DROUGHT MONITORING BULLETIN

May 2022

HOT SPOT

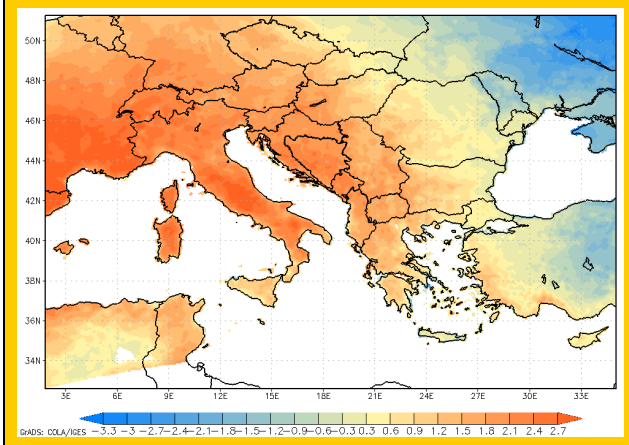
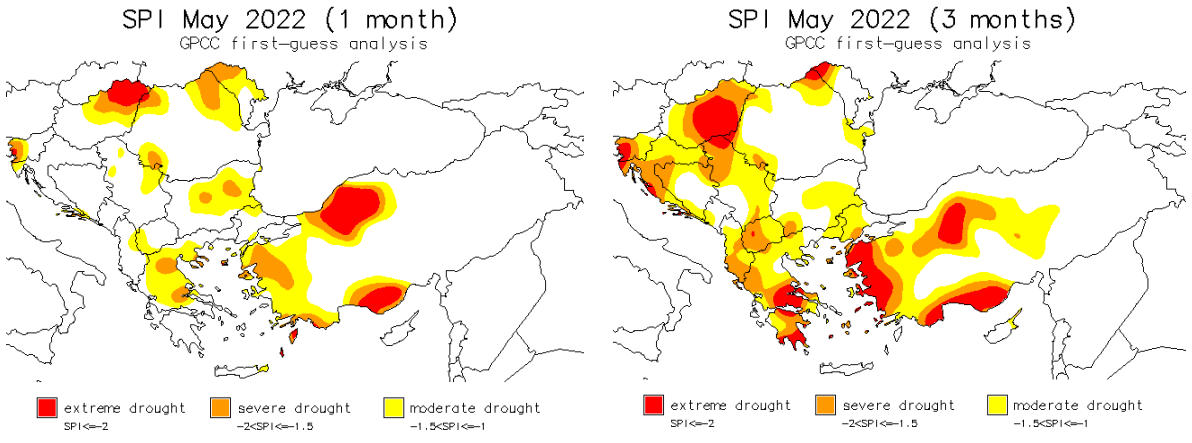


Figure presents **anomaly of the mean air temperature for May 2022** in comparison to 1991-2020 period, revealing May was 2-3 °C warmer than normal in central and western part of Balkan Peninsula. In southwestern half of the region, from Slovenia to Greece and northwestern Turkey, air temperatures in mid- and late May were especially high for this time of year and many localities broke the 30 °C degree mark already, classifying air temperature in second half of May among the hottest 5 % of local historic records.

STANDARDIZED PRECIPITATION INDEX

Drought situation with regard to the precipitation level is presented by Standardized Precipitation Index (SPI). The SPI calculation is based on the distribution of precipitation over long time periods (at least 30 years) and can be calculated at various time scales that reflect the impact of 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 2022** 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.



Precipitation level in May was lower than normal across western Slovenia and over vast part of the eastern half of Balkan Peninsula and western half of Turkey. The monthly rainfall deficit across most of Moldova and eastern Romania, over central and eastern Bulgaria, to a wider Aegean Sea area stretching from western Turkey to central Greece indicated moderate to severe drought conditions, while the anomalies from the expected level of precipitation were even greater in northeastern Hungary as well as in northern and southwestern Turkey where extremely low SPI values indicate extreme lack of rain this May.

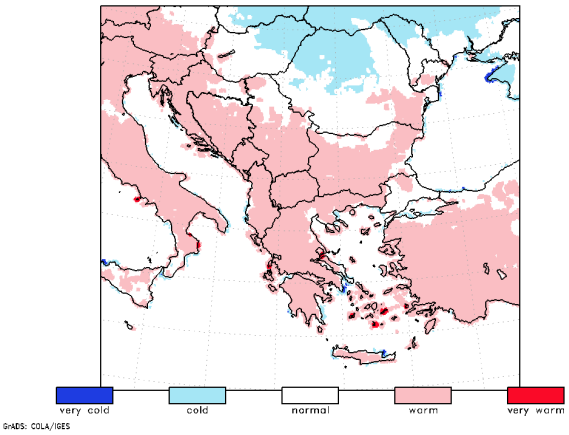
The 3-month overview reveals even greater part of the region was exposed to considerable lack of rain since March, with only Romania and southern Moldova, parts of Bulgaria, central Bosnia and Herzegovina and eastern half of Turkey not experiencing some level of drought, based on a 3-month accumulated precipitations. Severely to extremely low SPI3 values in the spring months over western Turkey were mainly a result of extreme lack of rain in April and May, in northern half of Balkan Peninsula it came as a result of severe precipitation deficit in March and May, while Greece was exposed to prolonged precipitation deficit of moderate to severe level throughout all spring months.

AIR TEMPERATURE 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 a 60-day period **from 1 April to 30 May 2022**.*

AVERAGE AIR TEMPERATURE ANOMALY (°C)
1 APRIL – 30 MAY 2022

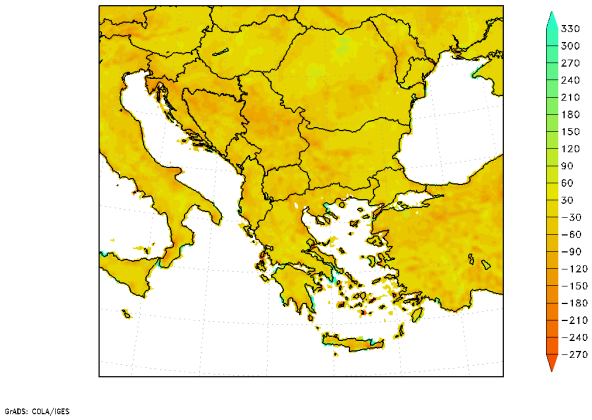
AVERAGE AIR TEMPERATURE PERCENTILE CLASSES
1 APRIL – 30 MAY 2022



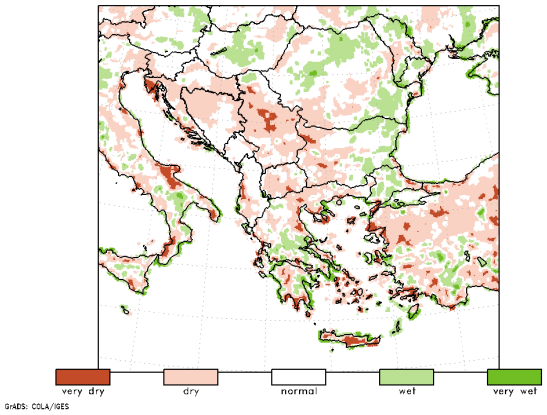
May began with warmer than normal air temperatures only over Hungary, up to 3 °C, while it was up to 3 °C colder than usual over the eastern and southern parts of the region from Moldova to southern Albania, Greece and Turkey. In mid-May, well above-average air temperatures came in to the region from the north-west, resulting in mean air temperatures 2-4 °C warmer than normal in area from Slovenia to northern Albania and central Hungary. Meanwhile, air temperatures remained 1-3 °C colder than normal over central Turkey. The warm spell with anomalies of at least 3 °C progressed south-eastward and by the end of the month expanded over the entire southwestern half of Balkan Peninsula and western third of Turkey, with Montenegro, Albania, most of Greece and Aegean Turkey experiencing air temperatures up to 5 °C above the average for this time of year. In Hungary and most of Romania, air temperatures

remained average, while Moldova continued to experience colder than normal air temperatures in May, up to 2 °C in late May. A 60-day mean air temperature covering April-May period results in average air temperatures across all of the region with the exception of northern parts of Hungary to Moldova where the 60-day window was up to 2 °C colder than normal. However, the 60-day overview averages out the amplitudes of cold and warm spells within the April-May period itself, since in general there was colder than normal April and warmer than normal May in western half of Balkan Peninsula, an average or colder than normal April-May in northernmost part of the region, and alternating spells of much colder and much warmer than normal air temperatures across Greece and Turkey.

ACCUMULATED WATER BALANCE ANOMALY (mm)
1 APRIL – 30 MAY 2022



ACCUMULATED WATER BALANCE PERCENTILE CLASSES
1 APRIL – 30 MAY 2022



May brought deficit in surface water balance to almost the entire region, with greatest anomalies from the local normal conditions present across Serbia, western Bulgaria and southern Moldova. Only across southern half of Greece and southern Turkey as well as some small localized areas in Slovenia, central Hungary, northern Romania, May surface water balance ended up in surplus values. Over a 60-day period covering April and May,

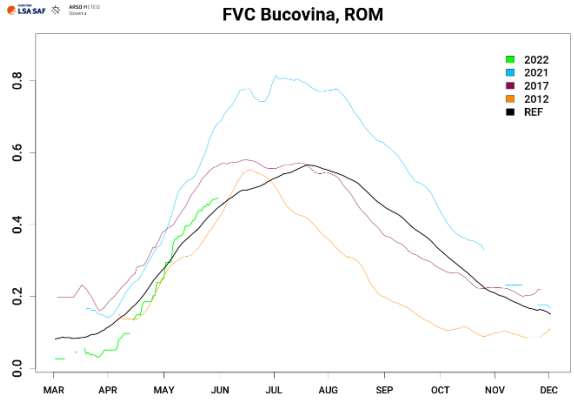
Over the northern and eastern part of Balkan Peninsula from Hungary, most of Romania, Moldova, to eastern half of Bulgaria and northeastern Greece, wet surface water balance in April was in May replaced by noticeable deficit. As a result, the 60-day surface water balance did not alleviate much from the average across most of these areas, the only exception are southern Moldova and northeastern Hungary where May deficit prevailed and a 60-day accumulations stood up to 90 mm below the normal. The opposite change in monthly surface water balance conditions occurred in southern Greece, from dry in April to mild wet in May, resulting in normal to dry 60-day surface water balance values, up to 60 mm. In other parts of the region, namely central and western Balkan Peninsula as well as central and northern Turkey, April as well as May saw continuous spell of surface water balance deficit, which over the 60-day period accumulated to up to 120 mm in a belt from northern Adriatic Sea to central Serbia, over northern Greece and all along northern Turkey, and in accumulated deficit of up to 90 mm over Albania, North Macedonia, western Bulgaria and northwestern Turkey, indicating dry to very dry surface water balance conditions.

REMOTE SENSING - FRACTION OF VEGETATION COVER

Fraction of vegetation cover (FVC) is a 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 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, then FVC slowly drops with vegetation senescence. Line shape depends on the sort of vegetation at the given location.

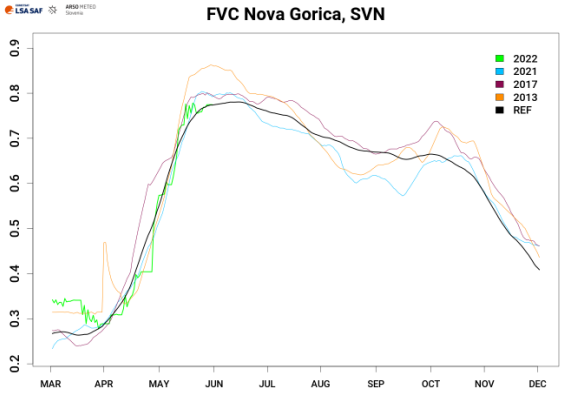
Graphs below present the **vegetation situation** as recorded **on 30 May 2022** at some locations across Southeastern Europe. FVC values for year 2022 are presented as a green line. Graphs also include reference line (2004–2021) in black, and lines in light blue (year 2021), magenta (year 2017) and 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, snow blanket or changes to product by product provider.

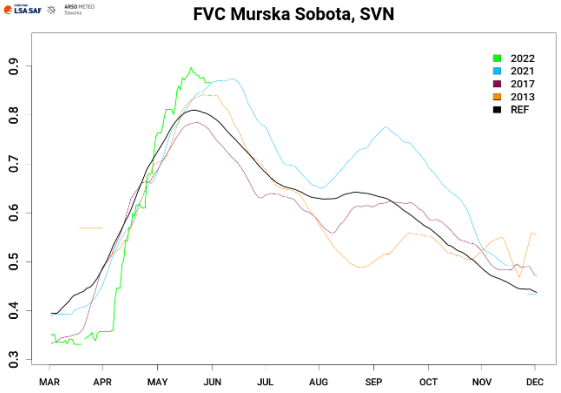
ROMANIA



Weather conditions in spring proved favourable for vegetation growth and development in Bucovina, northern Romania. Vegetation growth began as expected in the beginning of April and continued well throughout April and May, developing at the slightly higher rate than normal throughout April and May. FVC values at the end of May stood slightly above the average, indicating favourable vegetation season so far.

SLOVENIA

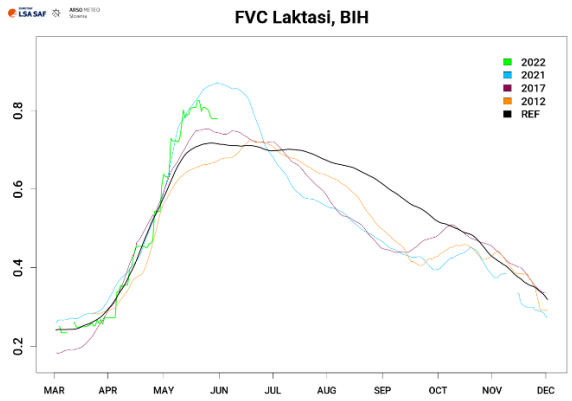


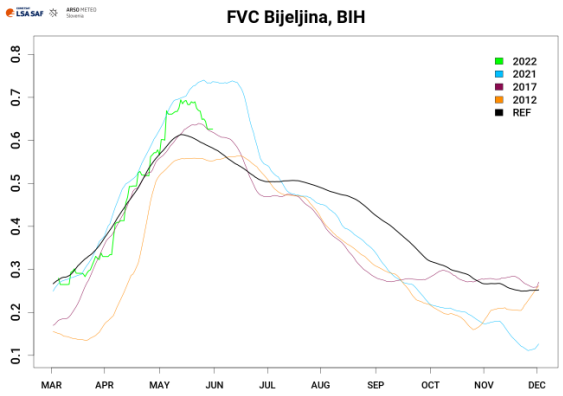


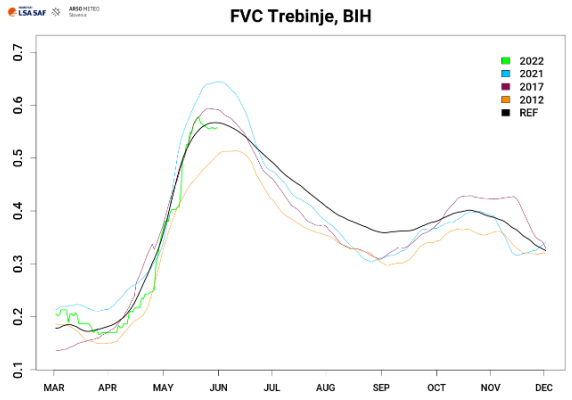
In Nova Gorica, western Slovenia, vegetation development followed well its usual pattern throughout April and May, indicating no greater anomaly from the average. In Murska Sobota in the north-east of Slovenia, fraction of cover with vegetation in winter months up until March was well under-average but weather conditions boosted vegetation growth in early April, slightly later than normal. Vegetation development has since then progressed well, at the higher rate than normal, and even reached higher than normal vegetation cover at its peak time in mid-

May. By the end of the month, FVC values indicate approximately 10 % higher vegetation cover than usual for this time of year.

BOSNIA AND HERZEGOVINA (REPUBLIC OF SRPSKA)

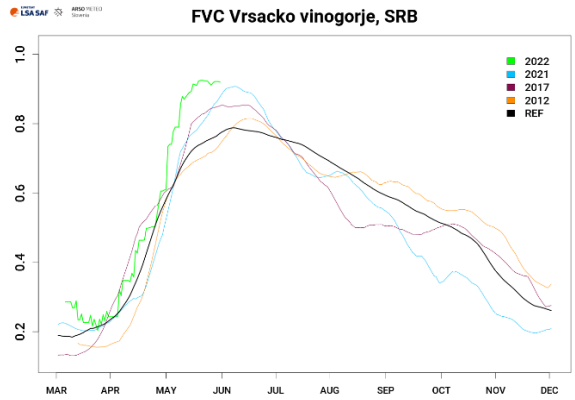


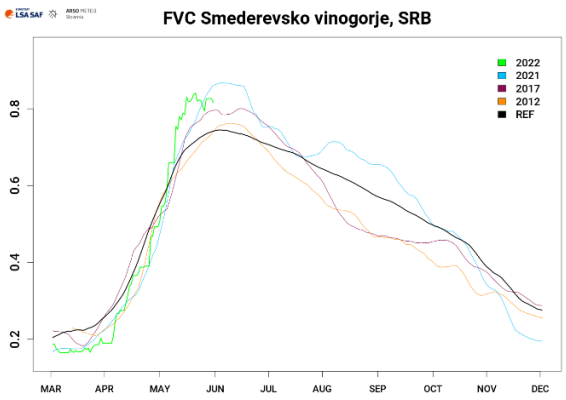




Good start to the vegetation season can be observed also at the three locations in Bosnia and Herzegovina. In Laktasi and Bijeljina along the northern part of the country, vegetation development began as expected in early April and continued well throughout the month, at the rate that surpassed the usual peak level of vegetation cover in mid-May for approximately 10 %. Also in Trebinje in the south, vegetation season began well in early April and followed the reference growth pattern as expected throughout April and May.

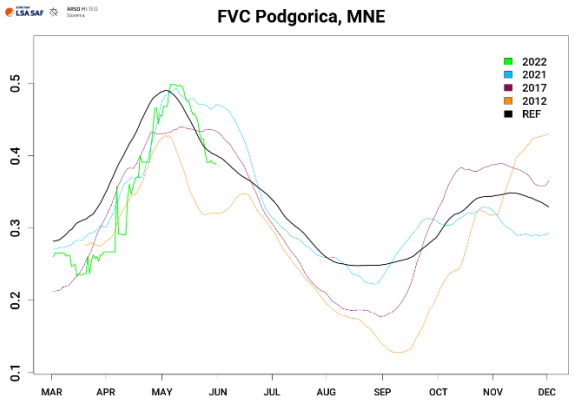
SERBIA





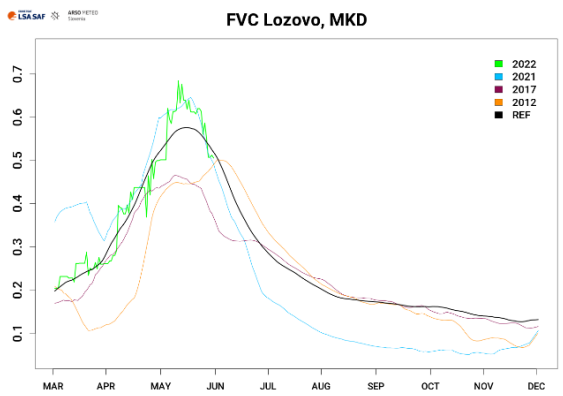
Vegetation development at both location in Serbia began in early April which is approximately their usual period of time when vegetation development begins. It was slightly ahead of time in Vrsacko vinogorje, northeastern Serbia, and at its usual time although starting from a lower level of cover with green vegetation in Smederevsko vinogorje, central Serbia. Vegetation at both location progressed at their usual rates throughout the month and by mid-May well exceeded its peak value, for approximately 10-15 %.

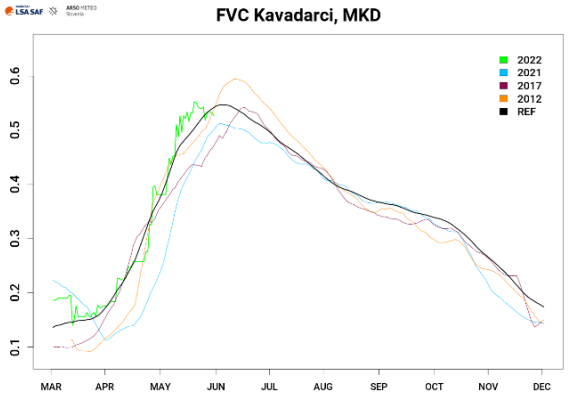
MONTENEGRO



This spring, the beginning of the vegetation season was delayed in Podgorica, southern Montenegro. Vegetation growth began in early April, which is approximately a month later than normal for this location, but then the development progressed at its usual rate throughout April and May. The peak of vegetation cover was reached only slightly later than normal and in a comparable level of cover as usually, indicating a good weather conditions for vegetation growth this spring.

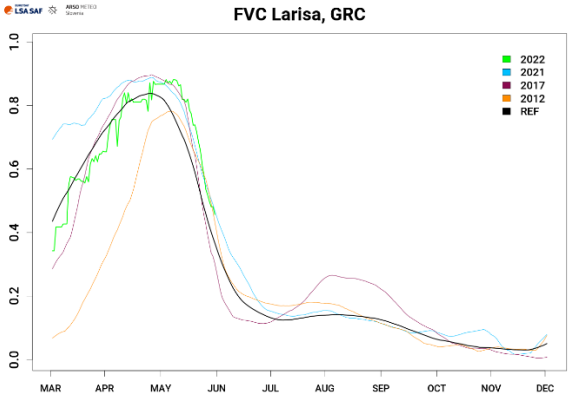
NORTH MACEDONIA

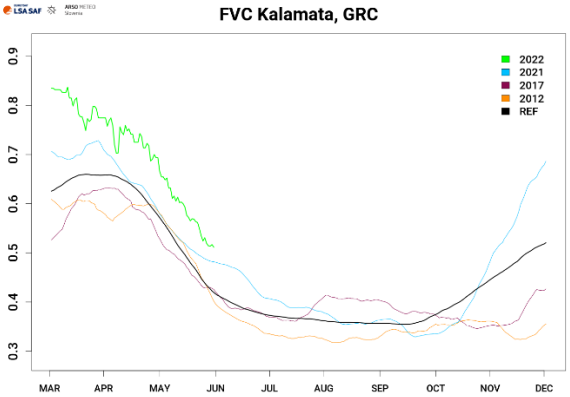




At both locations in North Macedonia, vegetation development this spring began and progressed as expected without major deviations from the usual. In Lozovo in central part of the country, favourable weather conditions supported further development in mid-May, resulting in exceeding the peak level of cover for up to 15 %. In Kavadarci in the south, vegetation development also reach its peak time in mid-May, which is slightly earlier than normally. At both locations, the senescence phase began by the end of May, which for Kavadarci might result in earlier decline in vegetation cover than normally.

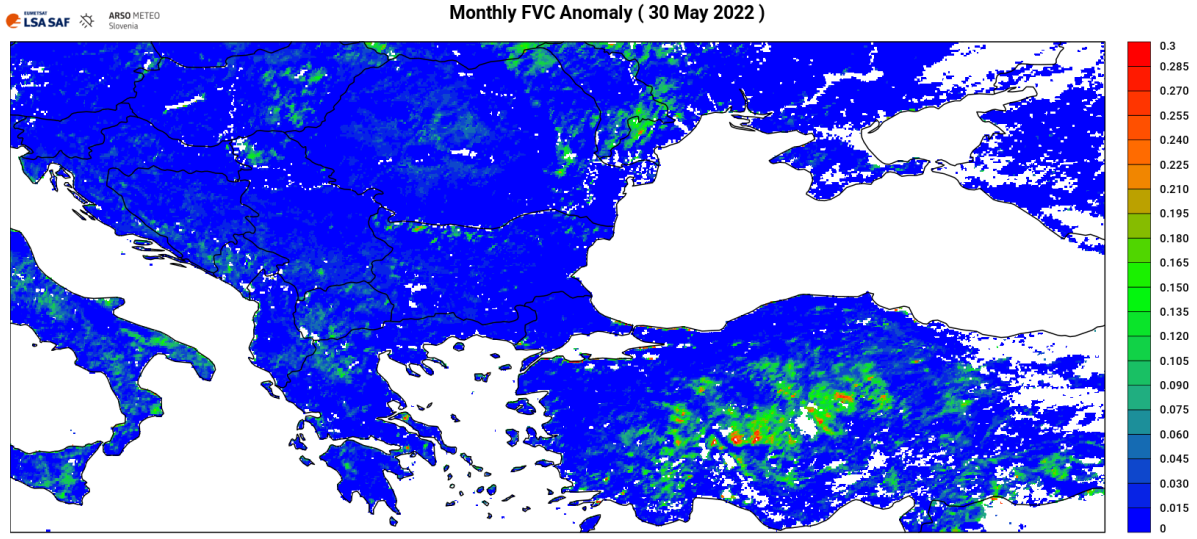
GREECE





In Larisa, central Greece, vegetation progressed at its usual rate throughout March and April, with level of cover only slightly delayed from its usual reference line. The delay in progress resulted in reaching its peak value in mid-May, not more than 2 weeks later than normal, followed by a rate of senescence which is usual for this location. Vegetation in Kalamata, southern Greece experienced a favourable conditions for growth in winter and spring, well exceeding its usual peak level of cover, for at least 20 %. During May, the vegetation continued its senescence phase at the rate usual for May, with FVC values remaining approximately 10 % above the regular values for this time of year.

Figure below shows negative anomaly of **accumulated 30-day FVC values** as recorded **on 30 May 2022** in comparison to the past 18 years (2004-2021), and is used experimentally.



Accumulated negative anomalies of FVC for May show no great deviations from the normal for this time of year over Balkan Peninsula, indicating the vegetation development that might had been delayed in some areas have reached its usual level for this time of year of even exceeded it. Some negative anomalies, accumulating in up to 15 % lower FVC as usual, are observed only across Moldova, northernmost Romania and eastern half of Hungary. However, a great part of central and southwestern Turkey is experiencing greatly reduced vegetation cover in May than normally, up to 20 % and in localised areas about 30 %.

DROUGHT IMPACT REPORTS

HUNGARY

Water level in lake Batalon reached record low in early May, and has not recorded as long water levels in spring (March) since 1921. In first days of May, water level stood at 104 cm, which is 14 cm lower than the summer average level .National Directorate of Water Affairs does not expect improvement of the situation. With summer months ahead, it is likely the water level will drop to 77 cm, approaching the level of water that may cause disruption in Batalon tourism.

According to official data, 50-80 millimeters of rain was missing from the soil, which was enough to wet the upper layers of the soil, and there was no inflow to the lakes [1, 2].

[1] https://index.hu/belfold/2022/05/08/szaz-eve-nem-volt-ilyen-sekely-a-balaton/
[2] https://infostart.hu/belfold/2022/05/05/az-udulesi-szezon-vegere-alig-maradhat-viz-a-balatonban

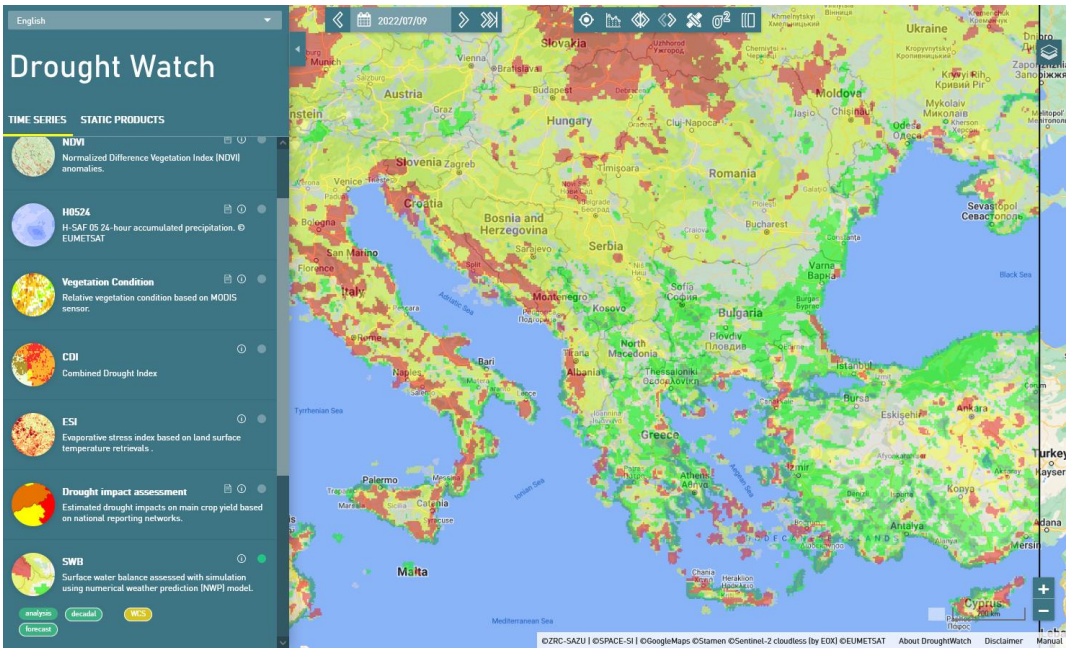
CROATIA

In the continental regions, the effect of the lack of precipitation during the first part of May was seen in the slow growth of green crop biomass, and a negative effect of drought on possible yields was observed. The situation improved with the arrival of large amount of precipitation at the end of May, after which a visible increase in green biomass was observed. In the coastal part of Croatia, the amount of precipitation accumulated for months is significantly below the reference average value, which has a negative effect on increased costs in agricultural production due to the increased need for irrigation. Yields of non-irrigated crops were reduced due to the effects of drought.

Extracted from:
https://meteo.hr/klima.php?section=klima_pracenje&param=spi&el=prspi
https://meteo.hr/klima.php?section=klima_pracenje&param=ocjena
https://meteo.hr/proizvodi.php?section=publikacije&param=publikacije_publikacije_dhmz&el=bilteni (preliminary report; publication is in preparation)
https://meteo.hr/klima.php?section=klima_pracenje&param=spi&el=karte_suse&Week=220331

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 2022**, as seen in Drought Watch tool[1].



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

Forecasted 60-day surface water balance, covering also the next 10 days, shows most of the area in southern half of the region, especially Bulgaria, North Macedonia, continental Greece and southwestern Turkey, is going to experience unusually wet surface water balance conditions. The surplus is expected to highly exceed the average for this time of year especially in continental parts of Greece and Turkey about the Aegean Sea and in the south-west of Turkey. At the same time, dry surface water balance conditions are going to continue across northern half of Balkan Peninsula and Albania, with especially high deficit present over the areas along the Adriatic Sea, northeastern Hungary, northernmost Romania and northern Moldova.

Methodology

DMCSEE Drought monitoring bulletin is based on numerical weather prediction (NWP) model simulations over SE Europe, SPI index calculations, remote sensing and public media drought impact reports. Precipitation data is provided by Global Precipitation Climatology Centre (GPCC; https://www.dwd.de/EN/ourservices/gpcc/gpcc.html), shown against the averages of the 1961-1990 time period. NWP simulations are performed with Non-hydrostatical Mesoscale Model at ~7 km spatial resolution (NMM; http://www.dtcenter.org/wrf-nmm/users/). Historical DMCSEE model climatology is computed with NMM for the time period between 1 January 1991 and 31 December 2020. European Centre for Medium Range Weather Forecast (ECMWF) ERA5 dataset (http://www.ecmwf.int/en/forecasts/datasets/reanalyses-datasets/era5) is used as input for simulations. Long-term averages (1991-2020), used for comparison of current weather conditions, are obtained from simulated dataset. Comparison of current values with long-term averages provides a signal on potentially ongoing drought. Remote-sensing product in the bulletin is based on the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) Land SAF MSG Daily Fraction of Vegetation Cover product (https://landsaf.ipma.pt/en/products/vegetation/fvc/), presented for the checked and confirmed locations and using long-term averages from 2004 to the last full year (currently to 2021). Information on drought impacts are obtained from only freely available online reports of national authorities and media newspapers.