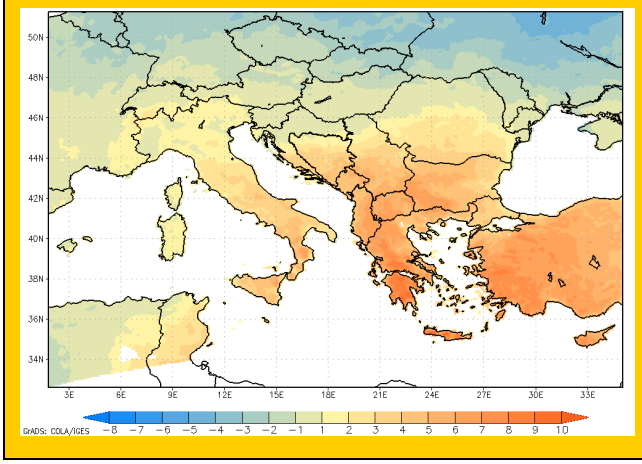
DROUGHT MONITORING BULLETIN

May 2020

HOT SPOT

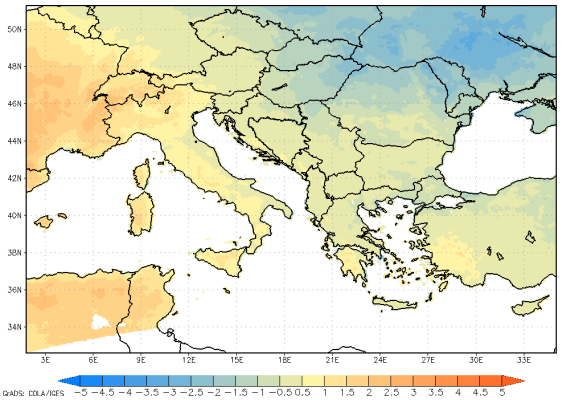


Although air temperatures in May were mostly colder than usual, southern half of Balkan Peninsula and western half of Turkey experienced a period of abnormally high air temperatures in mid-May. Daily air temperature maximums stretched as high as 35 °C in central and southern Greece, and reached 40 °C in western Turkey, exceeding the usual values for even 8-10 °C for this time of year. The **anomalies of 10-day mean air temperature from 11-20 May 2020** are presented in figure on the left.

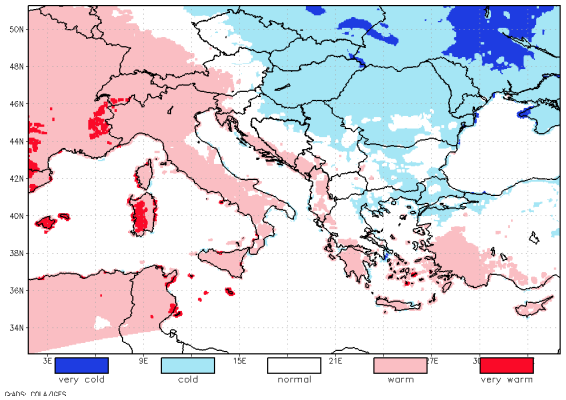
AIR TEMPERATURES AND SURFACE WATER BALANCE

*Figures in this section present anomalies of the average air temperature and accumulated surface water balance as well as classified values of the average **air temperature** and **surface water balance** in percentile classes for 60-day period **from 1 April to 30 May 2020**.*

AVERAGE AIR TEMPERATURE ANOMALY (°C)
1 APRIL – 30 MAY 2020



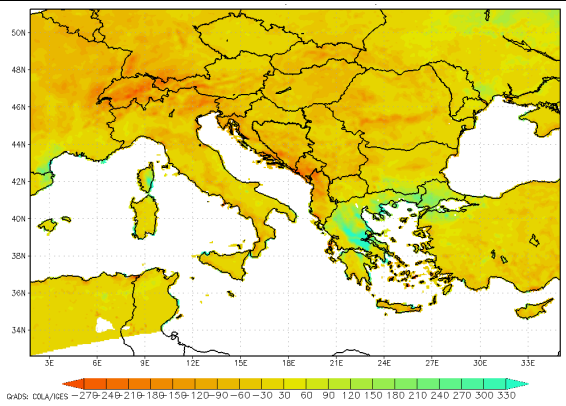
AVERAGE AIR TEMPERATURE PERCENTILE CLASSES
1 APRIL – 30 MAY 2020



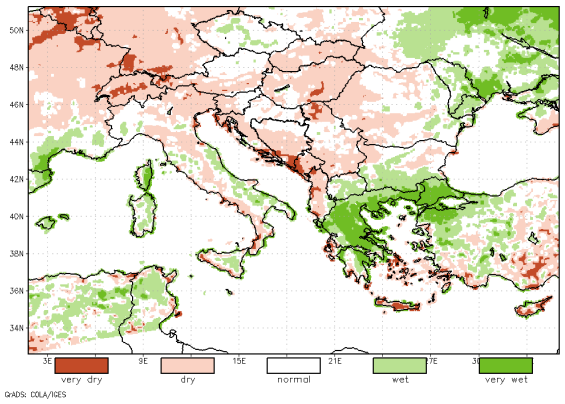
Across all region, air temperature anomalies generally dropped in early days of May in comparison to late April. Vast part of the central Balkan Peninsula experienced air temperatures up to 2 °C colder than usual, locally in northern Serbia, northeastern Hungary, Romania, Moldova and across most part of western and central Turkey it dropped up to 3 °C below the average. The drop of air temperatures was less intense over coastal areas along the northern

Adriatic Sea, western Black Sea and Aegean Sea where on average they remained unchanged or dropped for up to 1 °C, across northern Greece up to 2 °C below the usual temperatures. In mid-May, air temperatures remained up to 2 °C colder than usual across northernmost Balkan Peninsula from Slovenia and continental Croatia to Hungary to northern Romania, in Moldova up to 3 °C colder, while on the other hand mid-May brought unusually warm air temperatures for this time of year to the rest of the region. Across the thin belt from coastal Croatia to coastal Romania, they were 2-4 °C warmer than normally, with a strong gradient of even higher air temperature anomalies towards Aegean Sea area. Vast part of western Turkey and southern half of Greece experienced air temperatures 8-10 °C warmer than mid-May average. Across the entire southern half of Balkan Peninsula along with western Turkey, mid-May air temperatures classified among the hottest 5 % of local records. By the end of the month, it went from one extreme to the other as air temperatures dropped significantly across all region. If mid-May daily maximums reached 30 °C in Serbia and Romania, and 35-40°C in Greece and Turkey, there were days in late May where daily maximums did not exceed 16 °C or 20 °C, respectively. On average, last 10 days of May were up to 4 °C colder than normal in western Hungary, countries along the Adriatic Sea and Greece. Anomalies of up to 6 °C below the average were present in Romania, Bulgaria, Serbia and northwestern Turkey, and up to 7 °C below the average in Moldova, classifying them among the coldest 5 % of local records.
High amplitudes in both extremes throughout May which were experienced mostly across southern half of Balkan Peninsula and western Turkey contributed to monthly average ranging about the usual values or not more than 1 °C, locally in southern Greece up to 1,5 °C warmer than normally. Mostly colder-than-usual first half of May along with significantly colder than usual end of May over northern part of Balkan Peninsula resulted in monthly air temperature anomalies up to 2 °C below the average, locally across northeastern Hungary and Moldova up to 2,5 °C below the average.

ACCUMULATED WATER BALANCE ANOMALY (mm)
1 APRIL – 30 MAY 2020



ACCUMULATED WATER BALANCE PERCENTILE CLASSES
1 APRIL – 30 MAY 2020



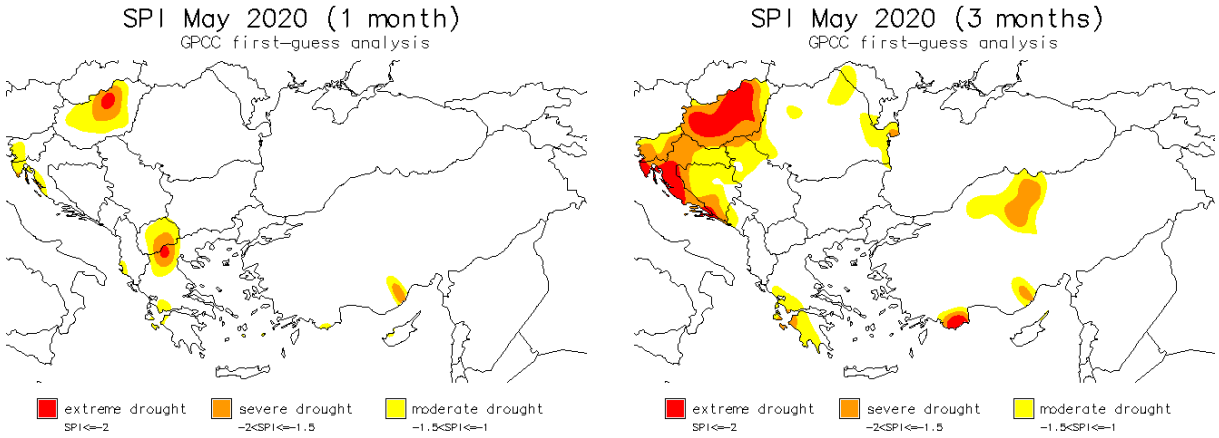
Precipitation amount in May was scarce especially over the region's north and south where they classified below the 25th percentile of local records. This includes entire Hungary, the Alpine part of the region, North Macedonia, most of continental Greece and scattered locations over southwestern Turkey. Considering the 60-day April-May period, surface water balance was negative over vast part of Balkan Peninsula - with the exception of Greece, North Macedonia and southern Bulgaria –, where anomalies from the usual ranged mostly between -90 mm and -150 mm, in areas along the southern Adriatic Sea, western Romania and over the southern Carpathians anomalies reached up to -210 mm. Despite noticeable lack of rain in May over

continental Greece, the 60-day accumulation of surface water balance remained much higher than normal. They ranged from up to 150 mm across its north and north-east, to over 300 mm above the usual values in central part of the country, mostly due to very wet April. On the contrary, deficit of 60-day accumulated surface water balance was present over western and southern Greece, up to -90 mm. In terms of comparing surface water balance accumulations over April-May period with the March-April period, the dry parts of the region including northern half of Balkan Peninsula remained dry, mostly to a lesser degree although it worsened over Adriatic Sea coastline, while parts of the region with water balance surplus including Greece, North Macedonia, Bulgaria and Moldova remained in wet to very wet classification.

STANDARDIZED PRECIPITATION INDEX

The drought situation with regard to the precipitation accumulation is presented by Standardized Precipitation Index (SPI). The SPI calculation is based on the distribution of precipitation over long time periods (30 years, in our case long-term average 1961-1990 was used). The SPI can be calculated at various time scales which reflect the impact of the drought on the availability of water resources. The long term precipitation record is fit to a probability distribution, which is then normalised so that the mean (average) SPI for any place and time period is zero. SPI values above zero indicate wetter periods and values less than zero indicate drier periods. Only the dry part of the extreme anomalies is presented on the maps.

Standardized precipitation index for **May 2020** is shown in figures below. SPI for one-month indicates possible drought conditions which can have impact on vegetation while SPI for three-month period can be indicative also for surface water status.



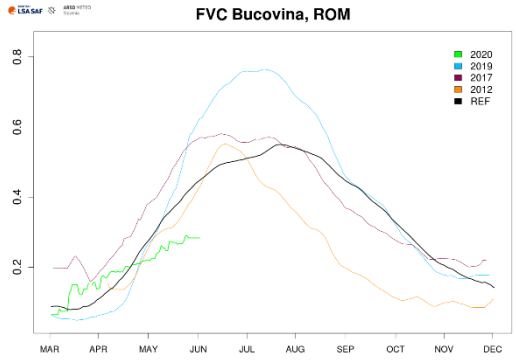
While precipitation level in May was relatively high over northeastern Turkey and in area stretching from Slovenia, across central Serbia and over to Romania and Moldova, Hungary on the other hand experienced a very dry month. Precipitation level was considerably lower than normal also over the bordering area from North Macedonia across to northern Greece where SPI1 values indicate conditions of severe to extreme drought. Moderate drought conditions in May were present also over localised areas along the northern Adriatic Sea coast and western Greece, but also in southern Turkey where SPI1 indicates severely dry conditions. A 3-month overview of SPI values indicate severely to extremely dry conditions across region's entire north-west – mostly a result of dry March and April in Slovenia and Croatia, and a dry April and May in Hungary –, as well as in southwestern Turkey as a result of moderate to severe drought conditions persisting since March. Lasting under-average precipitation level in western Greece also resulted in moderately dry conditions in May, according to SPI3.

REMOTE SENSING - FRACTION OF VEGETATION COVER

Fraction of vegetation cover (FVC) is vegetation index, based on multi-channel remote sensing measurements (data from EUMETSAT's LSA SAF data base is used for products in this bulletin). FVC shows fraction of the total pixel area that is covered by green vegetation, which is relevant for applications in agriculture, forestry, environmental management and land use, it has also proved to be useful for drought monitoring. Values vary according to the vegetation stage and of course to the damages of possible natural disasters (including drought). FVC values are lower at the beginning of the growth season, the highest at the full vegetation development and then FVC slowly drops with vegetation senescence. Line shape depends on sort of the vegetation.

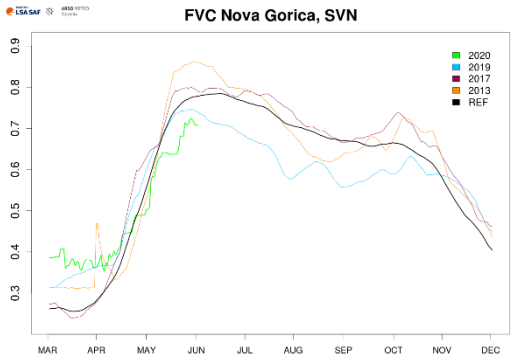
Graphs below present the **vegetation situation** as recorded **on 1 June 2020** in some regions of Southeastern Europe. FVC values for year 2020 are presented as a green line. Graphs also include reference line (2004–2019) in black, and lines in light blue (year 2019), magenta (year 2017) and orange (year 2012, or 2013 for Slovenia) for comparison. Possible missing values or sharp decline of values could be a result of a prolonged cloudy weather, extreme weather events or snow blanket.

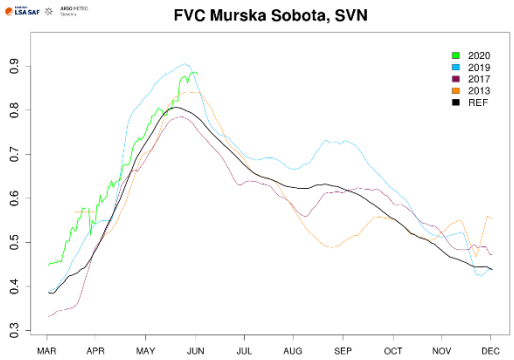
ROMANIA



Although generally progressing throughout spring months without major setbacks the rate of vegetation growth in Bucovina in northern Romania is considerably slower than normal. Between early March and late May, fraction of vegetation cover increased for approximately only 20 % while usually it increases for approximately 35 %. At the end of May, FVC values stood at only two thirds of the average values reached by this time.

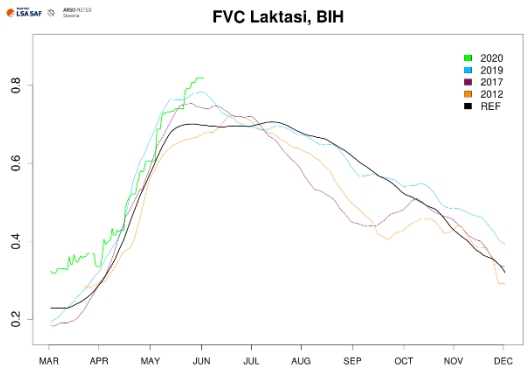
SLOVENIA

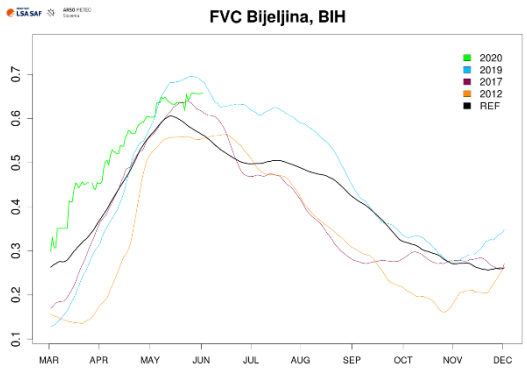


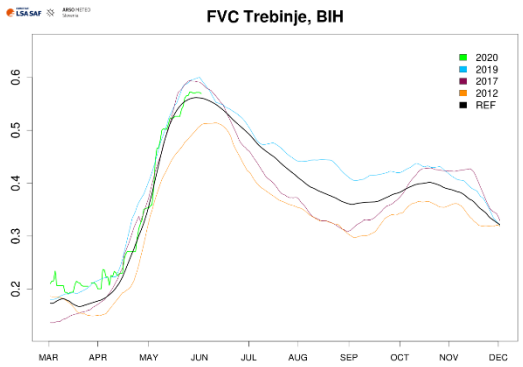


In Nova Gorica in western Slovenia, high boost in vegetation development at the beginning of spring was only temporary and from April onward the development progressed at the usual rate. FVC values for second half of May indicate a certain decline in progress, leaving FVC values at approximately 10 % lower values than at the peak time which normally comes at the beginning of June. On the contrary, vegetation development in Murska Sobota in northeastern Slovenia began and continued at the usual rate and with higher-than-normal values reached this spring. Although usually the vegetation cover started to decline after mid-May, the further growth continued, exceeding the peak values of FVC for approximately 10 %.

BOSNIA AND HERZEGOVINA (REPUBLIC OF SRPSKA)

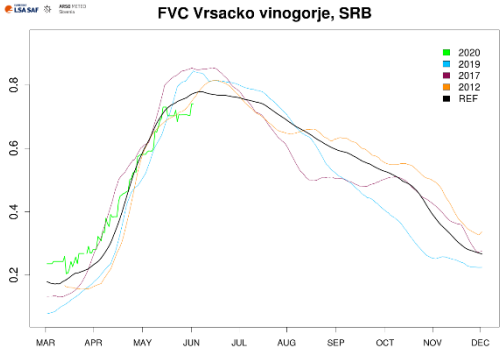


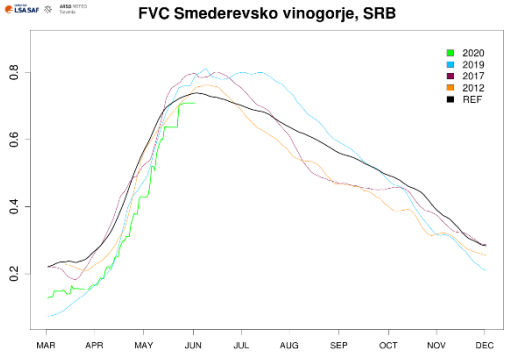




At both locations across northern Bosnia and Herzegovina, in Laktasi and in Bijeljina, vegetation development began with a boost in early spring and, with above-average level of vegetation cover, it followed the usual rate of progress. The highest level of vegetation cover which in Laktasi normally begins in mid-May was exceeded by more than 10 % while in Bijeljina the peak value of mid-May was also exceeded and instead of a decline in vegetation cover, the fraction of vegetation cover continues to remain at the high level. In Trebinje in southern Bosnia and Herzegovina, vegetation has been developing at its expected progress rate throughout all vegetation season.

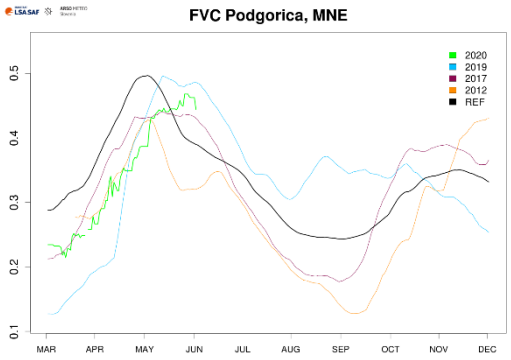
REPUBLIC OF SERBIA





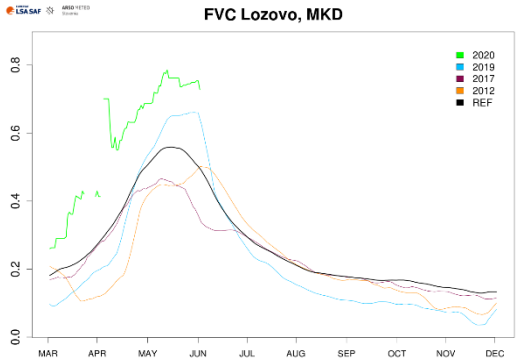
While vegetation development in Vrsacko vinogorje in northeastern Serbia was slightly above-average in March and April, it further on progressed with a slightly lower rate than normally. At the end of May, FVC values were slightly below-average. In Smederevsko vinogorje in central Serbia, vegetation development was continuously lagging behind for 1-2 weeks, although it grew at its usual rate of development. At the end of May, the level of vegetation cover is nearly at its average level.

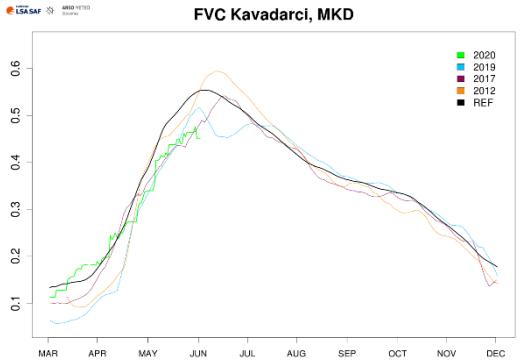
MONTENEGRO



In Podgorica in southern Montenegro, unfavourable weather conditions delayed spring vegetation development for nearly a month which continue to be seen throughout the spring months. Although delayed, its growth followed the average pattern of development, however, its peak seems to be reached at the slightly lower level of vegetation cover than usually according to FVC values.

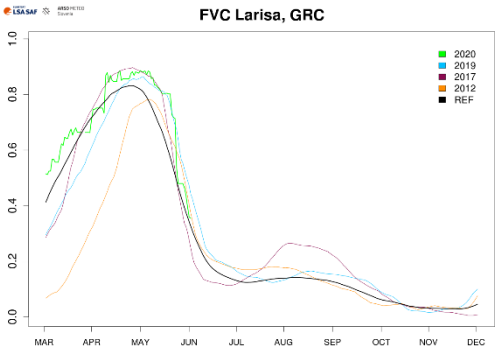
NORTH MACEDONIA

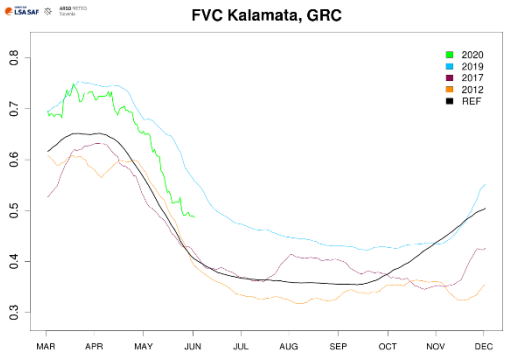




This year, spring weather conditions in Lozovo in central part of North Macedonia were favourable for vegetation development as the fraction of vegetation cover is continuously exceeding its average coverage for almost 20 %. It started slightly earlier than normally but was developing at a slightly higher rate throughout the spring months, resulting in exceeding its peak in mid-May for almost 25 %. On the other hand, vegetation in Kavadarci in southern part of North Macedonia was developing as usually only throughout March and mid-April but then started to progress at the slower rate, resulting in approximately 10 % lower vegetation coverage at the peak of the season.

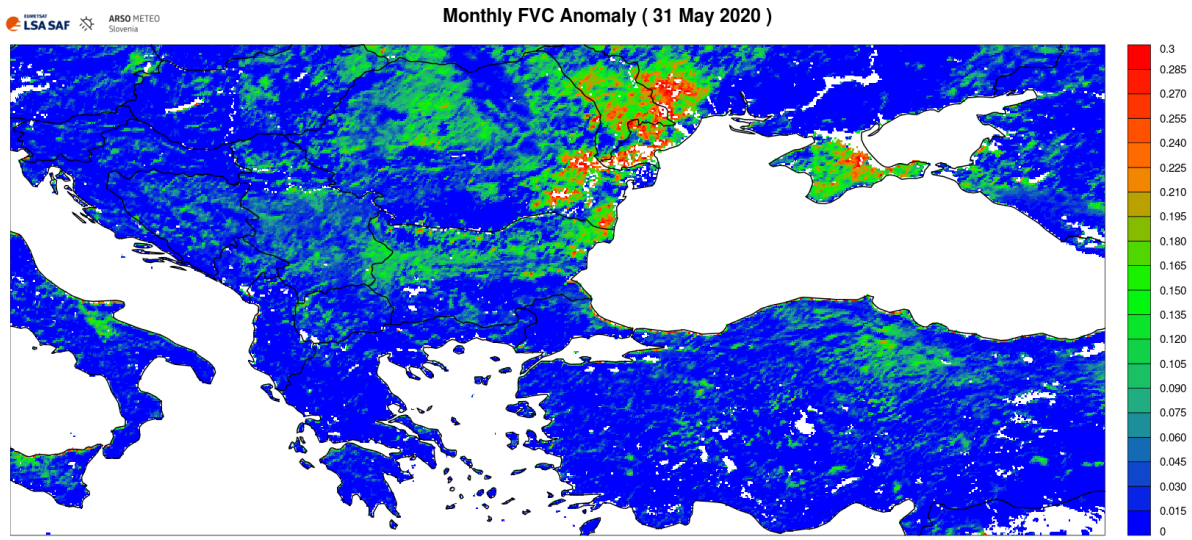
GREECE





Spring weather conditions seem to be favourable for vegetation development also in Larisa in central Greece, with the exception of early April period where some decline can be observed according to FVC. Slightly above average FVC values continued throughout first half of May, followed by the usual progress of decline in last two weeks of May. Level of vegetation cover in Kalamata in southern Greece continues to be well above-average this spring, exceeding the usual values for 10-15 %. Despite the decline which is usual after mid-April, FVC values continue to exceed the reference values.

Figure below shows negative anomaly of **accumulated 30-day FVC values** as recorded **on 31 May 2020** in comparison to the past 16 years (2004-2019), and is used experimentally.



Monthly FVC accumulations for May show high level of negative anomalies from the average coverage across southeastern Romania and southern Moldova where vegetation cover was reduced by almost 30 % in relation to the local average coverage in May. It goes in line with well-above-average air temperatures and prolonged water balance deficit that these two parts of the region experienced over the last 60-day period. To a lesser degree, up to 15 %, FVC accumulations were at the end of May lower also across vast part of the rest of Romania, central Moldova and northern half of Bulgaria. Negative anomalies although of a lesser degree can be observed also across northern Turkey, Bosnia and Herzegovina, Serbia and eastern half of Hungary.

IMPACT REPORTS

MOLDOVA

The officials from Ștefan Voda district in southeastern Moldova reported that impacts of drought are present in localities that received barely any precipitation in spring months, and due to the water stress, the multi-annual apricot, plum and cherry plantations were affected [1].

ROMANIA

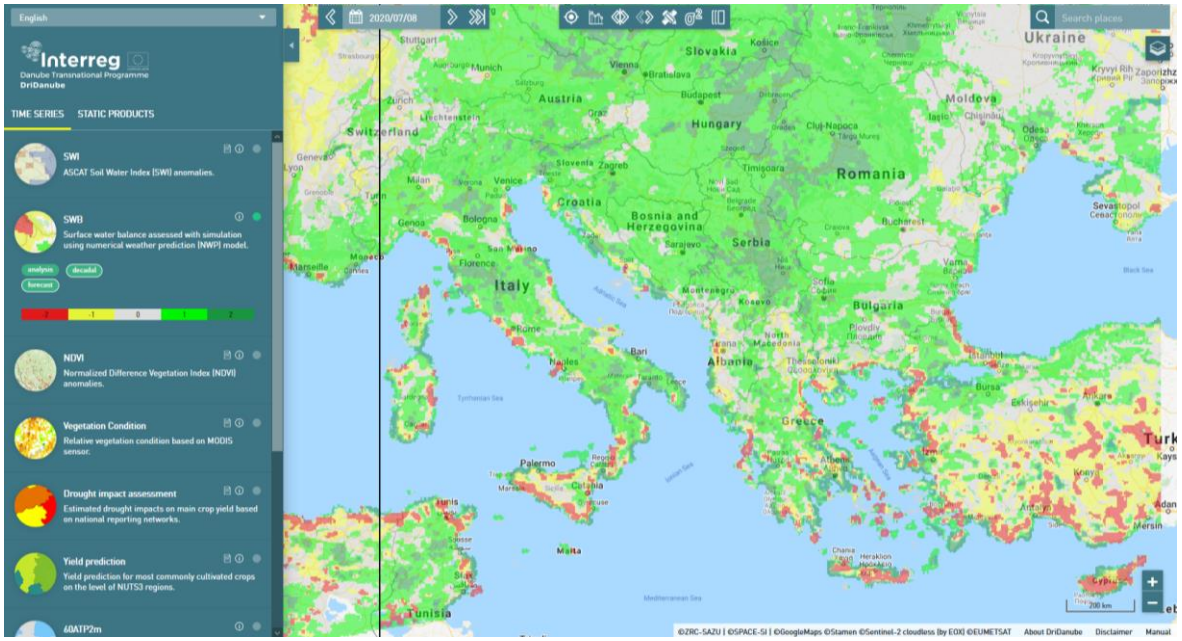
In Buzau County in southeastern Romania, livestock breeders observed insufficient precipitation level through heavily affected grassland. Rain in May did not come to all the areas, and where it did it proved insufficient. Dried fodder left over from winter was already used up and animal breeders, especially in the open field area, no longer have a place to take the animals to graze because grassland was dried up, not growing anymore. At the same time, the authorities asked for the support of the Buzău firefighters to supply water to herds of cows and sheep [2]. According to food industry representatives, grasslands being affected will obviously lead to an increase in fodder price, which could further influence the price of meat in the autumn, especially beef and pork [3].

Of agricultural crops, most affected are cereal crops, especially wheat. In Ilfov Country surrounding the country's capital, wheat and rapeseed production is nearly halved. The negative impacts are most vivid through market prices for cereals, which have already become more expensive considering lasting drought conditions had been present across vast part of the country. The price of wheat increased a lot over the last two months, by about 30 euros per ton. The millers have already increased the price of flour, resulting in food processors announcing higher prices for bakery products in the summer [3]. In the view of heavily affected wheat production, authorities decided to ban the export of wheat to destinations other than the EU for a week. Given that also other crop yields are expected to be affected by drought, there is still real potential for the reintroduction of export bans if considered that the country's food security is in danger [4].

[1] http://www.interlic.md/2020-05-06/ministrul-ion-perju-a-organizat-o--edin-a-online-cu-responsabilii-direc-iilor-agricole-raionale-63590.html?highlight=secet%C4%83
[2] https://agrointel.ro/143259/pompieri-cisterna-apa-animale/
[3] http://stiri.tvr.ro/covid-19---i-seceta-scumpesc-alimentele--producatorii-au-pierderi-de-milioane-de-euro-din-cauza-crizei-sanitare_861562.html#view
[4] http://stiri.tvr.ro/cea-mai-grava-seceta-din-ultimul-secol-afecteaza-europa-de-est_862138.html#view

OUTLOOK

Figure below presents model simulations of the **60-day accumulated surface water balance anomaly** in historical percentile classes for the time period **from 11 May to 9 July 2020**, as seen in Drought Watch tool[1].



[1] https://www.droughtwatch.eu/

In comparison to April-May period, surface water balance is expected to noticeably improve across vast part of the region. Dry to very dry conditions previously present over northern half of Balkan Peninsula are expected to be replaced by water balance surplus, which in central part of the region including Serbia, eastern Hungary and western Romania could be classified as very wet. Above-average water balance will remain across central Greece and northwestern Turkey, however, the surplus is expected to be lower in comparison to April-May period. On the other hand, coastal Greece, Aegean Sea islands and southwestern Turkey will continue to experience dry to very dry conditions.

Methodology

DMCSEE Drought monitoring bulletin is based on numerical weather prediction (NWP) model simulations over SE Europe, SPI index calculations and remote sensing. Precipitation data is provided by Global Precipitation data Centre (GPCC; see: https://www.dwd.de/EN/ourservices/gpcc/gpcc.html). NWP simulations are performed with Non-hydrostatical Mesoscale Model with cca. 7 km spatial resolution (NMM; see: http://www.dtcenter.org/wrf-nmm/users/). Historical DMCSEE model climatology was computed with NMM model for time period between 1 January 1990 and 31 December 2019. European Centre for Medium Range Weather Forecast (ECMWF) ERA5 data set (see: http://www.ecmwf.int/en/forecasts/datasets/reanalyses-datasets/era5) was used as input for simulations. Long term averages (1990-2019), used for comparison of current weather conditions, are obtained from simulated data set. Comparison of current values to long-term averages provides signal on potential ongoing drought severity.