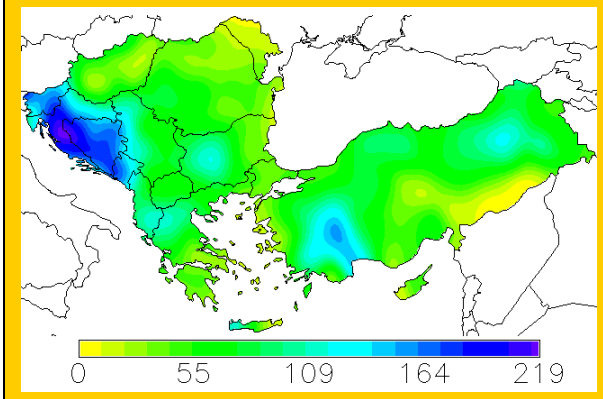
DROUGHT MONITORING BULLETIN

May 2023

HOT SPOT

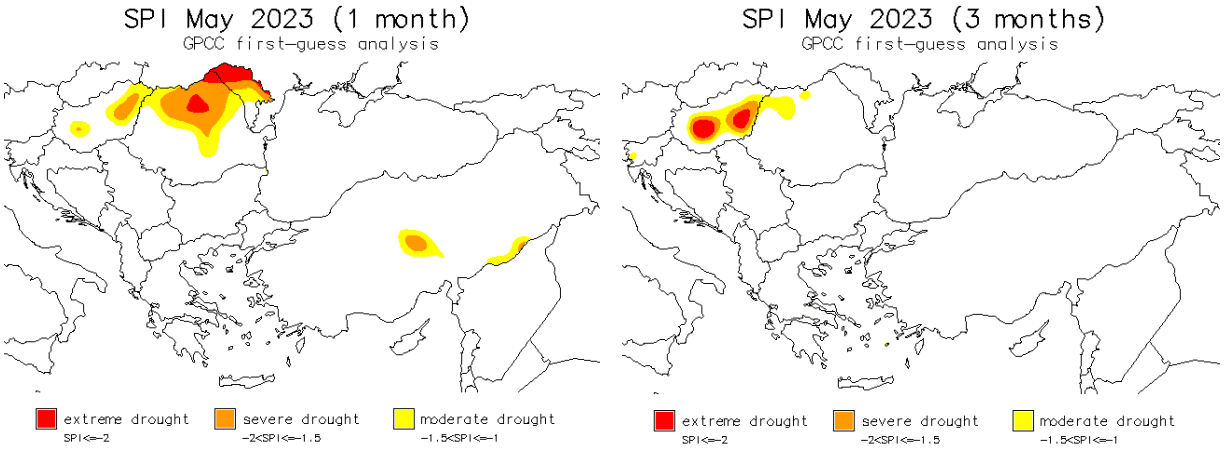


According to the **modelled precipitation level for May 2023** shown on the figure on the left, several countries along the western Balkan Peninsula but also over its central part and across western and eastern Turkey experienced very wet conditions this May, while on the other hand, across northern and northeastern Balkan Peninsula including Hungary, Romania and Moldova as well as central and southeastern Turkey, May was scarce in precipitation amount, for the second month in a row in eastern Hungary.

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 2023** 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.



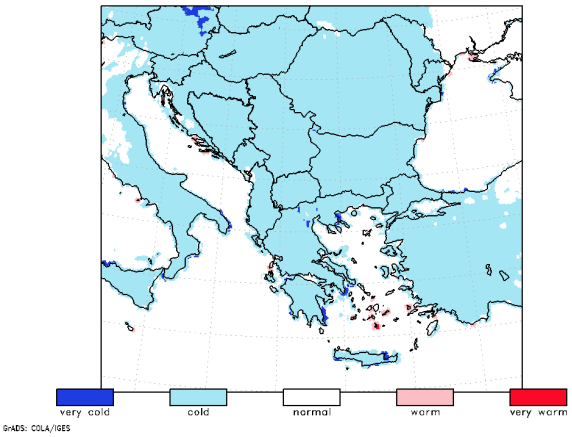
Monthly SPI for May shows that precipitation level over much of the northern Romania, eastern Hungary and central Moldova as well as over localised area in central Turkey was much lower than normal, indicating severe drought conditions for this time of the year, while lack of rain this May was even more profound over northern Moldova and central-northern Romania compared to the normal, indicating extremely dry conditions. Looking at the three-month period from March to May, this spring brought well under-average amount of rain to most of central and eastern Hungary, as SPI3 indicates severe to extreme spring drought over that part of the country, especially on the account of dry April and May, and drought of moderate level over northwestern Romania as a result of dry May.

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 their classified values in percentile classes for a 60-day period **from 1 April to 30 May 2023**.*

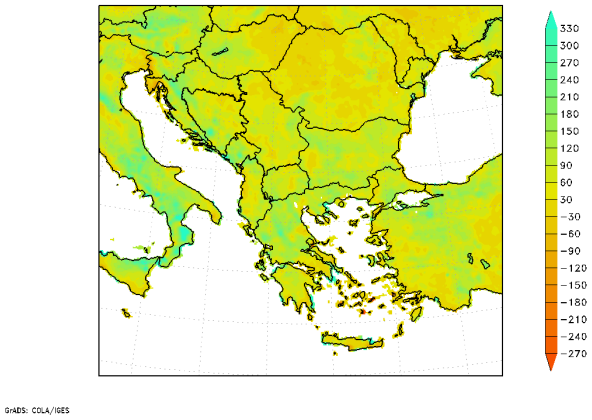
AVERAGE AIR TEMPERATURE ANOMALY (°C)
1 APRIL – 30 MAY 2023

AVERAGE AIR TEMPERATURE PERCENTILE CLASSES
1 APRIL – 30 MAY 2023

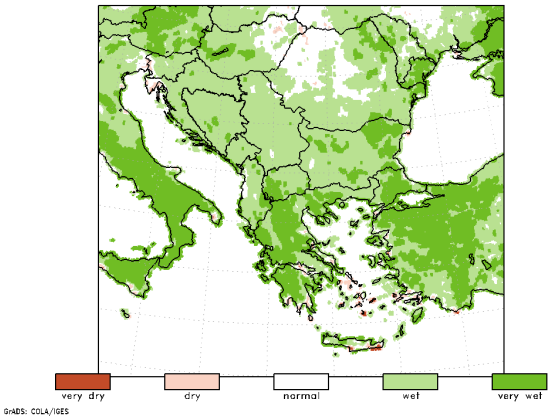


May was characterised by mostly colder than normal air temperatures. First days of the month were unusually cold especially over Moldova and eastern Romania where air temperatures were 3-5 °C below the average for this time fo year, and 1-3 °C colder than normal over the rest of the eastern half of the region, from northern Hungary, over Bulgaria and North Macedonia to Greece and along the northern coastline of Turkey. In mid-May, a spell of colder than normal air temperature now spread over to the western half of the region with air temperatures up to 3 °C below the mid-May average. By the end of the month, colder spell came to an end over much of the region with the exception of Greece and western third of Turkey where they remained up to 2 °C, locally in southwestern Turkey up to 4 °C below the average. At that time, central and eastern parts of Balkan Peninsula remained in average air temperatures while coastal Croatia, Slovenia, Hungary and Pannonian parts of Serbia and Romania experienced slightly warmer than normal air temperature conditions, exceeding the average for up to 2 °C. With both April and May generally ending up colder than usual, the 60-day mean air temperature across the region stood up to 2 °C below the long-term averave across majority of the region, with only scattered, localised areas experiencing average mean air temperature of the April-May period.

ACCUMULATED WATER BALANCE ANOMALY (mm)
1 APRIL – 30 MAY 2023



ACCUMULATED WATER BALANCE PERCENTILE CLASSES
1 APRIL – 30 MAY 2023



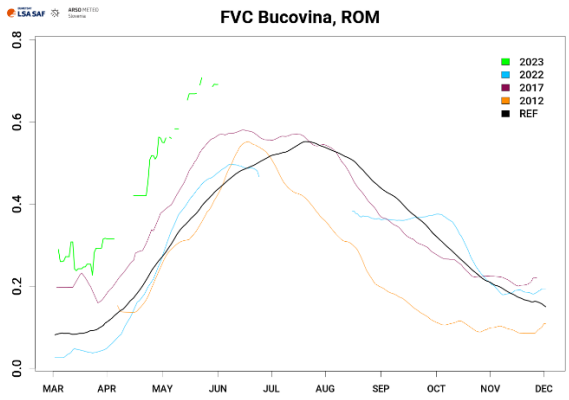
Considering accumulated precipitation and evapotranspiration conditions, the 60-day period from April to May brought surface water balance deficit of up to 60 mm to eastern Hungary, werstern Romania and central Turkey, and a deficit of up to 90 mm to western Slovenia and northwestern Croatia. In the meantime, other parts of the region were under wetter than normal conditions where surface water balance surplus ranged mostly betweren 90 and 120 mm, but it also reached up to 180 mm over central Greece and central Croatia. As a result of intense precipitation events, localised areas over Greece, Croatia, Bosnia and Herzegovina, Montenegro and over the wider Bosporus area recorded even greater surface water balance surplus, up to 300 mm. As seen from the surface water balance percentile map, Greece, western Turkey and scattered areas over Bulgaria and North Macedonia along with other localised areas across the region recorded one of the wettest April-May periods in comparison to the long-term.

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 in general low at the beginning of the growth season, the highest at full vegetation development, then FVC slowly drops with vegetation senescence. Line shape depends on the sort of vegetation at the given location.

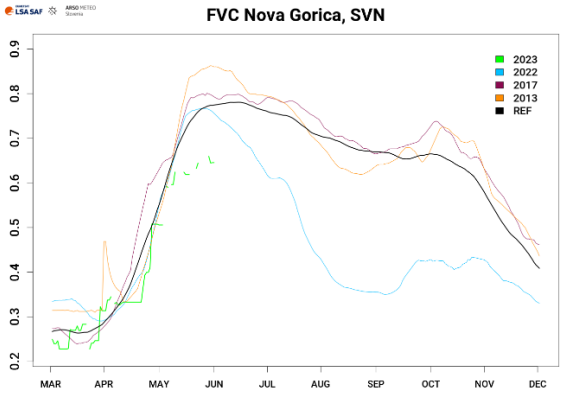
Graphs below present the **vegetation situation** as recorded **on 31 May 2023** at selected locations across Southeastern Europe. FVC values for year 2023 are presented as a green line. Graphs also include reference line (2004–2022) in black, and lines in light blue (year 2022), magenta (year 2017) and orange (year 2012, or 2013 for Slovenia) for comparison. Possible missing values or their sharp decline could be a result of a prolonged cloudy weather, extreme weather events, snow blanket or changes to product by the product provider.

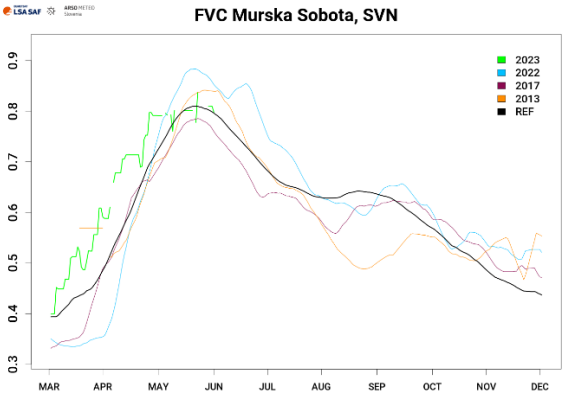
ROMANIA



Weather conditions this spring proved favourable for vegetation growth in Bucovina, northern Romania. Growing season began on the base of double the level of cover that is usual in March and continued its growth at the regular rate, resulting in reaching reference FVC values approximately a month ahead of its usual time. With an unchanged growing rate also during most of May when the reference line would normally begin to flatten, the unit was approximately 70 % covered with green vegetation instead of the usual 40 %.

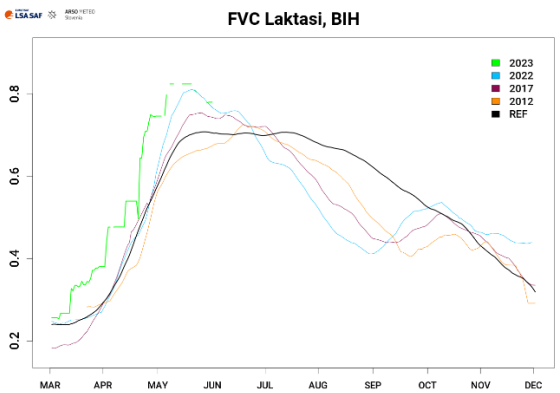
SLOVENIA

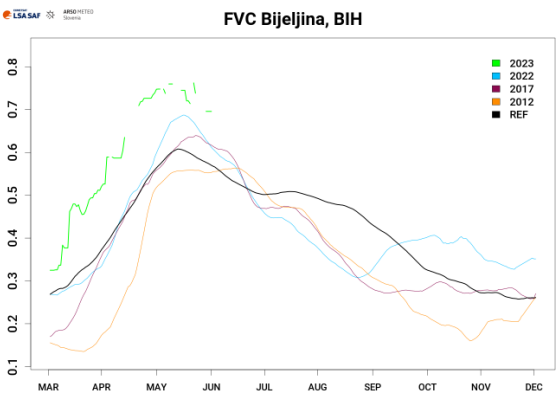


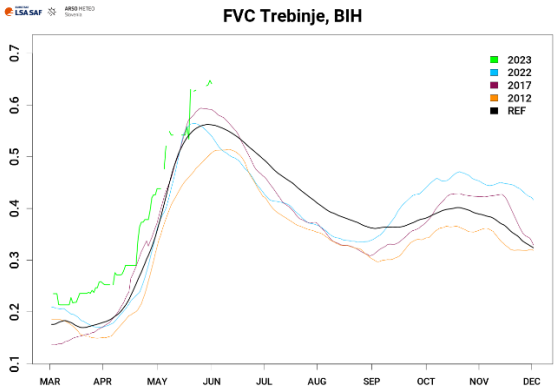


Vegetation season began as normal in Nova Gorica, western Slovenia although FVC values were slightly legging behind throughout March and April. May weather conditions did not support further growth as in second half of May the fraction of cover with vegetation increased by only 5 % compared to the normal 15-20 %. Murska Sobota, northeastern Slovenia experienced favourable weather conditions for vegetation development this spring. Growing season began 3-4 weeks earlier than normal and progressed at its usual rate, meaning FVC values were all March and April 10-15 % higher than normal. May weather conditions were less favourable, and stagnated the progress at the average FVC for this time of the year.

BOSNIA AND HERZEGOVINA (REPUBLIC OF SRPSKA)

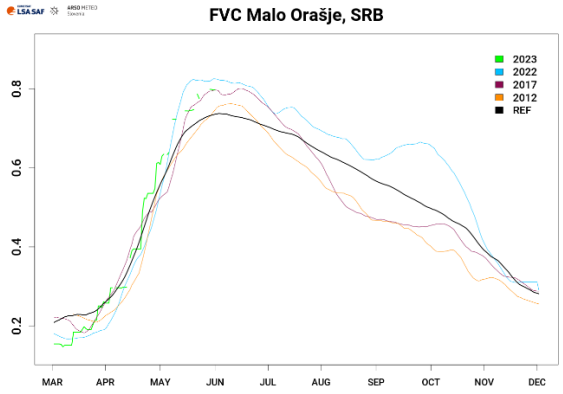


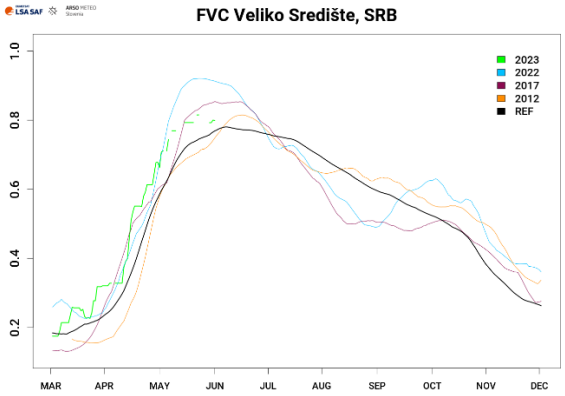




Weather conditions supported vegetation growth well in Bijeljina, northeastern Bosnia and Herzegovina this spring as the growing season began a month earlier than normal and by progressing at its usual rate resulted in FVC values continuously exceeding the average for about 20 %, even during the seasonal peak. Vegetation development in Laktasi in the north-west and in Trebinje in the south of the country followed a different pattern of development than in Bijeljina. Although the growing season began earlier also in these parts of the country, the rate of growth was in Trebinje lower than normal during first half of spring and adopted its usual pattern only from mid-April onward. In Laktasi, vegetation development progressed at the usual rate all season, with few temporal periods of stagnation, as seen from the FVC graph. At its peak time in mid-May, vegetation cover was in Laktasi and in Trebinje approximately 10 % higher than normal.

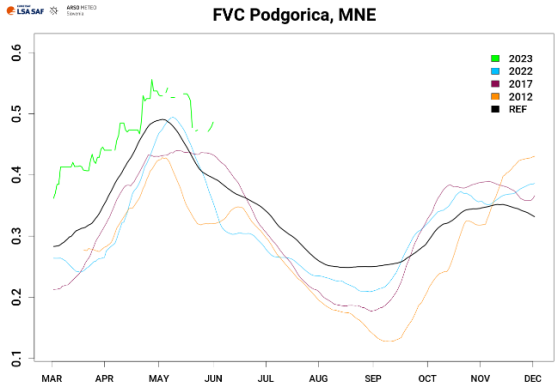
SERBIA





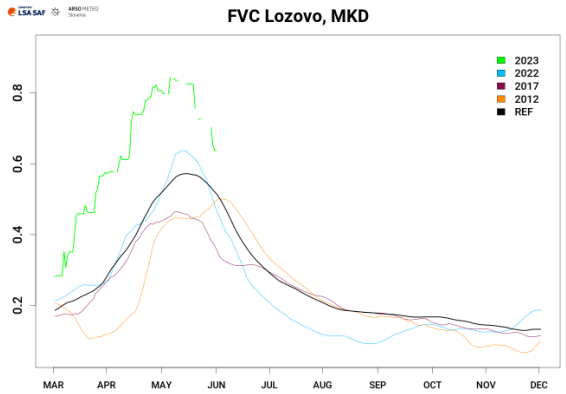
Malo Orasje, central Serbia as well as Veliko Srediste in the north-east of the country so far experienced more or less regular vegetation season this spring. The development followed well its usual growing rate, although in Veliko Srediste the level of vegetation cover was advancing for 1-2 weeks throughout much of the spring. Also the seasonal peak, the level of cover with vegetation was at both locations slightly exceeded, according to the FVC.

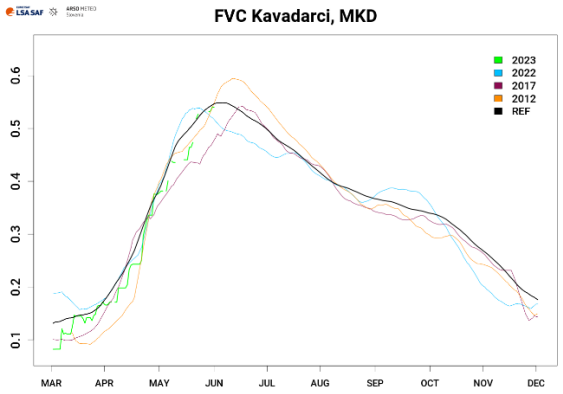
MONTENEGRO



In Podgorica, the fraction of cover with green vegetation has continuously been above-average this spring. It was in early March approximately 10 % greater than normal although in first half of spring up to mid-April, vegetation development progressed at a slightly slower rate than it normally would at this time of the year. Second half of spring showed improvement in vegetation growth, as a boost in growth can be observed around the end of April and its peak cover was also exceeded by approximately 5 %.

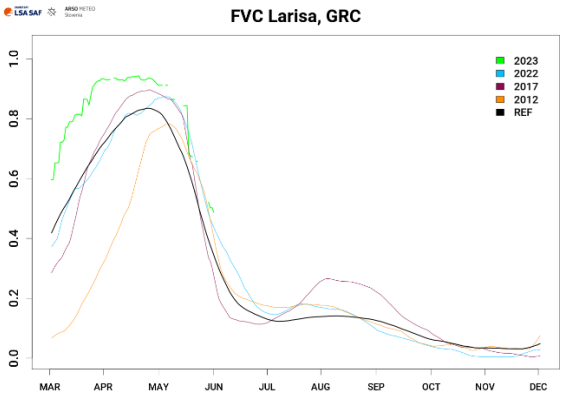
NORTH MACEDONIA

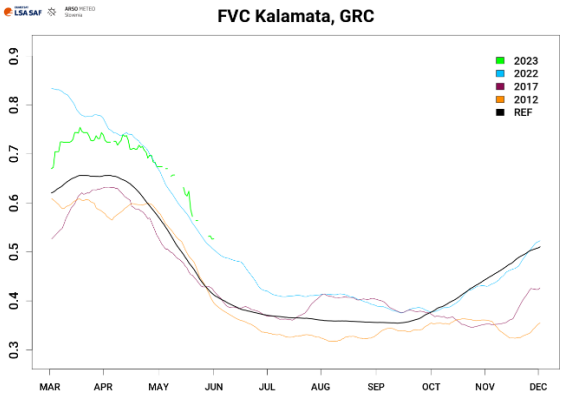




Vegetation in Lozovo, central North Macedonia has so far also had a favourable growing season. According to the FVC index, vegetation season began on the base of a slightly above-average vegetation cover in early March and then progressed at the high rate during spring months, expanding from a coverage of approximately 25 % to more than 80 % between March and mid-May, and exceeding the peak coverage by 25-30 %. On the other hand, in Kavadarci in the southern part of the country, vegetation cover prior to the beginning of the growing season was very scarce and although the growth progressed at the usual rate, the total fraction of vegetation cover remained slightly below-average for most of March and April, and there can be a slight hindrance of growth observed throughout May, according to the FVC index.

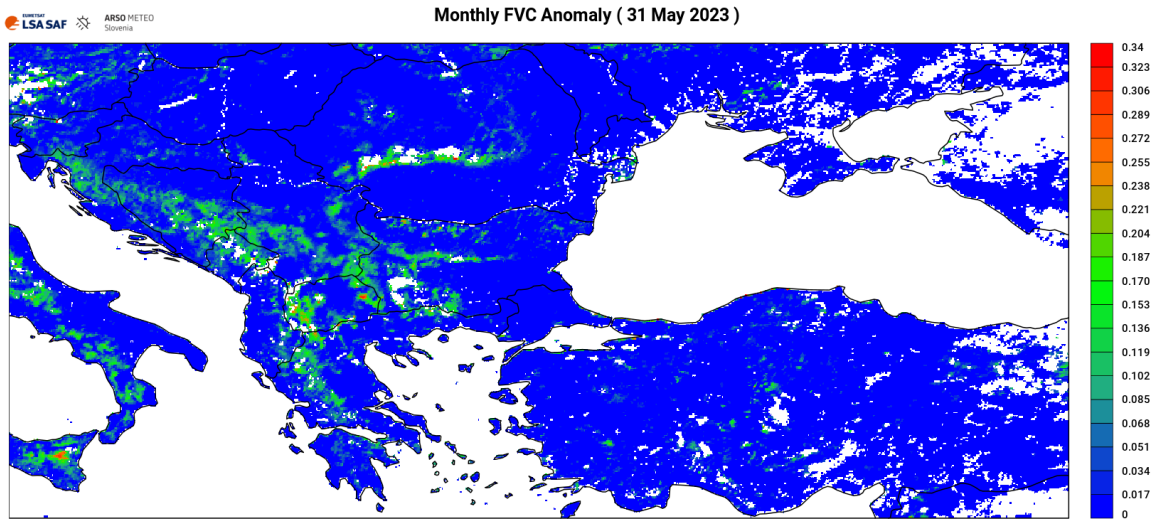
GREECE





Weather conditions proved favourable for vegetation growth and development also in Larisa, central Greece and in Kalamata in the south, which recorded a well-above-average level of cover with vegetation this March and April, up to 10 % higher in Kalamata and up to 20 % higher in Larisa. In Kalamata in particular, the senescence phase followed a similar pattern and level of cover as a year before, continuously exceeding the long-term average for about 10 %. In Larisa, senescence phase began approximately 2 weeks later than normal, then progressed at its regular rate.

Figure below shows negative anomaly of **accumulated 30-day FVC values** as recorded **on 31 May 2023** in comparison to the past 19 years (2004-2022), and is used experimentally.



During May, fraction of vegetation cover was lagging behind its usual levels for this time of year across most of the mountainous areas from southern Slovenia to western Bulgaria and far eastern Greece, along the southern branch of the Carpathians and over much of the western part of North Macedonia and central Greece. At these parts of the region, vegetation cover would normally expand over an up to 20 % greater portion of unit. Vegetation cover would normally be slightly higher, up to 10 %, also in some localised areas across Slovenia, continental Croatia and western Romania.

DROUGHT IMPACT REPORTS

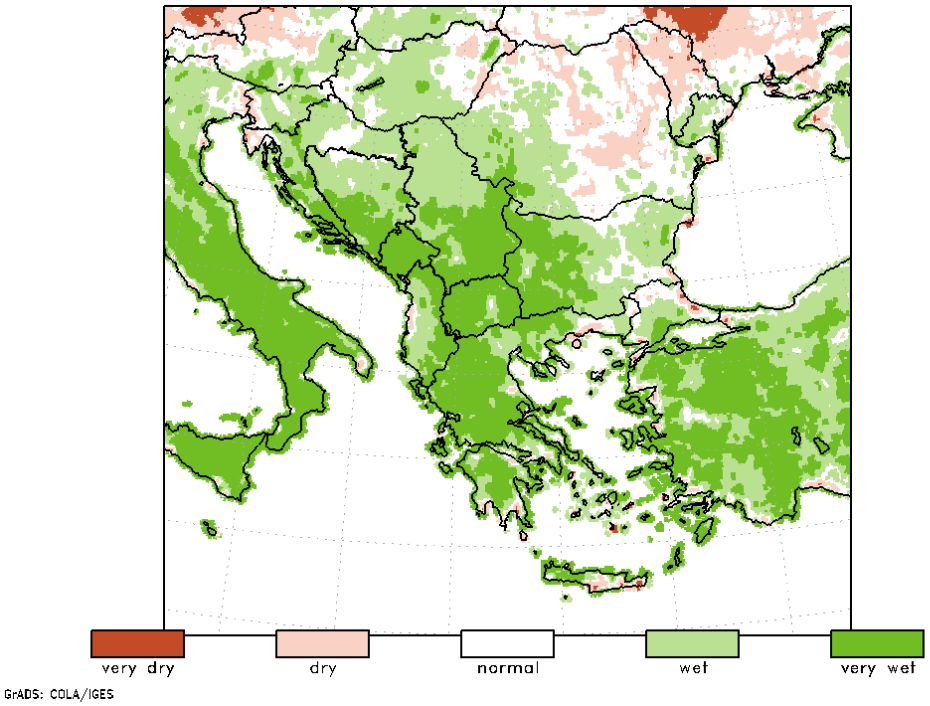
ROMANIA

While some parts of the country experienced heavy rains and floods that swept away hundreds of hectares of cultivated land, other parts of Romania faced the lack of soil moisture, eventually leading to topsoil drought conditions this late spring. In some counties along the southern parts of Romania, such as Campia Baraganului, Calarasi or Braila, agricultural crops were already observed suffering negative impacts due to the lack of rain. According to the vice-president of the League of Associations of Agricultural Producers from Romania (LAPAR), under drought stress were mostly autumn crops but also those sown in spring.

[1] https://agrointel.ro/260617/anul-agricol-la-extreme-nina-gheorghita/

OUTLOOK

Figure below shows model simulations of the **60-day accumulated surface water balance anomaly** in historical percentile classes for the time period **from 1 May to 29 June 2023**.



According to the forecast 60-day water balance up until the end of June, the surface water balance conditions of the April-May period are expected to intensify across the region, meaning southern parts of the region including Greece and western half of Turkey are expected to remain wetter than normal, a change from wet to very wet surface water balance conditions is expected also across central-wetern part of Balkan Peninsula from southern Croatia to western Bulgaria, while conditions over much of the northeastern Balkan Peninsula, from eastern Hungary to the Black Sea and Moldova, surface water balance is expected to become drier than normal for this time of year.

Methodology

DMCSEE Drought monitoring bulletin is based on numerical weather prediction (NWP) model simulations over SE Europe, SPI index calculations, remote sensing product 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 average 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 model climatology in terms of air temperature and surface water balance is computed with NMM on the base of 1 January 1991 to 31 December 2020 time period, using European Centre for Medium Range Weather Forecast (ECMWF) ERA5 dataset (http://www.ecmwf.int/en/forecasts/datasets/reanalyses-datasets/era5) 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 against long-term average or in percentile classes (the two extreme classes with a 5-percent range and each of the middle three classes with a 30-percent range) 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 2022). Information on drought impacts are obtained from freely available online reports of national authorities and media newspapers.