MEDITERRANEAN CLIMATE OUTLOOK FORUM
MEDCOF-10 Online Forum

MONITORING SUMMARY MEDCOF-10

for April 2018

Second Draft Version

Last update: 24 May 2018

Compiled by

WMO RA VI RCC Toulouse Node on Long Range Forecasting

Météo France

Toulouse, France

WMO RA I North Africa RCC Tunisian Node

Institut National de la Météorologie (INM)

Tunis, Tunisia

WMO RA VI RCC Offenbach Node on Climate Monitoring

Deutscher Wetterdienst (DWD)

Offenbach, Germany

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

1. Oceanic Analysis

Over the Pacific Ocean: still a "La Niña" pattern:

- Along the equator, little change in SSTs with negative anomalies east of the date line (Niño 3.4 index of -0.3°C, warming since March) and warm anomalies to the west (GLORYS 1992-2009, MERCATOR-Océan). In the sub-surface, the cold anomaly (Eastern Pacific) has reduced in April (see fig. 1.3).
- In the northern hemisphere, mainly positive anomalies. No clear PDO pattern visible, although the index remains negative (-0.8 for this month, see https://www.ncdc.noaa.gov/teleconnections/pdo/)
- In the southern hemisphere, warm anomalies remaining in the western part of the basin, especially around New Zealand. And a large negative anomaly in the eastern sub-tropics.

Over the Maritime Continent and the Indian Ocean:

- warm anomalies (<1°C) in the Northern hemisphere. To the South (up to 20°S), still a contrast between a warm western part and a cool eastern part of the basin.
- DMI close to zero (source: MERCATOR-Ocean).

Over the Atlantic:

- In the North Atlantic, warm anomalies to the West, and cold anomalies to the East, close to Europe. SSTs remain colder than normal off the western coast of Africa. Positive anomalies over the north-eastern arctic part of the basin.
- along the equator, neutral conditions (positive trend between March and April).

Over the Mediterranean:

- SSTs globally warmer than normal.

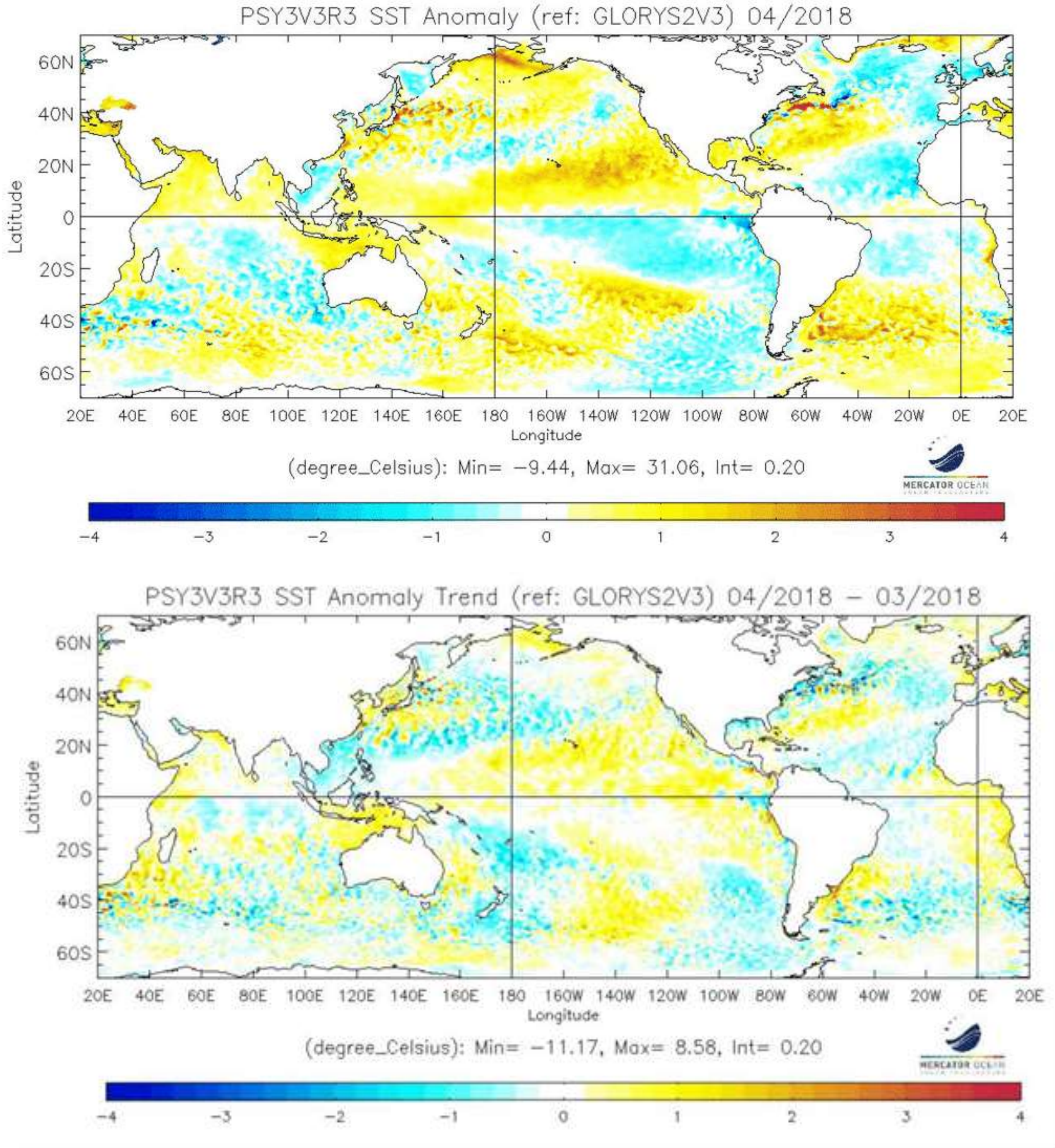


Figure 1.1: top: SST Anomalies (°C). Bottom: SST tendency (current – previous month), (reference Glorys 1992-2013).

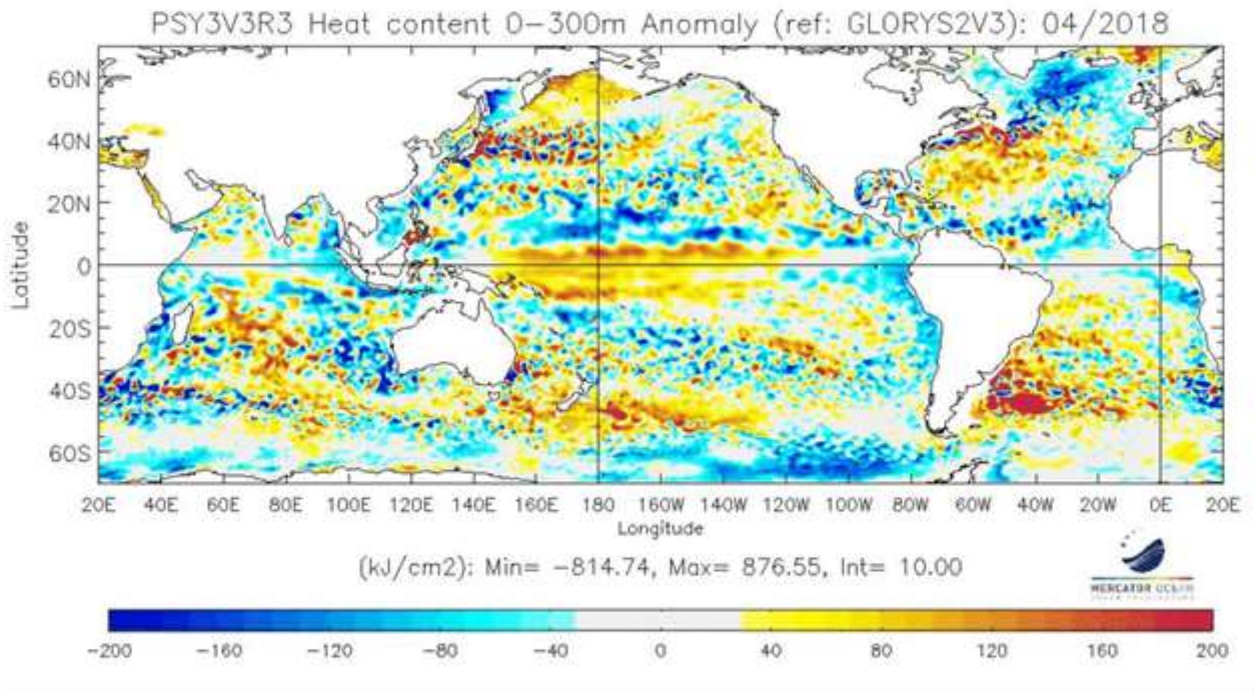


Figure 1.2: map of Heat Content Anomalies (first 300m, kJ/cm2, reference Glorys 1992-2013)

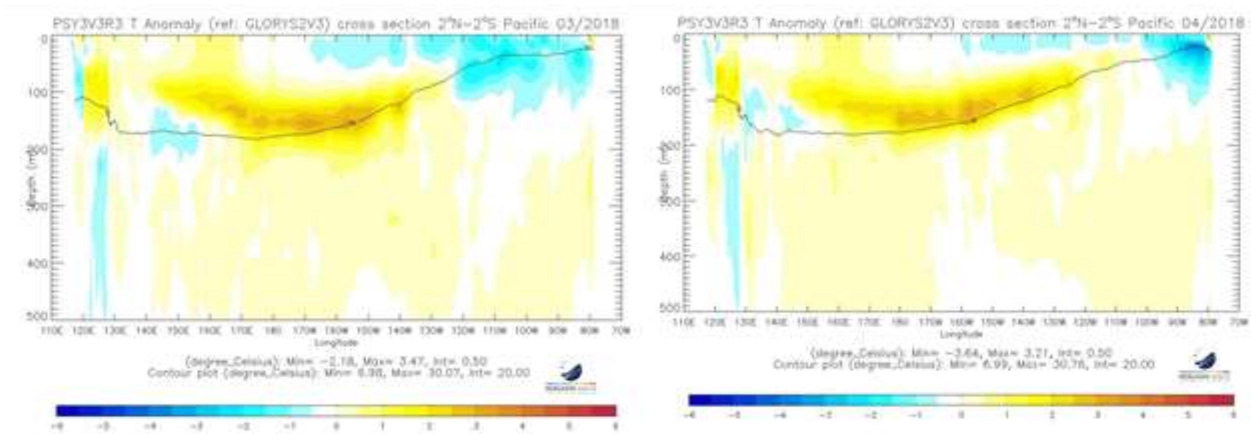


Figure 1.3: Oceanic temperature anomaly in the first 500 meters in the Equatorial Pacific (previous and current month)

http://www.pmel.noaa.gov/tao/drupal/assorted_plots/images/sst_wind_mon.png

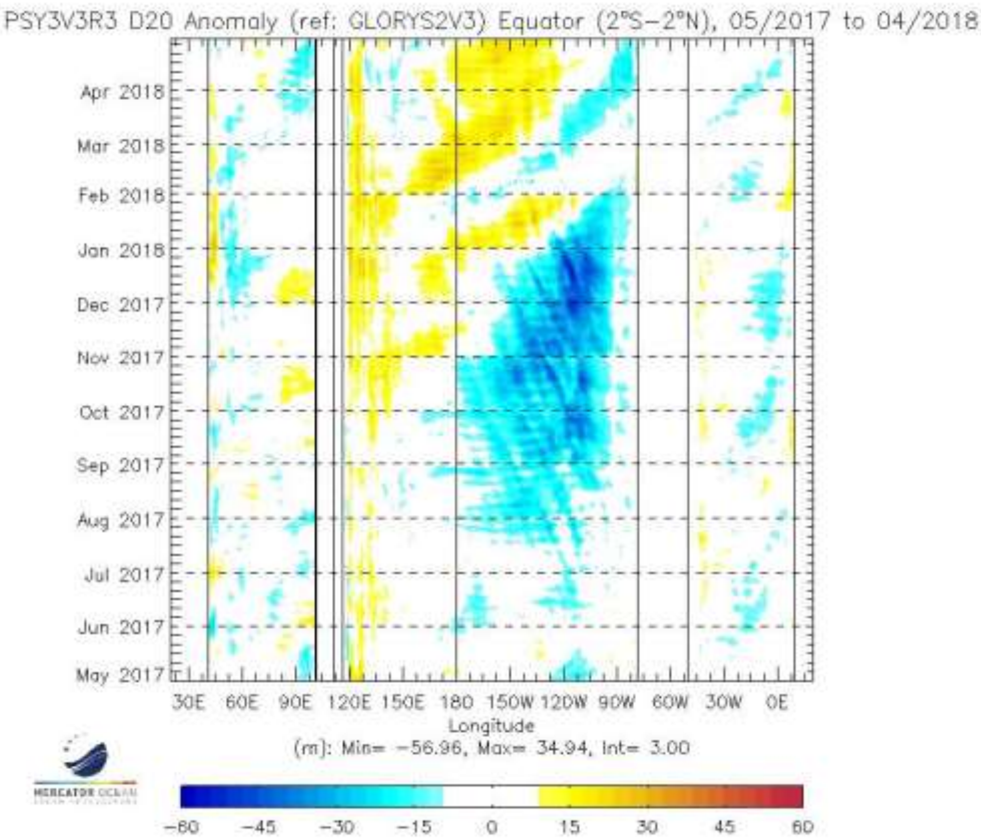


Figure 1.4: Hovmöller diagram of Thermocline Depth Anomalies (m) (depth of the 20°C isotherm) along the equator for all oceanic basins over a 12 month period

2. Atmospheric Circulation Analysis

Velocity Potential Anomaly field in the high troposphere (fig. 2.1 – insight into Hadley-Walker circulation anomalies):

- no typical "La Niña" response in April around the equatorial Pacific. Anomalies look like MJO impacts (MJO was active in April).
- the main anomaly dipole concerned Africa (upward anomaly motion) and the Maritime Continent (downward anomaly motion), consistent with MJO in phases 7,8,1,2 and 3.

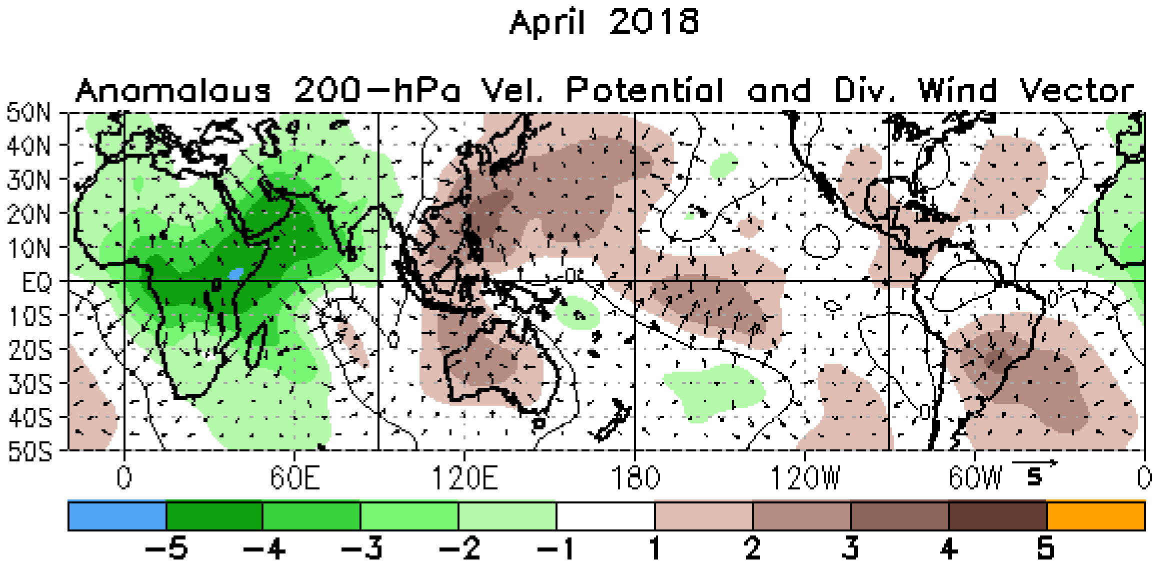


Figure 2.1.a: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly).
http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml

SOI :

- SOI index lower than in March, close to neutrality at +0.5 (NOAA Standardized SOI: https://www.ncdc.noaa.gov/teleconnections/enso/indicators/soi/).

MJO (fig. 2.1.b)

- Active MJO all along the month in phases 7, 8, 1, 2 and 3

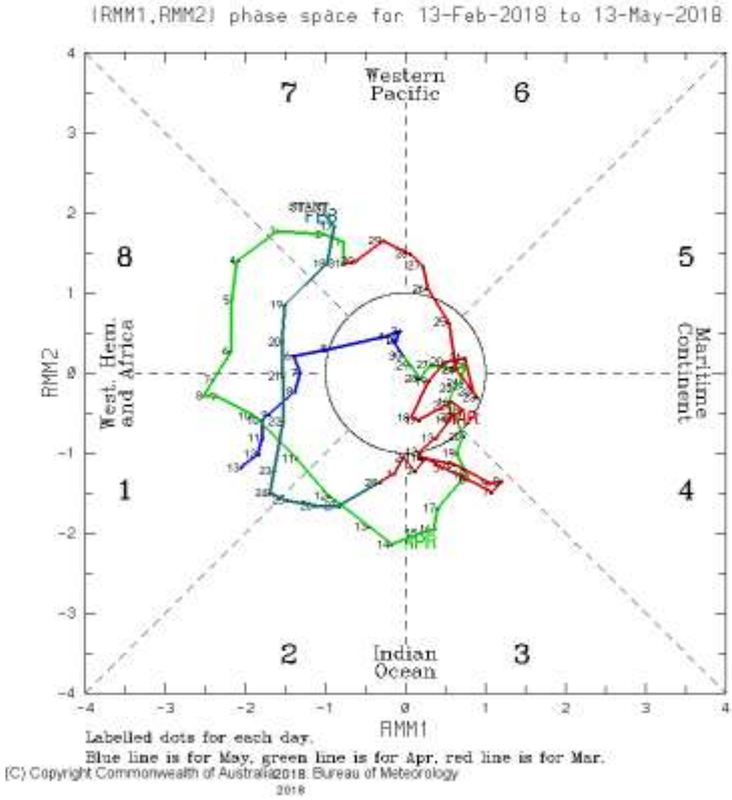


Figure 2.1.b: indices MJO

http://www.bom.gov.au/climate/mjo/

Stream Function anomalies in the high troposphere (fig. 2.2 – insight into teleconnection patterns tropically forced):

Cyclonic anomalies over the eastern Pacific, very similar to the ones observed in Feb. and March, and consistent with La Niña composites. Consequently, the positive anomaly that spreads up to SW of the USA could be originated from La Niña.

Anywhere else, no noticeable anomalies in the inter-tropical area.

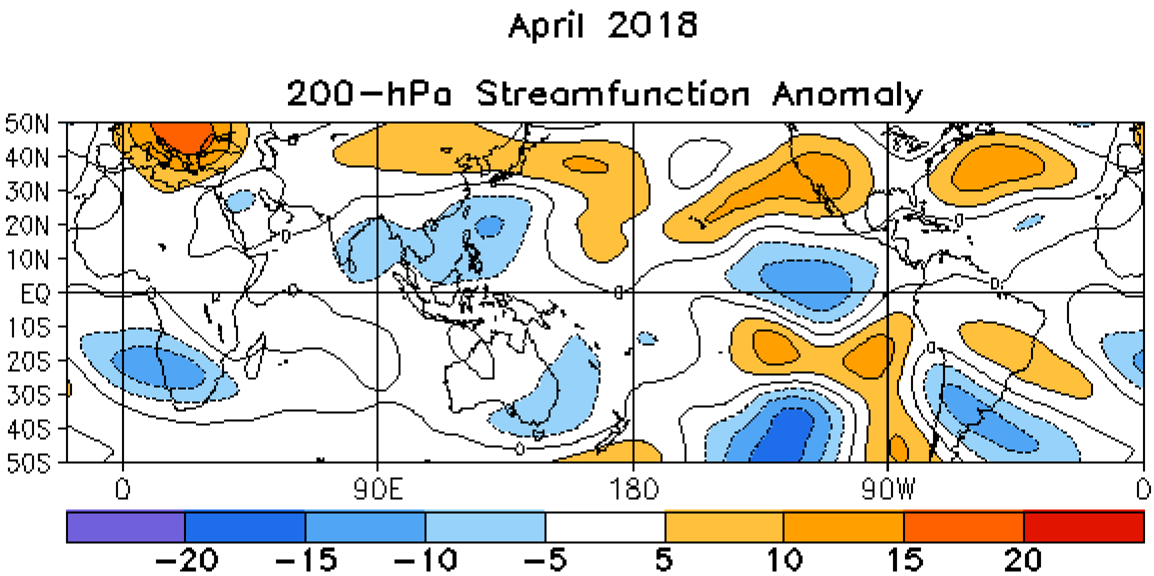


Figure 2.2: Stream Function Anomalies at 200 hPa.

http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt22.shtml

<u>Geopotential height at 500 hPa</u> (fig. 2.3 – insight into mid-latitude general circulation):

- over Northern Atlantic and Europe, anomalies project on the positive phases of NAO and EA (East Atlantic). Active perturbations have concerned essentially Western Europe.
- on the North-American continent, anomaly dipole between the SW (+) and NE (-) : therefore the atmospheric circulation had a significant North component during the month over Canada and the USA.

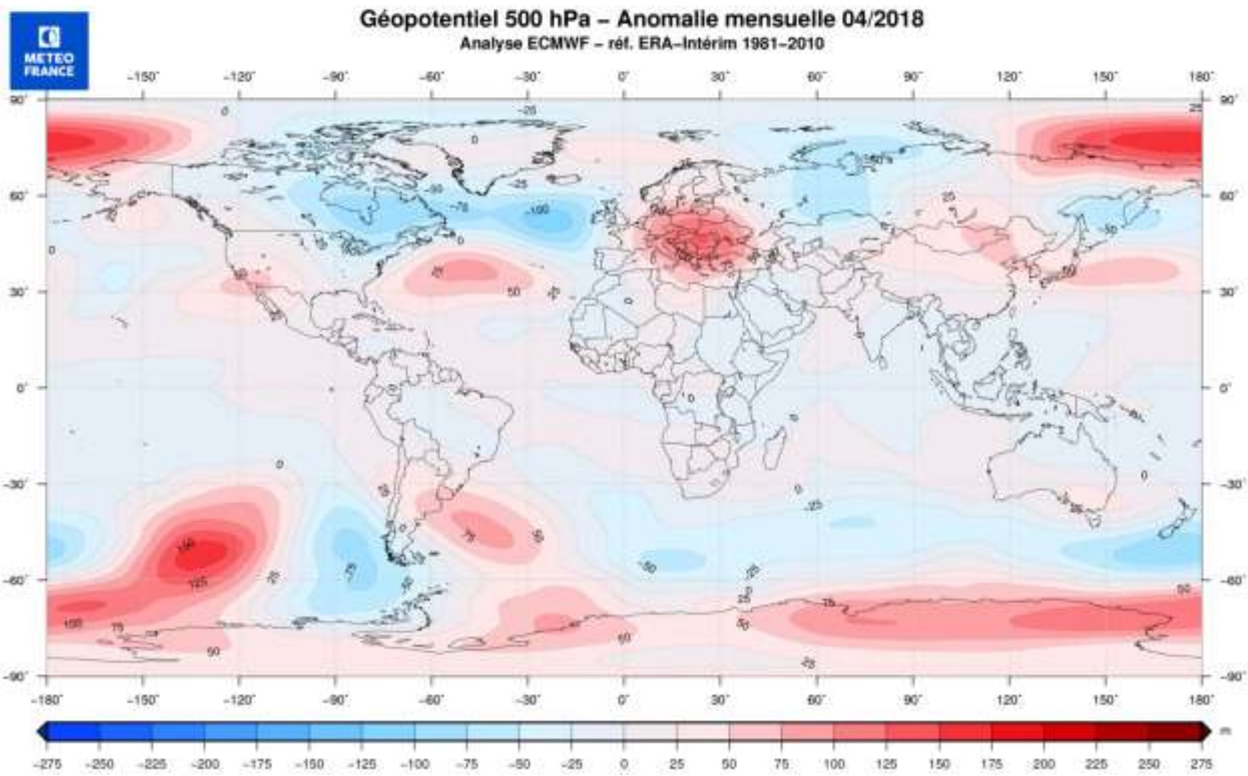


Figure 2.3: Anomalies of Geopotential height at 500hPa (Meteo-France)

Sea level pressure and circulation types relevant for Europe

Both Icelandic Low and Azores High were more intense than normal, resulting in a positive NAO phase (fig. 2.4, table 1). The Icelandic Low also was extended to the south, which is typical for a positve EA phase. Thus the position of the North Atlantic frontal zone was located relatively far in the south affecting especially Iberia, the western Mediterranean and parts of northwest Africa with cool and moist air. NAO+ was active during nearly the whole month except the beginning and a short interruption in the middle of the month (fig. 2.5). Arctic Oscillation (AO) started with a negative phase in early April, but changed gradually to a positive phase until the end of the month, when north-hemispheric circulation was getting more zonal. The AO- pattern in early April could have had an affect on enhanced meridionalisation in the northern hemisphere, considering strong geopotential anomalies in many parts of the northern middle latitudes, while tropical teleconnection was probably low in Europe.

The second main pattern over Europe was a large and intense high pressure anomaly with its core located over Italy and southeastern Europe. It did not contribute much to EATL/WRUS and SCAND patterns because the anomaly was located further to the west and south. Nevertheless it affected particularly southeastern and central Europe but also adjacent areas by warming due to subsidence and periods of high sunshine duration. Especially Central Europe and central Mediterranean parts were also influenced by warming due to southerly advection of subtropical air masses.

Hess-Brezowsky weather types in April 2018 were mainly southerly, westerly or high pressure over Central Europe (table 2). Most effective for warming in Europe were Sa (south anticyclonic) and HM (High over Central Europe) types. Northerly or northwesterly types, which often produce cold spells in April, were missing at all.

Météo France weather type classification shows a clear dominance of the types Atlantic Trough and Blocking for April 2018, which corresponds to low pressure over the North Atlantic and high pressure over various parts over the European continent (fig. 2.6). This is in sharp contrast to March 2018 which was mainly a cold month in Europe and had very different circulation patterns. On the other hand, the weather type distribution of April continued into the first half of May 2018.

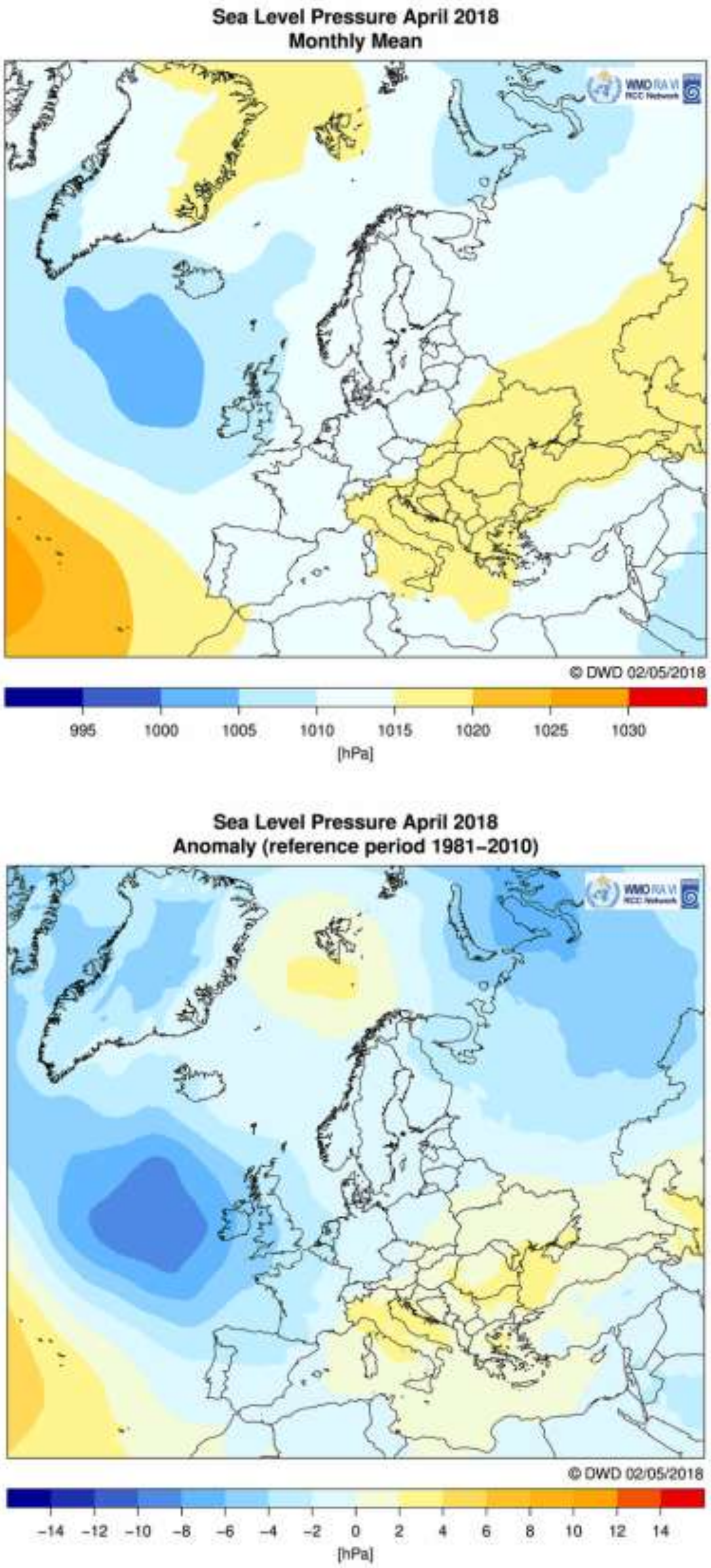
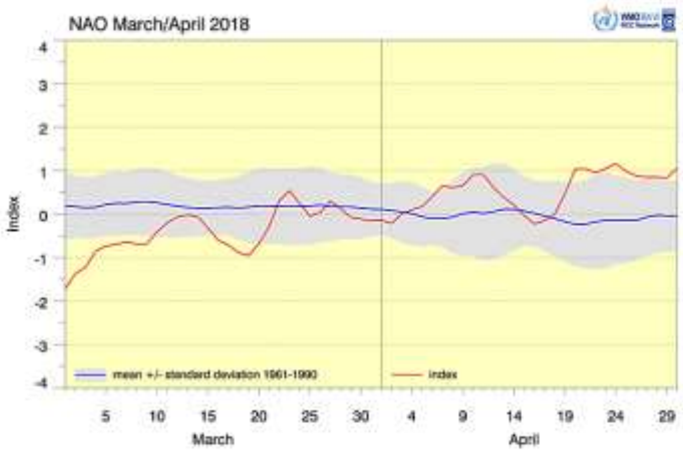


Figure 2.4: Mean sea level pressure over the North Atlantic, Europe and North Africa (top) and 1981-2010 anomalies (bottom). Source: DWD, https://www.dwd.de/DE/leistungen/rcccm/int/rcccm_int_ppp.html?nn=490674

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
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	0.5	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	-1.9
NOV 17	-0.1	0.1	0.7	0.4	-2.0	---	-1.2	-0.1	-2.2
OCT 17	0.7	0.6	0.7	-0.6	-0.3	---	0.0	0.3	-1.2
SEP 17	-0.5	1.6	-1.2	-0.5	-0.3	---	-2.5	0.5	-1.7
AUG 17	-1.5	2.0	1.4	-1.6	0.2	---	-2.9	-1.6	1.8
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	-1.4	-1.4

Table 1: Evolution of the main atmospheric indices for the Northern Hemisphere for the last months: http://www.cpc.ncep.noaa.gov/products/CDB/Extratropics/table3.shtml



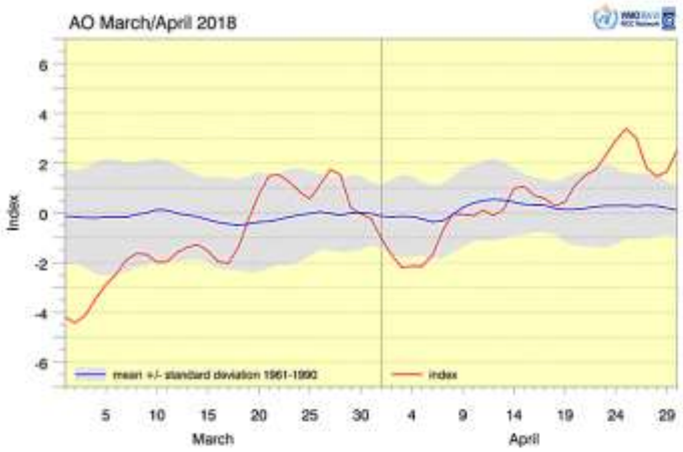
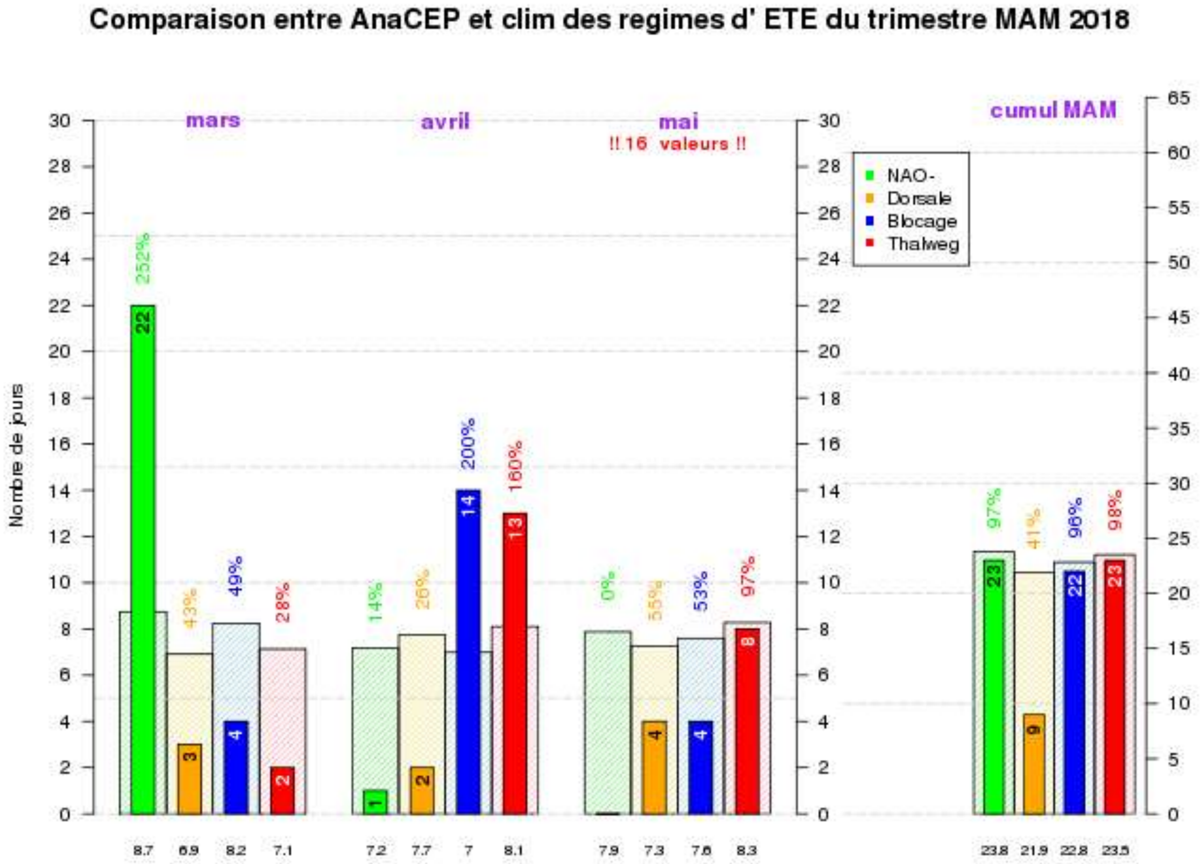


Figure 2.5: North Atlantic Oscillation (NAO, top) and Arctic Oscillation (AO, bottom) indices with 1961-1990 mean standard deviation (shading). Source: DWD, data from NOAA CPC: http://www.cpc.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

April 2018	GWL Hess & Brezowsky
01.04.2018	Ws
02.04.2018	Ws
03.04.2018	Ws
04.04.2018	Ws
05.04.2018	Ws
06.04.2018	Sa
07.04.2018	Sa
08.04.2018	Sa
09.04.2018	Sa
10.04.2018	SEz
11.04.2018	SEz
12.04.2018	SEz
13.04.2018	SEz
14.04.2018	SEz
15.04.2018	SEz
16.04.2018	SEz
17.04.2018	HM
18.04.2018	HM
19.04.2018	HM
20.04.2018	HM
21.04.2018	HM
22.04.2018	Wz
23.04.2018	Wz
24.04.2018	Wz
25.04.2018	Wz
26.04.2018	Wz
27.04.2018	TrW
28.04.2018	TrW
29.04.2018	TrW
30.04.2018	TrW

Table 2: Daily data of Hess/Brezowsky weather type classification: http://www.pik-potsdam.de/~uwerner/gwl/welcome.htm for April 2018. Weather types: Ws: west southerly, Sa: south anticyclonic, SEz: southeast cyclonic, HM: High over Central Europe, Wz: west cyclonic, TrW: trough over Western Europe. Source: DWD



METEO FRANCE

Figure 2.6: Distribution of weather types of Météo France classification (summer regime): NAO-, Atlantic ridge (Dorsale), Blocking (Blocage), Atlantic trough (Thalweg).

Source: Météo France, http://seasonal.meteo.fr/en/content/suivi-clim-regimes-trim

3. Precipitation

- In the equatorial band, quite consistent response to La Niña. Anyway, contrary to March, there are significant differences over the Maritime Continent, where MJO had strongly weakened convection.
- strong positive anomaly over the Indian Basin (cf negative VP200 anomalies).
- strong contrast over Africa, with deficit of precipitations around the Gulf of Guinea.
- over Europe, strong West-East contrast, consistent with Z500 anomalies.

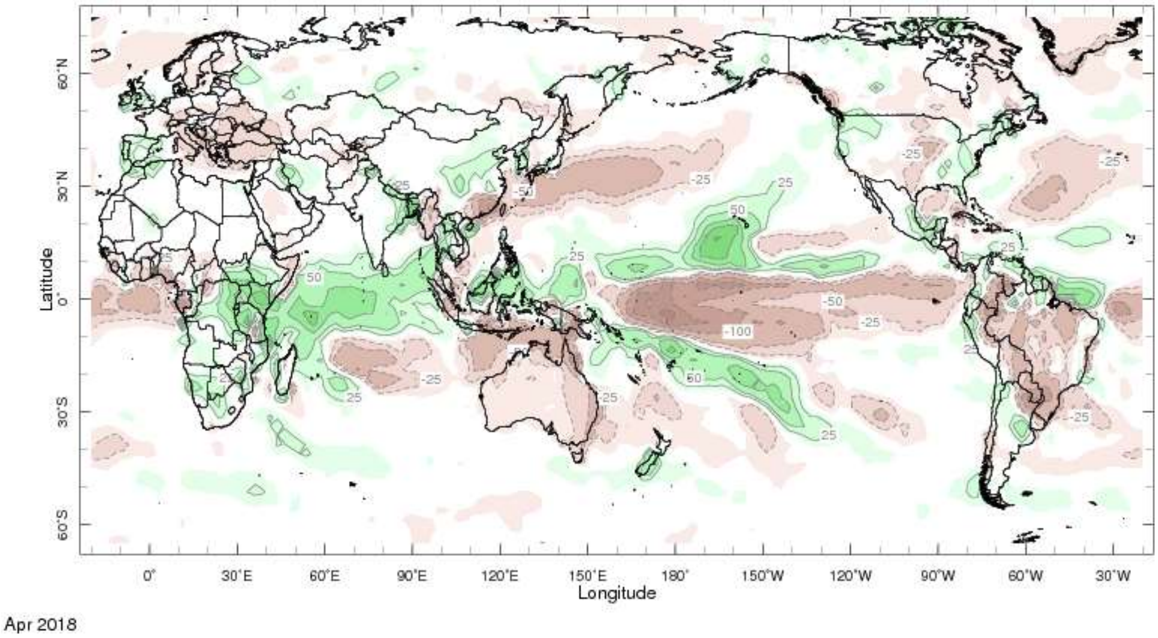


Figure 3.1: Rainfall Anomalies (mm) (departure to the 1979-2000 normal) – Green corresponds to above normal rainfall while brown indicates below normal rainfall.
http://iridl.ldeo.columbia.edu/maproom/.Global/.Precipitation/Anomaly.html

Precipitation in MedCOF Europe/RA VI domain

There was a sharp contrast in precipitation totals between the west and east of the domain. Exposed locations especially at the western coast of Iberia and in the Pyrenees received monthly totals of above 150mm, while places near the western and northern Black Sea coast, but also in central and southern Italy, Greece, Turkey and eastern Syria were very dry with less than 10mm (fig. 3.2).

In terms of anomalies, there was a large range between less than 20% of the 1981-2010 normal in places near the Black Sea and in Italy, Greece, Turkey, eastern Syria and above 250% locally in Spain and parts of the Middle East. Absolute anomalies, too, show a large range of beyond +/-70mm with largest deficits especially at the Dalmatian coast and eastern Turkey and most excess in Portugal, Spain and southern France.

Totals were in the lower tercile over a large area from Italy to Georgia/Armenia, mostly below the 10th tercile. In contrast, precipitation was in the upper tercile in parts of Portugal, Spain and southern France, but also in places in the Middle East.

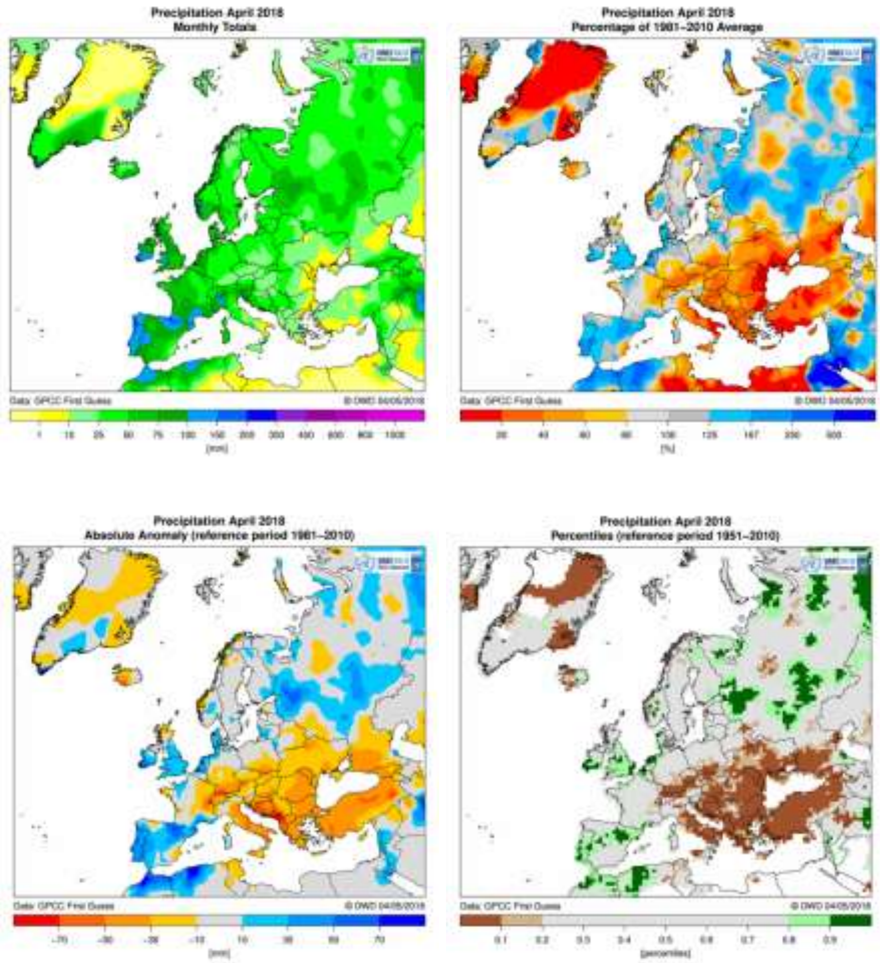


Figure 3.2: Monthly precipitation sum (upper left), percentage of normal (upper right), absolute anomalies (lower left), and percentiles (lower right) for April 2018 (1981-2010 reference for percentages and anomalies, 1951-2010 for percentiles) in Europe/RAVI. Data from GPCC (First Guess version). Source: DWD, http://www.dwd.de/DE/leistungen/rcccm/int/rcccm_int_rrr.html?nn=16102

Precipitation in North Africa

Monthly precipitation totals in April 2018 were below 20 mm over almost all of the RA I domain. Rainfall amounts exceeding 120 mm were registered in the extreme north-west of Algeria and in the north of Morocco. During this month, western Egypt and northern Algeria and Morocco have known above-normal totals of precipitation. In the extreme west of Egypt, rainfall amounts were greater than 500% of rainfall normal amounts. Near-normal conditions occurred over the center and north of Algeria and Morocco, and almost all of Tunisia. These regions received between 75% and 125% of the normal. Libya and most parts of the Sahara, which is known as a dry zone, were even drier than usual during this month of the year with less than 20% of the normal.

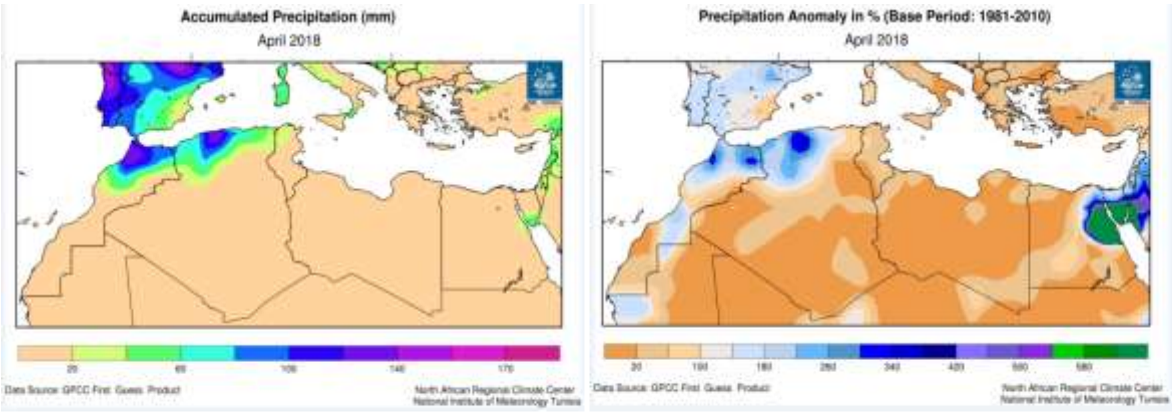


Figure 3.3: Left: Total precipitation; Right: Absolute anomalies of precipitation in the RAI-NA Region (North Africa) Data from NCDC (National Climate Data Centre NOAA – reference 1981-2010)
http://www.meteo.tn/htmlen/donnees/climatemonitoring.php.

4. Temperature

- large positive anomaly over the European continent (up to +5°C)
- large negative anomaly over the USA and Canada (up to -5°C)

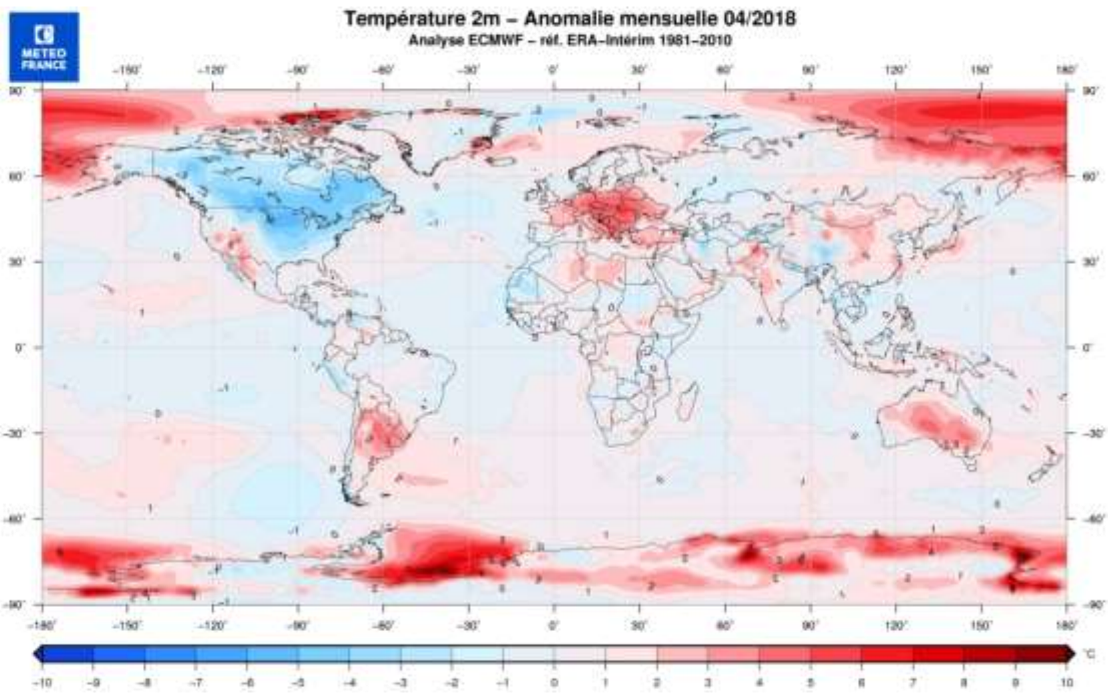


Figure 4.1: Temperature Anomalies (°C) (Meteo-France)

Temperature in MedCOF Europe/RA VI domain

Monthly mean temperature in April 2018 in the lowlands of the MedCOF RA VI domain ranged from 10°C in the north-eastern Ukraine to above 20°C in southern Israel and southern Jordan (fig. 4.2).

With respect to anomalies, April was warmer than normal in almost the whole domain except in south-westernmost (Portugal / southwestern Spain) and easternmost parts (Azerbaijan). Highest anomalies within the domain occurred in southwestern Ukraine / northern Romania with above +5°C (1981-2010 reference) and decreasing to the west, south and east. Some countries or stations reported the warmest or one of the three warmest Aprils since at least 1901, e.g. warmest April in Hungary, Slovenia, third warmest in France. In regions of highest anomalies the warming was particularly due to extreme warm spells with high pressure influence and long sunshine duration, further to the west more to subtropical warm air advection.

Due to high anomalies, almost all of the area with positive anomalies had temperatures in the upper tercile. The areas with negative anomalies mainly had temperatures in the middle tercile, partly also in the lower tercile.

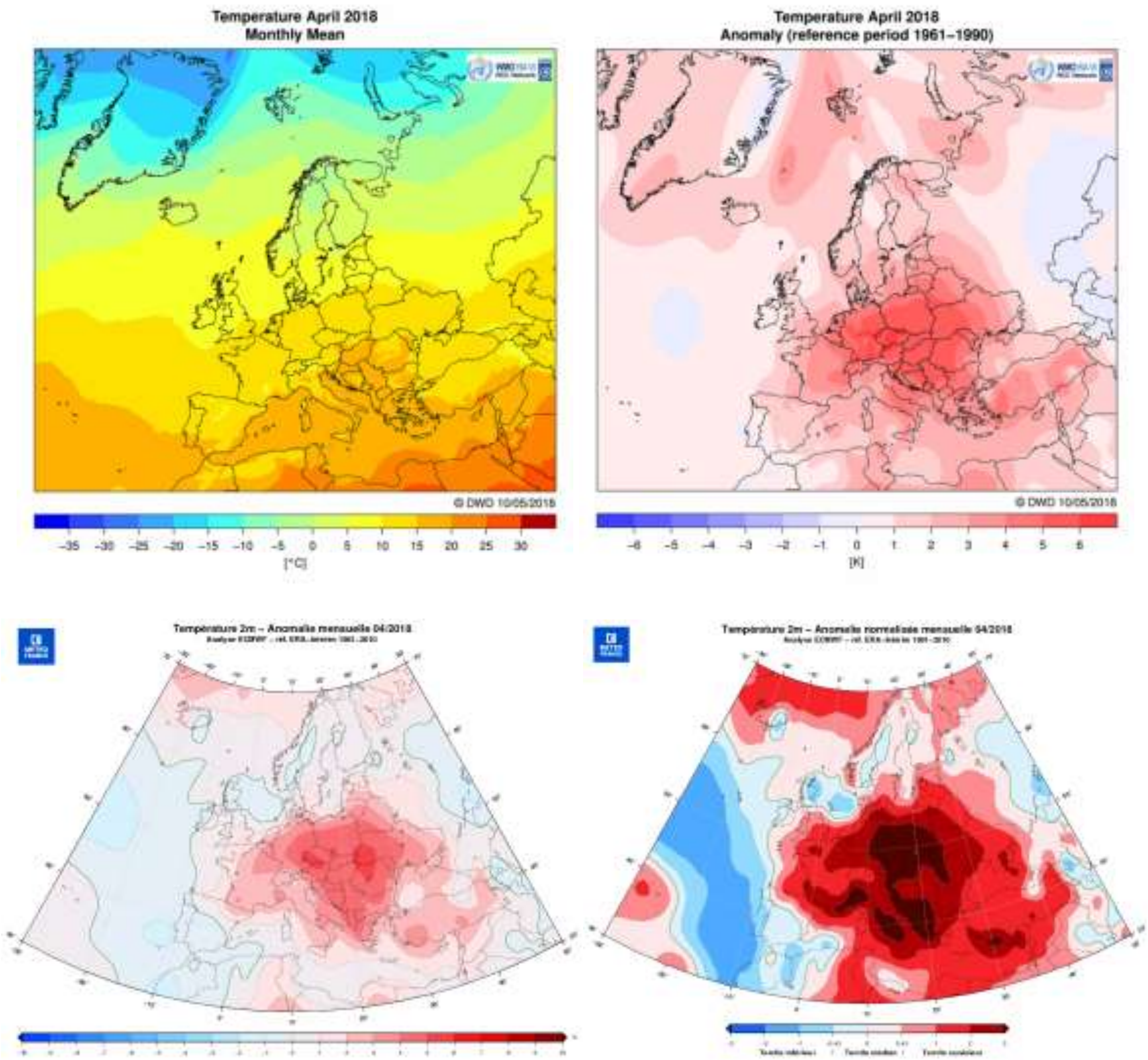


Figure 4.2: Mean temperature (upper left) and anomalies (1961-1990 reference, upper right) in °C in the RA VI Region (Europe) interpolated from CLIMAT station data, for April 2018. Source: DWD, http://www.dwd.de/DE/leistungen/rcccm/int/rcccm_int_ttt.html?nn=490674.

Lower left: Absolute anomaly of temperature (1981-2010 reference), lower right: Standardized temperature anomalies, from ERA-Interim Reanalysis (Source: Meteo France)

Temperature in North Africa

Fig. 4.3 shows the monthly trend of air temperature anomaly in degrees Celsius in April from 1979 to 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 North Africa region was the 7th highest since 1980, at 0.9 °C above the normal 1981-2010.The warming rate is about +0.41°C per decade.

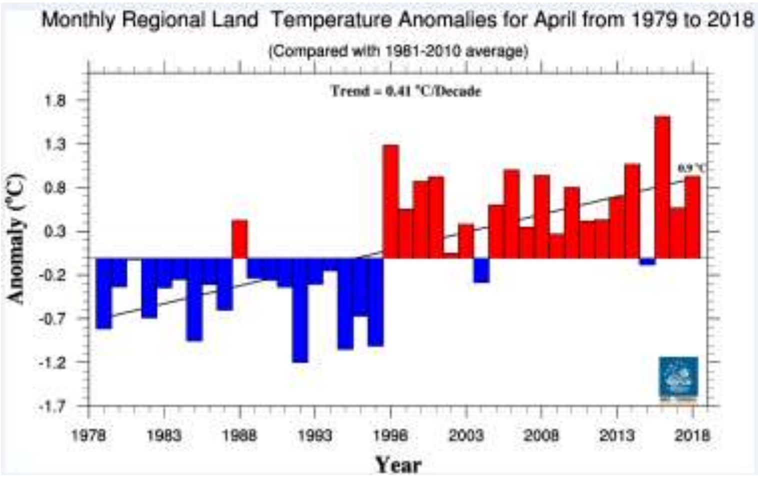


Figure 4.3: Monthly mean temperature anomaly (April 1979-2018), time series plot with trend line

During the month of April 2018, registered temperatures were above normal over Egypt, Libya, Tunisia and the major part of Algeria. Below-normal anomalies were registered over all Morocco and the southwest of Algeria. Monthly mean temperature in April 2018 ranged from less than 10°C in the North of Morocco and Algeria to above 30°C in southern Algeria and Egypt. Temperature anomaly has reached more than +3°C especially in the central part of Libya. Some records have been noticed at several stations.

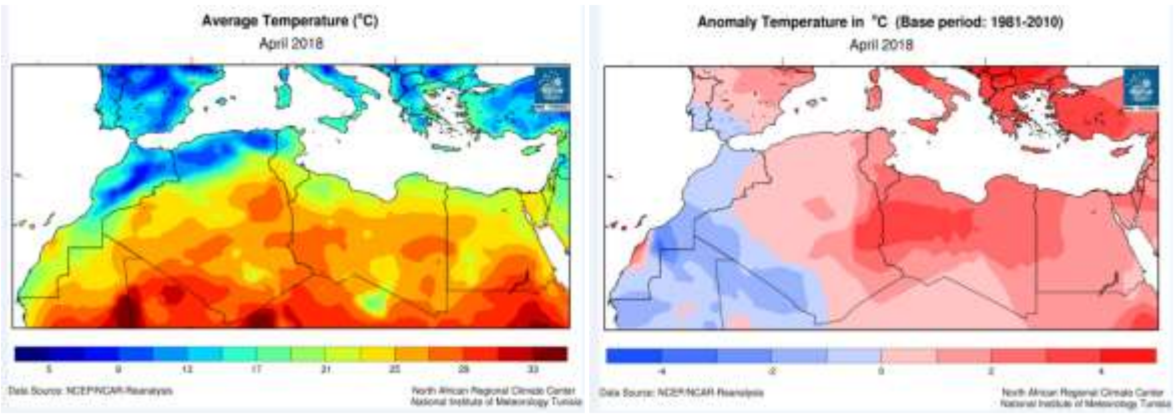


Figure 4.4: Left: Mean temperature; Right: Absolute anomalies of temperature in the RAI-NA Region (North Africa) Data from NCDC (National Climate Data Centre NOAA – reference 1981-2010), http://www.meteo.tn/htmlen/donnees/climatemonitoring.php.

5. Sea ice

In the Arctic: remaining close to record-low extent (2nd lowest, behind 2016). Record low for the Bering Sea.

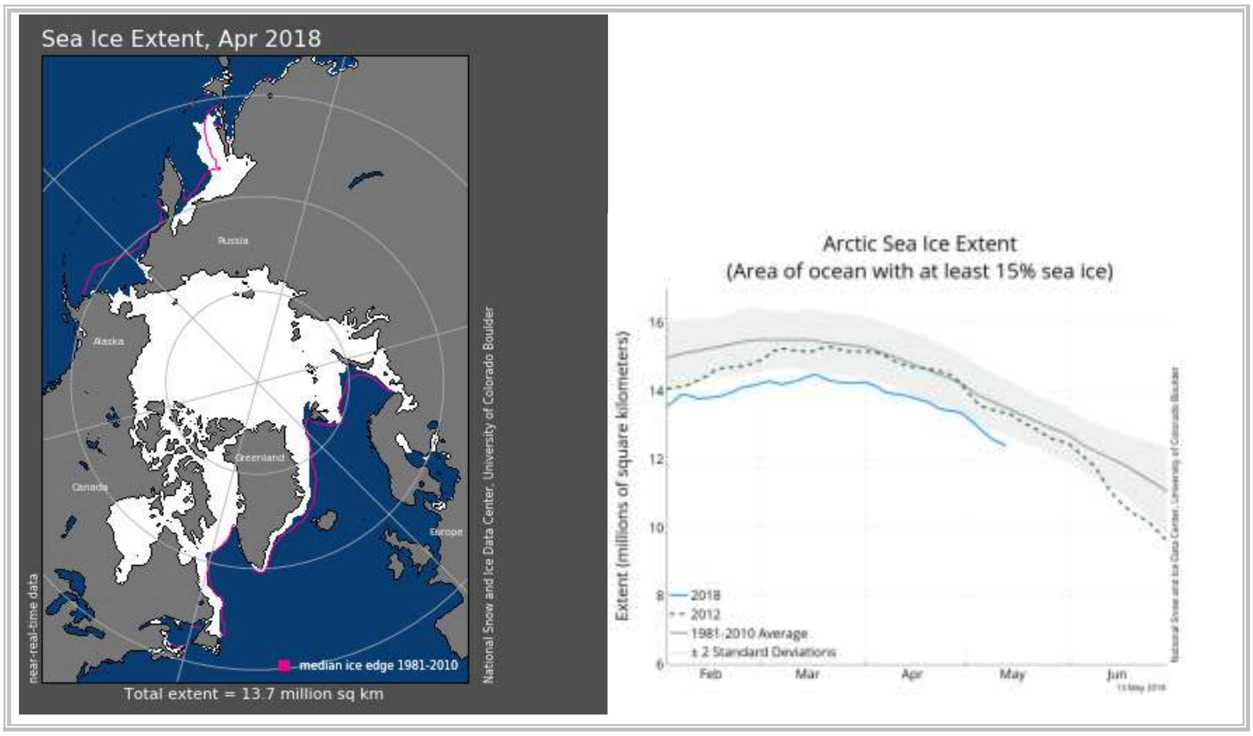


Figure 5.1: Sea Ice extension in the Arctic. The pink line indicates the median extension (for the 1981-2010 period).

http://nsidc.org/data/seaice_index/

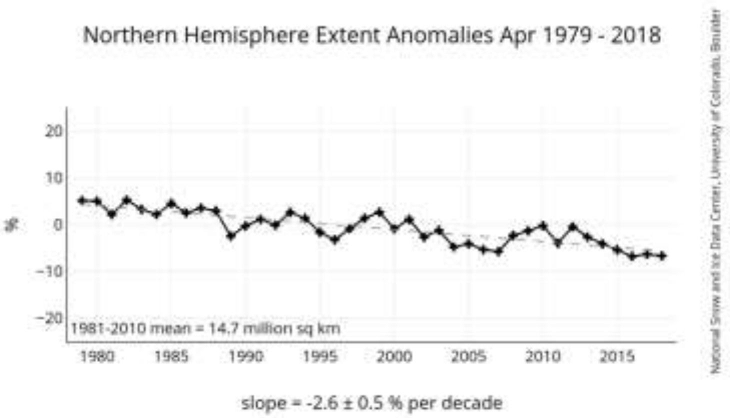


Figure 5.2: Monthly Sea Ice Extent Anomaly in the Arctic for the month of analysis.

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