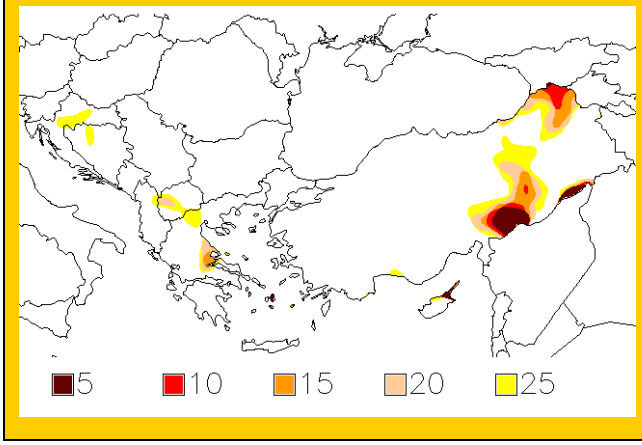
DROUGHT MONITORING BULLETIN

June 2020

HOT SPOT

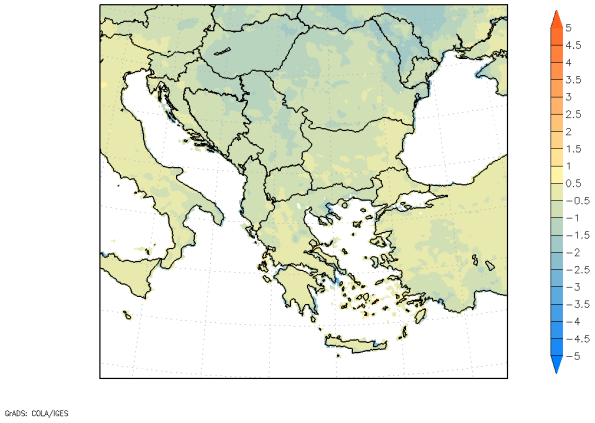


June was largely unproblematic in terms of drought conditions, from both the temperature and dryness aspects. While precipitation level was high in parts of northern and central Balkan Peninsula, scarce precipitations were observed in southern and far northeastern Turkey, and locally in central Greece and North Macedonia it also records in lowest 30th percentile. **Precipitation percentiles for June 2020** are mapped on figure on the left.

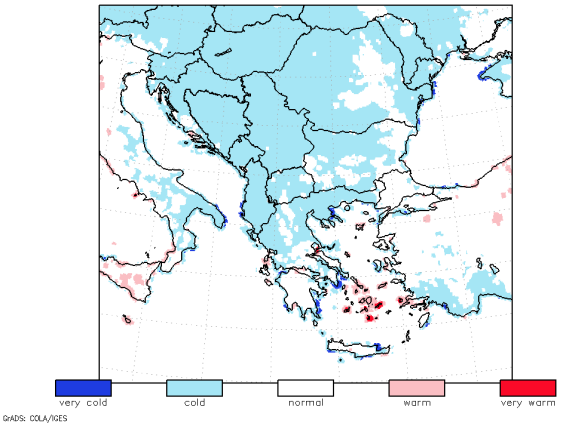
AIR TEMPERATURES AND SURFACE WATER BALANCE

*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 May to 29 June 2020**.*

AVERAGE AIR TEMPERATURE ANOMALY (°C)
1 MAY – 29 JUNE 2020



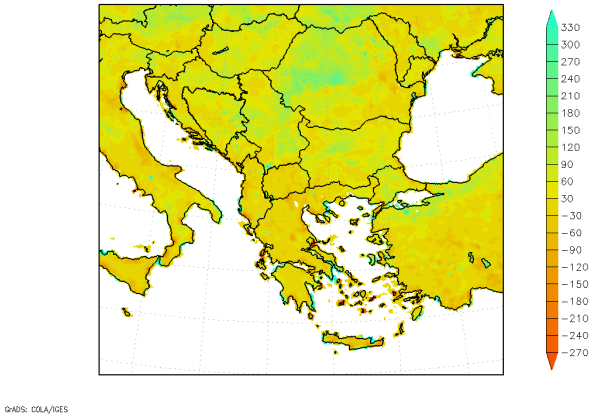
AVERAGE AIR TEMPERATURE PERCENTILE CLASSES
1 MAY – 29 JUNE 2020



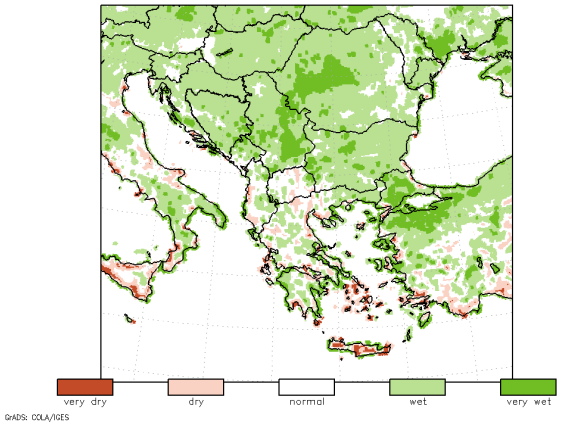
In general, a trend can be observed across the region for June about slow progression from below-average to normal or slightly warmer-than-normal air temperatures throughout the month. A period of colder-than-usual air temperatures of late May continued into June although deviations from the average were much lower in first days of June, mostly up to 2 °C colder

across northern and eastern Balkan Peninsula, and up to 3 °C colder in the rest of the region, including southern Moldova and western Turkey. In mid-June, warmer air temperatures started spreading across the region from its north-east, resulting in anomalies of up to 2 °C across northern Moldova and normalized air temperatures across northern and eastern Balkan Peninsula, both of which remained so throughout the rest of June. Meanwhile, countries along the Adriatic Sea, central Balkan Peninsula, Greece and southwestern Turkey continued to experience under-average air temperatures, mainly up to 3 °C although anomalies deepened over Albania and northwestern Greece to up to 4 °C below the average. In late June, colder-than-usual air temperatures gave way to a period of normalized weather in terms of air temperatures also across the southern and western part of the region. Coastal part of continental Greece remained the only exception to this as, with temperatures of up to 2 °C colder than usual. Lower than normal for this time of year was also the average air temperature of the May-June period. Especially due to very warm mid-May over countries of southern Balkan Peninsula, anomalies from the average ranged between -1 °C and 1 °C over that part of the region, while they gradually decrease below the average further toward the northern part where May-June was up to 1.5 °C colder than usual, locally in northeastern Hungary and across Moldova even up to 2 °C colder.

ACCUMULATED WATER BALANCE ANOMALY (mm)
1 MAY – 29 JUNE 2020



ACCUMULATED WATER BALANCE PERCENTILE CLASSES
1 MAY – 29 JUNE 2020



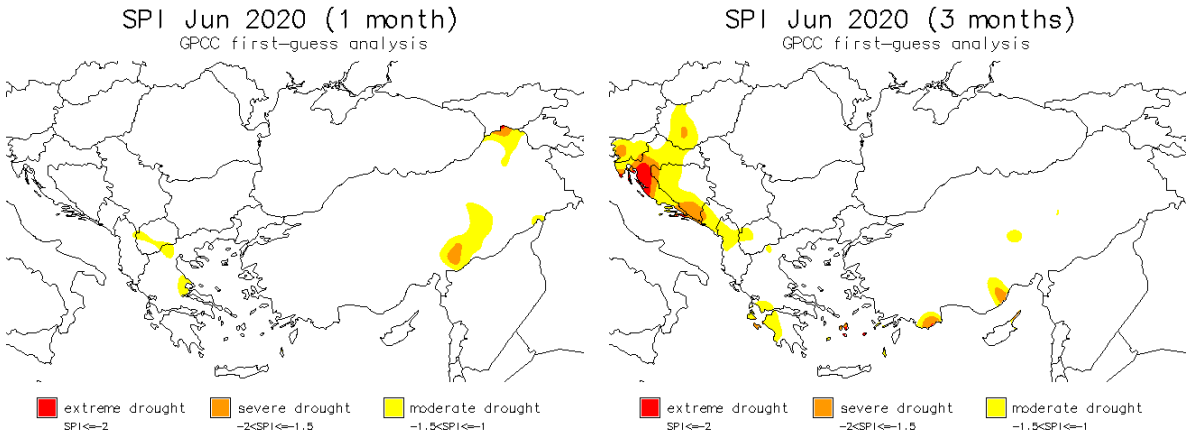
High precipitation level in May as well as June over the northern and central part of Balkan Peninsula resulted in well above-average surface water balance of that 60-day period. It ranged between 90 mm and 150 mm, creating an unusually wet conditions, while over the Carpathians and northwestern Romania it reached up to 240 mm. Also Bosnia and Herzegovina, parts of Bulgaria and Bosporus area encountered water balance surplus of the similar range, while Slovenia, Croatia, Montenegro, Moldova and continental Greece ended a 2-month period with the average accumulation of surface water balance. Low precipitation level in May over Albania and North Macedonia, together with average precipitation level in June resulted in water balance deficit of up to 60 mm in North Macedonia and up to 90 mm in Albania, indicating dry water balance conditions. On the other hand, highly negative water balance levels continued to be present over the islands in southern part of the Aegean Sea, indicating very dry conditions.

According to surface water balance level accumulated from 1 April 2020, first half of vegetation season was unusually wet across the entire continental Greece and Bosporus area, while it was very dry over its coastal parts, especially in southern Greece. Countries along the Adriatic Sea also ended first half of vegetation season with deficit of water balance accumulations, especially due to very dry April. Accumulations of surface water balance over the rest of the region classify among the average to wet values.

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 **June 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.



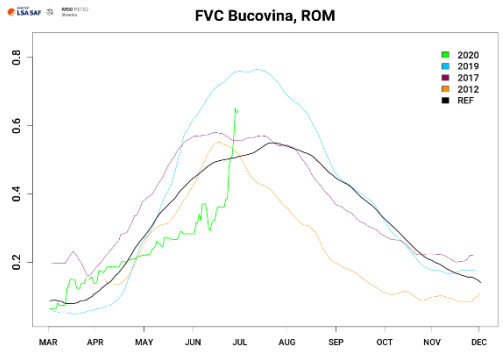
High precipitation level over the northern half of Balkan Peninsula and about-average level over its south kept most of this area out of drought conditions. Moderate drought conditions developed only across parts of North Macedonia and central Greece as also indicated by SPI1 values. The rainfall deficit in June was greater only over localised area in southern and in far northeastern Turkey where SPI1 values indicate moderate to severe drought conditions. A 3-month overview singles out the wider Adriatic Sea area, mostly as a result of extremely dry conditions in April and moderate to severe ones in May, and southern Greek islands along with southwestern Turkey where April and especially May were drier than normal.

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.

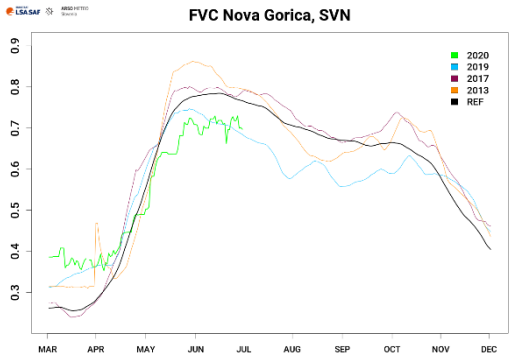
Graphs below present the **vegetation situation** as recorded **on 30 June 2020** in some regions of Southeastern Europe. FVC values for year 2020 are presented as a green line. Graphs also include reference line (2004–2019) in black, and lines in light blue (year 2019), magenta (year 2017) and orange (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.

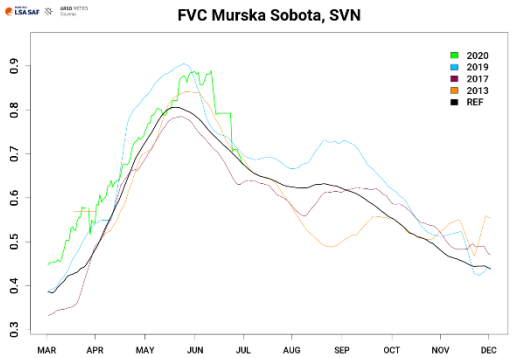
ROMANIA



Unfavourably dry winter to early spring conditions negatively impacted early vegetation growth in Bucovina in northern Romania. Throughout the first months of vegetation season, it developed at much lower rate than usual, then colder-than-usual June with water balance surplus proved favourable for vegetation development. Noticeable improvement can be observed also with FVC index.

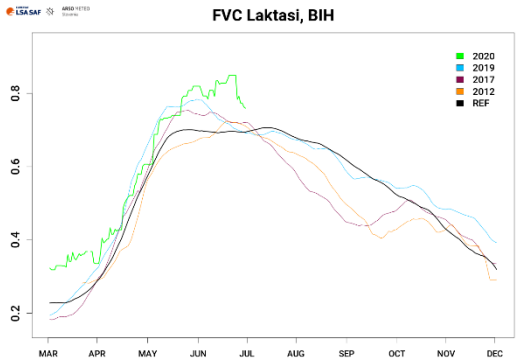
SLOVENIA

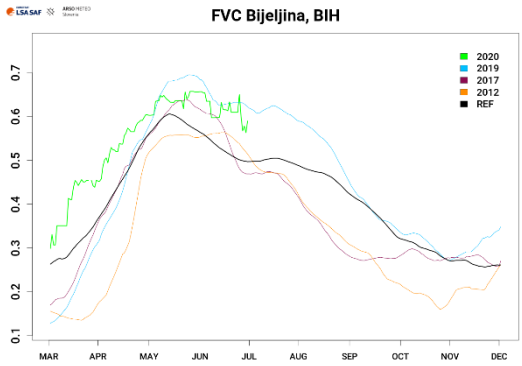


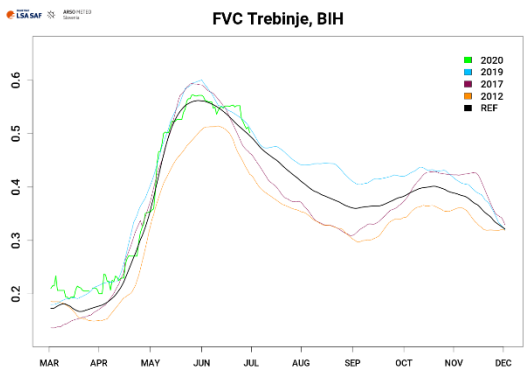


Warm start of the vegetation season boosted vegetation development at both locations, Nova Gorica in western Slovenia and Murska Sobota in northeastern part of the country. Despite drier than usual spring, a steady vegetation development can be observed in Murska Sobota, with an additional boost in early summer that followed wet conditions in June. On the other hand, vegetation growth continued throughout spring months in Nova Gorica although its peak seems to be reached at the lower level than normally, with FVC values approximately 10 % lower than normally. Fraction of vegetation cover remained more or less about the same value throughout June, as expected for this time of year, although at the lower coverage.

BOSNIA AND HERZEGOVINA (REPUBLIC OF SRPSKA)

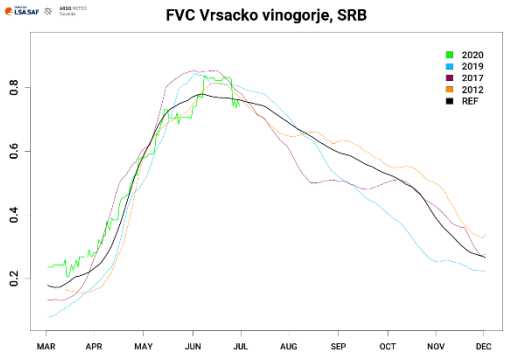


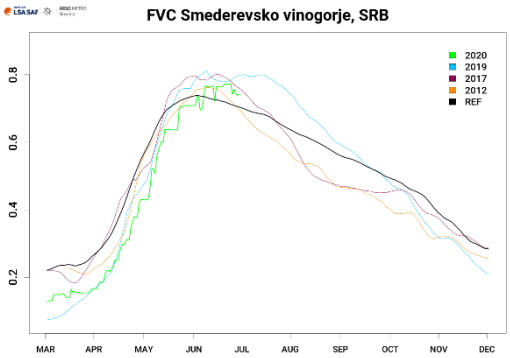




Similar as for northeastern Slovenia, vegetation in Laktasi in northern Bosnia and Herzegovina at first experienced boost in its growth due to warm early spring, followed by a relatively average progression throughout the rest of the spring. May brought favourable conditions for a second boost, which saw vegetation development exceed its peak for more than 15 % in June. Also in Bijeljina in northeastern part of the country, vegetation had a favourable season for its development and has continuously been exceeding the average values for approximately 5-15 % throughout all season already. Wet conditions and moderate temperatures resulted in above-average peak values of FVC and a decline of a lower rate than normally. In Trebinje in southern part of the country, vegetation has been following its ordinary pattern of development since late April, after initial boost experienced in March.

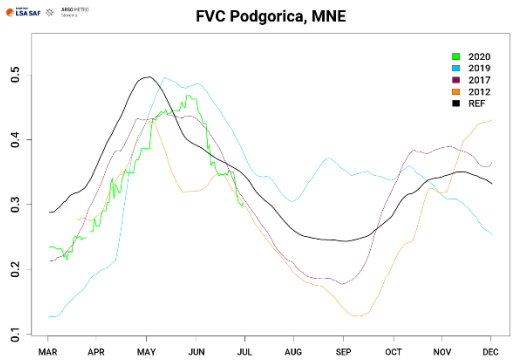
REPUBLIC OF SERBIA





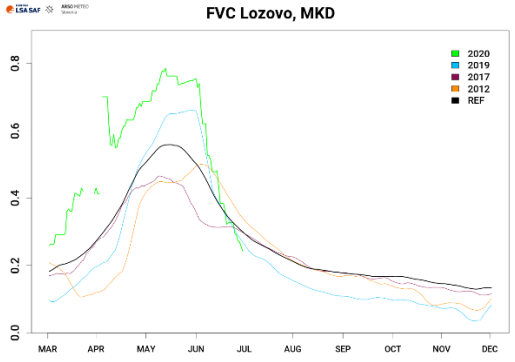
Warmer-than-usual spring boosted vegetation growth in March in Vrsacko vinogorje in the lowlands of northeastern Serbia. Also in this part of the region did initial boost turn into average progress throughout April and May. Favourable June conditions seems to have come just in time as further vegetation development was already beginning to hinder at the end of May, but managed to exceed the average peak value in mid-June. On the other hand, vegetation development began later than usual in Malo Orasje in central Serbia, although it then progressed at its usual rate and pattern throughout spring, and although it reached its peak approximately 2-3 weeks later it seems to have slightly exceeded it, according to FVC values.

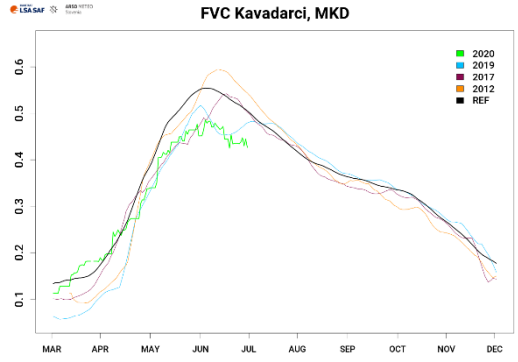
MONTENEGRO



Main characteristic of this year's vegetation development in Podgorica in southern Montenegro is a delay of the vegetation development of approximately 2-3 weeks. As for the development itself, it followed its usual rate of progress throughout spring months, with the exception of its peak which, when occurred in late May, reached slightly lower FVC values than normal. The decline afterwards occurred at higher rate than usually and resulted in below-average vegetation cover at the end of June.

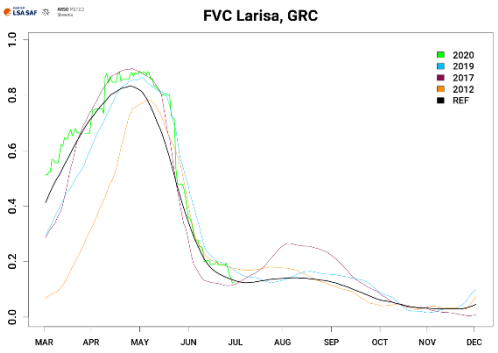
NORTH MACEDONIA

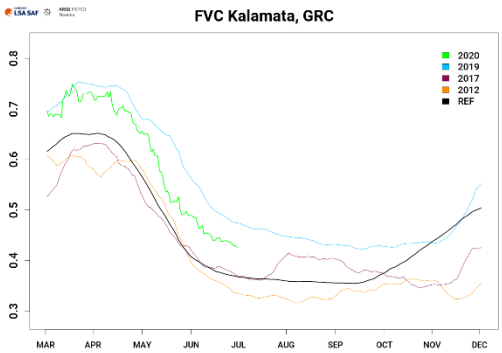




Above-average water balance of the spring months in Lozovo in central part of North Macedonia provided favourable conditions for vegetation development in first half of vegetation season. According to FVC values, the vegetation coverage was continuously up to 20 % higher than normally, also during its peak in mid-May. Lack of rain in June, as indicated also by negative SPI values, sped up the decline which thus occurred at a higher rate than normally, resulting in below-average vegetation cover by the end of June already. Much different was the vegetation growth in Kavadarci in southern part of the country. As it followed its regular pattern of development until mid-April, slightly slower rate of progression throughout April and May resulted in below-average peak values in early June, approximately 10 % lower, similar to last year's peak value. Also the decline of vegetation cover, which follows the peak, continues at its usual rate as well.

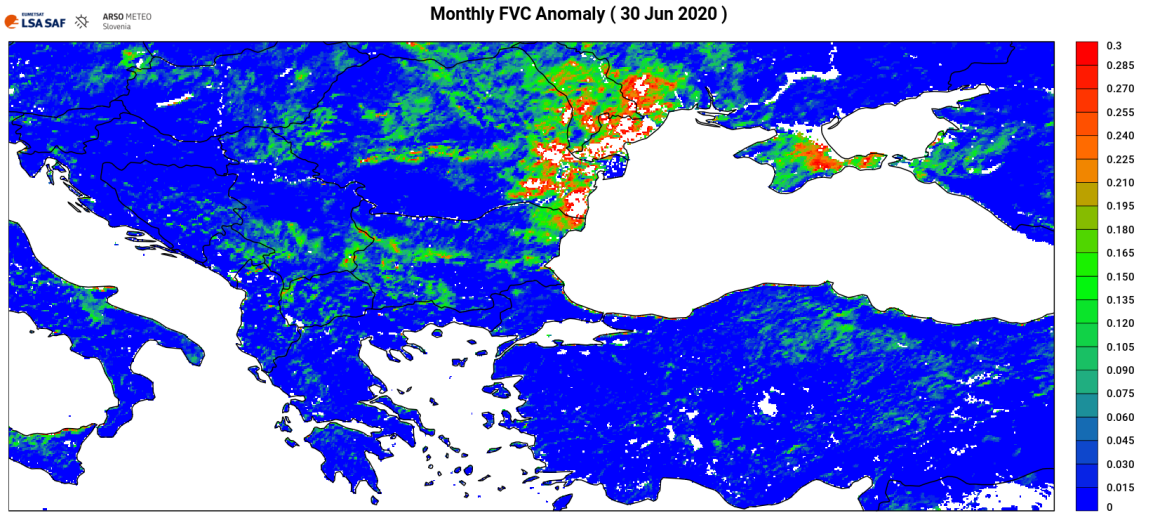
GREECE





About-average winter water balance over Larisa in central-eastern Greece provided optimal conditions for the development of its vegetation in March, while much wetter than usual spring water balance conditions resulted in a slight boost in growth in late April and May at the peak of the season, according to FVC. June too brought average water balance conditions, which resulted in expected rate of decline in vegetation coverage throughout the month. In Kalamata in the south of the country, conditions have been favourable for vegetation development throughout all season already as it follows it usual pattern of development although at approximately 10 % higher than normal FVC 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.



June accumulations of below-average FVC values showed to be greatest, between 25 % and even greater than 30 %, over coastal Romania and southern Moldova. Other areas across the region with a fraction of vegetation cover 10-20 % lower than usual in June include vast part of Romania with the exception of its south, lowlands of northern Serbia and central Hungary and areas along the Balkans mountain range, involving Montenegro, North Macedonia and western Bulgaria. Several scattered locations across western and northern Greece, all across central and especially northern Turkey as well as Albania show signs of lower than usual vegetation cover for this time of year.

IMPACT REPORTS

MOLDOVA

The preliminary local data collected by the Ministry of Agriculture, Regional Development and Environment in Moldova show that spring drought affected about 60 % of the field sown with winter crops. The lack of precipitation affected primarily the southeastern districts, including Basarabeasca, Taraclia, Stefan Voda, and Causeni. The preliminary assessments shows also that about 2,000 hectares were cultivated again. Due to lasting under-average precipitation levels from winter to spring months, hydrological drought developed as well although recent rain has slightly improved the situation [1, 2].

ROMANIA

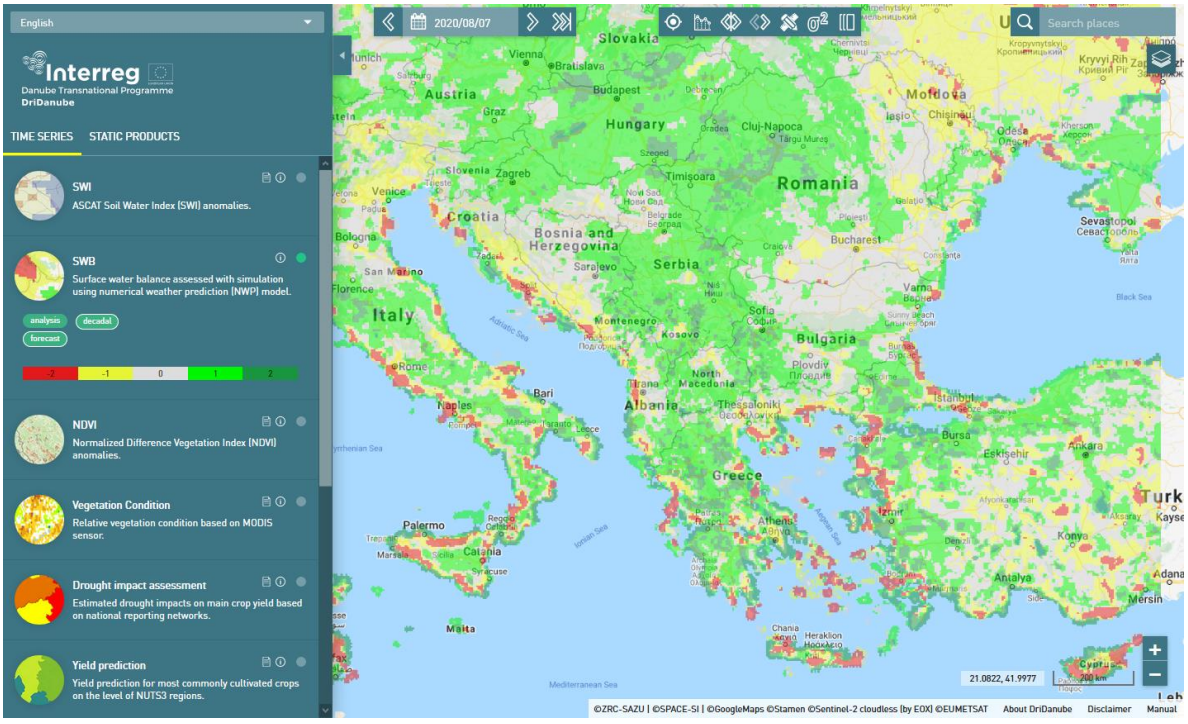
According to the Romanian Minister of Agriculture, out of the total of 2.9 million hectares sown in autumn, the commissions for assessing the damage caused by the drought have already drawn up claims for compensations for 1.3 million hectares. Most affected were the coastal counties Constanta with 329 000 ha of cultivation land affected, and Tulcea where agricultural crops sown on 122 000 ha are compromised. Greatly affected was also country's south-east, especially Ialomita and Buzau counties. In the latter, 90 % of farmers filed claims

for compensation since almost 70 000 ha of agricultural land there were damaged by this spring drought. Among the most affected were also Botosani County in northern Romania with 105 000 ha affected, and Timis County in western Romania where 75 000 ha of land was assessed damaged due to spring drought [3, 4].

[1] https://www.ipn.md/en/over-half-of-winter-crops-affected-by-drought-7966_1073928.html
[2] https://www.moldpres.md/en/news/2020/06/11/20004714
[3] https://agrointel.ro/145063/procese-verbale-incheiate-pentru-13-milioane-de-hectare-afectate-de-seceta/
[4] http://stiri.tvr.ro/seceta-extrema-in-romania--cel-mai-afectat-este-jude--ul-constan--a_863241.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 10 June to 8 August 2020**, as seen in Drought Watch tool[1].



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

In comparison to May-June period, central and northern parts of Balkan Peninsula will remain in wet to very wet conditions, and no great changes are expected over Slovenia and Albania where normal-to-wet conditions and normal-to-dry conditions will persist, respectively. Noticeable changes are expected along the Peninsula's coastal belts and south. In Adriatic countries, accumulated water balance values which previously classified as wet are expected to show dry and very dry conditions. The "drying" direction of change is foreseen for Danube lowlands in Bulgaria and Romania and across eastern Romania where conditions are expected

to normalize, while over Romanian northern parts and across Moldova, moderately dry conditions are foreseen to develop. On the other hand, accumulated water balance for the observed window indicate a change from partially dry to wet and very wet across North Macedonia and continental Greece. With regard to islands in southern part of the Aegean Sea, there is no change expected and dry to very dry conditions are foreseen to continue.

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.