



WMO RAI



WMO RA VI
RCC-Network



MEDITERRANEAN CLIMATE OUTLOOK FORUM MEDCOF-12 Online Forum

MONITORING SUMMARY MEDCOF-12

for April 2019

First Draft

Last update: 21 May 2019

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: weakening "El Niño" pattern:

- SST anomalies along the equator are still positive, but have weakened since March 2019 in all Niño regions (1+2, 3, 3.4 and 4). Nevertheless they were still above El Niño thresholds according to NOAA analysis. From late April to mid-May, the equatorial Pacific has slightly warmed at the surface in the west, but cooled in the east according to the analysis of BOM Australia. Sub-surface temperatures show an increasing cooling from January to April 2019 below 100m depth, weak positive anomalies only persisted in the upper 100m. According to BOM, a cooling of the upper sub-surface layer in the eastern equatorial Pacific went on until mid-May. All this is a typical sign of a weakening El Niño. In the ENSO Outlook of BOM, the present assessment of the ENSO situation has been downgraded to “El Niño Watch”. For more details see: <http://www.bom.gov.au/climate/enso/index.shtml#tabs=Sea-sub%E2%80%93surface>, <https://www.ncdc.noaa.gov/teleconnections/enso/indicators/sst/> .
- In the northern hemisphere mainly positive anomalies. No PDO pattern, index is zero (-0.0 for April 2019, see <https://www.ncdc.noaa.gov/teleconnections/pdo/>)
- In the southern hemisphere, a pattern of alternating positive and negative SST anomalies can be found.

Over the Maritime Continent and the Indian Ocean:

- Weak warm anomalies (<1°C) on the Indian Ocean in the northern hemisphere, cool anomalies over parts of Indonesia. In the southern hemisphere mostly warmer than normal, but cool close to Australia.
- The Indian Ocean Dipole (IOD) is still in a neutral phase like in DJF 2018/19 (but predictions for JJA show a change to positive IOD, see <http://www.bom.gov.au/climate/enso/index.shtml#tabs=Indian-Ocean>
- Dipole Mode Index (DMI) is also close to zero according to NOAA, see <https://stateoftheocean.osmc.noaa.gov/sur/ind/dmi.php>

Over the Atlantic:

- In the North Atlantic, western parts have a clear anomaly pattern, positive close to the USA, and negative south of Greenland. In the east, there are clearly positive anomalies close to the Arctic, Northern and Western Europe, but almost normal SST close to Iberia and northern Africa.
- Further in the south a zone of slightly-below-normal SST between Central America and the West African coast, and a warm equatorial Atlantic.
- [In the South Atlantic, there are clearly positive anomalies.](#)

Over the Mediterranean and Black Sea:

- Slightly warmer than normal in northern parts, particularly over the Adriatic Sea and the Black Sea. Around normal in the southern and eastern Mediterranean.

April 2019

Tocn(°C) Anomaly vs 1992-2013

0.31

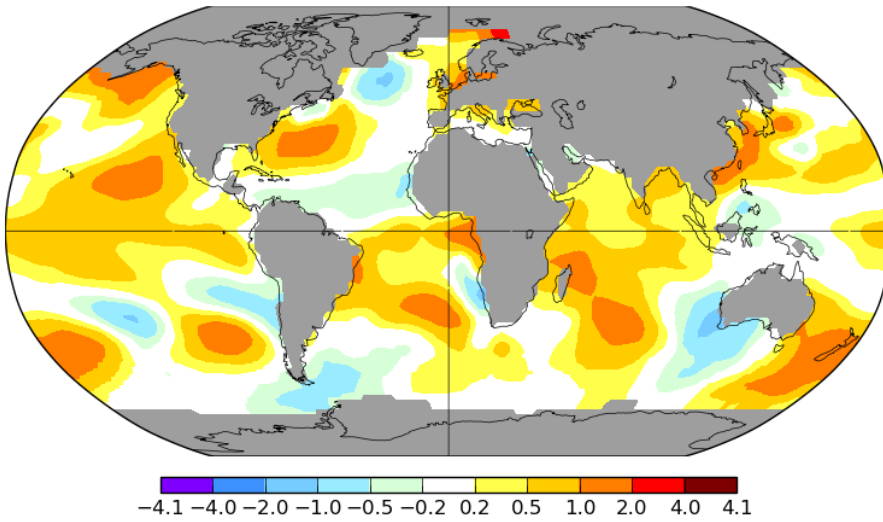


Figure 1.1: Sea surface temperature anomalies for April 2019, 1992-2013 reference. Data from ERSSTv5 Ocean model analysis with 250km smoothing, source: NASA GISS, <https://data.giss.nasa.gov/gistemp/maps/>

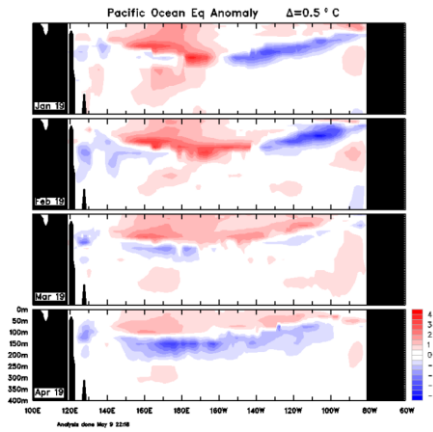


Figure 1.2: Monthly Pacific Ocean temperature anomalies in the sub-surface January-April 2019. Source: BOM, <http://www.bom.gov.au/climate/enso/index.shtml#tabs=Sea-sub%20%93surface>

Commented [FFM1]: Same reference period than in Figure 1.1?

2. Atmospheric Circulation Analysis

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

- Upward anomaly motion over Africa and western Pacific, downward over the eastern Pacific, Central America and western Atlantic. Corresponds to weakening El Niño conditions in the Pacific (warming in the west, cooling in the east).
- Monthly SOI for April 2019 was -1.3 for BOM, +0.1 for NOAA, which ~~means~~ means mainly neutral ENSO conditions, see <https://www.ncdc.noaa.gov/teleconnections/enso/indicators/soi/>

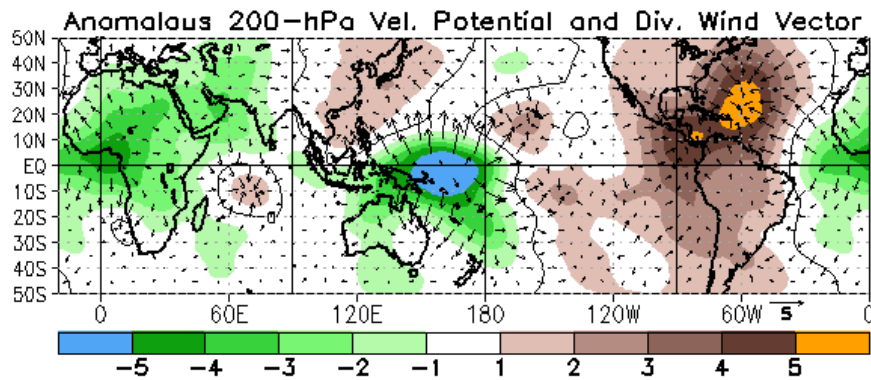


Figure 2.1.a: Velocity Potential Anomalies at 200 hPa and associated divergent circulation anomaly for April 2019. Green (brown) indicates a divergence-upward anomaly (convergence-downward anomaly). <http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/figt24.shtml>

MJO (fig. 2.1.b)

- After a neutral phase until 20 April, MJO became active and moved from the Indian Ocean over the maritime continent, the western Pacific to Africa until mid-May.

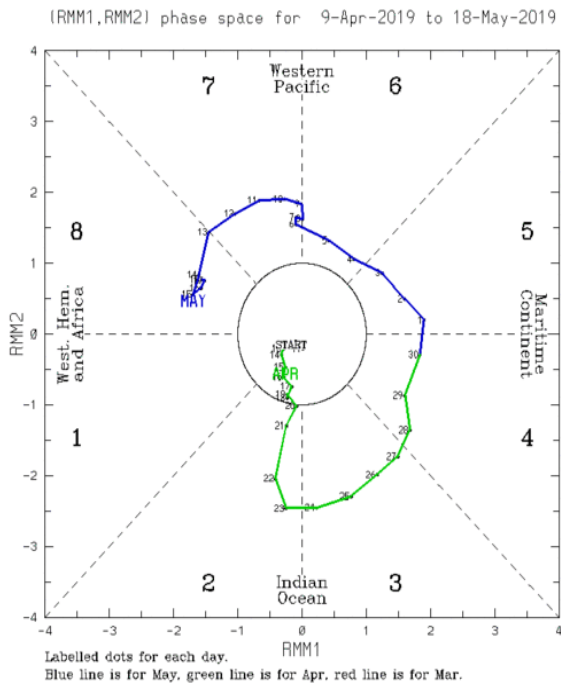


Figure 2.1.b: indices MJO

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

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

Teleconnection over the western Pacific, another weaker one from West Africa

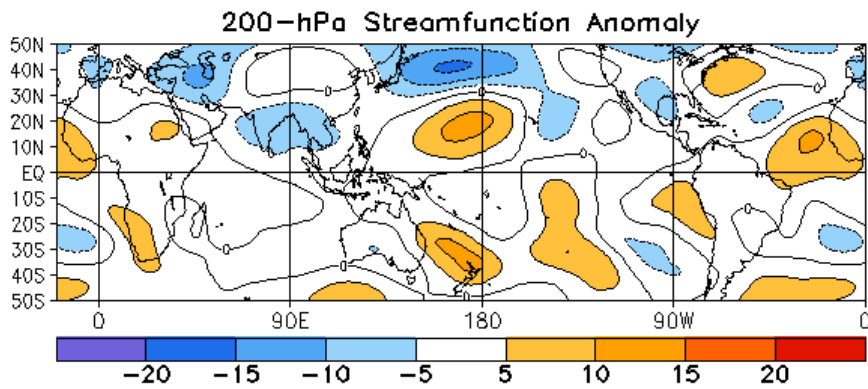


Figure 2.2: Stream Function Anomalies at 200 hPa in April 2019.

<http://www.cpc.ncep.noaa.gov/products/CDB/Tropics/fig22.shtml>

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

- Strong positive geopotential anomaly from Greenland to Scandinavia, low pressure anomalies over the Mediterranean region

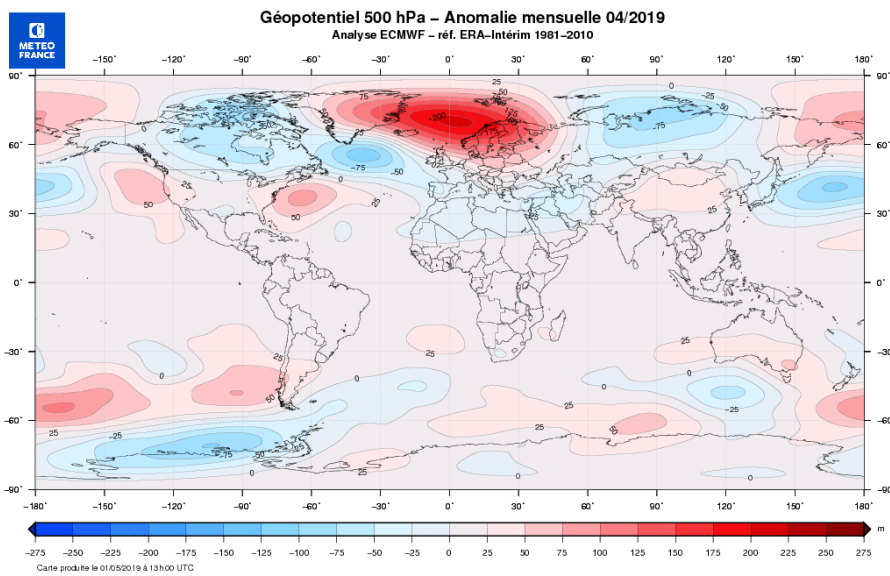


Figure 2.3: Anomalies of Geopotential height at 500hPa (Meteo-France)

Commented [FFM2]: In other places, Météo-France

Sea level pressure and circulation types relevant for Europe

- Intense Blocking High over Scandinavia, clearly the most dominating large-scale pattern
- Low pressure area from the North Atlantic extending into the Western Mediterranean
- East of the Blocking High advection of colder air into the Eastern Mediterranean region.

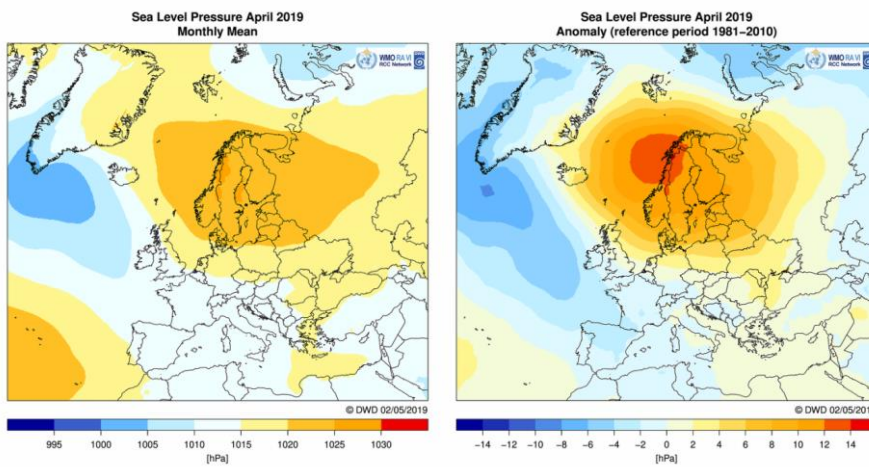


Figure 2.4: Mean sea level pressure over the North Atlantic, Europe and North Africa and 1981-2010 anomalies.
 Source: DWD, https://www.dwd.de/DE/leistungen/rcccm/int/rcccm_int_ppp.html?nn=490674

Commented [FFM3]: Anomalies(ref period 1981-2010) for April

MONTH	NAO	EA	WP	EP-NP	PNA	TNH	EATL/WRUS	SCAND	POLEUR
APR 19	0.4	-1.0	-1.3	0.7	-0.8	---	0.8	2.1	-0.4
MAR 19	0.9	0.9	0.9	2.1	-0.1	---	-1.1	-0.9	0.9
FEB 19	-0.1	-0.1	2.1	1.2	-1.7	1.6	0.5	-0.4	0.7
JAN 19	0.2	-1.7	1.0	1.1	0.4	0.3	0.7	-0.1	0.1
DEC 18	0.5	1.4	0.1	---	0.6	-0.6	-0.4	1.3	1.5
NOV 18	-0.3	0.3	-0.6	1.4	0.2	---	1.5	1.9	0.8
OCT 18	1.5	-0.4	-1.1	1.2	0.4	---	0.4	-1.1	-1.3
SEP 18	1.8	0.1	-1.8	-0.8	1.2	---	-1.8	-0.7	0.5
AUG 18	2.4	1.8	-1.4	-0.8	1.2	---	-0.5	-1.1	0.0
JUL 18	1.4	2.4	-0.8	-0.2	-0.8	---	-2.2	2.3	-0.1
JUN 18	1.4	-0.5	-0.4	0.1	0.7	---	-0.2	-0.8	-0.9
MAY 18	2.0	-0.1	-0.2	-1.0	-1.1	---	-1.4	1.7	-0.3
APR 18	1.2	1.1	-0.7	-0.2	-1.1	---	0.5	0.3	-1.3

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>

NAO and AO were only temporarily active in April 2019. In May 2019 there was a tendency to both negative NAO and AO phase.

Commented [FFM4]: But also in March, it seems NAO temporarily active

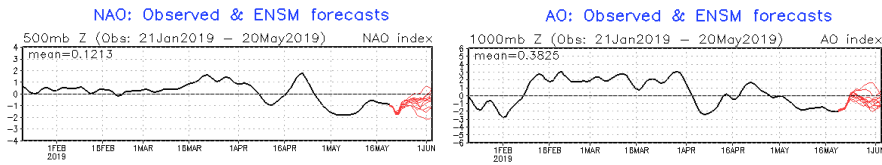


Figure 2.5: North Atlantic Oscillation (NAO) and Arctic Oscillation (AO) indices. Source: NOAA CPC, http://www.cpc.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

Hess-Brezowsky weather types also show the predominance of high pressure over Scandinavia during most of the month (April). Only later in the month, southerly advection into Europe became also relevant.

Date	GWL Hess & Brezowsky
01 April 2019	SEz
02 April 2019	SEz
03 April 2019	SEz
04 April 2019	SEz
05 April 2019	SEz
06 April 2019	HNfz
07 April 2019	HNfz
08 April 2019	HNfz
09 April 2019	HNfz
10 April 2019	HNfz
11 April 2019	HNfz
12 April 2019	HNfz
13 April 2019	HNfz
14 April 2019	HNfz
15 April 2019	HNfA
16 April 2019	HNfA
17 April 2019	HNfA
18 April 2019	HNfA
19 April 2019	HFa
20 April 2019	HFa
21 April 2019	HFa
22 April 2019	HFa
23 April 2019	Sz
24 April 2019	Sz
25 April 2019	Sz
26 April 2019	Sz
27 April 2019	Sz
28 April 2019	Nz
29 April 2019	Nz
30 April 2019	Nz

Table 2: Daily data of Hess/Brezowsky weather type classification: <http://www.pik-potsdam.de/~u Werner/gwl/welcome.htm> for April 2019. Explanation of weather types: see next page. Source: DWD

Explanation of Hess/Brezowsky Weather Types

Type	Description
BM	High-pressure bridge over Central Europe
HB	High over British Isles
HFa	Scandinavian High, Ridge over Central Europe predominantly anticyclonic
HFz	Scandinavian High, Ridge over Central Europe predominantly cyclonic
HM	High over Central Europe
HNa	Icelandic high, Ridge over Central Europe, predominantly anticyclonic
HNFa	High over Scandinavia-Iceland, low over Mediterranean, predominantly anticyclonic
HNFz	High over Scandinavia-Iceland, upper air low over Central Europe, predominantly cyclonic
HNz	Icelandic high, Trough over Central Europe predominantly cyclonic
Na	Northerly, Central Europe predominantly anticyclonic
NEa	North-Easterly, Central Europe predominantly anticyclonic
NEz	North-Easterly, Central Europe predominantly cyclonic
NWa	North-Westerly, Central Europe predominantly anticyclonic
NWz	North-Westerly, Central Europe predominantly cyclonic
Nz	Northerly, Central Europe predominantly cyclonic
Sa	Southerly, Central Europe predominantly anticyclonic
SEa	South-Easterly, Central Europe predominantly anticyclonic
SEz	South-Easterly, Central Europe predominantly cyclonic
SWa	South-Westerly, Central Europe predominantly anticyclonic
SWz	South-Westerly, Central Europe predominantly cyclonic
Sz	Southerly, Central Europe predominantly cyclonic
TB	Low over British Isles
TM	Low Central Europe
TrM	Trough over Central Europe
TrW	Trough over Western Europe
Ü	Transition / Undetermined
Wa	Westerly, Central Europe predominantly anticyclonic
WS	South-Shifted Westerly
WW	Westerly angular / Maritime Westerly (Block E. Europe)
Wz	Westerly, Central Europe predominantly cyclonic

Comparaison entre AnaCEP et clim des regimes d' ETE du trimestre MAM 2019

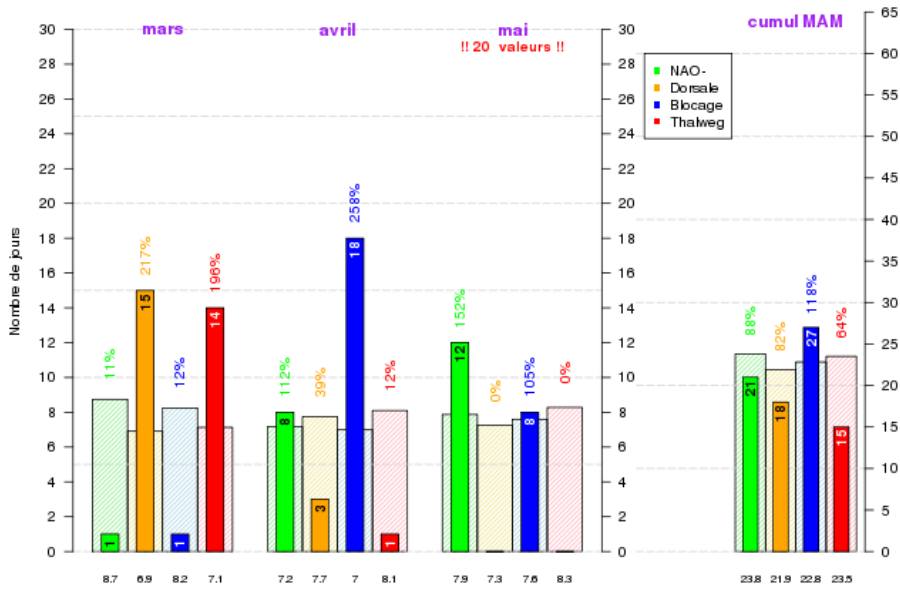


Figure 2.6: Distribution of weather types of Météo France classification (summer regime) for March-May 2019: NAO-, Atlantic ridge (Dorsale), Blocking (Blocage), Atlantic trough (Thalweg).

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

Météo France weather type classifications, too, show a predominance of Scandinavian blocking for April 2019, in sharp contrast to March. A second type, which occurred occasionally, was NAO-. That kind of distribution also continued in May 2019.

3. Precipitation

- Precipitation response over the equatorial Pacific mainly corresponds to weakening ENSO conditions both in the ocean and atmosphere (warming SST and upward motion in the west, cooling SST and downward motion in the east).
- Indian Ocean: some areas of positive anomalies south of India and over the maritime continent might be the result of moving MJO and warm SST.
- Some local precipitation over some parts of Africa points to increased convection
- Dryness over northeastern Africa (Somalia, Ethiopia, Kenya): slow movement of ITCZ to the north, delayed rain period.
- Heavy rainfalls over Iran, Afghanistan, even extending to eastern parts of RA VI.

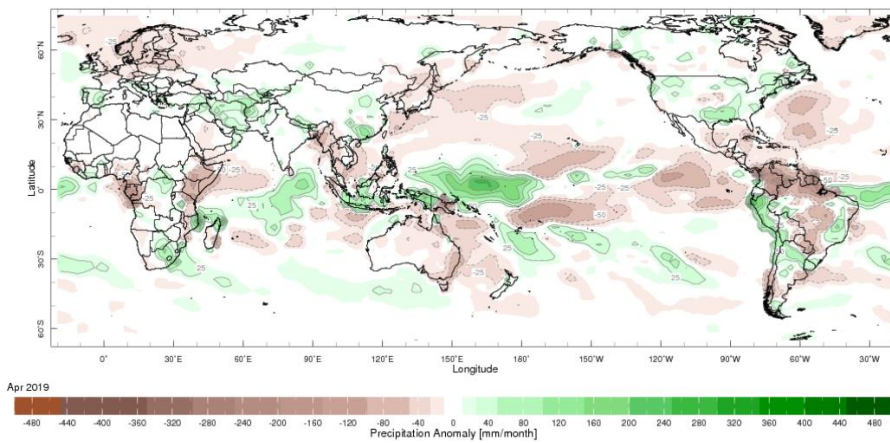


Figure 3.1: Rainfall Anomalies (mm) (departure to the 1979-2000 normal) – Green corresponds to above normal rainfall while brown indicates below normal rainfall.
<http://iridl.ldeo.columbia.edu/maproom/Global/Precipitation/Anomaly.html>

Precipitation in MedCOF Europe/RA VI domain

While northern Europe was very dry, much of the RA VI MedCOF domain received normal or above-normal precipitation in April 2019. Some places in various parts of the domain had precipitation above the 80th or 90th percentile. Especially northern and western Iberia, places in southern France, northern Italy, western Balkans, but also in the east some areas of Georgia and eastern Turkey received some heavy precipitation resulting in monthly totals above 100mm. Relatively little precipitation (less than 80% of normal) fell in northern France, southern Italy (Sicily), northern Hungary, parts of western and central Turkey. Southern parts of the Middle East (southern Israel, Jordan, even places in Syria started the dry period.

Commented [FFM5]: The text is a little confused. It refers to percentile and then, it changes to absolute values.

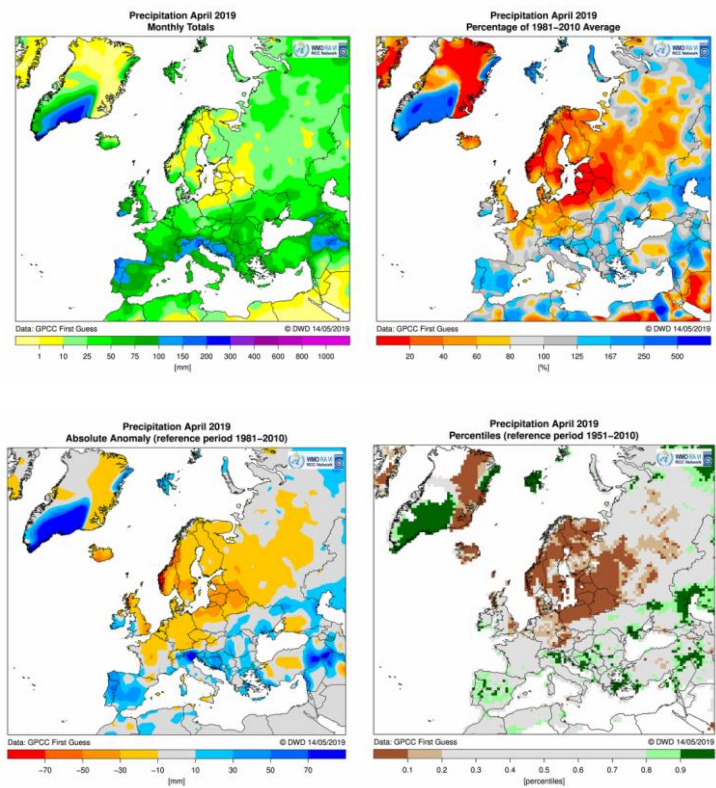


Figure 3.2: Monthly precipitation sum (upper left), percentage of normal (upper right), absolute anomalies (lower left), and percentiles (lower right) for April 2019 (1981-2010 reference for percentages and anomalies, 1951-2010 for percentiles) in Europe/RAVI. Data from GPCC (First Guess version). Source: DWD, http://www.dwd.de/DE/leistungen/rcccm/int/rcccm_int_rrr.html?nn=16102

Precipitation in North Africa

Monthly precipitation totals in April 2019 were below 20 mm over almost all of the RA I domain. Rainfall amounts exceeding 40 mm were registered in the extreme north of Algeria and Tunisia and in the north of Morocco. Near normal conditions occurred over the southern Algeria, most of Libya and Egypt. These regions received between 75% and 125% of the normal. Slightly above-normal conditions occurred especially in the southwest of Libya and the extreme southeast of Algeria. Over Tunisia, most parts of Algeria and Morocco the precipitation was below normal during this month of the year with less than 20%.

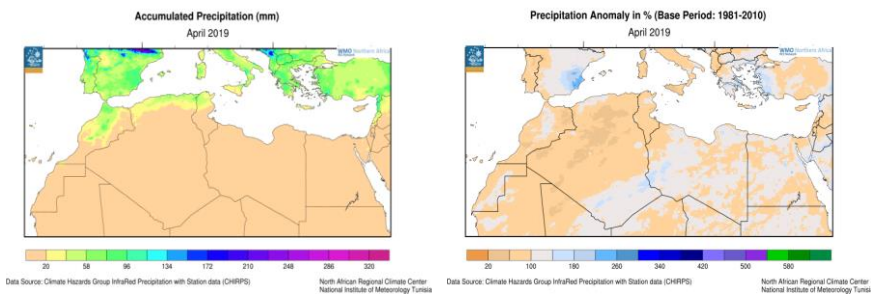


Figure 3.3: Left: Total precipitation; Right: Percentage of normal precipitation in the RAI-NA Region (North Africa)
Data from NCDC (National Climate Data Centre NOAA – reference 1981-2010)
<http://www.meteo.tn/htmlen/donnees/climatemonitoring.php>.

4. Temperature

- Pronounced warming in the Arctic region, to a lesser extent also in northern and central latitudes in Europe
- Cool over large parts of northern Africa, the Arab Peninsula and parts of the Middle East and Turkey, to a lesser extent in parts of the Mediterranean region
- Some parts of southern and eastern Africa and southern Asia warm
- Cold over eastern Canada.

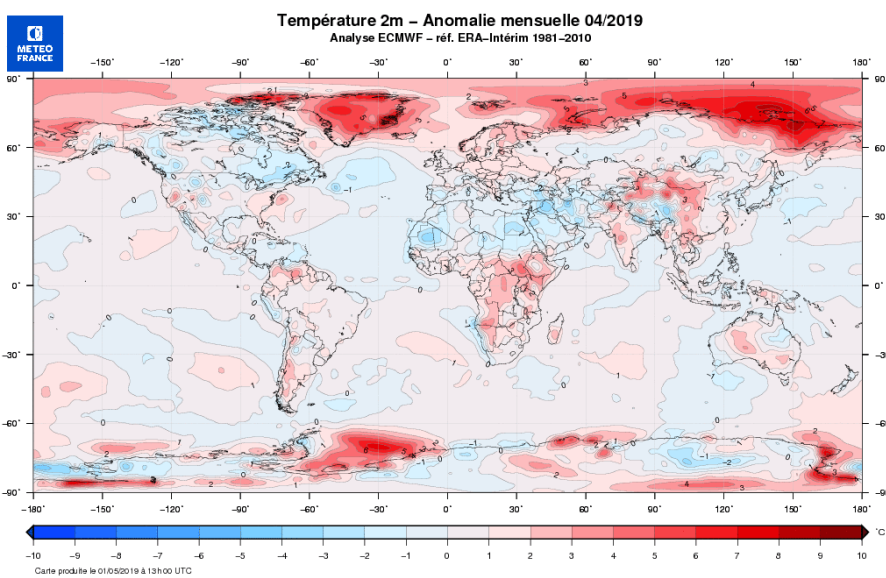


Figure 4.1: Temperature Anomalies (°C) (Meteo-France)

Temperature in MedCOF Europe/RA VI domain

Monthly mean temperature in April 2019 in the RA VI MedCOF domain was mostly between 10 and 15°C, in some parts below, especially in the north and in higher elevations. Places in southern Iberia and most of the Middle East had mean temperatures above 15°C, southern Israel even above 20°C.

Anomalies (1961-1990 reference) were positive especially in northern parts of the domain, mostly in a range between +1 and +2°C, in parts of Hungary, central Balkans, western Romania and northwestern Ukraine between +2 and +3°C, locally in the Balkans even above. Temperatures were around normal in southern Iberia, over much of the Mediterranean, eastern Romania/Bulgaria. It was mostly colder than normal over Turkey, South Caucasus, and Middle East.

Compared to 1981-2010 reference of ERA-Interim, large parts of Iberia, Corsica, Sardinia had anomalies below -1°C, the same for parts of Turkey, Cyprus, Middle East, in eastern Syria and locally in northeastern Turkey even down to -3°C.

In terms of terciles, much of the northern parts of the domain and the Balkans were in the upper tercile range. Most of Iberia, almost the entire Mediterranean basin, Cyprus, Turkey, Middle East and parts of South Caucasus were in the lower tercile range. Quite a small transition zone between these two was in the middle tercile range.

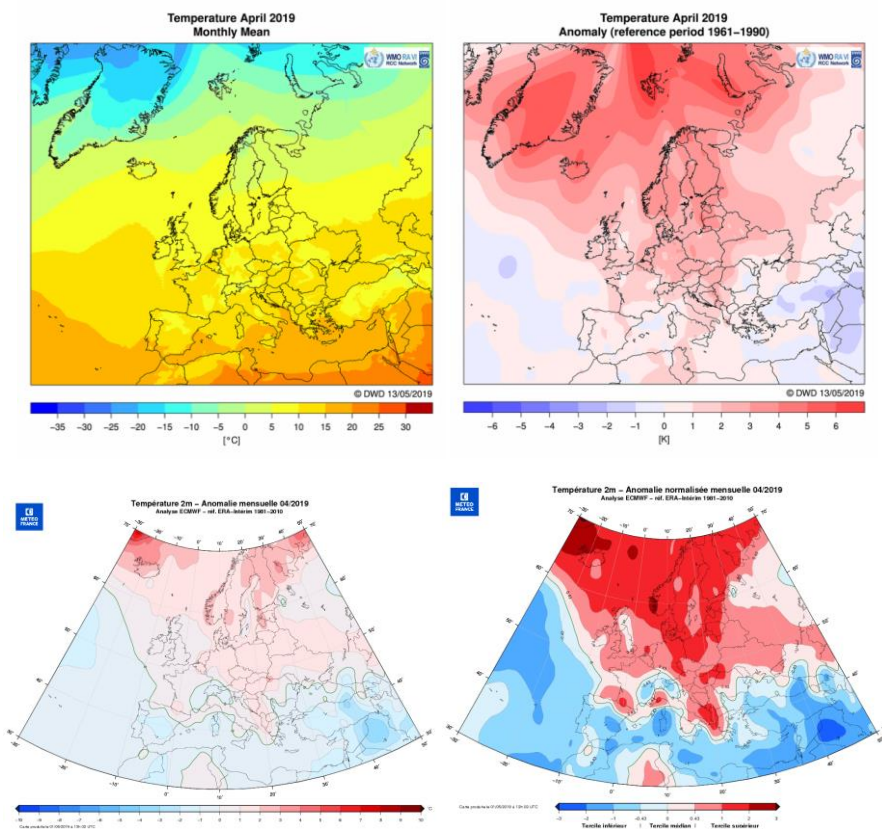


Figure 4.2: Mean temperature (upper left) and anomalies (1961-1990 reference, upper right) in °C in the RA VI Region (Europe) interpolated from CLIMAT station data, for April 2019. Source: DWD, http://www.dwd.de/DE/leistungen/rccm/int/rccm_int_ttt.html?nn=490674.

Lower left: Absolute anomalies of temperature (1981-2010 reference), lower right: Standardized temperature anomalies, from ERA-Interim Reanalysis (Source: [MétéoMétéo France](#))

Temperature in North Africa

The graph of Fig. 4.3 shows the monthly trend in anomaly air temperature in degrees Celsius of April since 1979 through 2019. 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, which was below the normal 1981-2010, has reached - 0.2 °C. For April, the warming rate was about 0.39°C per decade.

Commented [FFM6]: Perhaps anomaly land air temperature

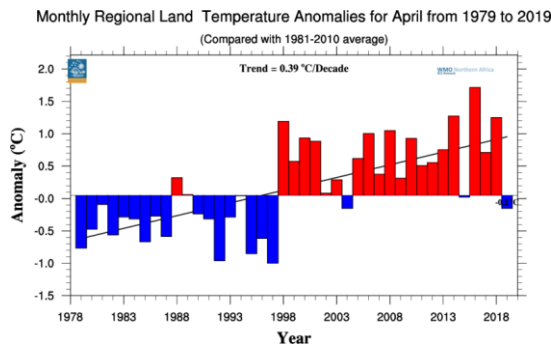


Figure 4.3: Monthly mean temperature anomaly (April 1979-2019), time series plot with trend line

During the month of April 2019, registered temperatures were above normal over Tunisia, the major part of Libya and the east of Algeria. Below-normal anomalies were registered over almost all Morocco and Egypt, the western and southern regions of Algeria and the extreme south of Libya. Monthly mean temperature in April 2019 ranged from less than 10°C in the North of Morocco and Algeria to above 28°C in southern Algeria and Egypt. Temperature anomaly has reached less than -3°C especially in the south of Algeria.

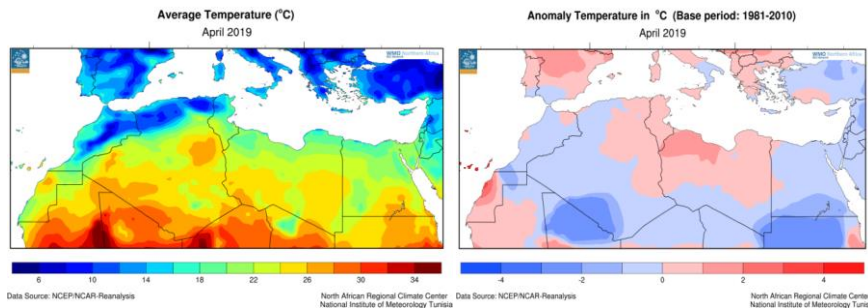


Figure 4.4: Left: Mean temperature; Right: Absolute anomalies of temperature in the RAI-NA Region (North Africa) Data from NCDC (National Climate Data Centre NOAA – reference 1981-2010), <http://www.meteo.tn/htmlen/donnees/climatemonitoring.php>.

Commented [FFM7]: April is missing

5. Sea ice

In the European part of the Arctic: less sea ice than normal especially near the south-eastern coast of Greenland, south of Svalbard and west of Novaya Zemlya. Also some northern and eastern parts of the Baltic Sea had missing sea ice.

Sea ice of the whole Arctic region in April declined further in April 2019 and reached a new low record since start of the series in 1979.

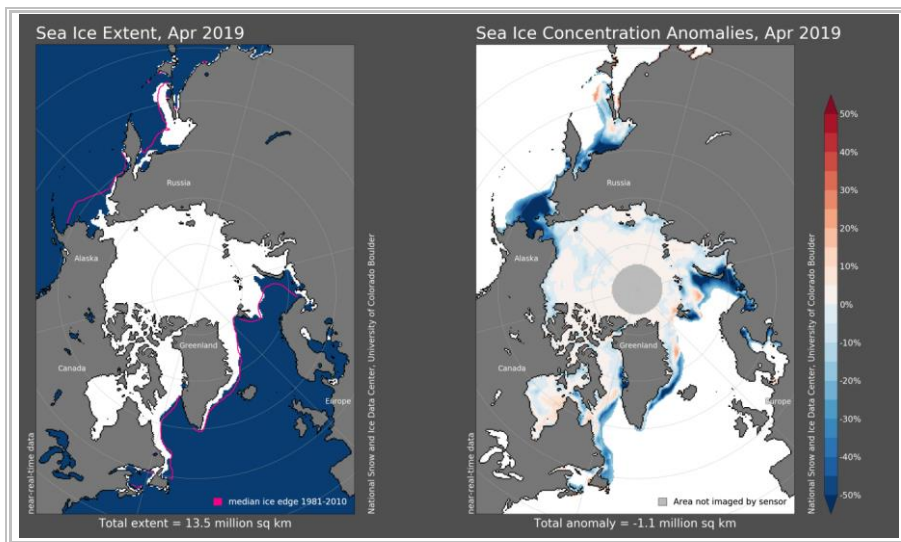


Figure 5.1: Sea Ice extension in the Arctic. The pink line indicates the median extension (for the 1981-2010 period).

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

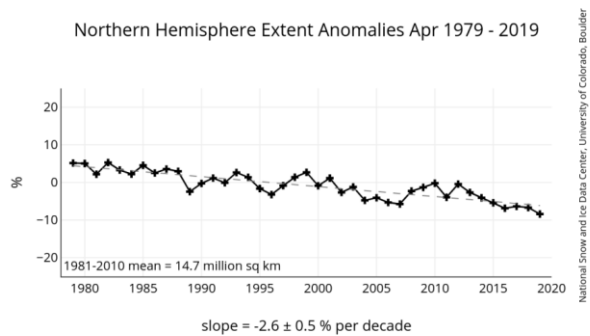


Figure 5.2: Monthly Sea Ice Extent Anomaly in the Arctic for the month of analysis.

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

References:

Météo France Monthly Seasonal Forecast Bulletin and climate monitoring maps: <http://seasonal.meteo.fr> (password protected)

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>