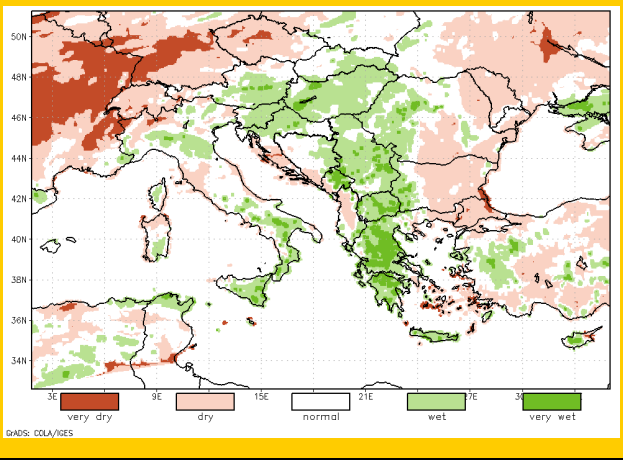
DROUGHT MONITORING BULLETIN

July 2020

HOT SPOT



July brought dry weather to the vast area across eastern part of the region from Moldova to eastern Greece. Figure on the left presents **July 2020 precipitation level in percentile classes with the base period of 1981-2010.** Lack of precipitation was most acute across eastern Bulgaria bordering over to Greece as scarce precipitation level classified among the lowest 5 % of local historic records. Warmer-than-usual air temperatures across that part of the region further aggravated dry conditions.

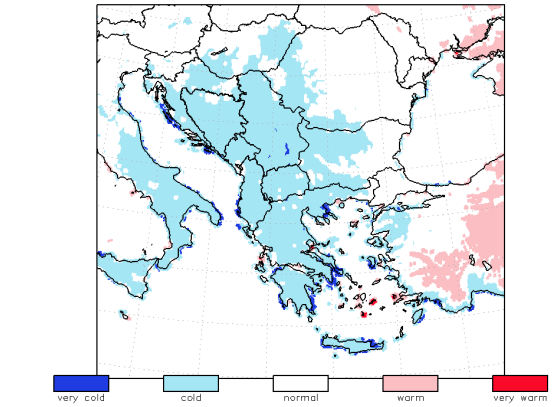
AIR TEMPERATURES AND SURFACE WATER BALANCE

*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 31 May to 29 July 2020**.*

AVERAGE AIR TEMPERATURE ANOMALY (°C)
31 MAY – 29 JULY 2020

GrADS: COLA/IGES

AVERAGE AIR TEMPERATURE PERCENTILE CLASSES
31 MAY – 29 JULY 2020



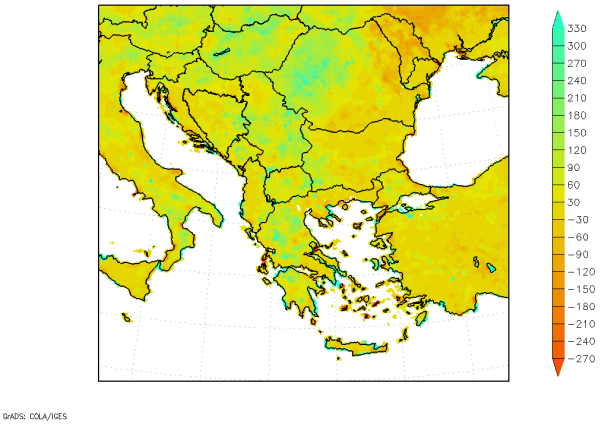
GrADS: COLA/IGES

In most of the central and across northern Balkan Peninsula, more or less average air temperatures from late June continued into July, early days of the month brought unusually high air temperatures to wider Black Sea area, western Turkey and region's western coasts from Albania to Greece. On average, first days of July were even up to 3 °C warmer than usually

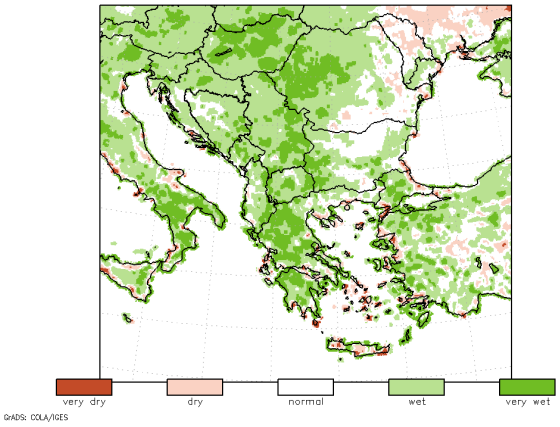
over Romania's south-east, eastern Bulgaria, across vast part of western Turkey and locally in northwestern and far northeastern Greece, where air temperatures of well over 30 °C were present. In mid-July, above-average air temperatures gave way to weather much colder than usual across the entire region. With the exception of western Greece, central Romania and southeastern Turkey where air temperatures ranged about the average, air temperatures across the rest of the region were on the average up to 2 °C colder than normal; its north-west stretching across Slovenia, Croatia, Bosnia and Herzegovina, Hungary and most of Serbia, experienced air temperatures up to 3 °C colder than normal. In comparison to long-term average, late July saw no noticeable deviations of air temperatures across most of the region, meaning anomalies ranged for up to 1 °C about the local average values for this time of the year. The only exception to this was southwestern Turkey were air temperatures exceeded the average for 1-2 °C.

A 60-day average of air temperatures over June-July period shows air temperatures of about-usual values across Slovenia and Hungary, and also in countries in the wider Black Sea area where warm June was replaced by colder July. The gradient of negative anomalies from the average then progressed in south-west direction, indicating this 2-month period was colder than it usually is in that part of the region. Averaged over June and July, air temperatures of up to 1.5 °C colder than usual were present from southern parts of Bosnia and Herzegovina, and Serbia, to Greece, mostly as a result of much colder than normal June.

ACCUMULATED WATER BALANCE ANOMALY (mm)
31 MAY – 29 JULY 2020



ACCUMULATED WATER BALANCE PERCENTILE CLASSES
31 MAY – 29 JULY 2020



June brought unusually high precipitation level to most of the region, with the exception to Moldova, southeastern Romania and southern Greece where precipitation level in June could be classified as dry. In July rainfall rate in July was then well-above-average over Greece, and it continued to be unusually high also all across central Balkan Peninsula from North Macedonia to Hungary, Slovenia and continental Croatia. While on the other hand, high precipitation level of June was in July replaced by lack of rain all along the Adriatic Sea coastline, Aegean Sea islands and wider area around the Bosporus Strait, and across vast part of Bulgaria, with the exception of its far west. Parts of Romania and Moldova that experienced unusually low rainfall rate in June already, continued to receive little rain also in July, with the area of unusually low precipitation level in July now spread across the entire Moldova and eastern half of Romania.

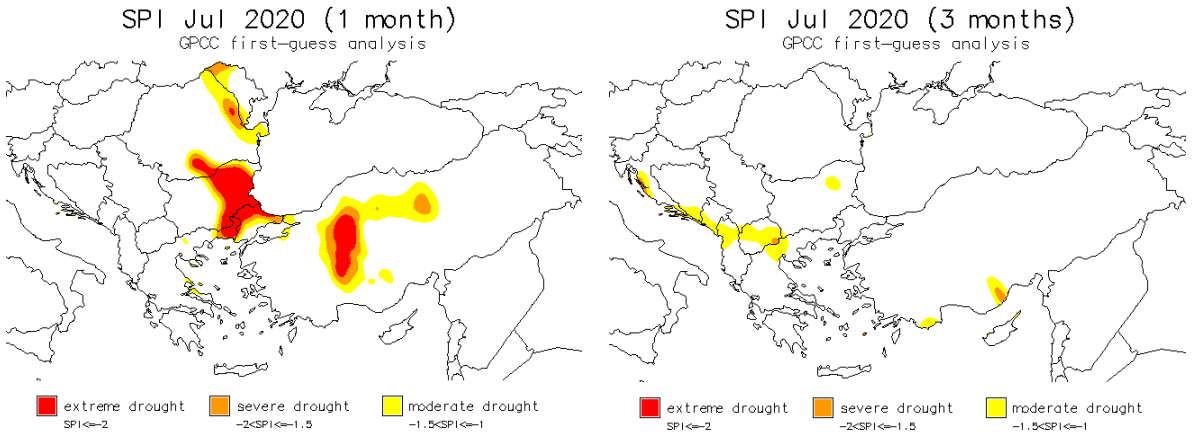
Averaged over the June-July period, the part of the region stretching from Slovenia, Hungary,

western Romania and down to southern Greece mostly experienced surface water balance surplus between 120-180 mm, with often times stormy weather creating local anomalies of up to 300 mm or more especially over central Greece and western Romania. On the other hand, June-July water balance accumulations summed up to more or less average values in countries along the Adriatic Sea, and a deficit of mainly up to 60 mm over Albania, Bulgaria, eastern Greece and western half of Turkey. Consecutive months of below-average precipitation level over southern and eastern Romania as well as Moldova resulted in accumulated surface water balance deficit of between 60-120 mm in Romania and up to 150 mm in Moldova.

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



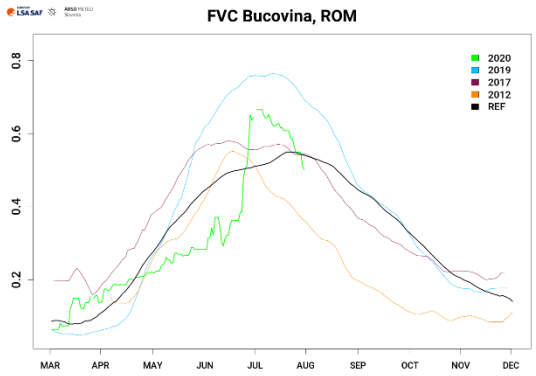
Extremely low precipitation level in July across eastern part of the region, which classifies among the lowest 5 %, is reflected through SPI1 values that indicate extreme drought conditions locally in southern Romania, across vast part of eastern half of Bulgaria to the area about the Bosporus Strait, and also across western third of Turkey. In July, moderate to severe drought conditions developed also across eastern Romania, northern Moldova and locally in central Turkey. A 3-month overview of SPI values indicate moderate drought conditions were present across North Macedonia, mainly a result of severe drought conditions in May and moderate ones in June, as well as across the Adriatic Sea and northern Albania due to persisting presence of slightly to moderately negative SPI values from May onward.

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.

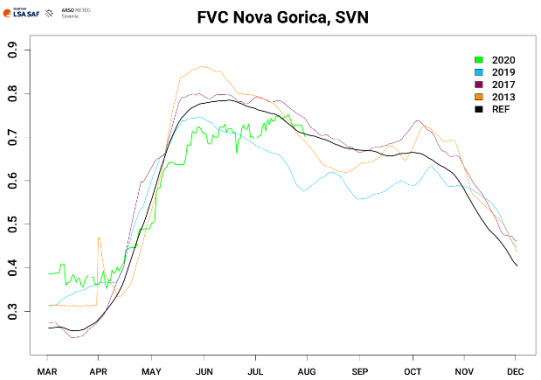
Graphs below present the **vegetation situation** as recorded **on 3 August 2020** in some regions of Southeastern Europe. FVC values for year 2020 are presented as a green line. Graphs also include reference line (2004–2019) in black, and lines in light blue (year 2019), magenta (year 2017) and orange (year 2012, or 2013 for Slovenia) for comparison. Possible missing values or sharp decline of values could be a result of prolonged cloudy weather, extreme weather events or snow blanket.

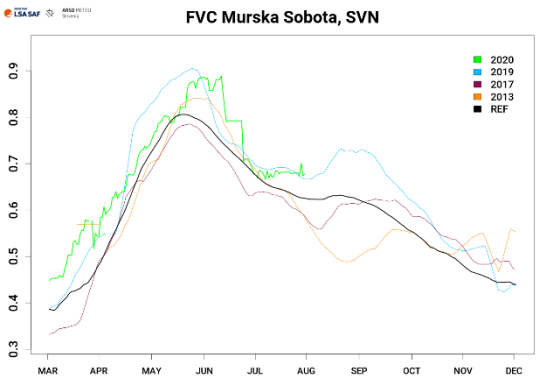
ROMANIA



In Bucovina, northern Romania, early vegetation growth in March was followed by a much slower progress throughout dry spring and early summer. Favourable weather conditions in June came as a welcome boost to vegetation, seen as a sudden increase of FVC values for about 30 % in second half of the month. The boost was only temporary as dry weather returned in July, causing rapid decline in vegetation cover to the under-average values by the end of the month.

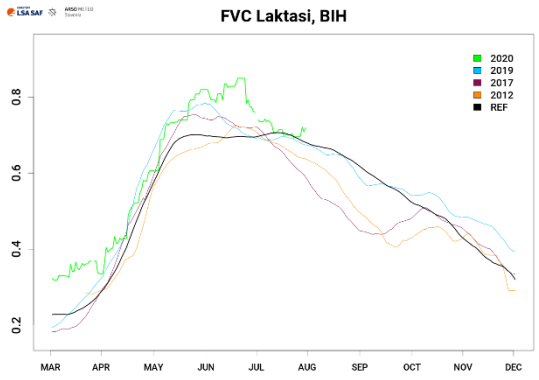
SLOVENIA

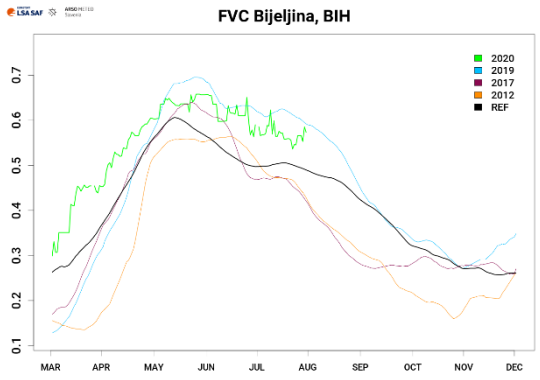


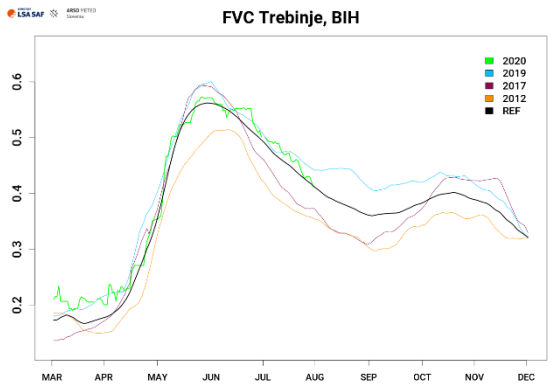


Warm air temperatures boosted early spring vegetation development in Nova Gorica, western Slovenia. Above-average FVC values were only temporary as the advantage gained in early spring was compensated throughout April and May. Dry spring months resulted in under-average vegetation cover from mid-May onward and a peak of about 10 % lower than normally. As of the end of July, vegetation cover met the reference value for this time of year. On the other hand, vegetation development has this vegetation season been above-average in Murska Sobota in northeastern Slovenia. FVC was most noticeably exceeding the average values in early spring and at its peak of the year which this year came in mid-June, both times for up to 15 %. Extreme weather events could be a reason for sharp decline of values late June, while throughout July the fraction of vegetation cover remained more or less constant.

BOSNIA AND HERZEGOVINA (REPUBLIC OF SRPSKA)

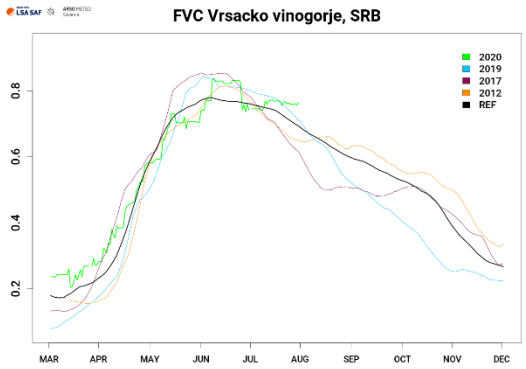


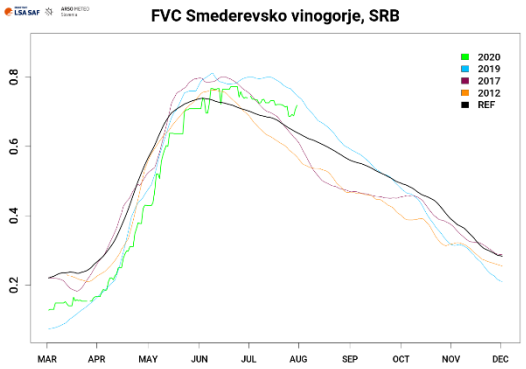




In Laktasi and in Bijeljina, located along the northern Bosnia and Herzegovina, vegetation development began early and by the end of March exceeded the usual coverage by approximately 15 %. The above-average development continued throughout all spring and exceeded its usual peak values, in Laktasi for about 10 % and in Bijeljina about 5 %. While sharp decline in Laktasi throughout late June and early July brought at least temporary end to above-average coverage, vegetation cover continues to be above-average in Bijeljina, for approximately 10 %. Regarding Trebinje in southern Bosnia and Herzegovina, vegetation development was slightly above-average at the beginning of spring, and has since then continued to follow its average progress without any noticeable anomalies.

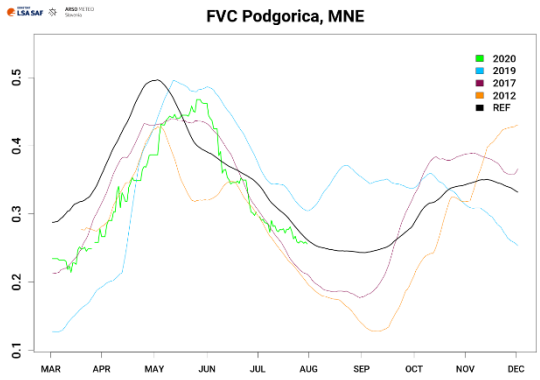
REPUBLIC OF SERBIA





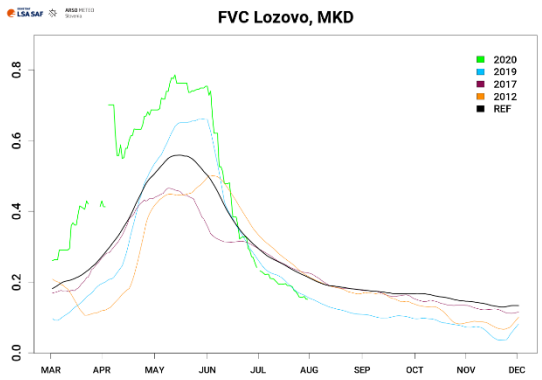
Slightly above-average vegetation development in early spring can be observed also in Vrsacko vinogorje in northeastern Serbia. Further development progressed at the slightly lower rate than normally although vegetation cover did not lag behind its usual values until late May since coverage seemed to have remained almost unchanged for most of May. In June, it has experienced a noticeable boost to above-average peak values, as well as sudden decline, after which, according to FVC values, weather conditions again came favourable to vegetation development as the rate of senescence is slower than normally. In Smederevsko vinogorje in central Serbia, spring weather conditions were unfavourable to vegetation development as it began few weeks later than normal. Once it began, its rate of progress was as usual and even slightly exceeded its peak values, although approximately 2-3 later than normally. Also the rate of senescence continued as usual, although slightly delayed, as expected for this season.

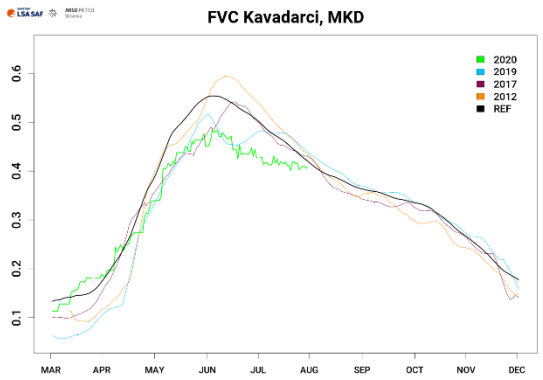
MONTENEGRO



Winter to spring conditions were unfavourable for vegetation development also in Podgorica, southern Montenegro. Vegetation growth began approximately a month later but then followed its regular rate of progress and further growth until it reached its peak in early June, a month later in line with this season's development. FVC values suggest the peak was reached at slightly lower vegetation cover than normally, and also the rate of senescence has since June been slightly higher than normally.

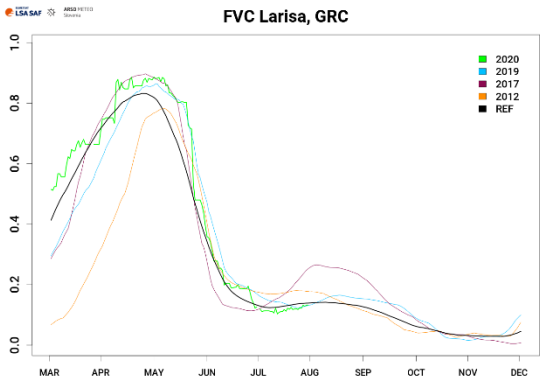
NORTH MACEDONIA

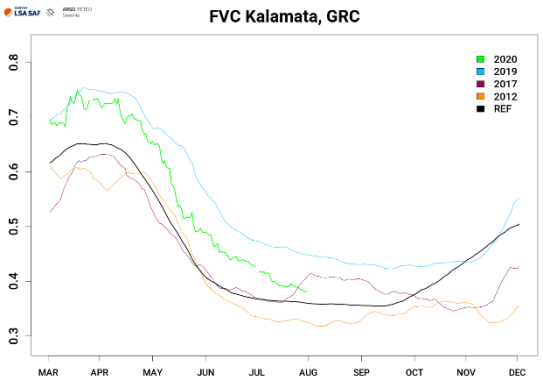




Early spring conditions proved very favourable for vegetation development in Lozovo in central part of North Macedonia. At the beginning of March, vegetation cover was about 5 % higher than normally but then rose to approximately 30 % above the average values by mid-May. Dry conditions of May and further on in June resulted in rapid decline of vegetation cover, from the vegetation cover of approximately 75 % at the beginning of June down to little over 20 % at the end of the month. In July, decline continued although with a much smaller rate, similar as in last year. In Kavadarci in southern part of the country, vegetation growth began as normal in March through April. Then it began progressing at the slower rate than normal until its peak in early June, resulting in altogether 10 % lower vegetation cover than usually. Over June and July, the first months of senescence, the rate of decline was slightly lower than expected, meaning that although the peak period was reached at lower FVC values, the vegetation cover at the end of July stood at nearly average values again.

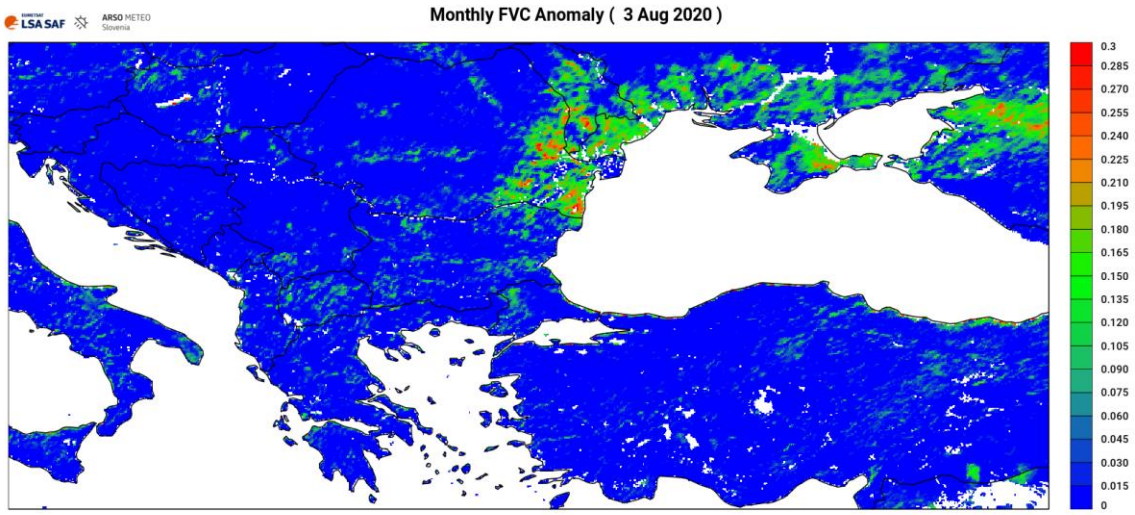
GREECE





This year's vegetation season proves favourable for vegetation development in Kalamata in southern Greece as it has been continuously exceeding the average level of vegetation cover for 10-15 %. Slightly higher rate of senescence can be observed throughout July although FVC values indicate the coverage is still above-average. Also in Larisa in central Greece, vegetation has been developing as expecting this vegetation season, and even exceeded the average values around its peak period of April and May for approximately 5 %. From June onward, it has followed its usual pattern of decline as expected and at the end of July stand at the average.

Figure below shows negative anomaly of **accumulated 30-day FVC values** as recorded **on 3 August 2020** in comparison to the past 16 years (2004-2019), and is used experimentally.



July accumulations of below-average FVC values point out to highest decline from the usual vegetation cover, which indicates potential damage to the vegetation, across vast part of southeastern Romania and over southern Moldova. Negative anomalies, of up to 15 %, can be observed also at scattered locations all across southern part of Balkan Peninsula, including Albania, North Macedonia, Bulgaria but also Greece.

IMPACT REPORTS

MOLDOVA

The Republic of Moldova is facing one of the driest years. The drought that lasted from autumn to spring, severely affected the winter crops. Most drastic decrease in production per hectare is expected be in wheat. According to the national authorities, this year the harvest of wheat will be about 600 thousand tons at the country level, which results in estimated losses of over 50 % [1, 2]. While this amount is enough to cover the domestic needs of the country, there will be significantly less wheat for export [1]. The weather conditions affected not only cereals but all crops, also peas, autumn barley, spring barley and sunflowers [3]. Severely affected were fields in the south and center of the country, especially in the districts of Stefan Voda, Basarabeasca and Comrat [3]. In the south of Moldova, about 80% of the cultivated area was affected by drought [1]. In the region of Gagauzia in southern Moldova, this year's grain harvest presented only 34 % of the planned harvest in the first category cereals, meaning economic losses of about 250 million lei. Due to the fact that the harvested corn is dry and of poor quality, it will be processed for animal feed [2, 4]. Some fields in southern Moldova were nearly entirely affected which left some households unable to harvest enough to feed the

animals, and forced to clear their crops [2, 3, 4]. With the harvest significantly lower than last year, not all farmers would be able to meet their contractual quota obligations [3].
Agricultural producers submitted claims to the Government about the disastrous situation in the agricultural sector due to prolonged drought and disastrous hail. However, since the claims have not been resolved so far, farmers from Stefan Voda and Causeni districts protested and blocked Causeni-Chisinau national highway to demand greater help from the authorities. One of the reasons is their inability to cover debts to banks due to the drought and epidemic [5, 6, 7].

ROMANIA

According to the Ministry of Agriculture, this year's drought has so far affected 1.2 million hectares of the 2.9 million hectares that were sown in autumn. Most affected were cereal fields along the southern and eastern Romania [8]. At national level, wheat production is estimated to be 50% lower than in 2019. The Ministry of Agriculture was forced to take measures in order to ensure the harvest could meet domestic demand [9, 8]. According to the National Institute of Statistics, the price of milling and bakery products increased by more than 3% over the first half of the year [9]. In Calarasi County in southeastern Romania, drought damage to agricultural crops is said to be of a similar rank than the one in 2007. Some farmers managed to start old irrigation systems that have been abandoned for years [10]. In some other places, drought has completely compensated wheat crops. The farmers from Dobrogea barely have anything to harvest [8]. Similarly goes for some farmer in Vaslui in eastern Romania who, due to negligible amount of rain since August 2019 that destroyed both autumn and spring crops, was forced to abandon their agricultural business [11]. In the Vrancea area in southwestern Romania, the rain was scare to a point the first as well as second scythe are zero. In the absence of vegetation to feed their livestock with, animal breeders had to rely on food supplies since April. Some are seriously considering selling their animals or take them to the slaughterhouse [12].

BULGARIA

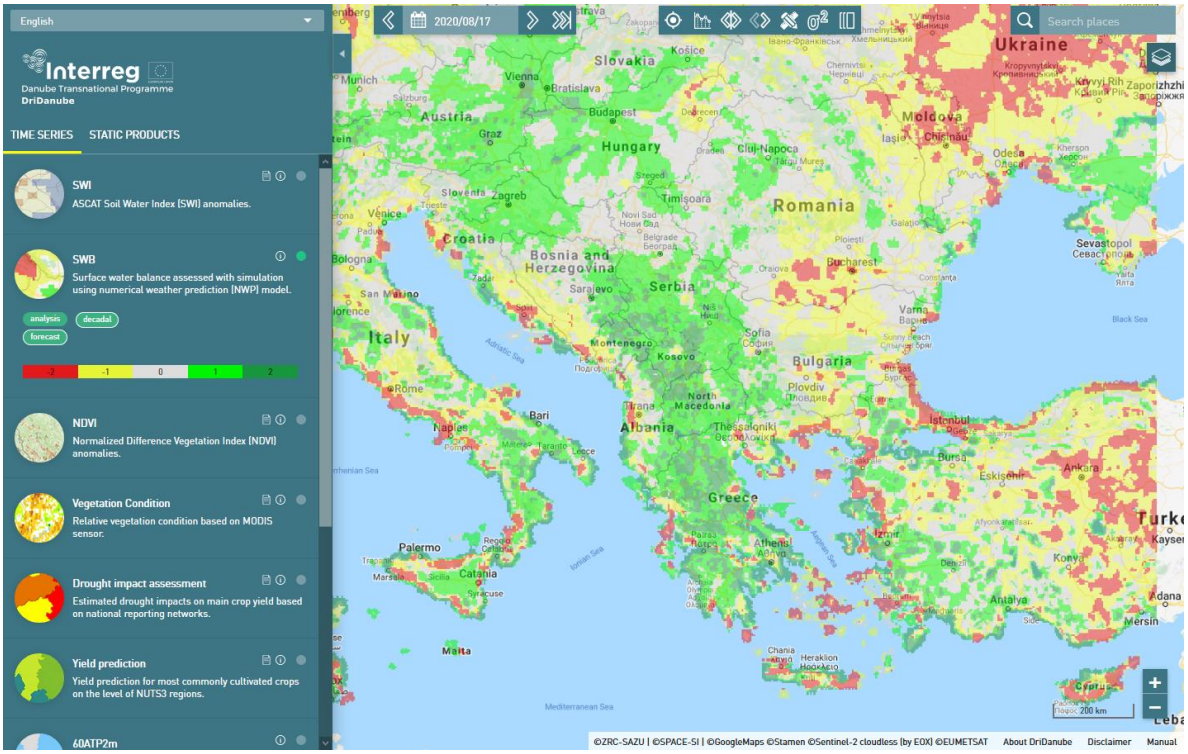
The snowless winter and spring-to-summer drought did not allow cereals to grow and develop, and have drastically reduced yields across northern and eastern Bulgaria. The grain producers in Lovech region in northern Bulgaria report yields of wheat and barley about 15-20 % lower than in 2019 [13]. Also in Yambol region in eastern Bulgaria, significantly lower yields have been observed for barley and oilseed rape, on average about 40 % lower than a year before [14]. In Dobrich region in northeastern Bulgaria, which is traditionally the leader in the production of bread grain, a drought of such intensity has not happened in Dobrich since 2001. This summer, wheat in Dobrich region was harvested at an average yield of 178 kilograms, reaching only 32 % of last year's harvest [15, 16, 17, 18]. The grain market in Dobrich region is already at a price 10 percent higher than at the start of the harvest [18]. In the view of ongoing drought in Dobrich, grain producers have looked at optimizing the varietal structure for the upcoming autumn sowing of wheat [15].

Prolonged lack of rain across northern and eastern Bulgaria resulted in hydrological drought in that part of the country. Some dams had critically low levels, with Ticha, Kamchia, Yastrebino and Asenovets among the most affected by the dry winter-to-summer [19]. In Yastrebino in northeastern Bulgaria, drought forced surrounding agricultural producers to use the dam water for irrigation, which further reduced water level in Yastrebino Dam. Low water levels in dams have been alarmed also by the fishermen as low water level in the dams presented problem for the fish in it and the aquaculture. At the end of July, the flow of the Yastrebino Dam in northeastern Bulgaria was at only 20 %, which presented a threat for water shortage to the municipality of Antonovo with more than 10,000 inhabitants. Altogether, drought aggravated the dispute over the supply of water for irrigation, ecosystems and public demand [19].
Water shortages in the Lovech village of Malinovo made residents to block the main road Sofia-Varna and protest over water supply problems, induced by lack of sufficient rainfall as well as consequent irrigation of agricultural areas. The neighboring villages of Stefanovo and Prelom also reported of having water available for household demand only on some days, while residents felt not enough was done to stop water [20].

[1] https://mybusiness.md/ru/novosti-biznesa/item/14850-v-moldove-neurozhaj-pshenitsy-podorozhaet-li-muka
[2] http://www.trm.md/ro/economic/fermierii-din-sudul-tarii-grav-afectati-de-seceta
[3] http://trm.md/ro/social/agricultorii-estimeaza-pierderi-de-peste-50-din-cauza-secetei
[4] http://www.trm.md/ro/economic/agricultorii-inregistreaza-pierderi-din-cauza-secetei
[5] https://unimedia.info/ro/news/f4f828847943d99b/mai-multi-agricultori-din-causeni-si-stefan-voda-anunta-proteste-in-legatura-cu-situatia-dezastruoasa-in-sectorul-agricol.html
[6] https://www.ziarulnational.md/live-video-protest-masiv-al-agricultorilor-in-legatura-cu-ajutorul-autoritatilor-vorbesc-ca-vor-fi-oferite-100-de-milioane-de-lei-dar-ce-facem-cu-100-de-lei-pentru-ha/
[7] https://omg.md/posts/fermery-zablokirovali-natsionalnuyu-trassu
[8] http://stiri.tvr.ro/cereale-mai-pu--ine--paine-mai-scumpa--dupa-ce-seceta-a-distrus-culturile_865158.html#view
[9] http://stiri.tvr.ro/produc--ia-de-grau-se-anun--a-cu-50prc--mai-mica-decat-in-2019--romania-a-fost-anul-trecut-al-doilea-cel-mai-mare-exportator-din-ue_865661.html#view
[10] http://stiri.tvr.ro/culturi-distruse-de-seceta--au-fost-afectate-1-2-milioane-de-hectare_866132.html#view
[11 https://agrointel.ro/149430/tanar-fermier-probleme-mari-culturi-afectate-seceta/
[12] https://agrointel.ro/132734/despagubiri-seceta-pasuni-nutret-decizie/
[13] http://www.bta.bg/bg/c/BO/id/2237830
[14] hhttp://www.bta.bg/bg/c/BO/id/2244275
[15] http://www.bta.bg/bg/c/BO/id/2247333
[16] https://www.dnes.bg/index/2020/07/03/niski-dobivi-ot-zyrno-proval-na-rekoltata-shte-poskypne-li-hliabyt.455350
[17] https://btvnovinite.bg/predavania/tazi-sutrin/unishtozhena-rekolta-shte-skochi-li-cenata-na-brashnoto-i-hljaba-sled-tezhkata-susha.html
[18] https://blitz.bg/obshtestvo/regioni/dobrudzha-plache-nevizhdana-ot-20-godini-susha-izpepeli-rekoltata-ot-pshenitsa_news758537.html
[19] https://nova.bg/news/view/2020/07/30/295210/суша-заплашва-десетки-хиляди-жители-на-северна-България
[20] http://www.bta.bg/bg/c/BO/id/2248931

OUTLOOK

Figure below presents model simulations of the **60-day accumulated surface water balance anomaly** in historical percentile classes for the time period **from 20 June to 18 August 2020**, as seen in Drought Watch tool[1].



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

In comparison to the 60-day June-July period, weather conditions are expected to noticeably worsen surface balance conditions over already-affected Moldova, eastern and southern Romania, across to northern Bulgaria, and also central Turkey. A change from wet and very wet conditions to average surface water balance values is expected over northern Serbia and northern Romania. While the areas along the Adriatic Sea and the Aegean Sea are expected to continue to remain dry to very dry, and no noticeable change is expected also over the already well-above-average water balance conditions across continental Greece, North Macedonia, Albania, Serbia and a wider area of the Great Plain.

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.