MEDITERRANEAN CLIMATE OUTLOOK FORUM
MEDCOF-11 Meeting

MONITORING SUMMARY MEDCOF-11

for October 2018

Second draft

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Compiled by

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The following MedCOF monitoring summary is based on

- climate monitoring working reports from RA I NA RCC Node-CM, RA VI RCC Node-CM and RA VI RCC Node-LRF
- a contribution from R. Bojariu (Administratia Nationala de Meteorologie, Romania) about climate drivers

Introduction: Climate predictive drivers for the Mediterranean region

Data evaluation of the following climate drivers gives the following results:

- El Niño – Southern Oscillation (ENSO): ENSO shows weak signs of positive phase. El Niño is favored to develop in winter 2018-2019 with a probability of ~95%.
- Tropical Atlantic Variability: The TASI SST anomaly index is an indicator of the meridional surface temperature gradient in the tropical Atlantic Ocean (TASI = Tropical Atlantic SST index). It is calculated as the difference of the NAT (North Atlantic Tropical SST index) and SAT (South Atlantic Tropical SST index) indices. After a long negative phase during January to September 2018, TASI has started a weak positive phase in October 2018. Same for NAT.
- Pacific Decadal Oscillation (PDO): still in a positive phase, but very weak at the moment, close to zero, almost no signal.
- Atlantic Multidecadal Oscillation (AMO): had a zero minimum in June 2018 and is now in a week positive phase.
- Eurasian Snow Cover: October anomalies are slightly positive, but less than in the preceding 6 years. A slightly positive AO/NAO can be favored in the following winter. Especially extended snow cover over Southern Siberia seems consistent with a slightly positive AO/NAO.
- Arctic Sea Ice Extent is below normal, although it comes closer to normal presently in November 2018. Negative anomalies in the ice extent over Arctic regions are usually related to favorable conditions for atmospheric blockings over the Northern Hemisphere.
- Polar Vortex: There is a possible tendency towards a strong polar vortex in December 2018. A negative AO phase has developed in the second half of November. Stronger polar vortex is consistent with zonal circulation prevalence over the NH in winter (i.e. mild conditions over Europe). However, we do not know if the strong polar vortex will persist into the winter.
- Quasi-biennial Oscillation (QBO) in the stratosphere: QBO is in a west phase, but descending.
- Global warming: October 2018 was the second warmest October on record on global average according to NOAA NCEI data.

The relevant drivers and their impact are summarized in Table 1.

Phenomenon/Mechanism/factor	Atmospheric blocking events in Atlantic/European area	Zonal circulations	Stratospheric warmings	NAO phase	Shifts in the jet stream position/intensity over Atlantic/Europen area
Weak/moderate El Nino			yes		yes
Normal NAT SST index		normal trade winds			
Positive AMO? Transition to negative AMO?	-				
PDO	-				
May SST		slightly enhanced		slightly positive	Northward over Europe?
Normal snow cover extent in Eurasia					
Reduced Arctic sea ice concentration	enhanced	less frequent	yes	negative	yes
Strong polar vortex?				positive (in the first part of the winter)?	Northward over Europe?
Transition to westerly QBO					

Table 1: Observed drivers of predictability. Kindly provided by R. Bojariu, based on various sources.

Preliminary conclusions:

- Observed drivers offer few clues for the future winter (DJF)
- El Niño is favored in the next winter by model ensemble (favoring stratospheric warming in the 2nd part of the winter with associated severe weather in the NH)
- AO/NAO phase may change sign on sub-seasonal scale

I. Analysis of the oceanic and atmospheric state

I.1 Oceanic analysis

Over the Pacific Ocean :

- Along the equator, significant SST warming, together with the eastward propagation of a Kelvin wave in subsurface. SSTs in the Niño 3.4 box have exceeded the "El Niño" threshold, to reach 0.7°
- In the Northern Hemisphere, globally warmer than normal over the tropics, cooler in the mid-latitudes, warmer to the North, especially near the Bering Strait. No significant PDO signal (see https://www.ncdc.noaa.gov/teleconnections/pdo/)

Over the Maritime Continent :

- neutral conditions.

Over the Indian Ocean :

- in the Northern hemisphere, cooling to the West, leading to a neutral DMI (still positive anyway)
- 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.
- Northern tropics : neutral (cf TNA)
- Warmer than normal along the Equator, especially over the gulf of Guinea.

Over the Mediterranean :

- Globally warmer than normal

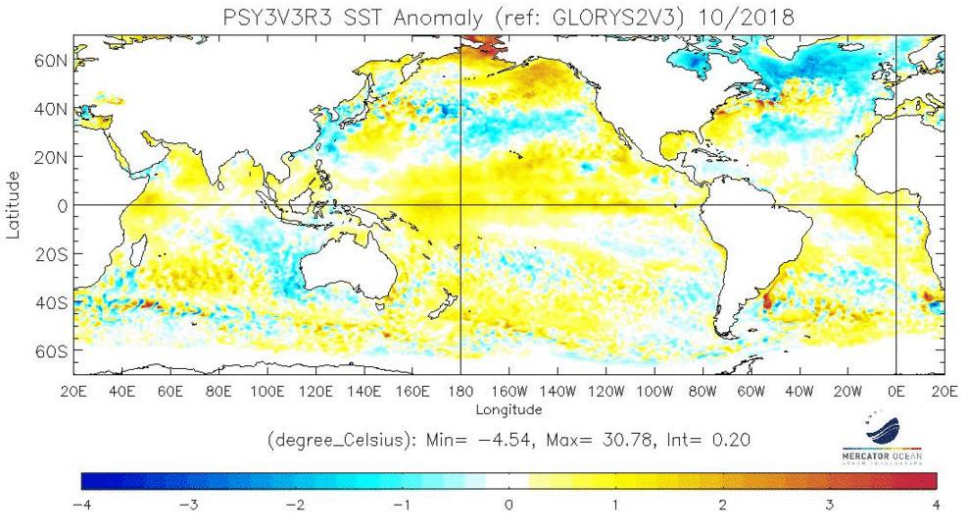

fig.I.1.1: SST Anomalies (°C).

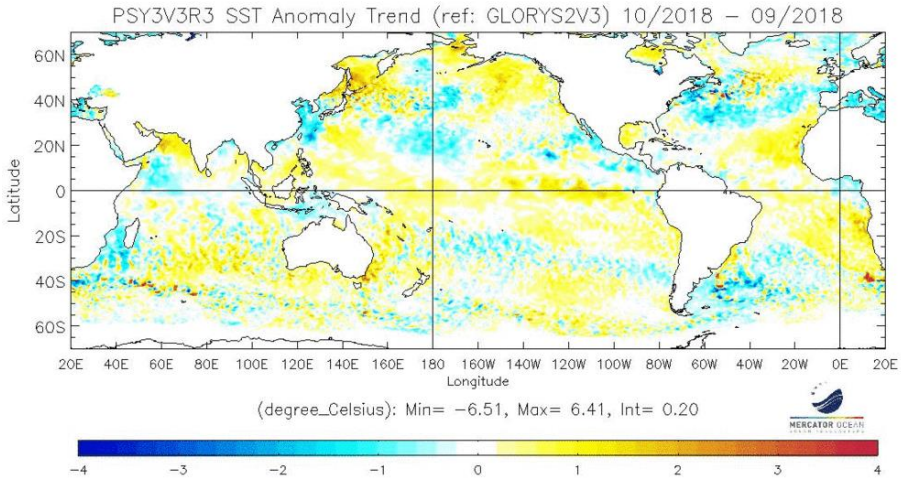

fig.I.1.2: SST tendency (current – previous month), (reference Glorys 1992-2013).

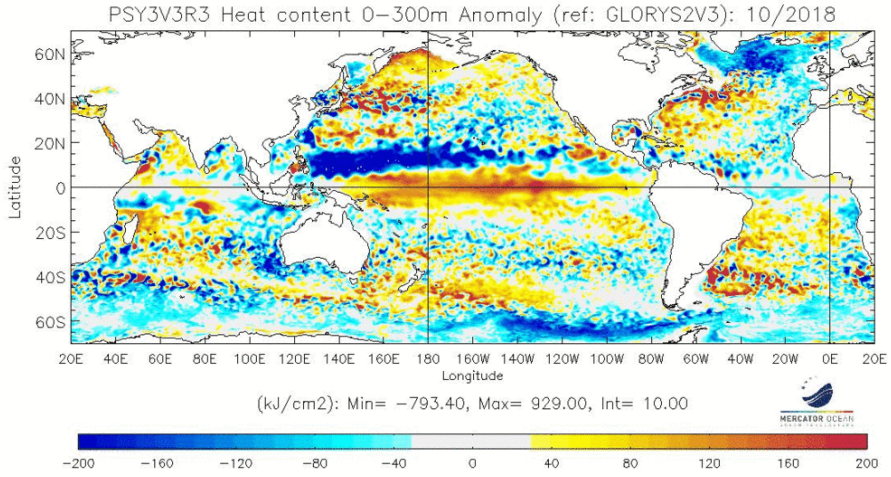

fig.I.1.3: map of Heat Content Anomalies (first 300m, kJ/cm2, reference Glorys 1992-2013)

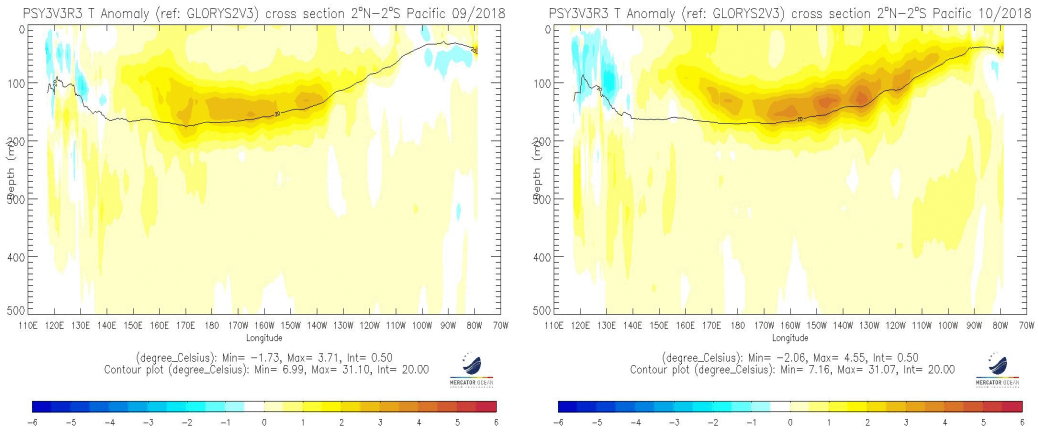

fig.I.1.4: Oceanic temperature anomaly in the first 500 meters in the Equatorial Pacific (previous and current month)

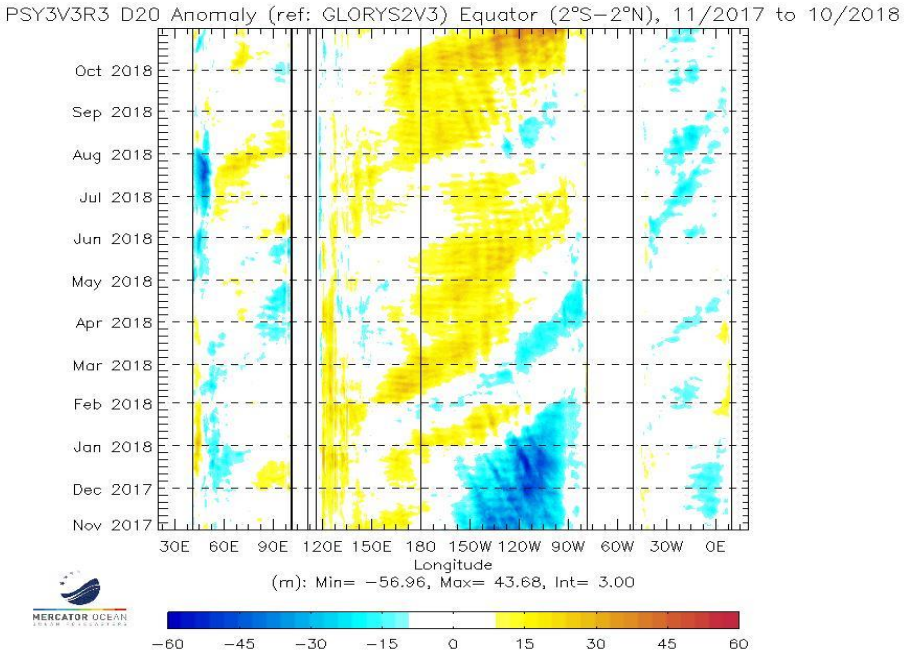

fig.I.1.5: Hovmöller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 6 month period

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 September. Main anomalies: upward over the Atlantic, downward over the Maritime Continent and Western Pacific.
- Active MJO over the Atlantic up to western Indian Ocean (phase 1 and 2). It explains the main upward anomaly centred over the Gulf of Guinea, and the main downward anomaly over the Maritime Continent
- Over the Indian Ocean, VP200 anomaly dipole, consistent with a positive DMI
- Over the rest of Pacific Ocean, weak anomalies. No typical "El Niño" response

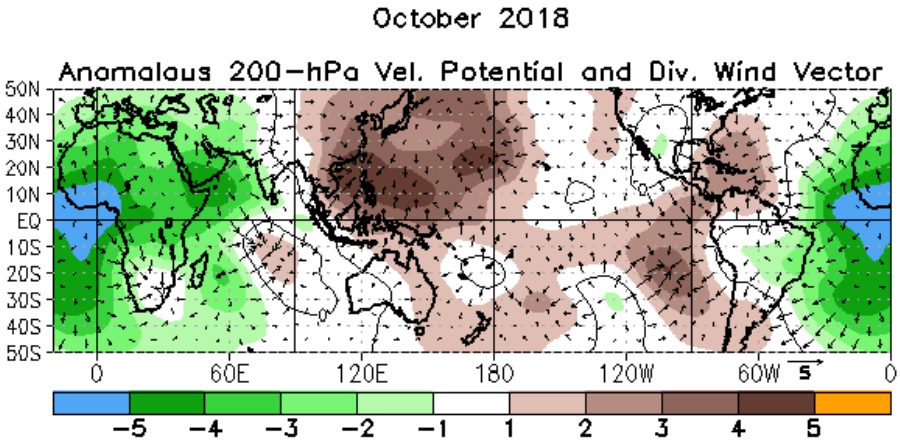

fig.I.2.1.a: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly.
Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly).
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

SOI :

- Positive SOI in October (it was negative in the recent months, see NOAA Standardized SOI: https://www.ncdc.noaa.gov/teleconnections/enso/indicators/soi/). According to the BOM calculation, the index has reached the value of +3 (-10 in September). (http://www.bom.gov.au/climate/current/soihtm1.shtml).

MJO (fig. I.2.1.b)

- active MJO during the 1st half of the month

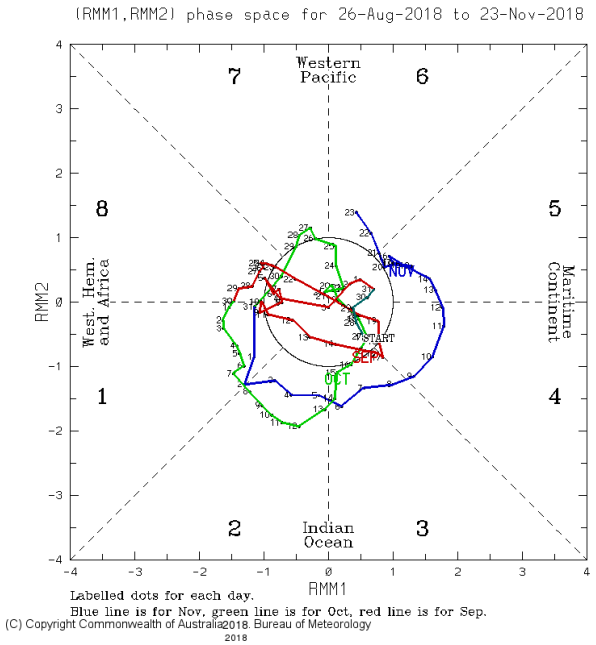

fig.I.2.1.b: indices MJO http://www.bom.gov.au/climate/mjo/

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

- related to the large downward anomaly centred near the Maritime Continent, there is a cyclonic anomaly dipole on both sides of the equator over Eastern Indian Ocean. It was already in place last month. It extends up to Middle East and the Eastern Mediterranean.
- no other significant anomalies in the inter-tropical band.

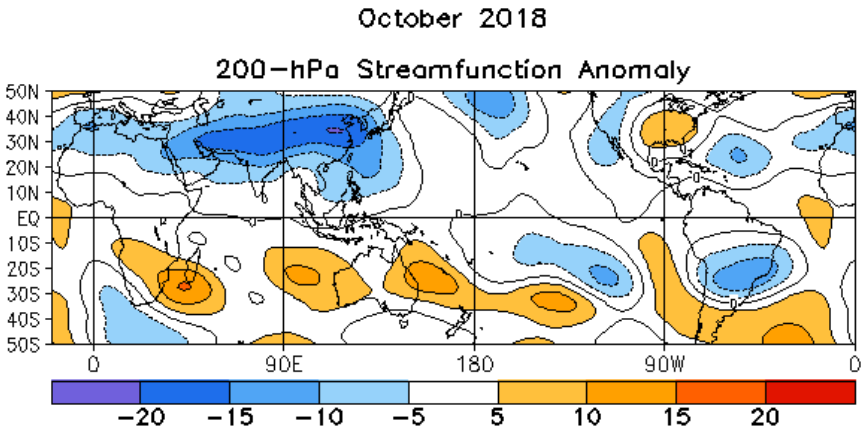

fig.I.2.2: Stream Function Anomalies at 200 hPa.
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

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

- positive NAO pattern over the Atlantic, but shifted northward compared to typical NAO
- Negative anomalies over Western Mediterranean Sea

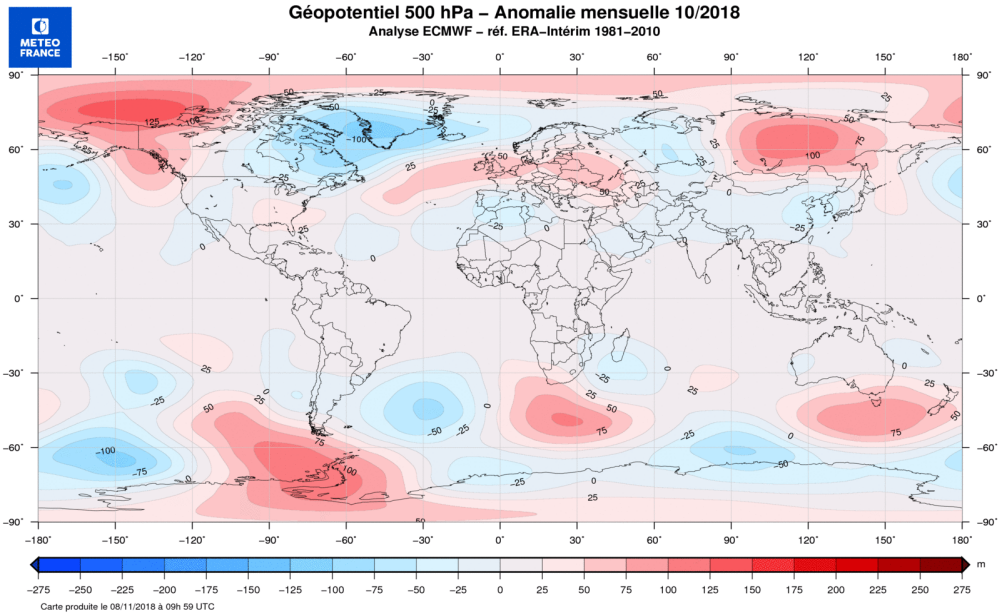

fig.I.2.3: Anomalies of Geopotential height at 500hPa (Meteo-France)

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
OCT 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 12 months. (see http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/table3.shtml for the most recent 13 months).

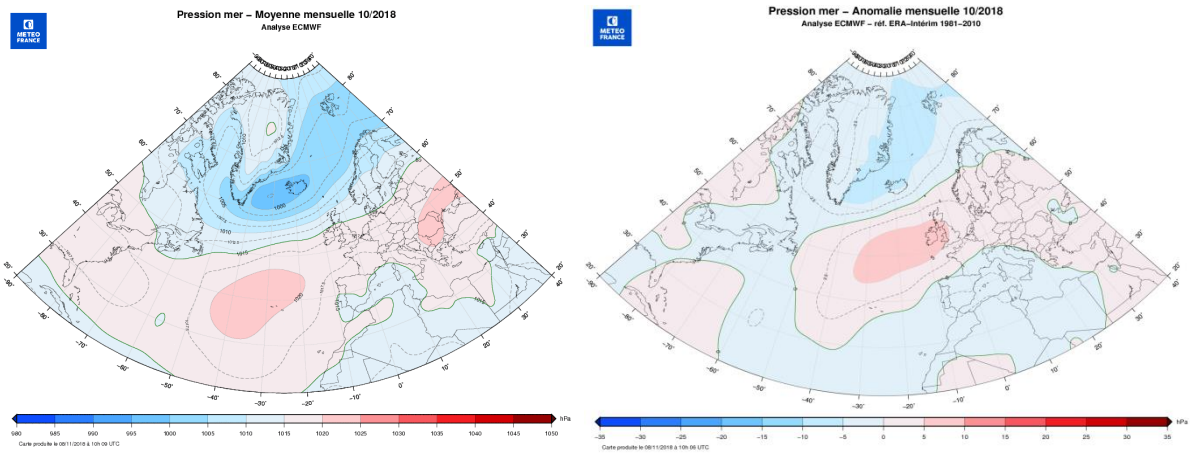

fig.I.2.4: Monthly mean sea level pressure and anomalies (Meteo-France)

The Azores High is shifted far to the north and a long high pressure zone extended from the North Atlantic over Central Europe to the Balkans and Eastern Europe. The Icelandic Low is stronger than normal, causing a well-established NAO+ phase, but the frontal zone is quite far in the north over northern Europe.

Especially the Western Mediterranean and the Middle East were affected by cyclonic influence.

I.2.b Precipitation

- Mostly dry over the Maritime Continent and Western Pacific in agreement with subsidence anomalies. Also dry over the Caribbean and the North-East of South America.
- Wet for eastern Pacific (along the equator) up to Mexico and Texas.
- Over Europe, mostly dry from the British Isles to Norway and wet over the Mediterranean Basin

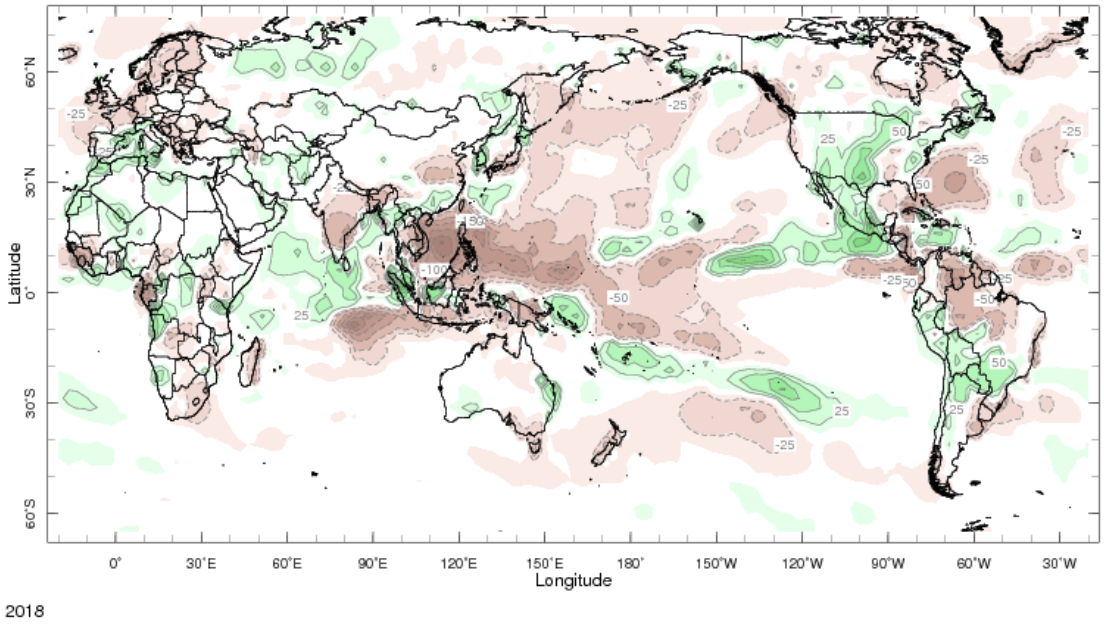

fig.I.2.6: Rainfall Anomalies (mm) (departure to the 1979-2000 normal).

Green corresponds to above normal rainfall while brown indicates below normal rainfall.

http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/Anomaly.html

Europe:

Dry situation over Northern, Western and Central Europe, due to the predominance of anticyclonic circulation. These dry conditions have been persisting for several months, and enforced the drought. Northern Portugal and much of France, especially the eastern parts were particularly dry. Dry conditions were also over south-east Europe. Places in the Balkans and Romania/Moldova/Ukraine received less than 10mm of precipitation in the whole month.

At the contrary, wet conditions over Western Mediterranean with several high precipitation events, locally more than 300mm precipitation totals in southern France and flooding, related to cyclonic anomalies, and also in parts of Turkey and the Middle East.

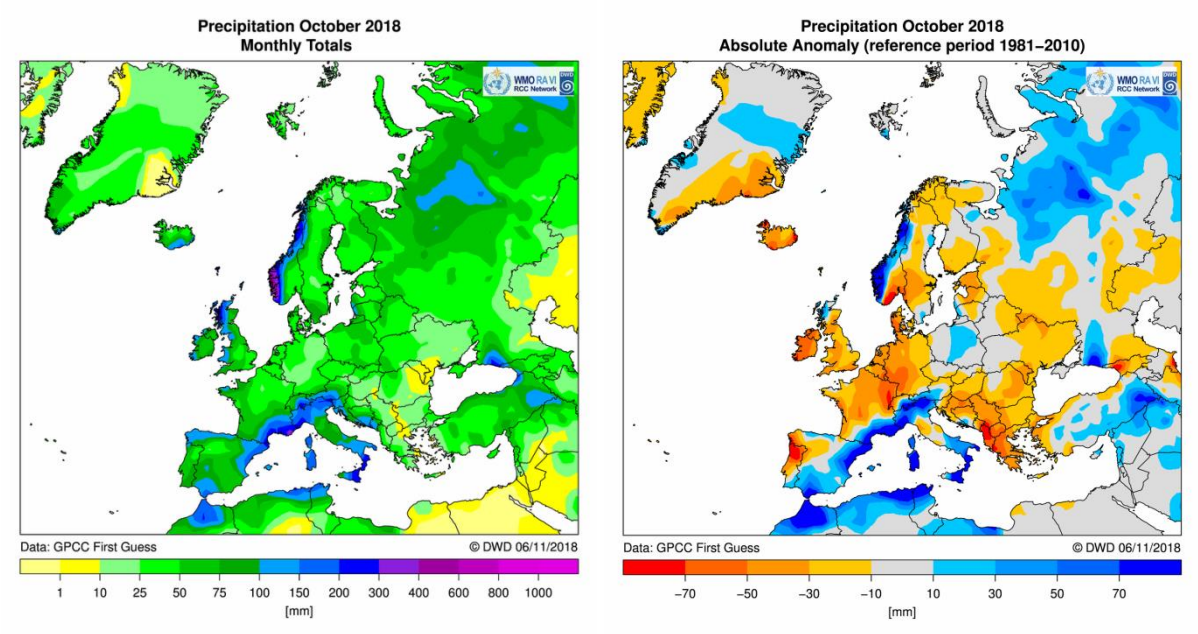

fig.I.2.7.a: Monthly totals and absolute anomaly (1981-2010 reference) of precipitation in the RA VI Region (Europe), data from GPCC (Global Precipitation Climatology Centre), http://www.dwd.de/rcc-cm.

North Africa

During the month of October 2018, total precipitation is mainly expected over the northern sector. Most parts of North Africa region received between 20 mm to 60 mm or less than 20 mm except North-western Tunisia, North-Eastern Algeria and the extreme North-western Morocco, which received between 100 mm to above 200 mm of precipitation (Figure I.2.8-left).

During this month, all Tunisia, west of Libya, north and southeastern Algeria, all Morocco and the south-eastern Egypt recorded above-normal totals of precipitation. In some regions rainfall amounts were greater than 250% of rainfall normal amounts and reached locally 600% of normal.
Below normal conditions occurred over the center and south of Algeria, Eastern Libya and western Egypt. These regions received less than 40% of 1981-2010 average precipitation.

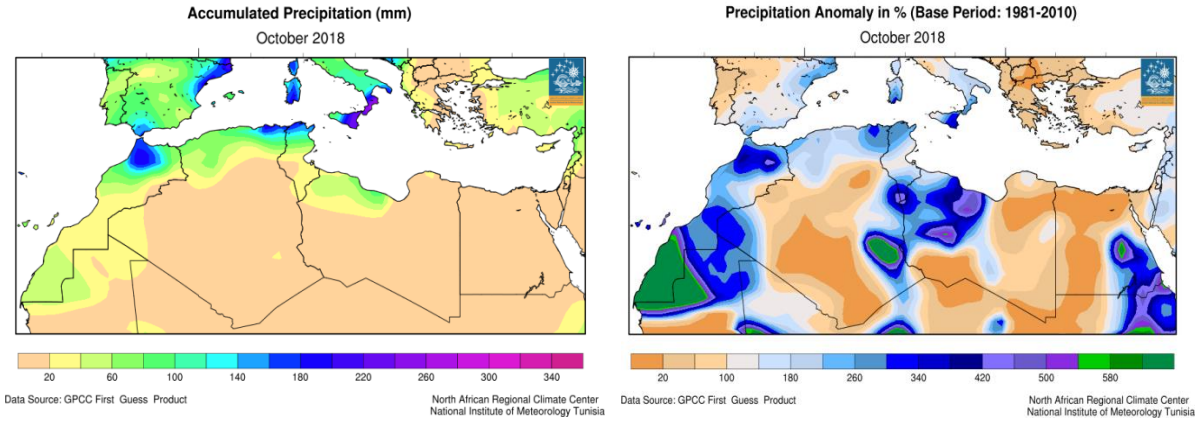

fig.I.2.8: Left: Total precipitation; Right: Absolute anomalies of precipitation in the RAI-NA Region (North Africa) Data from NCDC (National Climate Data Centre NOAA – reference 1981-2010), http://www.meteo.tn/htmlen/donnees/climatemonitoring.php

I.2.c Temperature

- over Europe, temperature once again above normal for most countries with the exception of the British Isles and Scandinavian countries (normal conditions)
- strong positive anomaly over Alaska and from Central America to Florida. Negative anomalies over the rest of the North American continent.
- strong warm anomalies over the Arctic.

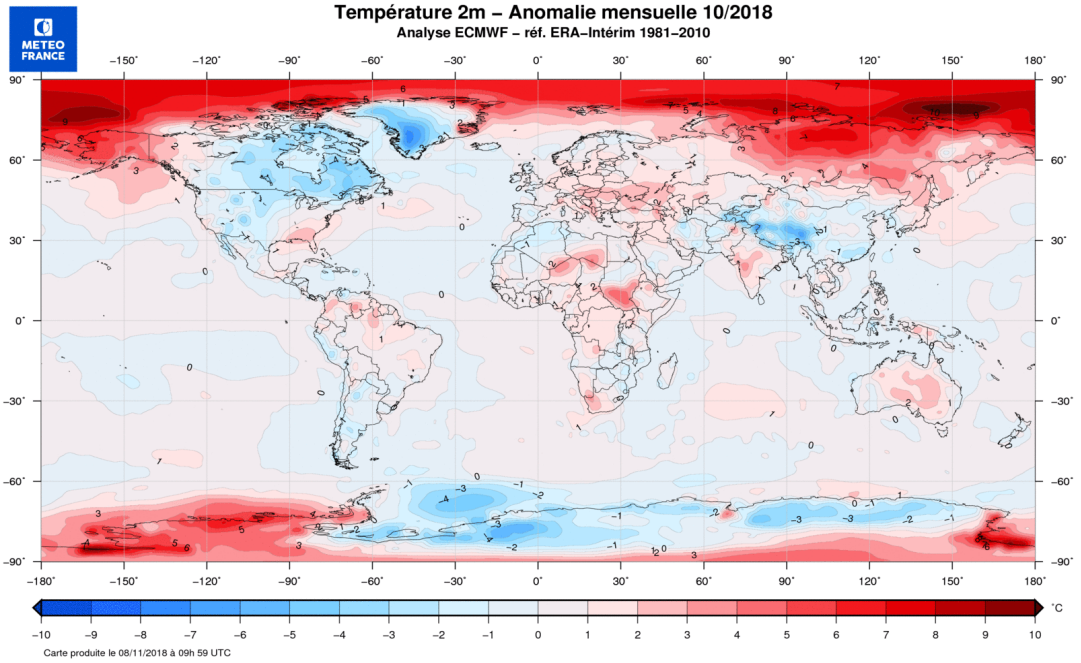

fig.I.2.9: Temperature Anomalies (°C) (Meteo-France)

Europe:

Temperature was above normal over much of France, Italy, the Balkans and further to eastern parts of the domain, all in the upper tercile. On the other hand, it was colder than normal in western France in much of Iberia. In Iberia, even the lower tercile was reached.

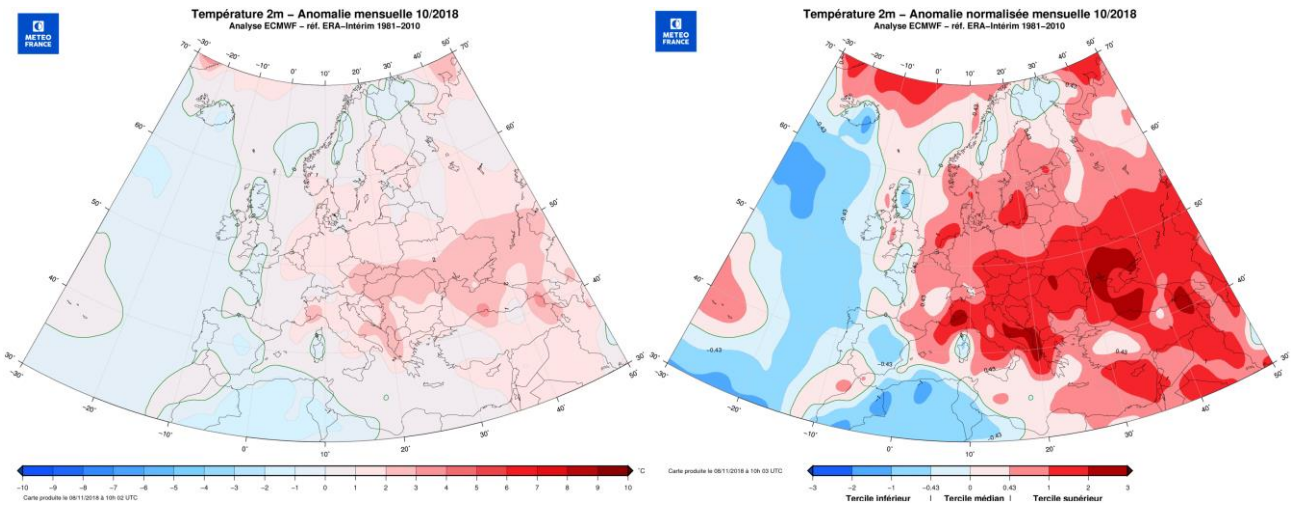

fig.I.2.10: Left graph: Absolute anomaly of temperature in the RA VI Region (Europe). Right graph: Standardized temperature anomalies

North Africa:

The graph fig.I.2.11 shows the monthly trend of air temperature anomaly in °C of October since 1979 through 2018. For each year, the positive anomaly is indicated by the red vertical bars and the negative anomaly is indicated by the blue vertical bars. The black line tracks the changes in the trend over time.

The land mean temperature of the region during October 2018 was the 7th highest since 1979, at 0.9°C above the normal of 1981-2010. The warming rate is of about 0.41 °C/decade.

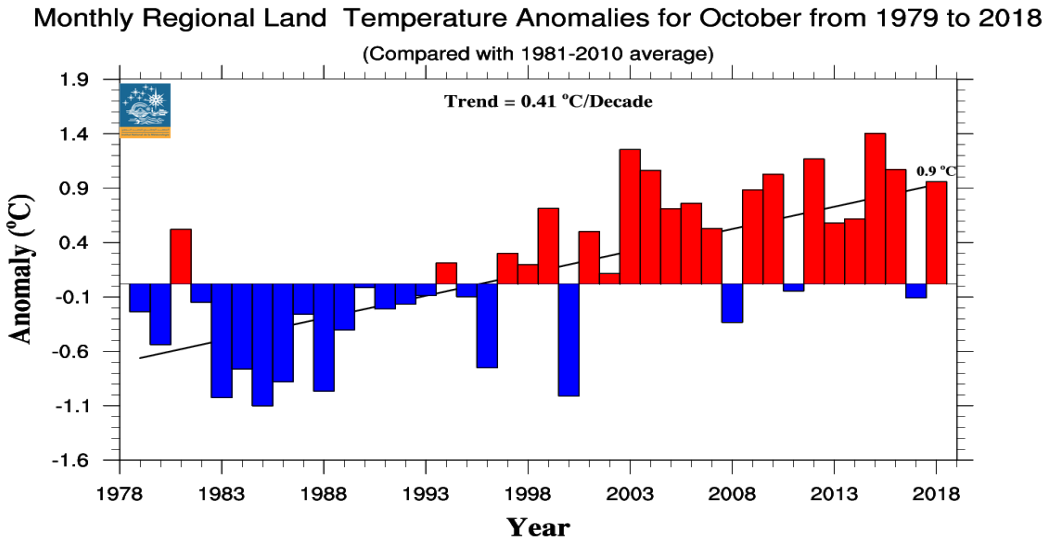

fig.I.2.11: Land monthly anomalies of mean temperature for October from 1979 to 2018 (reference period 1981-2010)

Monthly mean temperature in October 2018 ranged from less than 9°C in the north of Morocco and Algeria to above 28°C in the extreme south of Egypt.

The month of October 2018 was characterized by a negative anomaly of temperature over Tunisia, most parts of Algeria and the Eastern Morocco. Warmer than average mean temperatures prevailed over most parts of eastern countries of North Africa region (Libya and Egypt) except for the extreme northwest of Libya which recorded less than average temperatures (fig.I.2.12).

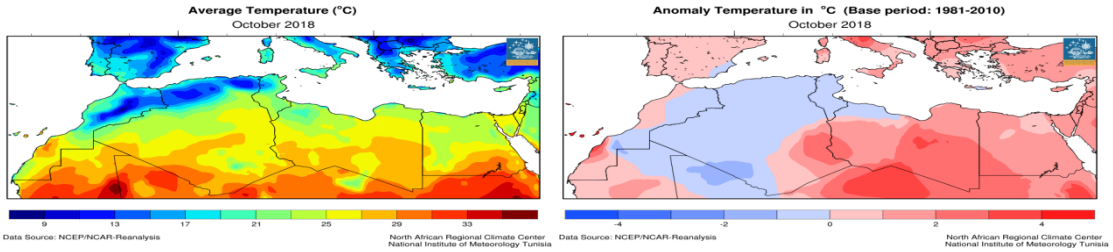

fig.I.2.12: Left: Mean temperature; Right: Absolute anomalies of temperature in the RAI-NA Region (North Africa).
Data from NCEP/NCAR Reanalysis (The National Centers for Environmental Prediction (NCEP)/ The National Center for Atmospheric Research (NCAR) – reference 1981-2010), http://www.meteo.tn/htmlen/donnees/climatemonitoring.php .

I.2.d Sea ice

- In the Arctic : very strong deficit, close to the lowest extension since 1979
- In Antarctica : Strong deficit

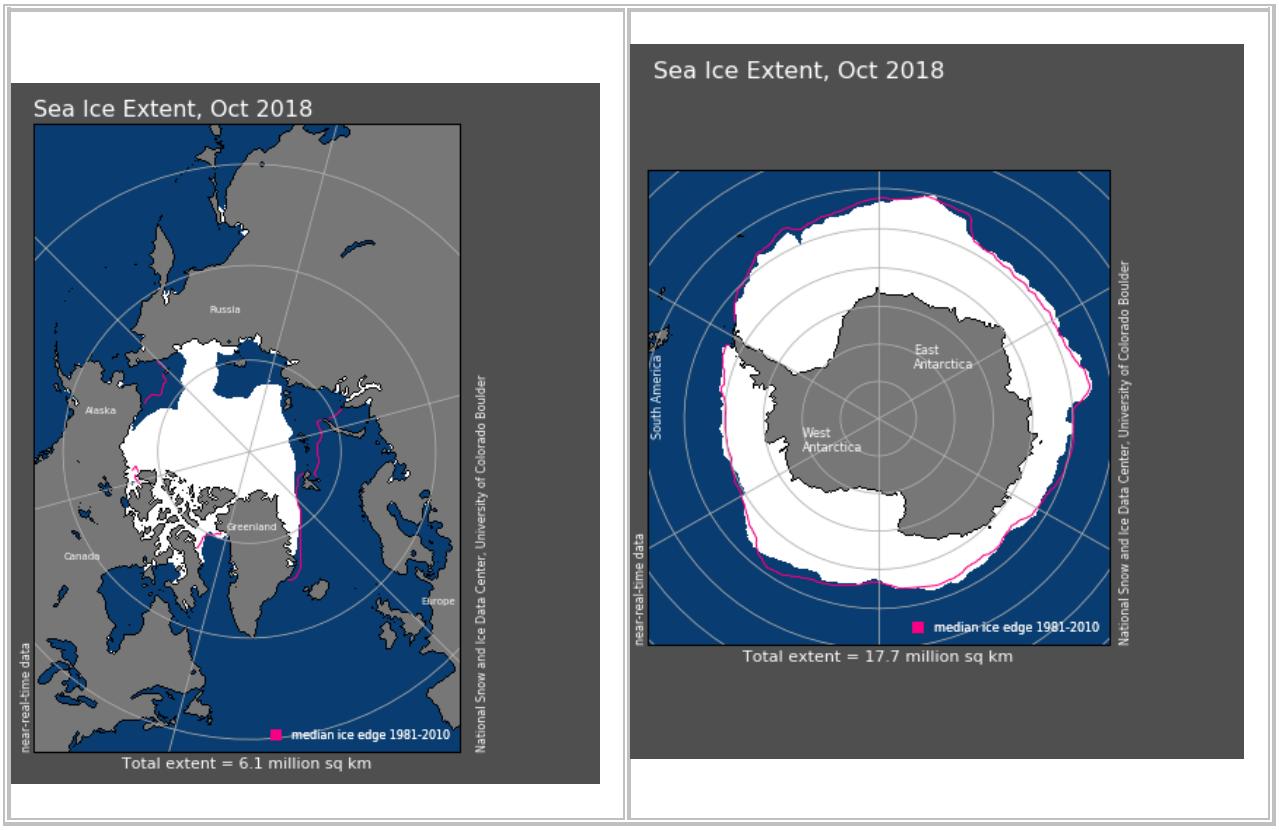

fig.I.2.13: Sea-Ice extension in Arctic (left), and in Antarctic (right). The pink line indicates the averaged extension (for the 1979-2000 period). http://nsidc.org/data/seaice_index/

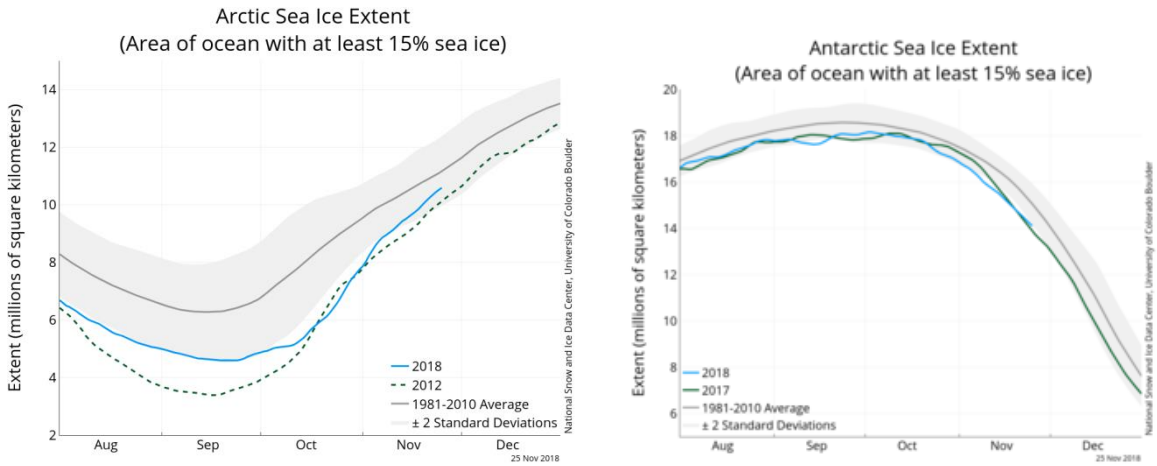

fig. I.2.14: Sea-Ice extension evolution from NSIDC. https://nsidc.org/data/seaice_index/images/daily_images/N_stddev_timeseries.png

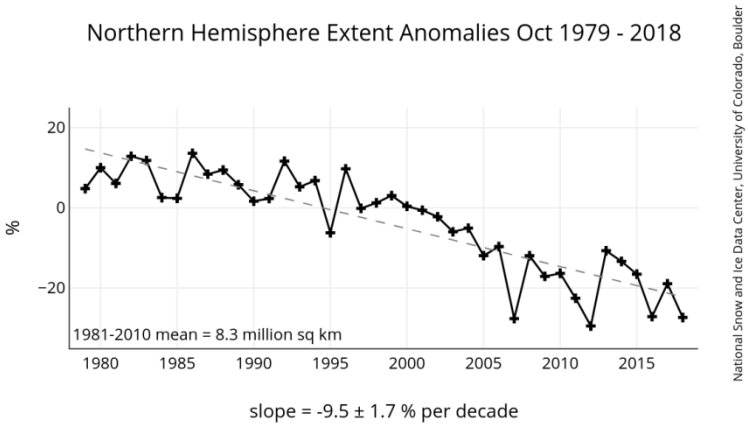

fig 1.2.15: Monthly Sea Ice Extent Anomaly in the Arctic for the month of analysis. http://nsidc.org/data/seaice_index/images/n_plot_hires.png

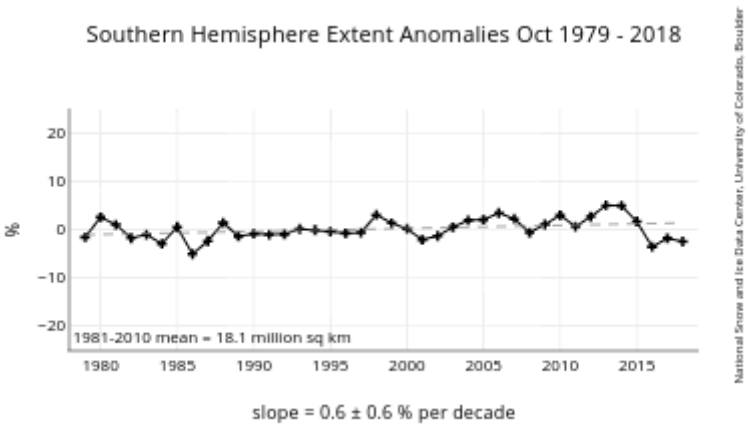

fig 1.2.16: Monthly Sea Ice Extent Anomaly in the Antarctic for the month of analysis (http://nsidc.org/data/seaice_index/)

References:

Météo France Monthly Seasonal Forecast Bulletin and climate monitoring maps: http://seasonal.meteo.fr/en

WMO RA I RCC Node on Climate Monitoring Website with monitoring results: http://www.meteo.tn/htmlen/donnees/climatemonitoring.php

WMO RA VI RCC Node on Climate Monitoring Website with monitoring results: http://www.dwd.de/rcc-cm

GPCC: http://gpcc.dwd.de