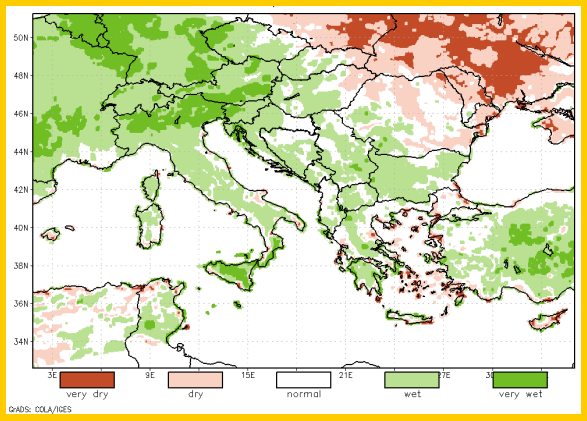
DROUGHT MONITORING BULLETIN

May 2024

HOT SPOT

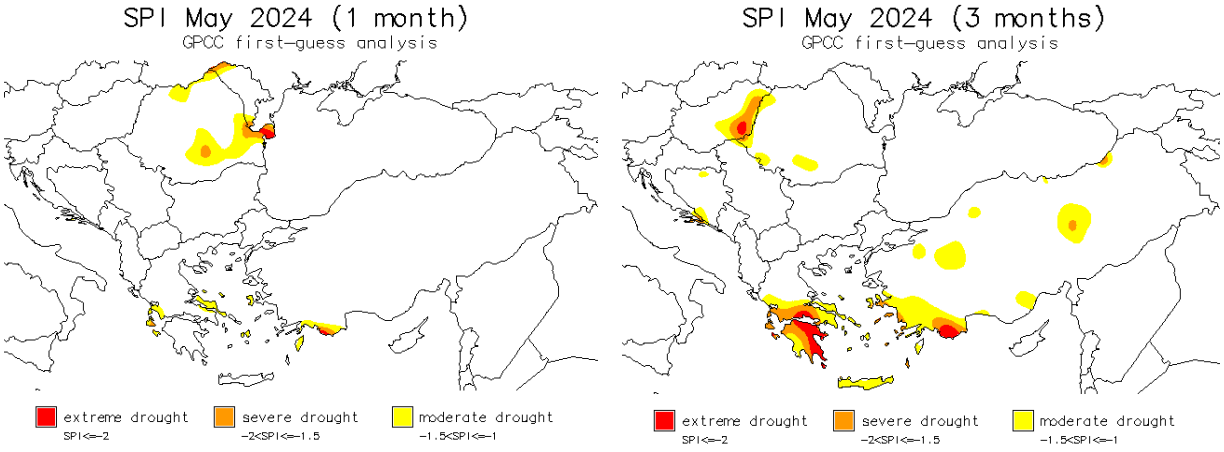


In most of the region, May was normal or even abundant in precipitation level, resulting in mostly wetter than normal monthly surface water balance. On the contrary, lack of rain was evident across far north-east, from eastern Hungary to the Black Sea, and locally over the Aegean Greece, as seen on figure on the left showing **surface water balance for May 2024 in percentile classes** compared to 1991-2020. Of that part of the region, the area between Hungary and Romania continued to experience drier than normal surface water balance conditions for the fifth month in a row.

STANDARDIZED PRECIPITATION INDEX

Drought situation with regard to 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 2024** 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.

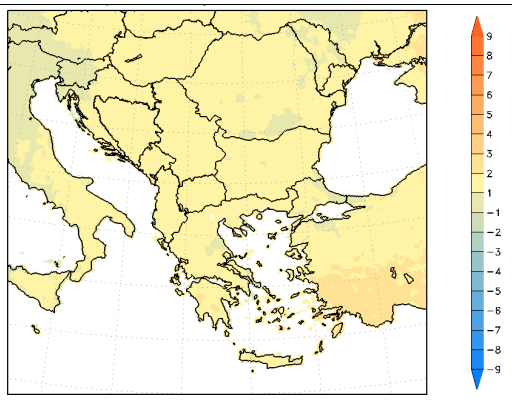


Vast part of the region, especially its western half, Greece, Bulgaria and central Turkey, recorded average to higher than normal precipitation level this May, while northeastern quarter and Aegean Turkey received less than their usual amount of rain. Over southern and southeastern Romania and northernmost Moldova, monthly deficit grew to the level of moderately to severely dry conditions, according to SPI. Over the 3-month period from March to May, spring precipitation conditions reveal considerable lack of rain across southern half of Greece and southwestern Aegean Turkey as well as over eastern Hungary, where 3-monthly deficit indicated severely to extremely dry conditions, compared to 1991-2020, mostly on the account of very dry April and drier than normal March. Although May brought above-average rainfall rate to central Turkey, some localised areas there still recorded noticeable precipitation deficit on the 3-month basis due to moderately dry March and severely dry April.

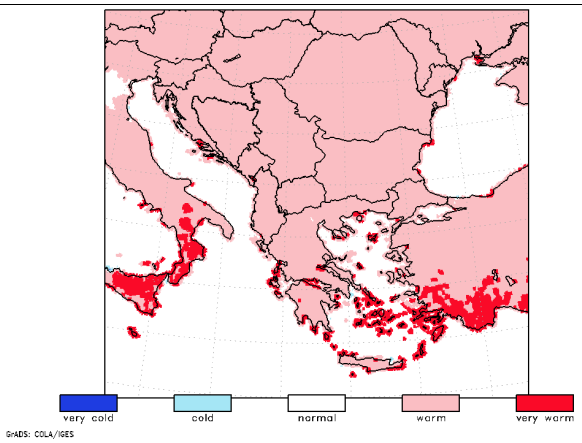
AIR TEMPERATURE AND SURFACE WATER BALANCE

Figures in this section show anomalies of the mean air temperature and accumulated surface water balance as well as their absolute values in percentile classes for the 60-day period between 1 April to 30 May 2024.

AVERAGE AIR TEMPERATURE ANOMALY (°C)
1 APRIL – 30 MAY 2024



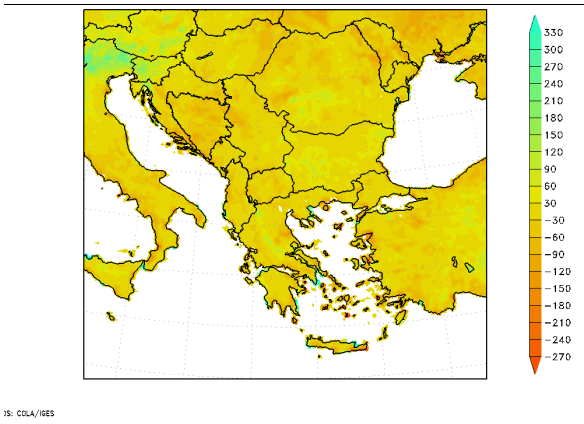
AVERAGE AIR TEMPERATURE PERCENTILE CLASSES
1 APRIL – 30 MAY 2024



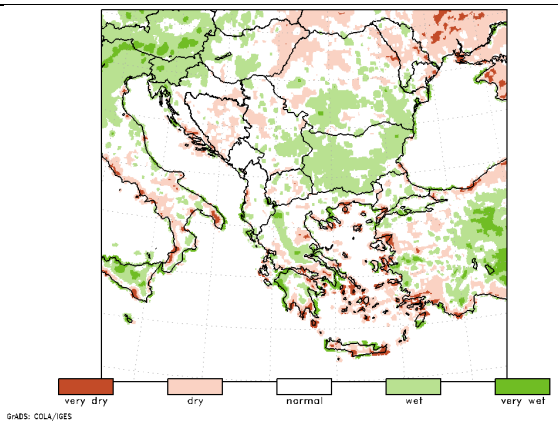
May began with warmer weather across northern half of Balkan Peninsula, from Slovenia to Bosnia and Herzegovina and Romania, with air temperatures up to 2 °C higher than long-term average, while mostly average air temperatures prevailed across the rest of the region. Mid-May saw noticeable west-to-east temperature gradient: while up to 2 °C warmer than normal air temperatures stretched all along the western Balkan Peninsula, from Slovenia across Montenegro to western and southern Greece, they dropped to at least 2 °C below the long-term average in countries of the eastern Balkan Peninsula, closer to the Black Sea and Moldova up to 5 °C below the average. End of the month remained colder than normal over the western Black Sea area from Romania to the Bosporus Strait, while on average air temperatures rose up to 2 °C above the usual for this time of year over northern Balkan Peninsula over the Great Plain and southern Greece and Turkey, in western Hungary up to 3 °C higher.

Past 60-day period covering April and May was on average up to 2 °C warmer than usual over the entire region excluding Slovenia, in southwestern Turkey up to 3 °C warmer, mostly on the account of well warmer than normal first half of April, in Turkey also end of April, and also occasionally May.

ACCUMULATED WATER BALANCE ANOMALY (mm)
1 APRIL – 30 MAY 2024



ACCUMULATED WATER BALANCE PERCENTILE CLASSES
1 APRIL – 30 MAY 2024



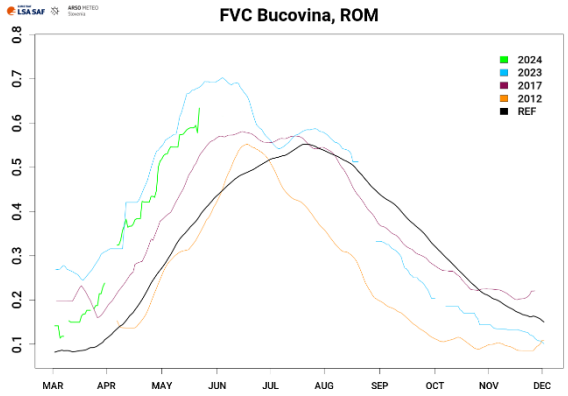
April and May were characterised by the opposite surface water balance conditions nearly everywhere across the region. The only exceptions were Slovenia and southern Turkey that experienced wetter than normal both April and May, resulting in up to 180 mm and up to 90 mm of surface water balance surplus, respectively; and on the opposite spectrum also localised border areas between Hungary and Romania, and between Romania and Moldova where both months proved drier than normal, accumulating between 90 and 120 mm of surface water balance deficit. Elsewhere, the accumulated surplus and deficit over the April-May period resulted in more or less average values for this time of year, with an inclination towards up to 90 mm of locally accumulated deficit over the belt from Croatia and Bosnia and Herzegovina to northeastern Hungary, and towards up to 90 mm of locally accumulated surplus over Greece and Bulgaria, locally in northern Greece up to 150 mm.

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.*

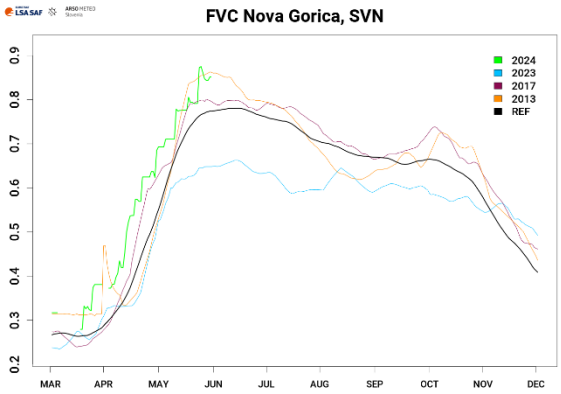
Graphs below present the **vegetation situation** as recorded **on 31 May 2024** at selected locations across southeastern Europe. FVC values for year 2024 are presented in green line. Graphs also include reference line (2004–2023) in black, and lines in light blue (year 2023), magenta (year 2017) and orange (year 2012, or 2013 for Slovenia) for comparison. Missing values or their sharp decline can be linked to prolonged cloudy weather, extreme weather events, snow blanket, human intervention or changes to product by the product provider.

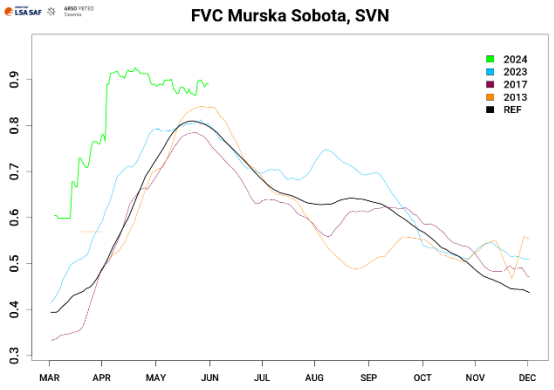
ROMANIA



With spring came favourable weather conditions for early vegetation development in Bucovina, northern Romania where it began about two weeks ahead of its usual time. Weather conditions supported further growth throughout the rest of spring, as vegetation development progressed at the slightly higher rate than normal. It continued at such rate even throughout May when normally the rate of growth would begin to slow down, resulting in up to 25 % higher fraction of cover with canopy.

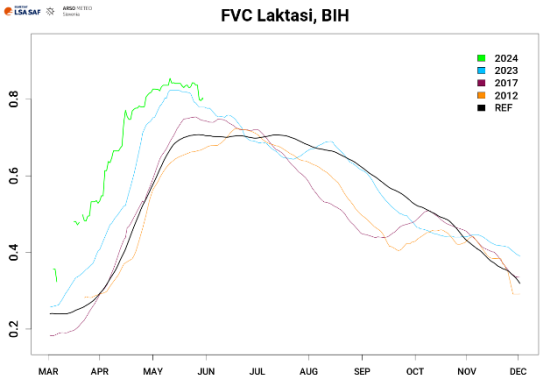
SLOVENIA

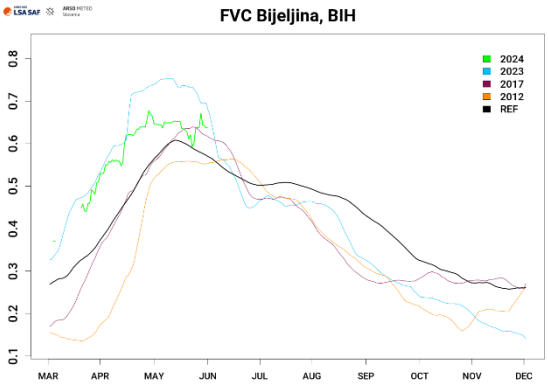


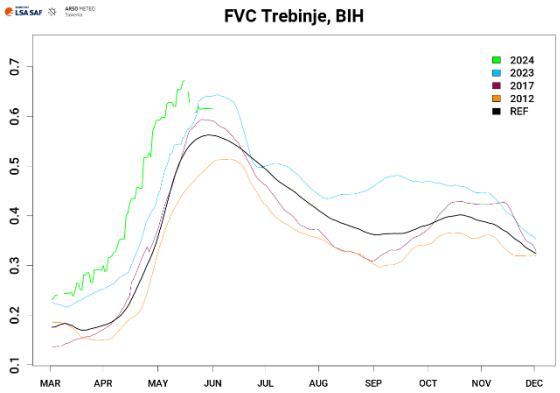


Vegetation season in Nova Gorica, western Slovenia boosted into growth in mid-March, about two weeks earlier than normal, then progressed at the regular rate throughout April and May. Even at its usual peak time at the end of May vegetation growth continued at the unchanged rate, exceeding seasonal peak for about 10 %. Also in Murska Sobota, northeastern Slovenia, vegetation development began two weeks earlier and on the base of greater level of FVC than normal. Weather conditions proved favourable in March, which saw vegetation cover exceed its seasonal peak FVC by April already, a month and a half earlier. It remained about that level for the rest of spring, thus standing slightly above the regular peak value at the end of May.

BOSNIA AND HERZEGOVINA (REPUBLIC OF SRPSKA)

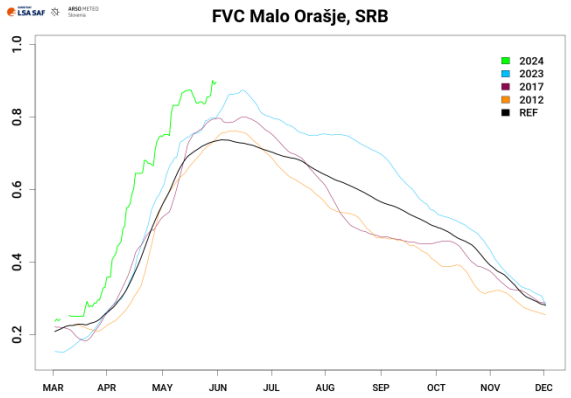


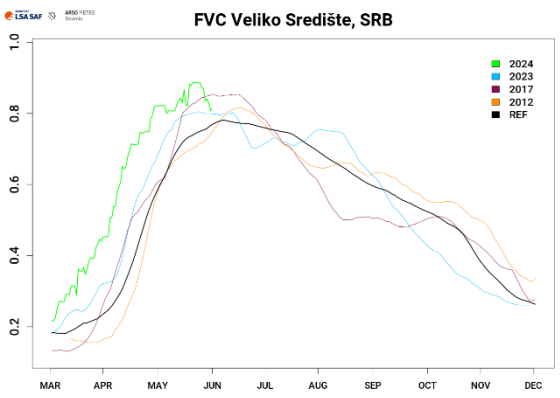




In Laktasi, northwestern Bosnia and Herzegovina vegetation development began in early March which is almost a month earlier than normal. Later development progressed at the regular growing rate, meaning seasonal peak fraction of cover, which occurred at the regular time in early May, was exceeded by approximately 10 %, similar as the year before. Despite slight decline in FVC values in second half of May, they remain above-average. In Bijeljina, northeastern Bosnia and Herzegovina, vegetation season also began earlier than normal, reaching relevant levels of vegetation cover approximately two weeks ahead of time. Vegetation grew to the level of its usual seasonal peak in mid-April, almost a month earlier, and remained slightly above-average for the rest of the spring. Vegetation in Trebinje in southern part of the country saw early onset of vegetation development in second half of March, about three weeks earlier. Further development progressed at the regular rate throughout spring, resulting in up to 15 % higher fraction of cover with canopy just before the seasonal peak time at the end of May, during which FVC values indicate sharp but not great decline.

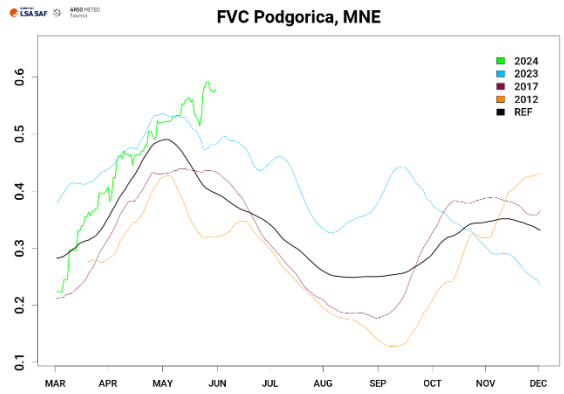
SERBIA





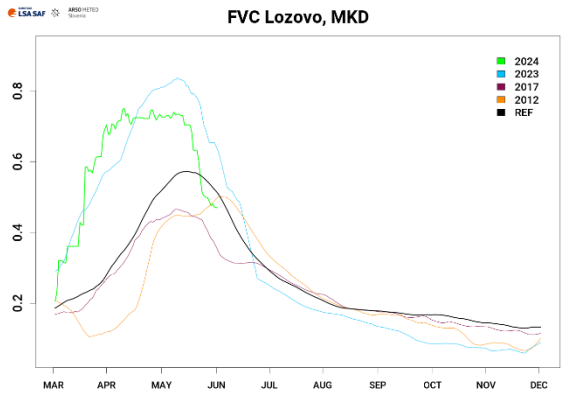
Vegetation season began slightly earlier than normal in Malo Orasje, central Serbia, but faster than normal growing rate throughout April resulted in reaching its usual peak fraction of cover by the end of April, up to a month earlier than normal. Vegetation growth continued at unusually high rate even throughout May, resulting in approximately 90 % of unit covered with canopy at the end of the month, compared to usual 75 % at that time of the year. Vegetation in Veliko Srediste, northeastern Serbia also experienced favourable spring conditions for growth. Its onset began a month earlier than normal, and by following its usual growing rate at this time of the year also seasonal peak values were reached about a month earlier, in mid-April already, The rate of further development began to slow down in late April, flattening the curve of the seasonal peak towards just below 90 % of unit covered with canopy in mid-May, about 15 % greater than normal. End of May saw sharp but not big decline in FVC, but which remain above-average.

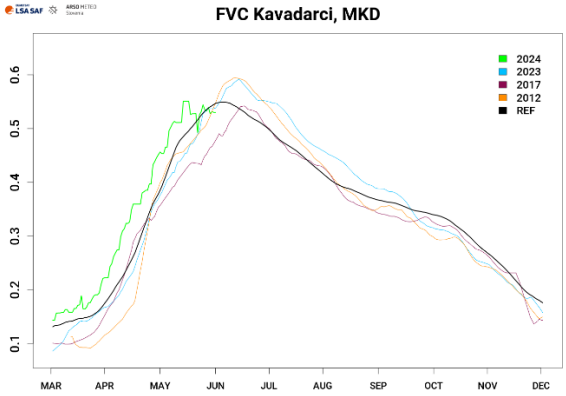
MONTENEGRO



Despite beginning from the lower FVC in early March, vegetation in Podgorica, southern Montenegro boosted into growth in mid-March when fraction of cover with canopy expanded from below-average 20 % to above-average 40 % in only three weeks. Vegetation growth progressed at the regular rate since then, and continued to expand throughout all spring months, beyond early May which normally presented the seasonal peak time, and has by the end of May not entered senescence yet.

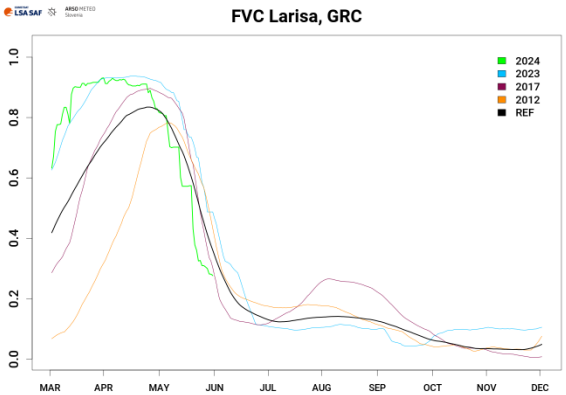
NORTH MACEDONIA

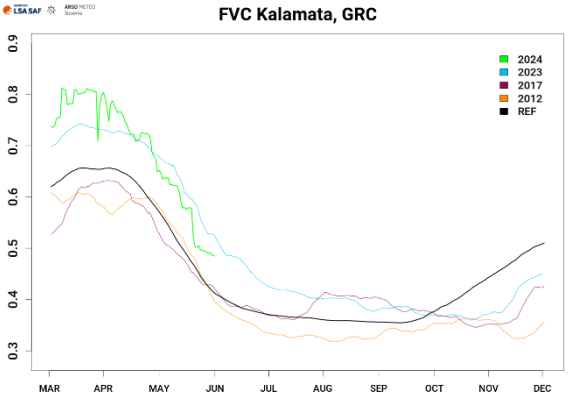




Spring weather supported abundant vegetation growth in Lozovo, central North Macedonia. FVC grew from initial 20 % in early March to exceeding 55 % by mid-March, which is normally seasonal peak value reached in mid-May. Vegetation continued to grow until early April, then remained at high level senescence began in mid-May, quickly bringing FVC down to just below the average. In Kavadarci, southern North Macedonia vegetation development followed well its usual growing pattern, with only slightly earlier boost in growth in late March. Seasonal peak was reached two weeks earlier and remained at the more or less average level until late May.

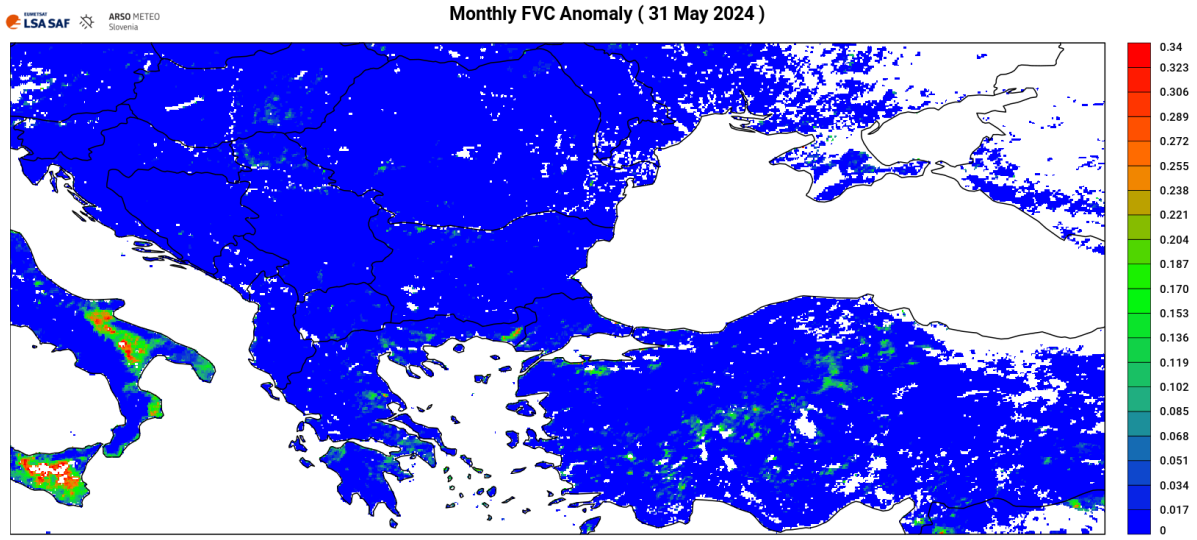
GREECE





Spring weather in Larisa, central Greece supported abundant vegetation development as it reached the level of seasonal peak in mid-March already, approximately a month and a half earlier than usual. Vegetation cover remained at this high level, of the coverage of about 90 %, for the entire time until senescence phase began as usual in early May. In a series of sharp, cascadal drops in FVC values throughout May at the rate slightly higher than normal, fraction of cover was continuously behind the normal for this time of year, reaching relevant levels about a week earlier than normal. Vegetation in Kalamata, southern Greece also experienced favourable growing season this year. Seasonal peak, reached at the regular time in early April, was lasting no shorter than usual, and fraction of cover with green canopy at that time exceeded the usual for up to 15 %. Senescence phase also began at the usual time, and although it progressed at the slightly higher rate than normal, FVC values remained above-average throughout April and May due to the abundant level of cover during seasonal peak. Sharp fall in FVC values can be observed in mid-May, after which FVC remained above-average nonetheless.

Figure below shows negative anomaly of **accumulated 30-day FVC values** as recorded **on 31 May 2024** in comparison to the past 20 years (2004–2023), and is used experimentally.



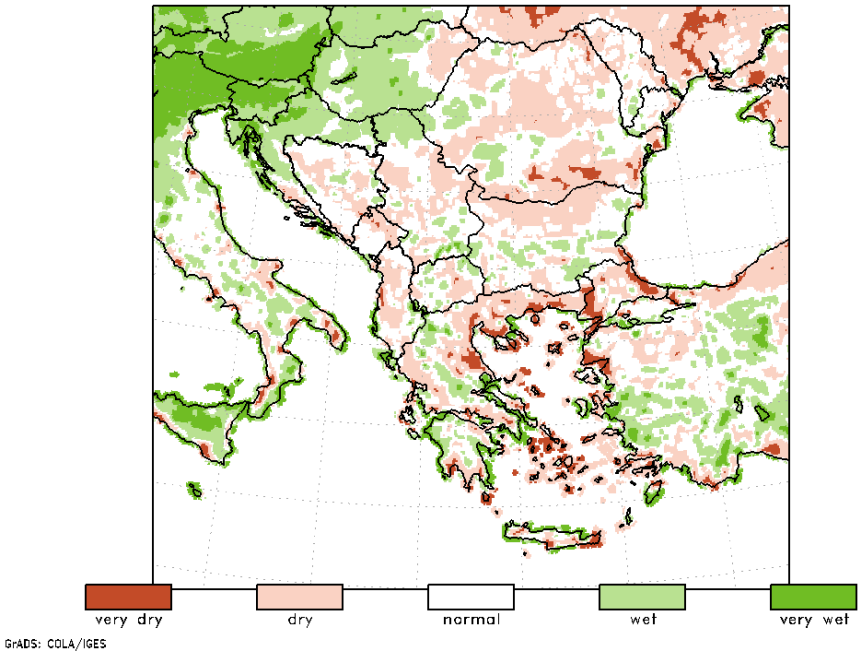
Monthly accumulated FVC deficits for this time of year show no great anomalies from the usual across the region in May, with the exception of isolated areas across Aegean Greece, locally in northwestern Turkey and in a belt across central Turkey, from its south-east to the north, where fraction of vegetation cover appear to be 10–20 % lower than usual for this time of year.

DROUGHT IMPACT REPORTS

No drought impacts on the environment were found across the region.

OUTLOOK

Figure below shows model simulations of the **60-day accumulated surface water balance** in historical percentile classes for the time period **between 1 May and 29 June 2024**.



Compared to the April-May period, surface water balance conditions are expected to show tendency towards drier than before across Turkey and over most of Balkan Peninsula with the exception of its north-west: drier-than-normal surface water balance conditions will either prevail, or generally replace previously experienced wet conditions during April and May, such as over southern Serbia, southern Romania, over much of Bulgaria and continental Greece. Over Turkey, dry conditions where already present will continue, and so will the level of surface water balance surplus over its central part generally decrease. Dry to very dry surface water balance will persist over Aegean Greece. Meanwhile, much of Hungary and Croatia are expected to shift towards wetter-than-normal conditions, as well as intensification from wet to very wet conditions is expected over Slovenia.

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 have a 5-percent range, and each of the middle three classes has 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 2023). Information on drought impacts are obtained from freely available online reports of national authorities and media newspapers.