MEDITERRANEAN CLIMATE OUTLOOK FORUM
MEDCOF-15 Online Forum

ANALYSIS AND VERIFICATION
OF THE MEDCOF-14 CLIMATE OUTLOOK
FOR THE 2020 SUMMER SEASON
FOR THE MEDITERRANEAN REGION (MED)

Final version

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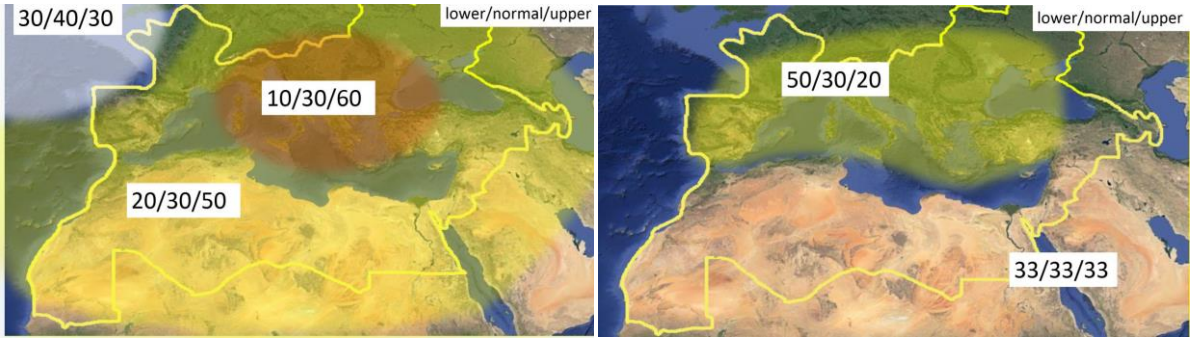
The following MedCOF verification report is based on

- the outcome of the consensus forecast of MedCOF 14,
- climate monitoring results of RA I NA RCC and RA VI RCC networks,
- the analysis and verification report of SEECOF-24 for 2020 summer season for southeast Europe (SEE)
- national verification reports received from NMHSs or posted in RCOF forums of MedCOF, SEECOF or PRESANORD.

1 MedCOF-14 Climate outlook for the 2020 summer season



(a) (b)

Figure 1: Graphical presentation of the climate outlook for the 2020 summer season for the Mediterranean region (a) Temperature Outlook, (b) Precipitation Outlook

Sea surface temperature, general circulation and soil moisture

As stated in the MedCOF14 consensus statement, observed sea surface temperatures along most of the Tropical Pacific were slightly above normal (neutral El Niño conditions) in spring 2020, with higher anomalies over the western part of the basin. Cold anomalies in the subsurface suggested that a development of a La Niña event was starting, which was supported by most models. However, the majority of them still predicted normal conditions during June-August 2020. The Indian Ocean Dipole was neutral in spring 2020, but forecasted to become negative during summer 2020.
Atmospheric response was consistent over the tropics, but less clear over the North Atlantic and Europe, with differences among models. In general terms, they seemed to favour higher pressures over Central and Southern Europe, and more intense westerlies over northern Europe.
Some parts of Central Europe and the Balkans had experienced significant drought in spring 2020, with soil moisture below normal in May. In case of anticyclonic situations, a dry soil can enhance the risk of heat waves.

Temperature

Within this general context, temperature should have been warmer than normal over most of the domain, with a stronger signal centered on the Balkans (Figure 1a). Over the northwestern part, the more intense westerly flow forecasted could have damped the warm signal, with more likelihood of normal conditions.

Precipitation

Precipitation forecasts showed drier-than-normal conditions over Southern Europe and the Mediterranean Sea. For the rest of the region no large-scale precipitation signal was present in the forecasts (see figure 1b). The climatological forecast (33, 33, 33) over the southern part of the domain also implied the fact that no meaningful forecast can be provided for these seasonally dry areas.

2 Analysis of the 2020 summer season

Analysis of the summer season temperature and precipitation anomalies and general circulation are based on maps and monthly or seasonal bulletins on the climate in the WMO region I – NA and VI for the summer 2020 (WMO RA I RCC Node on Climate Monitoring: https://www.meteo.tn/en/climate-monitoring-watch; WMO RA VI RCC Offenbach Node on Climate Monitoring: http://www.dwd.de/rcc-cm), contributions from Météo France (http://seasonal.meteo.fr/), Regional Climate Outlook Forums for Southeastern Europe (SEECOF-24, http://www.seevccc.rs) and North Africa (PRESANORD, http://acmad.net/rcc/presanord.php), and national verification reports from MedCOF participants.

2.1. General circulation

2.1.1. Ocean

While the western tropical Pacific still was warmer than normal (1981-2010 reference) at the ocean surface in summer 2020, sea surface temperatures (SST) in the eastern tropical Pacific were colder than normal on seasonal average, particularly close to South American coast (Fig. 2). On the other hand, SST in the Indian Ocean remained above normal, without any significant west-east gradient.

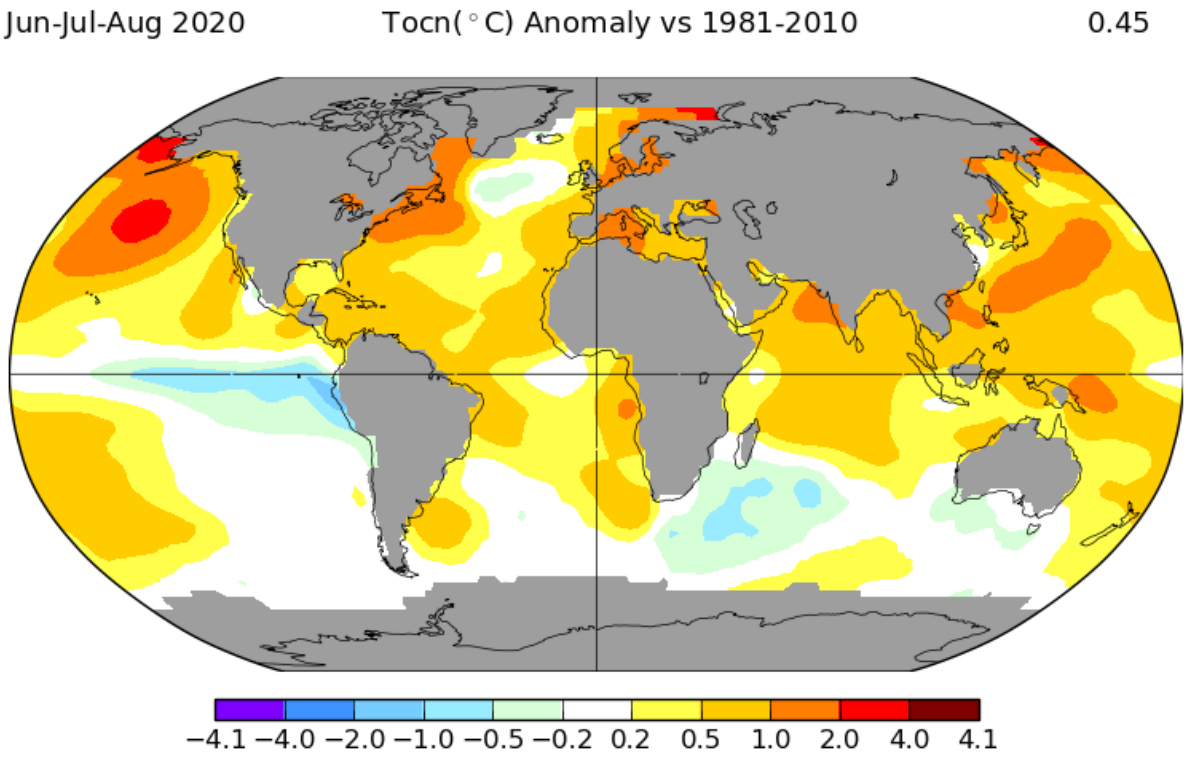


Figure 2: Sea surface temperature anomalies for boreal summer 2020 (June-August), 1981-2010 reference. Data from ERSSTv5 Ocean model analysis with 250km smoothing, source: NASA GISS, https://data.giss.nasa.gov/gistemp/maps/

In June and July 2020, the equatorial Pacific Ocean experienced a warming at the surface and at the subsurface (Fig. 3), therefore the negative anomalies decreased compared to May 2020. In August 2020, however, a cooling in the central and eastern equatorial Pacific occurred down to a depth of 150-200m, which could be regarded as the beginning of the La Niña event.

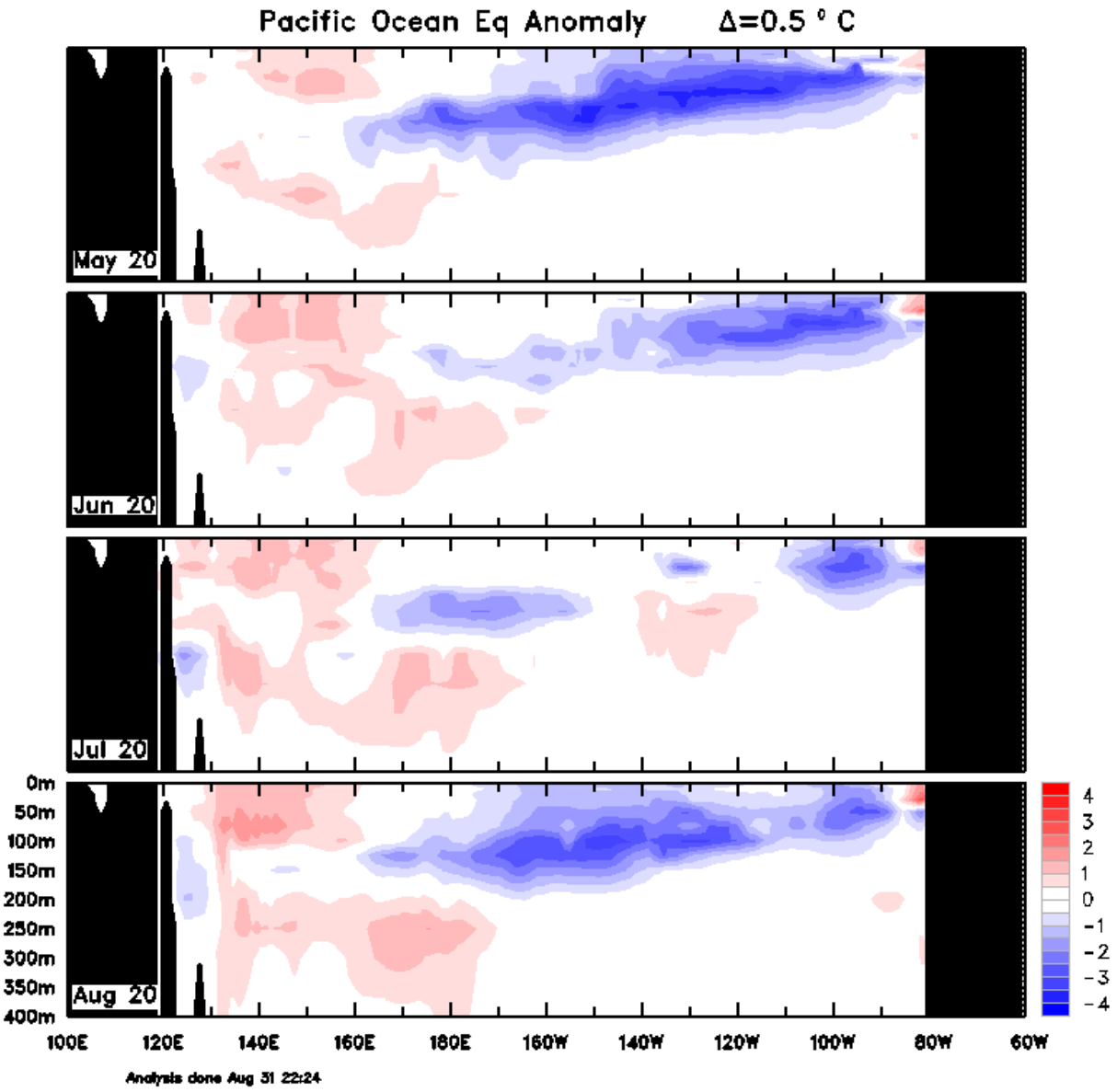


Figure 3: 4-month sequence of vertical temperature anomaly sections at the equatorial Pacific for May-August 2020. Source: Australian Government, Bureau of Meteorology (BOM), http://www.bom.gov.au/cgi-bin/oceanography/wrap_ocean_analysis.pl?id=IDYOC007&year=2020&month=08

Looking at the specific Niño regions (Tab. 1), SST remained below normal (1971-2000 reference) during summer in the eastern regions (1+2 and 3). In the western region 4, SST decreased from June to August, but remained around normal. The combined region 3.4 had negative anomalies in all three months, but SST fell only in August 2020 below the -0.5°C threshold of La Niña. This means that there was a development from neutral to La Niña conditions during summer 2020, but the seasonal mean was still neutral as forecasted.

MONTH	NIÑO 1+2		NIÑO 3		NIÑO 4		NIÑO 3.4	
	TEMP	ANOM	TEMP	ANOM	TEMP	ANOM	TEMP	ANOM
June 2020	22.13°C	-0.74°C	25.75°C	-0.68°C	29.07°C	0.23°C	27.30°C	-0.35°C
July 2020	20.44°C	-1.18°C	25.08°C	-0.54°C	28.83°C	0.02°C	26.89°C	-0.33°C
August 2020	19.69°C	-0.95°C	24.42°C	-0.57°C	28.47°C	-0.21°C	26.18°C	-0.64°C

Table 1: Sea surface temperature and anomalies for various Niño regions in boreal summer months 2020 (June-August), 1971-2000 reference. Data from ERSST.v5 ocean model analysis, source: NOAA, https://www.ncdc.noaa.gov/teleconnections/enso/indicators/sst.php with definitions of Niño regions.

The Indian Ocean Dipole (IOD) index switched from slightly positive to slightly negative values from June to August 2020 (Fig. 4) and was neutral on seasonal average, consistent to the quite homogeneous SST anomalies over the Indian Ocean. Thus, the forecasted negative IOD has not occurred, but at least there was a tendency to negative or lower values.

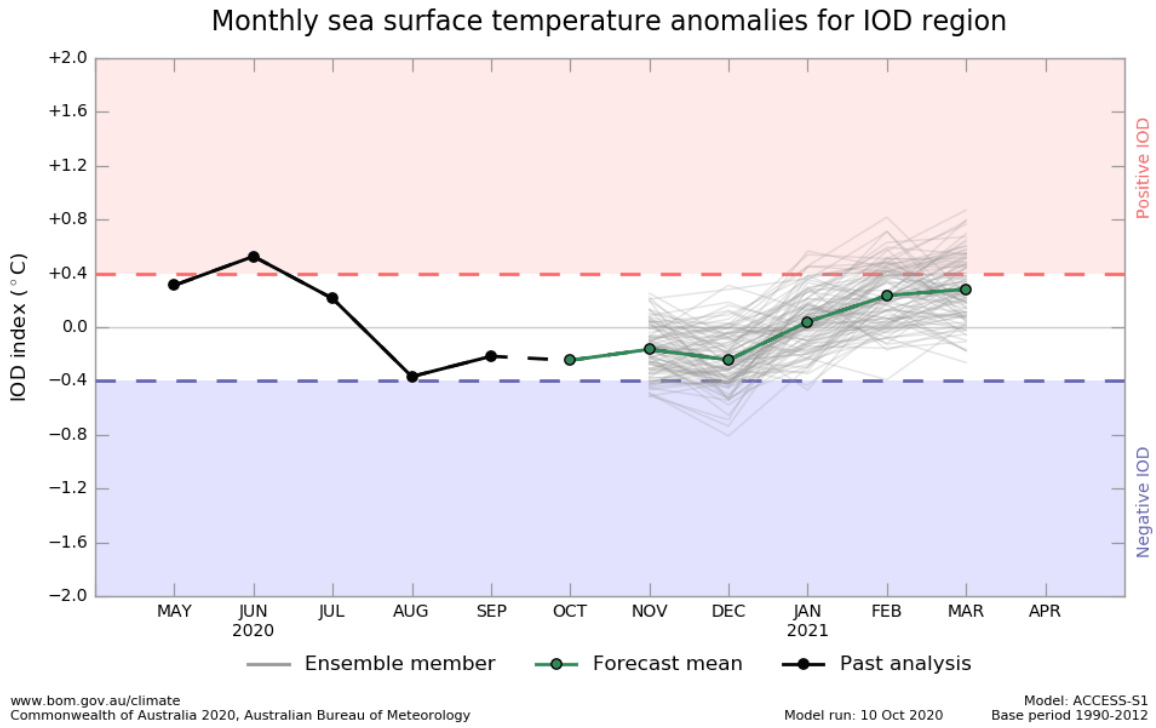


Figure 4: Monthly Indian Ocean Dipole (IOD) index. Source: Australian Government, Bureau of Meteorology (BOM), http://www.bom.gov.au/climate/enso/#tabs=Indian-Ocean

2.1.2. Atmosphere

Seasonal averages of 500-hPa geopotential in summer 2020 show a slight ridge over the western Mediterranean and a broad trough over the eastern Mediterranean (Fig. 5), but they were mainly close to normal patterns. Only the northeastern parts of the domain, namely the Ukraine had notably more anticyclonic conditions. However, there were strong fluctuations from month to month (Fig. 6). June had a very meridional pattern over Eastern Europe and was mainly cyclonic over the Balkans and the eastern Mediterranean, also over Western Europe, while an intense ridge extended over European Russia to the north. July and August had weaker anomalies, which partly compensated each other.

Sea level pressure had mostly a cyclonic anomaly over the MedCOF domain on seasonal average (Fig. 7), but again with large differences from month to month (Fig. 8). The general picture expected from the forecasts (higher pressure over Central and Southern Europe, more intense westerlies over Northern Europe) occurred only temporarily in summer 2020 (mainly in July), but not generally that summer, in June 2020 it was even vice versa.

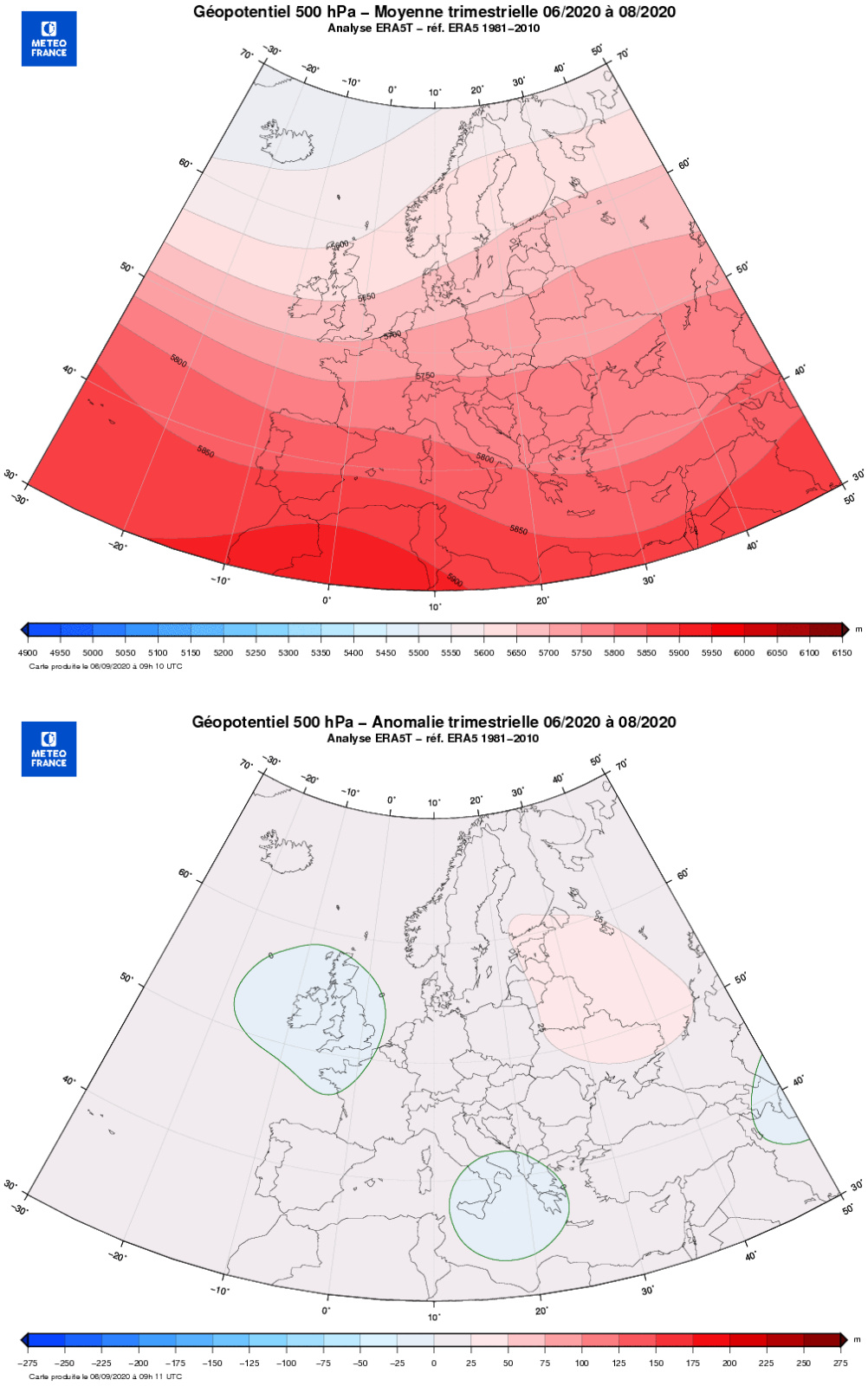


Figure 5: Seasonal mean and anomalies of 500-hPa geopotential for summer 2020 (1981-2010 reference). Source: Météo France, data source: ECMWF ERA5/ERA5T reanalysis, http://seasonal.meteo.fr/content/suivi-clim-cartes-ERA5

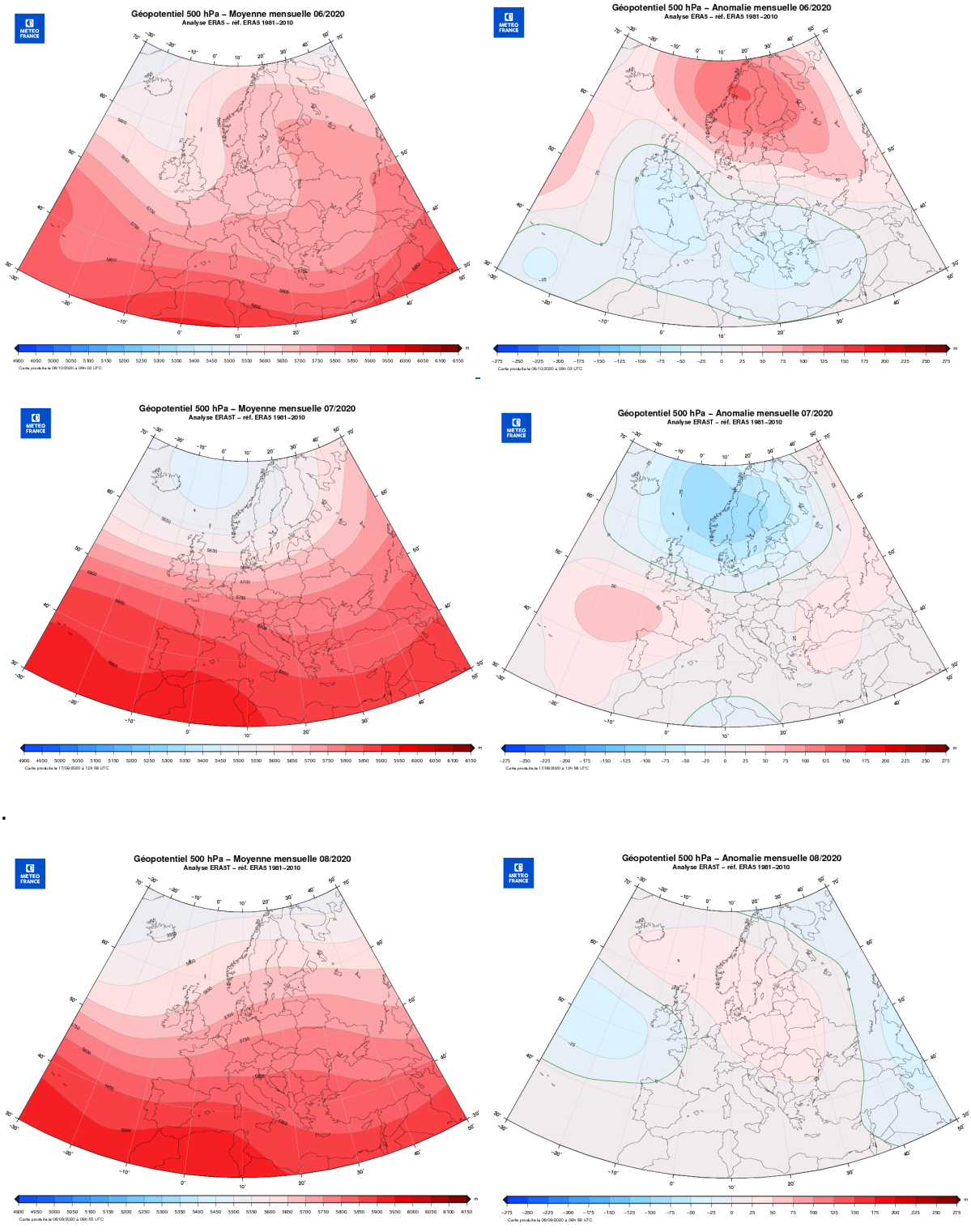
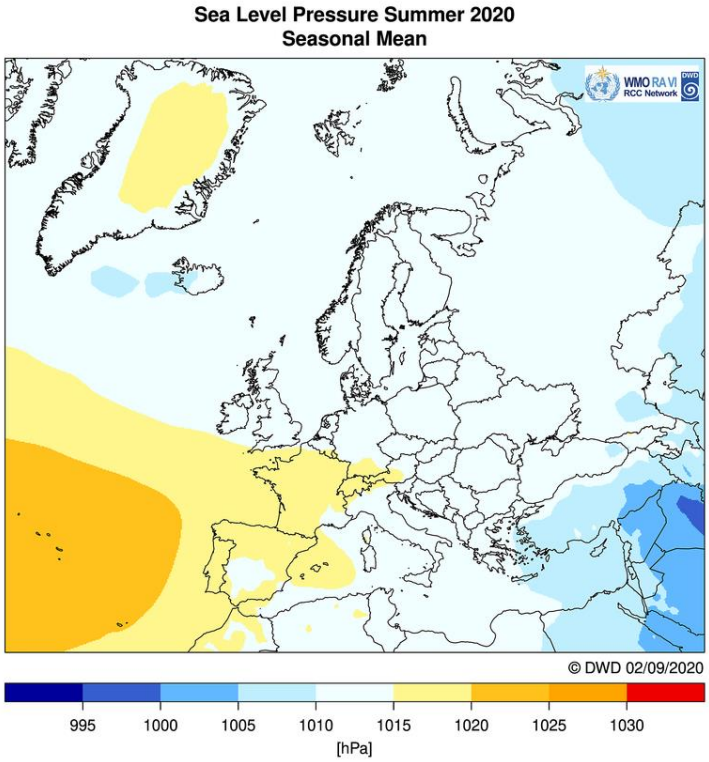


Figure 6: Same as Figure 5, but for the months June, July, and August 2020.



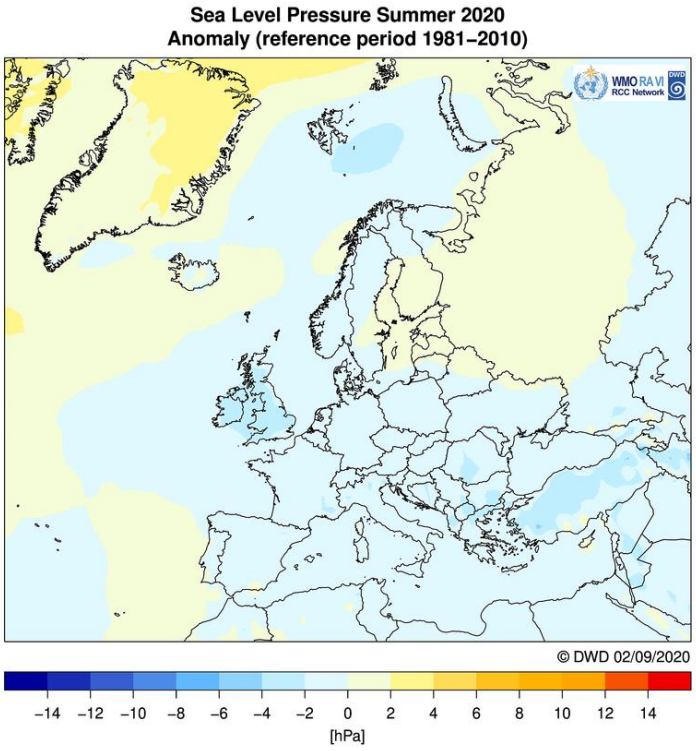


Figure 7: Seasonal mean sea level pressure (upper graph) and its seasonal anomalies (lower graph) for summer 2020 (1981-2010 reference). Source: Deutscher Wetterdienst (DWD), data source: DWD numerical ICON model analysis, http://www.dwd.de/EN/research/weatherforecasting/num_modelling/01_num_weather_prediction_modells/icon_description.html?nn=484268

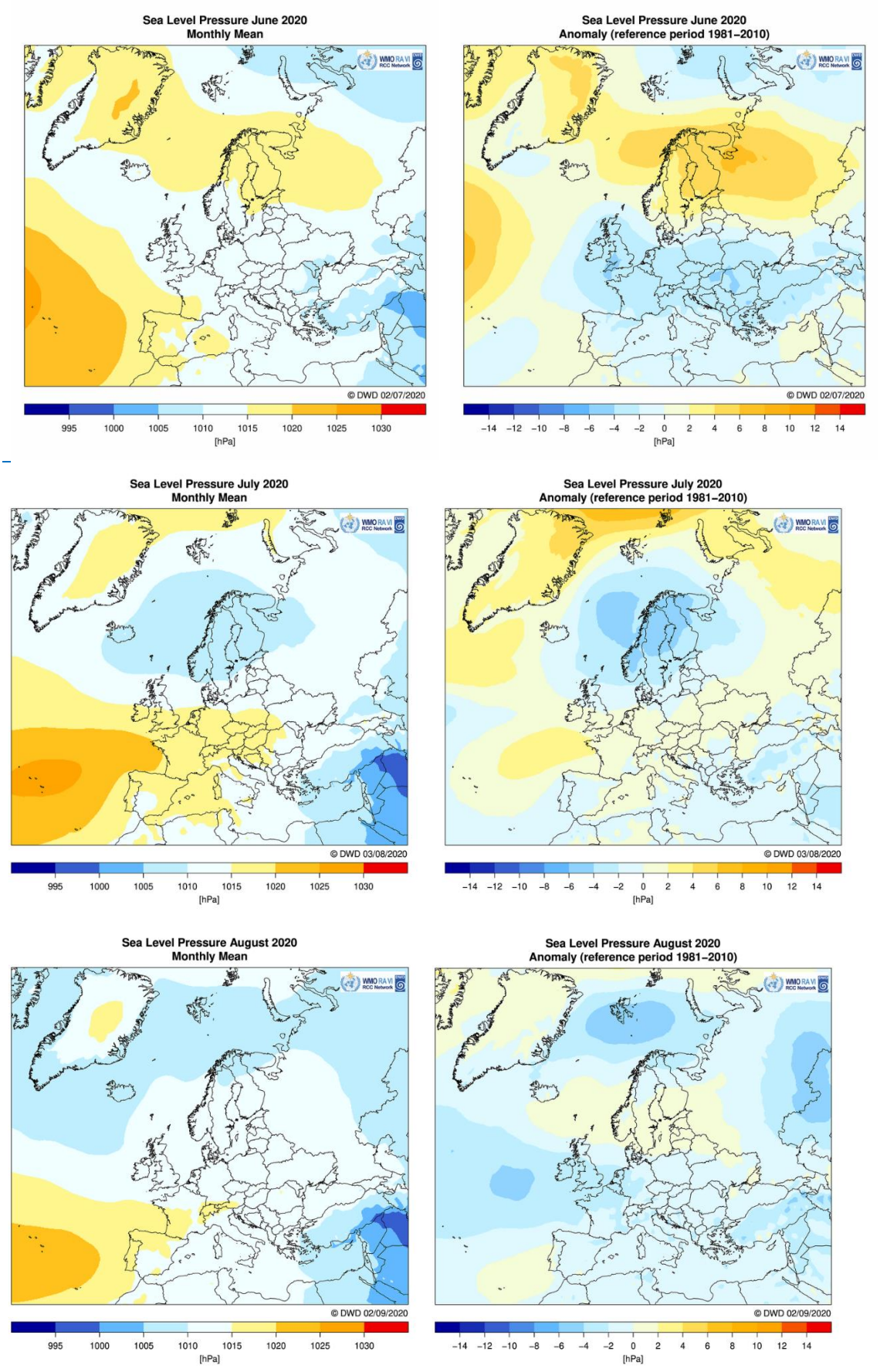


Figure 8: Same as Figure 7, but for the months June-August 2020.

The Météo France weather type classification showed a slight preference for summer blocking and Atlantic low types (Fig. 9), while the expected zonal type occurred only in July 2020 more frequently.

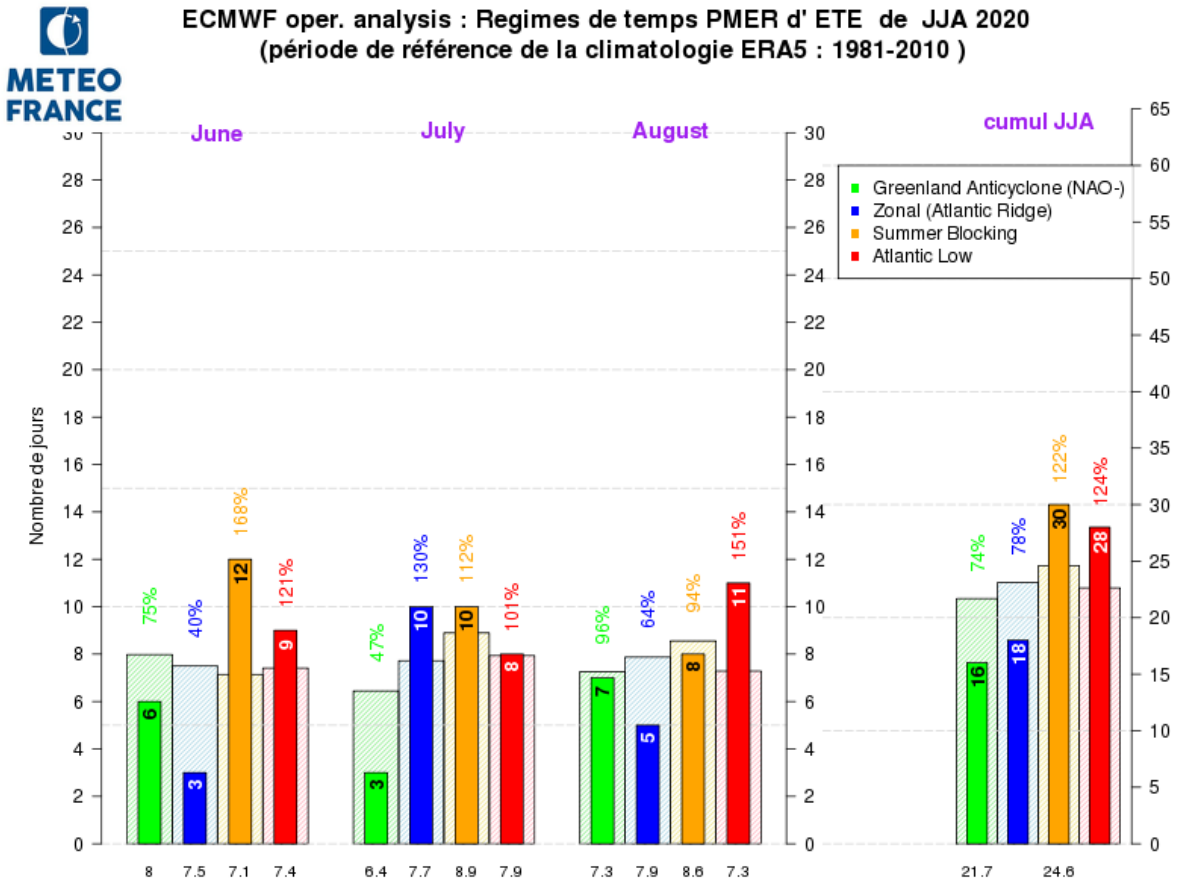


Figure 9: Number of days with circulation types of the Météo France classification for each month of the summer 2020 season and for the whole season (right), and in percent of the climatological frequency distribution 1981-2010. Source: Météo France, http://seasonal.meteo.fr/en/content/suivi-clim-regimes-trim

The NOAA CPC classification also reveals a change within the summer months (Tab. 2). In June 2020, a negative East Atlantic – West Russia pattern dominated (low pressure over the East Atlantic, high pressure over west Russia), but it weakened in July. Instead, a negative phase of a Scandinavia pattern (low over Scandinavia) came up in July and a positive phase of an East Atlantic pattern developed in August.

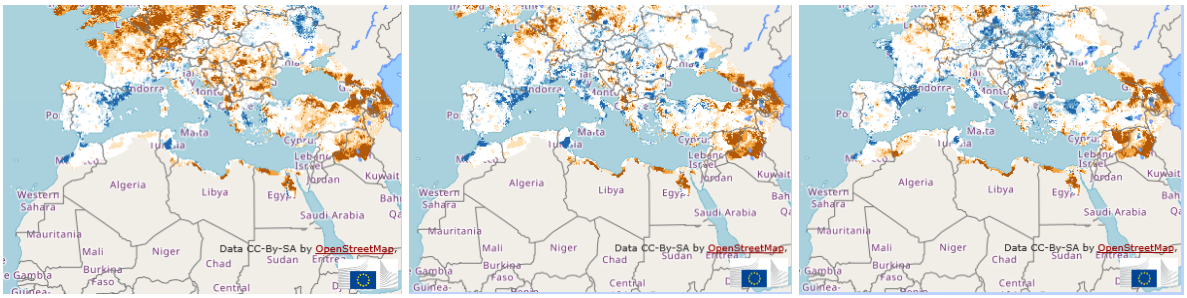
yyyy	mm	NAO	EA	WP	EP/NP	PNA	EA/WR	SCA	TNH	POL	PT	Ex.V
2020	6	0.16	-0.08	-1.25	-0.69	0.86	-2.01	0.58	-99.90	-0.24	-99.90	55.5
2020	7	-1.19	0.46	-0.54	-1.97	1.20	-0.68	-2.29	-99.90	-0.08	-99.90	56.0
2020	8	0.03	1.57	-0.21	-2.39	1.80	0.64	-1.56	-99.90	-0.51	0.54	75.6

Table 2: Circulation indices of NOAA CPC patterns for the summer months 2020. ExV = explained variance in %. ftp://ftp.cpc.ncep.noaa.gov/wd52dg/data/indices/tele_index.nh

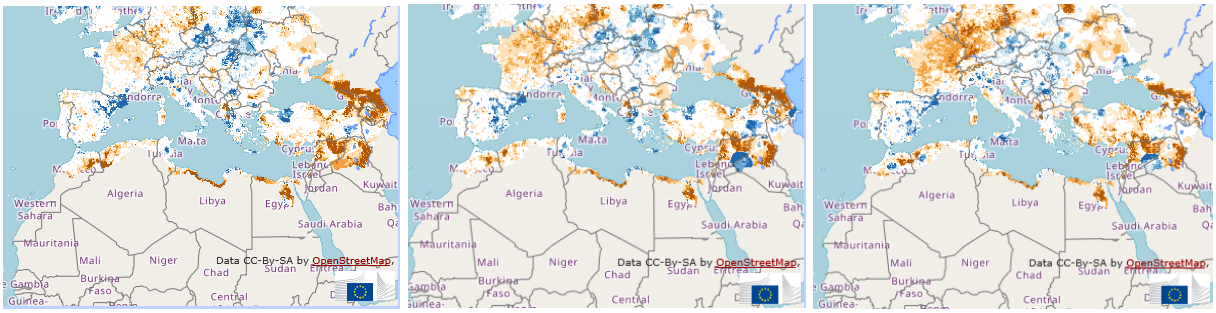
2.2. Soil moisture

Over Western Europe and the Balkan Peninsula, soil moisture was below normal in early June, but this did not persist during summer except for eastern Bulgaria. In contrast, the soils were dry in the South Caucasus region and parts of Turkey during much of the summer, later also in the Ukraine. This means, soil moisture had only partly an impact in the domain.

June 2020 first decade *second decade* *third decade*



July 2020 first decade *second decade* *third decade*



August 2020 first decade *second decade* *third decade*

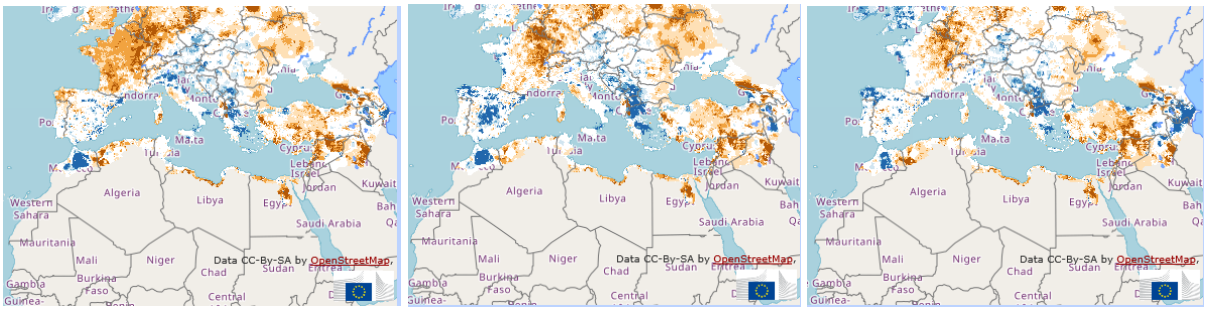


Figure 10: Soil moisture anomalies for 10-day periods in summer 2020 (brown: below normal, blue: above normal, 1995-2019 reference). Source: European Drought Observatory (EDO), https://edo.jrc.ec.europa.eu/edov2/php/index.php?id=1138

2.3. Temperature

Europe and Middle East (RA VI)

Temperature was higher than the 1981-2010 normal in almost the entire domain with anomalies mostly around +1°C (Fig. 11). A few places had near-zero or even slightly negative anomalies, especially in northwestern France (Brittany) and southern Italy. On the other hand, the central Ukraine was +2°C warmer than normal. In France, it was the 7th warmest summer and the third warmest August since 1900.

Seasonal mean temperatures in the lowlands ranged from around 18°C in northwestern France to around 30°C in southeastern Turkey, Syria, Israel and Jordan, in higher elevations mostly between 15 and 20°C.

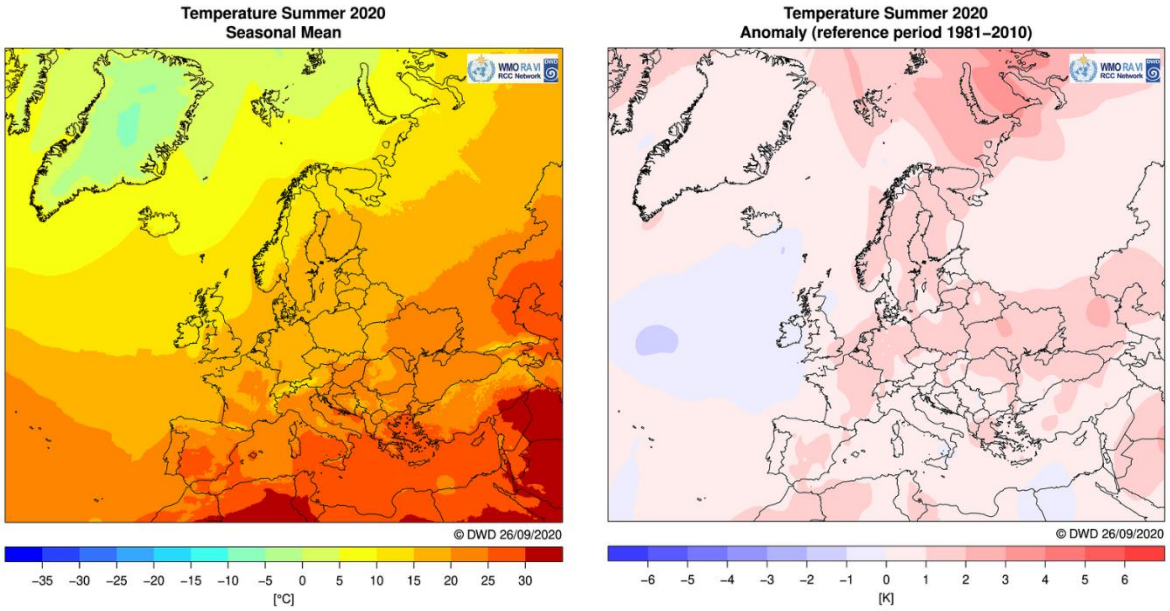


Figure 11: Surface air temperature for summer 2020. Left: seasonal mean, right: anomalies, 1981-2010 reference, source of both maps: WMO RAVI RCC, based on interpolated CLIMAT data, www.dwd.de/rcc-cm

In terms of terciles, temperatures were in the upper tercile in much of the domain (Fig. 12-14). Only some places in various parts of the domain had seasonal means in the middle tercile, a few isolated places even in the lower tercile. The latter might be due either to local effects or to artificial interpolation results.

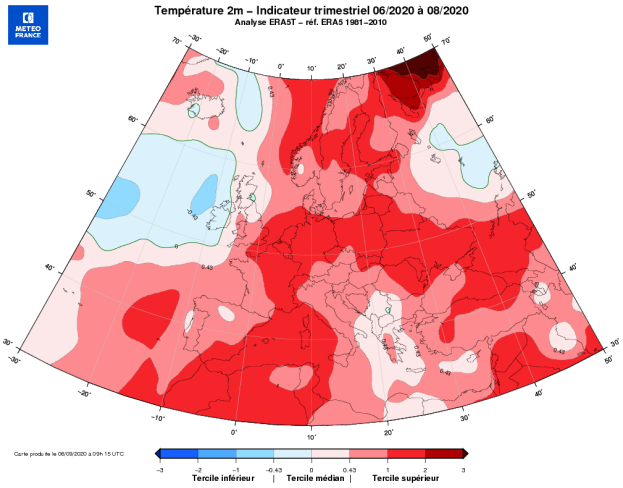


Figure 12: Seasonal normalized temperature anomalies of summer 2020 surface air temperature based on ERA5T grid data, 1981-2010 reference. The data range between -0.43 and +0.43 represents the middle tercile, below -0.43 the lower tercile and above +0.43 the upper tercile. Source: Météo France, data reference: https://www.ecmwf.int/en/forecasts/datasets/reanalysis-datasets/era5

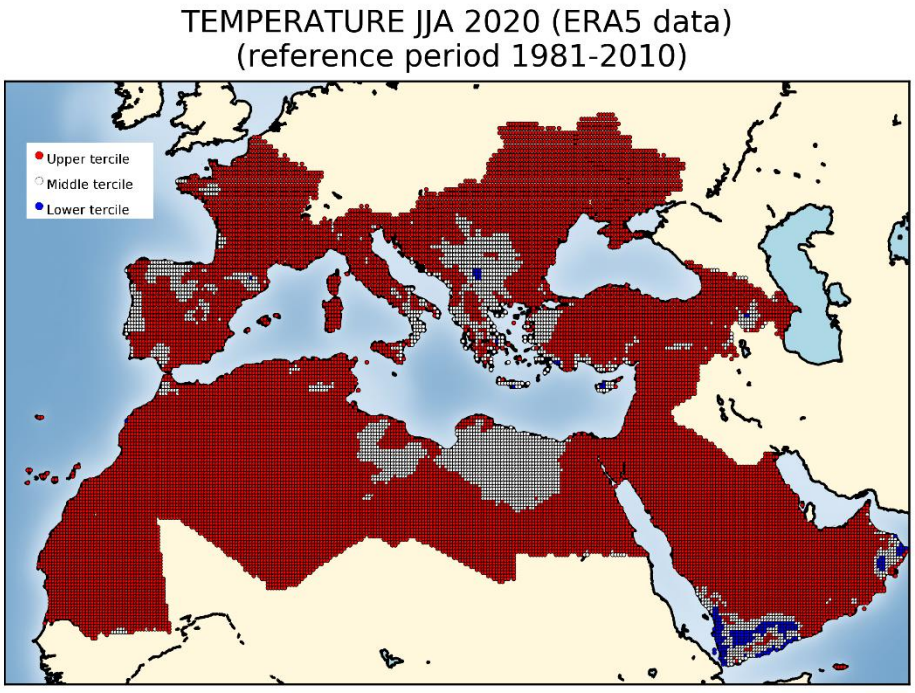
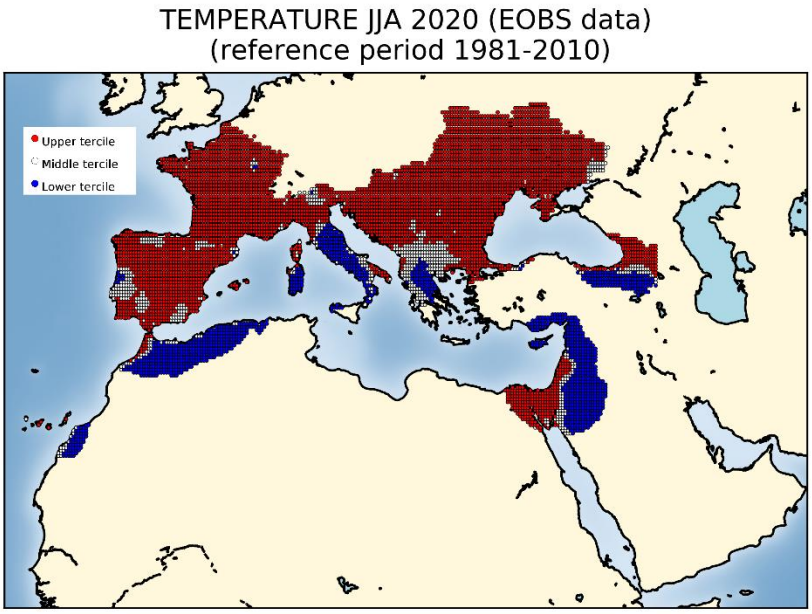


Figure 13: Terciles of summer 2020 surface air temperature based on ERA5 Reanalysis, 1981-2010 reference. Source: AEMET, data source https://www.ecmwf.int/en/forecasts/datasets/reanalysis-datasets/era5

E-OBS data shows some more areas in the lower tercile, but this is not supported by other data sources, so it might be due to erroneous data.



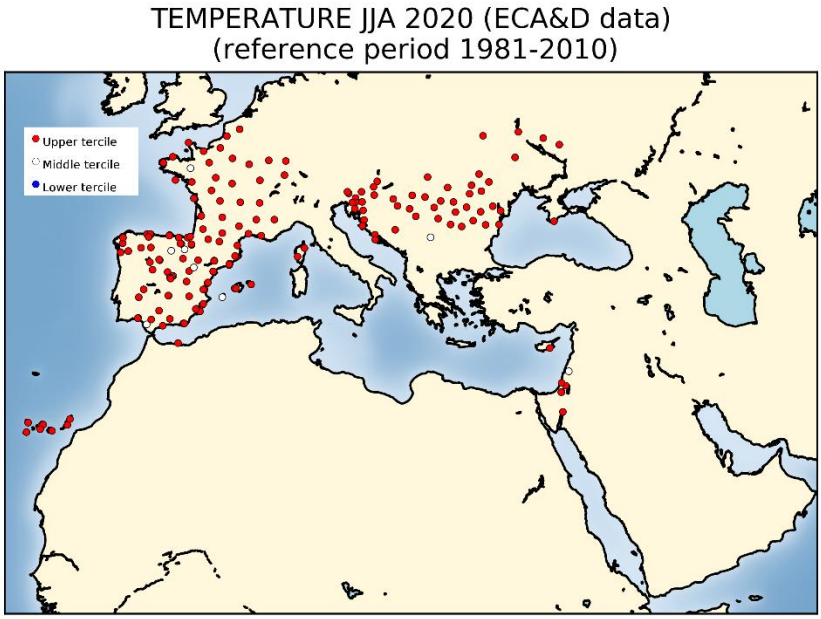


Figure 14: Terciles of summer 2020 surface air temperature based on interpolated E-OBS grid data (upper graph) and individual ECA&D station data (lower graph), 1981-2010 reference. Note: E-OBS uses a higher number of stations than those which are freely available at ECA&D. Source: AEMET, data source: http://www.ecad.eu/

North Africa (RA I)

Summer 2020 was above normal in almost all over the North Africa region (Fig. 16). Mean temperatures were ranging between 16.5°C and 46°C (Fig. 15). The seasonal mean temperature was at its minimum over the center of Morocco and the coastal areas of North Africa.

Most parts of the domain had temperatures in the upper tercile (Fig. 17). There were only some regions in the northeast of Libya and the south of Egypt, where the temperature was in the lower tercile.

In Morocco, the temperatures were above normal over almost all the country.

In Algeria, the mean temperatures were normal to above normal approximately all over the country. The anomalies recorded were more than +2°C compared to normal climate value particularly in the western country from the north to the south, and normal values were observed in the extreme northeastern region, and central littoral zone.

In Tunisia, the summer season temperature was above normal over almost all of the country with exception of some regions in the northeast, the southeast and the central west where normal conditions were observed.

In Libya, the temperature was below normal over the extreme northeastern regions, and normal over the south, in the remaining regions the temperature was above normal.

Above-normal temperatures were observed over almost all of Egypt except the south where the temperature was normal to below normal.

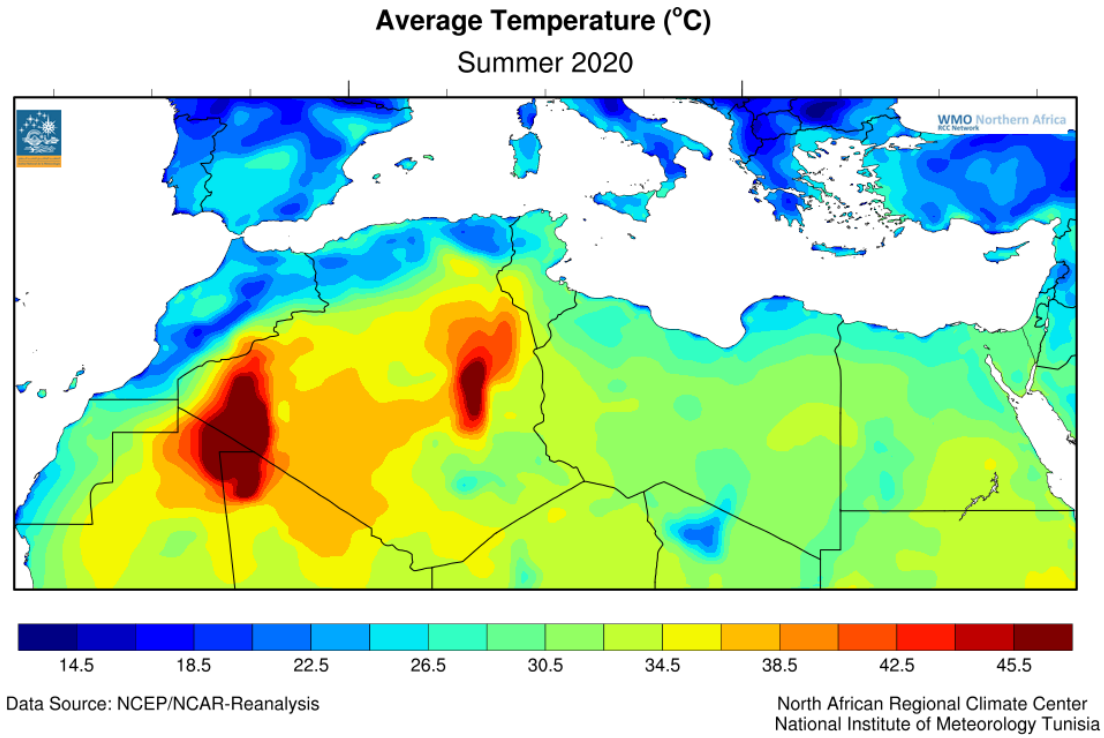


Figure 15: Mean temperature for summer season 2020 in North Africa (in °C). Source: INM, (Data from NCEP/NCAR reanalysis, http://www.esrl.noaa.gov)

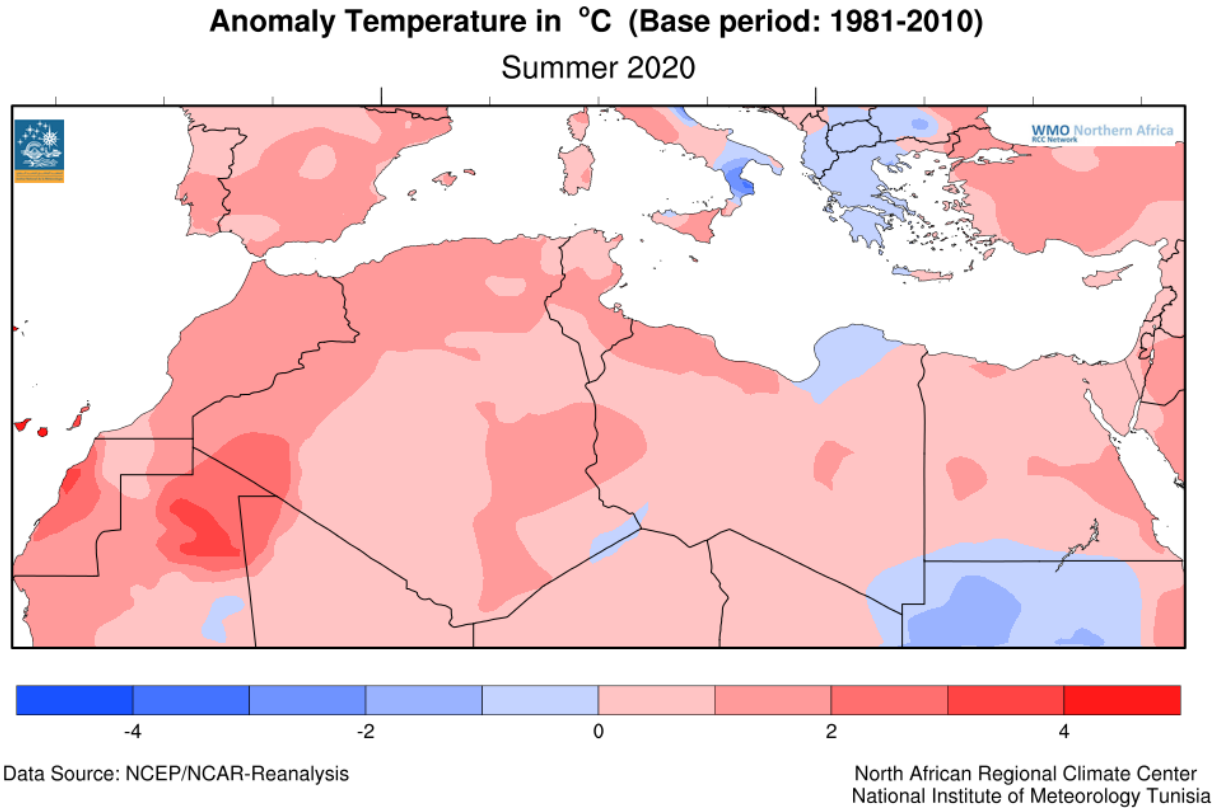


Figure 16: Temperature anomaly for summer season 2020 in North Africa (in °C), reference period 1981-2010. Source: INM, Data from NCEP/NCAR reanalysis, http://www.esrl.noaa.gov

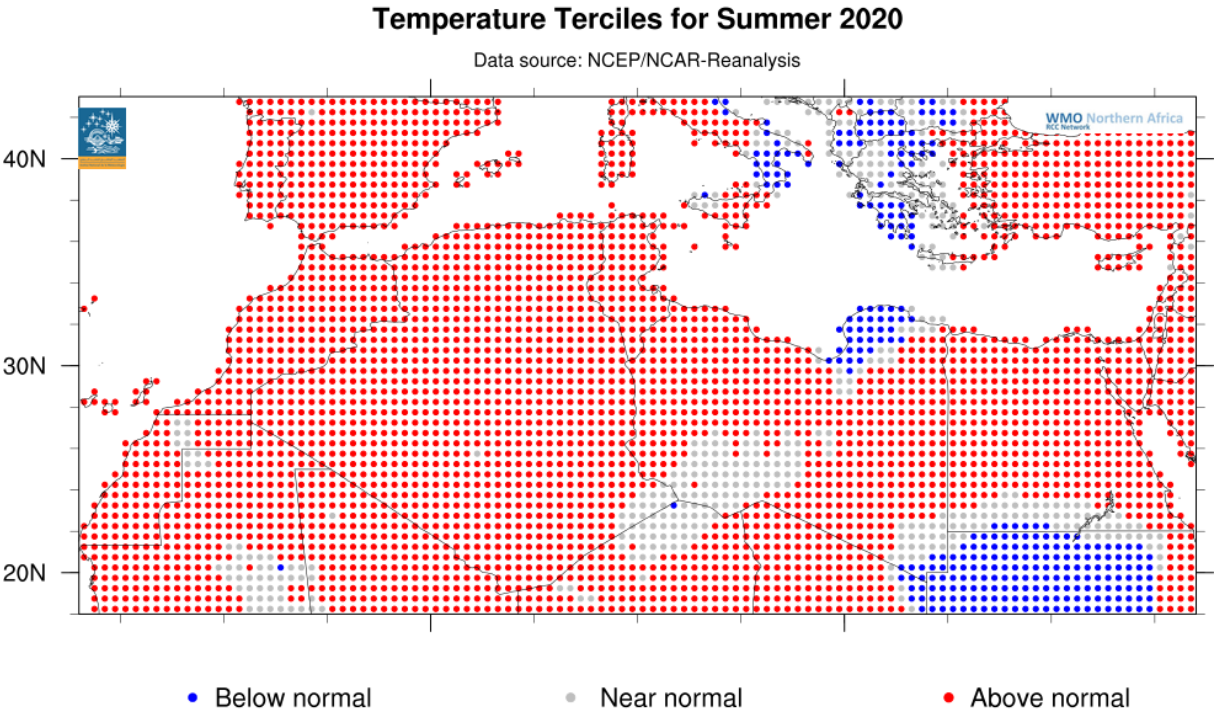


Figure 17: Tercile distribution for temperature of JJA 2020 in North Africa, reference period 1981-2010. Source: INM, Data from NCEP/NCAR reanalysis, http://www.esrl.noaa.gov

2.4. Precipitation

Europe and Middle East (RA VI)

Precipitation was above normal in the westernmost parts of the domain (western France, northwestern Iberia), parts of Italy (particularly the north and in Sardinia), western parts of the Balkan Peninsula from Slovenia to northern Greece and in parts of the South Caucasus region, locally also in northeastern Turkey (Fig. 18). In contrast, precipitation was below normal in most of the other parts of France, parts of Iberia, and most areas around the Black Sea. It was the driest July in France since 1959.

Seasonal totals ranged from zero in Israel and Jordan to above 600mm in the Alps.

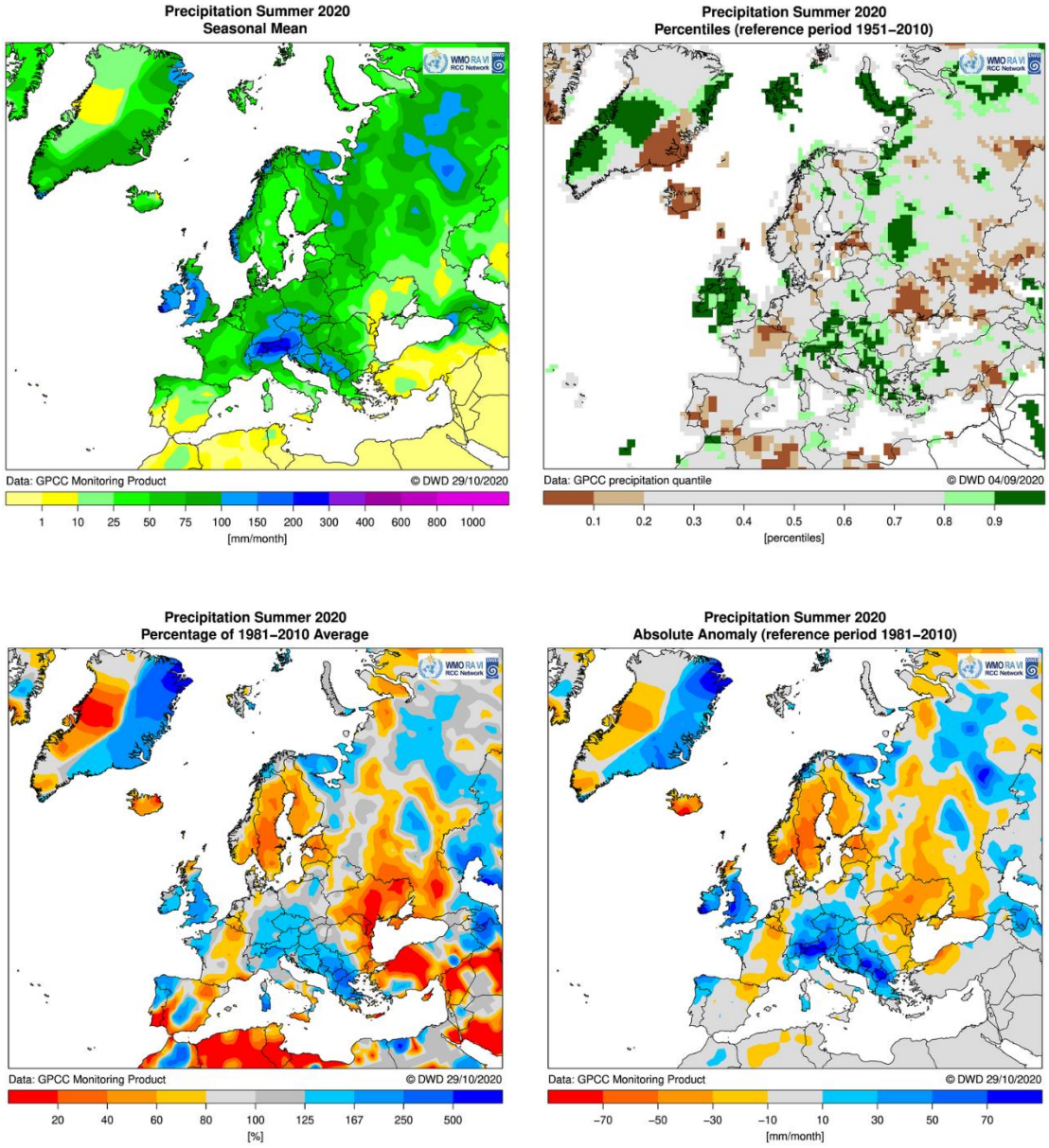
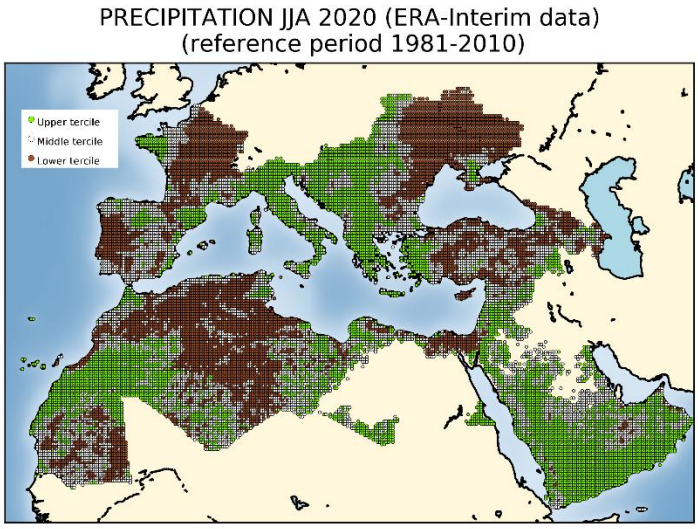


Figure 18: Precipitation for summer 2020 in Europe. Upper maps: seasonal total in mm/month and percentiles, lower maps: percentage of 1981-2010 average and absolute anomalies, source: WMO RAVI RCC, www.dwd.de/rcc-cm , data source: GPCC, http://gpcc.dwd.de

In terms of percentiles, precipitation was in the upper tercile particularly in Italy and much of the Balkan Peninsula, but also in various other places of the domain (Fig. 19-20). Most of France, Iberia, the Ukraine and areas west of the Black Sea, Turkey and the South Caucasus had precipitation either in the lower or in the middle tercile. There are slight differences between the verifying datasets, but the general patterns are similar.



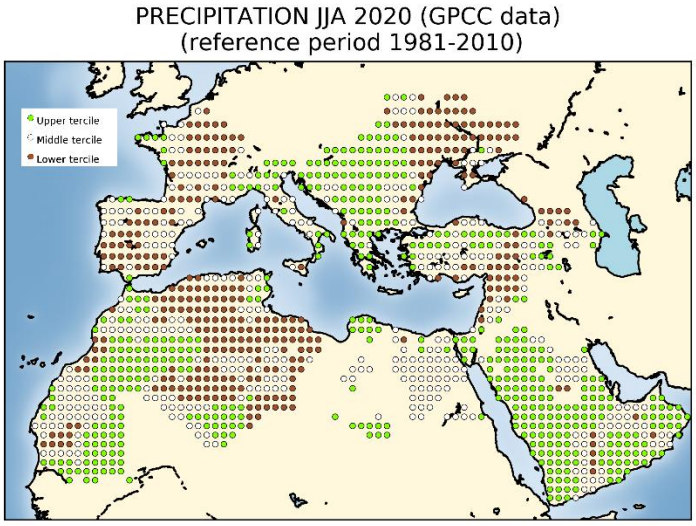
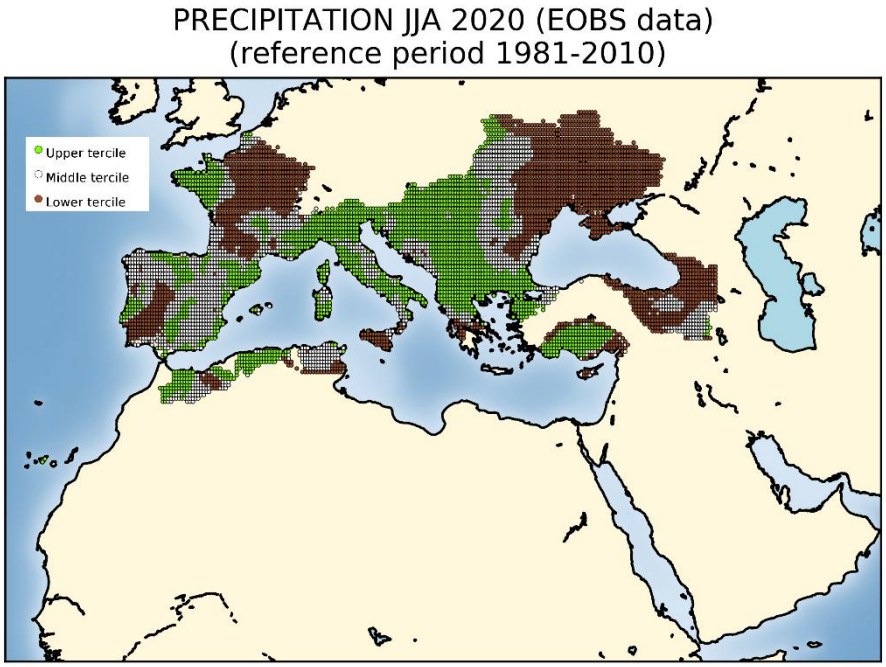


Figure 19: Terciles of summer 2020 precipitation based on ERA-INTERIM/ERA5 Reanalysis (upper graph) and GPCC (lower graph) grid data, 1981-2010 reference. Source: AEMET, data reference:

ERA-INTERIM: http://www.ecmwf.int/en/research/climate-reanalysis/era-interim ,

ERA5: https://www.ecmwf.int/en/forecasts/datasets/reanalysis-datasets/era5 , GPCC: http://gpcc.dwd.de



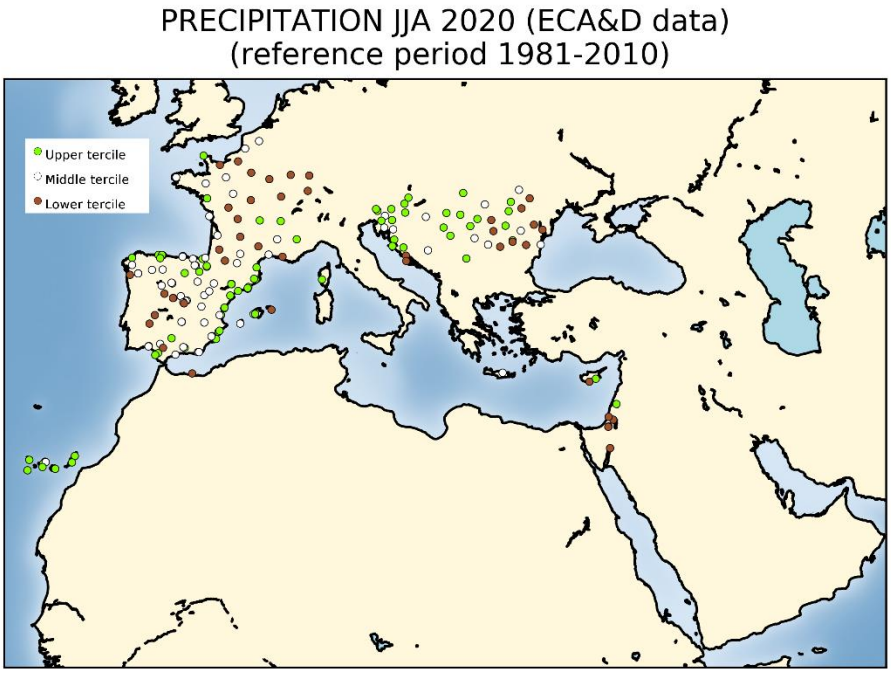


Figure 20: Terciles of summer 2020 precipitation based on interpolated E-OBS grid data (upper graph) and individual ECA&D station data (lower graph), 1981-2010 reference. Source: AEMET, data source: http://www.ecad.eu/

A more detailed analysis for south-eastern Europe, including high impact events, is given in the analysis and verification report of the SEECOF-23 CLIMATE OUTLOOK for the 2020 summer season for southeast Europe (SEE), provided by SEECOF-24 (presently draft version):

http://www.seevccc.rs/SEECOF/SEECOF-24/STEP-1/Draft-Version-Final-assessment-of-SEECOF-23-climate-outlook-for-summer-season-2020-28-10.pdf

North Africa (RA I)

During the 2020 summer season, the precipitation was above normal over some parts of North Africa (Fig. 22). According to the tercile map (Fig. 23), the precipitation was in the upper tercile over most parts of North Africa, in the lower tercile over the north of Algeria, the extreme north east of Morocco and in the lower or middle tercile over the western parts of Libya, northeastern and southwestern parts of the Algerian Sahara and the north and the centre of Tunisia.

In Morocco, precipitation during summer 2020 was above normal over mountains (Tetouan, Alhouceima, Taza, Fez, Ifrane and Midelt), coastal (Larache, Kenitra, Rabat, Aljadida and Safi) and Saharan (Laayoune and Dakhla) stations. Elsewhere, below-normal precipitation was recorded towards the northeast (Oujda), the southeast (Errachidia) and the central west (Agadir and Sidi Ifni) regions.

Except the northwestern zone of the Sahara, the accumulated rainfall totals in most parts of Algeria were below normal. The eastern highlands zones observed the maximum amount reaching 60 mm during the whole 3 months' summer period (June-July-August, Fig. 21). However, Algeria recorded a high deficit rainfall amount where the percentages with respect to the normal conditions were varying between -50 % and -100%. Therefore, the summer conditions were drier in a large part of Algeria.

In Tunisia, the total precipitation amount was above normal in the northeast region and at small stations distributed in the centre and the southwest. Over the remaining region, the precipitation was normal to below normal.

In Libya, the precipitation was above normal over most parts of the country and near normal over the western regions.

In Egypt, the precipitation was above normal over all of the country.

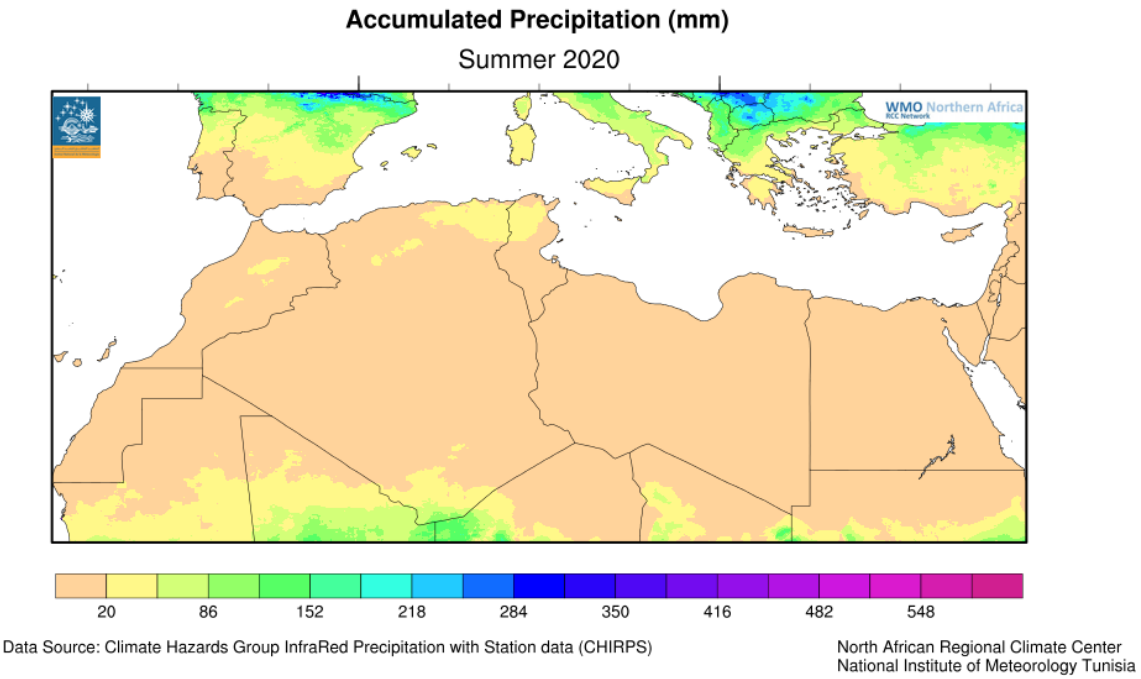


Figure 21: Total precipitation for summer season 2020 in North Africa (in mm). Source: INM, Data from CHIRPS: ftp://ftp.chc.ucsb.edu/

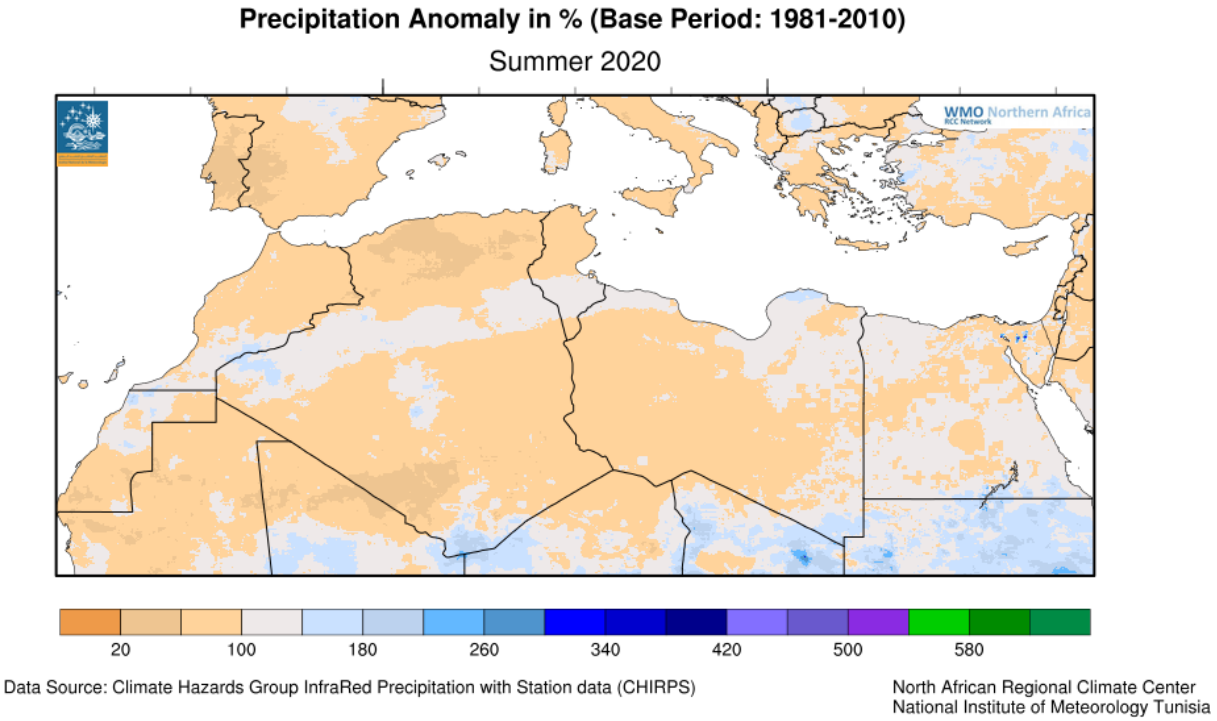


Figure 22: Precipitation anomaly for summer season 2020 in North Africa (in %) (Reference period 1981-2010). Source: INM, data from CHIRPS: ftp://ftp.chc.ucsb.edu/

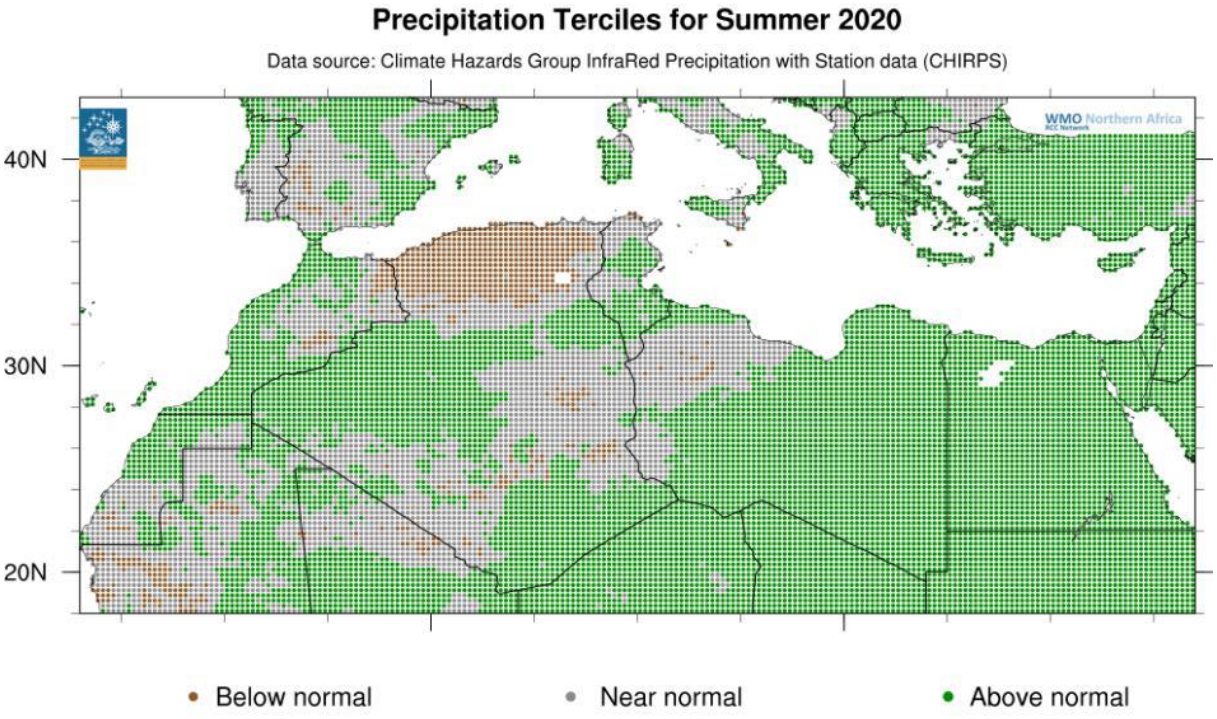


Figure 23: Terciles for precipitation (Reference period 1981-2010). Source: INM, data from CHIRPS: ftp://ftp.chc.ucsb.edu/

3 Verification of the MedCOF-14 climate outlook for the 2020 summer season

3.1. Temperature

Europe/RA VI

The MedCOF-14 outlook favored the upper tercile for almost the whole domain with 50-60% probability. Only for northwestern France and northwestern Iberia, the middle tercile was preferred (40%).

The outlook was correct for most of the domain since much of it had temperatures in the upper tercile. Some parts of the domain had temperatures in the middle or maybe lower tercile due to subscale effects, so the outlook partly overestimated the temperature. In northwestern France and northwestern Iberia, the temperature was partly in the upper and partly in the middle tercile, therefore the outlook was also partly correct in that area.

North Africa (RAI)

The MedCOF-14 climate outlook for the summer 2020 season favored the upper tercile over most of the entire North African domain.

The outlook for temperature was correct over most of the region with exception of small regions in the NW of Libya and the south of Egypt where the temperature was in the lower tercile.

3.2. Precipitation

Europe/RA VI

The MedCOF-14 outlook favored a dry scenario (lower tercile) over almost the whole domain with 50% probability, especially for southern Europe and the Mediterranean Sea area. No preferred scenario was given to the northernmost (northern France, northern Ukraine) and easternmost (South Caucasus, eastern Turkey, Middle East) parts of the domain.

The outlook was only for parts of the domain correct, such as western Iberia, most of France, west of the Black Sea and parts of central Turkey. Italy and large parts of the Balkan Peninsula, the Mediterranean sea areas and western Turkey had precipitation in the upper tercile, which was underestimated by the outlook.

North Africa

No scenario for the North Africa region was favoured, as summer is considered as dry season for most of North Africa. In fact, the precipitation was above normal over the most parts of North Africa: Egypt, most parts of Libya, the northwest of the Algerian Sahara, the NE and the CW of Tunisia and over the extreme NW, the mountains and the Saharan regions of Morocco. Elsewhere precipitation was normal or below normal.

MedCOF-14 precipitation prediction did not give valuable information.

4. Users' perceptions of the MedCOF-14 outlook

Europe/RA VI

For the SEECOF domain, Users' perceptions are reflected in the national verification summaries for SEECOF-23, which are available on the SEECOF website:

http://www.seevccc.rs/SEECOF/SEECOF-24/STEP-1/

From the other countries, the following information was given:

Spain: AEMET provides seasonal forecasts to the general public on the AEMET webpage and on the MedCOF webpage.

North Africa

Morocco: The seasonal forecast outlook is monthly disseminated to 15 departments and ministries.

Tunisia: The permanent national commission responsible for drawing up the national plan to fight against disasters and their prevention and the Ministry of Agriculture.

Appendix A: Contributors to verification of MEDCOF-14

- World Meteorological Organization as initiator and supporter of this activity

Europe and Middle East (RA VI)

- **Climate Centres:**

- WMO RA VI RCC Offenbach Node on Climate Monitoring, Deutscher Wetterdienst, Germany
- South East European Virtual Climate Change Center hosted by Republic Hydrometeorological Service of Serbia, Republic of Serbia

- **National Meteorological and Hydrological Services:**

- Republic Hydrometeorological Service, Republika Srpska, Bosnia and Herzegovina
- National Institute of Meteorology and Hydrology, Bulgaria
- Météo France, Republic of France
- National Environmental Agency (NEA), Georgia
- Deutscher Wetterdienst, Federal Republic of Germany
- Hellenic National Meteorological Service, Greece
- Israeli Meteorological Service
- Republic Hydrometeorological Service of Serbia, Republic of Serbia
- AEMET, Spain
- Turkish State Meteorological Service, Republic of Turkey

- **Further National Meteorological and Hydrological Services via SEECOF-24:**

- Centre of Operational Hydrometeorology, Armenia
- Federal Hydrometeorological Institute, Federation of Bosnia and Herzegovina
- Meteorological and Hydrological Service of Croatia, Republic of Croatia
- Meteorological Service of Cyprus
- State Hydrometeorological Service, Republic of Moldova
- Hydrometeorological Institute of Montenegro
- Hydrometeorological Service of Republic of North Macedonia
- Slovenian Environment Agency, Slovenia
- Ukrainian Hydrometeorological Center, Ukraine

North Africa (RA I)

- Office National de la Météorologie, Algeria
- National Meteorological Directorate, Morocco
- National Institute of Meteorology, Tunisia

APPENDIX B: **Analysis and verification of the MedCOF-14 climate outlook for the summer season 2020:**

Europe/RA VI

Country	Seasonal temperature (JJA)		Seasonal precipitation (JJA)		High Impact Events
	Observed	**MedCOF-14 climate outlook for temperature**	**Observed**	**MedCOF-14 climate outlook for precipitation**	
Albania *	Normal to above normal	Above normal (10, 30,60)	Around normal	Below normal (50,30,20)	No events
Armenia (1)	Above normal	Above normal (20, 30,50)	Below normal (90% of the norm)	No signal (33,33,33)	Extreme precipitation (41mm/3hour) on 19th of June in Gekharquniq region, (51mm/4.5 hour) in Lori region, 81mm/3.25hour in Gyumri (13.VII), 34mm/5hour in Syuniq region was recorded. Hail: Unusual hail in Shirak region, Flooding in Gyumri: (https://www.youtube. com/watch?v=38FZUW1fywQ) Forest fires: On June, a large fire broke out in Khosrov reserve, burning specially protected areas. Cold wave: In August 21-28, a cold wave was registered, particularly severe in the southeastern regions. The minimum temperature of 0°C was recorded in Ashotsk in those days, 1°C in Martini, - 1°C in Pushkin mountain pass, which are the lowest temperatures ever recorded in August in these areas. Drought: during summer, severe drought was observed in lowland areas. Wind storm: During summer, strong wind above (25m/sec) was observed; in Vaanadzor it is unusual for summer time.
Azerbaijan *	Above normal	Above normal (20, 30,50)	Normal to above normal	No signal (33,33,33)	No events

Country	Seasonal temperature (JJA)		Seasonal precipitation (JJA)		High Impact Events
	Observed	MedCOF-14 climate outlook for temperature	Observed	MedCOF-14 climate outlook for precipitation	
Federation of Bosnia and Herzegovina (1)	Above normal in almost entire Bosnia and Herzegovina (very warm and extremely warm)	Above normal (10, 30,60)	Below normal southwest Bosnia; Normal and above normal Central, West, East and South Bosnia and Herzegovina.	Below normal (50,30,20)	- July 25th: 63 mm – 1 hour. - August: Extremely warm for 60-70% territories
Rep. Srpska, Bosnia and Herzegovina (5)	Normal to above normal	Above normal (10, 30,60)	Normal to above normal	Below normal (50,30,20)	No events
Bulgaria (1)	Near or above normal	Above normal (10, 30,60)	Near or below normal	Below normal (50,30,20)	Drought conditions in East Bulgaria are the most prominent particularity of summer 2020. June was actually a wetter month and there were days with heavy rain and landslides, thunderstorms and hailstorms (9-10 and 14-15 June). July was wet in West Bulgaria and very dry in East Bulgaria. There was an undergoing drought since the summer of 2019 and in July it re-emerged in East Bulgaria despite the rain in June. August was similar to July with rain in the west and rather dry conditions in the east of the country. The wildfire season strengthened in east Bulgaria in August due to the drought.

Country	Seasonal temperature (JJA)		Seasonal precipitation (JJA)		High Impact Events
	Observed	MedCOF-14 climate outlook for temperature	Observed	MedCOF-14 climate outlook for precipitation	
Croatia (1,5)	Normal or above normal	Above normal (10, 30,60)	Normal (in the most part of Croatia) Below normal (part of Dalmatia) Above normal (part of the Istra, Gorski Kotar, northwestern and small part of eastern Croatia)	Below normal (50,30,20)	Two heat waves were observed during summer – the first one at the end of July and the second one around the middle of August. Along the Adriatic coast the heat wave was mainly due to the high minimum temperature. There were no temperature records observed. In all three months convective related severe weather phenomena (thunderstorms, hail, heavy rains, flash floods, waterspouts) were observed mostly all over Croatia: - on June 8th, the maximum daily amount of precipitation was observed in Istra (82 mm of rain fell in just 5 hours in Pazin) - on July 24th the extreme 1 hour amount of precipitation was recorded at Zagreb Grič (58,9 mm). An urban flood occurred in Zagreb during the night (24/25 July). In the period from June 24th at 12 UTC to June 25th at 12 UTC the amount of precipitation exceeded multi-annual average in July (which is 77 mm) - on August 5th (at 06 UTC) high precipitation amounts (in 24 hours) were measured in almost whole Croatia.

Cyprus (5)	Normal to above normal	Above normal (20, 30,50)	Below normal	Below normal (50,30,20)	June Extremes were recorded with great positive departures, like Athalassa station where the maximum for the station was 40.5°C departing 6.5°C from the normal (36°C), and at Achna station, where the maximum temperature of the station was 36.9°C, surpassing by 5.9°C of the normal of 31°C. For the period 27-29 of June EMMA yellow warnings were issued, concerning high temperature. July Above normal daily maximum temperatures (deviating by 4°C or more from normal) were recorded, like the highest daily maximum temperature of Prodromos that was 34.5°C (with a normal of 27.9°C). Highest daily minimum temperatures were also recorded, with positive departures greater than 4°C, like the station of Polis Chrysochous where a minimum of 25.6°C was by 4.5°C above station's normal (21.1°C). It is especially useful to add that Athalassa station on July 2020 recorded the highest mean maximum temperature (39.7°C) since 1982. During July EMMA warnings with yellow awareness level were issued, concerning extreme high temperatures on 3, 4, 6, 11, 12, 13, 14, 15, 20, 21, 22, 24, 25, 27 and 28 of July and with orange awareness level on 5, 29, 30 and 31 of July On the 10th, 12th, 13th, 14th και 15th of July isolated showers resulted in accumulated precipitation of 29% of normal. August Extremes were recorded with positive departures greater than 4°C, like Athalassa station where the highest daily maximum temperature (44.5°C) was 7.6°C greater than normal (36.9°C) and Prodromos station, where the highest daily maximum temperature (37°C) was 9°C greater than normal (28°C). For the dates 1, 2, 4, 5, 13-19 and 29 of August EMMA yellow warnings were issued, while for the dates 6 and 30 EMMA orange warnings were issued and the 31st of August EMMA red warning was issued. All the above warnings concerned high temperatures. On the 3rd, 4 th and 12th of August episodes of local showers resulted in accumulated precipitation of 0.3mm (15% of normal).

Country	Seasonal temperature (JJA)		Seasonal precipitation (JJA)		High Impact Events
	Observed	**MedCOF-14 climate outlook for temperature**	**Observed**	**MedCOF-14 climate outlook for precipitation**	
France *	Above normal West/ Northwest: locally around normal	Above normal (20, 30,50) Northwest: (30,40,30)	Mainly below normal Northwest and Southeast: above normal	South: below normal (50,30,20) Elsewhere: No signal (33,33,33)	- Heat wave 30 July - 1st August, intense but short - Heat wave 6-13 August, Severe like 2019 or 2003 in the northern part of the country - Hot, sunny and dry summer in northeastern France. Temperatures 1.5 °C above normal. Rainfall deficit from 30% to 70%. Strong dewatering of shallow soils
Georgia (1)	Above normal	Above normal (20, 30,50)	Near or below normal	No signal (33,33,33)	No events
Greece (2,5)	Above normal for most of the country	Above normal (10, 30,60)	Above or near to normal values (1971-2000) for the most of the country with the greater values occurring in west Macedonia, in the north Ionian Sea, in Attica and in the east Peloponnese.	Below normal (50,30,20)	Seven people including an 8- month-old baby lost their lives in heavy flooding caused by thunderstorms and torrential rains that swept the Greek island of Evia on 8th August 2020. The flooding blocked roads and damaged houses on the island, northeast of Athens. Dozens of people were evacuated from affected areas.
Hungary*	Above normal	Above normal (10, 30,60)	Above normal	Below normal (50,30,20)	No events

Country	Seasonal temperature (JJA)		Seasonal precipitation (JJA)		High Impact Events
	Observed	MedCOF-14 climate outlook for temperature	Observed	MedCOF-14 climate outlook for precipitation	
Israel (5)	Above normal	Above normal (20, 30,50)	No precipitation	No signal (33,33,33)	No events
Italy*	Above normal South: normal to above normal	Above normal (10, 30,60)	Normal to above normal, locally below	Below normal (50,30,20)	No events
Jordan*	Above normal	Above normal (20, 30,50)	No precipitation	No signal (33,33,33)	No events
Lebanon *	Above normal	Above normal (20, 30,50)	No precipitation	No signal (33,33,33)	No events
Moldova (5)	Above normal	Above normal (10, 30,60)	Below normal	Below normal (50,30,20)	During the summer season, stinging meteorological phenomena were reported in the form of torrential rains and hail (June, July), which caused damage to crops and damage to the objects of the national economy. The exceptionally warm weather and significant deficit of precipitation, which was observed on the territory of the Republic of Moldova for most of the summer (July-August) contributed to the pedological and atmospheric drought. Due to the dry conditions, which were maintained during much of July and August in a large part of the country, unfavorable conditions were reported for the formation of corn, sunflower, sugar beet, as well as for the growth and development of vegetable crops and other crops.

Country	Seasonal temperature (JJA)		Seasonal precipitation (JJA)		High Impact Events
	Observed	MedCOF-14 climate outlook for temperature	Observed	MedCOF-14 climate outlook for precipitation	
Montenegro (1,5)	Above normal	Above normal (10, 30,60)	Below normal (dry in the central and southern area) Normal in most of the country Above normal (NW-NE belt of northern mountainous region)	Below normal (50,30,20)	Pljevlja: new record of 175.6 mm in August 2020; 05.08.2020- Stormy wind and heavy precipitation in Podgorica and along the coast caused damages on the trees, streets were flooded and traffic was disrupted. https://www.kurir.rs/region/crna-gora/3509363/jako-nevreme-pogodilo-deo-crne-gore-u-podgorici-poplavljene-ulice-olujni-vetar-lomio-stabla-video
North Macedonia (5)	Normal	Above normal (10, 30,60)	Above normal - variable precipitation regime	Below normal (50,30,20)	July - Exceeded daily precipitation 53.6mm on 5th in Bitola
Portugal *	North: around normal South: above normal	Above normal (20, 30,50)	Below normal to normal	Below normal (50,30,20)	No events
Romania *	Above normal	Above normal (10, 30,60)	West: above normal East: below normal	Below normal (50,30,20)	No events

Country	Seasonal temperature (JJA)		Seasonal precipitation (JJA)		High Impact Events
	Observed	MedCOF-14 climate outlook for temperature	Observed	MedCOF-14 climate outlook for precipitation	
Serbia (1,5)	Above normal / Normal	Above normal (10, 30,60)	Above normal in almost entire Serbia	Below normal (50,30,20)	* Summer 2020 The 2nd wettest summer for Serbia in the last 70 years. The wettest summer for Nis and Kopaonik, 2nd wettest for Sjenica, Krusevac and Leskovac. Record-breaking daily precipitation sums for Kopaonik and Sjenica. Record-breaking number of summer days with the precipitation sums above 20 mm in Sjenica and Nis, and above 50 mm in Kraljevo and Kopaonik. * June Record-breaking daily precipitation sums in Kragujevac on June 11 and in Nis on June 16. Maximum number of days with precipitation above 20 mm exceeded at Zlatibor. * August Wettest August in Sjenica since record-keeping began.

Country	Seasonal temperature (JJA)		Seasonal precipitation (JJA)		High Impact Events
	Observed	MedCOF-14 climate outlook for temperature	Observed	MedCOF-14 climate outlook for precipitation	
Slovenia (5)	Above normal	Above normal (10, 30,60)	wetter than normal, except in the centre, east and parts of north-east where normal, and south-east where drier than normal	Below normal (50,30,20)	Intense high precipitation supercell storm in Domžale (10 km northeast from Ljubljana) and surroundings on 29 July. Extreme rainfall at places (> 50 mm/hour), giant hail (hailstones larger than 5 cm in diameter, some pieces 10 cm or even more), Fast moving (25 m/s) supercell storm caused damage in a long stretch in eastern Slovenia (area from Radeče to Ormož, around 46.25 °N, 15.63° E) on 30 August. Medium to large size hail and severe wind gusts (Lisca officially 25.6 m/s, Rogaška Slatina 21,1 m/s; locally more than 28 m/s), Brief, but intense hailstorm (5–10 minutes at places) in Kras (Tomaj and surroundings, about 45.76° N, 13.86° E) on 30 August.

Spain (5)	Above normal	Above normal (20, 30,50) Northwest: around normal (30,40,30)	Normal In parts above or below normal	Below normal (50,30,20)	First heat wave between 25 July and 2 August, and a second heat wave between 6 and 10 August, maxima well above 40°C Regarding cold episodes, the prolonged episode that lasted between June 5 and 19 stood out, with daily maximum and minimum temperatures well below normal, as well as the cold episode on 28-31 August, with temperatures also well below the usual for the time of year. As regards intense or heavy precipitation events during the 2020 summer, the most noticeable were: JUNE) a) 3-4 June. More intense rainfall in areas of the northern half of the IP, eastern Castilla-La Mancha and Sierra de Cádiz. b) 6-8 June. Precipitation in Catalonia, Valencia, Mallorca and Ceuta. c) 11 – 12 June. The north of IP was affected. d) 24-25 June. Storms of strong intensity in areas of the Pyrenees. JULY) e) 1-2 July. Precipitation in the eastern Cantabrian and in the northern half of Catalonia, being more intense in this latter area. f) 8-9 July. Precipitation with rainfall of some intensity in the north and east of IP. AUGUST) g) 11-12 August. The presence of a cut-off low in the west of IP caused intense precipitation in the center of Iberia, Córdoba, Galicia and Asturias provinces. h) 17-20 August. Precipitation affected Galicia, Cantabrian regions and northwest of Castilla y León. i) 28-29 August. Precipitation spread to the Cantabrian regions, Catalonia, the Mediterranean coast to Murcia and the Balearic Islands, exceeding 100 mm in areas of the Pyrenees between Barcelona and Girona.

Country	Seasonal temperature (JJA)		Seasonal precipitation (JJA)		High Impact Events
	Observed	**MedCOF-14 climate outlook for temperature**	**Observed**	**MedCOF-14 climate outlook for precipitation**	
Syria *	Above normal	Above normal (20, 30,50)	No precipitation	No signal (33,33,33)	No events
Turkey (2)	Near or above normal	Above normal West: (10, 30,60) Centre/East: (20,30,50)	Above normal at western and eastern Black Sea coast of the Turkey Below normal in the southeastern part of the Turkey	West: below normal (50,30,20) East: no signal (33,33,33)	On June 21, heavy rain and flood caused 6 casualties and also adversely affected agriculture areas in Bursa province (Western part of Turkey - Marmara Region). On August 22, a flood occurred in Giresun province (Eastern Black Sea Region) and its districts. 10 casualties and many buildings were destroyed or damaged. July 2020 was the sixth hottest July in the 50 years long-term period (1971-2020).

Country	Seasonal temperature (JJA)		Seasonal precipitation (JJA)		High Impact Events
	Observed	**MedCOF-14 climate outlook for temperature**	**Observed**	**MedCOF-14 climate outlook for precipitation**	
Ukraine (5)	Above normal	Above normal (20, 30,50)	below normal (56% stations) normal (23% stations) above normal (21% stations)	North: No signal (33,33,33) South: Below normal (50,30,20)	• During June and July meteorological extraordinary phenomena were observed in many regions of the country. In June, heavy rains and showers (30-62 mm precipitation per 1-10 hours), squalls (speed 25-29 m/c) were recorded • 22-23/06 in the Carpathian region were recorded, long heavy rains 100-158 mm per 11-23 hours. • During the rainy periods from 21 to 25 June, hydrological posts recorded the amount of precipitation in range from 100 to 400 mm. These rains caused catastrophic floods in Lviv, Ivano-Frankivsk, Chernivtsi, Zakarpattia regions, resulting in 3 casualties and flooding of 250 settlements. Agricultural lands were flooded, private houses were destroyed and farms, roads, bridges, shore protection, dams partially damaged. In July, heavy rains (30-60 mm precipitation per 2-9 hours), heavy showers (30-56 mm per 1hour, squall (speed 27 m/s) were recorded. Unfavorable weather conditions locally caused disruptions in power, telecommunications, utilities and transport. • Summer was arid in the former regions of Ukraine, with the exception of the western regions, in the center were areas with the driest conditions from 1961.

Note:

1 – Basic climatological period (1961-1990)

2 – Basic climatological period (1971-2000)

3 – Basic climatological period (1951-2000)

4 – Basic climatological period (1980-2009)

5 – Basic climatological period (1981-2010)

6 – No information about the basic climatological period

*Data base: ERA5 1981-2010 for temperature, GPCC 1981-2010 for precipitation

North Africa (RA I)

Country	Seasonal temperature (JJA)		Seasonal precipitation (JJA)		High impacts events
	Observed	**MedCOF-14 climate outlook for temperature**	**Observed**	**MedCOF-14 climate outlook for precipitation**	
Algeria (1)	Normal to above normal	Above normal	Below normal	No clear signal	- Hot and dry summer season. - Forest fire occurrence
Egypt *	Above normal	Above normal	Above normal over all of the country	No clear signal	No comment
Libya *	Above normal, locally below normal in the extreme NE	Above normal	Near to below normal in western parts Above normal elsewhere	No clear signal	No comment
Morocco (1)	Above normal conditions over almost all the country	Above normal conditions over Morocco (20/30/50).	Above normal conditions over extreme NW, mountains and Saharan regions Below normal conditions over NE and SE Atlas side Normal conditions elsewhere	No clear signal (33/33/33)	July: 2 absolute records of high daily minimum temperature for 2 stations: Agadir and Guelmim (central west region)

Country	Seasonal temperature (JJA)		Seasonal precipitation (JJA)		High impacts events
	Observed	**MedCOF-14 climate outlook for temperature**	**Observed**	**MedCOF-14 climate outlook for precipitation**	
Tunisia (1)	Near normal conditions over the NE,CW and the SE Above normal elsewhere	Above normal (10,40,50)	Above normal over NE/CW Normal to locally below normal elsewhere.	No clear signal	August : A new record for maximum daily temperature for the station of Kasserine (in the center west)

Note:
(1) Basic climatological period (1981-2010)
* Data source: Temperature: NCEP/NCAR reanalysis data, precipitation: CHIRPS

References:

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PRESANORD http://acmad.net/rcc/presanord.php

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