The Republika Srpska,
Bosnia and Herzegovina
RHMS
Нада Рудан
N.Rudan**@rhmzrs.com**

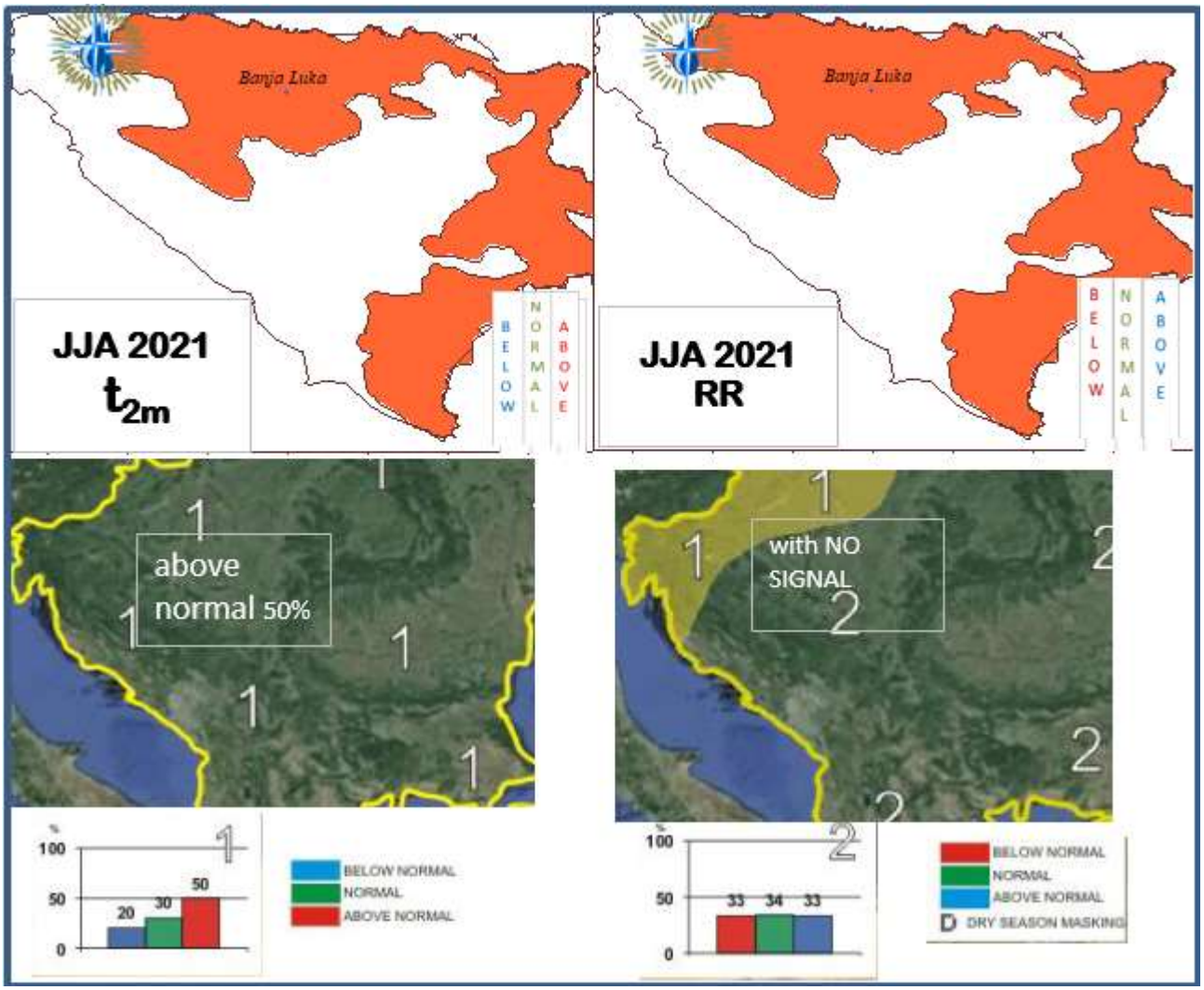
Verification of the JJA 2021 outlook over

The Republika Srpska, Bosnia and Herzegovina

1. SEECOF-25, MedCOF-12 Climate outlook for the 2021 summer season:

Temperature and Precipitation

According to the seasonal forecast, based on tercile ranks and climate classification ratings, thermal conditions over the Republika Srpska for the 2021 summer had been described as ***warmer than normal (****the portion 1, down left).* ***According to observed values, this climatological prognosys was correct.*** *Precipitation forecast was likely to experience usual climate pattern - no signal, 33% probabilites* ***(****the portion 2, down rught). Observations were in the range* ***very dry to extremely dry****. The precipitation outlook was wrong.*



Temp (left) and PRC tot (right) for jja2021- outlook (below) and observed values (above)

- ❖ *June 2021 was driest on record over 130 years; the fifth warmest June in 130 years.*
- ❖ *The lack of JJA rainfall total, averaged over the Srpska teriitory, was -35%; the real drought was worse, due to the heat and wind, which additionally dried up the soil.*
- ❖ *Suthern of the RS was hit by an extreme drought; dry period lasted over 100 days. This affected forest fires.*
- ❖ *JJA Tmean anomaly counted from **1.6 to 2.8℃;** JJA Tmax= 40.2℃ (Banja Luka/July 8th,); JJA Tmin = 3℃ (Drinić, Sokolac/August 30th).*
- ❖ *According to poor amount of precipitation, very high air temperatures and increased evaporation, summer 2021 is among 5 driest in the past 70 years.*

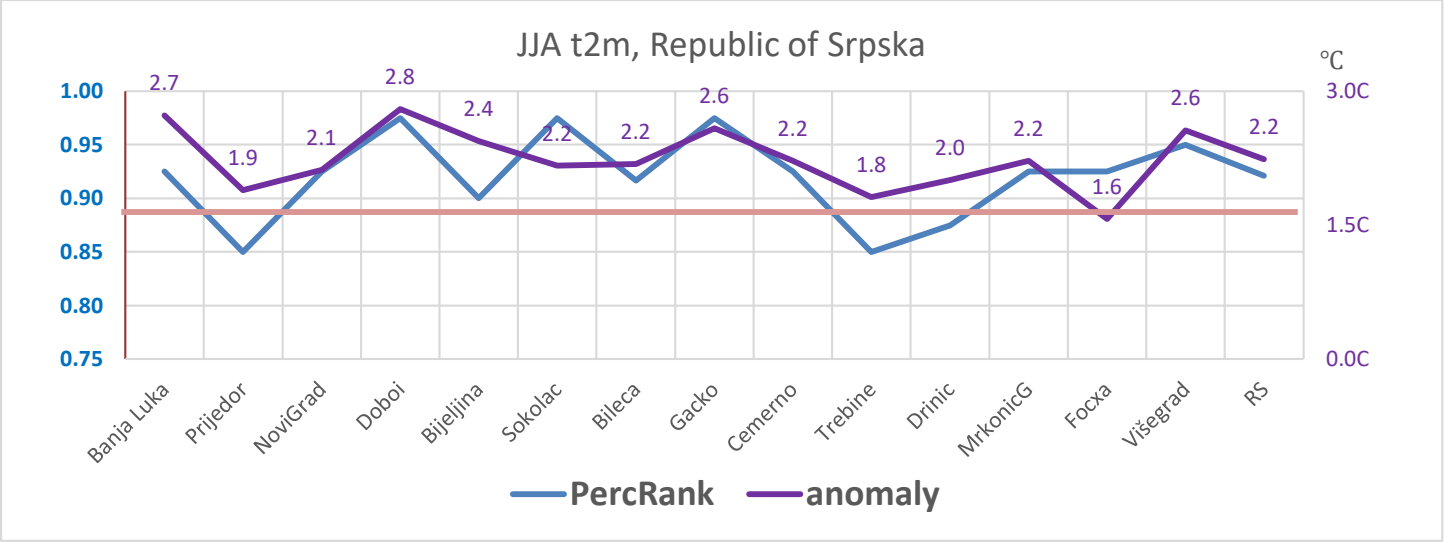
- **Analysis of the 2021 Summer season**

Thermal conditions

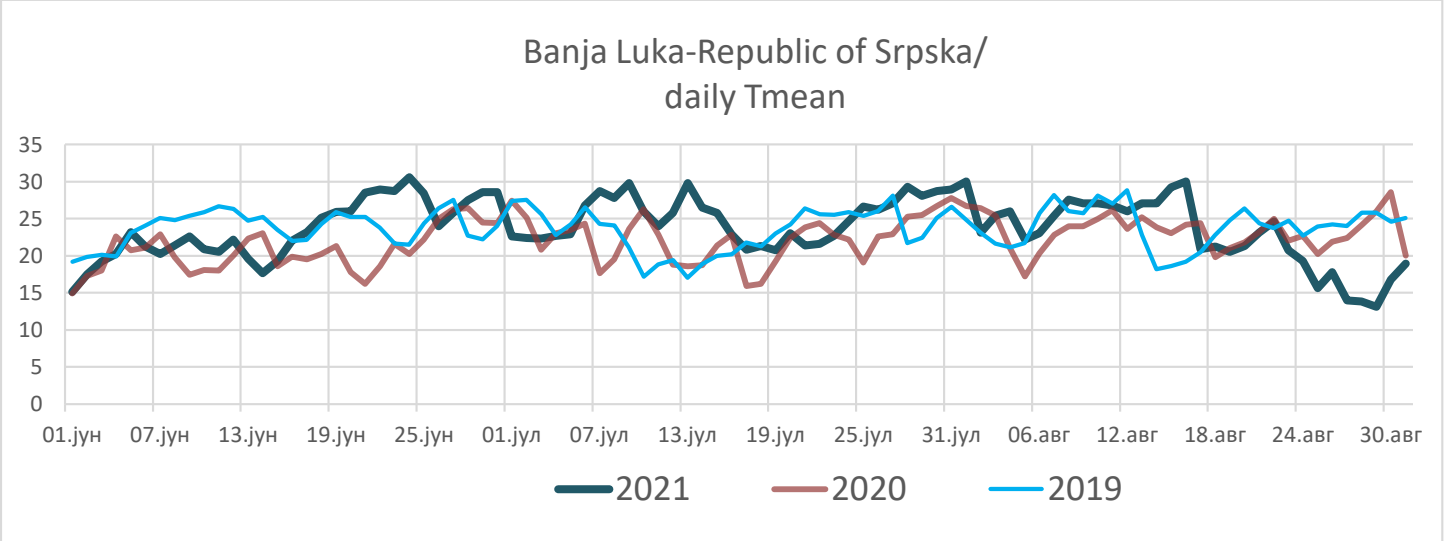
Summer temperatures exceptionally above normal (>90P), compared to the reference period 1981-2010; the warmest year 2012, the freshest 1976 year:

JJA-2021 t_{mean} - statistics with reference to (ref 1981-2010) in Republika Srpska (℃)

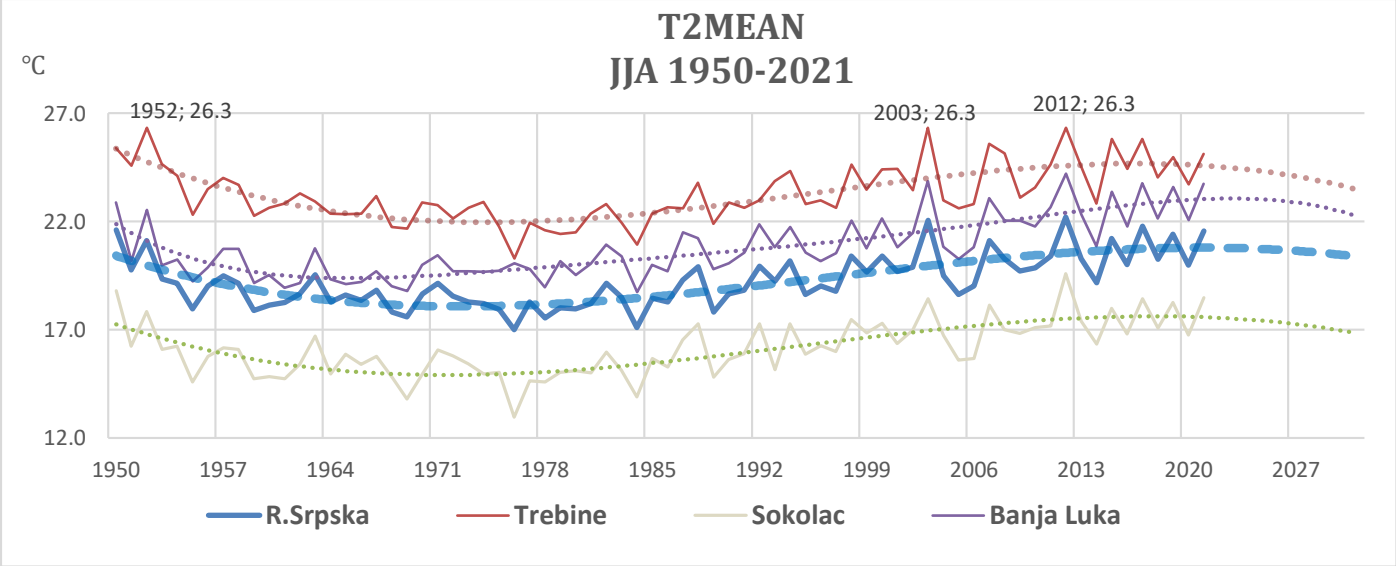
Station	t_{mean} 1981-2010	STD	z (STI)	Percentille (NORMSDIST)	PercRank 2021	**JJA 2021 (mm)**	**lower tercille**	**upper tercille**	**median**	tercille category
Бања Лука Bana Luka	21.0	1.05	2.61	**1.00**	0.95	**23.7**	20.6	21.5	20.8	above
Приједор Priedor	21.2	1.08	1.76	**0.96**	0.90	**23.1**	20.6	21.8	21.1	above
Нови Град NoviGrad	20.2	1.13	1.87	**0.97**	0.95	**22.3**	19.6	20.5	20.1	above
Добој Doboy	20.5	1.00	2.79	**1.00**	0.98	**23.3**	20.0	21.0	20.4	above
Бијељина Bijeljina	21.3	1.19	2.05	**0.98**	0.93	**23.8**	20.8	21.8	21.2	above
Соколац Sokolac	16.3	1.02	2.12	**0.98**	0.98	**18.5**	15.8	16.9	16.3	above
Билећа Bileca	18.4	7.31	0.69	**0.75**	0.95	**23.5**	20.6	21.5	21.0	above
Гацко Gacko	17.3	0.90	2.87	**1.00**	0.98	**19.9**	16.8	17.8	17.3	above
Чемерно Cxemerno	14.8	0.92	2.41	**0.99**	0.95	**17.0**	14.4	15.2	14.9	above
Требиње Trebine	23.3	1.13	1.60	**0.94**	0.90	**25.1**	22.8	23.5	23.0	above
Дринић Drinic	17.1	1.12	1.79	**0.96**	0.92	**19.1**	16.8	17.4	17.2	above
Фоча Focxa	19.4	1.00	1.57	**0.94**	0.95	**21.0**	19.1	19.9	19.4	above
МркГрад MrkonicG	18.3	1.12	1.99	**0.98**	0.95	**20.6**	17.7	18.7	18.2	above



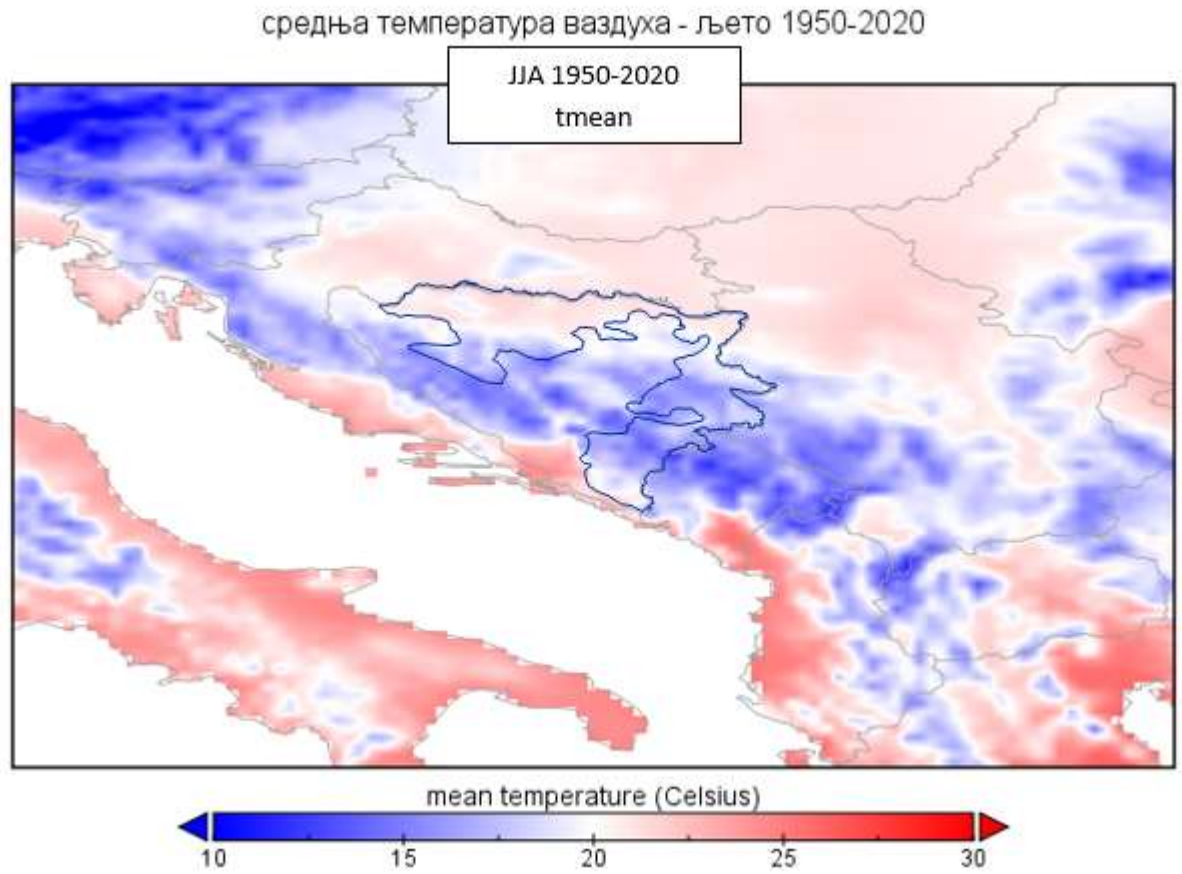
JJA Tmean anomaly ranger from 2-3degC;Percentille above 90th in most part of country.

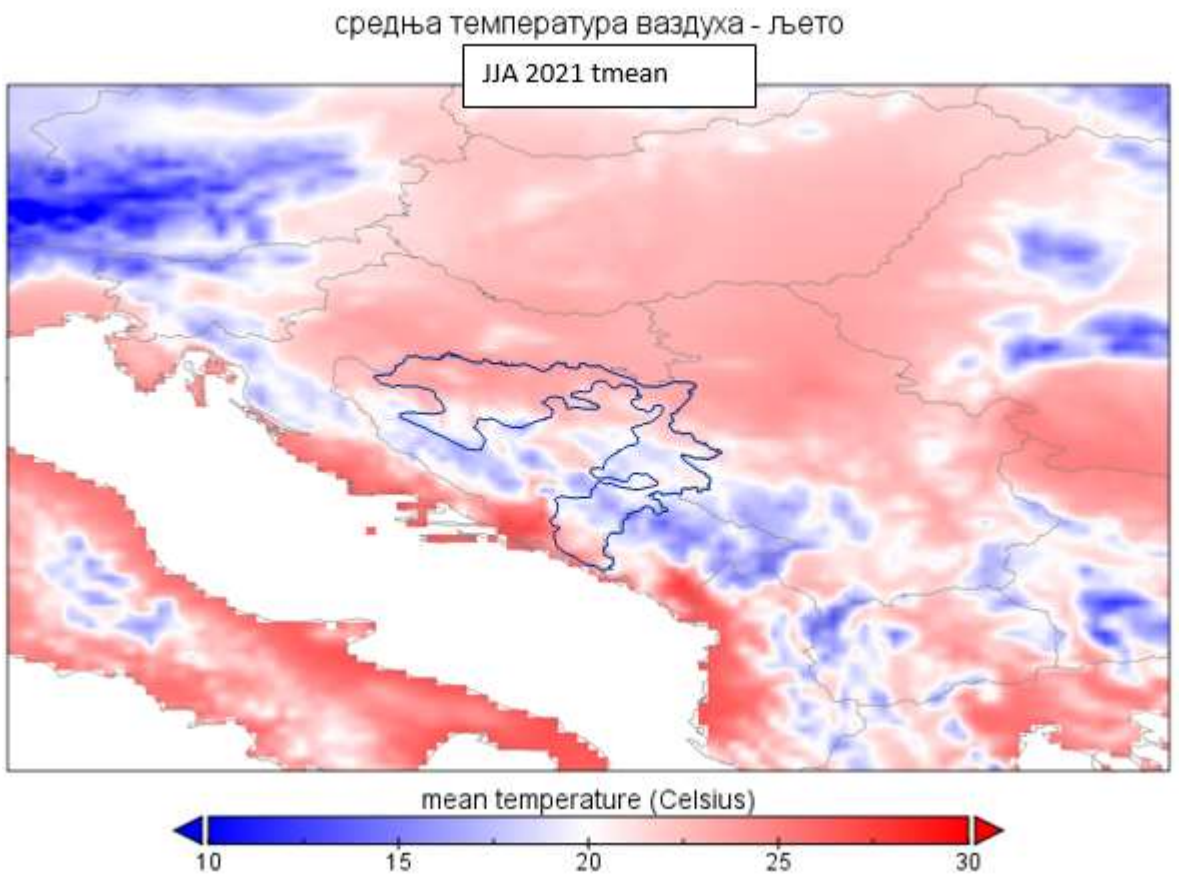


June 2021 was the fifth warmest June in 130 years. Extremely warm weather pattern in July, the third warmest in 130 years; with 2.8℃ anomally regardin to the1981-2010 the weather type was clasified by ***extremely above normal***;



Summers in 1952, 2012,2003 the hottest



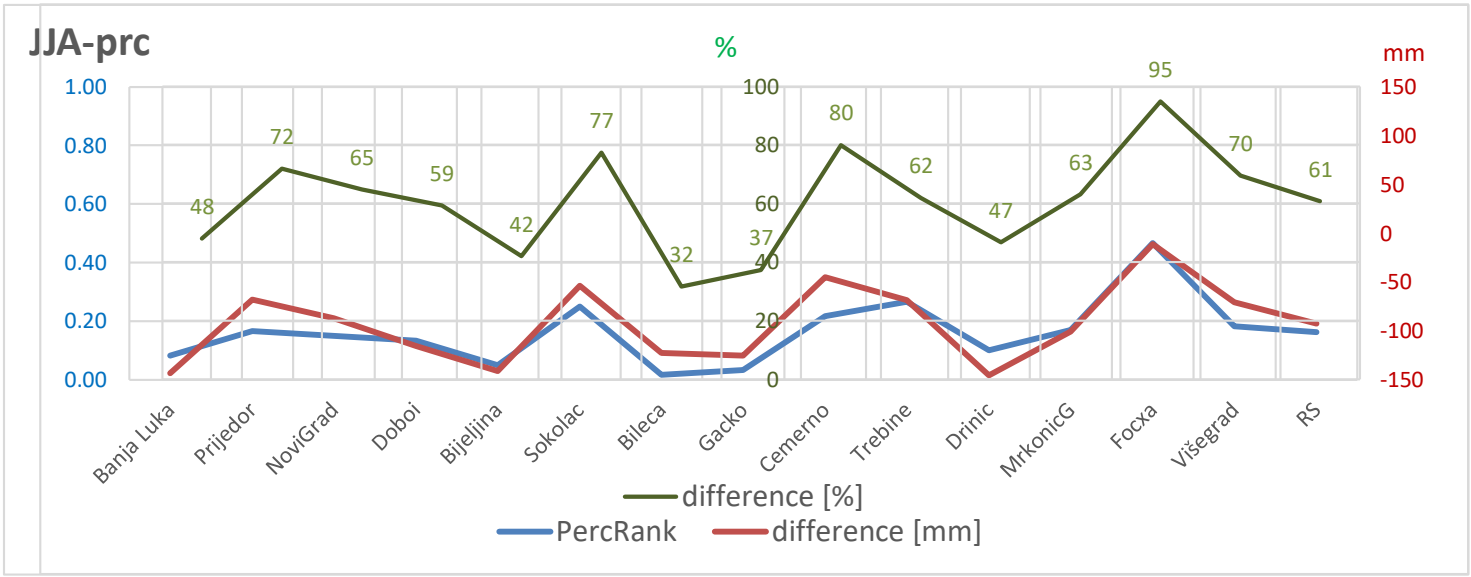


JJA 2021 (above) and 1950-2020 (below) Tmean, according to ECA&D/ Copernicus climate data store

Rainfall

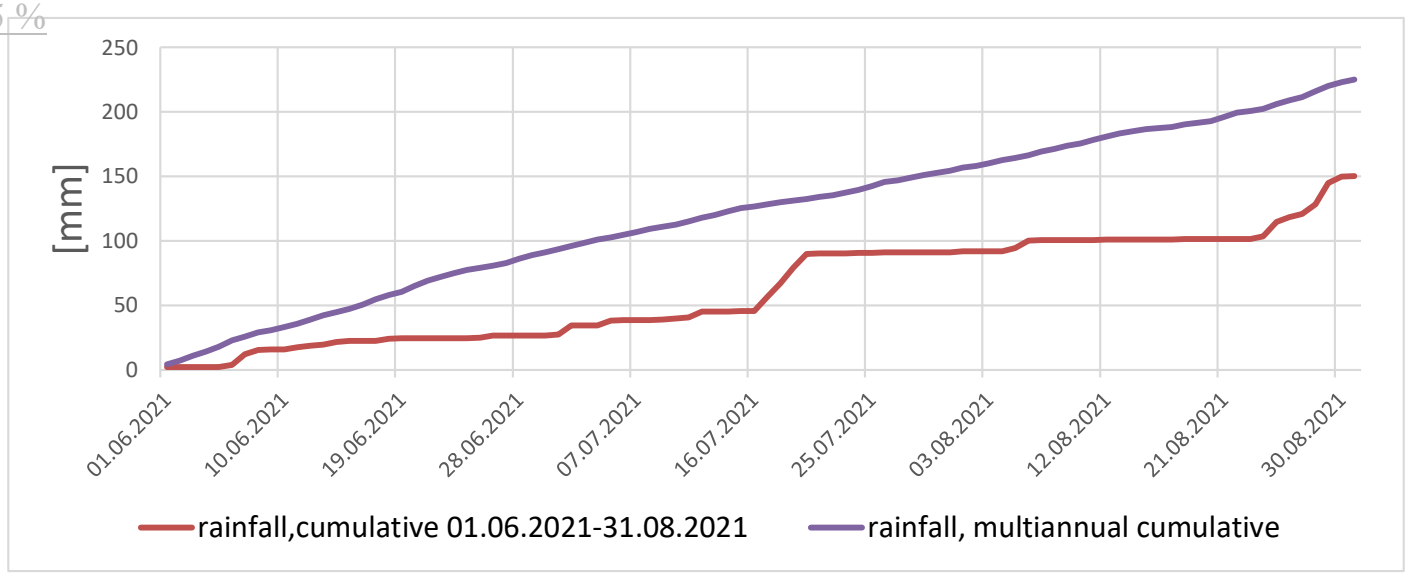
JJA-2021 precipitation statistics over RS (ref 1981-2010);

Station	jja1981 -2010	STD	z (SPI)	NORMSDIST (z) (percentile)	PercRank 2021	JJA 2021 (mm)	% jja2021 (ref1981-2010)	trend %	lower tercille	upper tercille	median	tercille category
Бања Лука *Bana Luka*	276	81	-1.76	**0.04**	0.08	**132**	48.0	-52.0	235	313	273	**below**
Приједор *Priedor*	243	76	-0.89	**0.19**	0.17	**175**	72.0	-28.0	198	271	219	**below**
Нови Град *NoviGrad*	247	71	-1.22	**0.11**	0.15	**160**	64.8	-35.2	216	279	246	**below**
Добој *Doboy*	284	104	-1.12	**0.13**	0.13	**168**	59.3	-40.7	218	321	272	**below**
Бијељина *Bijeljina*	243	78	-1.82	**0.03**	0.05	**102**	42.0	-58.0	216	278	255	**below**
Соколац *Sokolac*	238	64	-0.85	**0.20**	0.25	**184**	77.3	-22.7	207	259	239	**below**
Билећа *Bileca*	179	71	-1.72	**0.04**	0.02	**57**	31.6	-68.4	144	196	175	**below**
Гацко *Gacko*	200	84	-1.50	**0.07**	0.03	**75**	37.3	-62.7	158	226	198	**below**
Чемерно *Cxemerno*	224	98	-0.46	**0.32**	0.22	**179**	79.9	-20.1	186	254	203	**below**
Требиње *Trebine*	179	97	-0.70	**0.24**	0.27	**111**	61.9	-38.1	133	229	161	**below**
Дринић *Drinic*	272	87	-1.66	**0.05**	0.10	**127**	46.7	-53.3	243	309	251	**below**
Фоча *Focxa*	215	81	-0.14	**0.44**	0.47	**204**	94.8	-5.2	175	225	204	**normal**
МркГрад *MrkonicG*	264	102	-0.89	**0.19**	0.18	**172**	65.3	-34.7	227	291	265	**below**



In the southern parts, the consecutive dry days (CDD) period lasted over 100 days. Gacko-Bileća area encountered extreme drought (with SPI4 rain index <-2). This affected large, long-lasting fires. Rain deficit, averaged over the RS was -35 %, with reference to 1991-2020.

-35 %



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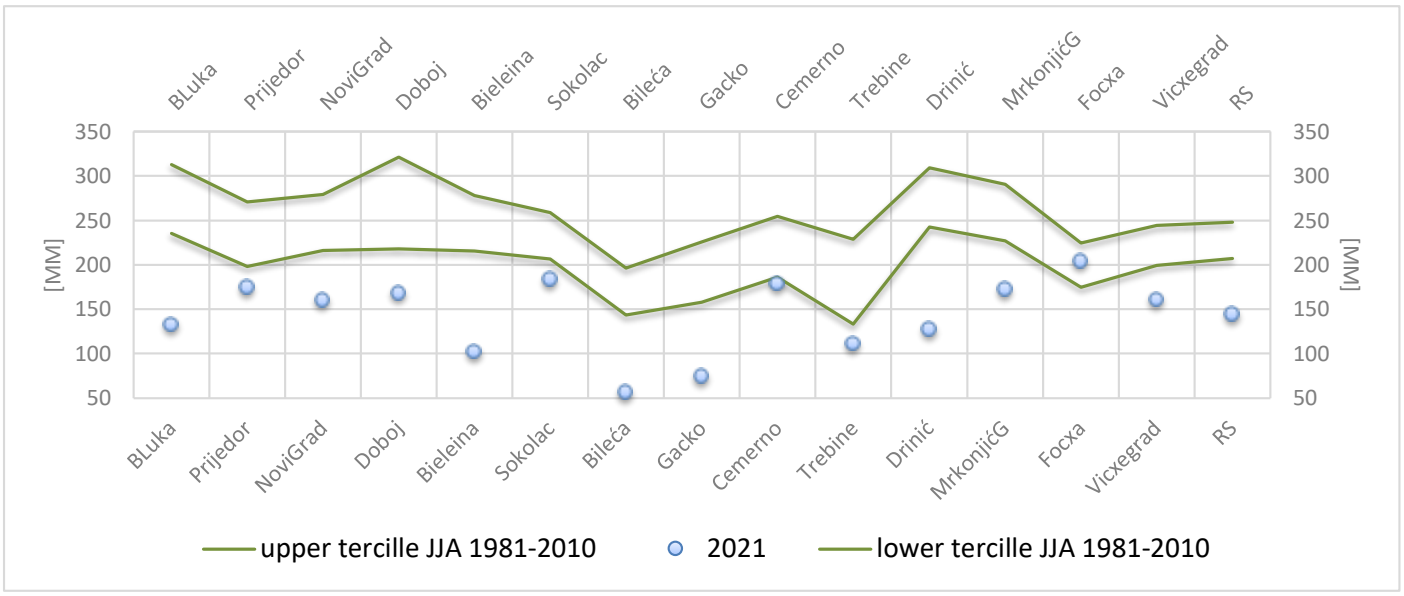
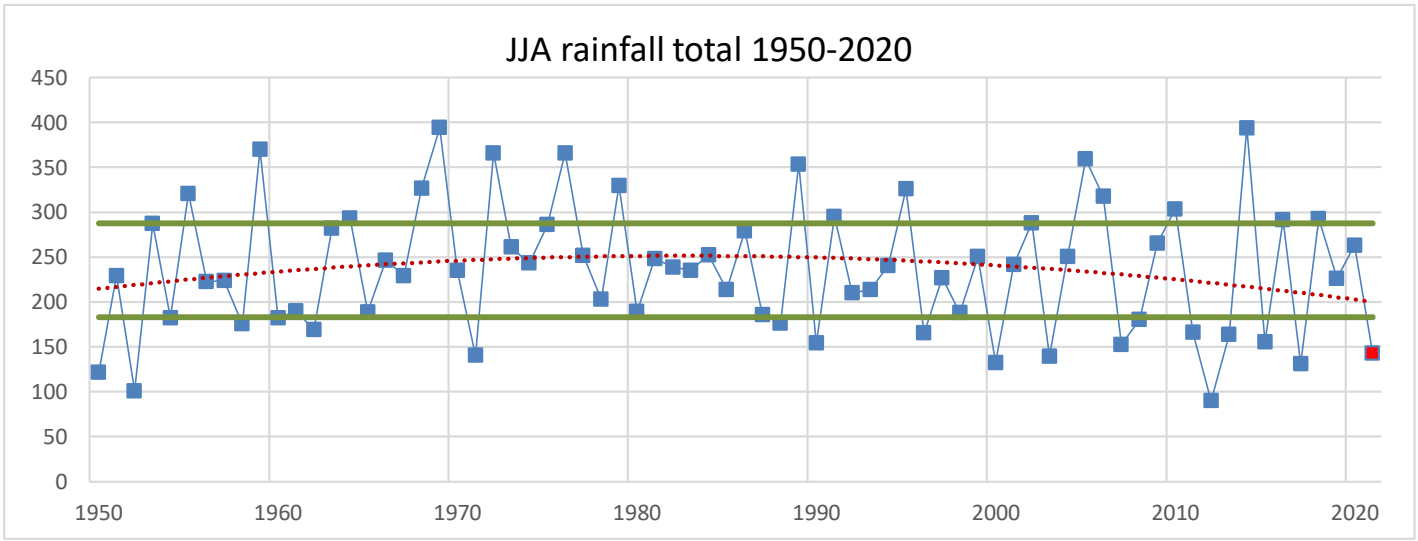
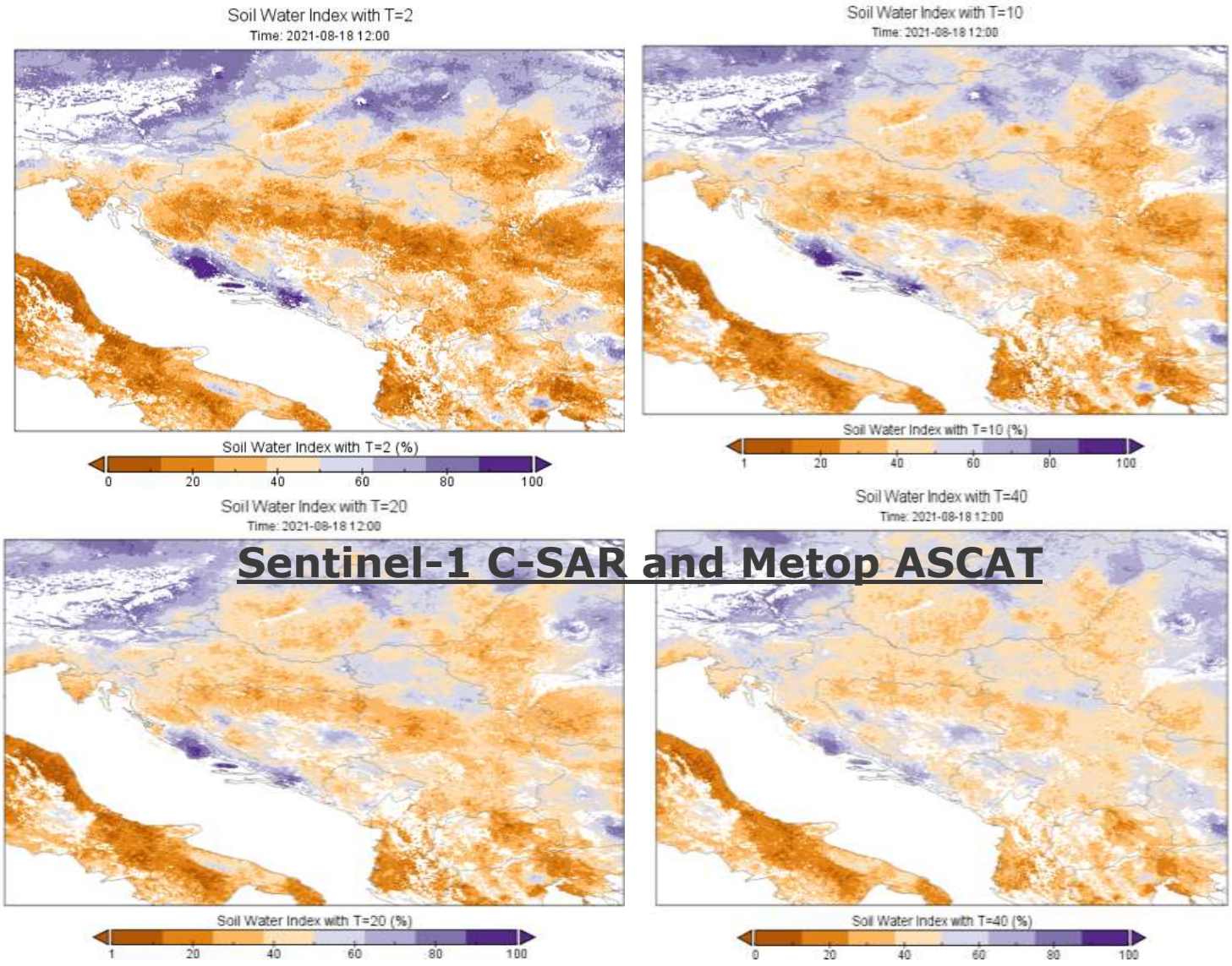


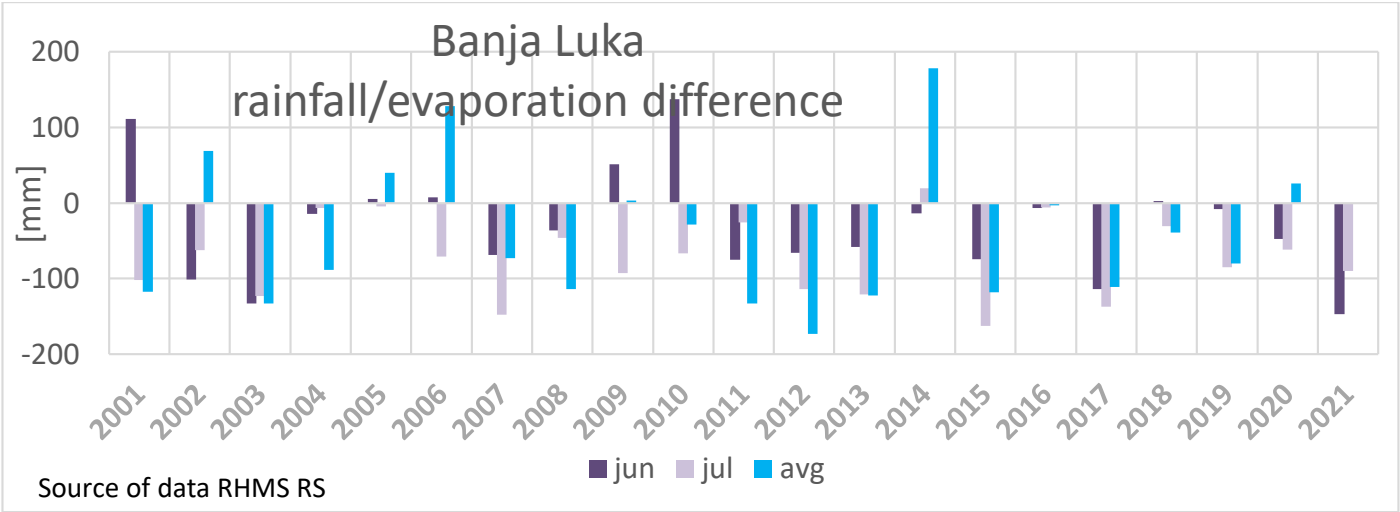


Polynom Trend line (red) indicates similar dry summers in 1950s; empiric return period >070yr.

Drought-**soil water index** was below 40% in most parts of the country in August, as the previous period passed with scanty rain. According to satellite data, processed by the RHMZ climatology department, soil was significantly drained up to a depth of 40 cm, in most parts of the country.

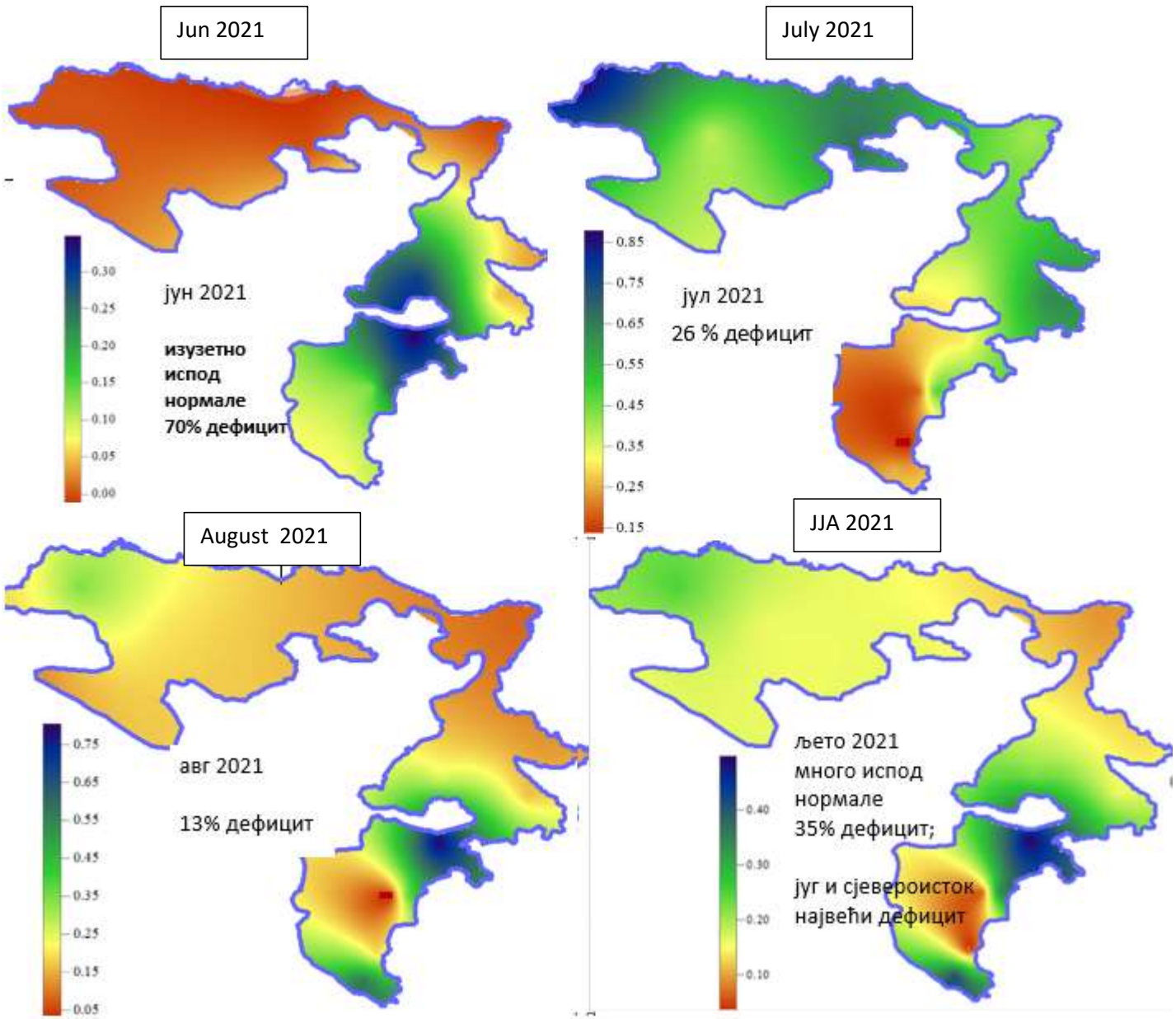


Satelite data application in climate monitoring of RHMS RS: Sentinel-1 C-SAR and Metop ASCAT



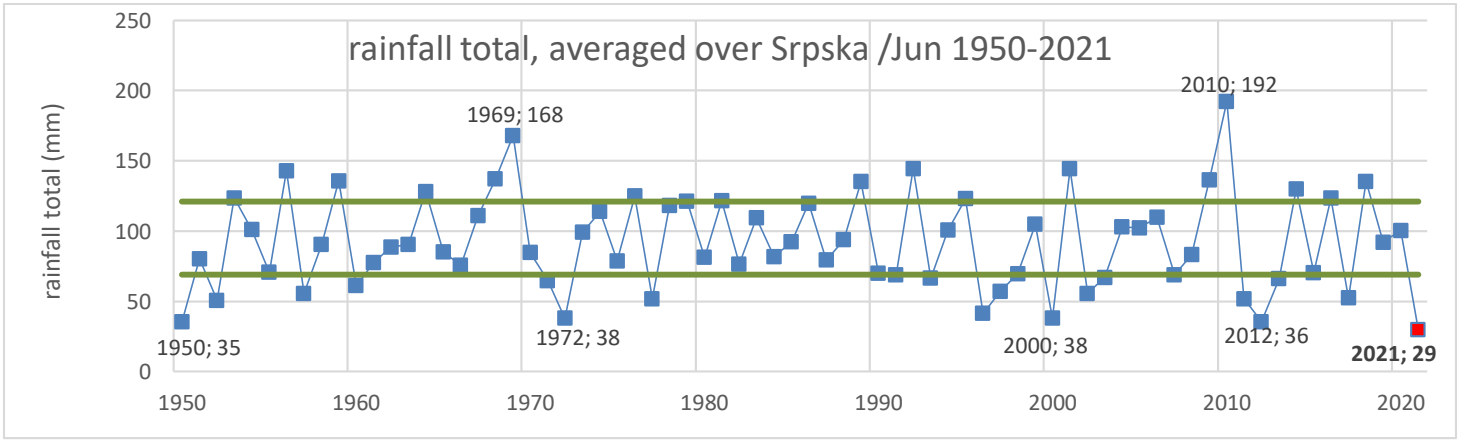
Source of data RHMS RS

2011 was the driest year at annual level, from 1860 onwards;2011 and 2000 the driest over the growing season; 2003, 2017 and 2000 driest summers, based on difference evaporation / rainfall



The south of Republic of Srpska (East Herzegovina) is characterized by a long dry period in the summer season, due to the modified Mediterranean climate and drought is a "normal condition.

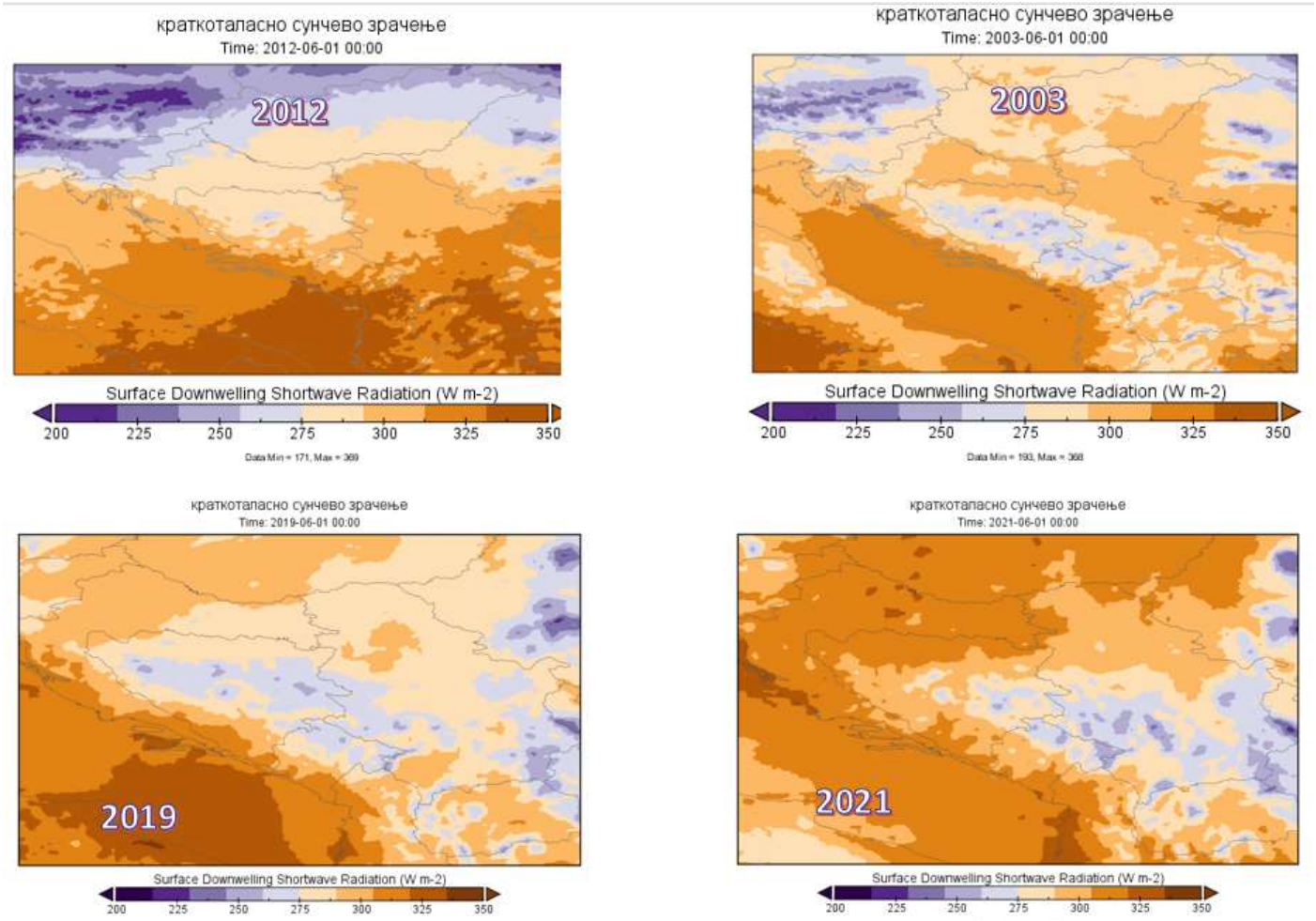
However, perennial severe droughts in the north, where the Republic's largest area of crop production is located, are not a normal occurrence and are considered as a climatic variation / anomaly, with 50-70 years of return period, over which the drought appears at least once; weaker droughts have a shorter return period. Jun 2021 was the the driest June over the northern and central regions since 1861; On average, the rainfall deficit counted 73%.



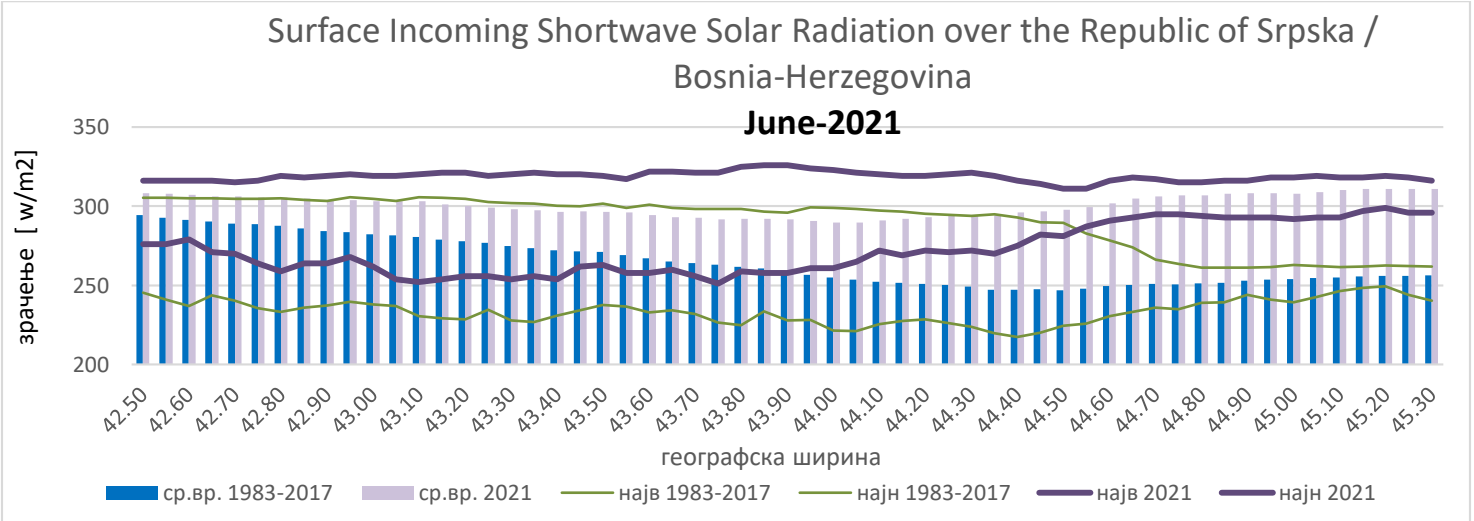
Solar Radiation

Satelite data application in climate monitoring of RHMS RS: Solar radiation according to CMSAF / EUMETSAT data source

Summers in 2012,2003,2019,2020 the sunniest, according
Surface Incoming Shortwave Solar Radiation



Solar radiation and insolation, exceptionally above normal range, especially in the northern parts of the country, which caused a lack of convective precipitation (downward air movement within the high-pressure ridge prevented significant cloud development).



The average air temperature over the territory of the RS was 0.5℃ above the arithmetic means for the period 1991-2020, what is within the normal range.

However, this period cannot be considered as representative climate normal for the summer months, due to the significant deviation of the aritmethic mean over the period 1991-2020 and assotiated weather categorisation, based on percentilles, is far from reality. In other words, instead to belong to 50P (supposed distribution is Normal), percentile of **1991-2020 Tmean** is above 75P.

2. High impact events:

High impact events: long lasting drought and high temperatures caused wild fires in the Southern area of the Republika Srpska.

3.Verification of the climate outlook for the 2020 summer

Country	**Seasonal temperature (JJA)**		**Seasonal precipitation (JJA)**	
	Observed	SEECOF, MedCOF *climate outlook*	Observed	SEECOF, MedCOF *climate outlook*
The Republika Srpska, Bosnia and Herzegovina	***above***	*above*	**below**	*No signal*

Assesment:

There was 50% probability for above-average summer temperature and no signal for the precipitation outlook. In most parts of Srpska there were exceptionally above temperatures and exceptionally below rainfall. The outlook was correct for temperature but wrong for precipitation.