GLOBAL CLIMATE BULLETIN

n°222 – December 2017

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I. DESCRIPTION OF THE CLIMATE SYSTEM (October 2017)

I.1.Oceanic analysis

Over the Pacific ocean :

- since September, no significant SST evolution in the tropical Pacific. Niño 3.4 index : -0.4℃ (-0.5° C in Sept.). Still a strong West-East gradient, consistent with a La Niña phase of ENSO.
- in subsurface, the only significant evolution concerns the Wastern part of the basin, with an intensification of the warm reservoir (west of 150°W)
- Noisy PDO+ pattern, the main element is the persistence of a warm anomaly all along the Northern tropics.

Over the Maritime Continent :

- No significant evolution : slightly above normal SSTs

Over the Indian Ocean :

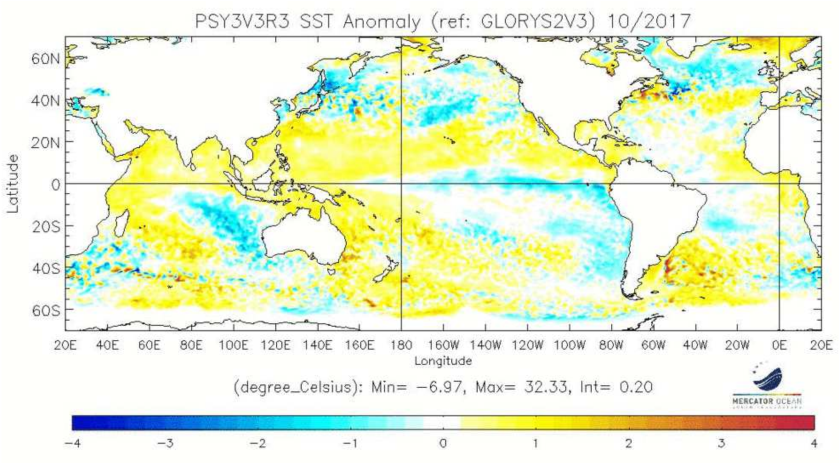
- In the northern hemisphere, generalised warm anomalies. The IOD is still slightly positive, due to a weak gradient.
- In the southern hemisphere, persisting SST gradient (enhanced in October) between a still cold eastern basin and a warm western basin.

Over the Atlantic:

- little evolution in the tropics. Still warm anomalies in the Gulf of Guinea up to the coasts of Senegal; and in the Caribean Sea and Gulf of Mexico.
- over Northern Atlantic, persisting North-South gradient, the cold blub is still present (confirmed by the subsurface)

Over the Mediterranean:

- anomaly gradient between the West (warmer than normal) and the East (cooler than normal).



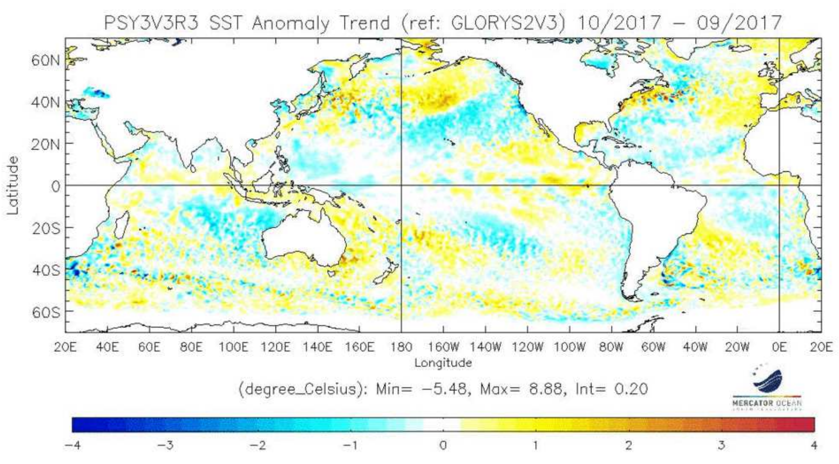


fig.I.1.1: top : SST Anomalies (℃) . Bottom : SST tendency (current – previous month), (reference Glorys 1992-2013).

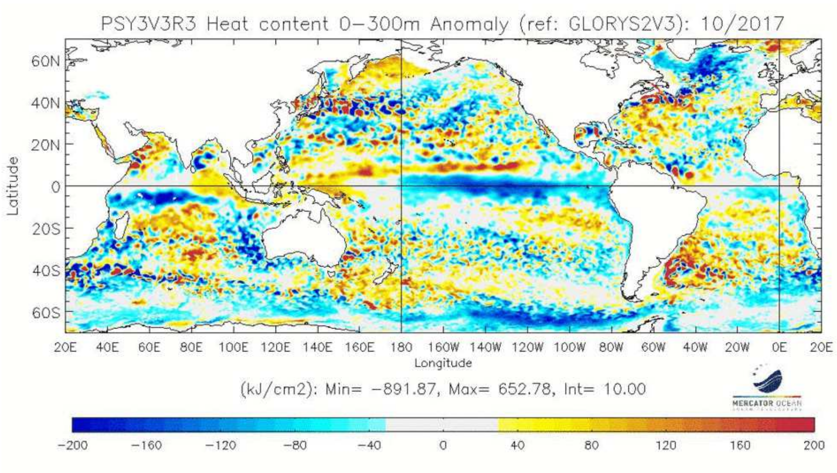


fig.I.1.2: map of Heat Content Anomalies (first 300m, kJ/cm2, reference Glorys 1992-2013)

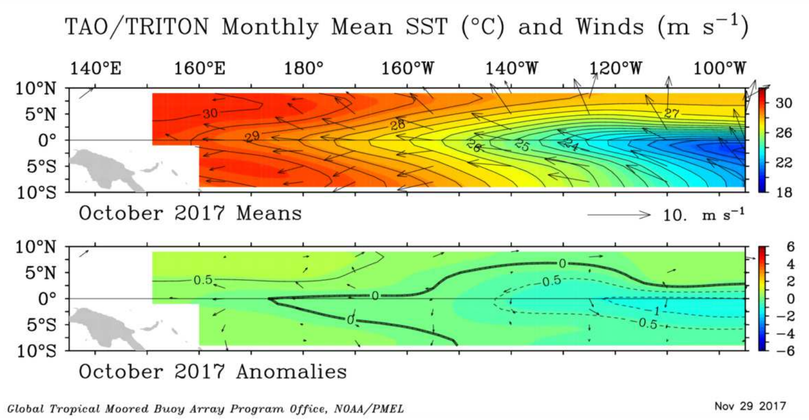


fig.I.1.3: SST Anomalies and Wind anomalies over the Equatorial Pacific from TAO/TRITON.http://www.pmel.noaa.gov /tao/drupal/assorted_plots/images/sst_wind_mon.png

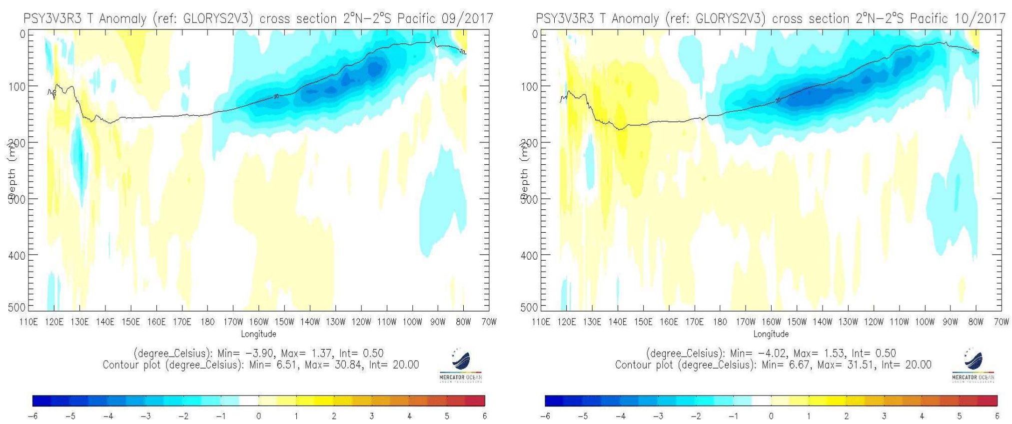


fig.I.1.4: Oceanic temperature anomaly in the first 500 meters in the Equatorial Pacific (previous and current month)

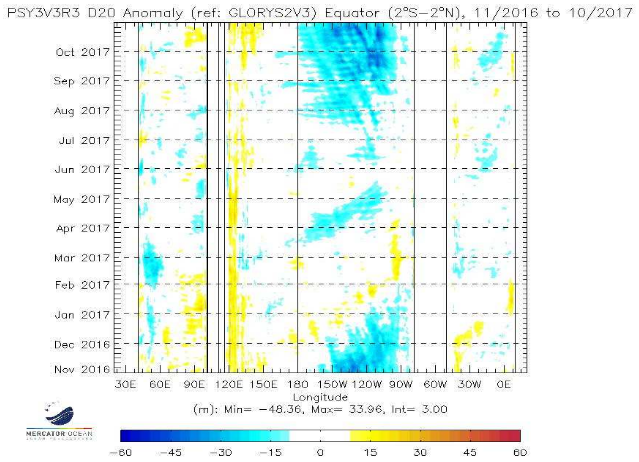


fig.I.1.5: Hovmüller diagram of Thermocline Depth Anomalies (m) (depth of the 20℃ isotherm) along the equator for all oceanic basins over a 6 month period

Sea surface temperature near Europe :

European Arctic Sea: Still very mild north of Iceland except close to the coast of northern Scandinavia / northern European Russia, no significant change.

North Sea: close to normal, no significant change.

Baltic Sea: below normal to normal, negative anomalies became slightly weaker.

Cold blob south of Greenland/Iceland: still persisting, but shifted a little bit eastward reaching Ireland without much change of intensity.

Subtropical East Atlantic: Cooling close to southwest Iberia intensified, rest of subtropical East Atlantic still warm. There are some negative anomalies along the 30℃N la titude.

Mediterranean: Western and eastern Mediterranean showed above normal anomalies while Central Mediterranean and in the Aegean Sea had a significant cooling, could be partly due to local events.

Black Sea: Slightly colder than normal, seasonal cooling was stronger than normal.

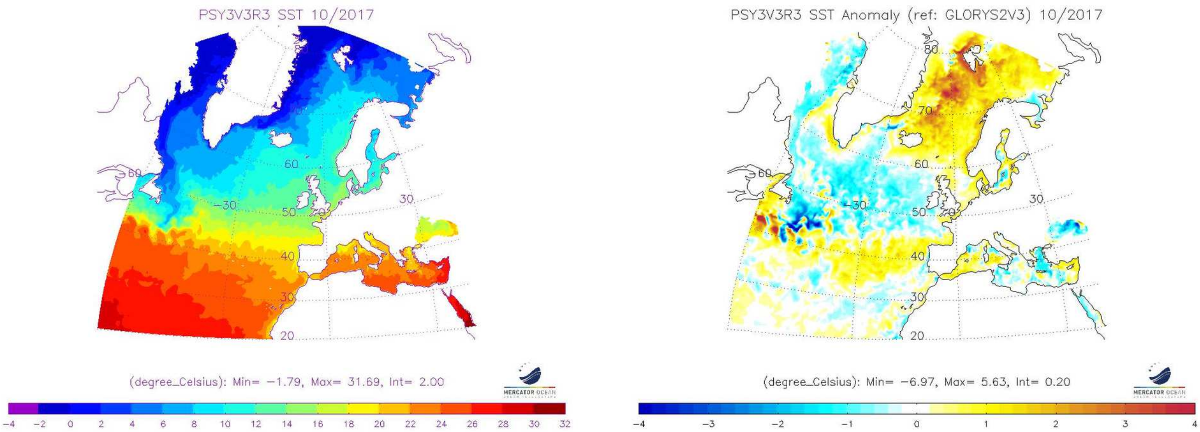


fig.I.1.6 : Mean sea surface temperature in the RA VI Region (Europe) and anomaly (reference Glorys 1992-2013).

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) :

- compared to the previous months, stronger upward anomaly over the Maritime Continent and still a downward anomaly over the very Eastern equatorial Pacific, along the South-American coasts.
- as in August, downward motion anomalies over the eastern part of tropical Pacific, consistent with the SST anomalies (a hint of some ocean-atmosphere coupling) and upward motion anomalies over the Maritime Continent, especially to the east. This is consistent with La Niña impact.
- Over the Indian Basin, West-East anomaly dipole, despite a quite neutral DMI. So this pipole is probably due to the La Nina influence.
- Over the Atlantic, large downward anomaly.

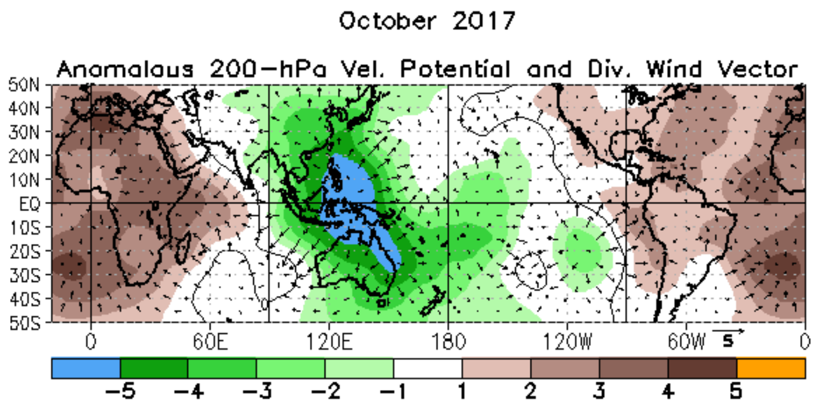


fig.I.2.1.a: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly). http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

SOI :

- still a positive SOI in October (+0.9), stronger than in September (+0.6). See NOAA Standardized SOI: https://www.ncdc.noaa.gov/teleconnections/enso/indicators/soi/ .

MJO (fig. I.2.1.b)

- Strong MJO activity in October (as in August). THis explains the strong contrasts observed on the Velocity Potential anomaly map.

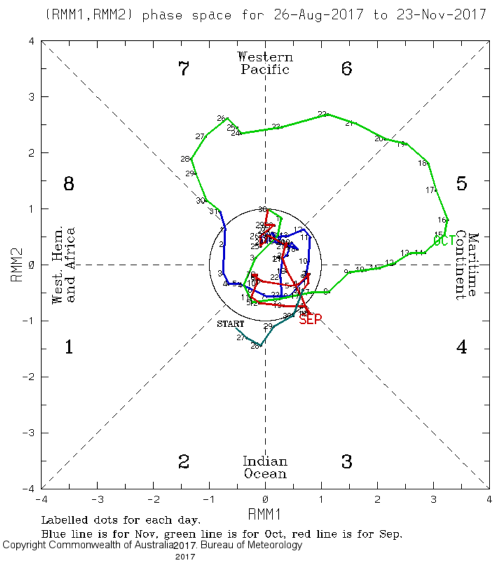


fig.I.2.1.b: indices MJO http://www.bom.gov.au/climate/mjo/

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

- Contrary to the previous months, significant anomalies in the inter-tropical band.
- on Eastern Pacific, cyclonic anomalies in both side of the eaquator, consistent with the persistent downward anomaly over extreme Eastern Pacific/South American coasts.
- Close to the Indian basin, anticyclonic anomalies around 20°N and S. Although these anomalies are loca ted far from the Maritime Continent, one can think that there is a link with the upward motion anomaly.
- No clear teleconnexion toward mid-latitudes : the PNA- pattern could potentially be associated with La Nina pattern.

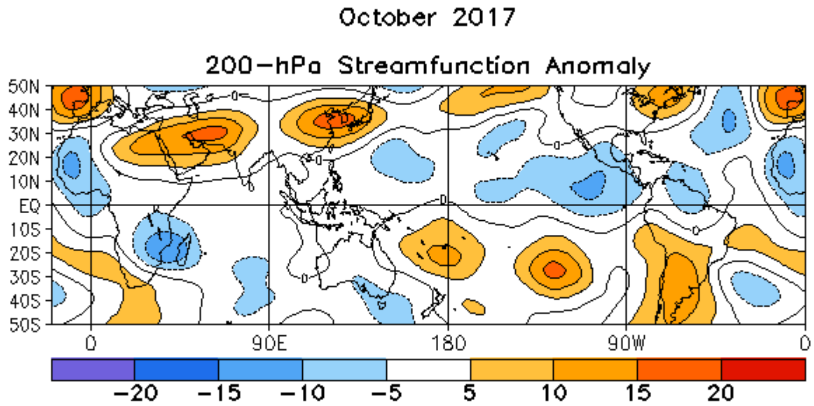


fig.I.2.2: Stream Function Anomalies at 200 hPa.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

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

- Northern Atlantic and Europe : strong anomaly dipole between West and Central Europe. East-Atlantic like pattern, but shifted westerly.
- Pacific-America : strong positive anomaly over Gulf of Alaska. Good projection on the negative phase of PNA.

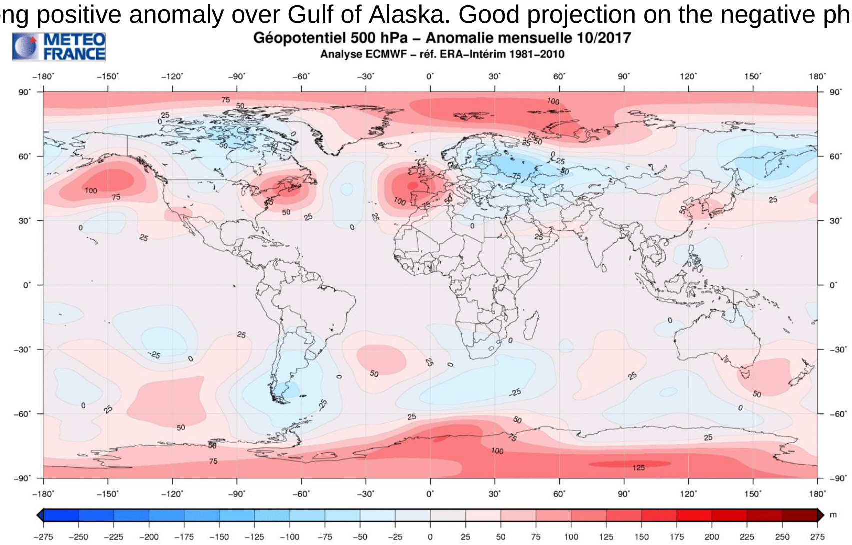


fig.I.2.3: Anomalies of Geopotential height at 500hPa (Meteo-France)

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
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
JUL 17	1.3	1.8	0.5	0.0	1.3	---	-0.6	0.0	-0.1
JUN 17	0.4	2.0	-0.8	0.5	1.2	---	0.3	-1.4	-0.1
MAY 17	-1.7	0.5	0.7	-0.7	-0.2	---	1.5	0.9	0.5

APR 17	1.7	-0.6	-0.4	1.0	0.1	---	0.7	-1.5	-1.4
MAR 17	0.4	1.0	-2.1	-1.0	-0.0	---	-1.0	-1.0	0.7

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

In the monthly mean pressure distribution the Iceland low appeared in its normal position but with slightly negative pressure anomalies. The Azores high is shifted to nort-east with maximum pressure anomalies of more than +5 hpa over western France. The circulation indices in October were not well pronounced allthough 4 (Xavier, Ophelia, Brian and Herwart) storms passed western Europe from south to north..

The DWD Hess/Brezowsky classification showed most of the month a westerly flow over Central Europe with a short interruption between 19-22 October.

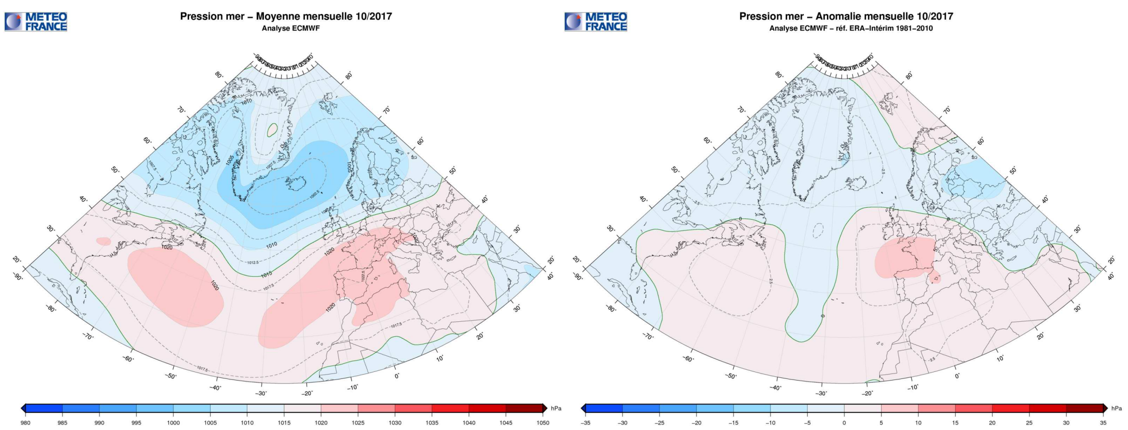


fig.I.2.4: Mean sea level pressure in the RA VI Region (Europe) (top) and 1981-2010 anomalies (bottom).

Circulation indices: NAO and AO

NAO had a positive phase up to the 20th of October with a maximum of more than 1 around the 15th. The last 10 days NAO was negative. This means that only short-living meridional circulation occurred over the North Atlantic.

AO was in a positive phase during most of the month.

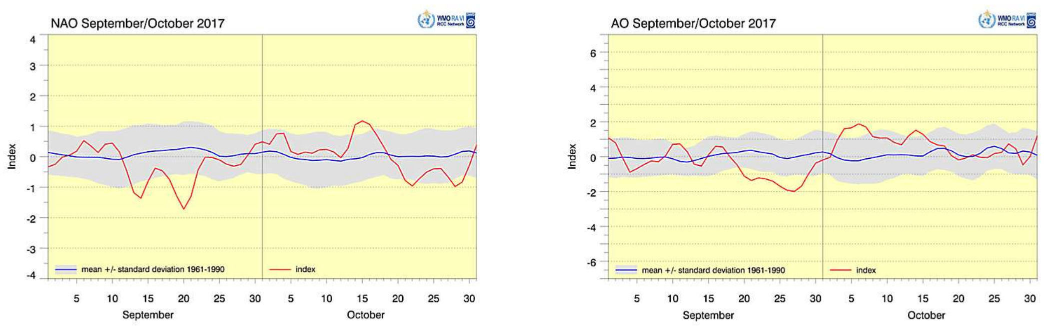


fig.I.2.5: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices with 1961-1990 mean standard deviation (shading). http://www.dwd.de/rcc-cm , data from NOAA CPC: http://www.cpc.ncep.noaa.gov/products/precip /CWlink/daily_ao_index/teleconnections.shtml

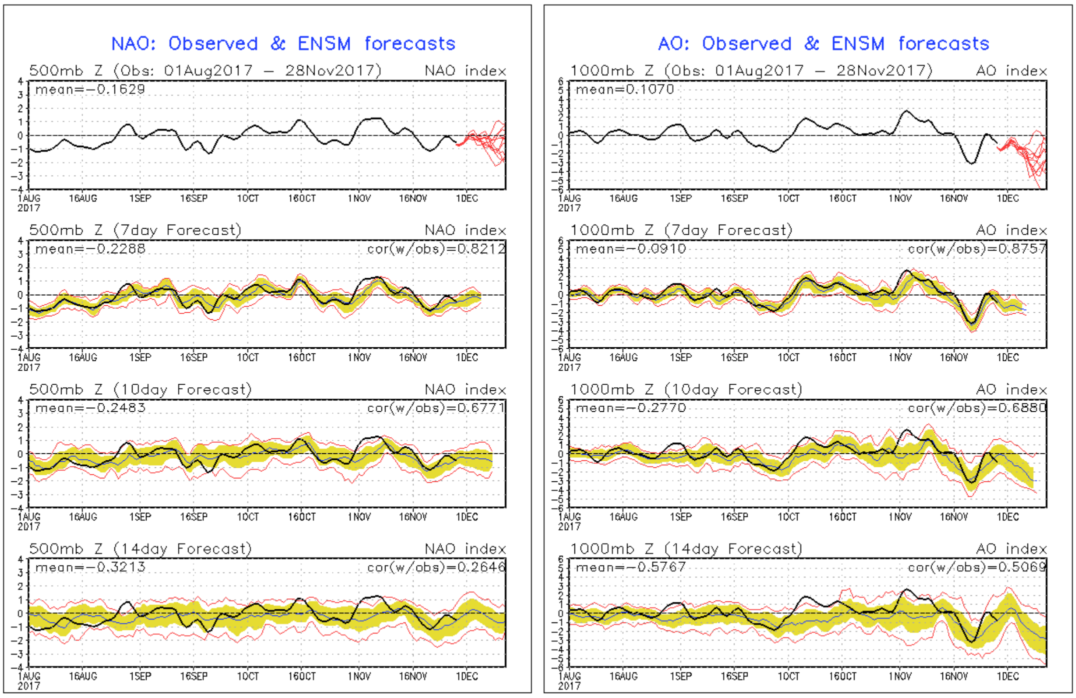


fig. I.2.5a: North Atlantic Oscillation (NAO, left) and Arctic Oscillation (AO, right) indices for the last 4 months and forecasts for the following weeks. Source: NOAA CPC, http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

I.2.b Precipitation

- In agreement with SST anomalies and velocity potential anomalies, above normal rainfall for the Maritime Continent (particularly over the east) and India, and below normal over the Equatorial Pacific.
- Drier than normal over West-Africa and for Amazonia where rainfall deficits have been persisting since April.
- drier than normal for the Carribean, wetter than normal over Central America.
- Over Europe, strong contrast between West/South-West (very dry) an East (very wet), consistent with Z500 anomalies.

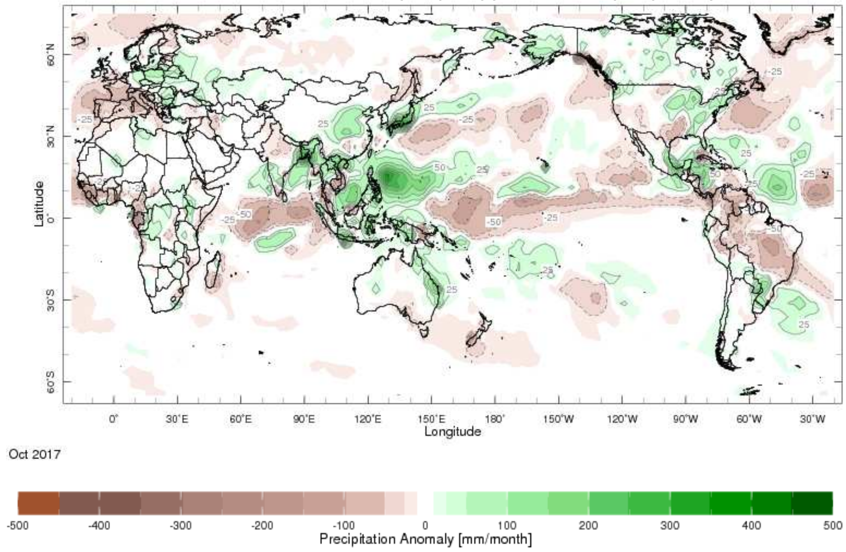


fig.I.2.6: Rainfall Anomalies (mm) (departure to the 1979-2000 normal).
Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/Anomaly.html

Precipitation anomalies in Europe:

Above-normal precipitation occurred in southern Scandinavia, Central and Eastern Europe while southern and western Europe received below normal precipitation and suffer from drought. Norway was affected by two heavy precipitation events, the one from 30 September - 2 October and the second one from 20 - 22 October 2017, only 100 km eastwards from each other. On the Baltic coast of Poland several stations registered monthly total precipitation of more than 170 mm or 300%. Serbia was very wet in the southern part with up to 238% (or 161.6 mm) at Kopaonik. Around the eastern Black Sea heavy precipitation occurred. Turkey reported at station Rize a monthly total of 407.6 mm.

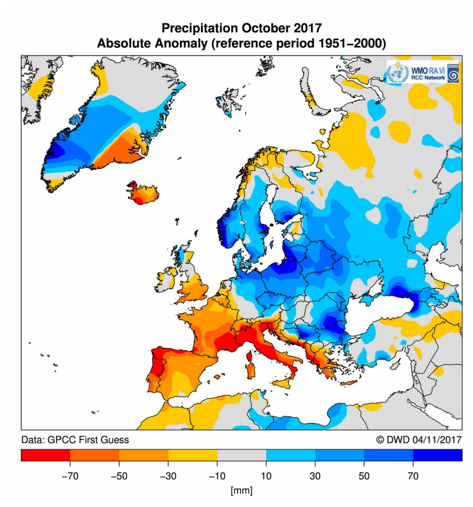


fig.I.2.7.a : Absolute anomaly (1951-2000 reference) of precipitation in the RA VI Region (Europe), data from GPCC (Global Precipitation Climatology Centre), http://www.dwd.de/rcc-cm.

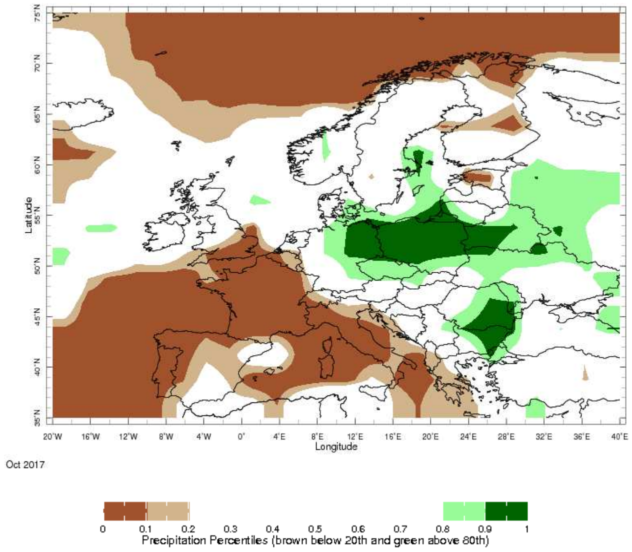


fig.I.2.7.b : Percentiles of precipitation, 1981-2010 reference. Data from NOAA Climate Prediction Center, http://iridl.ldeo.columbia.edu/maproom/Global/Precipitation/Percentiles.html

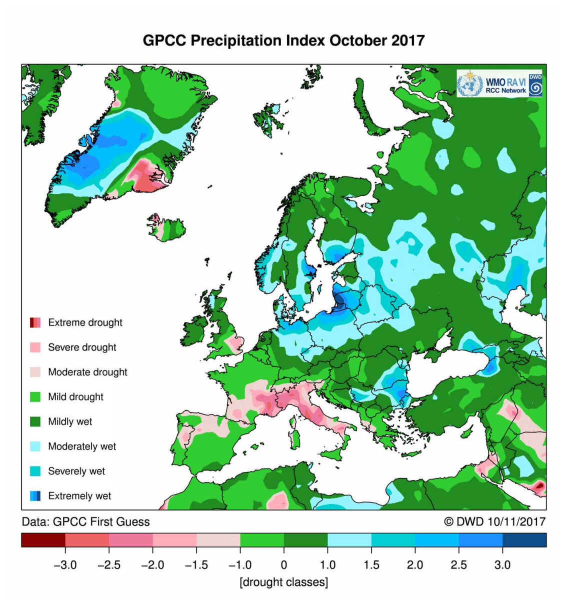


fig. I.2.8: GPCC Precipitation Index, http://www.dwd.de/rcc-cm .

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	+ 27.5 mm	+ 1.072
Southern Europe	- 25.6 mm	- 0.278

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 western Europe, large positive anomaly, close to classical impact of EA mode (cf http://seasonal.meteo.fr /fr/content/suivi-clim-modes-impacts)
- over the rest of the Eurasian continent, large negative anomaly, probably related (at least partly) to the early snow cover over Siberia.
- over North America, strong positive anomalies avec Alaska and Eastern Canada. At the contrary , negative anomaly (significant) over the Western part of USA.

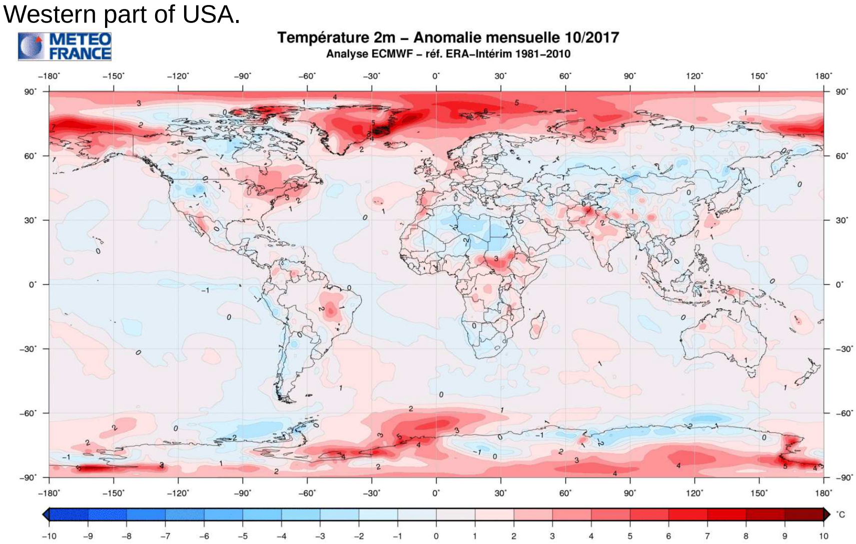


fig.I.2.9: Temperature Anomalies (℃) (Meteo-France)

Temperature anomalies in Europe:

The western half of Europe was warmer than normal and eastern Europe and northern Africa was slightly below normal. Very mild in the Arctic region due to warm air advection . This October was the warmest in Portugal in the last 87 years (since 1931) with an average daily temperature of +3 ℃ above normal and an average maximum a ir temperature of about +5 ℃ above normal. The IPMA r eported 2 heat waves for Portugal one from 1st to 16th and the other from 23rd to 30th of October, which covered a large part of the country. In Spain it was the second warmest October since 1965.

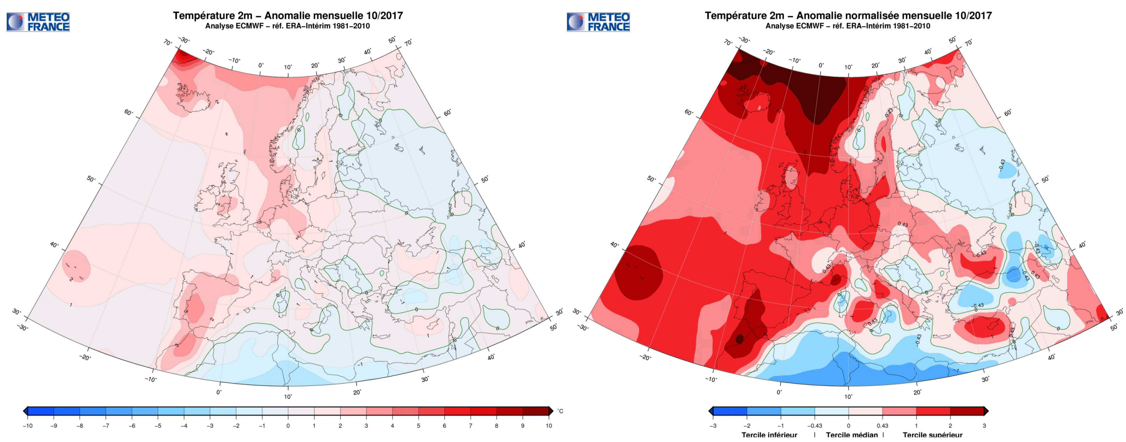


fig.I.2.10: Left graph: Absolute anomaly of temperature in the RA VI Region (Europe). Right graph: Standardized temperature anomalies

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	+ 1.1 ℃
Southern Europe	+ 1.1 ℃

I.2.d Sea ice

- In the Arctic, the ice extent remained well below 1981-2010 normal
- Fort the Antarctic, the deficit remained also very high, with an annual maximum just above the 2016 record level.

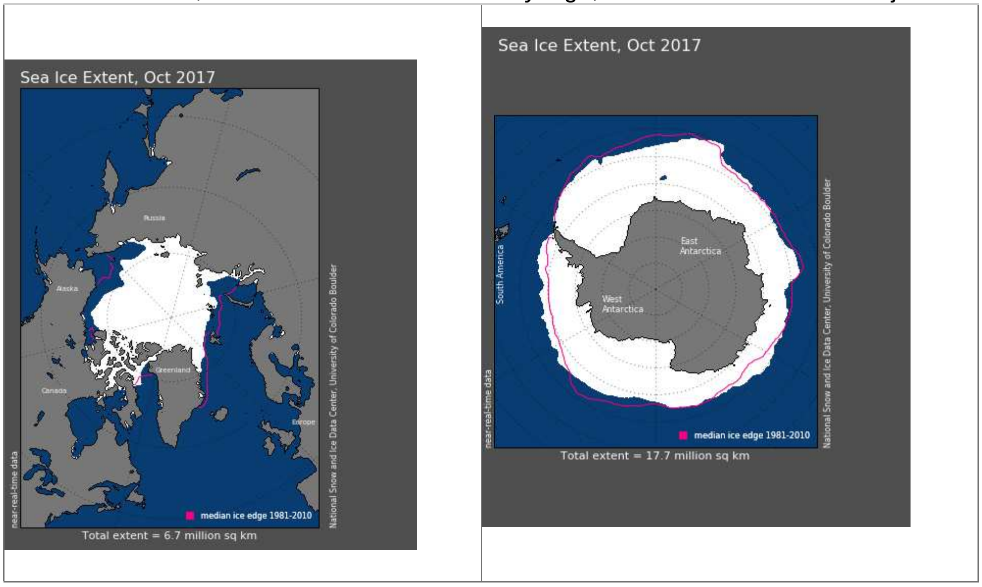


fig.I.2.11: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

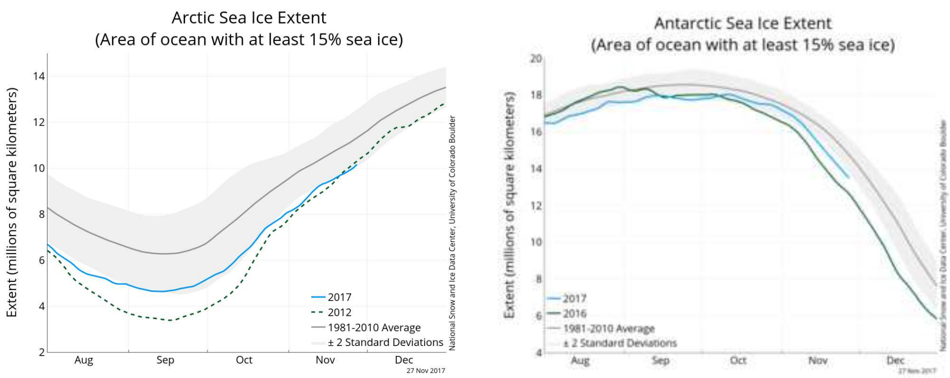
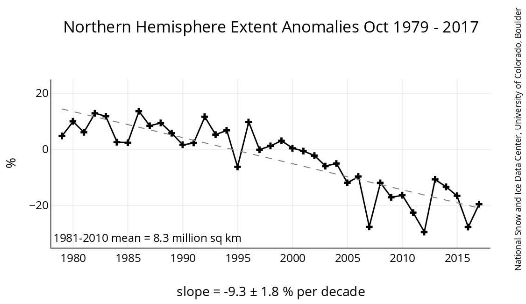


fig. I.2.12 : Sea-Ice extension evolution from NSIDC. https://nsidc.org/data/seaice_index/images/daily_images /N_stddev_timeseries.png



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

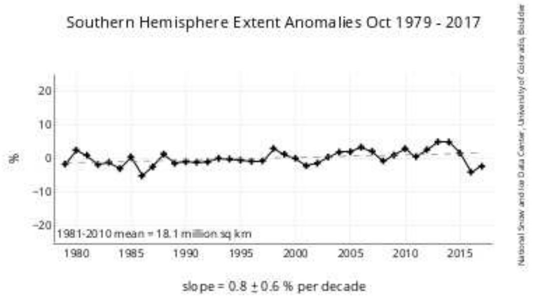


fig 1.2.13 : Monthly Sea Ice Extent Anomaly Graph in Antarctic for the month of analysis (http://nsidc.org/data/seaice_index/)

II. SEASONAL FORECAST FROM DYNAMICAL MODELS

II.1. OCEANIC FORECASTS

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

Models in good agreement this month.

- Pacific Ocean: further cooling is expected along the Equatorial rail, up to the date line. La Niña conditions should therefore settle for the next three months. Over the northern mid-latitudes,the North-South gradient remains strong between the tropics (warm) and mid-latitudes (cold).
- Indian Ocean: warm/cool contrast persisting between the western and the eastern basin in the southern hemisphere. In the northern hemisphere, a little warmer to the west, close to neutral to the east, so the DMI index would stay slightly positive but not significantly (see figure II.1.7).
- Atlantic Ocean:
  - in the tropics, quite neutral conditions.
  - In the northern basin, West East gradient with warmer than normal conditions close to Europe
- Mediterranean Sea : positive anomalies for the whole basin, especially to the west.

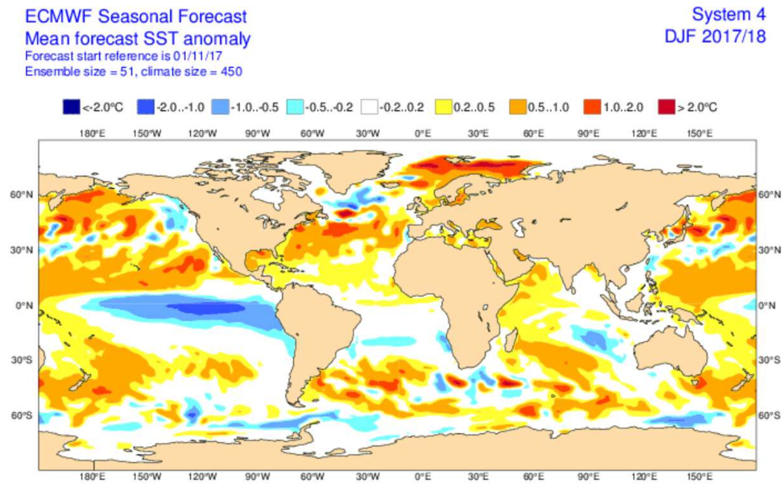


fig.II.1.1: SST anomaly forecast from ECMWF
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

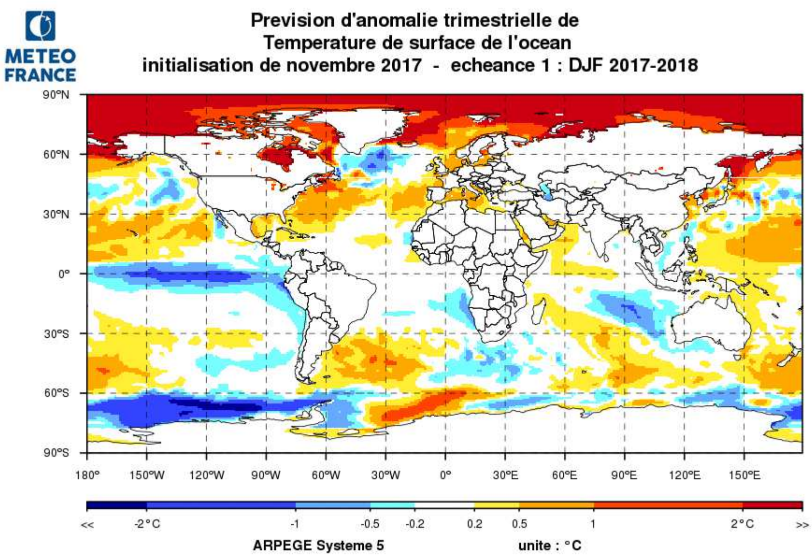


fig.II.1.2: SST Anomaly forecast from Meteo-France (recalibrated with respect of observation).
http://seasonal.meteo.fr

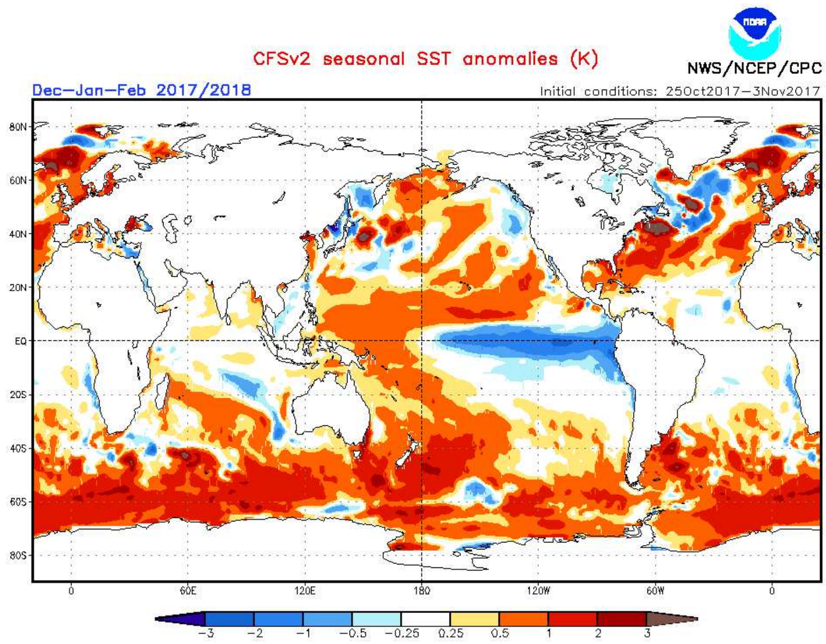


fig.II.1.3: SST Anomaly forecast from NCEP.
http://www.cpc.ncep.noaa.gov/products/people/wwang/cfsv2fcst/imagesInd1/glbSSTSeaInd1.gif

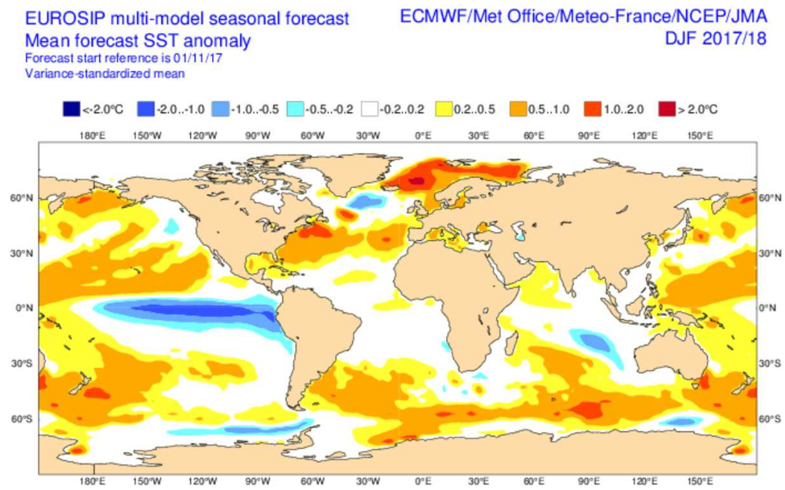


fig.II.1.4: SST Forecasted anomaly from Euro-SIP

II.1.b ENSO forecast :

***Forecast Phase*: weak to moderate La Niña likely for the next three-month period.**

La Niña conditions would therefore continue during the next months, with high probability. There is a good consistency between models concerning the intensity of this event. In terms of Nino3.4 index, the EUROSIP multi-model combination (see below) gives a very good overview of the intensity we could expect : a weak to moderate event.

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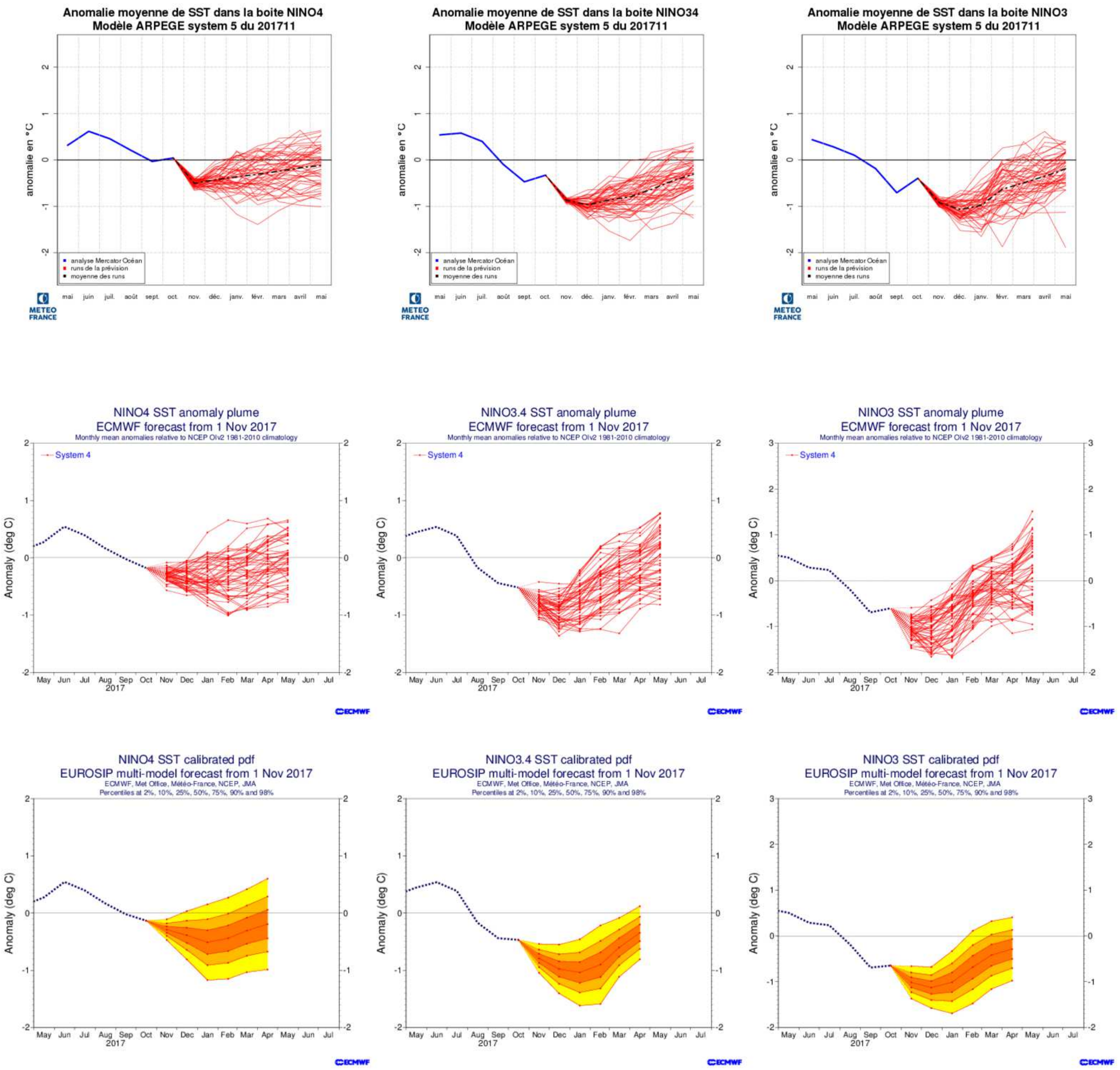
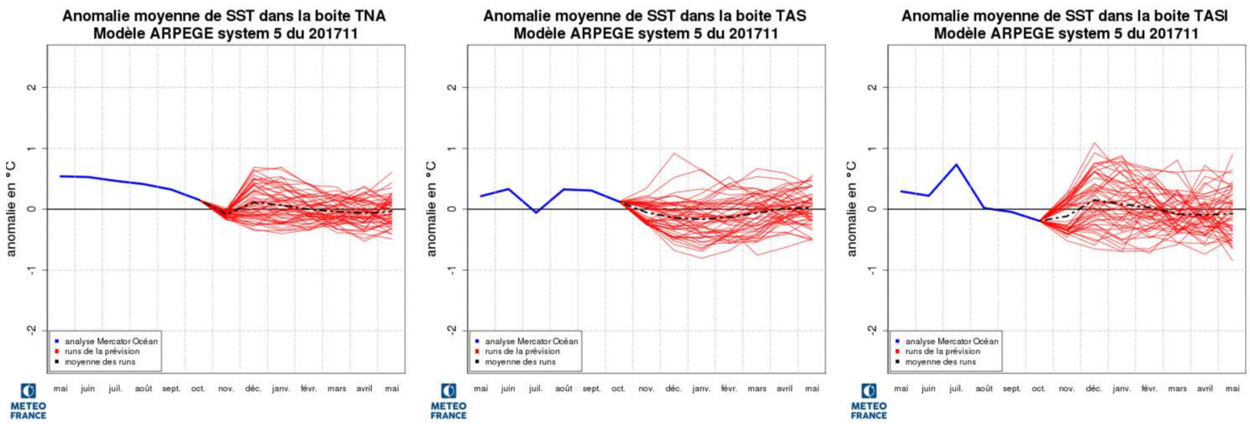


fig.II.1.5: SST anomaly forecasts in the Niño boxes from Météo-France (top) and ECMWF (middle) - monthly mean for individual members -
and EUROSIP (bottom) – recalibrated distributions -
(http://seasonal.meteo.fr , http://www.ecmwf.int/)

I.1.c Atlantic ocean forecasts

Neutral conditions forecasted



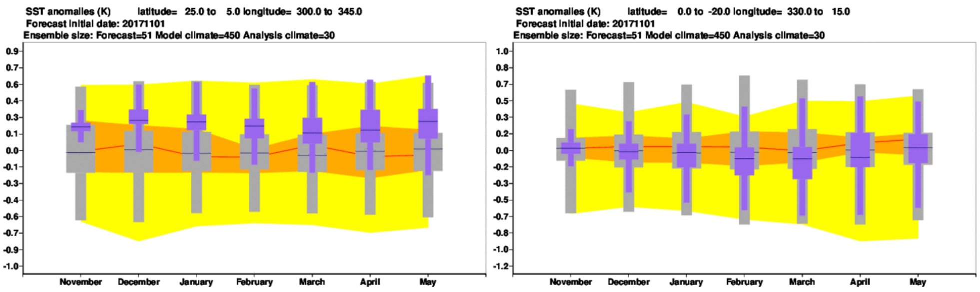


fig.II.1.6: SSTs anomaly forecasts in the Atlantic Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

I.1.d Indian ocean forecasts

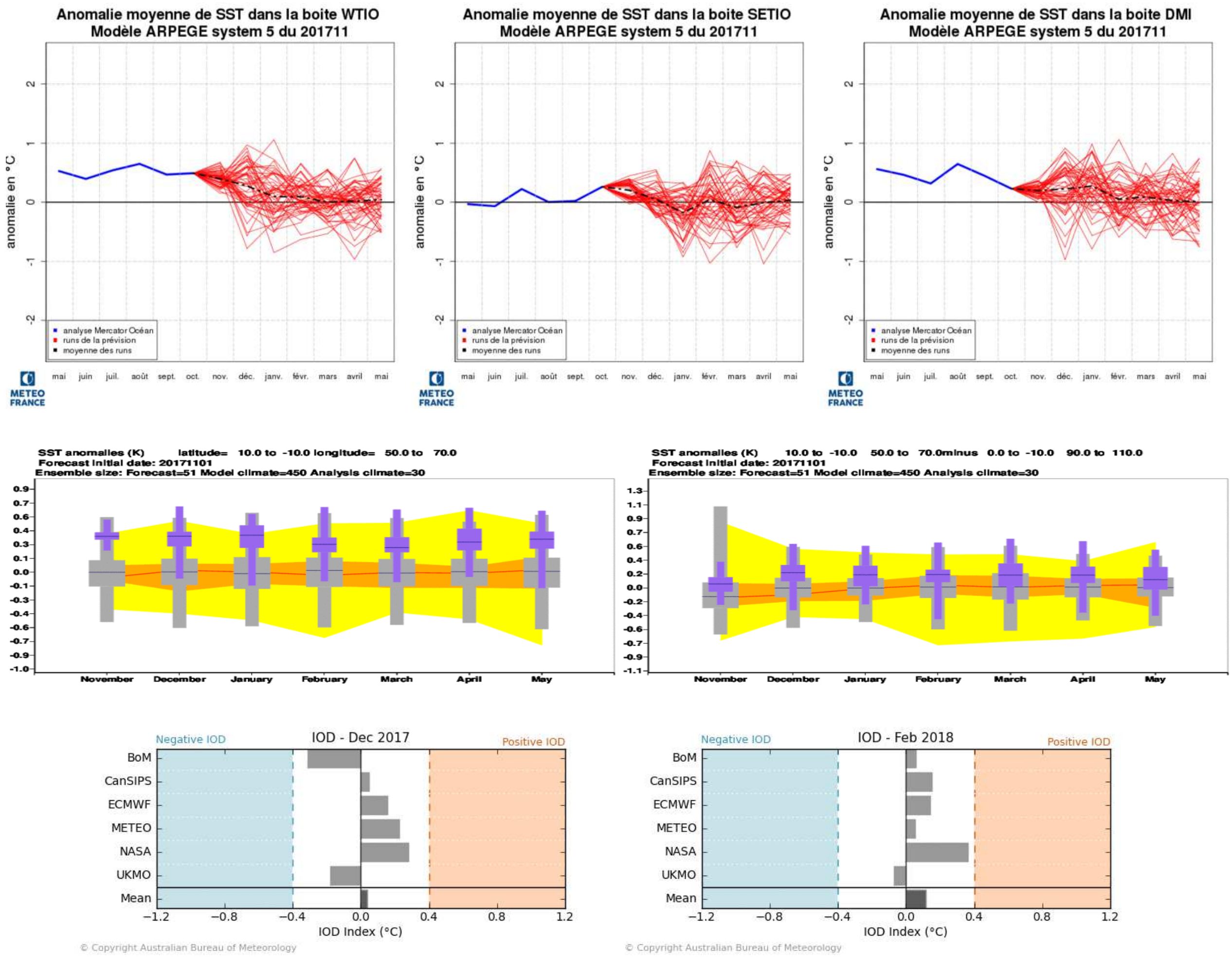


fig.II.1.7: SST anomaly forecasts in the Indian Ocean boxes from Météo-France and ECMWF, plumes / climagrams correspond to ensemble members and monthly means.

II.2. GENERAL CIRCULATION FORECAST

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

- Velocity potential :
  - MF, ECMWF and JMA are in good agreement, showing a La Niña-like atmospheric response : negative anomaly covering the Maritime Continent spreading to Japan, and a positive anomaly over the tropical Pacific. Over the Atlantic Ocean, no significant anomaly.
  - Over the Indian basin, some differences between models : MF and JMA forecast a strong negative anomaly (despite a neutral DMI), ECMWF forecasts the contrary. We priviledged ECMWF scenario.
- Stream Function :
  - Ninã-like response over the tropical Pacific. In the Northern hemisphere, MF SF anomaly field show a nice teleconnexion (PNA-) up to the Atlantic. This teleconnexion is less obvious in SF in ECMWF and JMA.
  - over the western part of Northern Atlantic, the tripole forecasted by MF is very convincing
  - over the Indian basin, no consistency between the models, this is not surprising because of the PV differences (see above)

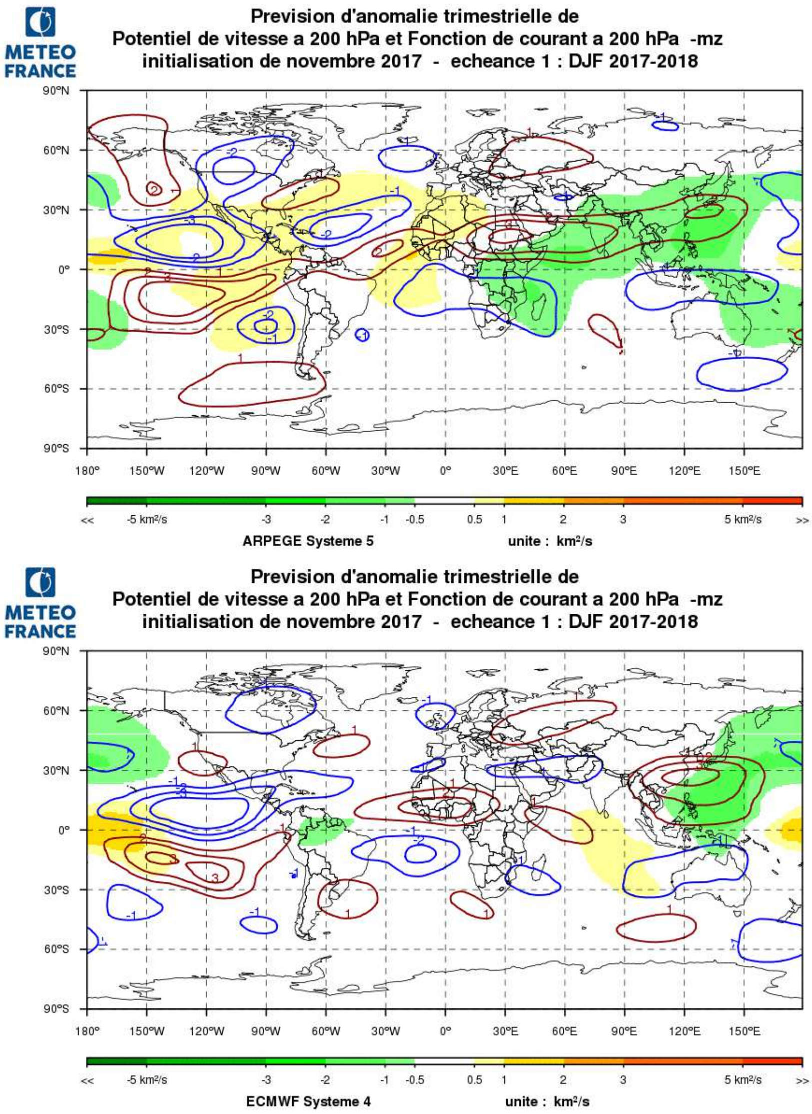
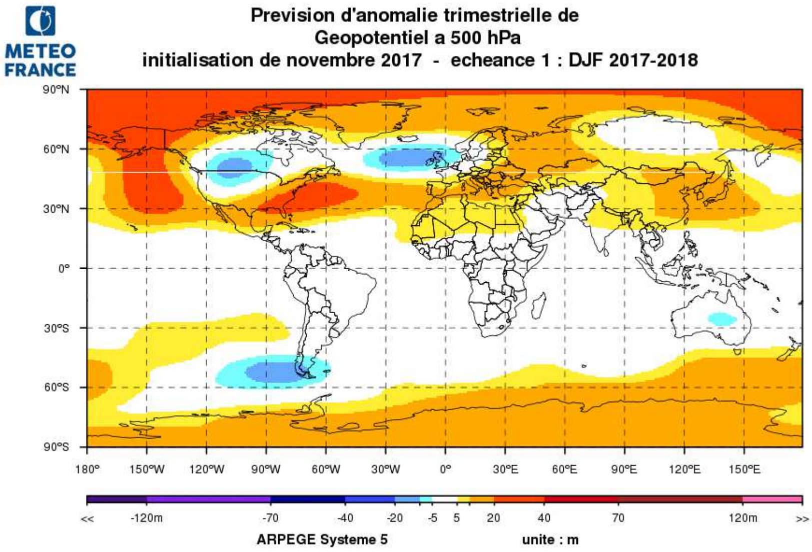


fig.II.2.1: Velocity Potential anomaly field χ (shaded area – green negative anomaly and pink positive anomaly), associated Divergent Circulation anomaly (arrows) and Stream Function anomaly ψ (isolines – red positive and blue negative) at 200 hPa by Météo-France (top) and ECMWF (bottom). http://seasonal.meteo.fr

II.2.b Geopotential height anomalies

Good agreement between ECMWF and MF-S5 over north America, with a negative PNA pattern suggested, which is consistent with a La Niña event.

Over Northern Atlantic and Europe, ECMWF and MF-S5 in good agreement, like most of the GPC models. The priviledged circulation is a positive NAO and/or a positive EA. MF-S6 (not operational yet) is very similar to MF-S5.



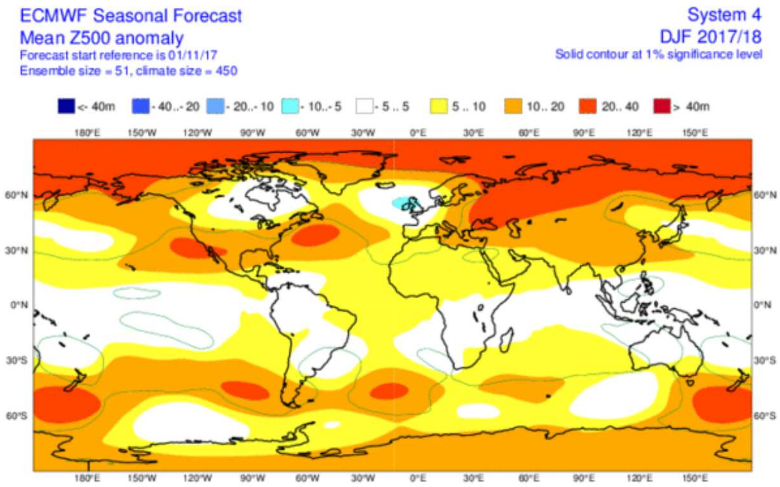


fig.II.2.2: Anomalies of Geopotential Height at 500 hPa from Météo-France and ECMWF. http://seasonal.meteo.fr http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast

fig II.2.3 : Mean Anomaly of Geopotential Height at 500 hPa from the EUROSIP models

II.2.c. modes of variability

MF-S5 forecasts a negative PNA. And for the runs forecasting PNA-, they also forecast positive NAO.

Over the Atlantic Ocean, NAO+ and EA are priviledged.

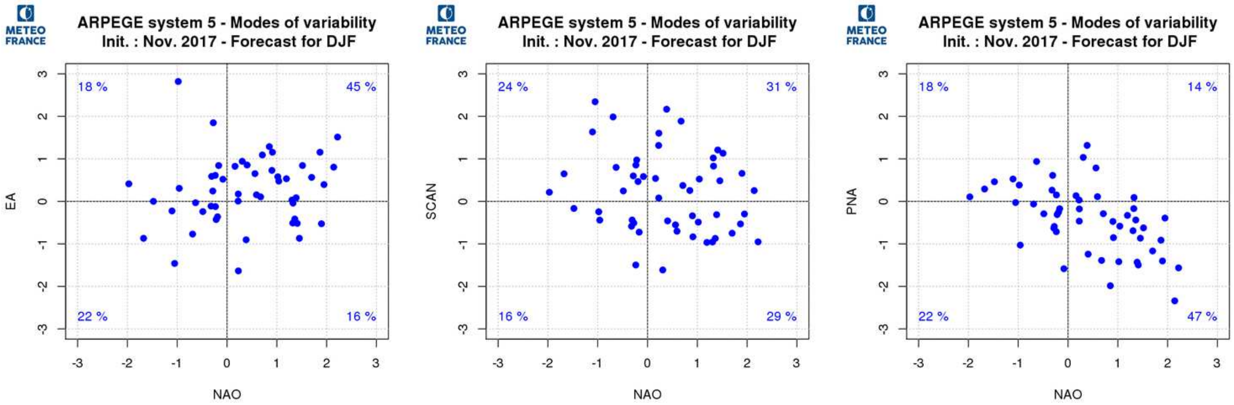


fig.II.2.4 : modes of variability forcasts over the Northern hemisphere with Meteo-France ARPEGE-S5

II.2.d. weather regimes

Enhanced occurrence of NAO+, but not significant.

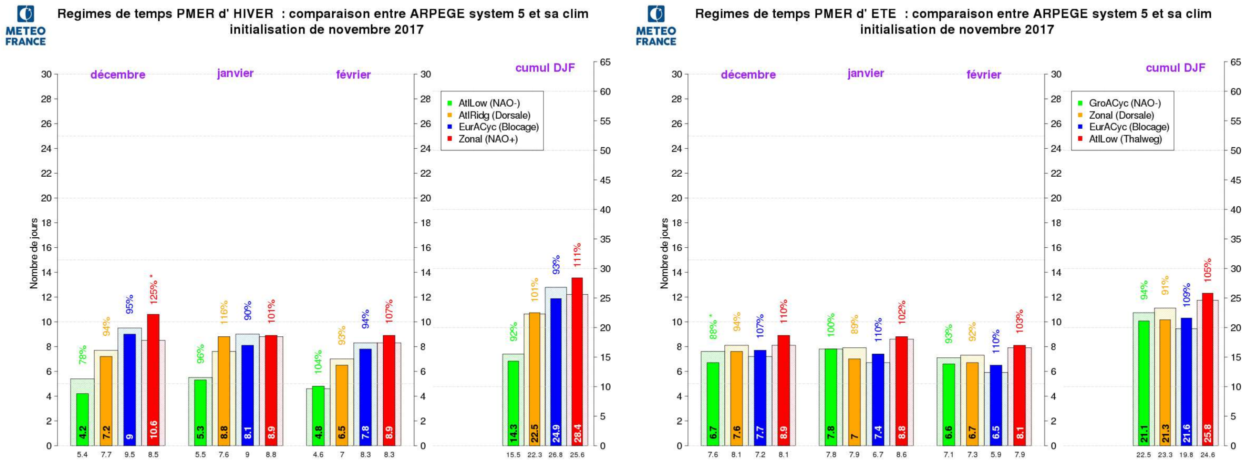


fig.II.2.5: North Atlantic Regime occurrence anomalies from Meteo-France ARPEGE-S5 : vertical bars represent the excitation frequency anomaly (in %) for each of the 4 regimes.

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

For Europe and the Mediterranean basin, the warm tercile is priviledged, in constistency with NAO+ EA+. The highest probabilities (>60%) covers generally Western Europe.

Over North America, the MF-S5 scenario seems robust, consistent with PNA-.

II.3.a Météo-France

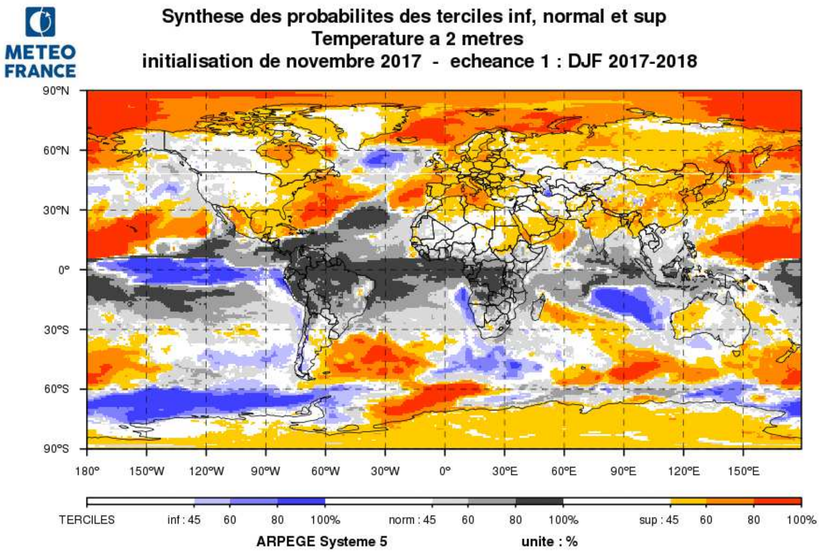


fig.II.3.1: Most likely category of T2m. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.3.b ECMWF

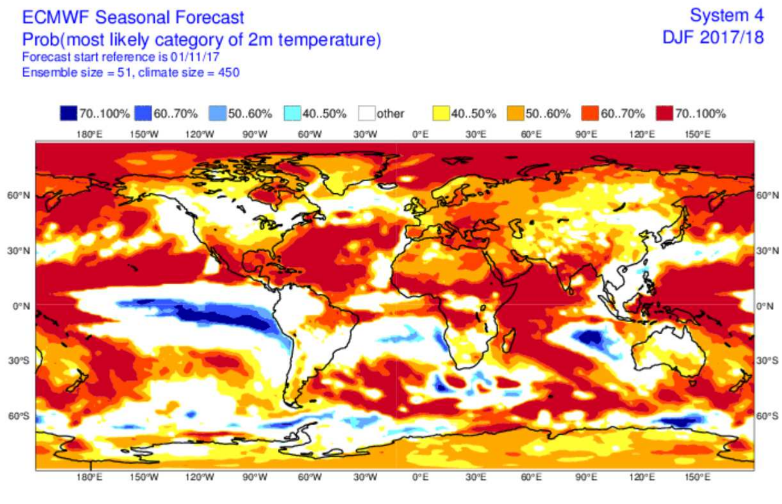


fig.II.3.2: Most likely category probability of T2m from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seaso...

II.3.c Japan Meteorological Agency (JMA)

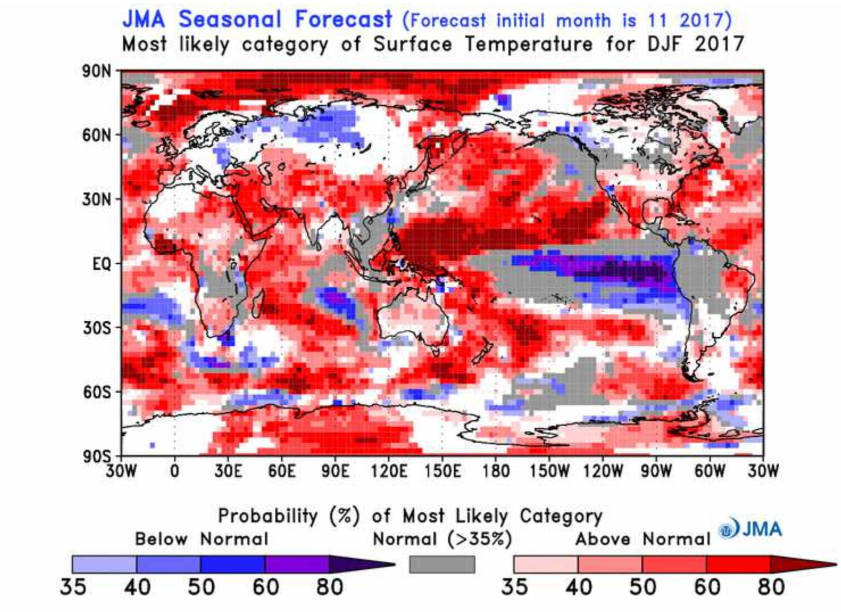


fig.II.3.3: Most likely category of T2m. Categories are Above, Below and Close to Normal.
White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst_gl.php

II.3.d EUROSIP

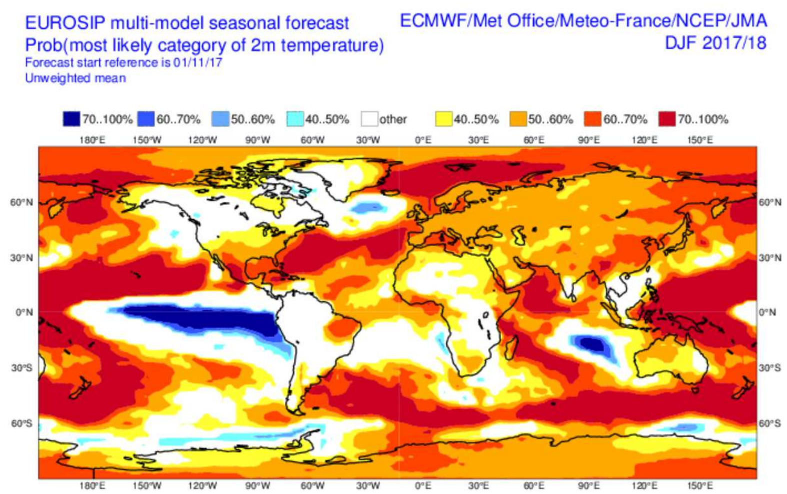


fig.II.3.4: Multi-Model Probabilistic forecasts for T2m from EuroSip (2 Categories, Below and Above normal – White zones correspond to No signal and Normal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

II.4. IMPACT : PRECIPITATION FORECAST

- Over Europe and the Mediterranean basin, models mainly forecast a North-South gradient (wetter than normal in the North, drier than normal in the South)
- over the Middle East, a dry scenario is generally priviledged, consistent with positive anomalies of Z500.
- the PNA- context may cause humid conditions over Canada and USA, dry conditions over Mexico
- north of the Maritime Continent, postivies precipitation anomalies, consistent with PV200. Conversely, dry signal over the equatorial Pacific;

II.4.a Météo-France

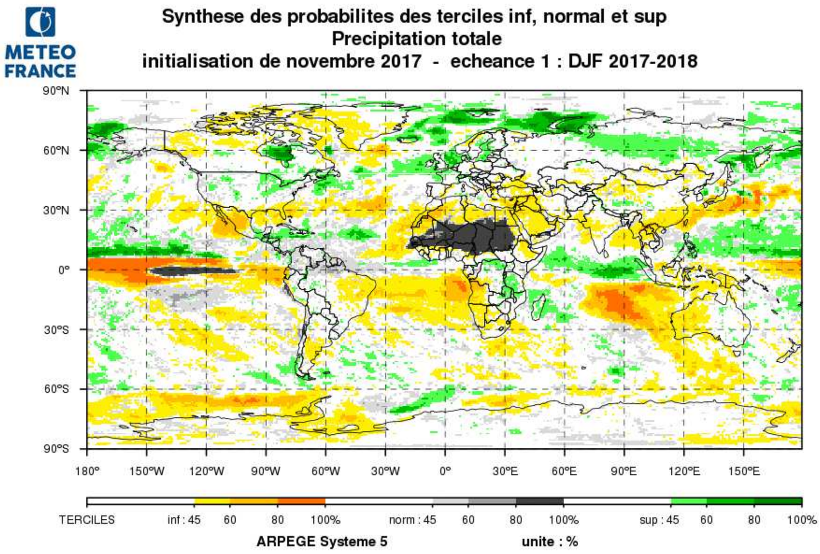


fig.II.4.1: Most likely category of Rainfall. Categories are Above, Below and Close to Normal. White zones correspond to No Signal. http://seasonal.meteo.fr/

II.4.b ECMWF

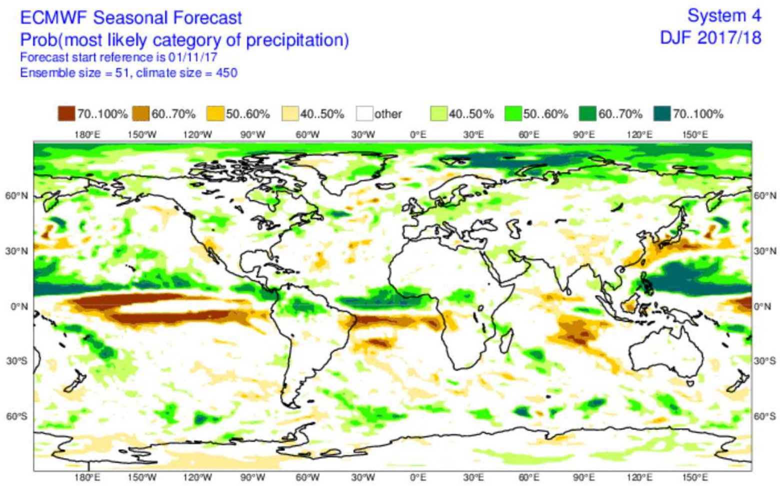


fig.II.4.2: Most likely category probability of rainfall from ECMWF. Categories are Above Normal, Below Normal and « other » category (Normal and No Signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/

II.4.c Japan Meteorological Agency (JMA)

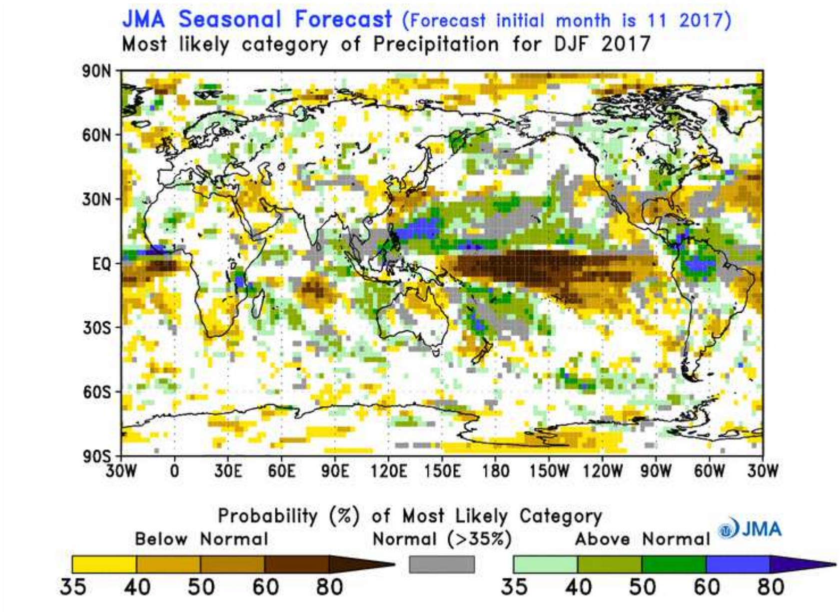


fig.II.4.3: Most likely category of Rainfall from JMA. Categories are Above, Below and Close to Normal. White zones correspond to No Signal.
http://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/fcst/fcst_gl.php

II.4.d EUROSIP

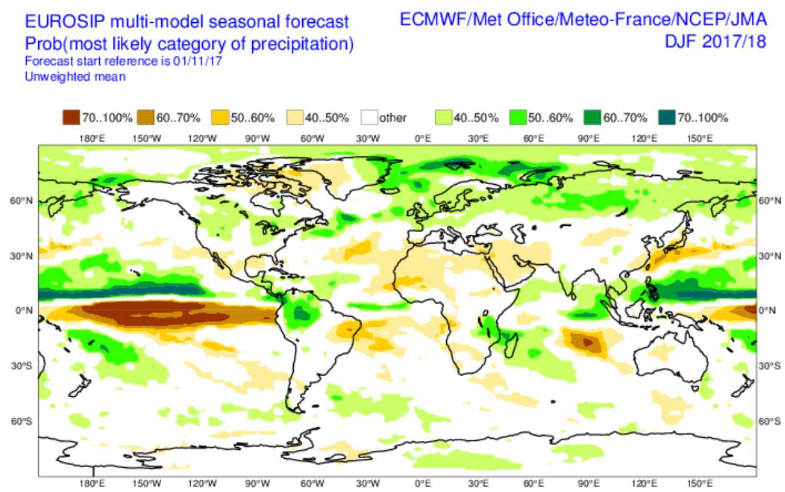


fig.II.4.4: Multi-Model Probabilistic forecasts for precipitation from EuroSip (2 Categories, Below and Above normal – White zones correspond to No signal).
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm/

II.5. REGIONAL TEMPERATURES and PRECIPITATION

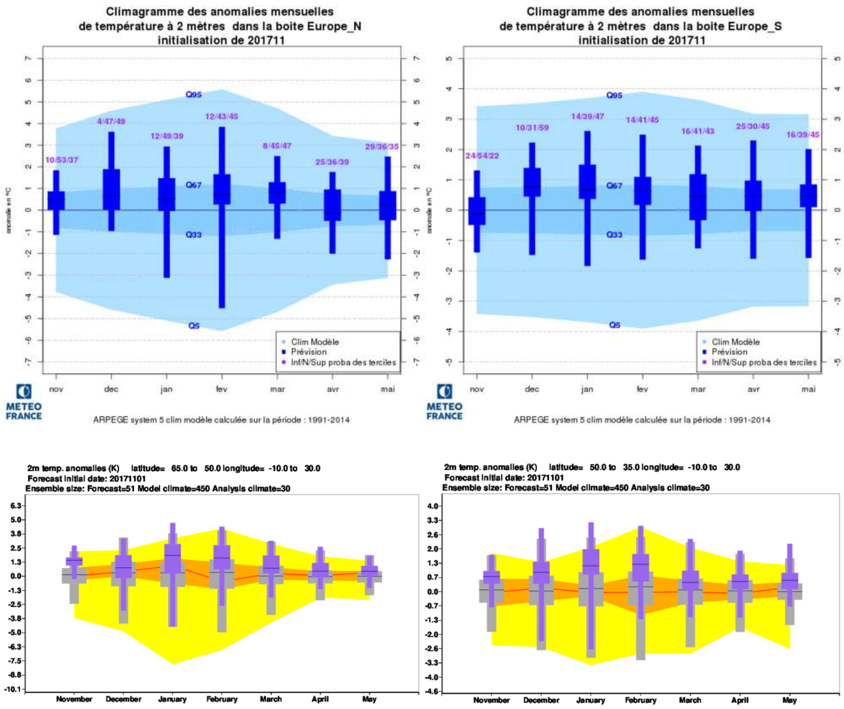


fig.II.5.1 : Climagrams for Temperature in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

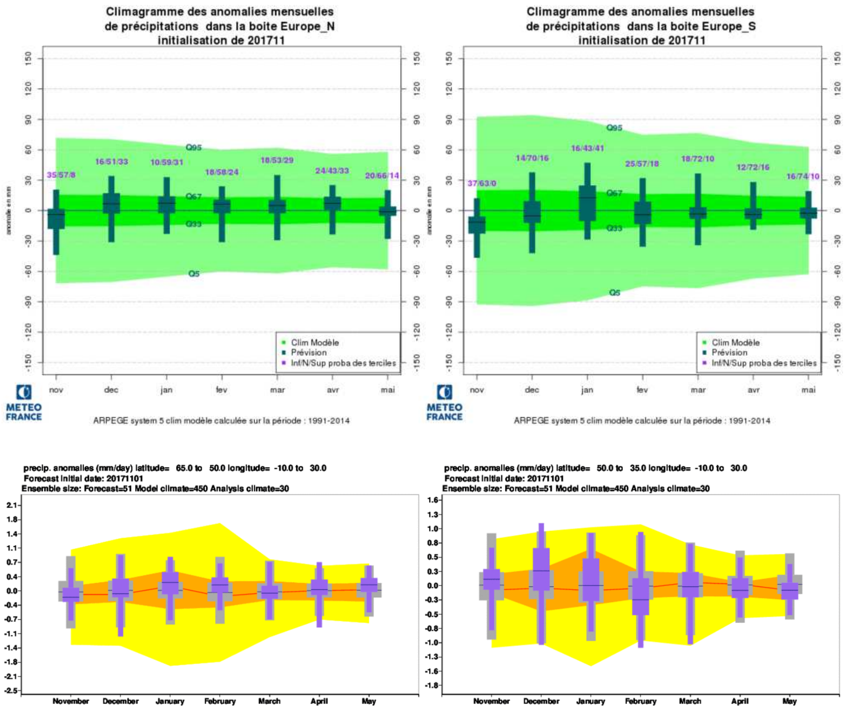


fig.II.5.2 : Climagrams for Rainfall in Northern Europe (left) and in Southern Europe (right) from Météo-France (top) and ECMWF (bottom).

II.6. "EXTREME" SCENARIOS

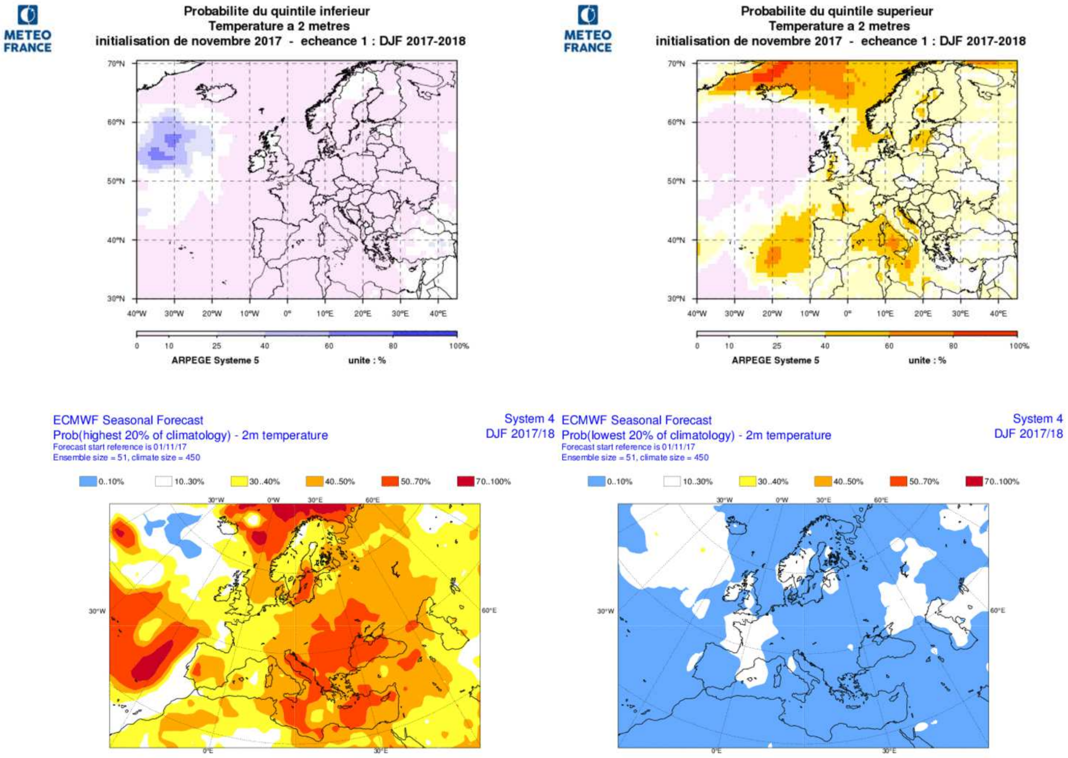


fig.II.6.1 : Top : Meteo-France T2m probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution). Bottom : ECMWF T2m probability of « extreme » below normal conditions (left - highest ~20%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

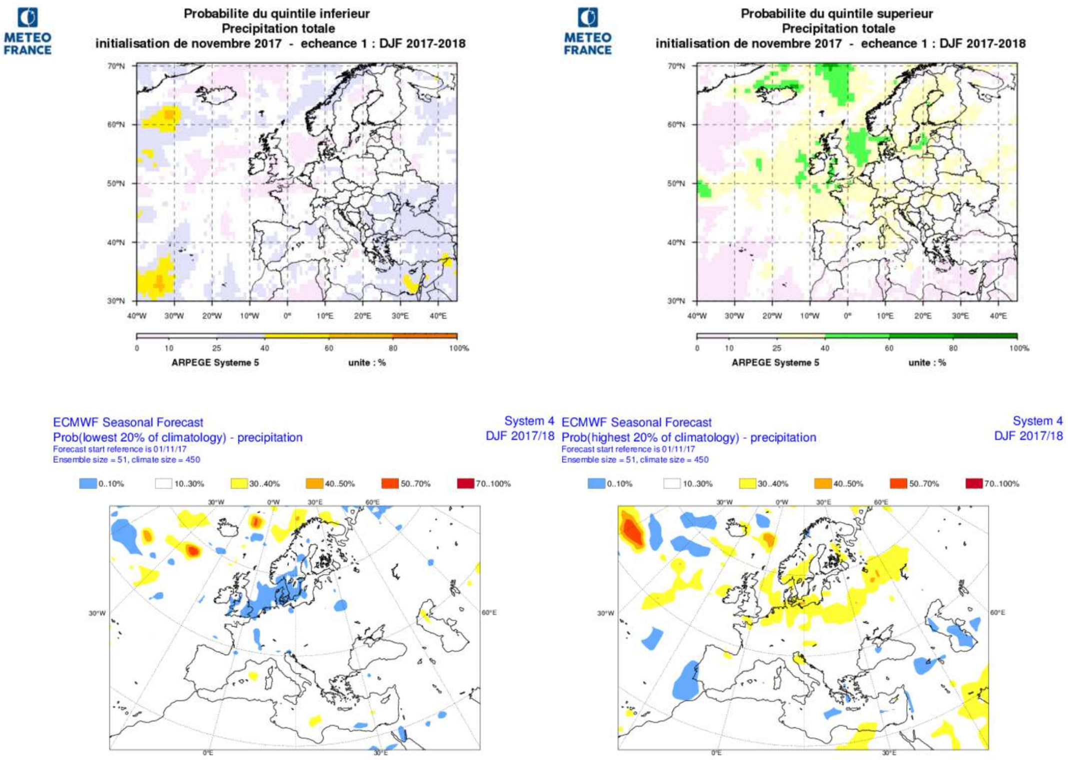


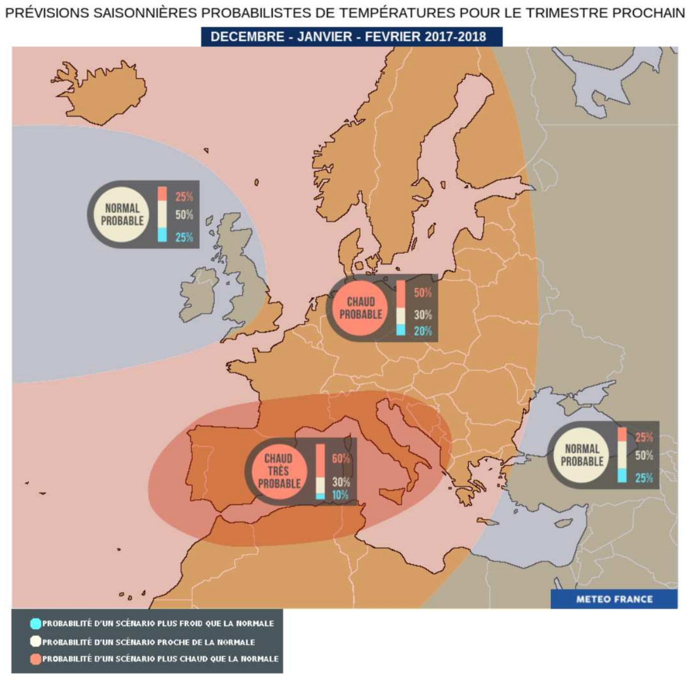
fig.II.6.2 : Top : Meteo-France rainfall probability of « extreme » below normal conditions (left - lowest ~15% of the distribution) and "extreme" above normal conditions (right - highest ~15% of the distribution).
Bottom : ECMWF rainfall probability of « extreme » below normal conditions (left - lowest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

II.7. DISCUSSION AND SUMMARY

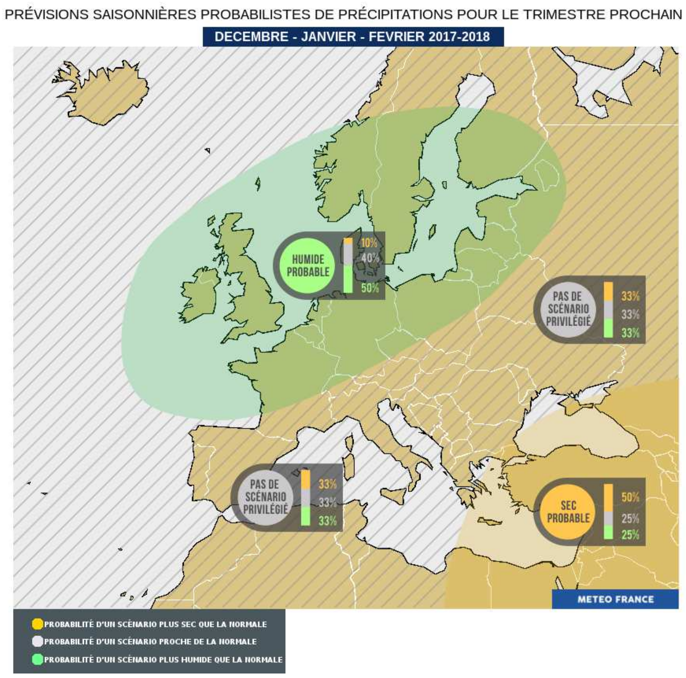
II.7.a Forecast over Europe

Models privilege a stronger zonal circulation over Western Europe. The La Nina event seems to drive (partly) the Atlantic circulation, which probably explains the good consistency between models. The dominant circulation is a combination between positive NAO and positive EA, the uncertainty concerns the relative weight of these 2 components. We privilege a scenario close to MF-S5 and EUROSIP.

Temperatures : warm scenario over the main part of Europe and the western Mediterranean basin. Over Britain Islands, neutral scenario, due to the influence of cold to neutral SST. Over the Eastern part of the domain, more uncertainty : neutral or no signal.



Precipitations: the zonal flow would enhance rainfall over northern Europe while drier than normal conditions should persist over the eastern Mediterranean basin.



<u>II.7.b Tropical cyclone activity</u>

Below-normal activity likely for south-western Pacific (consistent with La Niña). Close to normal for the Indian Ocean.

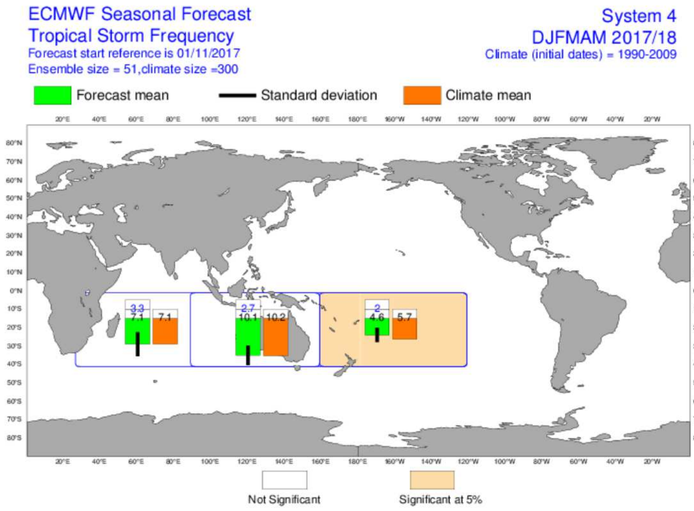


fig.II.7.1 : Seasonal forecast of the frequency of Tropical Cyclones from EUROSIP (Météo-France & ECMWF). http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmtrop/trop_euro /eurosip_tropical_storm_frequency/

III.1. Seasonal Forecasts

Presently several centres provide seasonal forecasts, especially those designated as Global Producing Centres by WMO (see http://www.wmo.int/pages/prog/wcp/wcasp/clips/producers_forecasts.html).

- BoM, CMA, CPTEC, ECMWF, JMA, KMA, Météo-France, NCEP and UK Met Office have ocean/atmosphere coupled models. The other centres have atmospheric models which are forced by a SST evolution which is prescribed for the entire period of forecast.
- LC-MME and Euro-SIP provide multi-model forecasts. Euro-Sip is presently composed using 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 interpretate the results, it is recommended to look to verification maps and graphs which give some insight into the expected level of skill for a specific parameter, region and period. A set of scores is presented on the web-site of the Lead-Centre for Verification (see http://www.bom.gov.au/wmo/lrfvs/) ; scores are also available at the specific web site of each centres.

This bulletin collects all the information available the 21st of the current month preceding the forecasted 3-month period.

III.2. « NINO », SOI indices and Oceanic boxes

El Niño and La Niña events primarily affect tropical regions and are monitored by following the SST evolution in specific area of the equatorial Pacific.

- Niño 1+2 : 0°/10°S 80W-90W ; it is the region where the SST warming is developing first at the surface (especially for coastal events).

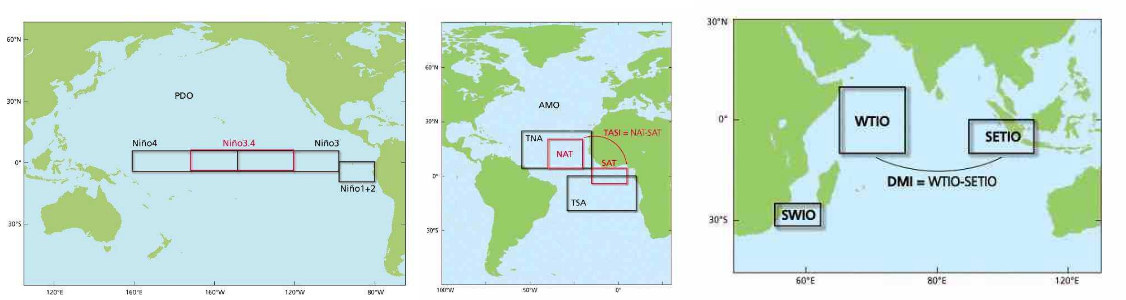
- Niño 3 : 5°S/5°N 90W-150W ; it is the region where the interanual variability of SST is the greatest.

- 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).

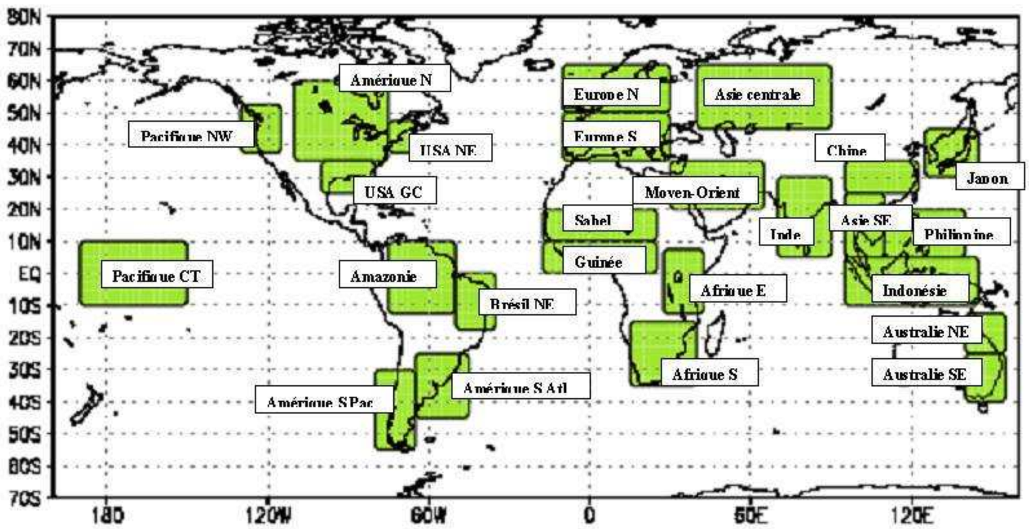
Associated to the oceanic « El Niño / La Niña » events, and taking into account the strong ocean/atmopshere coupling, the atmosphere shows also interanual variability associated to these events. It is monitored using the SOI (Southern Oscillation Index). This indice is calculated using standardized sea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

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