# GLOBAL CLIMATE BULLETIN

## n°233 – November 2018

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## I. DESCRIPTION OF THE CLIMATE SYSTEM (September 2018)

### I.1.Oceanic analysis

**Over the Pacific Ocean :**

- Along the equator, significant warming over the Niño 1 and Niño 2 boxes, together with the eastward propagation of a Kelvin wave initiated in August. This warming is not very strong even in subsurface. SSTs in the Niño 3.4 box have remained close to those of August (+0.3℃).
- In the Northern Hemisphere, the anomalies observed in August have strengthened in September : warm over the tropics (except to the West, where several typhoons have cooled the SSTs), cool in the mid-latitudes, warm to the North, especially near the Bering Strait. No significant PDO signal (see https://www.ncdc.noaa.gov/teleconnections/pdo/ )
- In the Southern Hemisphere, no significant changes.

**Over the Maritime Continent** :

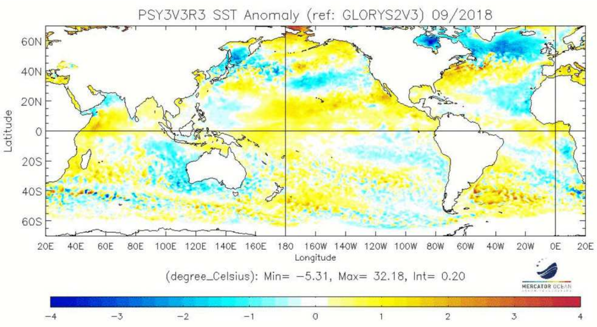
- Cooling trend, after a warming in August ! No long-term tendency.

**Over the Indian Ocean** :

- in the Northern hemisphere, warming to the West, leading to a positive DMI.
- In the Southern hemisphere, cold anomalies to the East and warm anomalies to the West.

**Over the Atlantic**:

- In the North Atlantic, persistence of the horseshoe structure with a strong cold anomaly from Canada to South Greenland, Iceland and the British Isles, extending southward to western Portugal, Canary islands, and eastern tropical Atlantic. In-between, a warm area is spreading from the Caribbean to the Azores, even reaching the gulf of Biscay.
- Warmer than normal along the Equator, especially over the gulf of Guinea.
- For the southern Atlantic basin, cold anomalies to the east and warm anomalies to the west.



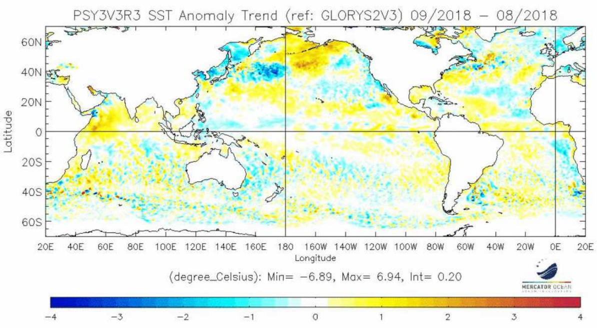




**fig.I.1.1**: top : SST Anomalies (℃) . Bottom : SST tendency (cur rent – previous month), (reference Glorys 1992-2013).

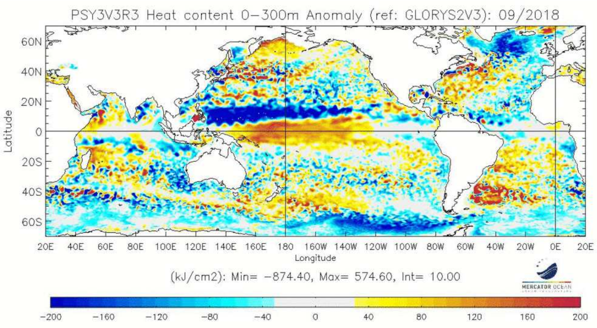



**fig.I.1.2**: map of Heat Content Anomalies (first 300m, kJ/cm2, reference Glorys 1992-2013)

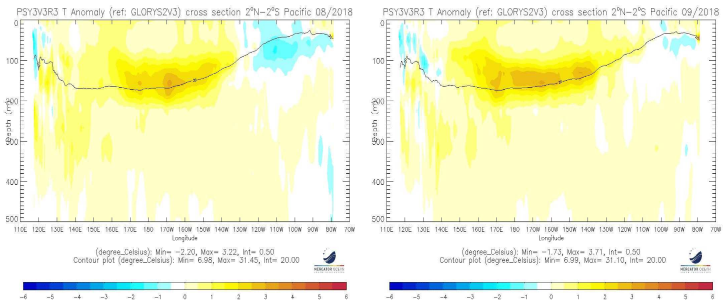



**fig.I.1.4**: Oceanic temperature anomaly in the first 500 meters in the Equatorial Pacific (previous and current month)

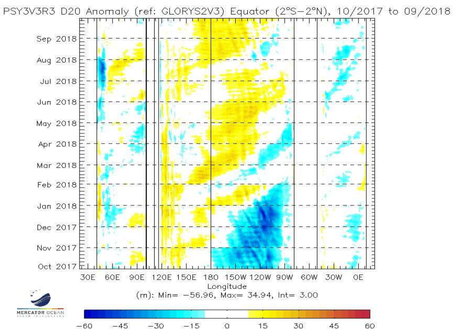



**fig.I.1.5**: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20℃ isotherm) along the equator for all oceanic basins over a 6 month period

Sea surface temperature near Europe :

**European Arctic Sea:** Still warmer than normal, as before particularly north of Svalbard (smaller sea ice extension, see fig. I.2.11) and on the White Sea. Some traces of cold anomalies close to northern Scandinavia, might be the result of a few arctic air outbreaks, which happened at the beginning and the end of the month.

**North Sea:** Close to normal. The warm anomaly of August has disappeared; cold air reached frequently that region and cooled the water surface gradually.

**Baltic Sea:** more or less around normal with local variability, again no more significant positive anomalies.

**Cold blob south of Greenland/Iceland:** no significant change compared to August, same extension to Iceland/Ireland and same intensity.

**Subtropical East Atlantic:** no significant change either. Still warmer than normal at Biscay and colder near Portugal, rather stationary conditions, even in the subsurface.

**Mediterranean:** The whole Mediterranean remained warmer than normal. Anomalies decreased in the north, but increased in the south and east. SST was still widely above 26℃, fostering the formation of medicanes, whi ch can produce high precipitation anomalies, visible also on monthly totals. In fact, a medicane formed in late September, passing over Greece and western Turkey.

**Black Sea**: more or less around normal with local differences particularly at coasts due to local weather.

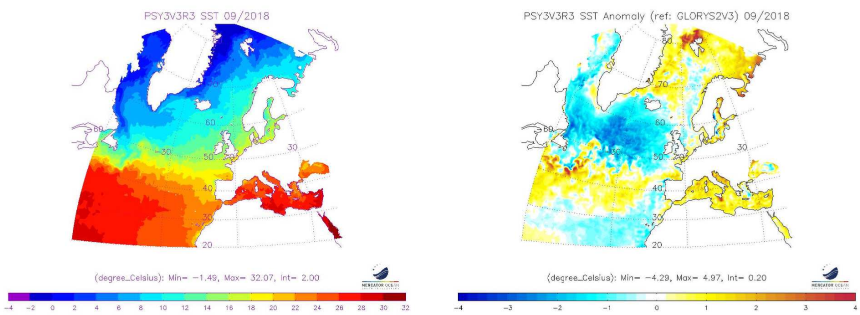



**fig.I.1.6** : Mean sea surface temperature in the RA VI Region (Europe) and anomaly (reference Glorys 1992-2013).

**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) :

- Patterns quite similar to those of August, but without an active MJO. The atmosphere seems to be responding to the emerging Niño : downward anomalies over the Maritime Continent, Australia, and the eastern Indian Ocean, as well as over the Carribbean. Ascent anomalies over the Eastern Pacific, East Atlantic and West Africa.

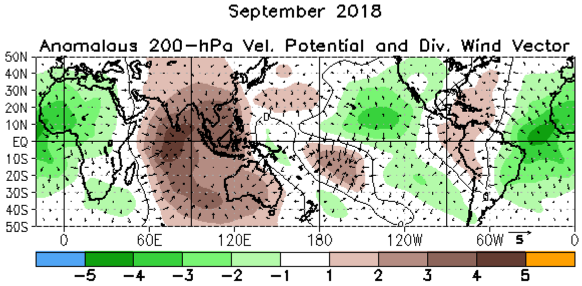



**fig.I.2.1.a**: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly). http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

SOI :

- SOI trending downward at -0.9 (NOAA Standardized SOI: https://www.ncdc.noaa.gov/teleconnections/enso/indicators/soi/ ) compared to -0.3℃ in August. According to the BOM calculation, the index has reached the value of -10 in September. Sustained values lower than -7 indicate an EL Niño event ( http://www.bom.gov.au/climate/current/soihtm1.shtml ).
MJO (fig. I.2.1.b)

- No active MJO during September (see green curve on illustration below).

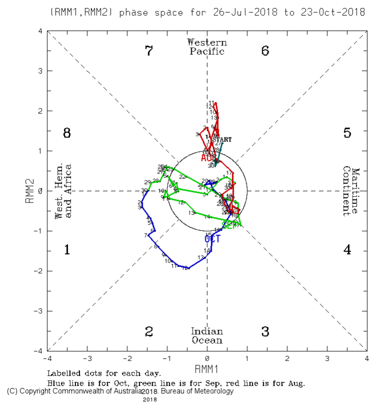



**fig.I.2.1.b**: indices MJO http://www.bom.gov.au/climate/mjo/

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.

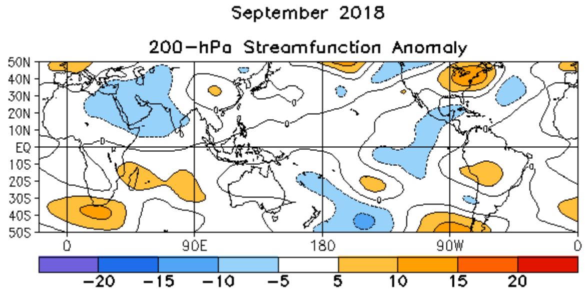



**fig.I.2.2**: Stream Function Anomalies at 200 hPa.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

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

- Strong positive NAO pattern over the Atlantic with enhanced westerlies around 55°N.
- Strong positive anomalies over the Bering strait and Alaska. Negative anomalies over Canada.

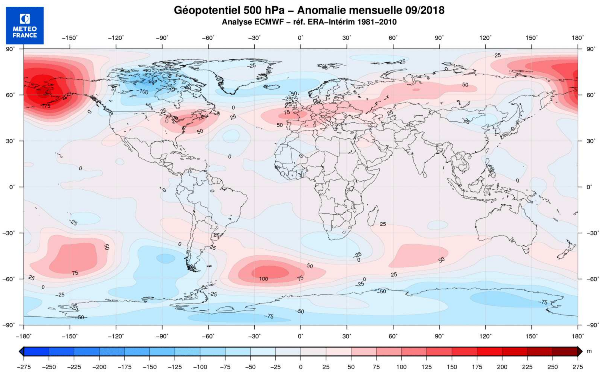



**fig.I.2.3**: Anomalies of Geopotential height at 500hPa (Meteo-France)

| MONTH | NAO | EA | WP | EP-NP | PNA | TNH | EATL/WRUS | SCAND | POLEUR |
|---|---|---|---|---|---|---|---|---|---|
| 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 |
| 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 |
| MAY18 | 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 |
| 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 |

Evolution of the main atmospheric indices for the Northern Hemisphere for the last 12 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

Strong zonal flow over the North Atlantic from Canada to northern Europe, resulting in a still positive NAO phase, which has a long duration since April 2018. The Icelandic Low was slightly more intense than normal and extended far to the east to the European North Polar Sea and Scandinavia. The SCAND- pattern continued from August.

The Azores High extended far to the north, so the frontal zone kept a northerly position. The position of the frontal zone is not unusual for September, but the pressure gradient is much higher than normal. The EA phase returned to normal, it seems that the high pressure zone was shifted too far to the north for giving an EA contribution, especially in 500 hPa.

The high pressure zone also extended eastwards to the European continent with high intensity, even higher than in August, although the advance of the Atlantic high pressure was only temporary. Related to the Russian High, an EATL/WRUS pattern intensified again.

There were different weather types contributing to the monthly average according to Météo France weather type classification. The most frequent one (12 days) was Atlantic Trough, which can best explain prevailing cyclonic conditions over north-western and northern Europe and anticyclonic influence over Central Europe. There were also 11 days with anticyclonic blocking, mainly in early September, and 7 days of Atlantic Ridge, mainly at the end of the month, the latter leading temporarily some colder air to Europe.

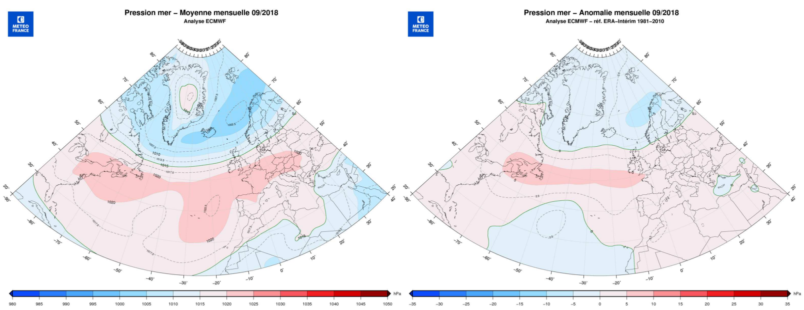



**fig.I.2.4:** Mean sea level pressure in the RA VI Region (Europe) (top) and 1981-2010 anomalies (bottom).

Circulation indices: NAO and AO

NAO+ phase continued from August over the whole month of September, though with high fluctuations. The highest index value was reached at the end of the month, when a broad ridge built up over the East Atlantic and Western Europe.

AO oscillated between a positive and a neutral phase several times that month. Polar air reached parts of Europe temporarily, but partly remained in polar regions.

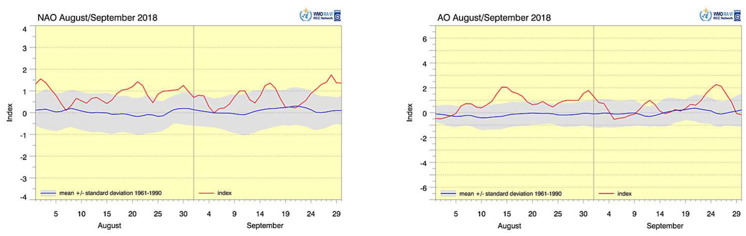



**fig.I.2.5**: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices with 1961-1990 mean standard deviation (shading). http://www.dwd.de/rcc-cm , data from NOAA CPC: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

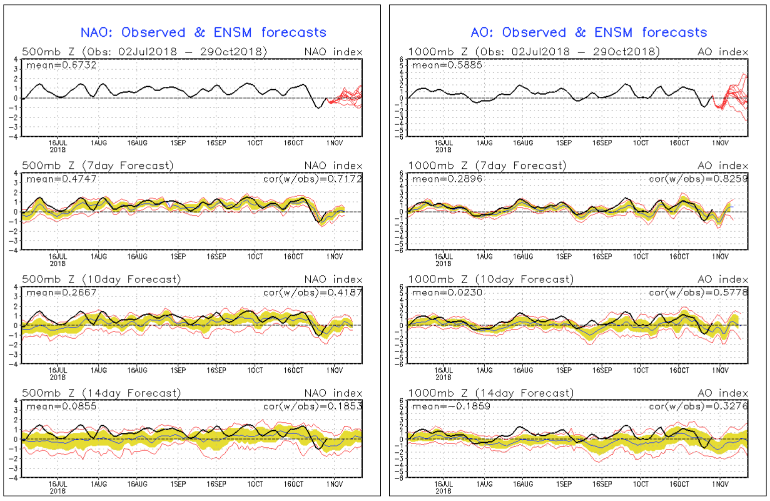



**fig. I.2.5a**: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices for the last 4 months and forecasts for the following weeks. Source: NOAA CPC, http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

I.2.b Precipitation

- Mostly dry over the Indian Ocean and its surroundings (Australia, India, Indonesia, Malaysia), in agreement with subsidence anomalies. Also dry over the Carribbean.
- Wet for eastern Pacific including Mexico (lots of hurricanes in September) and Texas. Also wet over West Africa and Western Pacific with a high number of strong typhoons.
- Over Europe, mostly dry except from the British Isles to Norway (positive NAO). Record high rain amounts have been recorded in western Norway.

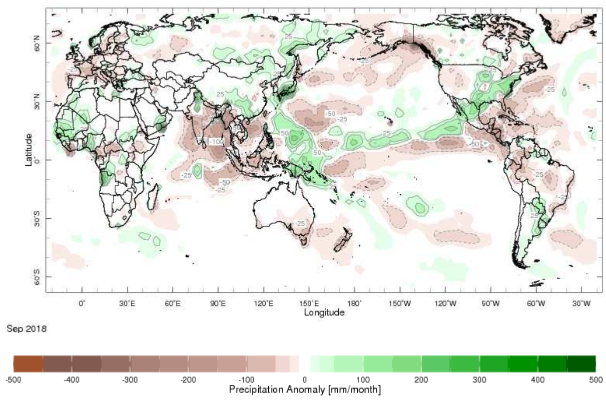



**fig.I.2.6**: Rainfall Anomalies (mm) (departure to the 1979-2000 normal).
Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/Anomaly.html

Precipitation anomalies in Europe:

Particularly wet over north-western Europe (Scotland, Norway) and also Finland/NW-Russia, in line with NAO+ and its extension to northern Europe. Sweden was drier due to lee effects, but also due to some Scandinavian blocking situations, which also influenced the Baltic countries. Other wet areas were over eastern Spain / western Mediterranean and Greece/Turkey (Medicane at the end of month). In between a large dry zone extending from Portugal over Central Europe to Eastern and South-eastern Europe caused by frequent high pressure influence. France was particularly affected by the precipitation deficit; much of the mainland country had monthly totals below the 10th percentile and had severe or partly extreme drought conditions. Main consequences of drought were high agricultural losses, lack of grass for livestock, low water levels in major rivers and lakes affecting ship traffic and fishery, and restrictions in water use (e.g. watering of sport areas, car wash etc.) over many weeks. Other countries had drought conditions also, e.g. parts of Italy and the Balkans. In further countries in Central Europe (e.g. Germany, Poland) the precipitation deficit was less extreme that month, but there were also drought problems because of the preceding dry summer and thus decreasing soil moisture.

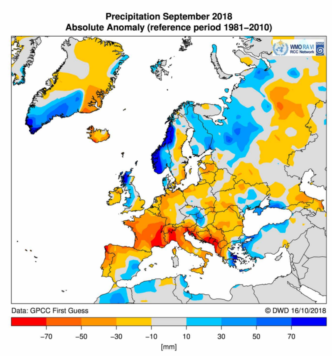



**fig.I.2.7.a** : Absolute anomaly (1951-2000 reference) of precipitation in the RA VI Region (Europe), data from GPCC (Global Precipitation Climatology Centre), http://www.dwd.de/rcc-cm.

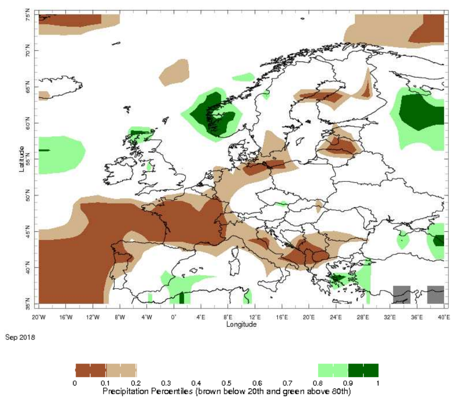



**fig.I.2.7**.b : Percentiles of precipitation, 1981-2010 reference. Data from NOAA Climate Prediction Center, http://iridl.ldeo.columbia.edu/maproom/Global/Precipitation /Percentiles.html

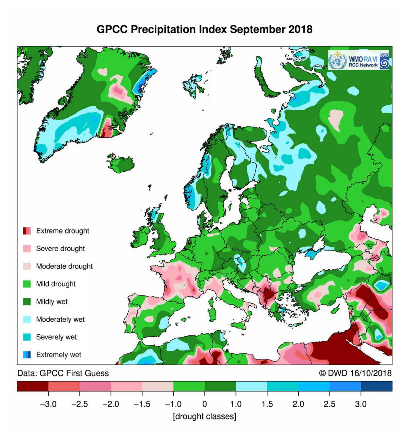



**fig. I.2.8**: GPCC Precipitation Index, http://www.dwd.de/rcc-cm .

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 | + 4.9 mm | + 0.304 |
| Southern Europe | - 16.9 mm | - 0.544 |

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 the exception of the British Isles (wet westerly flow). Warmest September for Europe as a whole according to Copernicus.
- strong positive anomaly over Alaska and the contiguous US (4th warmest September for the country).
- colder than normal over Canada and Greenland.

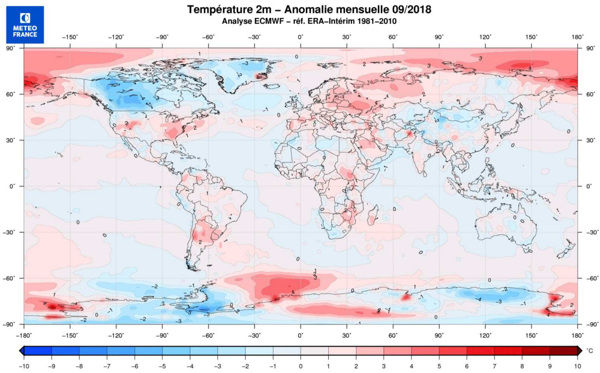



**fig.I.2.9**: Temperature Anomalies (℃) (Meteo-France)

Temperature anomalies in Europe:

Warmer than normal over almost whole Europe, mostly due to high pressure, related to subsidence, solar radiation and high sunshine duration. Also different weather types contributed warming in different countries, e.g. blocking situations in Eastern Europe where anomalies were highest.

Ireland and much of UK were colder than normal; these countries were most exposed to cyclonic systems and intrusion of Arctic air.

There were some new September temperature maximum records reported, for the European average, but also locally in various countries, e.g. in Spain as well as in northern Norway (25℃).

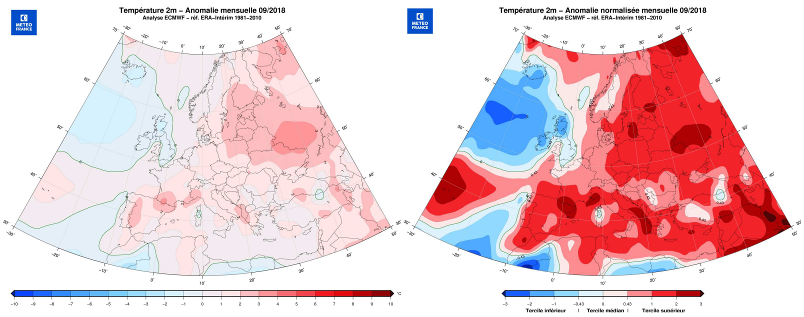



**fig.I.2.10**: Left graph: Absolute anomaly of temperature in the RA VI Region (Europe). Right graph: Standardized temperature anomalies

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 | + 1.6 ℃ |

I.2.d Sea ice

- In the Arctic : 6th lowest minimum extent on record. Very slow ice growth after the 20th.
- In Antarctica : Strong deficit, 4th lowest maximum extent, reached in early October.

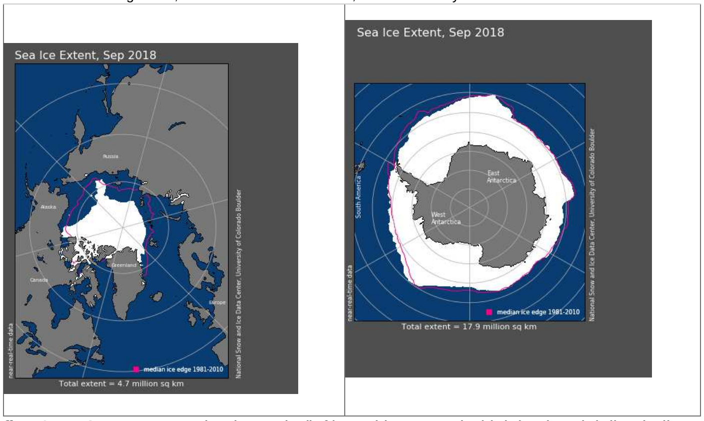



**fig.I.2.11**: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period).  http://nsidc.org /data/seaice_index/

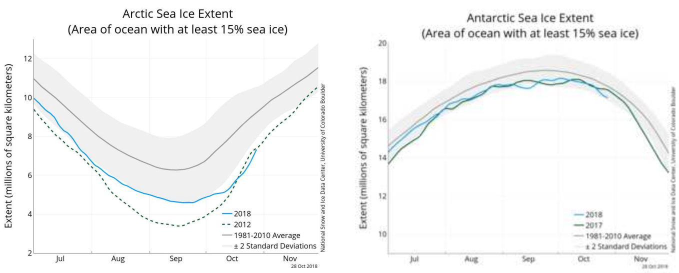
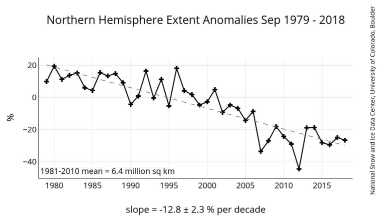



**fig. I.2.12** : Sea-Ice extension evolution from NSIDC. https://nsidc.org/data/seaice_index/images/daily_images/N_stddev_timeseries.png




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

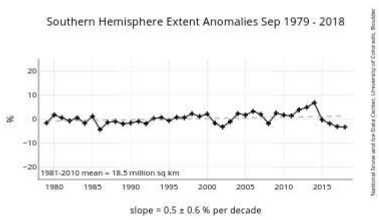



fig 1.2.13 : Monthly Sea Ice Extent Anomaly Graph in Antarctic for the month of analysis (http://nsidc.org/data/seaice_index/)

## II. SEASONAL FORECAST FROM DYNAMICAL MODELS

Onset of a weak-to-moderate El Niño event in November lasting until early boreal spring.

NB : In this bulletin, 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 - 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 of the El Niño event differs from one model to another.

- Pacific Ocean: Warm anomaly forecast along the Equator, east of the dateline, with a maximum between +1 and +2℃ in the Niño 3.4 box. The warm SSTs are however not forecast to spread as southward (along the peruvian coast) as excepted during a "classical" El Niño event. In the Northern Hemisphere, warm anomaly forecast in the tropics with a positive PDO. In the southern hemisphere on ly weak anomalies are forecast but they are consistent with a Niño configuration.
- Indian Ocean: The positive DMI of September has returned to more neutral values in October and is expected to remain so for the coming months (see BOM summary here : http://www.bom.gov.au/climate/model-summary/#tabs=Indian-Ocean). However, the models are not in good agreement : MF6 suggests a positive index, ECMWF5 a negative one, while CFS remains in the neutral range. During an El Niño event though, the DMI is usually positive.
- Atlantic Ocean:
  - northern Atlantic : no significant changes with a tripole-like configuration (cool, warm, cool).
  - South Atlantic : Warm anomalies rather marked in the western part
- Mediterranean Sea : persisting warm anomalies

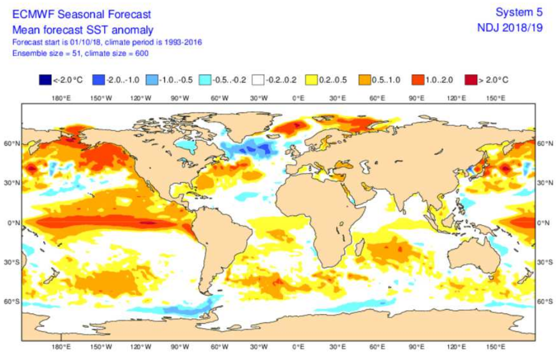



**fig.II.1.1**: SST anomaly forecast from ECMWF
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

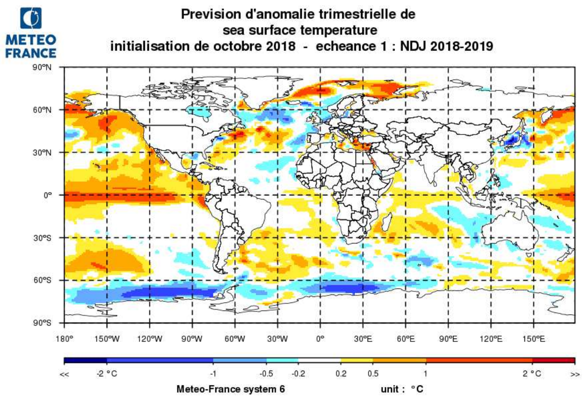



**fig.II.1.2**: SST Anomaly forecast from Meteo-France (recalibrated with respect of observation).
http://seasonal.meteo.fr

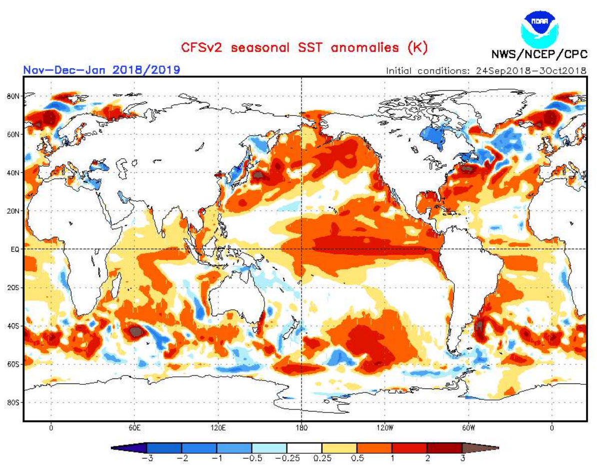



**fig.II.1.3**: SST Anomaly forecast from NCEP.
http://www.cpc.ncep.noaa.gov/products/people/wwang/cfsv2fcst/imagesInd1/glbSSTSeaInd1.gif

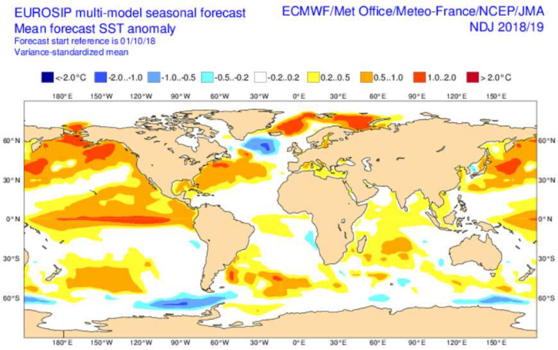



**fig.II.1.4**: SST Forecasted anomaly from Euro-SIP

II.1.b ENSO forecast :

***Forecast Phase*: weak to moderate El Niño**. Ongoing warming persisting through November and December and forecast to peak around +0.9℃/+1.0℃ in the N iño 3.4 box. MF6 and ECMWF5 forecast the maximum intensity for January or February and are somehow stronger in intensity than the other models. The event probability is now around 90% in the IRI synthesis (https://iri.columbia.edu/our-expertise/climate /forecasts/enso/current/ ).

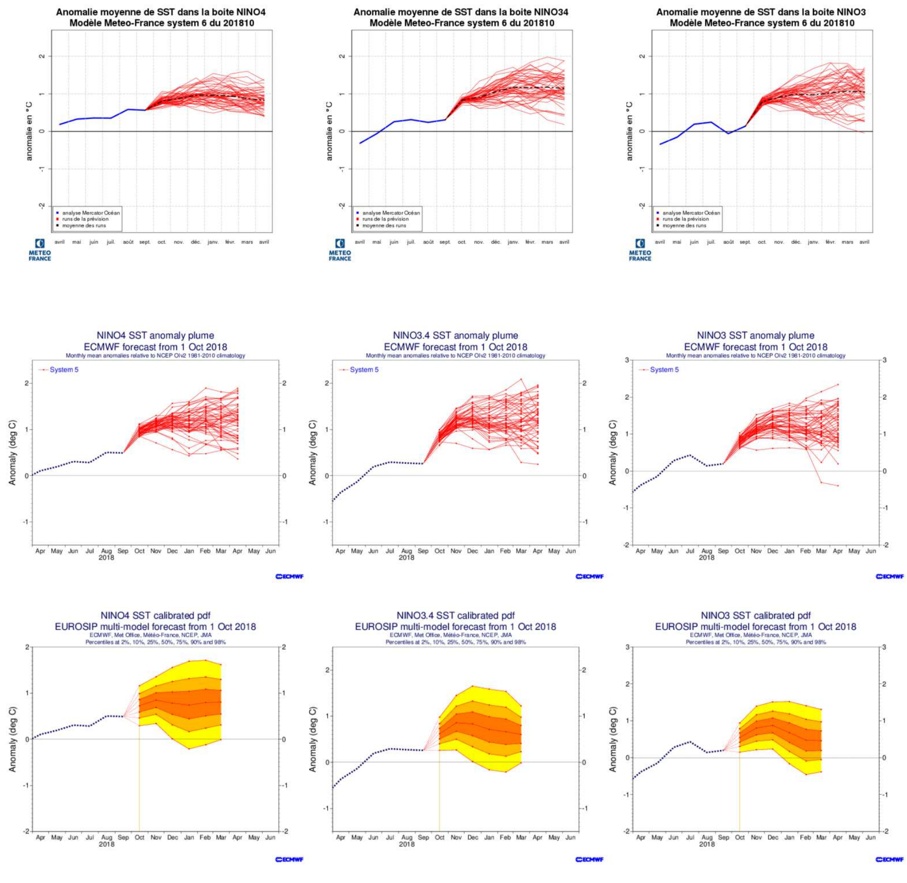
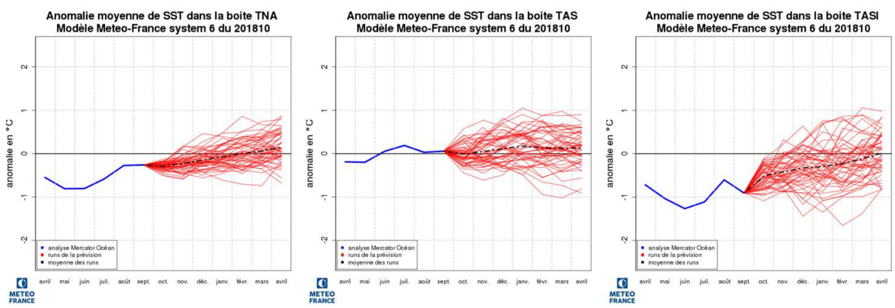



**fig.II.1.5**: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members - and EUROSIP (bottom) – recalibrated distributions -
( http://seasonal.meteo.fr , http://www.ecmwf.int/ )

I.1.c Atlantic ocean forecasts



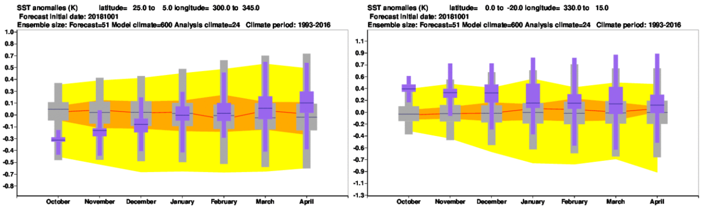



**fig.II.1.6**: SSTs anomaly forecasts in the Atlantic Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

I.1.d Indian ocean forecasts

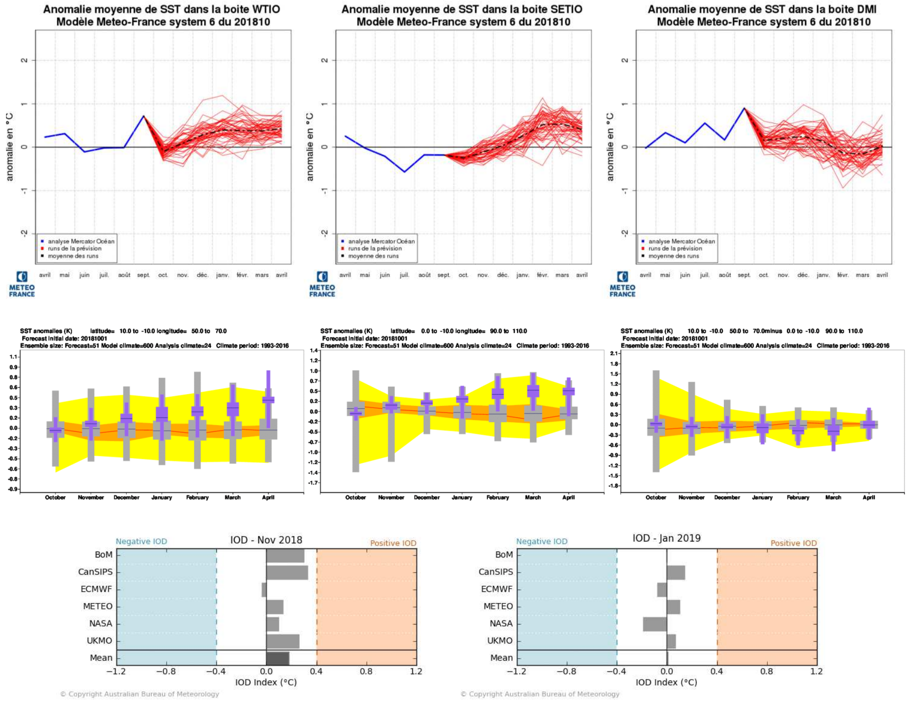



**fig.II.1.7**: SST anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

**II.2. GENERAL CIRCULATION FORECAST**

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

Typical atmospheric response to an El Niño event, but without any significant teleconnection with Europe.

- Velocity potential : El-Niño-type response except for south-eastern Pacific (lack of southward warming off the peruvian coast, as mentioned previously) . Upward motion anomalies are somehow displaced westward compared to what is expected during a typical El Niño. And they are mostly supposed to affect the northern hemisphere, east of the dateline. Subsidence anomalies for Indian Ocean and Maritime Continent, except for the eastern part (Papua-New Guinea, Salomon Islands). Elsewhere, there is no significant signal.
- 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 (even stronger with ECMWF).

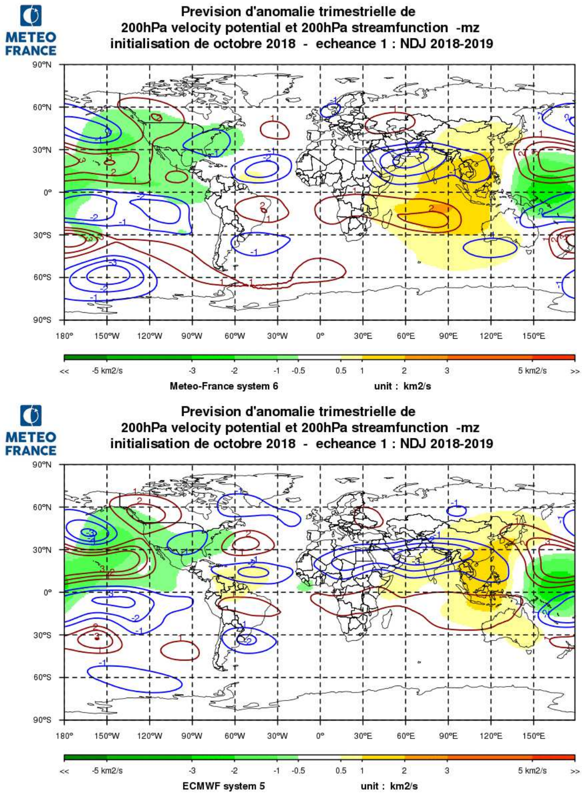



**fig.II.2.a**: Velocity Potential anomaly field χ (shaded area – green negative anomaly and yellow positive anomaly), associated with Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa by Météo-France (top) and ECMWF (bottom).
http://seasonal.meteo.fr

II.2.b Geopotential height anomalies

High spread among the GPC models regarding mid-latitudes 500 hPa geopotential height anomalies. The only consensus calls for a strong positive PNA signal.

Multi-model mean shows a south-westerly flow over western Europe while ECMWF5 is a mix of Scandinavian Blocking and positive East Atlantic pattern. This could lead to harsh struggle between these two flow regimes over western Europe. MF6 suggests both a blocking and NAO negative pattern. This is an isolated solution compared to other GPCs. Whatever the model though, there doesn't seem to be a strong polar vortex for the beginning of winter.

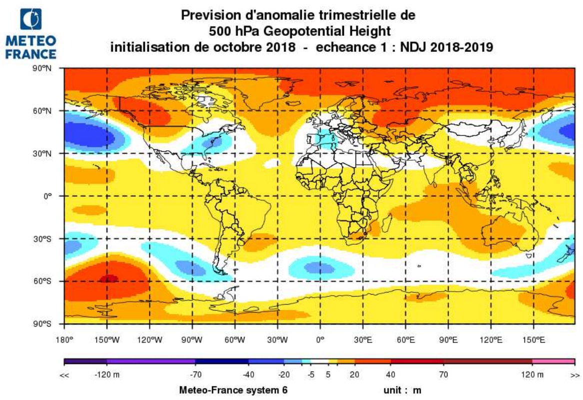



**fig.II.2.b.1**: Anomalies of Geopotential Height at 500 hPa from Météo-France.
http://seasonal.meteo.fr

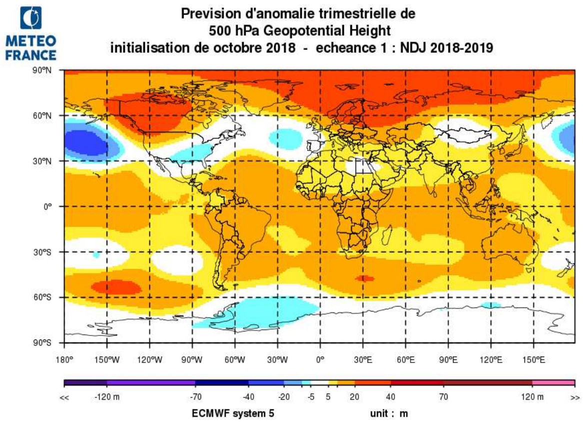



**fig.II.2.b.2**: Anomalies of Geopotential Height at 500 hPa from ECMWF.
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast

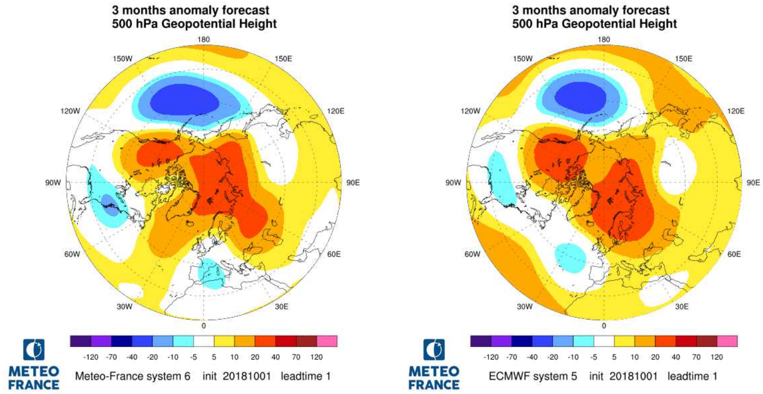



**fig.II.2.b.3**: Anomalies of Geopotential Height at 500 hPa from Météo-France.
http://seasonal.meteo.fr

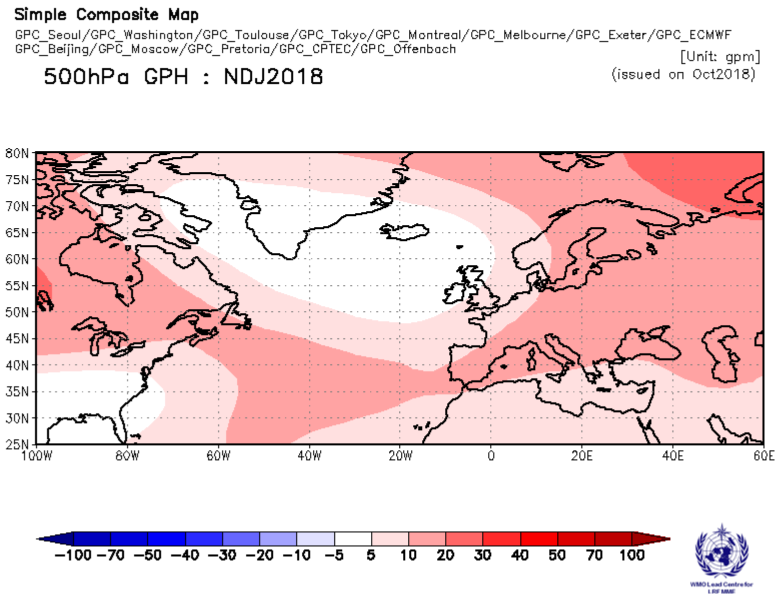



**fig II.2.b.4** : Multi-Model anomaly of geopotential height at 500 hPa (https://www.wmolc.org)

II.2.c. modes of variability

As expected, the blocking mode (SCAN) clearly dominates with both systems (70% and 74%). MF6 also projects on a negative NAO mode, wheras ECMWF projects on the EA+ mode (it does not project on the NAO pattern).

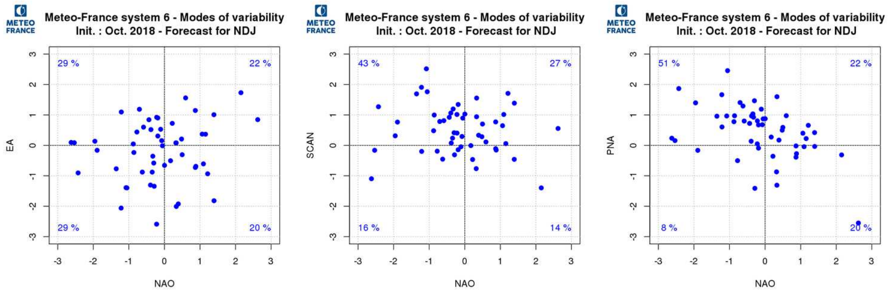



**fig.II.2.c.1** : modes of variability forecasts over the Northern hemisphere with Meteo-France MF-S6

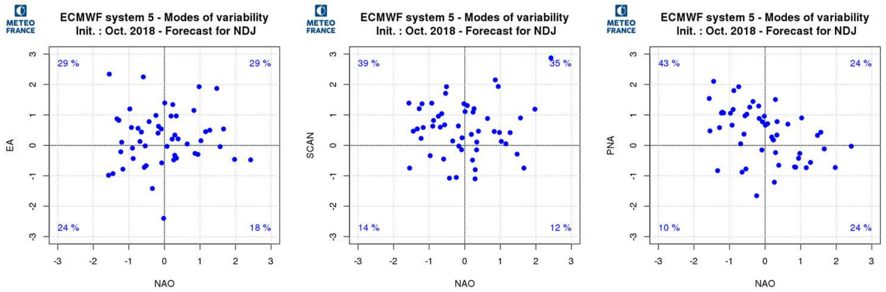



**fig.II.2.c.2** : modes of variability forecasts over the Northern hemisphere with ECMWF-S5

II.2.d. weather regimes

Here again, the blocking regime is favored by both models.

Of interest is ECMWF5 suggesting a significant lack of Atlantic Ridge, which is consistent with the East Atlantic positive pattern (AR is related to the EA- mode).

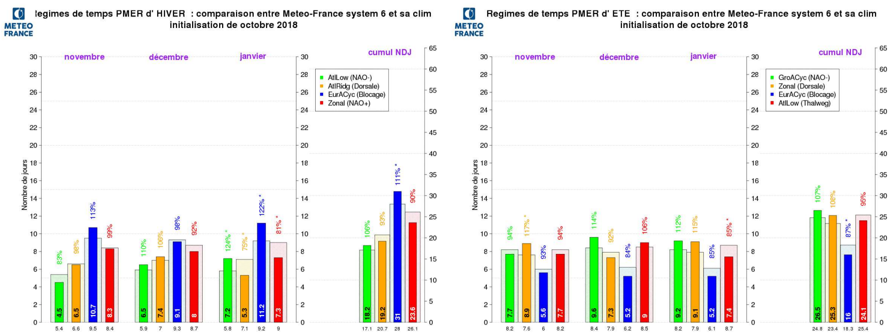



**fig.II.2.d.1**: North Atlantic Regime occurrence anomalies from Meteo-France MF-S6 : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.
Left : winter regimes; Right : summer regimes

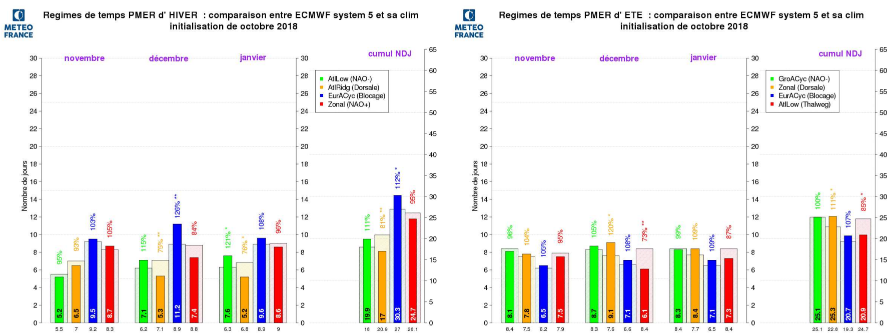



**fig.II.2.d.2 : North Atlantic Summer Regime occurrence anomalies from ECMWF-S5 : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes**
**Left : winter regimes; Right : summer regimes**

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

**For North America :** in agreement with the positive PNA, warm anomalies expected west of the Rockie Mountains, and cold anomalies to the east.

**For Europe and North Atlantic :** Of note, is the absence of a warm signal for most of Europe for the next three months. Consistent with its EA+/SCAND+ mix, ECMWF5 shows warm anomalies for the Mediterranean and for south-western Europe and no signal elsewhere (and even cold conditions for western Russia). MF6, influenced by its NAO- and SCAND+ configuration is somehow colder.

Eurosip is much warmer but is strongly influenced by MF5 (which is not relevant with its autumn warm bias) and by NCEP which seems to be excessive in its NAO+ pattern. The GPC Multi-Model resembles it but is less warm.

II.3.a Météo-France

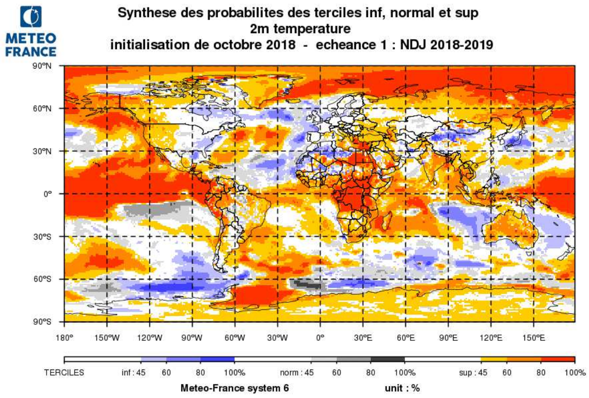



**fig.II.3.1**: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.3.b ECMWF

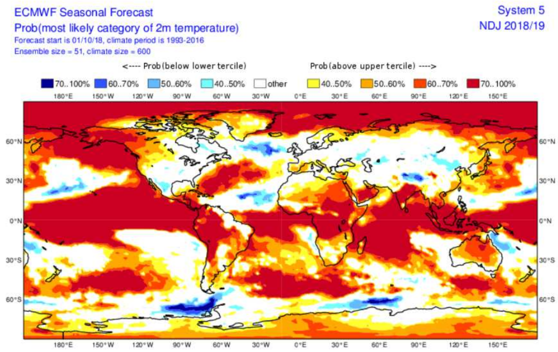



**fig.II.3.2**: Most likely category probability of T2m from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seaso...

II.3.c Japan Meteorological Agency (JMA)

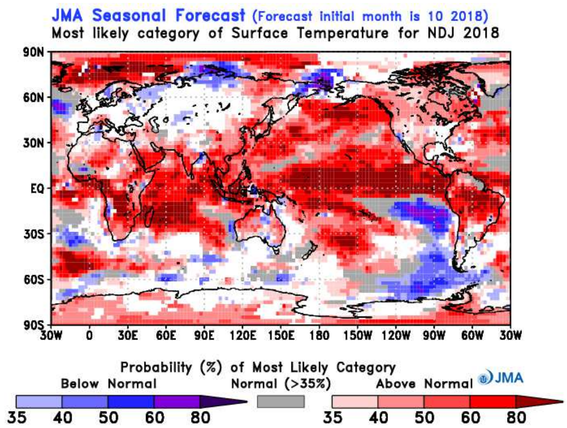



**fig.II.3.3**: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst_gl.php

II.3.d EUROSIP

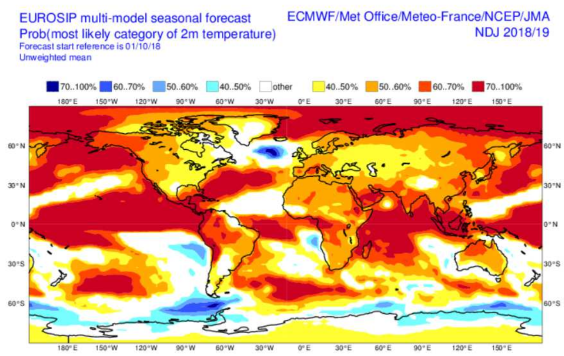



**fig.II.3.4**: Multi-Model Probabilistic forecasts for T2m from EUROSIP (2 Categories, Below and Above normal – White zones correspond to No signal and Normal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

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

- Mid-latitudes : Wet signal on the south-eastern United States in connection with positive PNA, and also over south-western California (El Niño consistent). For Europe, high spread among the forecast, which is no surprise ! MF6 is dry over the north and wet to the south (blocking) while ECMWF is wet from the Mediterranean (Blocking and EA+) to the Gulf of Biscay and Portugal (EA+), and is rather dry aver north-eastern Europe (blocking). On the other hand the multi-model scenarios call for wet conditions over the northern Europe (but the GPC mean is also wet over the eastern Mediterranean).
- inter-tropical regions : good agreement between models and also with an El-Niño type response. Dry over Australia, Maritime Continent (except Papua-New Guinea) and the Carribean. Wet over Mexico and western Peru.

II.4.a Météo-France

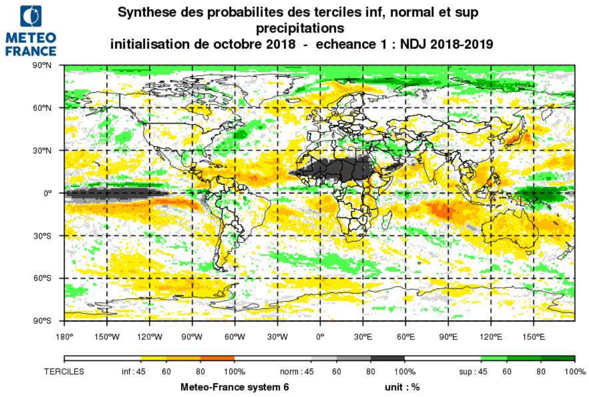



**fig.II.4.1**: Most likely category of Rainfall. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.4.b ECMWF

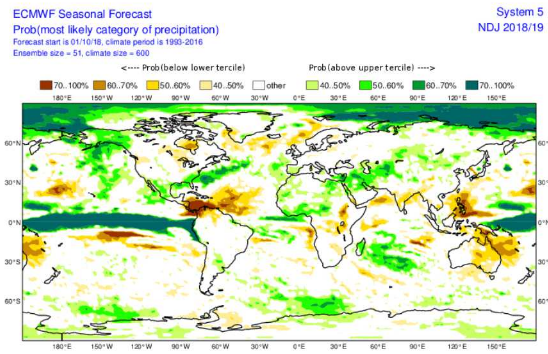



**fig.II.4.2**: Most likely category probability of rainfall from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.4.c Japan Meteorological Agency (JMA)

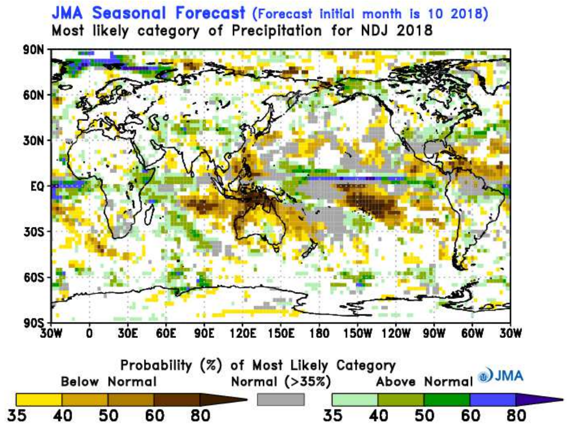



**fig.II.4.3**: Most likely category of Rainfall from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst_gl.php

II.4.d EUROSIP

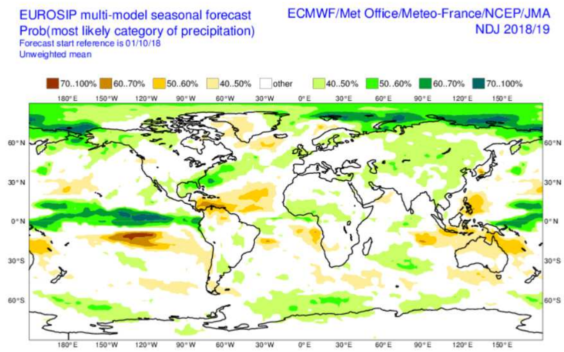



**fig.II.4.4:** Multi-Model Probabilistic forecasts for precipitation from EUROSIP (2 Categories, Below and Above normal – White zones correspond to No signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

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

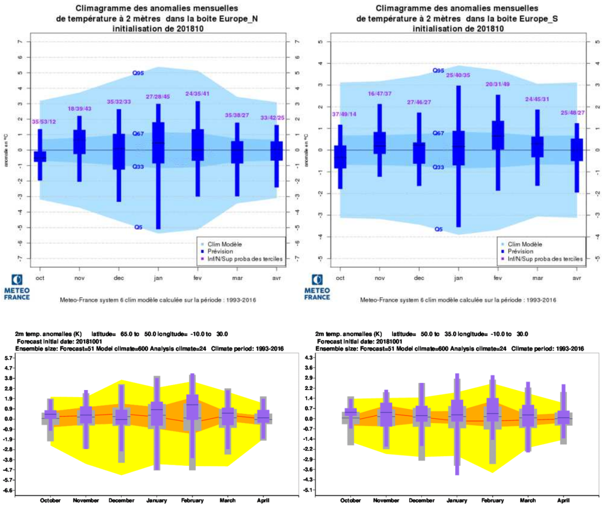



**fig.II.5.1** : Climagrams for Temperature in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

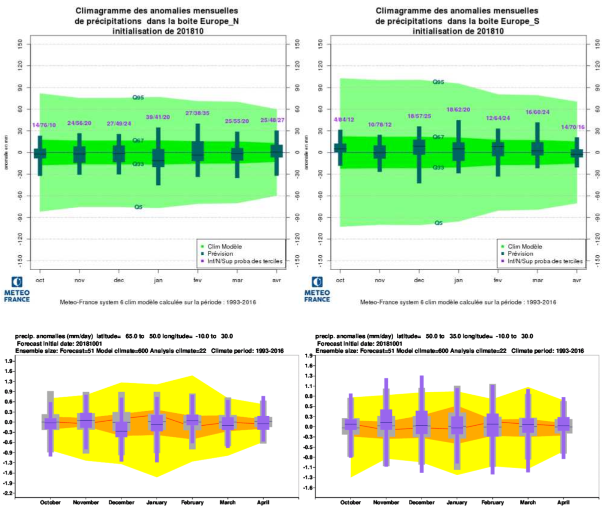



**fig.II.5.2** : Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

**II.6. "EXTREME" SCENARIOS**

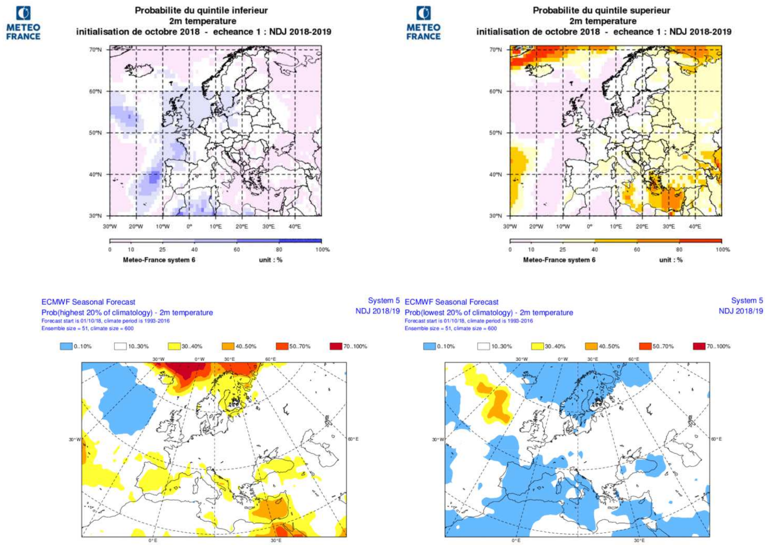



**fig.II.6.1** : Top : Meteo-France T2m probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution). Bottom : ECMWF T2m probability of « extreme » below normal conditions (left - highest ~20%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

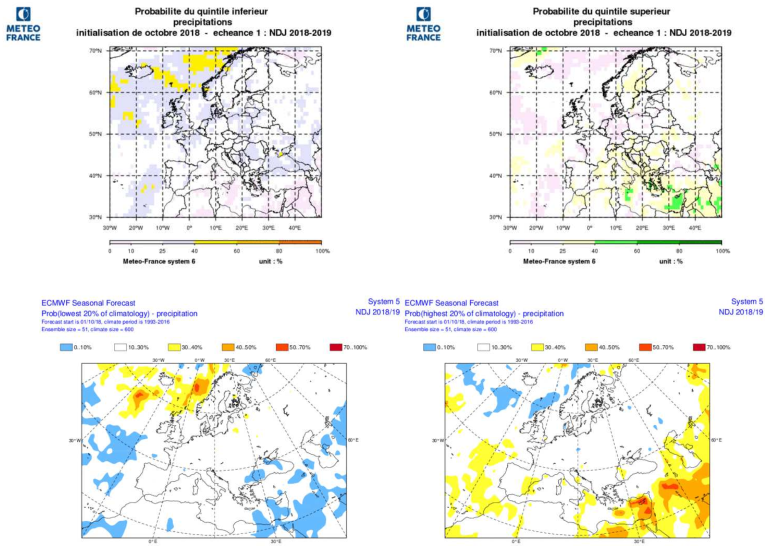



**fig.II.6.2** : Top : Meteo-France rainfall probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution).
Bottom : ECMWF rainfall probability of « extreme » below normal conditions (left -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

**II.7. DISCUSSION AND SUMMARY**

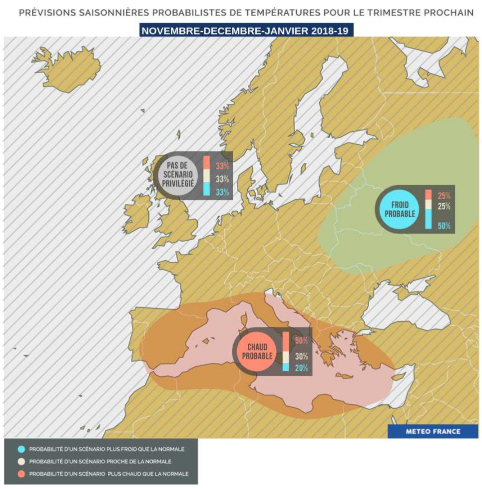
II.7.a Forecast over Europe

Let's take a look at those "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
- easterly QBO (but forecast to switch in early 2019) and very weak solar activity : favor SSW and NAO- circulations
- Eurasian October snow extent : around normal as of mid-October : no influence
- **Conclusion** : he odds seem to rather be in favour of a negative NAO pattern for the next three months
  Taking into account the models outputs and these predictors, we will go for a scenario resembling that of ECMWFS5 (mix of SCAND+, EA+, and somehow NAO-).

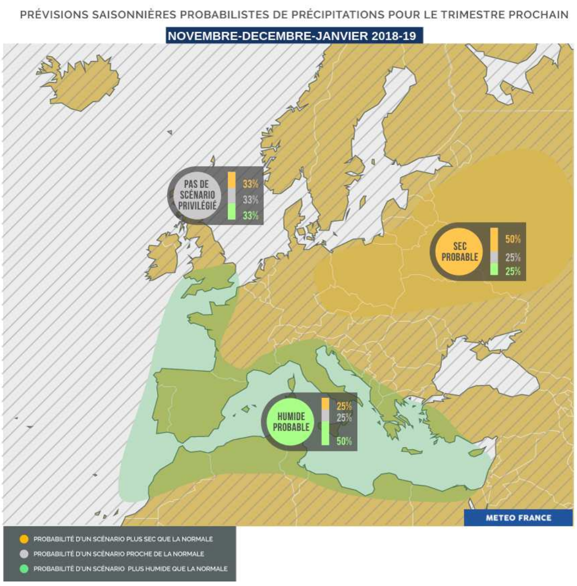
Also of note is the monthly ECMWF forecast for November which shows wet (especially for the Mediterranean) and cool conditions.

**Temperature** : The above conclusions would lead to mild conditions for the Mediterranean, and cold conditions for eastern Europe and western Russia. Elsewhere, no clear signal emerges, but high variability is expected as a consequence of the battle SCAND vs EA !!




**Precipitations** : Wet conditions likely over the Mediterranean, extending toward Portugal, western France and southern England (EA+ mode).

Dry conditions expected over parts of eastern Europe, Ukraine, and west Russia, in consistence with the blocking pattern. Elsewhere, no clear signal emerges.




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 Pacific** : forecast activity near normal. However the emergence of El Niño should displace the usual areas of formation and tracks more to the east.

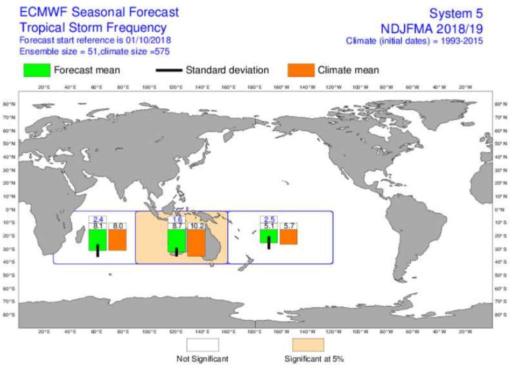



**fig.II.7.1** : Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro/eurosip_tropical_storm_frequency/

## 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, 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 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 $21^{st}$ 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).

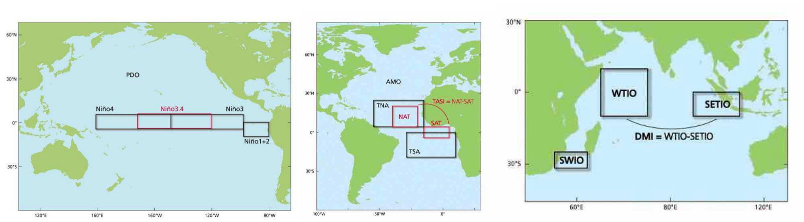
- Niño 3 : 5°S/5°N 90W-150W ; it is the region where the interanual variability of SST is the greatest.

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

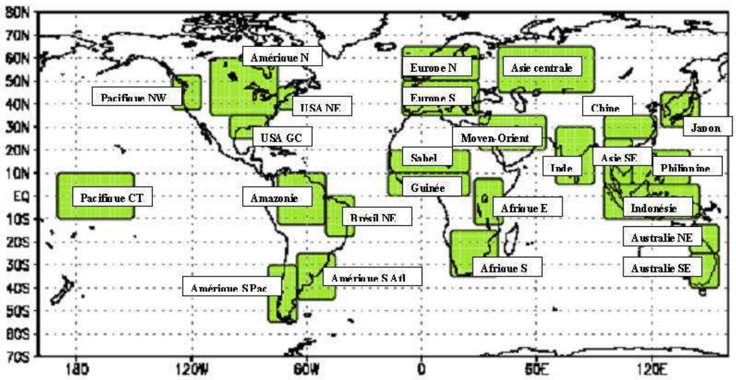
Associated to the oceanic « El Niño / La Niña » events, and taking into account the strong ocean/atmopshere coupling, the atmosphere shows also interanual variability associated to these events. It is monitored using the SOI (Southern Oscillation Index). This indice is calculated using standardized sea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