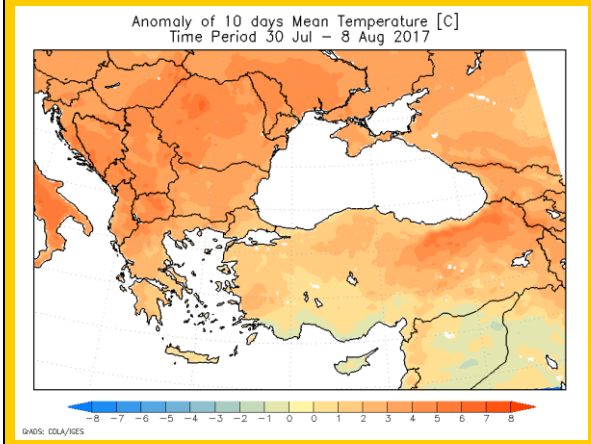
DROUGHT MONITORING BULLETIN

22nd September 2017

HOT SPOT

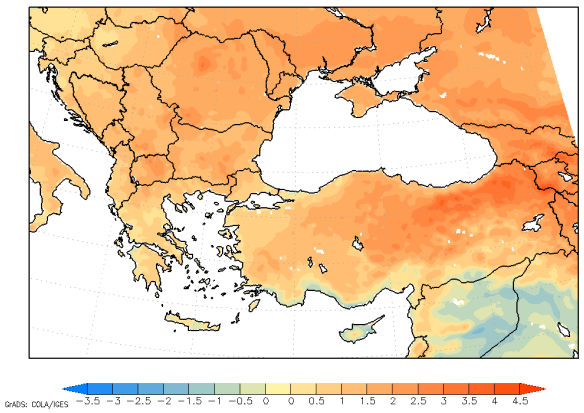


Heat wave that started in late July and continued into first decade of August surpassed the previous ones this summer in terms of intensity and extreme temperatures it brought to the region. In parts of central and western Romania, eastern Hungary, Serbia, Macedonia and areas along the Adriatic Sea, mean air temperature ranged between as high as 27–30 °C during that time with several cities experiencing new heat records. Figure on the left presents **anomalies of mean air temperature in early August** and shows values exceeded the average for 4–5 °C in northwestern and eastern Balkan Peninsula, and around 5–6 °C in central Balkan Peninsula and northeastern Turkey.

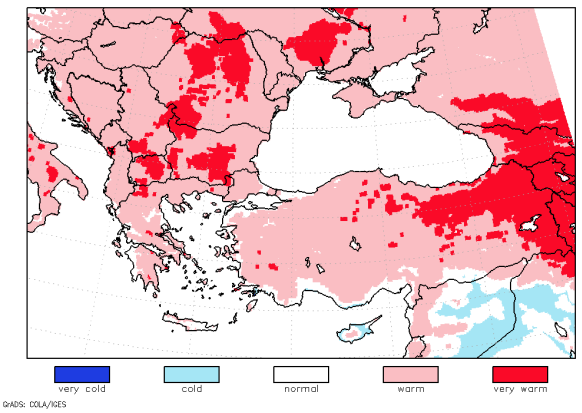
AIR TEMPERATURES AND SURFACE WATER BALANCE

*Figures in this section present anomalies of the average air temperature and accumulated water balance as well as classified values of the average **air temperature** and **surface water balance** in percentile classes for 60–day period **from 20th July to 17thSeptember 2017**.*

AVERAGE AIR TEMPERATURE ANOMALY (°C)
20th JULY – 17th SEPTEMBER 2017



AVERAGE AIR TEMPERATURE PERCENTILE CLASSES
20th JULY – 17th SEPTEMBER 2017

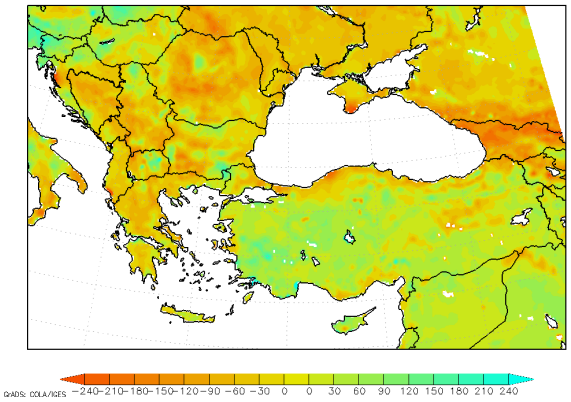


Following the first week of August with extreme air temperatures experienced in all countries of the region, anomalies of mean air temperatures were gradually declining throughout the month. Second decade of August was also warmer than usual although positive anomalies of mean air temperatures ranged mainly around 2–3 °C over Balkan Peninsula and up to 4 °C in central Turkey and northern Romania. Third decade of August brought lower temperatures to

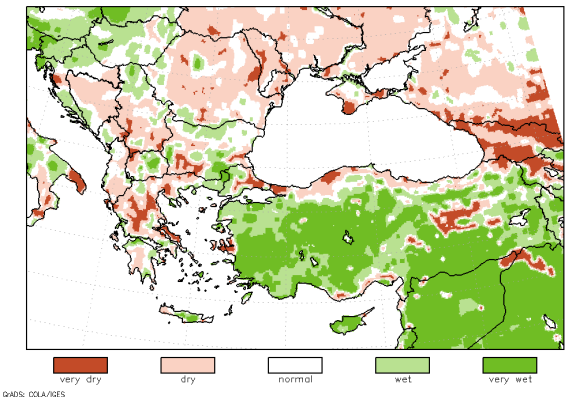
the region that persisted also in first week of September as air temperature dropped up to 1 °C below the long-term average in eastern Serbia, Bulgaria, Greece and western half of Turkey, and up to 2 °C below the average in Bosporus Strait area. Meanwhile, values of air temperatures were still above the average across the rest of the region although anomalies from the average state were not as high anymore and reached values of up to 1 °C above the average in Romania, Hungary and countries of western Balkan Peninsula and up to 2–3 °C in northeastern Turkey. Such conditions persisted through first week of September as well while second week of September saw sudden changes in air temperatures across the region. While air temperatures continued to decrease up to 2 °C below the average across far northwestern part of Balkan Peninsula, anomalies from normal state gradually increased and reached values of 3–4 °C in central Balkan Peninsula, 5 °C in Bulgaria and western Turkey and up to as high as 7–8 °C above the average in northern and central Turkey.

Overall view of air temperatures in a 60-day period shows entire region was experiencing above-average temperatures. Anomalies were the smallest in far northwestern part of Balkan Peninsula and coastal areas of Adriatic Sea, Aegean Sea and southern Turkey with air temperatures between 0.5–1.5 °C above the average. Anomalies of up to 2.5 °C above the usual values were present in central Balkan Peninsula, Bulgaria and western half of Turkey while locally they stretched even up to 3–4 °C above the average in central Macedonia, northern Romania and northeastern Turkey.

ACCUMULATED WATER BALANCE ANOMALY (mm)
20th JULY – 17th SEPTEMBER 2017



ACCUMULATED WATER BALANCE PERCENTILE CLASSES
20th JULY – 17th SEPTEMBER 2017

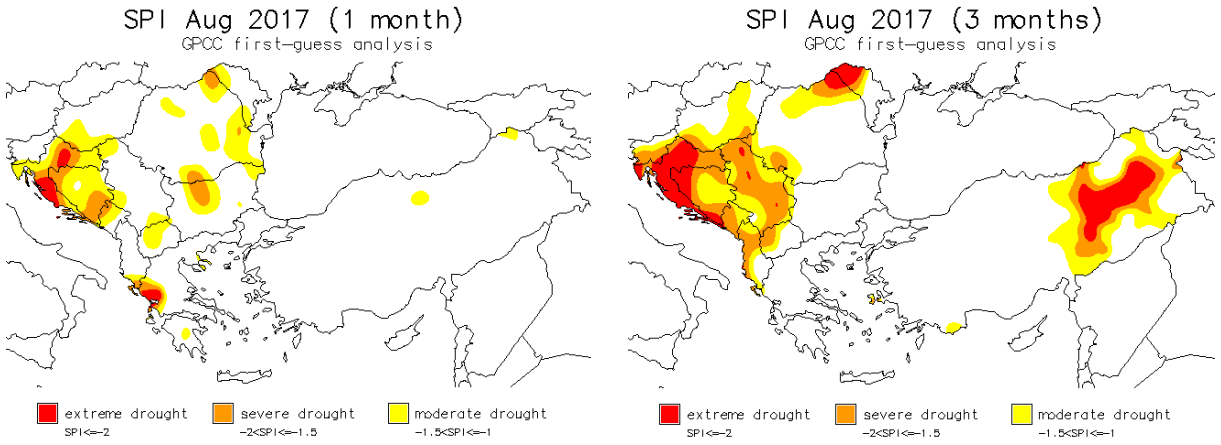


In comparison to June-July period, precipitation level of first half of September and below-average temperatures improved surface water balance situation in Hungary, Slovenia, northern Serbia and in areas along the Adriatic Sea. Surface water balance surplus ranged from 90–120 mm in Hungary, Croatia, northern Serbia and up to 180 mm in Alpine region. On the other hand, surface water balance remained negative in Bosnia and Herzegovina, Albania, Romania and along the northern Turkish coastline over the last 60-day period where water balance deficit ranged between 90–120 mm. Values of surface water balance remained positive in central Macedonia although they gradually declined across the rest of the country, reaching negative values of around 90 mm. Greece and southern Bulgaria experienced similar change from wet to dry conditions where level of water balance deficit over last 60 days classifies in lowest 5th percentile. Western half of Turkey remained in very wet conditions although after a dry spell in June and July, southern part of the country recorded positive water balance anomalies of around 30–60 mm.

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 period (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.

In terms of precipitation deficit, Croatia, Bosnia and Herzegovina and Macedonia were among the most affected countries in the region this August. Scattered areas in Romania, Bulgaria and Macedonia experienced moderate to severe drought conditions as well while extremely dry conditions were present also in western Greece. As seen on the right figure below, the 3-month overview of SPI index shows severe to extreme drought conditions present over western Balkan Peninsula where extreme drought conditions persisted since June, and over eastern half of Turkey where drought conditions were mainly a result of very dry June and July. Over the last two months, extreme drought conditions developed also in far northern parts of Romania and Moldova.



REMOTE SENSING – FRACTION OF VEGETATION COVER

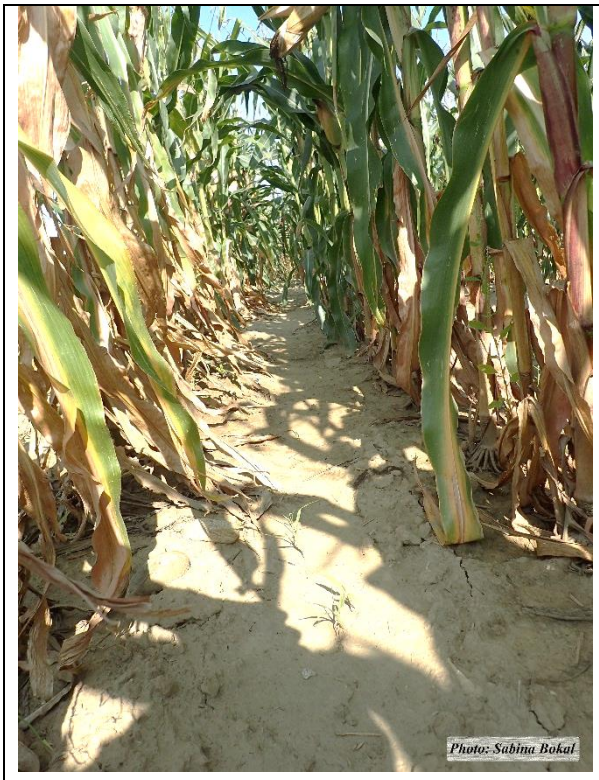
Remote sensing products are currently not available.

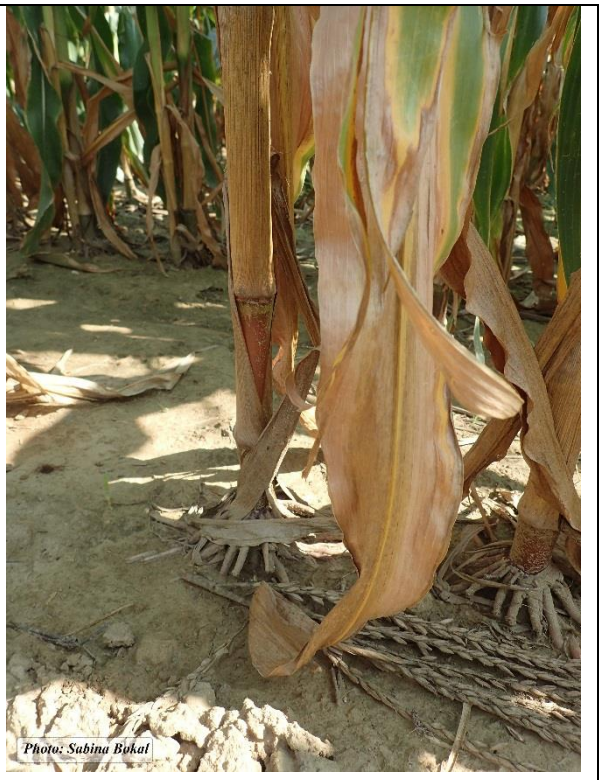
IMPACT REPORTS

In monthly agrometeorological bulletin, Republic Hydrometeorological Service of Serbia stated that unfavorable combination of high temperatures and lower rainfall is one of the reasons for reduced yield in all agricultural crops. On a large number of agricultural areas, mild precipitation in August arrived too late, especially for corn [1].

European Drought Observatory reported several heat waves of this summer hit also major agricultural areas in Croatia and Slovenia that left negative effects especially on grain maize and sugar beet. Maize yield in those regions is expected to fall below the five-year average. Below-average yield of potato and sugar beet is expected in Hungary as well [2].

Top left: olive trees in Korčula, Croatia
Top right: tomato plants in Korčula, Croatia
Bottom left: laurel in Korčula, Croatia





Top left and right: corn field, Hungary
Bottom left: sunflower field, Hungary

According to Slovenian Environment Agency, agricultural drought caused lost or heavily reduced maize crops, grassland, severely affected were also fruit and olive trees as well as vine. The groundwater level at the end of August was low to very low in the greater part of the country. In some aquifers of the southeastern and southwestern Slovenia, groundwater level at certain locations reached the lowest values of the record [3, 4, 5].

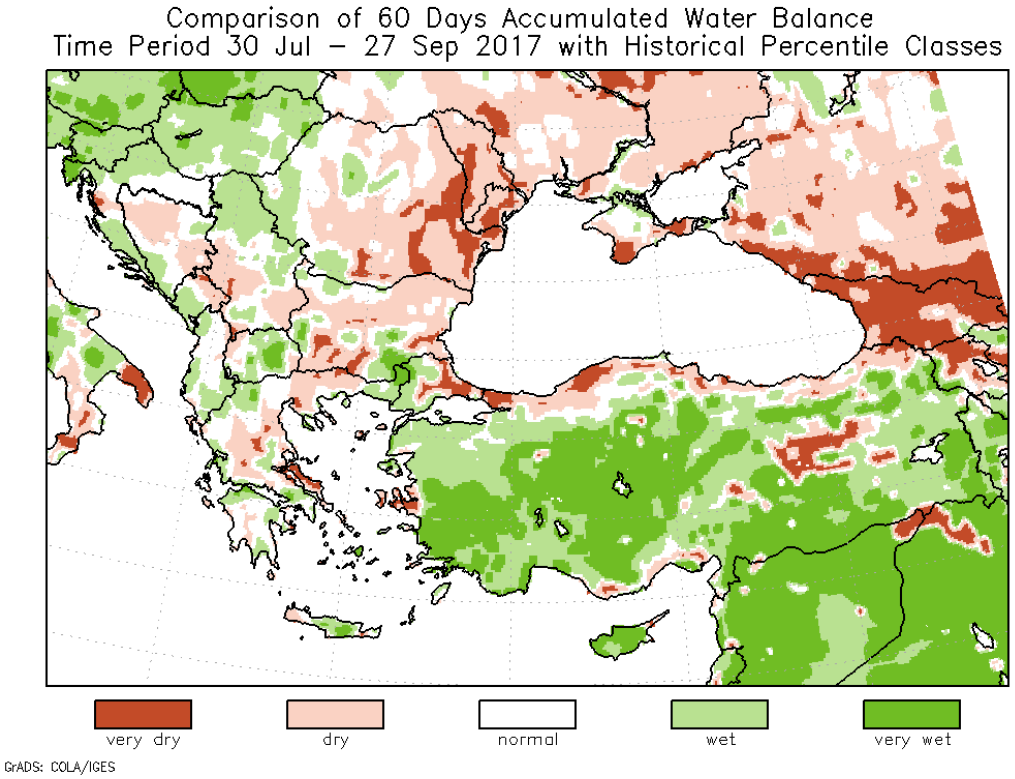
In Romania, heat waves and limited water supply negatively affected yield formation, agricultural damage is reported also in the plain area of Timis in western Romania where the areas cultivated with corn and soy are scorched. Due to only 2–3 liters of water per square meter in southwestern Romania over the last month and with no irrigation system, corn is almost dry and thousands of hectares of sunflower are affected. As reported by Romanian Television TVR, severely affected was also Mehedinti County in southwestern Romania where almost no rain in two months resulted in very high crop losses [6, 7, 8]. Due to the lack of rainfall, flow of the Danube river dropped to half the annual average and an island of the length of a stadium appeared

in the middle of the river, forcing crossing ships to take a detour [9]. Drought seemed to leave some impact also on decision-makers in Romania as the Ministry of Agriculture promised investing in establishing new irrigation systems [10].

Agricultural yield is decreased also in Macedonia, especially fodder crops and grain with expected 60–70% decrease in some parts of the country, as well as vegetable and fruit yields. The corn crops are not going to be harvested while alfalfa will be decreased up to 40% due to restricted irrigation caused by the low water level in the accumulation [11]. Long dry period negatively affected also vineyards in Kavadarci region where grapes look like burnt and the yield of grapes has decreased by 70%. Climate experts advise to take measures for adaptation to evident climate change [12, 13]. Due to cold winter and strong summer conditions, beekeepers from Stip region reported reduction of bee families and production of honey. Around 100 producers of honey in the region are going to be affected [14]. The water level of Kalimanci Lake is critically low as well. The fish fund is endangered and disappearance of the young fish occurred. Although the water level is below the critical point, there is huge pressure from farmers for water for irrigation [15].

[1]http://www.hidmet.gov.rs/podaci/agro/mesec.pdf
[2]https://ec.europa.eu/jrc/sites/jrcsh/files/jrc-mars-bulletin-vol25-no9.pdf
[3]http://meteo.arso.gov.si/uploads/probase/www/agromet/product/document/sl/HidrometeoroloskeRazmere_09082017.pdf
[4]http://meteo.arso.gov.si/uploads/probase/www/agromet/product/document/sl/HidrometeoroloskeRazmere_17082017.pdf
[5]http://meteo.arso.gov.si/uploads/probase/www/agromet/product/document/sl/HidrometeoroloskeRazmere_31082017.pdf
[6]http://stiri.tvr.ro/culturile-din-vestul-i-sudul-romaniei-afectate-de-canicula-i-seceta_820833.html#view
[7]https://www.youtube.com/watch?v=tVIp83E87Z0
[8]https://www.youtube.com/watch?v=9RnbdVLzYp0
[9]http://stiri.tvr.ro/debitul-dunarii-a-scazut-la-jumatate-din-cauza-secetei--in-mijlocul-fluviului-a-aparut-o-insula-de-lungimea-unui-stadion_820077.html#view
[10]http://stiri.tvr.ro/agricultura--irigata-cu-1-4-miliarde-de-euro--statul-vrea-sa-amenajeze-pentru-irigat-2-milioane-de-hectare--pana-in-2020_817605.html#view
[11]https://www.slobodnaevropa.mk/a/28664991.html
[12]http://duma.mk/region/kavadarci/23146-2017-08-10-10-42-00
[13]http://duma.mk/region/kavadarci/23379-2017-09-14-09-48-03
[14]http://glasno.press/index.php/macedonia/item/2345-пчеларите-од-штип-загрижени-за-својата-егзистенција
[15]http://kanal77.mk/поради-сушата-во-опасност-е-рибниот-фо/

OUTLOOK



Compared to surface water balance situation over the last two months, improvement from dry to wet conditions is expected in Slovenia, Hungary, northern Serbia and in coastal belt along the Adriatic Sea. Values of surface water balance will not change much over Macedonia, Greece and Turkey although its western half will experience less wet conditions. On the other hand, dry conditions will worsen over Romania and Moldova and water balance situation will change negatively over Bulgaria.

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.