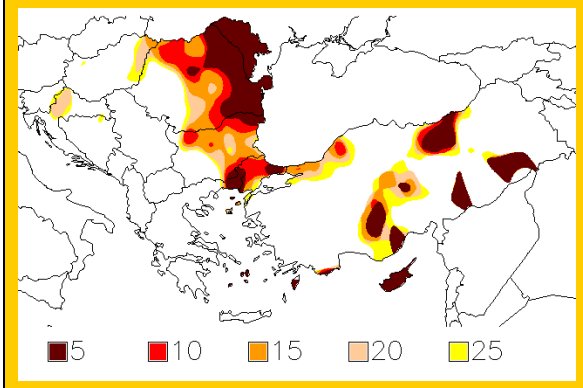
DROUGHT MONITORING BULLETIN

24th September 2018

HOT SPOT

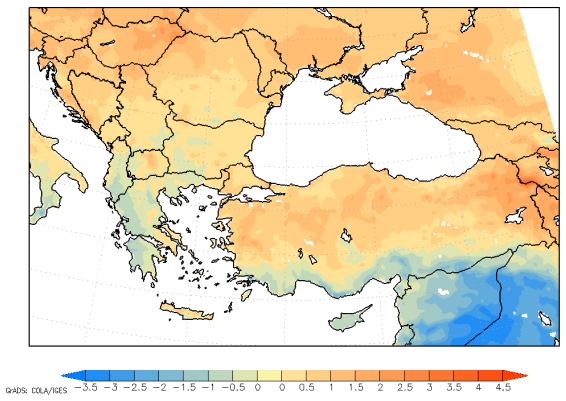


After a high precipitation level throughout June and July in Moldova, Romania, Bulgaria and northwestern Turkey, they received only scarce precipitations in August. Figure on the left shows **monthly precipitation level in percentile classes for August 2018**, namely lowest percentiles which indicate dry periods. August precipitation level across entire Moldova, along eastern Romania and in parts of northwestern, central and southeastern Turkey ranked among lowest 5 % of historical observations between 1951-2000.

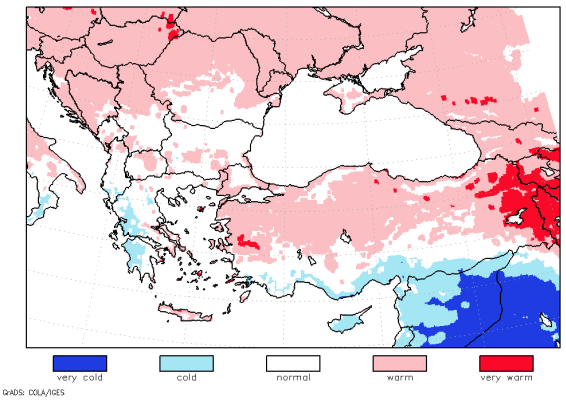
AIR TEMPERATURES AND SURFACE WATER BALANCE

*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 30th June to 28th August 2018**.*

AVERAGE AIR TEMPERATURE ANOMALY (°C)
30th JUNE – 28th AUGUST 2018



AVERAGE AIR TEMPERATURE PERCENTILE CLASSES
30th JUNE – 28th AUGUST 2018



In first week of August, anomalies of up to 4 °C above the average were present across Slovenia and northwestern Hungary, its far northeastern part and in middle Adriatic Croatia. Air temperatures exceeded the average for up to 3 °C across the rest of Croatia, Hungary, northern Serbia and far western and eastern Turkey. Positive anomalies gradually declined from north-west towards south-east of Balkan Peninsula where air temperatures in central Albania, FY Macedonia, most of Bulgaria and central Romania were only slightly above the average, up to

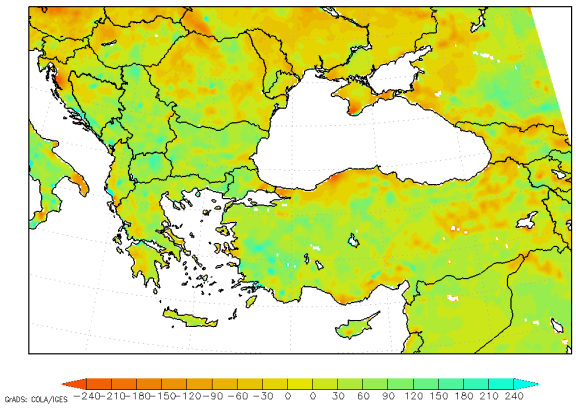
1 °C but slightly under-average further southeastern, of up to –1 °C in southern Albania, southwestern Bulgaria and across continental Greece. Meanwhile, air temperatures were higher than normal also across most of Turkey where they exceeded the average up to 2 °C, except for its southernmost border area where anomalies of even up to –2 °C were detected.

Second decade of August saw sudden changes over Turkey, leaving its wider central part colder than usual. Anomalies were the lowest along the mountainous area from south to northeast, up to –2 °C, and gradually rose towards west and southeast of the country where temperatures mostly reached normal values, locally exceeded them for up to 2 °C. At the same time, under-average temperatures continued over central and southern Greece while area of highest anomalies, ranging between 3–5 °C, moved eastward to central and eastern Hungary. Above-average air temperatures of up to 3 °C now spread across Moldova, northern Romania, northern Serbia and most of Croatia and Bosnia and Herzegovina.

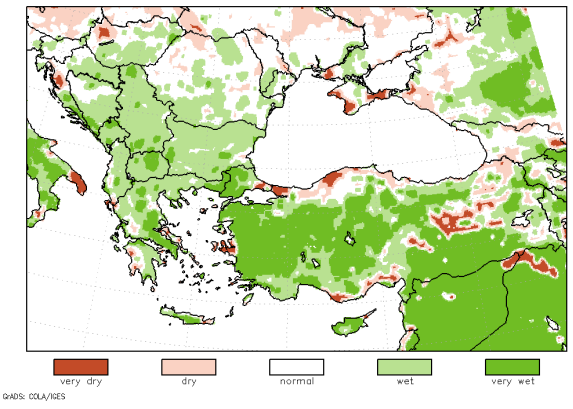
Last decade of August again brought the opposite change to Turkey again as wide central area experienced air temperature now between 2–4 °C above the long-term average. The rest of the country too was warmer than usual, for up to 2 °C, although a thin belt all along its southern border remained in under-average air temperatures, mostly up to –1 °C. That time, similar negative anomalies continued to be present also over southern Albania and most of Greece, especially its central part. The rest of Balkan Peninsula remained in higher-than-usual air temperatures. Area with highest anomaly, still between 3–5 °C, remained over eastern half of Hungary and northern Serbia but expanded further to east across wide northern half of Romania, except the Carpathians, as well as entire Moldova. Over the rest of Balkan Peninsula, from Slovenia to FYR Macedonia and Bulgaria, temperatures were mainly 1–3 °C above the average.

In general, August was warmer than usual across norther half of Balkan Peninsula and northern half of Turkey while air temperatures were near normal or slightly below the average mainly in Albania, Greece and all along southern Turkey. Highest monthly mean of 2.5 °C above the average classified eastern Hungary, far western Turkey and its eastern part among hottest 5 % of local observations. August mean was up to 1 °C lower than expected in southern half of Albania and most of continental Greece, while in a belt along southern Turkish border it was up to 1.5 °C, locally up to 2 °C, below the average.

ACCUMULATED WATER BALANCE ANOMALY (mm)
30th JUNE – 28th AUGUST 2018



ACCUMULATED WATER BALANCE PERCENTILE CLASSES
30th JUNE – 28th AUGUST 2018



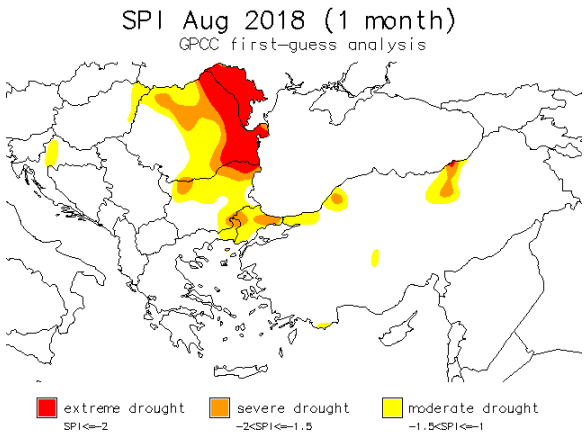
In comparison to the previous 60-day period, values of accumulated surface water balance over July and August have in generally dropped, resulting in smaller extent of very wet areas and in deepening of the water balance deficit where already present. Areas with highest deficit were scattered mostly across outermost parts of Southeastern Europe. Middle Adriatic area in Croatia

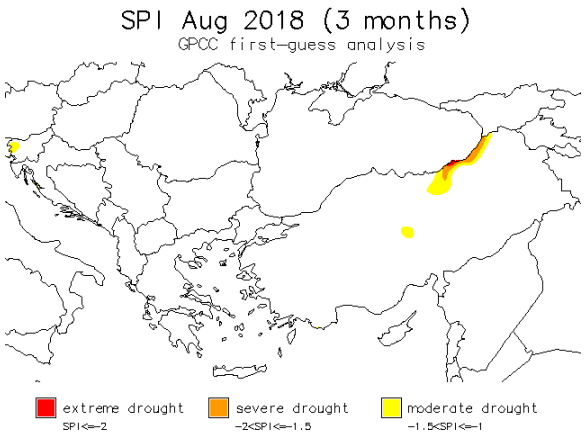
and Black Sea region in northern Turkey continued to show highest negative anomalies, of up to –240 mm. High water balance deficit was detected locally in southern Turkey and over Bosporus Strait as well, of up to –150 mm, but also in southernmost Albania and wide part of northwestern Hungary, of up to –120 mm. Other parts of the region where negative deviation from the usual state were detected include northern Hungary, central Slovenia, northwestern Bosnia and Herzegovina, coastal Albania, along western Greece, mountainous belt from southern to northeastern Turkey, scattered parts in northwestern and southeastern Romania and entire Moldova with exception of its southernmost part. All across the rest of the region, from southern Hungary to southeastern Greece and from southern Croatia to far eastern Greece, over the Carpathians and extensive area across western, central and southeastern Turkey, surface water balance resulted in positive values of mostly up to 60 mm but with local areas of surplus up to 120 mm scattered all across it. Anomalies from the local average were the highest, of up to 150 mm, in southernmost Croatia, central FYR Macedonia, western Bulgaria and over border area between Greece and Turkey.

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.

Noticeable lack of precipitation in August resulted in SPI1 values below –1 in a wide north-to-south belt across Romania, in continental Croatia, northwestern Turkey and locally in southwestern, central and northwestern Turkey along the mountainous part of the country, indicating dry conditions of moderate to severe intensity. Extremely dry conditions were present over entire Moldova and eastern part of Romania.
During meteorological summer, prolonged dry conditions were not as widespread and appeared locally over Alpine region in northwestern Slovenia and in central and northeastern Turkey, as indicated by a 3-month overview of SPI values. Persisting dry conditions of severe to extreme intensity were detected only along Black Sea coastline in northeastern Turkey.



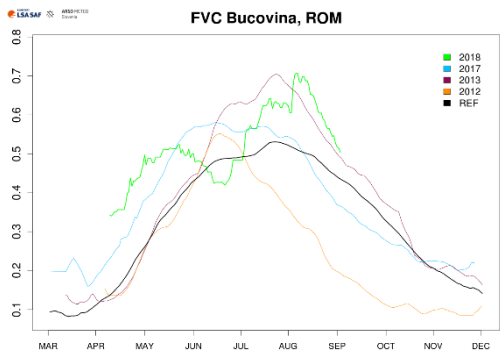


REMOTE SENSING – FRACTION OF VEGETATION COVER

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.

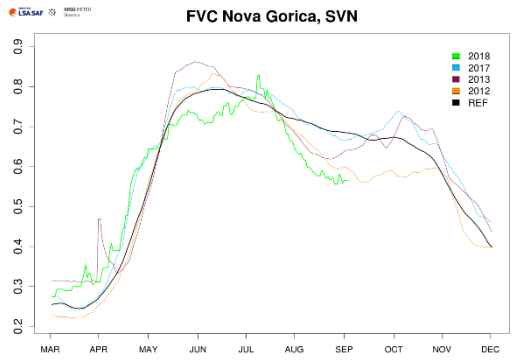
Graphs below present the **vegetation situation** as recorded **on 3rd September 2018** in some regions of Southeastern Europe. FVC values for year 2018 are presented as green line. Graphs also include reference line (2004–2017) in black, and lines in light blue (year 2017), magenta (year 2013) and orange (year 2012) for comparison.
Possible missing values or sharp decline of values could be result of a prolonged cloudy weather, extreme weather events or snow blanket.

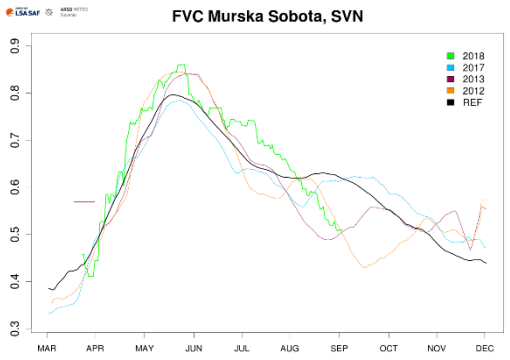
ROMANIA



Vegetation development in Bucovina in far northern Romania gradually increased throughout this year's vegetation season with exception of a month-long period from mid-May to mid-June. Second, highest peak of the season was reached in early August when vegetation cover exceeded the average state for approximately 20 %, similarly as in year 2013. Since then, FVC values decrease rapidly although still remain above the reference values at the end of August.

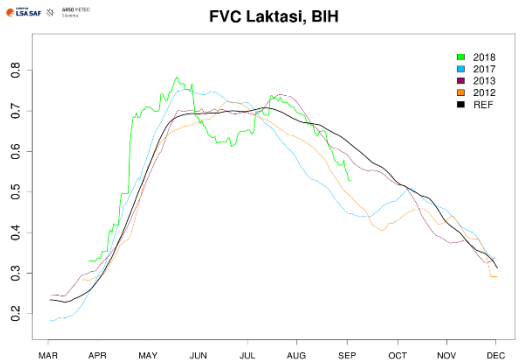
SLOVENIA

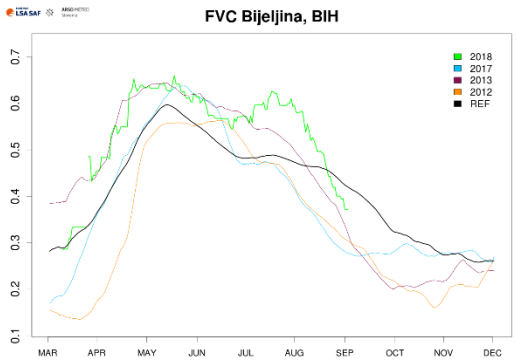


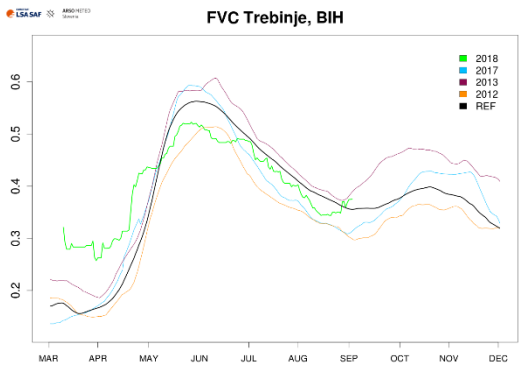


In Nova Gorica in western Slovenia, vegetation development reach its peak in early July, later than normally, and has been declining since then at higher rate than usually. Rapid decline subsided at the end of August, leaving vegetation cover at approximately 15 % lower level than expected, lower also than in years 2012 and 2013. In Murska Sobota in northeastern Slovenia, vegetation development more or less followed the reference pattern until early August, with occasional higher-than-usual FVC values. In August, the decline was expected to subside but instead continued at unchanged rate, unusual for this time of year. At the end of August, FVC stood 10 % lower than expected, similarly to years 2012 and 2013.

BOSNIA AND HERZEGOVINA (REPUBLIC OF SRPSKA)

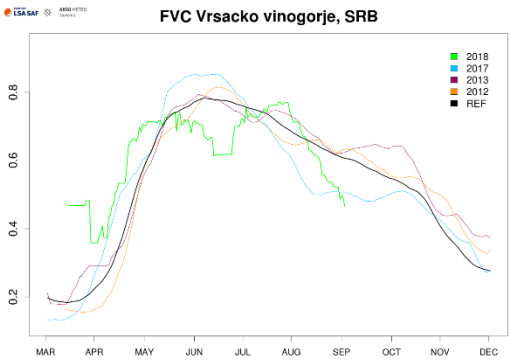


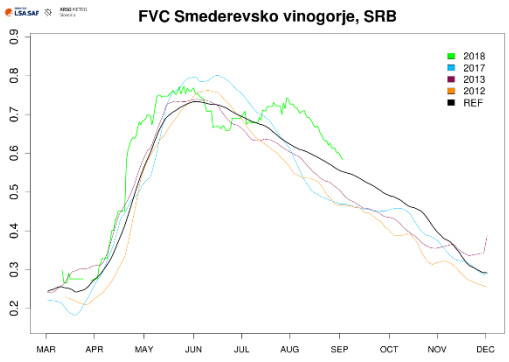




July conditions brought another boost in vegetation development during July in both Laktaši and Bijeljina along northern Bosnia and Herzegovina. After its peak in late July, FVC values continuously declined thought August and stood below the average at the end of the month, about 10 % in Laktaši and up to 5 % in Bijeljina. Vegetation in Trebinje in south of the country reached its peak in late May as expected, although not as high as normally, but maintained the regular trend of continuous decline in following months. Similarly to the pattern in latest dry years, FVC values started increasing again in late August, sooner than normally as expected for autumn.

REPUBLIC OF SERBIA

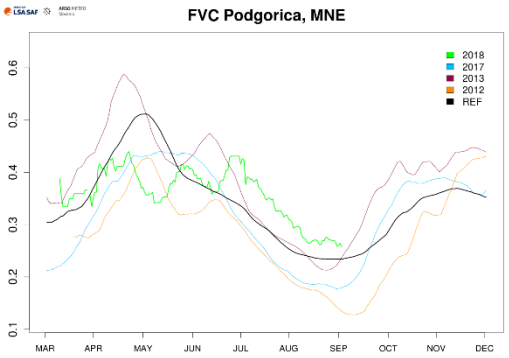




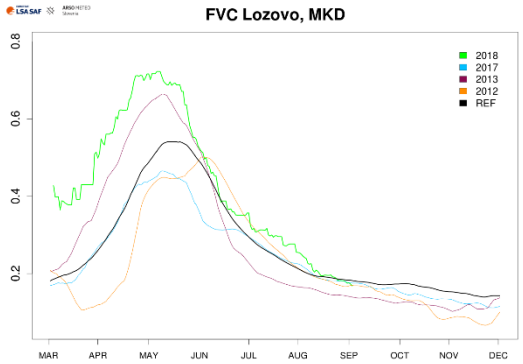
Similarly to this year's vegetation level pattern in lowlands of Laktaši and Bijeljina, FVC lines for lowalnds in Vršačko vinogorje and Smederevsko vinogorje too show noticeable drop in May-June period which resulted in two peaks reached this vegetation season. At both locations vegetation level declined throughout August although at the higher rate than usually. At the end of the month, in Smederevsko vinogorje FVC values still stood just above the reference line while in Vršačko vinogorje, FVC values were approximately 15 % below the average, similarly as in year 2017.

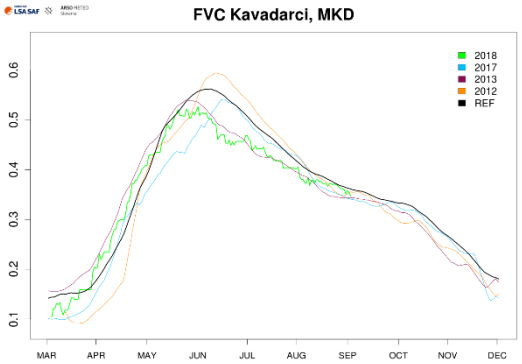
MONTENEGRO

After an unordinary vegetation development in late April and May, vegetation cover in Podgorica in southern Montenegro reached expected extent only in June. Another boost in vegetation growth followed later on that month with FVC values approximately 10 % higher than usually for that time of year. After a series of boosts and decreases in first months of observed period, vegetation level in July and August seems to decrease at the usual rate.



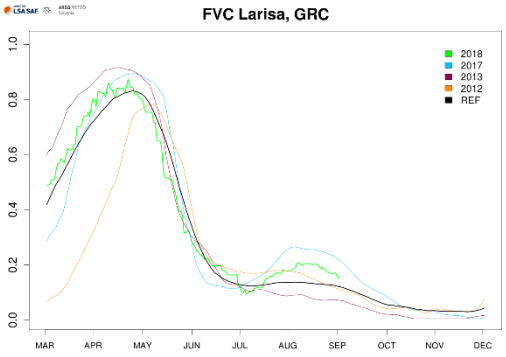
FYR MACEDONIA

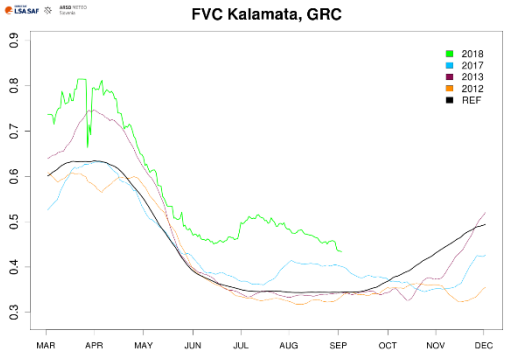




At the beginning of August, vegetation cover in Lozovo was higher than usually but declined throughout the month and reached the average by mid-August. Values ranged about the average since then but show slight trend in further decline. In Kavadarci in southern FYR Macedonia, vegetation development continues to keep the reference progress ever since April, however, the reference trend appears to be in place earlier than usually. At the end of August, FVC values were still below the average although approaching the reference line.

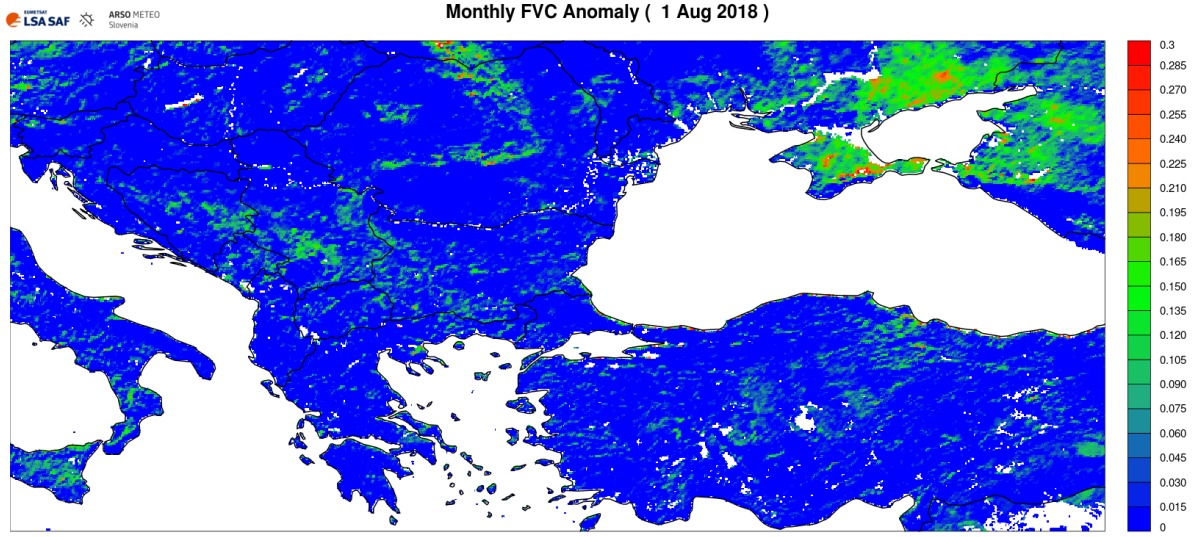
GREECE

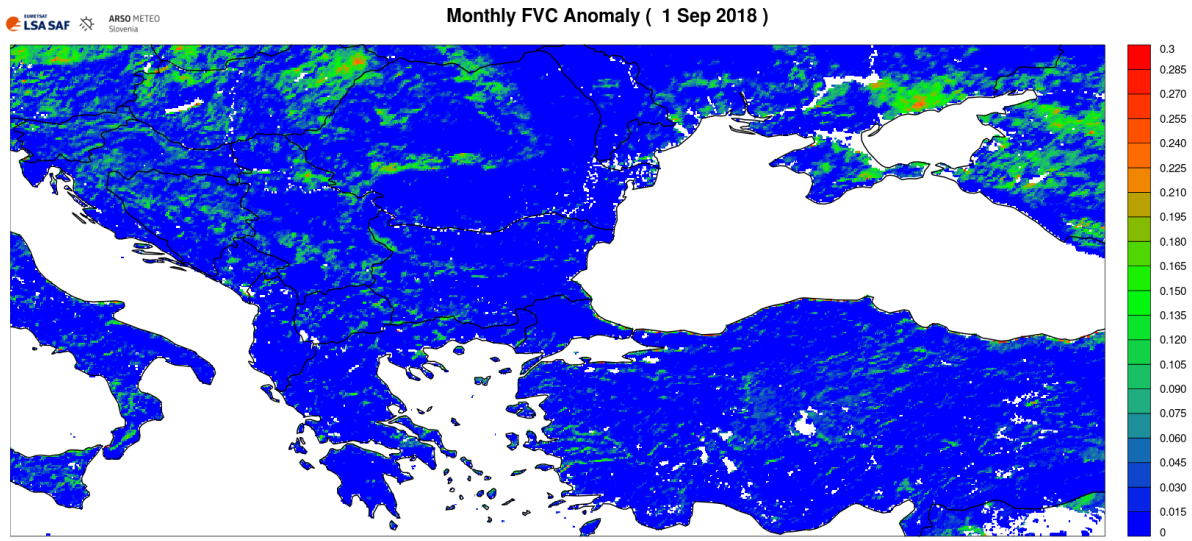




According to FVC values for Larisa in central-eastern Greece, vegetation developed in a regular way this vegetation season. Another minor boost of vegetation growth later this summer reached its peak in mid-August, exceeding the usual level for approximately 10 %, and has almost returned to average values by the end of the month. Also in Kalamata in southern Greece another minor boost can be seen for early July. Although vegetation level continuously declined since then, it remains above-average at the end of August, for approximately 10 %.

Figures below show negative anomaly of **accumulated 30-day FVC** as recorded on **1st August and 1st September 2018** in comparison to the past 14 years (2004–2017) and are used experimentally.





Monthly accumulations of FVC for August show wider extent of area with under-average vegetation cover, compared to the situation in July. FVC values dropped for up to 15 % from the usual state across vast part of northern half of Balkan Peninsula and relatively evenly across Turkey. Decrease was the highest locally northeastern Serbia and in northwestern and northeastern Hungary where values were near-normal at the beginning of August but decreased for up to 22 % by the end of the month.

IMPACT REPORTS

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

OUTLOOK

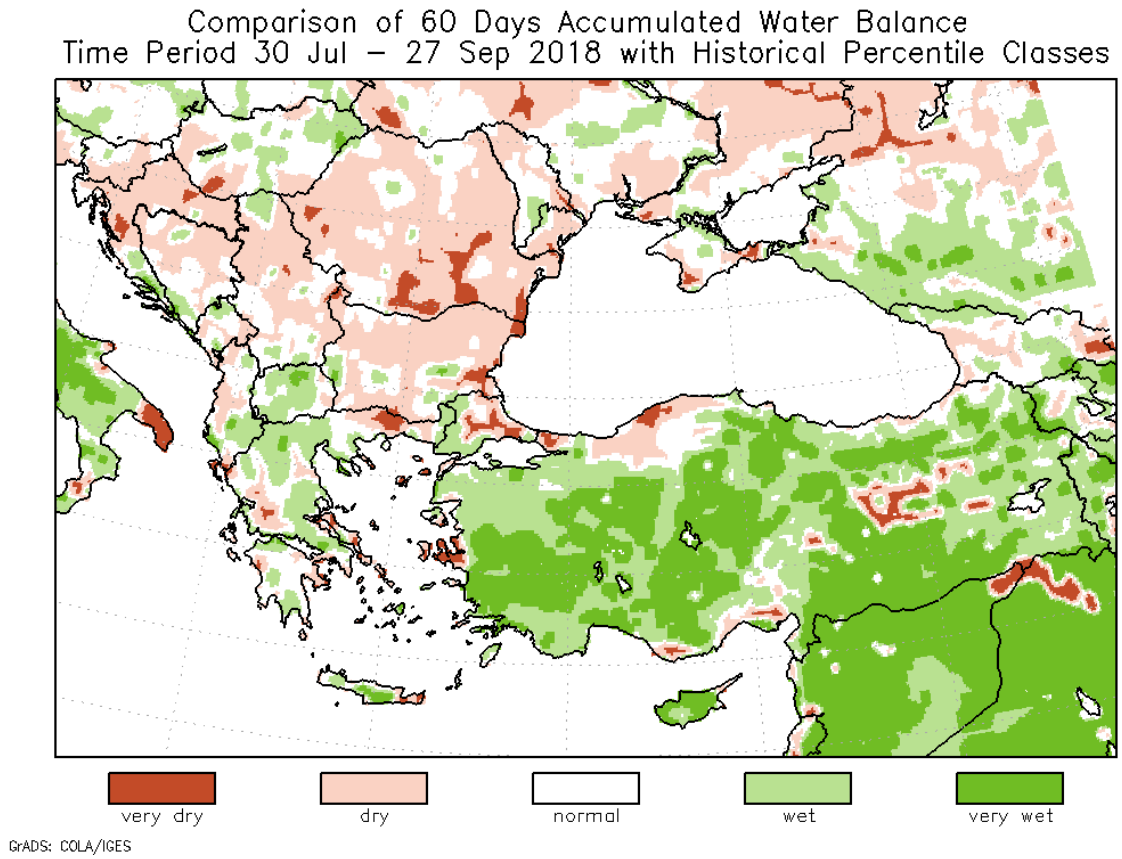


Figure above presents the model simulations of the **60-days surface water balance anomaly** (percentile) for the time period **from 30th July and 27th September 2018**. In comparison to the previous 60-day period, figure above indicates mainly unchanged surface water balance situation over central and eastern third of Turkey while across its western third and entire Balkan Peninsula it shows noticeably drier situation. Eastern half of Hungary, southern Croatia, FYR Macedonia and most of continental Greece will remain in wet range although to a lower intensity while the rest of the countries in Balkan Peninsula will experience negative change from wet to drier than usually.

Methodology

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; gpcc.dwd.de). NWP simulations are performed with Non–hydrostatical Meso–scale Model (NMM, see: http://www.dtcenter.org/wrf–nmm/users/). Historical DMCSEE model climatology was computed with NMM model for time period between 1st January 1979 and 31st December 2016. European Centre for Medium Range Weather Forecast (ECMWF) ERA–Interim data set (see: http://www.ecmwf.int/en/research/climate–reanalysis/era–interim) was used as input for simulations. Long term averages (1979–2016), 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.