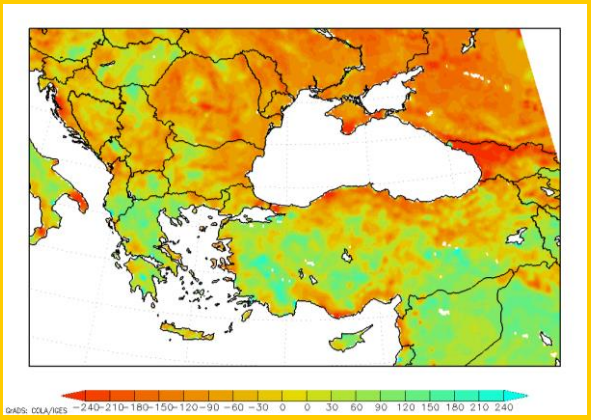
DROUGHT MONITORING BULLETIN

12th July 2018

HOT SPOT

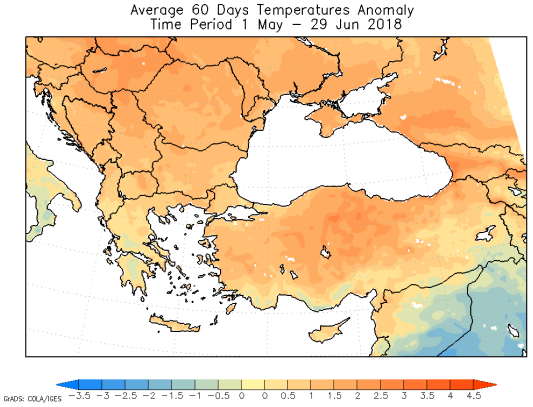


As spring is over, review of past months shows that early spring brought dry conditions mostly to Turkey and Greece but in April they spread over entire region. Later in spring, unfavourable conditions ended in many parts of southern half of the region but in most of its northern half they improved only by June. Figure on left shows **accumulated surface water balance between 1st April and 29th June** - parts of coastal Croatia, in central and southeastern Romania, and along coasts in northern and southern Turkey go into July with over 210 mm of accumulated water balance deficit higher than normally.

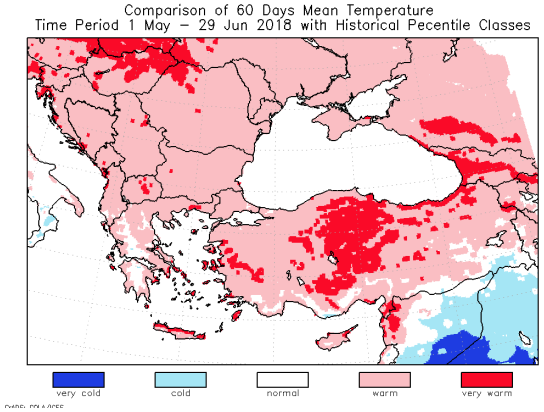
AIR TEMPERATURES AND SURFACE WATER BALANCE

*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 1st May to 29th June 2018**.*

AVERAGE AIR TEMPERATURE ANOMALY (°C)
1st MAY – 29th JUNE 2018



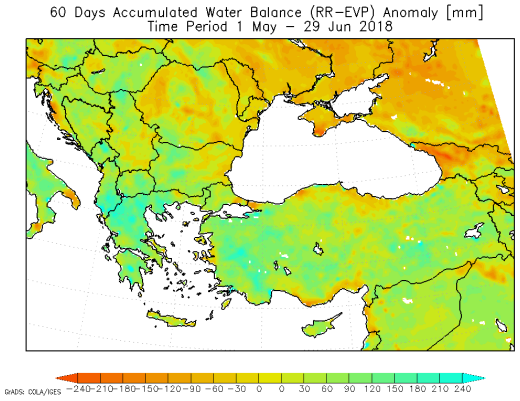
AVERAGE AIR TEMPERATURE PERCENTILE CLASSES
1st MAY – 29th JUNE 2018



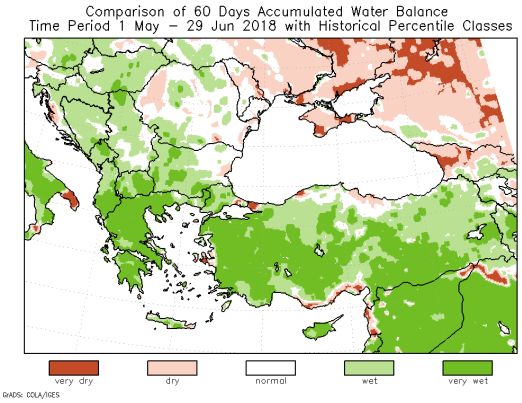
With exception of eastern Turkey where air temperatures were up to 1 °C below the average, first decade of June was warmer than usual across entire region. Air temperature exceed the average for up to 5 °C over Hungary, continental Croatia, northern Serbia, far western Romania but also in central FYR Macedonia. Across the rest of Balkan Peninsula and western Turkey,

air temperatures were between 2– 4 °C higher than usual except along its Black Sea coastline and wider central Turkey where air temperatures exceeded the average for up to 2 °C.
In mid-June, cooler spell hit the region from south-west. Areas with air temperatures significantly above the average, up to 3 °C and 4 °C, were located now only across Moldova, most of Romania, eastern half of Hungary and parts of central Turkey, while over the rest of the region they ranged slightly above the usual values. In western half of Greece and along Turkish Mediterranean coastline they even dropped up to 2 °C below the long-term average.
Sudden drop of air temperatures intensified in late June and spread across entire Balkan Peninsula. Continental Greece and Turkish Mediterranean coast that in early June experienced air temperatures within warmest 5% of their record now experienced air temperatures up to 4 °C below the average, classifying them within coldest 5% of the record for this time of year. Negative anomalies declined towards north-east: air temperatures in northern and central Balkan Peninsula ranged between 1–3°C below the average while eastern Romania and Moldova experienced around-average air temperatures. Meanwhile, air temperatures in central and northeastern Turkey remained above-average as anomalies ranged between 3–5 °C.
Despite intense drop of air temperatures at the end of the month, monthly average shows June was still warmer than usually across the region. Anomalies were the highest over central and eastern Hungary and central Turkey, of up to 2.5 °C, while in countries northern of Greece positive anomalies ranged mainly between 1–2 °C. Change of air temperatures over continental Greece as well as southern and southeastern Turkey throughout the month resulted in monthly mean about the average values, although locally it was up to 1 °C below the long-term average.

ACCUMULATED WATER BALANCE ANOMALY (mm)
1st MAY – 29th JUNE 2018



ACCUMULATED WATER BALANCE PERCENTILE CLASSES
1st MAY – 29th JUNE 2018

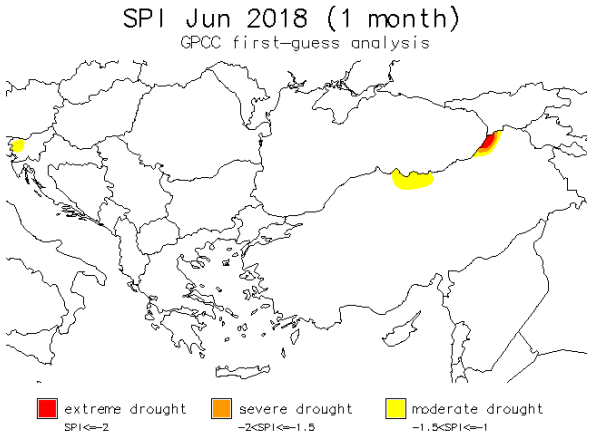


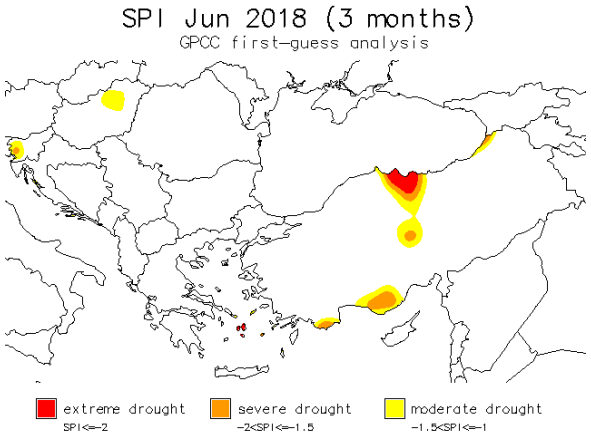
Compared to the situation over April and May when, except locally, most of the region was experiencing dry conditions, figures above show noticeable change in surface water balance over the last 60-day period. Intensive precipitations and lower-than-usual air temperatures resulted in highest water balance surplus detected over southern Albania and Greece where locally positive values even exceeded 240 mm. Very wet was also across western, central and southeastern Turkey, western Bulgaria, FYR Macedonia and over southern Pannonian Basin where positive water balance values ranged between 90–180 mm. Although water balance situation improved in terms of values also across other parts of the region, it mostly remained negative. Highest deficit, of up to 180 mm, was detected over Adriatic Sea coast. Water balance deficit decreased but remained negative also in Moldova, across vast part of Romania, eastern Bulgaria and parts of northern and southern Turkey along the coasts as negative values ranged between 60–120 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 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.

Drought conditions in June, according to the SPI1, were detected only in limited areas. Moderate dry conditions were noticed in northwestern Slovenia. Eastern Turkey coast along Black Sea was also drier than normal, from moderate to extreme at the very east. At those parts, scarce precipitation level in those parts classified within lowest 5–15% of the records.
SPI for three-month period shows more drier areas at the north of the region and in Turkey. Mainly moderate lack of precipitation were in western Slovenia and northeastern Hungary. In Severe drought in Turkey was classified at Mediterranean coast and in central continental part, while extremely dry conditions were detected in central Black Sea Region.





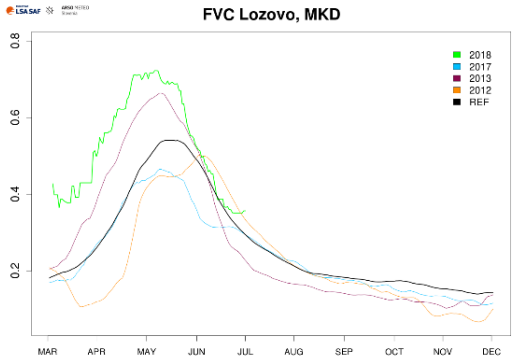
REMOTE SENSING – FRACTION OF VEGETATION COVER

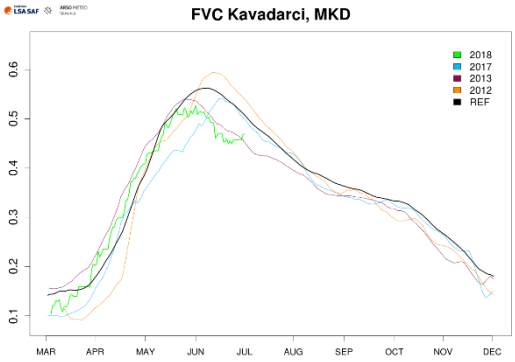
Fraction of vegetation cover (FVC) is vegetation index, based on multi–channel remote sensing measurements (data from Eumetsat's LSA SAF data base is used for products in this bulletin). FVC shows fraction of the total pixel area that is covered by green vegetation, which is relevant for applications 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 2nd July 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.

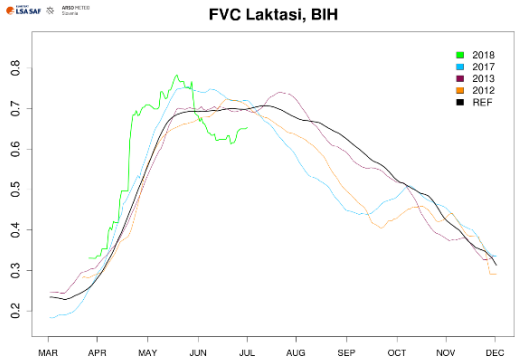
FYR MACEDONIA

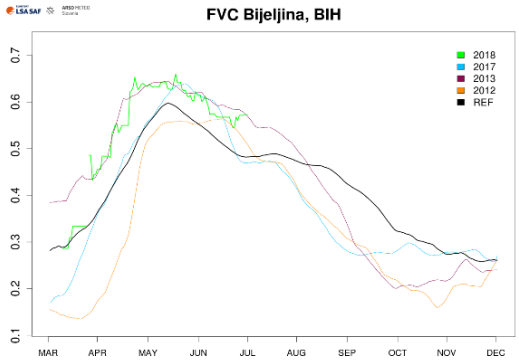


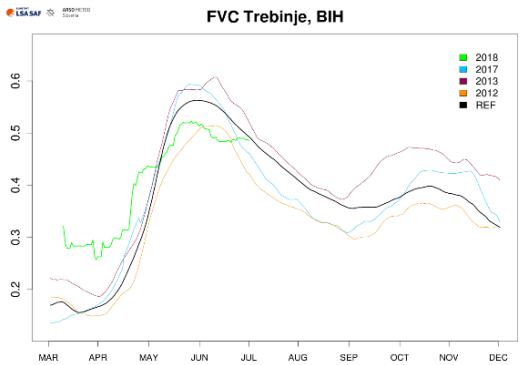


Vegetation in Lozovo in central Macedonia was developing as expected, with earlier start of vegetation season which reflects in higher FVC values in comparison to the reference. Peak of the vegetation development according to FVC was reached at the transition from April to May. In June, FVC values reached and follow reference line for almost entire month. Meanwhile in Kavadarci in southern Macedonia FVC values followed closely the reference line from the beginning of the season until mid-May when peak was reached. FVC values dropped for a little bit in June but the negative slope was not constant.

BOSNIA AND HERZEGOVINA (REPUBLIC OF SRPSKA)



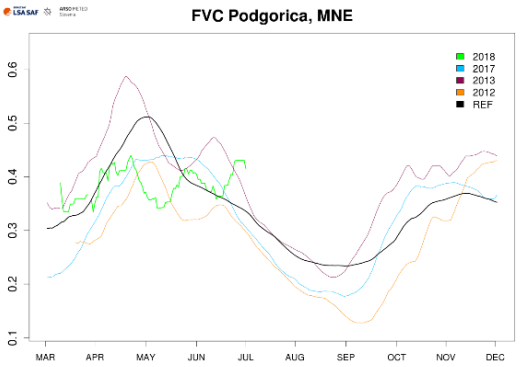




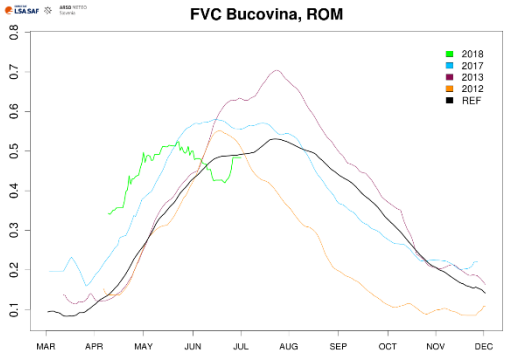
Vegetation development in Laktaši at the north of the country was ordinary until the end of April when high increment of FVC values occurred. FVC peak was noticed in the middle of May and after that values rapidly dropped below reference line. Therefore, FVC values in June were below the average but approximately constant. At the north-east, in Bijeljina, vegetation development advanced in comparison to the average development for the whole season. FVC line follow reference line, but with approximately 5–10 % higher values. This year's FVC values are very similar to those in year 2013. Rapid vegetation development characterized first half of spring in Trebinje in southern Bosnia and Herzegovina. FVC line follows the ordinary development but values are lower than usually since the beginning of May.

MONTENEGRO

Weather conditions in Montenegro in April, beginning of the vegetation season, was very unfavorable for vegetation development. April's air temperature were record high, while amount of precipitation was very low. April in Montenegro is classified as extremely hot and extremely dry after year 1949. Therefore, FVC line does not have normal shape of the curve, but still ranges approximately between 0.35 and 0.45 with no evident increase or decrease.

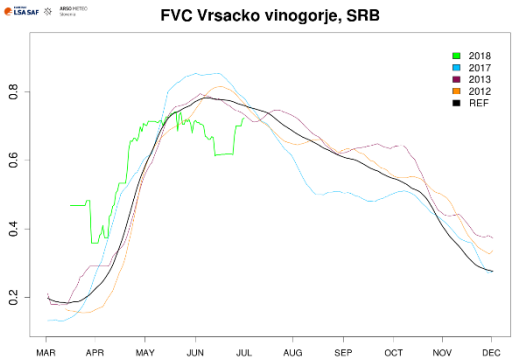


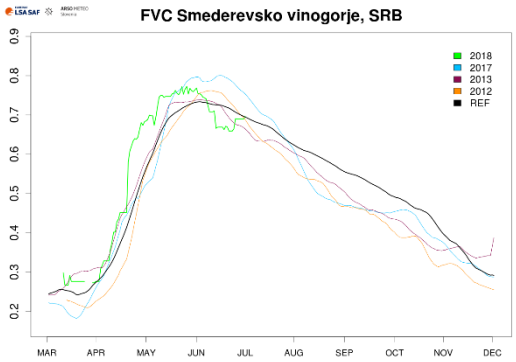
ROMANIA



FVC data for Bucovina are available from beginning of April. Vegetation development has been exceeding the average conditions until mid-May when FVC values started decreasing and approaching the reference line. Values were below average in June.

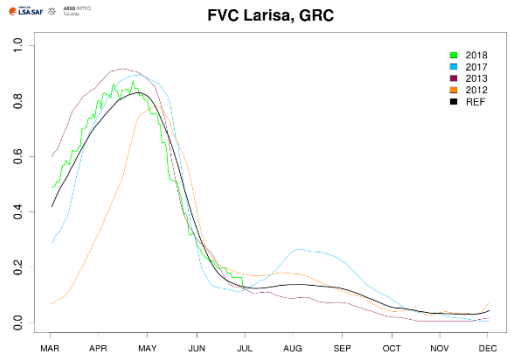
REPUBLIC OF SERBIA

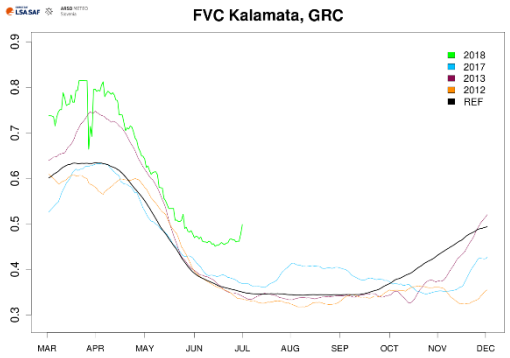




FVC values for Vrsacko vinogorje in north-east of Serbia were exceeding the average conditions from the beginning of vegetation season until mid-May. Since then, values ranged around 0.4 which is a little below the reference values. According to FVC, vegetation development in Smederevsko vinogorje (central Serbia) followed ordinary development and reach the peak of the season in May. FVC values decreased in June to its normal state.

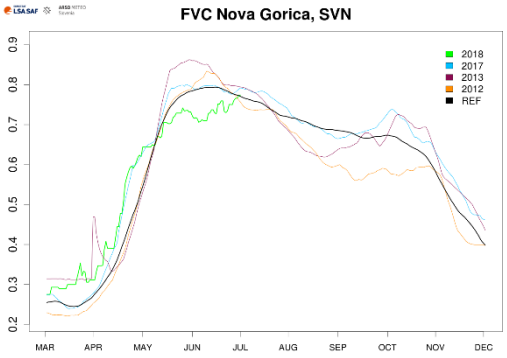
GREECE

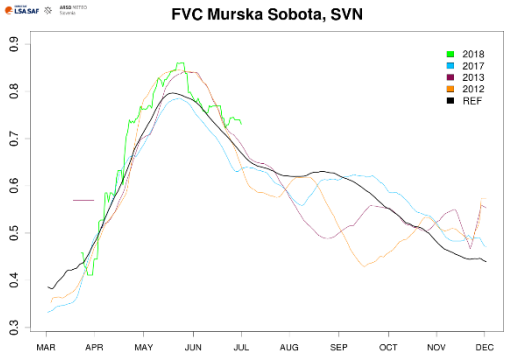




Vegetation development in Larisa is still following the reference line with no significant deviations. Vegetation in Kalamata is in great condition according to FVC index. Values are above reference line since the beginning of the vegetation season, in June for more than 10 %.

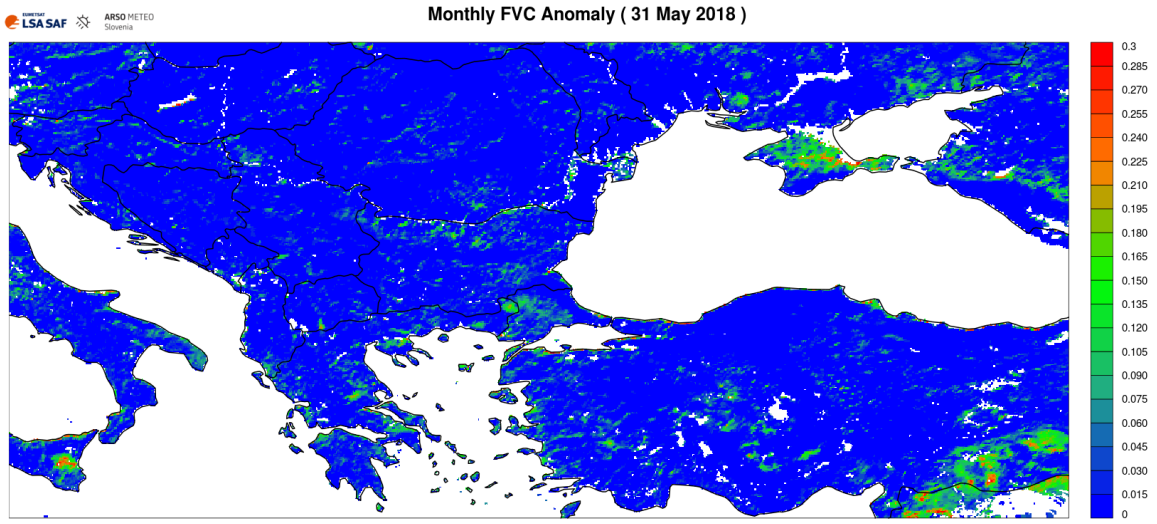
SLOVENIA

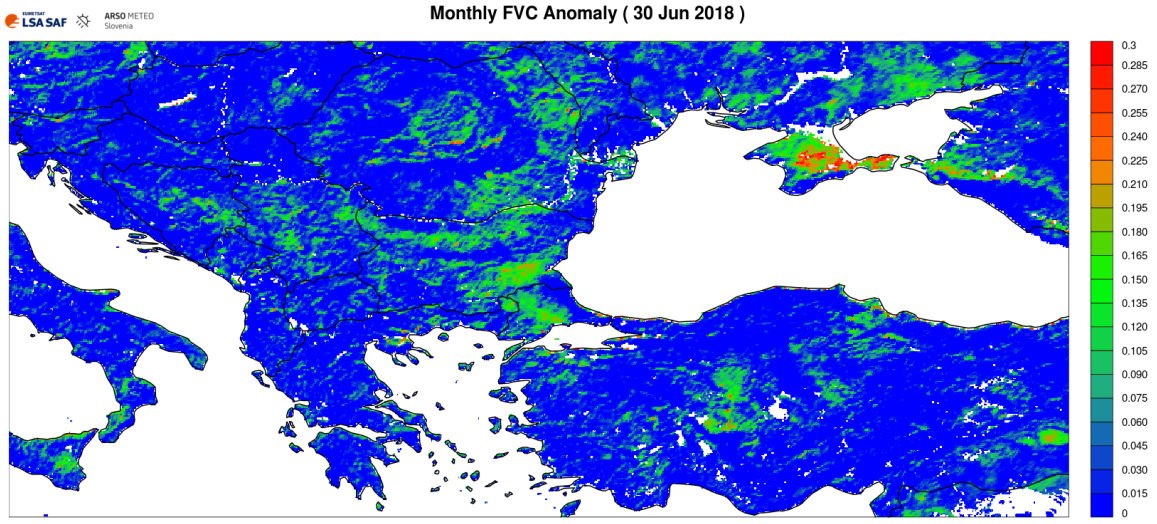




This year, vegetation is developing as expected in Murska Sobota withFVC values even exceeding the reference line since April. In Nova Gorica, values exceeded the average until early May but has since then been slightly below the reference line.

Figures below show negative anomaly of **accumulated 30-day FVC** recorded on **31st May and 30th June 2018** in comparison to the past 14 years (2004–2017) and are used experimentally.





Monthly negative accumulations of FVC index at the end of June are much more noticeable across the region than at the end of May, caused mainly by drought and torrential rain. Negative anomalies in vegetation cover, up to 19 %, are most evident in central and eastern Romania, northern and eastern Bulgaria, in scattered parts of mainly central Balkan Peninsula, mainly in Bosnia and Herzegovina and Serbia. FVC anomalies in central Turkey intensified; some scattered areas are also at the west and east of the country. Better vegetation state due to the FVC anomalies are at the south-east of Turkey comparable to the situation at the end of May.

IMPACT REPORTS

There are reports from **Moldova**, namely from Telenești region in central Moldova, that drought has already affected agricultural crops. At present, the production of peas, barley and part of cereal crops have been compromised. With dropped irrigation nowadays in that region, yield is expected to be very low [1]. Due to lack of precipitation and high air temperatures, there is evidence also of hydrological drought in the rivers and lakes. The General Inspectorate for Emergency Situations has warned the public about compliance with the anti-fire rules and called on economic agents and the population to rationally consume water resources [2].

Hydrological drought is also occurring in central southern **Turkey** where lake Meke, fed from groundwater resources, was reported drying heavily. Lack of precipitation over the past months and overuse of groundwater mainly for agricultural irrigation resulted in continual decline of groundwater level [3]. The lack of rainfall and the pollution in Aegean region of Turkey this year started threating the shores of Lake Bafa as well [4].

From Trakya in far northwestern part of Turkey they report that due to excessive rainfall early in the year, fertilization could not be done and roots of agricultural drops have not developed properly for drier part of season. Drought that occurred in April worsened the situation and left agricultural crops in Trakya, a region that meets 20 % of domestic wheat needs, greatly affected [5].

As harvest began in **Bulgaria**, reports say drought affected mostly wheat and barley. In Silistra and Razgrad region in northeastern Bulgaria, they are expecting the yield of the mentioned crops to be lower than last year when drought also affected them [6, 7].

[1] https://www.europalibera.org/a/seceta-a-afectat-o-parte-din-culturile-agricole/29288707.html
[2] http://24h.md/flash-codul-galben-de-seceta-ramane-in-vigoare-inca-pentru-o-saptamana/
[3] https://www.ntv.com.tr/turkiye/dunyanin-nazar-boncugu-meke-golukurudu,eG0g0znOCEO2Qb3F4fupFA
[4] https://www.ulusal.com.tr/yurt/bafa-golu-kuraklik-ve-kirlilik-tehdidi-altinda-h202278.html
[5] https://www.ulusal.com.tr/emek/kuraklik-kok-hastaligina-neden-oldu-h203455.html
[6] http://www.bta.bg/bg/c/BO/id/1821205
[7] http://www.bta.bg/bg/c/BO/id/1817937

OUTLOOK

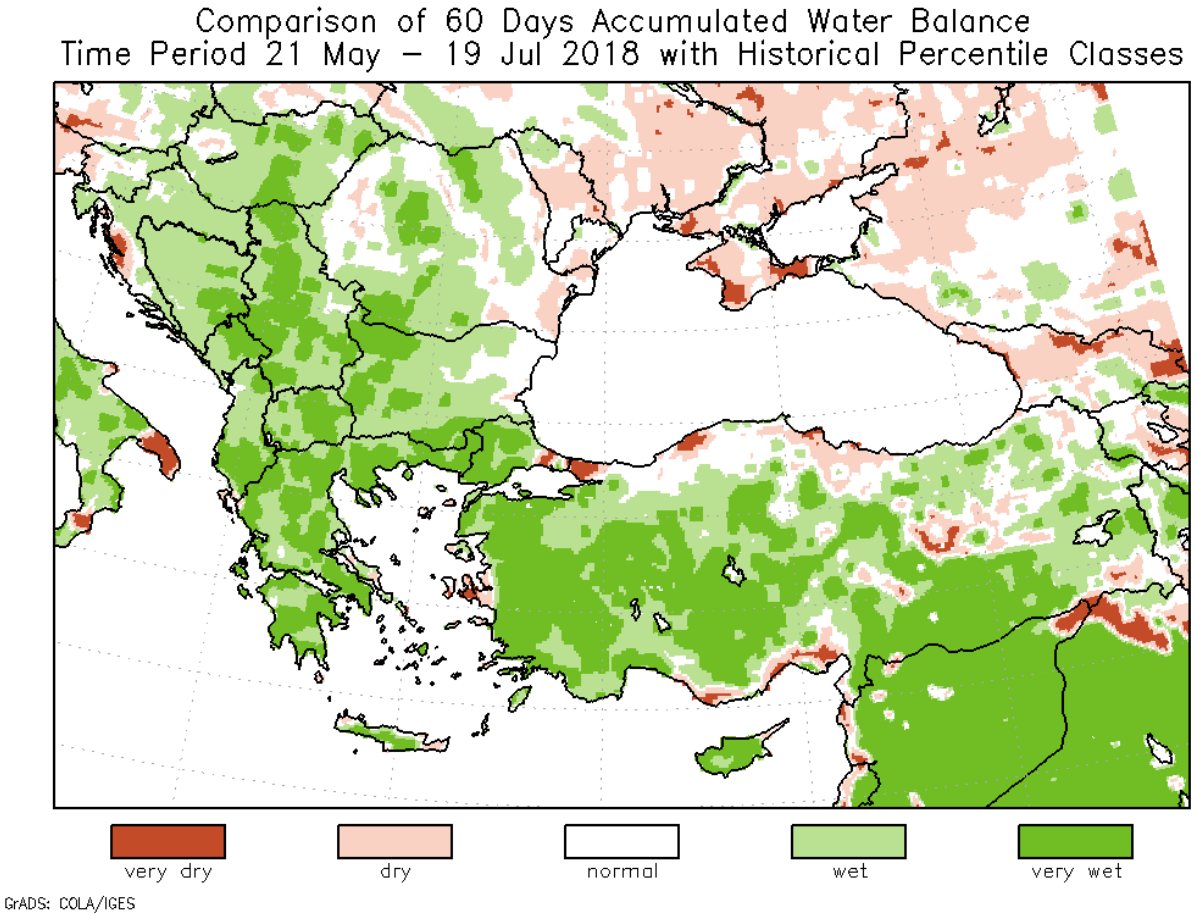


Figure above presents the model simulations of the **60-days water balance anomaly** (percentile) for the time period **from 21st May to 19th July 2018**. The outlooks shows that dry conditions will persist over central Moldova, southeastern Romania, northern and part of southern Turkey coastline and over Bosporus in northwestern Turkey. Water balance deficit will intensify over Zadar area in coastal Croatia and also came to Alpine part of the region. The rest of the region will remain in wet conditions although they will partially decline over FYR Macedonia, Greece and central Turkey. Water balance surplus will noticeably increase across Serbia, also its southern part that where currently about-average water balance conditions were present.

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.