific, while downward concerns Maritime Continent, Indian Ocean as well as around the Caribbean.
- No atmospheric response induced by El Niño or the Indian dipole (positive DMI)
- Atmospheric circulation was strongly forced by a very active MJO at the beginning of the month on the Indian Ocean, then on the maritime continent in the middle of the month, and finally in the western Pacific at the end of the month. It explains the monthly anomalies on the Indian Ocean and the West Pacific(see http://www.cpc.ncep.noaa.gov/products /hurricane/animation-html/vpot_200_...)
- Over the Atlantic, subsidence is attributed to baroclinic circulation further north (see http://www.cpc.ncep.noaa.gov /products/precip/CWlink/MJO/mjoupdate.pdf)
- Over the Gulf of Guinea strong positive anomaly (linked to subsidence further north?)

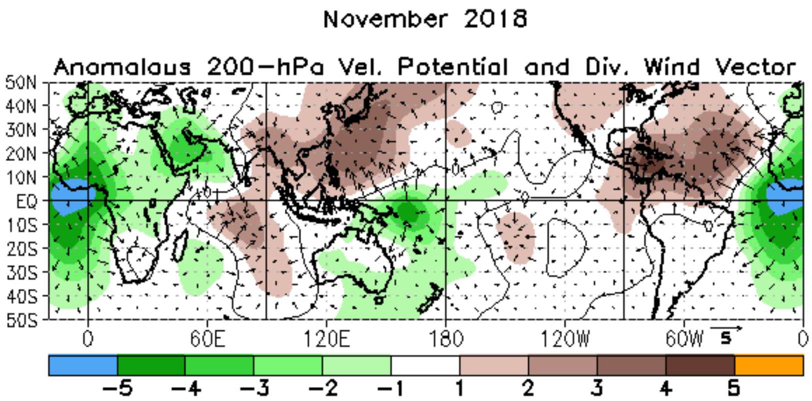


fig.I.2.1.a: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly). http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

SOI :

- close to 0 : -0.1 according to the NOAA calculation (see NOAA Standardized SOI: https://www.ncdc.noaa.gov/teleconnections/enso/indicators/soi/), and also -0.1 according to the BOM calculation (http://www.bom.gov.au/climate/current/soihtm1.shtml).

MJO (fig. I.2.1.b)

- active MJO during all of the month (see above the discution about velocity potentiel)

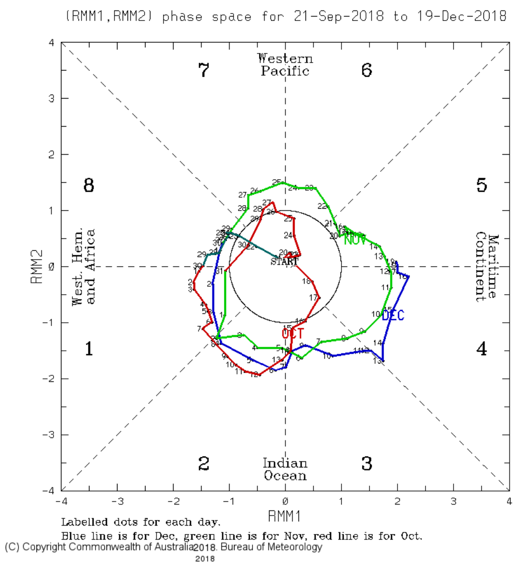


fig.I.2.1.b: indices MJO http://www.bom.gov.au/climate/mjo/

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

- no significant anomalies in the inter-tropical band.

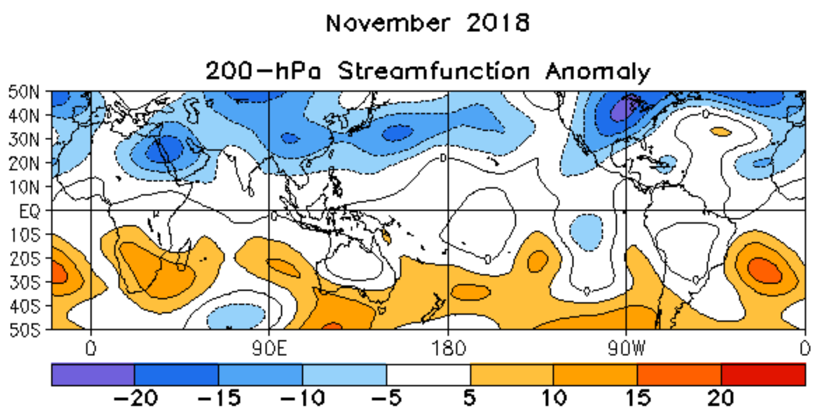


fig.I.2.2: Stream Function Anomalies at 200 hPa.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

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

- positive PNA pattern over North Pacific/North America
- negative NAO pattern over the Atlantic
- Strong blocking on Scandinavia

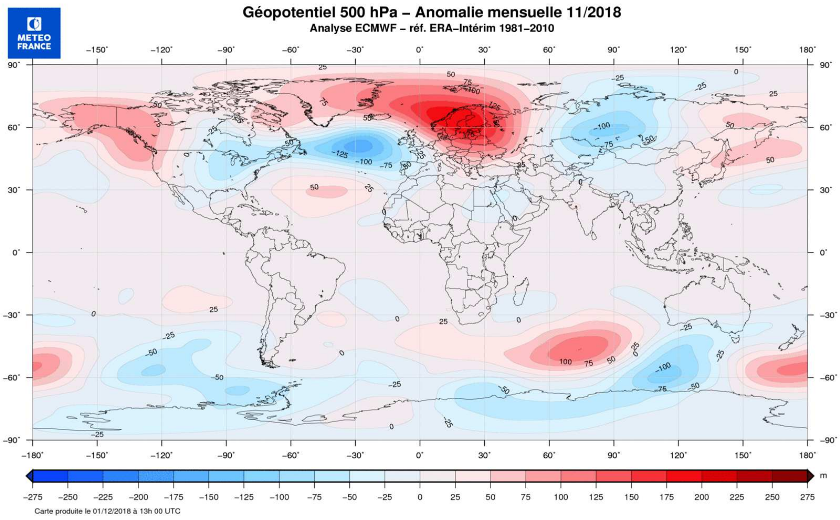


fig.I.2.3: Anomalies of Geopotential height at 500hPa (Meteo-France)

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
NOV 18	-0.3	0.3	-0.6	1.4	0.2	---	1.5	1.9	0.8
OCT 18	1.5	-0.4	-1.1	1.2	0.4	---	0.4	-1.1	-1.3
SEP 18	1.8	0.1	-1.8	-0.8	1.2	---	-1.8	-0.7	0.5
AUG 18	2.4	1.8	-1.4	-0.8	1.2	---	-0.5	-1.1	0.0
JUL 18	1.4	2.4	-0.8	-0.2	-0.8	---	-2.2	2.3	-0.1
JUN 18	1.4	-0.5	-0.4	0.1	0.7	---	-0.2	-0.8	-0.9
MAY 18	2.0	-0.1	-0.2	-1.0	-1.1	---	-1.4	1.7	-0.3
APR 18	1.2	1.1	-0.7	-0.2	-1.1	---	0.5	0.3	-1.3
MAR 18	-1.4	-0.6	0.8	0.3	-1.2	---	4.0	-0.8	0.1

Evolution of the main atmospheric indices for the Northern Hemisphere for the last 9 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

Azores High and Icelandic Low are more intense than normal and shifted to the south. This caused zonal flow over the North Atlantic shifted far to the south affecting mainly southern parts of Europe. First month with NAO- phase since March. The other main persisting patterns over Europe are a SCAND + phase and, together with the shifted Icelandic Low, a strong EATL/WRUS+ phase due to an ongoing anticyclonic anomaly over Scandinavia after the Russian High extended far to the northwest.

Southern Europe was mostly cyclonic, especially the western Mediterranean, but also the Middle East, consistent with VP200 upward anomaly, which extended from the tropics further north to the Mediterranean (see fig. I.2.1.a)

Note also a POLEUR- pattern, which has emerged in October and implies a weak polar vortex (but it became stronger later).

According to MF weather types classification three different types prevailed in November (winter types): Blocking (18 days, with high pressure over Central Europe, sometimes extending to Scandinavia), NAO- (8 days) and NAO+ (4 days).

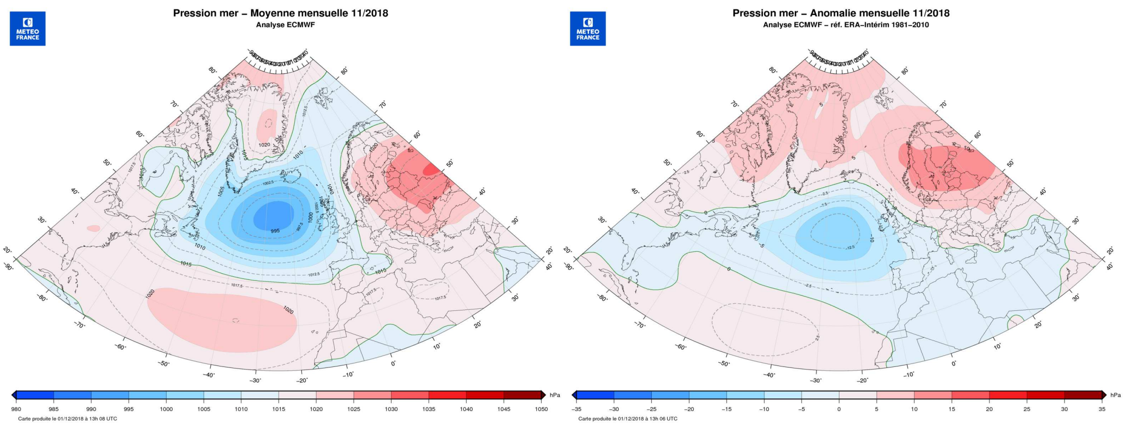


fig.I.2.4: Mean sea level pressure in the RA VI Region (Europe) (top) and 1981-2010 anomalies (bottom).

Circulation indices: NAO and AO

NAO was mainly in a positive phase or neutral in the first half of november and became negative in the second half of november . AO mainly shows the same kind of variability, implying that there was a hemispheric circulation change in the second part of month. Circulation became more meridional towards the end of the month, and cold air advanced far to the south of Europe particularly in the last days of November especially over the western parts inducing several cut-off lows over the western Mediterranean region. Monthly AO index for November 2018 was -1.1 after a long AO+ phase from April to October 2018 similar to NAO.

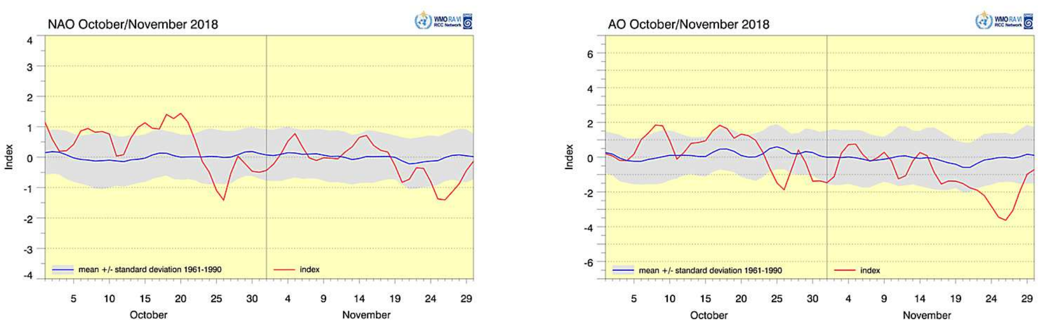


fig.I.2.5: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices with 1961-1990 mean standard deviation (shading). http://www.dwd.de/rcc-cm , data from NOAA CPC: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

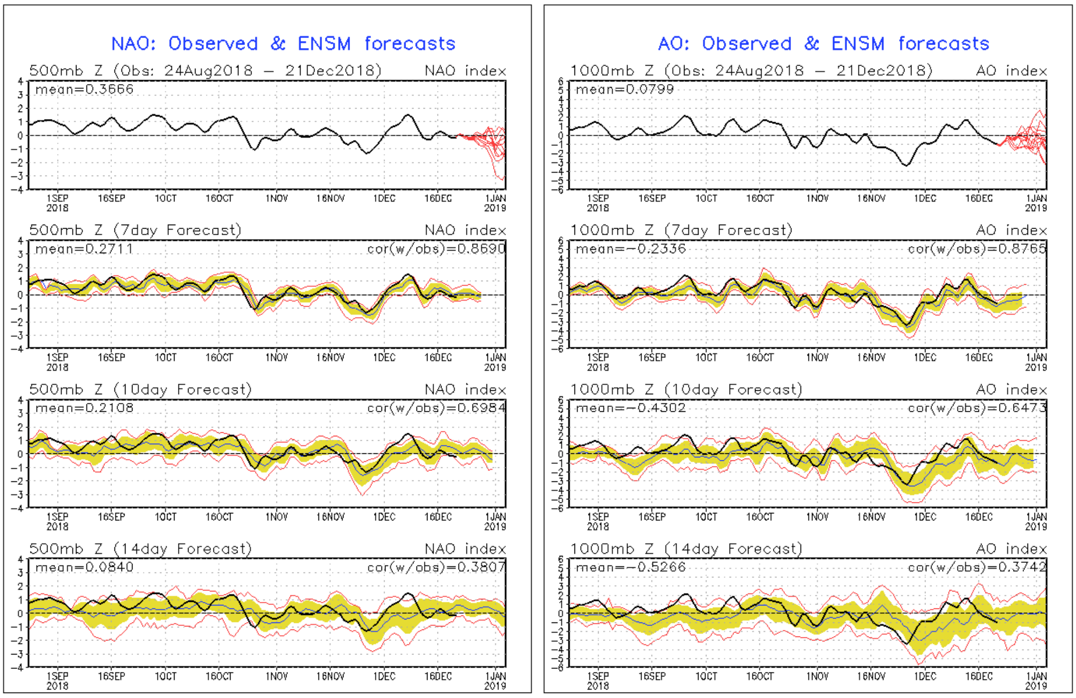


fig. I.2.5a: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices for the last 4 months and forecasts for the following weeks. Source: NOAA CPC, http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

I.2.b Precipitation

- Dry conditions aurond the Caribbean in agreement with subsidence anomalies. Also generally dry from the Indian Ocean to the maritime continent.
- Wet conditions in the extreme west of the equatorial Pacific as well as along South American coast.
- Over Europe dry conditions from Central Europe to Scandinavia and up to the west of Russia. Rather wet around the Mediterranean and the Middle East.

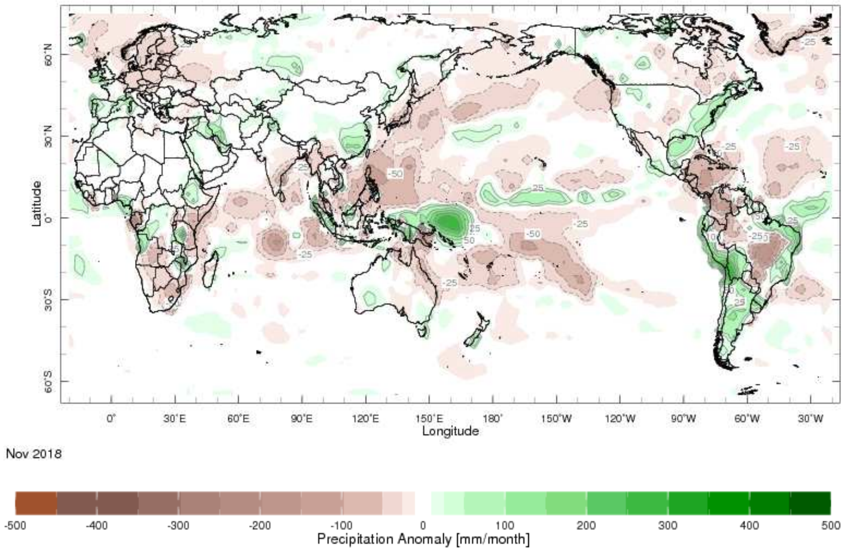


fig.I.2.6: Rainfall Anomalies (mm) (departure to the 1979-2000 normal).
Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/Anomaly.html

Precipitation anomalies in Europe:

It was particularly dry over Central, Eastern and Northern Europe with locally severe or even extreme drought conditions, consistent with the extension of the blocking High. Totals were mostly below the 10th percentile. Especially for Central Europe this was a continuation of the long drought period in the preceding summer half year, with dried soils and low water levels, both in rivers and groundwater.

Cyclonic influence from the North Atlantic resulted in above-normal precipitation in parts of Western Europe, but also in the western Mediterranean. Parts of southeastern Europe, too, had above-normal precipitation, either due to cyclonic systems moving over the Mediterranean from west to east, or by upper air lows coming from the east.

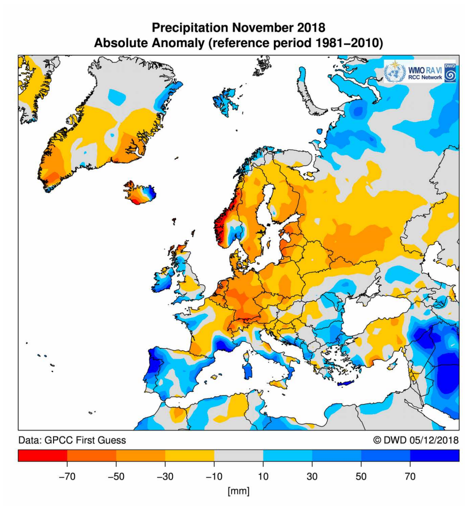


fig.I.2.7.a : Absolute anomaly (1951-2000 reference) of precipitation in the RA VI Region (Europe), data from GPCC (Global Precipitation Climatology Centre), http://www.dwd.de/rcc-cm.

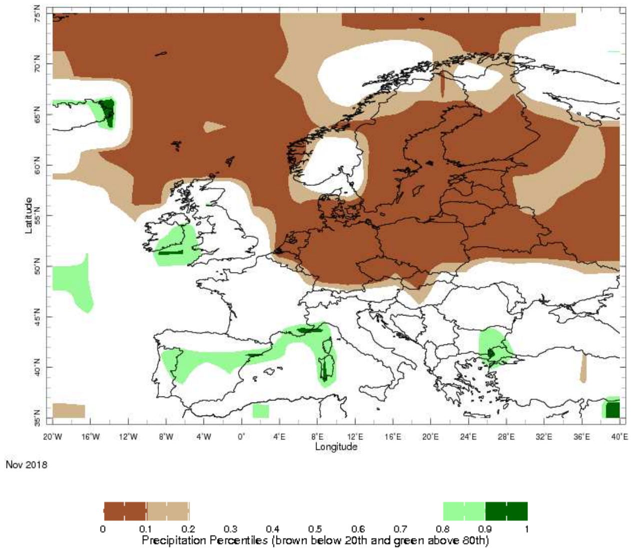


fig.I.2.7.b : Percentiles of precipitation, 1981-2010 reference. Data from NOAA Climate Prediction Center, http://iridl.ldeo.columbia.edu/maproom/Global/Precipitation/Percentiles.html

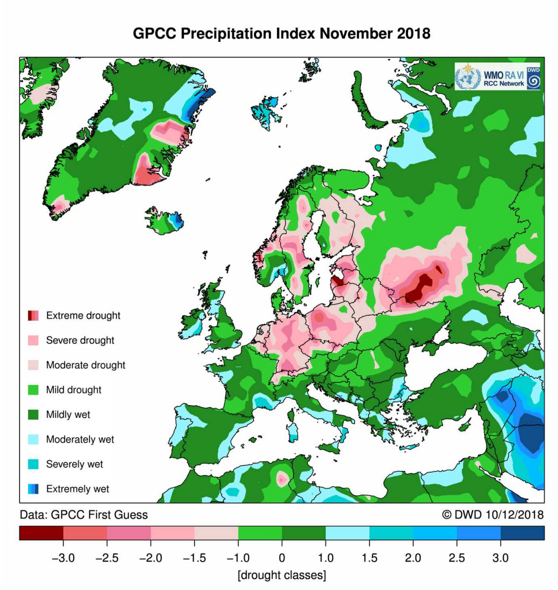


fig. I.2.8: GPCC Precipitation Index, http://www.dwd.de/rcc-cm .

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	- 29.6 mm	- 0.891
Southern Europe	+ 6.8 mm	+ 0.421

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

- over Europe, temperature once again above normal for most countries with strong values in northern Scandinavia, Italy and east of the Méditerranean. the only exceptions were the Iberian Peninsula and areas north of Black Sea where anomalies were negative
- Over North America rather cold temperatures except for Alaska and western Canada where temperatures were warmer than normal.
- Over the tropics strong warm anomalies north of South America, Africa and Indian.
- Over Arctic warmer conditions than normal.

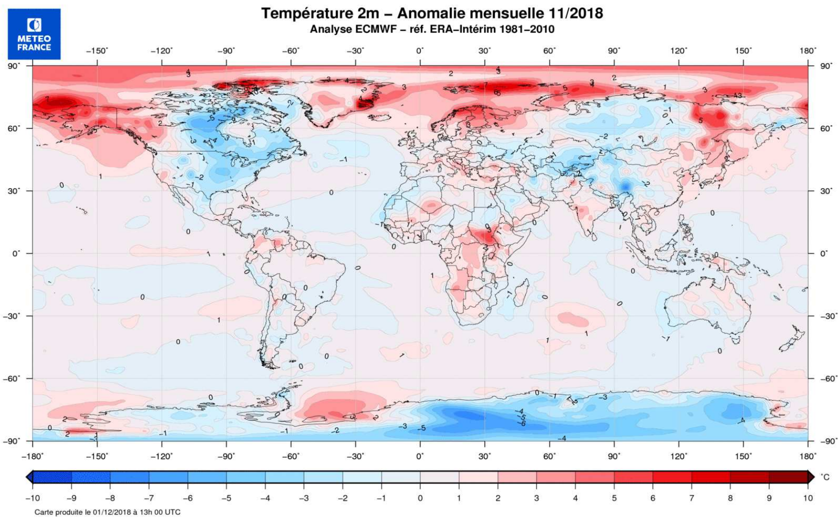


fig.I.2.9: Temperature Anomalies (℃) (Meteo-France)

Temperature anomalies in Europe:

Most of Europe was warmer than normal with highest anomalies in northern Scandinavia. This warming in northern Europe was due both to southerly advection along the blocking High and areas of strong subsidence within the high pressure zone. Another outstanding warmer-than-normal area was located in south-eastern Europe, mainly due to a subtropical warm spell at the beginning of the month.

Parts of western and southwestern Europe were colder than normal, since the main frontal zone over the North Atlantic and the colder air north of it was much shifted to the south. It was also colder than normal in parts of Eastern Europe (Ukraine, southern European Europe), when cold continental air moved along the southern flank of the Russian High to these areas and the air near surface cooled further due to snow coverage.

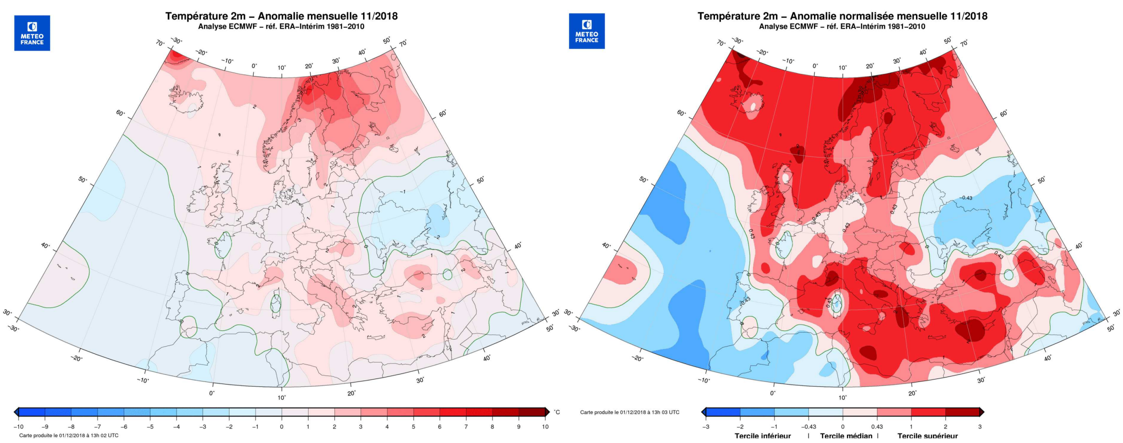


fig.I.2.10: Left graph: Absolute anomaly of temperature in the RA VI Region (Europe). Right graph: Standardized temperature anomalies

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	+ 1.8 ℃

Southern Europe	+ 1.1 °C

I.2.d Sea ice

- In the Arctic : Rapid expansion at the beginning of the month. Persistent deficit in the Chukchi Sea and Barents Sea. 9th rank ok weak extension over the period 1979-2018
- In Antarctica : Declined much more slowly than average in November but remains deficit.

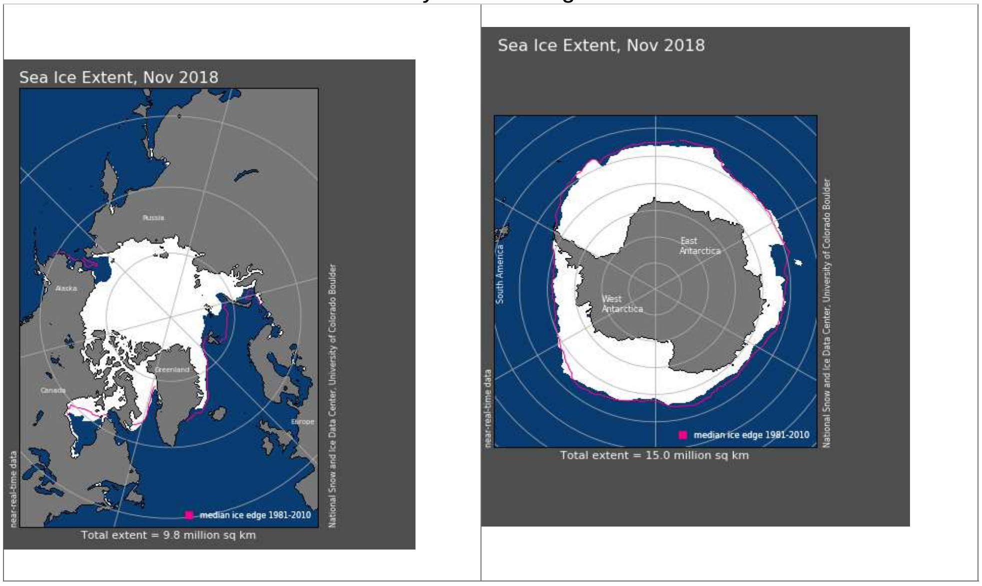


fig.I.2.11: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

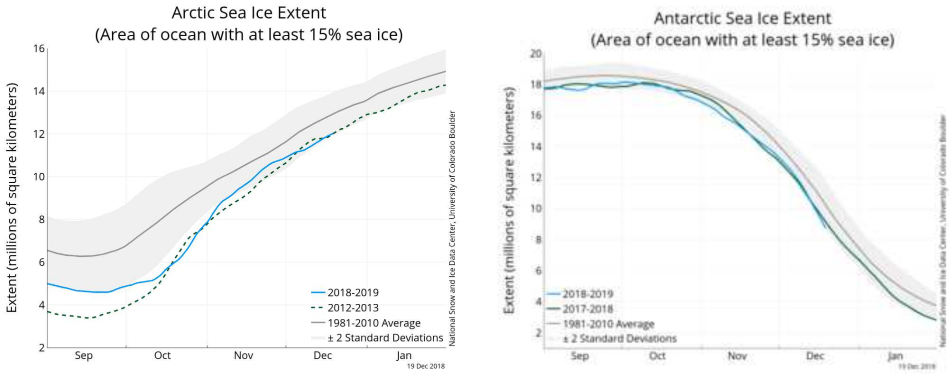
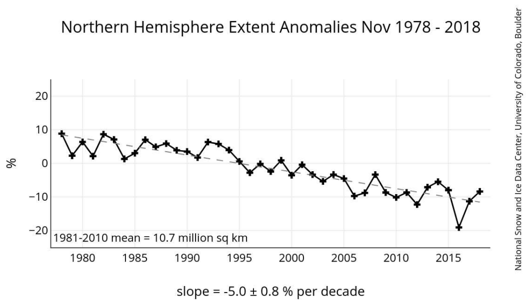


fig. I.2.12 : Sea-Ice extension evolution from NSIDC. https://nsidc.org/data/seaice_index/images/daily_images /N_stddev_timeseries.png



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

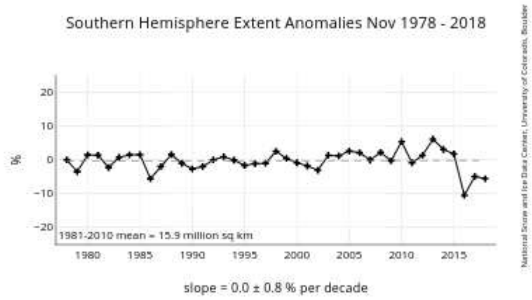


fig 1.2.13 : Monthly Sea Ice Extent Anomaly Graph in Antarctic for the month of analysis (http://nsidc.org/data/seaice_index/)

II. SEASONAL FORECAST FROM DYNAMICAL MODELS

A weak-to-moderate El Niño even continues in the coming months.

NB : MF-S6 is the operational model of Meteo-France. But please note that the EUROSIP system, shown in this bulletin, is still using MF-S5 outputs - viewable on http://seasonal.meteo.fr/fr/content/ARP5 -.

II.1. OCEANIC FORECASTS

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

Models are in rather good agreement for the next three months. However the duration and the intensity of the El Niño event differ from one model to another.

- Pacific Ocean: Warm anomalies forecasted along the Equator, east of the dateline, extending to the west, with a maximum around 1℃ in the Niño 3.4 box. In the Northern Hemisphere, warm anomaly forecast in Gulf of Alaska with a slightly positive PDO.
- Indian Ocean: Warm anomalies forecasted except in eastern Australia. DMI becomes neutral again. Note than during an El Niño event, the DMI is usually positive.
- Atlantic Ocean:
  - northern Atlantic : no significant changes with a tripole-like configuration (cool, warm, cool).
- Mediterranean Sea : persisting warm anomalies especially on the eastern basin.

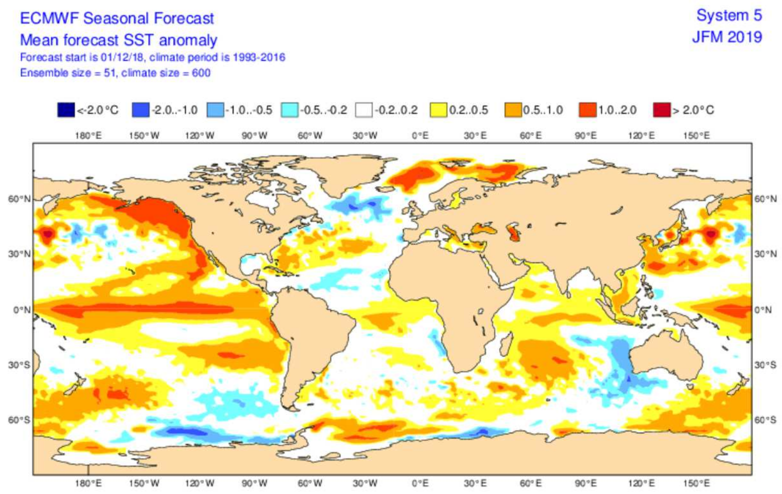


fig.II.1.1: SST anomaly forecast from ECMWF
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

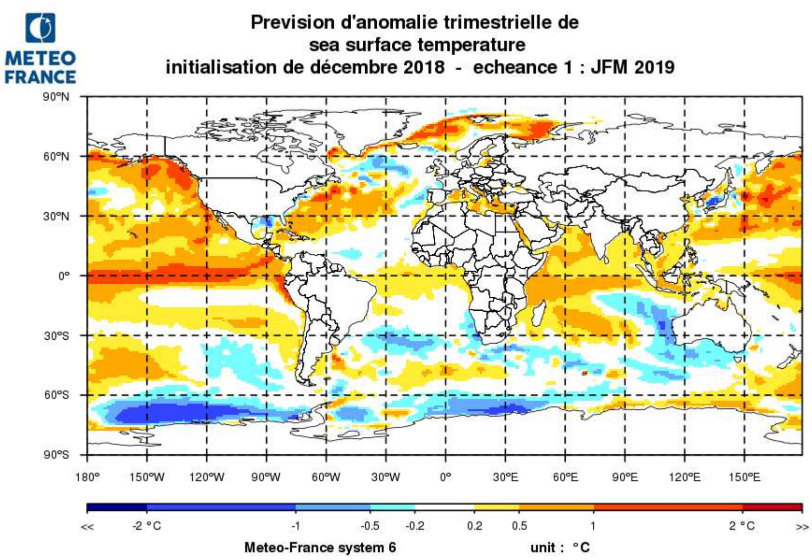


fig.II.1.2: SST Anomaly forecast from Meteo-France (recalibrated with respect of observation).
http://seasonal.meteo.fr

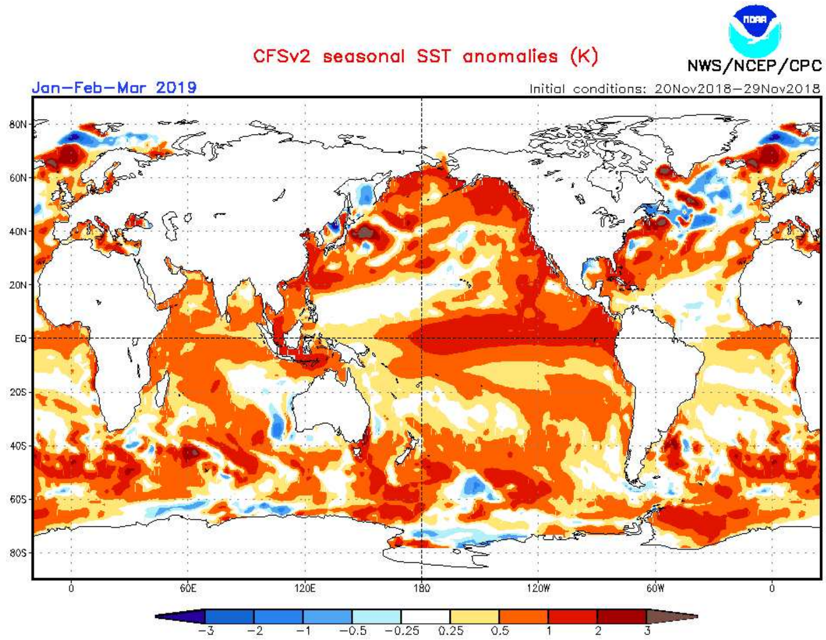


fig.II.1.3: SST Anomaly forecast from NCEP.
http://www.cpc.ncep.noaa.gov/products/people/wwang/cfsv2fcst/imagesInd1/glbSSTSeaInd1.gif

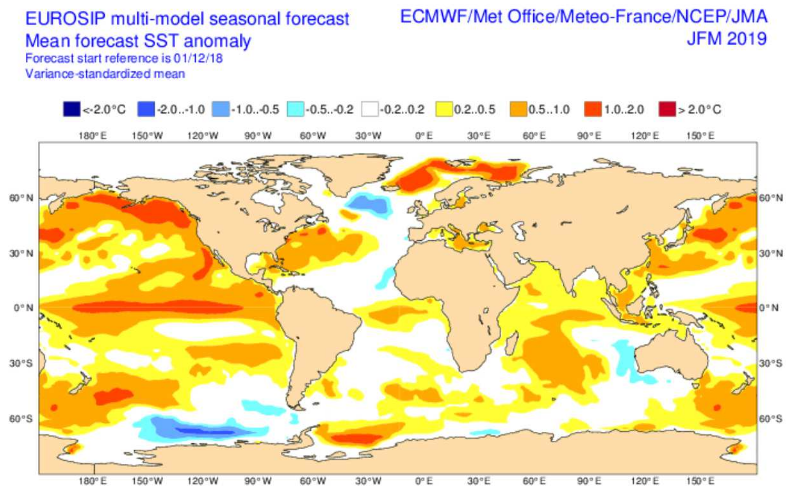


fig.II.1.4: SST Forecasted anomaly from Euro-SIP

II.1.b ENSO forecast :

***Forecast Phase*: weak to moderate El Niño**.

On the box Nino3.4 anomaly is in slight decrease with the calibrated data of Eurosip multi-model (mean anomaly around 0.7 °C over the quarter). From the raw data, CEP5 forecasts suggests a stationary trend (anomaly close to 0.9 °C) and MF6 continues t o be slightly up (anomaly around 1.2 °C). The event probability is now around 85% in the IRI synthesis (https://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/).

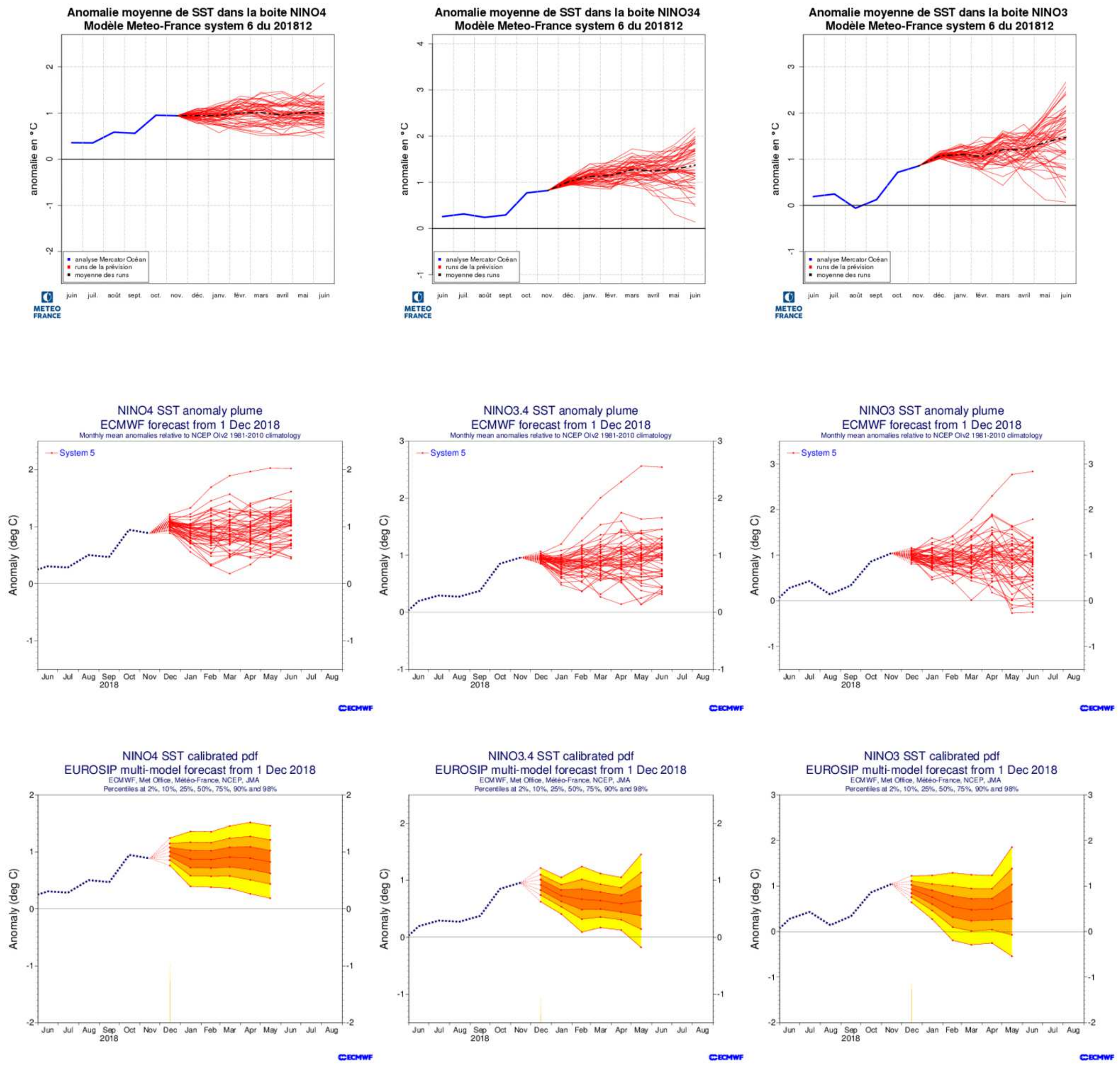
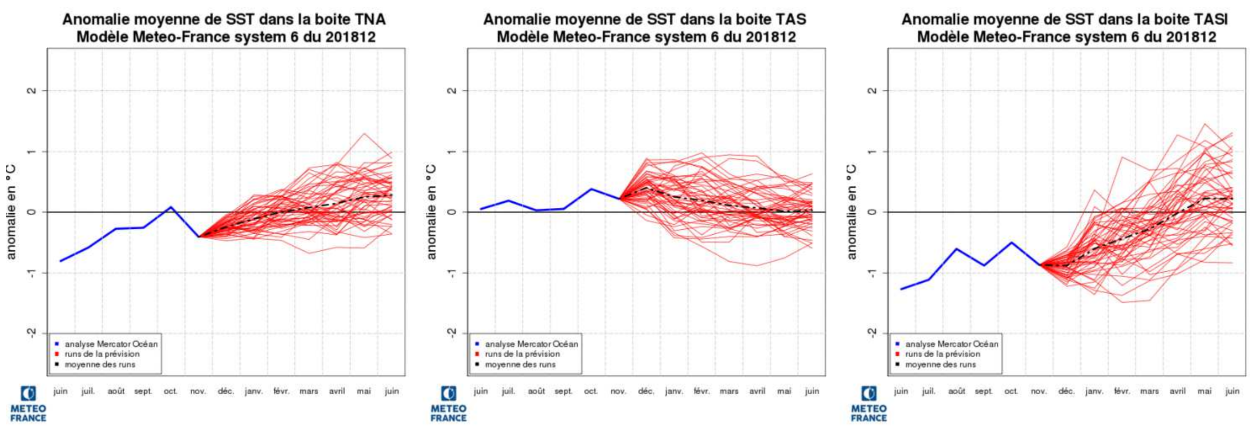


fig.II.1.5: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members -
and EUROSIP (bottom) – recalibrated distributions -
(http://seasonal.meteo.fr , http://www.ecmwf.int/)

I.1.c Atlantic ocean forecasts



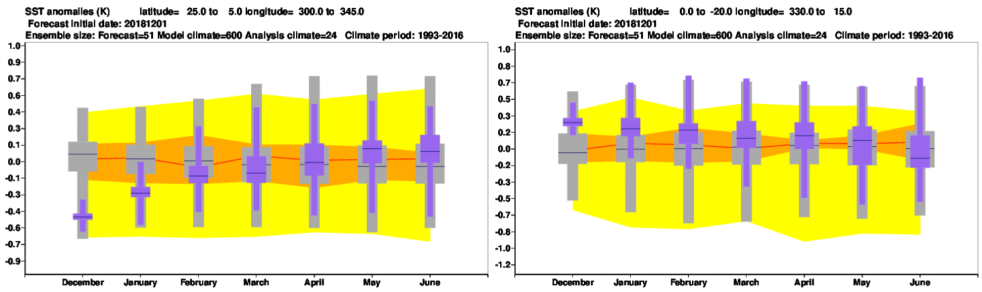


fig.II.1.6: SSTs anomaly forecasts in the Atlantic Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

I.1.d Indian ocean forecasts

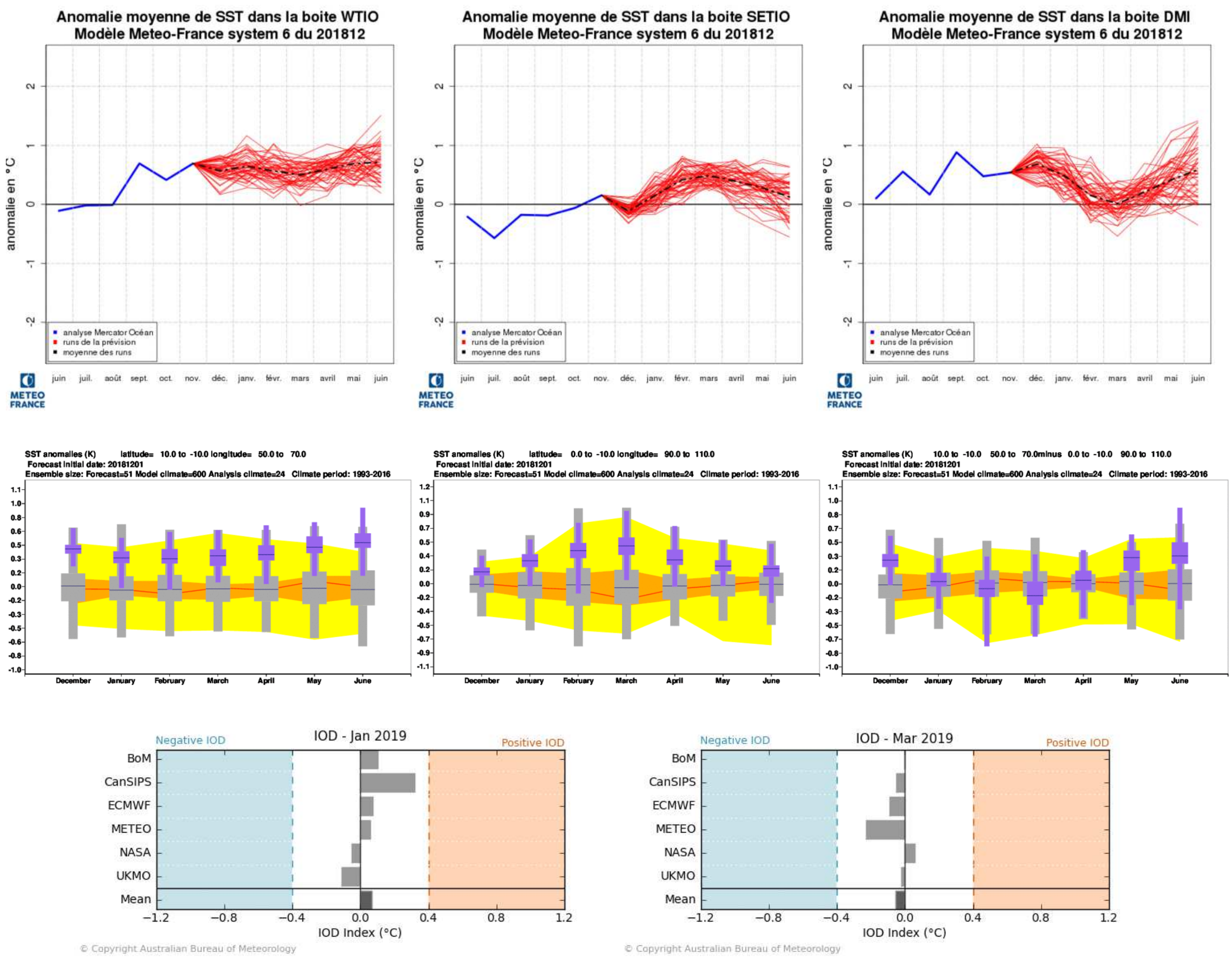


fig.II.1.7: SST anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

II.2. GENERAL CIRCULATION FORECAST

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

Atmospheric response to an El Niño event, but without any significant teleconnection with Europe. Rather good agreement between models (MF-S6, ECMWF-S5)

- Velocity potential : On the Pacific Ocean, atmospheric reponse is a little atypical to an El-Niño event with two areas upward motion anomalies : a west area more intense and east area very weak espacially with ECMWF-S5. On Indian Ocean and Maritime Continent more classic response to El Niño with strong subsidence anomalies. No signal over Africa.
- Stream function : consistent response to El Niño for both the Pacific and the Indian Ocean. Significant teleconnection is seen over North America with a positive PNA pattern (stronger with ECMWF). They differ in the location of the anticyclonic anomaly over Canada. Over the Atlantic Ocean no signal emerges from the models.

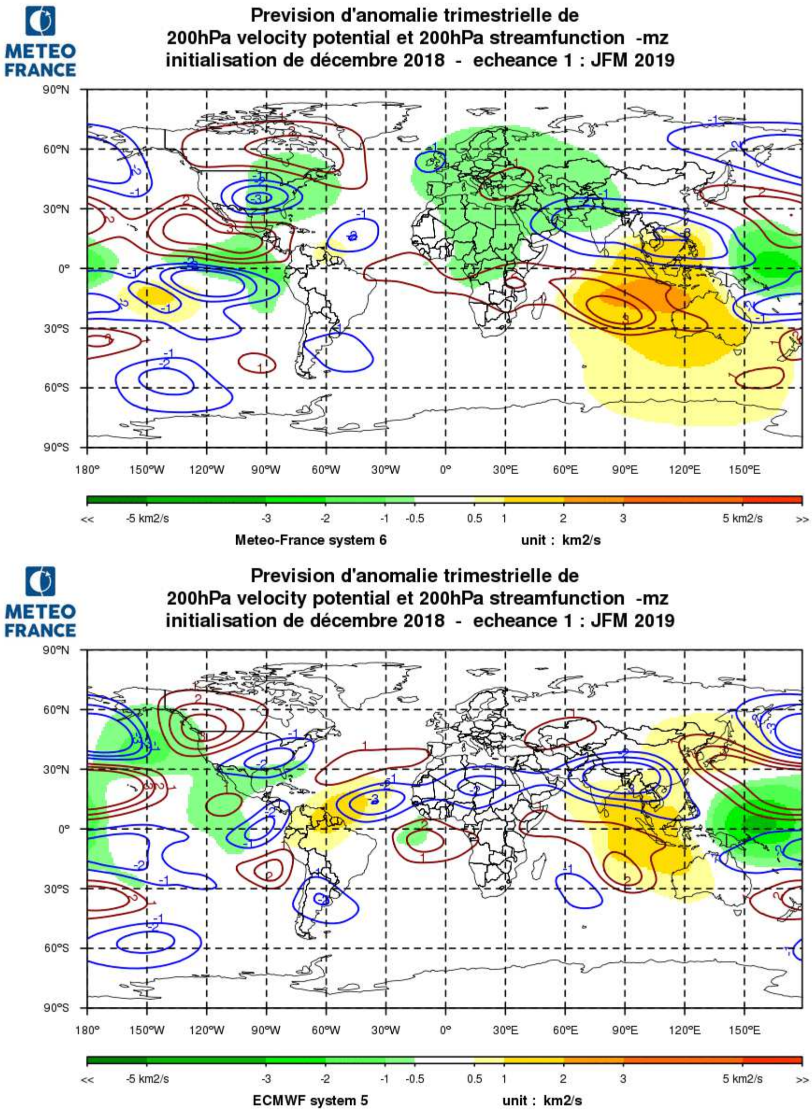


fig.II.2.a: Velocity Potential anomaly field χ (shaded area – green negative anomaly and yellow positive anomaly), associated with Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa by Météo-France (top) and ECMWF (bottom).
http://seasonal.meteo.fr

II.2.b Geopotential height anomalies

Good consensus for a strong positive PNA signal. Significant differences among models regarding Northern Atlantic and Europe.

Downstream from the PNA, the negative anomaly over the Eastern Coast of North America (extending more or less to the center of Atlantic according to the models)and a positive one close to Greenland (more ou less extending in the south or in the west according to the models). This dipole correspond to a negative NAO circulation. This is the signal shown by most of the GPC models.

But close to Europe, models are quite different . Anyway one can isolate some similarities from GPC composites : an negative anomaly over northwestern Europe and and positive anomalies of the Noth Pole in western Russia. This scenario was already in last month's forecast.

Another region where the GPC composite supports analysis of stream fonction anomaly : the relative minimum extending from Northern Indian Ocean to the Arabic Peninsula and to North Africa.

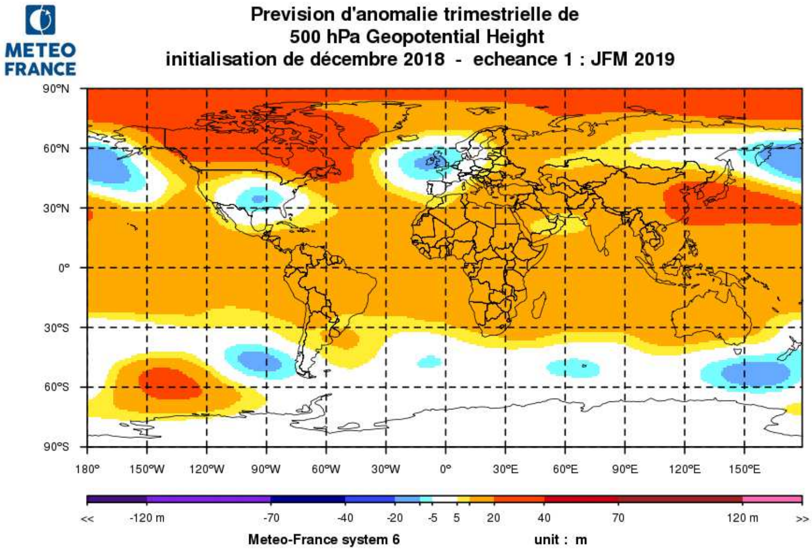


fig.II.2.b.1: Anomalies of Geopotential Height at 500 hPa from Météo-France.
http://seasonal.meteo.fr

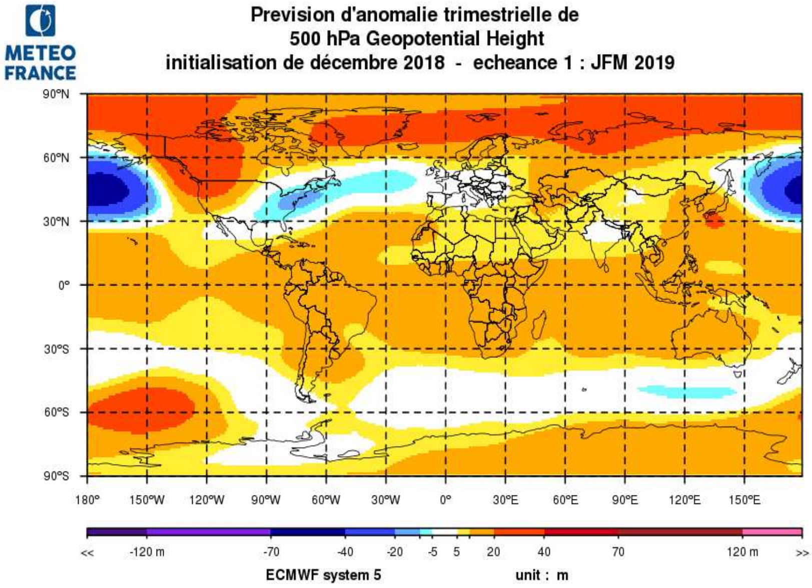


fig.II.2.b.2: Anomalies of Geopotential Height at 500 hPa from ECMWF.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast

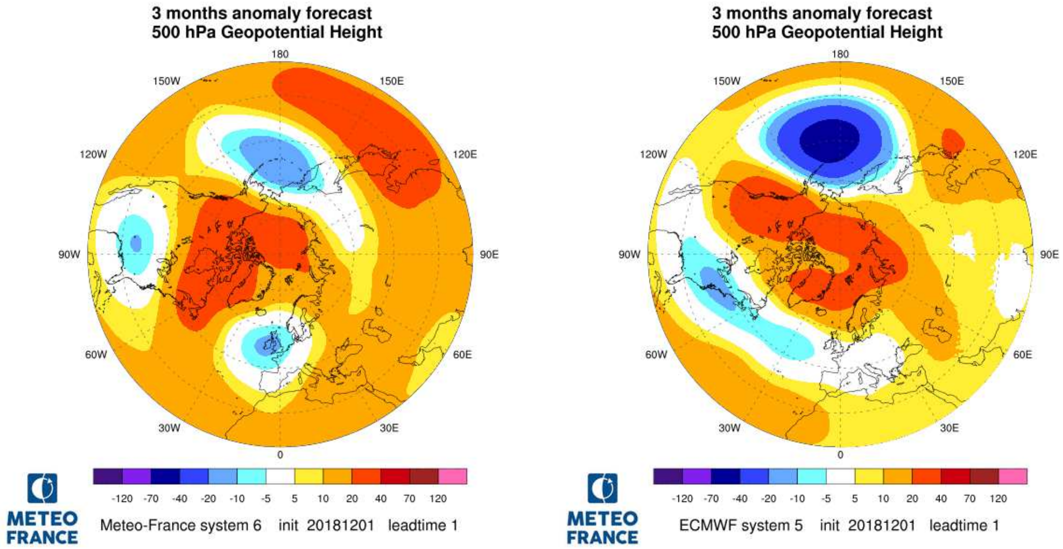


fig.II.2.b.3: Anomalies of Geopotential Height at 500 hPa from Météo-France.
http://seasonal.meteo.fr

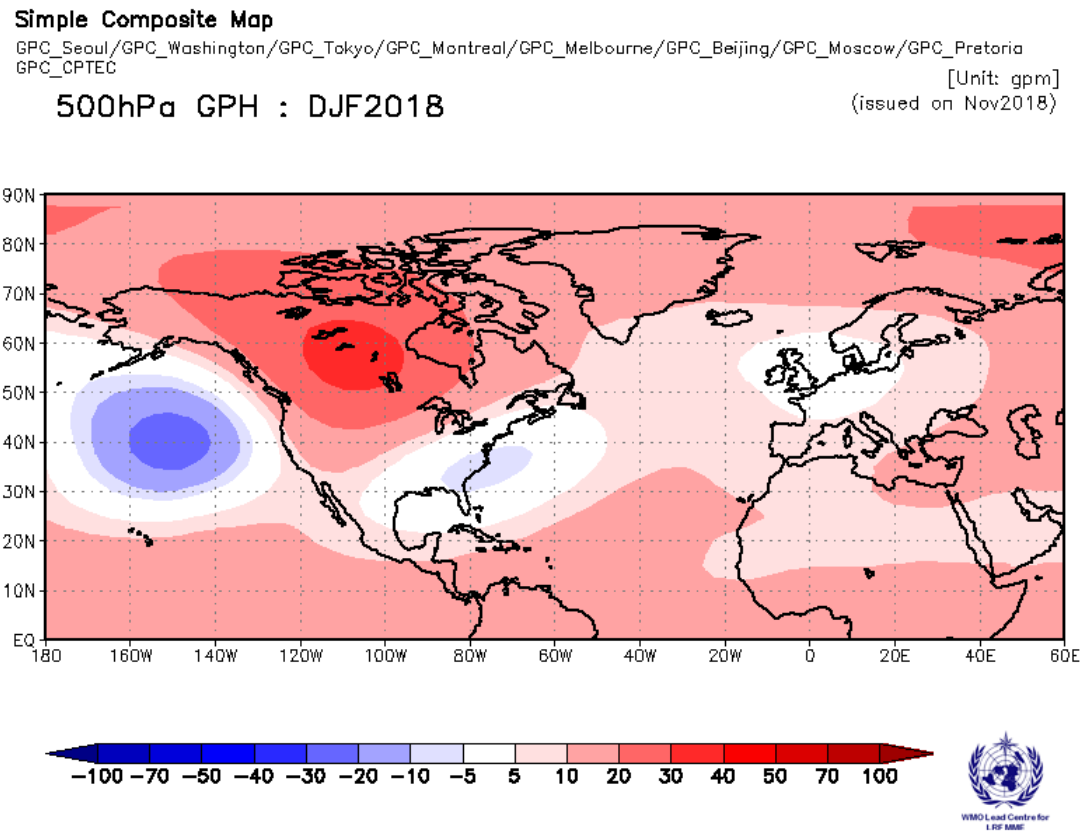


fig II.2.b.4 : Multi-Model anomaly of geopotential height at 500 hPa (https://www.wmolc.org)

II.2.c. modes of variability

Most probable phases : positive PNA and negative NAO.

For the secondary modes, positive EA and positive SCAN

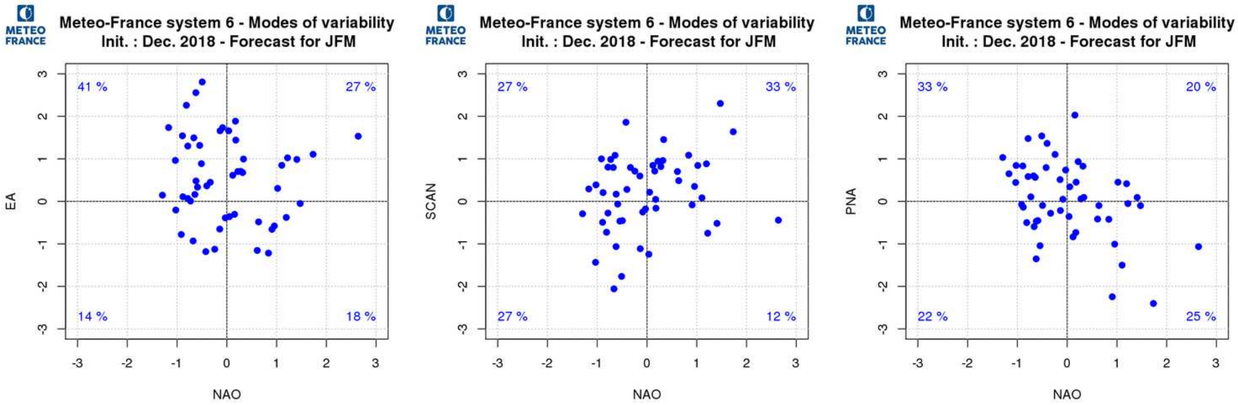


fig.II.2.c.1 : modes of variability forecasts over the Northern hemisphere with Meteo-France MF-S6

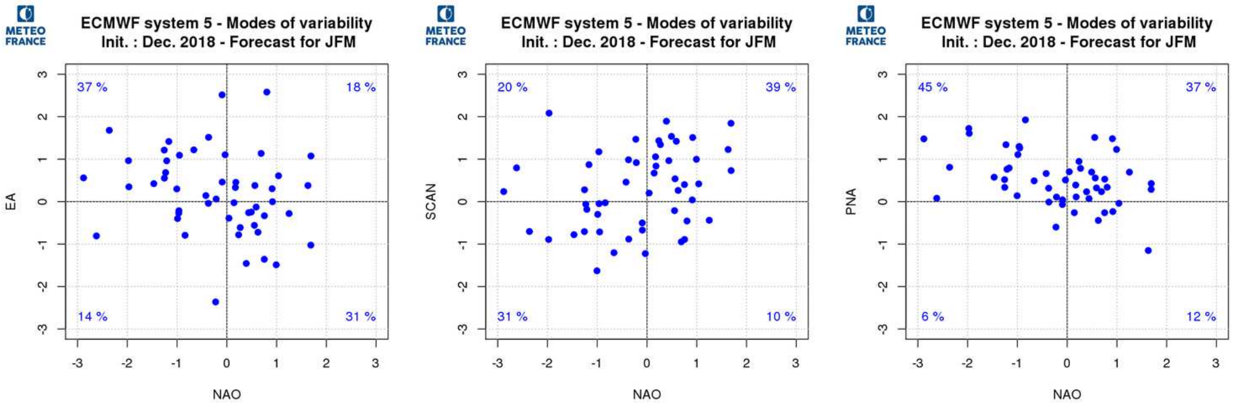


fig.II.2.c.2 : modes of variability forecasts over the Northern hemisphere with ECMWF-S5

II.2.d. weather regimes

No significant signal.

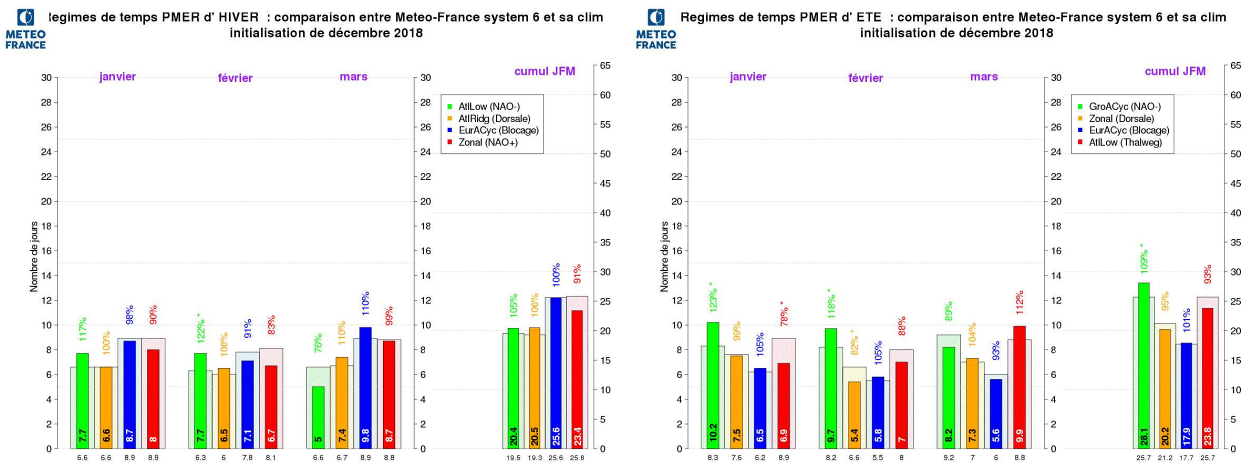


fig.II.2.d.1: North Atlantic Regime occurrence anomalies from Meteo-France MF-S6 : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.
Left : winter regimes; Right : summer regimes

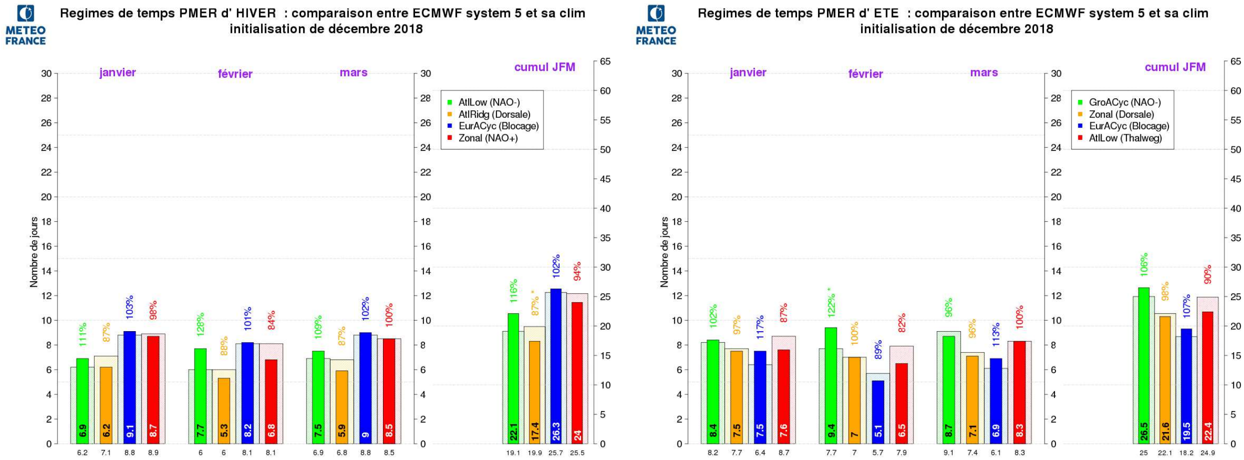


fig.II.2.d.2 : North Atlantic Summer Regime occurrence anomalies from ECMWF-S5 : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes
Left : winter regimes; Right : summer regimes

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

For North America : In agreement with the positive PNA, warm anomalies on the north-west half, and neutral to cold on the south-east half.

For Europe and North Atlantic : For a majority of models warm anomalies around the Mediterranean and southeastern Europe. No signal elsewhere.

II.3.a Météo-France

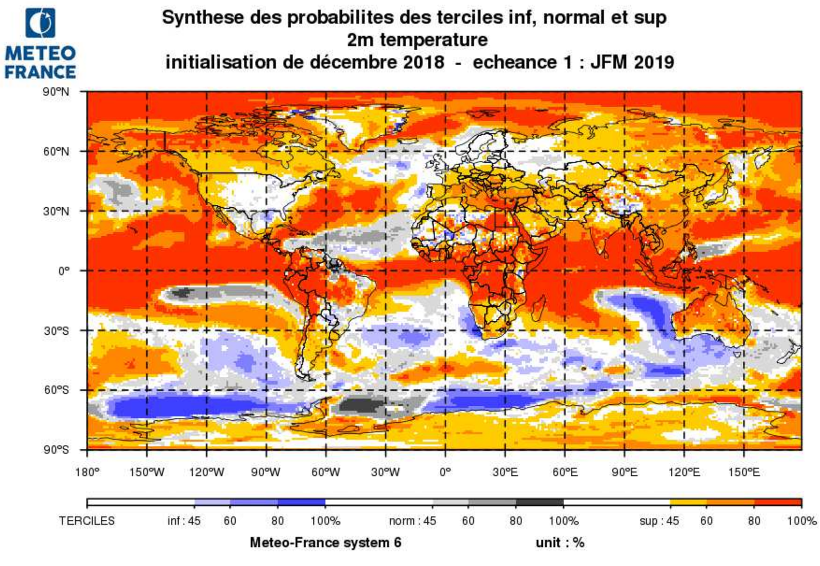


fig.II.3.1: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.3.b ECMWF

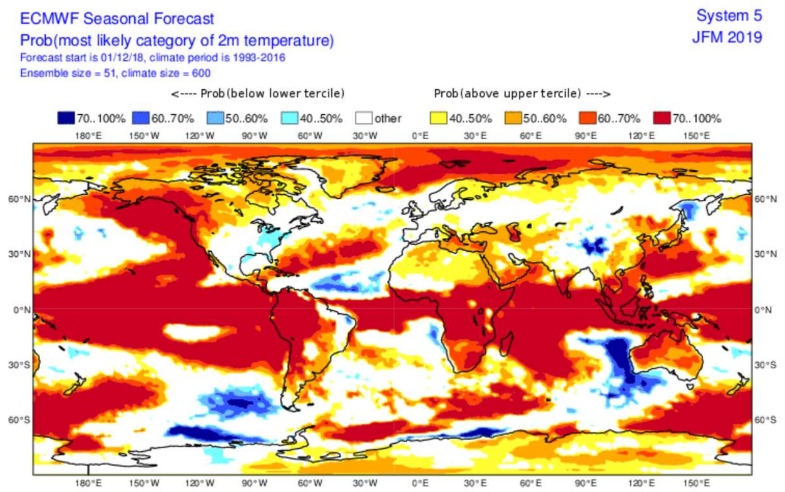


fig.II.3.2: Most likely category probability of T2m from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seaso...

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

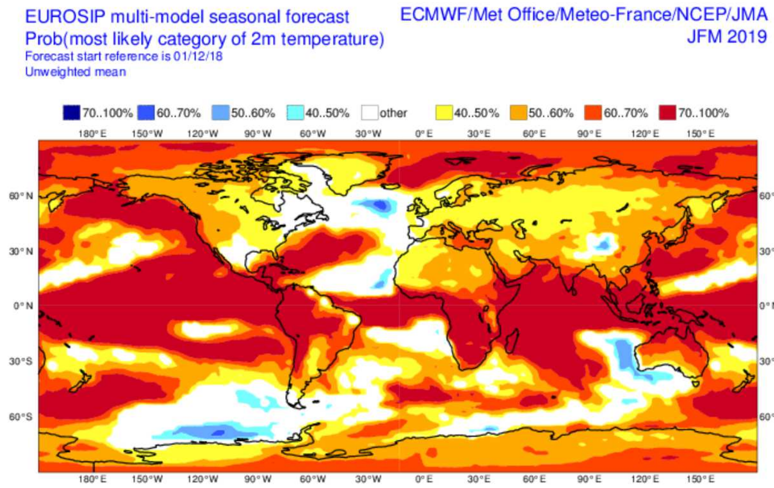


fig.II.3.4: Multi-Model Probabilistic forecasts for T2m from EUROSIP (2 Categories, Below and Above normal – White zones correspond to No signal and Normal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

II.3.e GPCC's composite

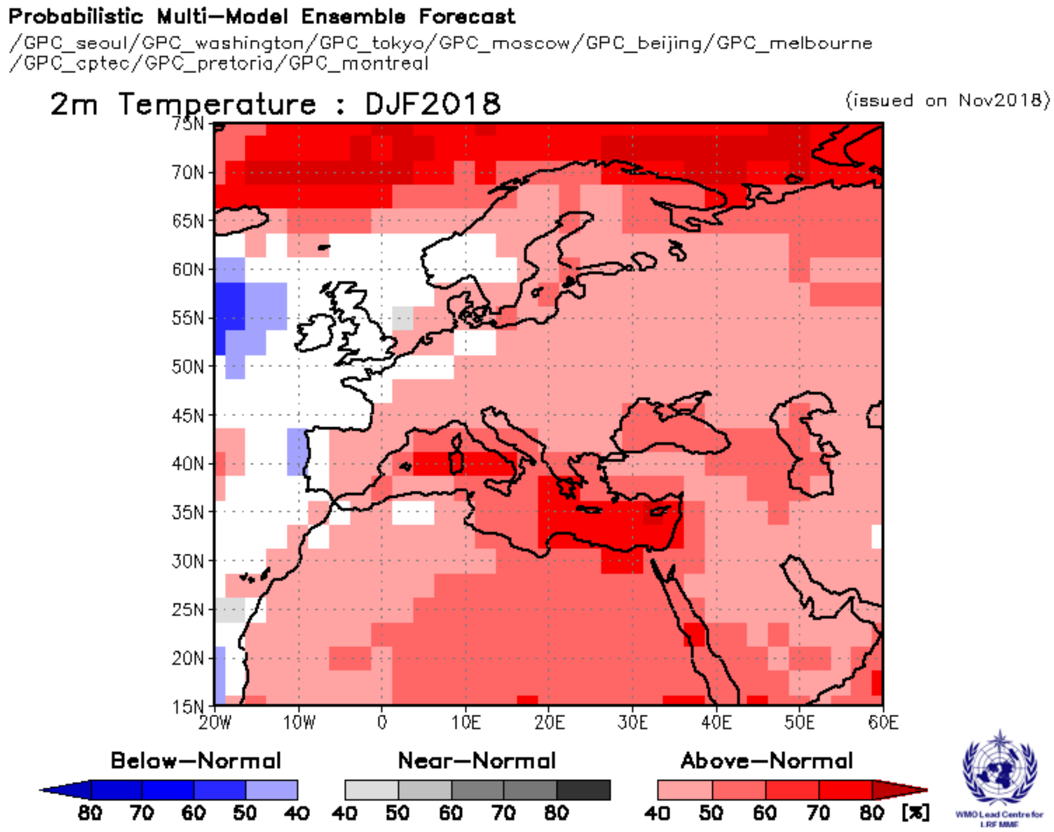


fig.II.3.1.c : Multi-model forecast of temperature anomalies at 2 metres (https://www.wmolc.org)

II.4. IMPACT : PRECIPITATION FORECAST

- Wet signal on the south-eastern United States in connection with positive PNA, and also over south-western California (El Niño consistent).
- For Europe, wet signal from soutwest to the center in connexion with soutward shift of atmospheric disturbances (mode NAO -). Dry signal north of British Isles in relation to the positive anomaly of geopotentiel.
- inter-tropical regions : good agreement between models and also with an El-Niño type response. Dry over Australia, Maritime Continent and the Carribean. Wet over Mexico and western Peru.

II.4.a Météo-France

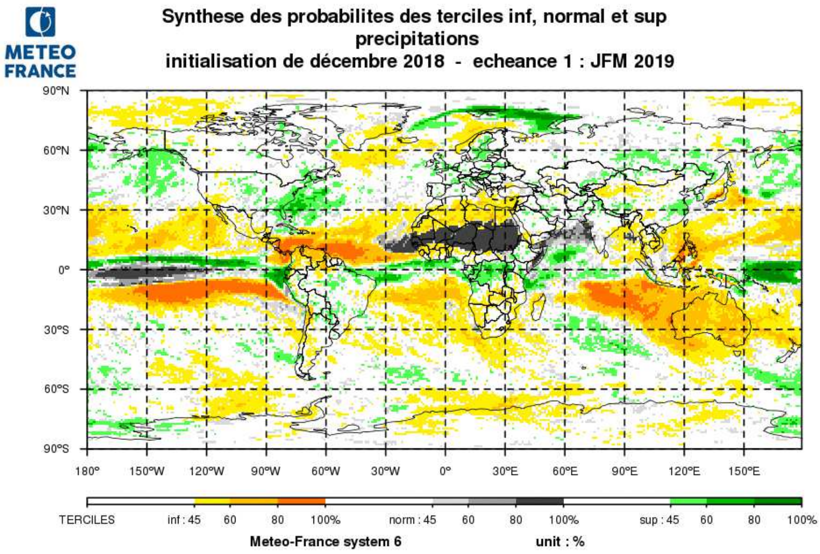


fig.II.4.1: Most likely category of Rainfall. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.4.b ECMWF

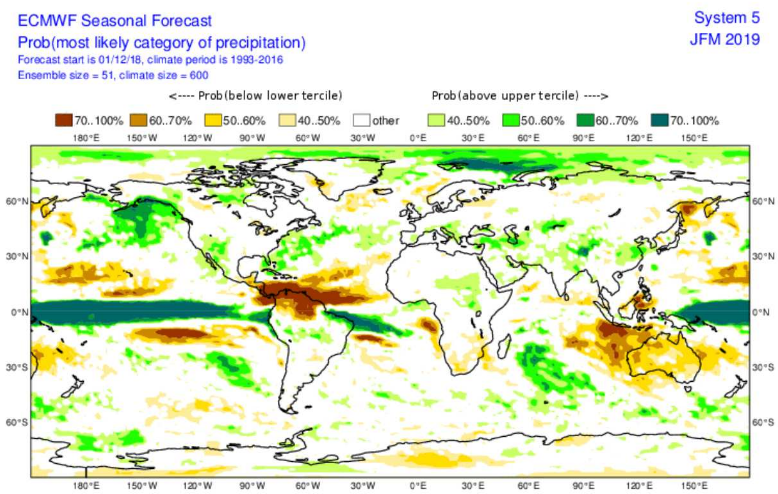


fig.II.4.2: Most likely category probability of rainfall from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

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

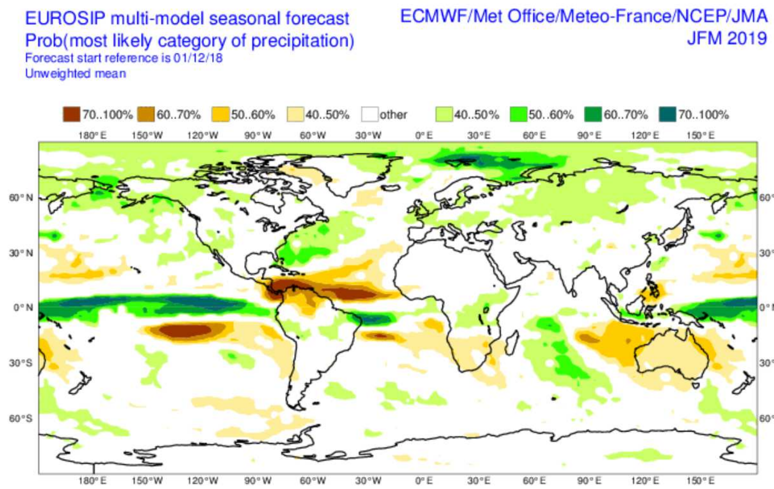


fig.II.4.4: Multi-Model Probabilistic forecasts for precipitation from EUROSIP (2 Categories, Below and Above normal – White zones correspond to No signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

II.4.e GPCC's Composite

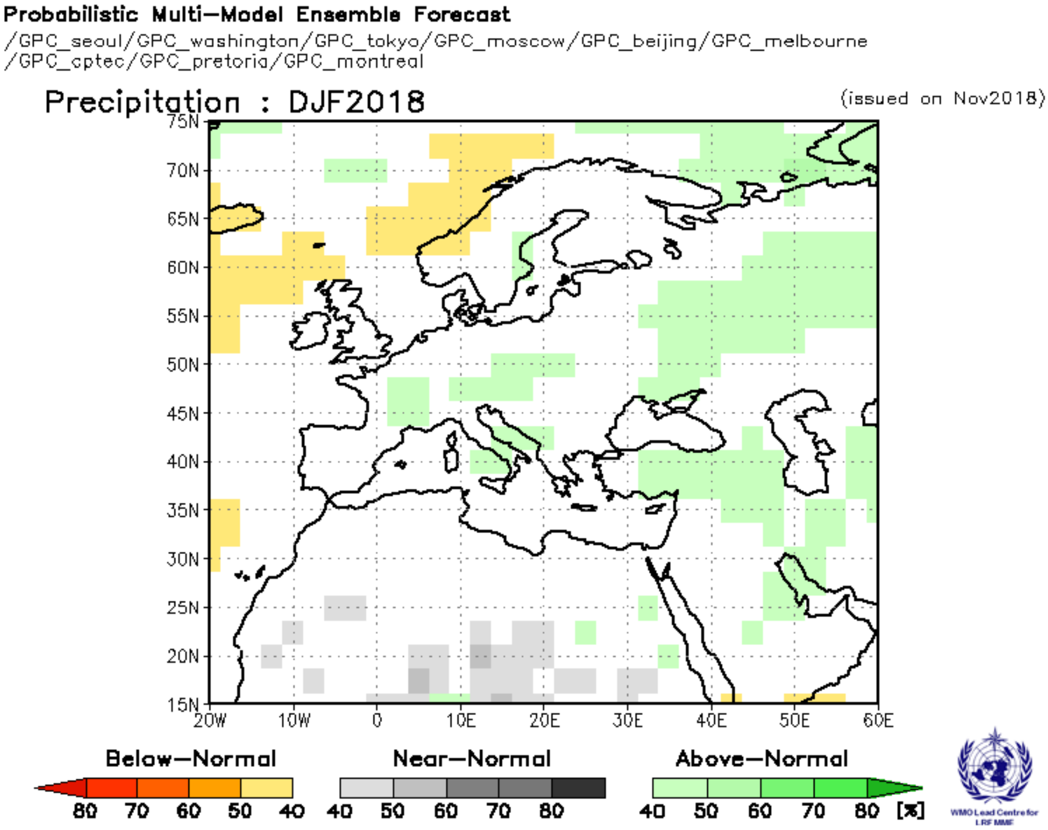


fig.II.3.2.c: Multi-model forecast of precipitation anomalies (https://www.wmolc.org)

II.5. REGIONAL TEMPERATURES and PRECIPITATION

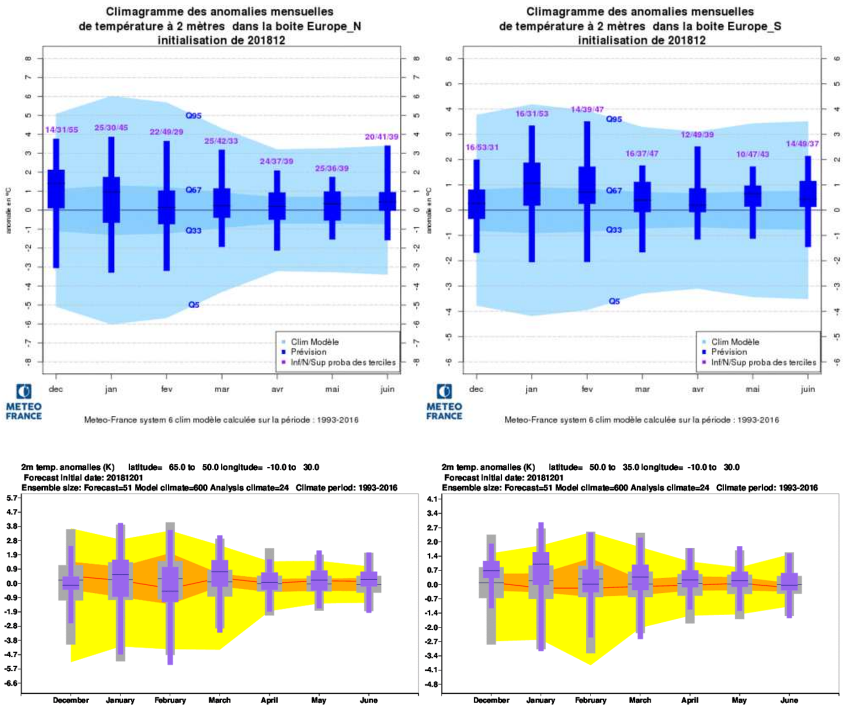


fig.II.5.1 : Climagrams for Temperature in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

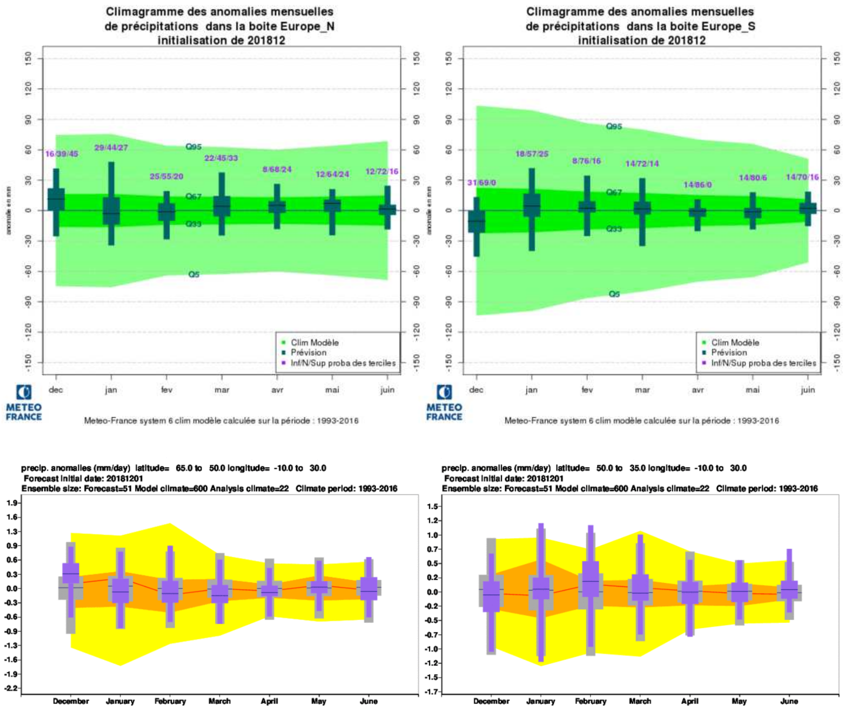


fig.II.5.2 : Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

II.6. "EXTREME" SCENARIOS

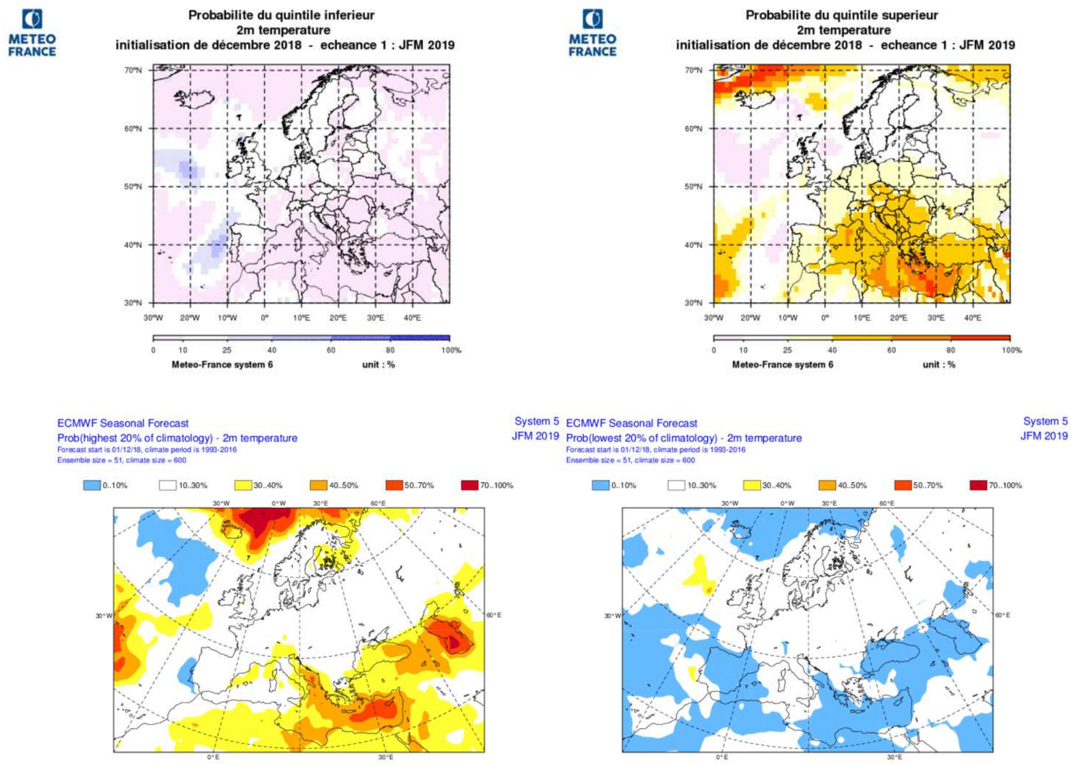


fig.II.6.1 : Top : Meteo-France T2m probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution). Bottom : ECMWF T2m probability of « extreme » below normal conditions (left - highest ~20%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

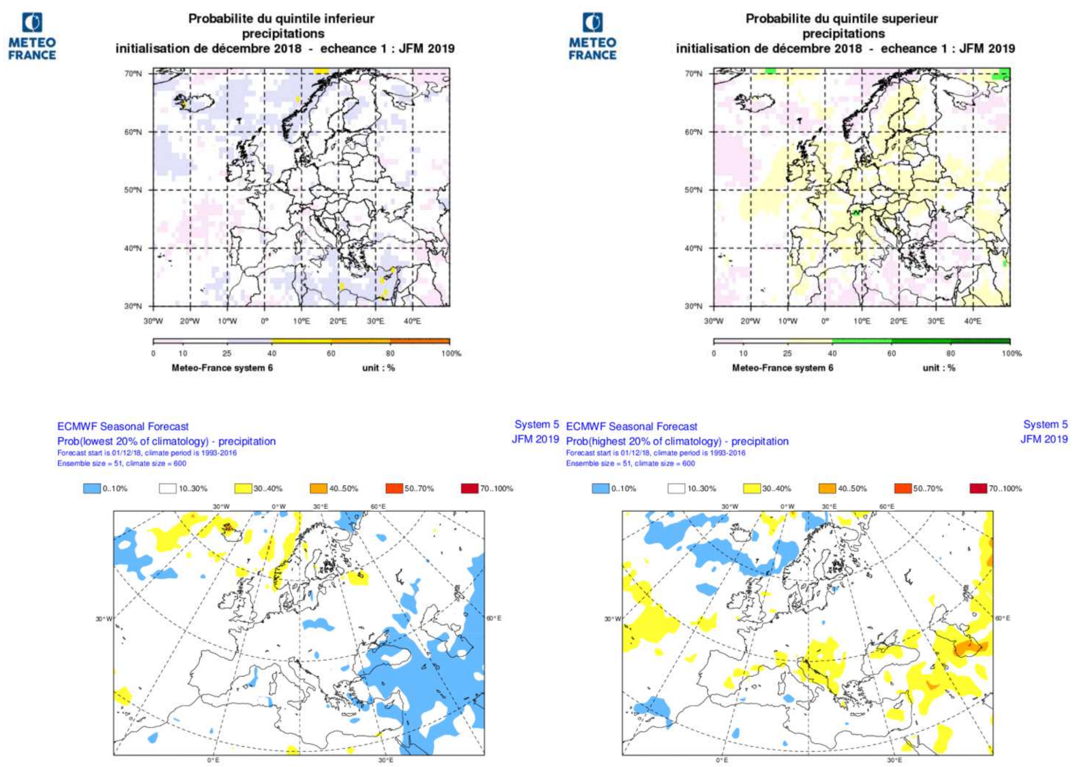


fig.II.6.2 : Top : Meteo-France rainfall probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution).
Bottom : ECMWF rainfall probability of « extreme » below normal conditions (left - lowest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

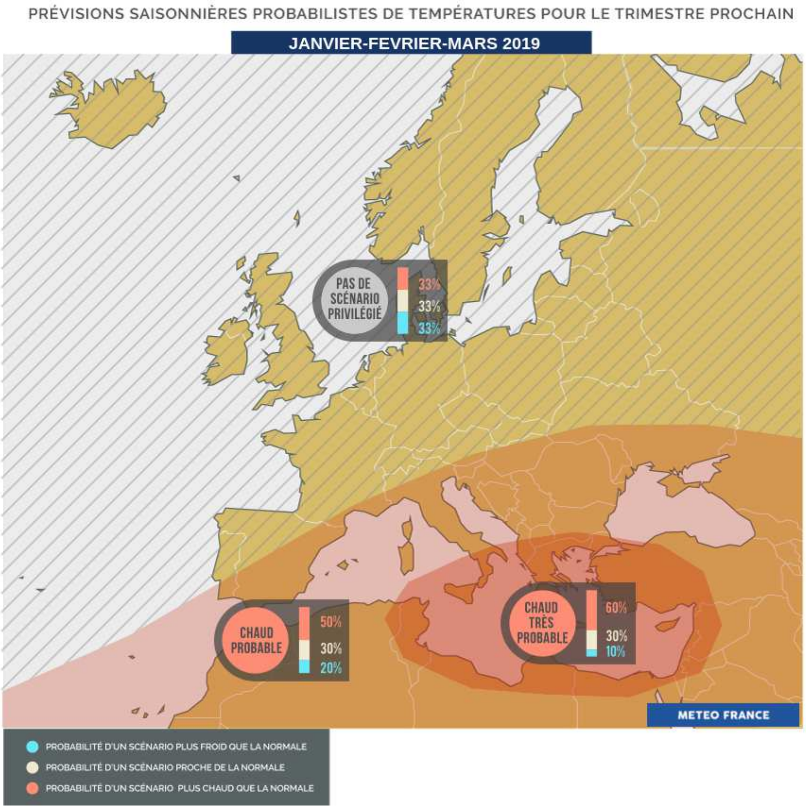
II.7. DISCUSSION AND SUMMARY

II.7.a Forecast over Europe

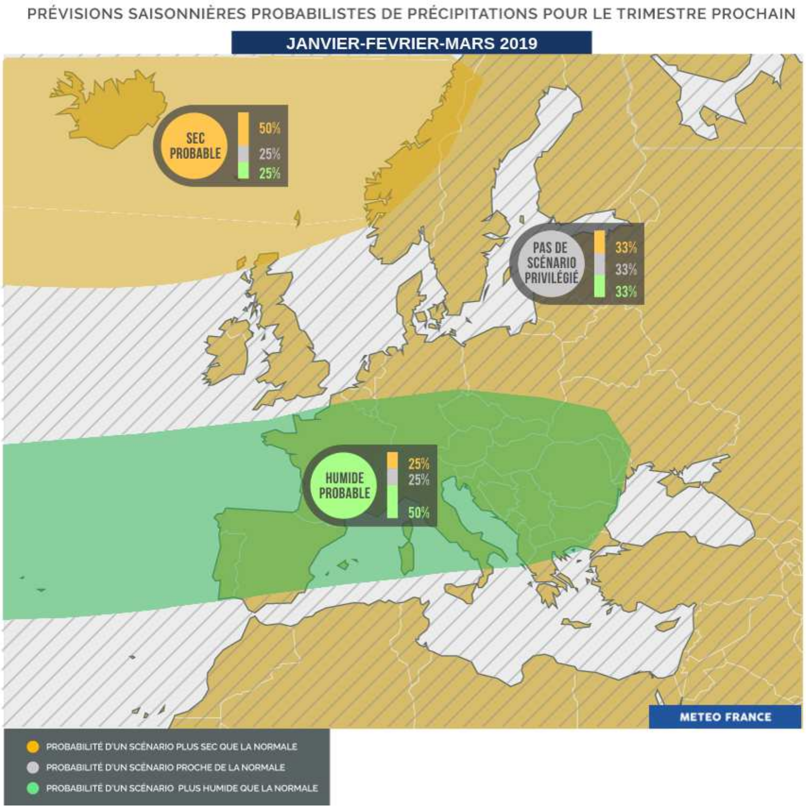
"Predictors" which could influence the weather in Europe for the next three months. :

- El Niño (weak to moderate) : favors negative NAO (and also EA+ and SCAND+ see composites on http://ds.data.jma.go.jp/tcc/tcc/products/clisys/enso_statistics/)
- Late summer Atlantic SSTs : the observed tripole pattern has been showned (Cassou, 2004) to favour positive NAO during the following winter
- westerly QBO (but recently sign change) : defavor SSW and NAO- circulations
- Eurasian October snow extent : around normal : no influence
- **Conclusion** : contradictory forcings
  Taking into account the models outputs in terms of large scale circulation, our privileged scenario corresponds to a negative NAO circulation dominating this winter. Secondary, positive EA circulation.

Temperature : The above conclusions would lead to mild conditions around the Mediterranean and southeastern Europe. No signal elsewhere.



Precipitations : Wet conditions over much of central and southern Europe as a result of soutward shift of atmospheric disturbances (mode NAO -). Dry signal north of British Isles.



II.7.b Tropical cyclone activity

Indian Ocean : lower than normal activity forecast around Australia, in agreement with Niño conditions. Close to normal for the western basin.

South-west Pacific : forecast activity below normal. To be qualified on the equatorial areas, where the activity could be inhanced.

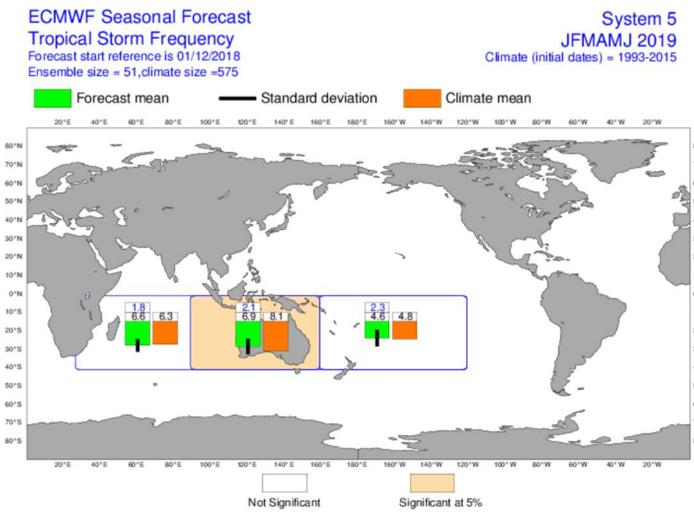


fig.II.7.1 : Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF). www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtr...">http://www.ecmwf.int/products/forecasts /d/charts/seasonal/forecast/euros...">www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip /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, DWD, 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 where the SST warming is developing first at the surface (especially for coastal events).

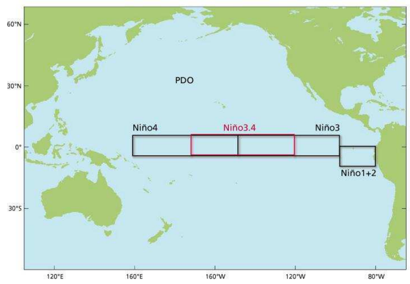
- Niño 3 : 5°S/5°N 90W-150W ; it is the region where the interanual variability of SST is the greatest.

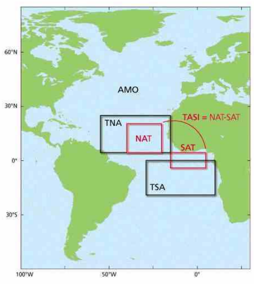
- Niño 4 : 5°S/5°N 160E- 150W ; it is the region where SST evolution have the strongest relationship with evolution of convection over the equatorial Pacific.

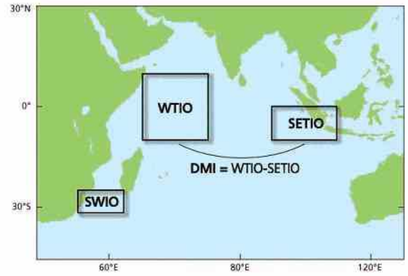
- Niño 3.4 : 5°S/5°N 120W-170W ; it is a compromise between Niño 3 and Niño 4 boxes (SST variability and Rainfall impact).

Associated to the oceanic « El Niño / La Niña » events, and taking into account the strong ocean/atmopshere coupling, the atmosphere shows also interanual variability associated to these events. It is monitored using the SOI (Southern Oscillation Index). This indice is calculated using standardized sea level pressure at Tahiti minus standardized sea level pressure at Darwin (see above figure). It represents the Walker (zonal) circulation and its modifications. Its sign is opposite to the SST anomaly meaning that when the SST is warmer (respectively colder) than normal (Niño respectively Niña event), the zonal circulation is weakened (respectively strengthened).

Oceanic boxes used in this bulletin :

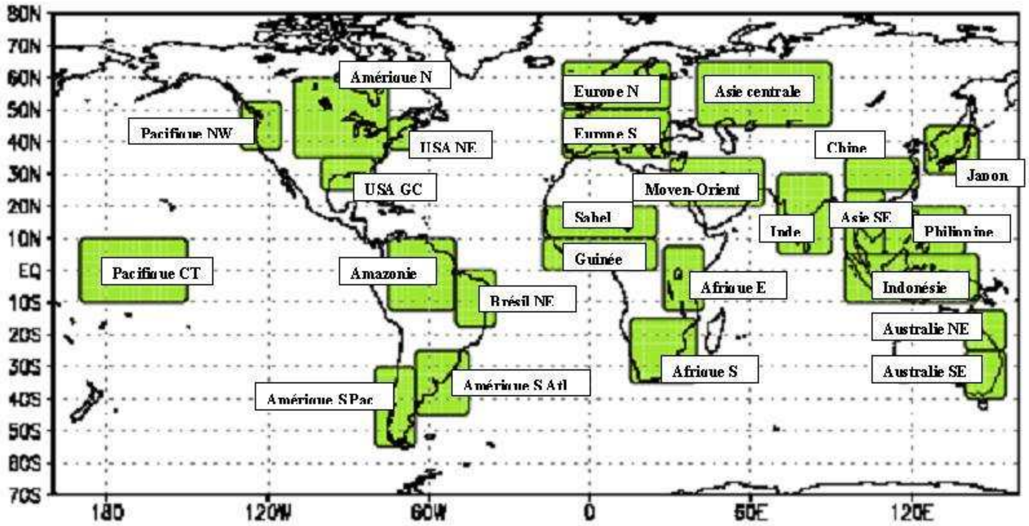






III.3. Land Boxes

Some forecasts correspond to box averaged values for some specific area over continental regions. These boxes are described in the following map and are common to ECMWF and Météo-France.



III.4. Acknowledgement

This bulletin is edited by the RCC-LRF Node of the RCC Network in Toulouse for the RA VI. It is a joint effort of the RCC-Climate Monitoring Node (led by DWD) and the RCC-LRF Node (Co-Led by Météo-France).