

Verification of DJF-18 outlook over The Republika Srpska, Bosnia and Herzegovina

1. SEECOF-20, MedCOF-11 Climate outlook for the 2019 winter season:

Temperature and Precipitation

According to the seasonal forecast, based on tercile ranks and climate classification ratings, thermal conditions over the Republika Srpska for winter 2019 had been described by the following categories: **no signal** over the entire Republika Srpska (the portion 1, left) except the southern where the normal and above conditions were forecasted by 40% probabilities both (the portion 2, left).

Precipitation forecast was as like 40% probabilities for normal and above normal conditions except Southern where the probability for wetter pattern was 50%.

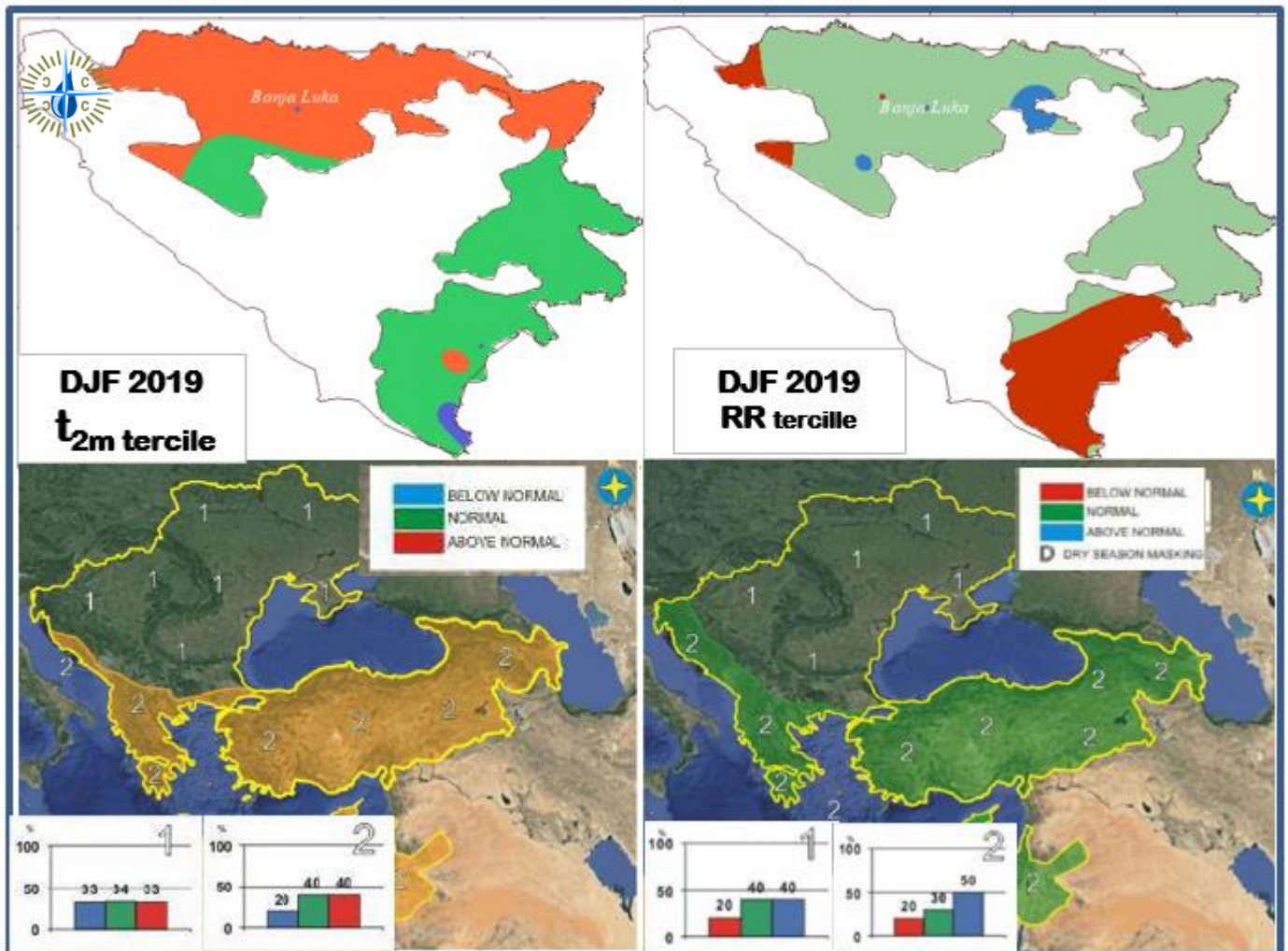


Figure1: Temp (left) and PRC tot (right) DJF18- Outlook (below) and observed values (above)

- ❖ The Republika Srpska (RS) registered warm to normal thermal conditions over the most of areas this winter, in average; extremely to very cold days occurred (< 0.02percentile) on 4-7th, 23-Feb over the South and mountains (Trebinye, Cxemerno) and 16-17Dec over the East (Bielyina); breaking the highest Tmax on February 28 (24.4°C Banja Luka); Southern during December and January below lower tercille
- ❖ dry to normal pattern with acumulated snow cover near normal; precip amount from 135mm (North) to 805mm (South)

1. Analysis of the 2019 Winter season

Air temperature: above values of upper tercile (north), normal over the rest of RS; below normal over the very southern; the coldest days: 07-jan with minus 13C of tmen (Tg) in average for RS, 23-feb, with minus 12C, 16-dec with minus 10C; on these days over the East, central and South, temperatures were in categoris extremely to very cold (including mountains areas). **Thermal conditions were warmer over the northern area, near normal over the rest of RS - except the south with colder pattern.**

Table 1. DJF-2019 t_{mean} statistics over RS (ref 1981-2010)

Station	t_{mean} 1981-2010	Percentille	DJF 2019	anomaly	lower tercille	upper tercille	median	tercille category
Бања Лука Bana Luka	1.5	0.78	2.9	1.4	0.6	2.2	1.3	above
Приједор Priedor	1.4	0.72	2.2	0.9	0.5	2.1	0.8	above
Нови Град NoviGrad	1.2	0.74	2.3	1.1	0.5	1.9	1.1	above
Добој Doboy	1.3	0.70	2.2	0.8	0.7	2.2	1.0	above
Бијељина Bijeljina	1.6	0.71	2.6	1.0	0.6	2.2	1.4	above
Соколац Sokolac	-2.4	0.54	-2.3	0.1	-3.0	-1.5	-2.8	normal
Билећа Bileca	3.9	0.28	3.2	-0.7	3.2	4.2	3.7	below
Гацко Gacko	-0.7	0.74	0.1	0.8	-1.2	-0.5	-0.9	above
Чемерно Sxeterno	-2.1	0.32	-2.7	0.7	-2.7	-1.5	-2.2	below
Требиње Trebine	6.2	0.38	5.8	1.0	5.7	6.6	6.2	normal
Дринић Drinic	-0.7	0.78	0.4	1.2	-1.3	-0.2	-0.9	above
Фоча Fosxa	0.7	0.61	1.1	0.4	0.3	1.1	0.5	normal
МркГрад MrkonicG	0.5	0.57	0.8	0.3	-0.2	1.0	0.3	normal

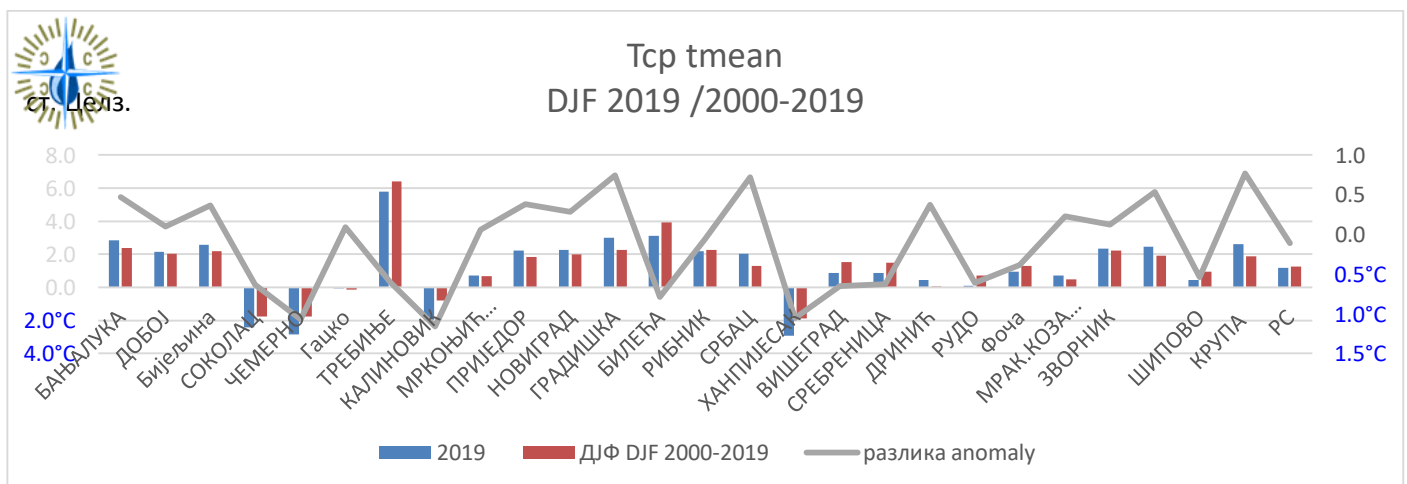


Figure 2: Spatial distribution of winter tmean over RS 2000-2019; anomalies vary from -1C (southern) to +0,8C (northern)

Mean air temperature, on seasonal scale of 30 years, averaged over RS, were in normal category for the 1981–2010 climatology. Anomalies range from -0,7 °C (Bileca) to 1,4°C (Banja Luka, regarding to strong foehn effect).

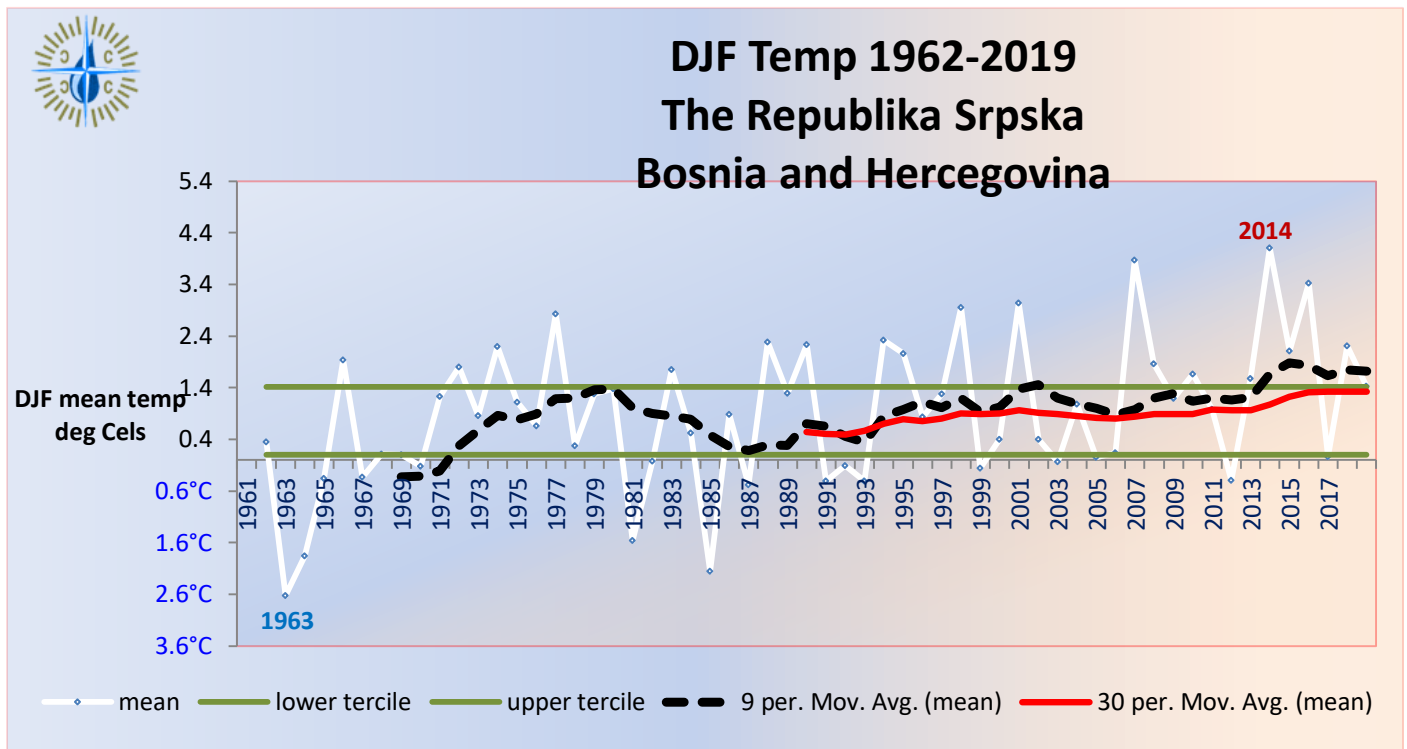


Figure 3: increasing trend of 30-yrs moving normal (red line) over RS inside normal range (inbetween lower and upper tercille categories 1981-2010)

December :

According to the 1981-2010 tercil-categories, the average air temperature is **about normal**, the Southern is mostly **below normal**. the hottest in RS was 1917 (4,1°C) and the coldest 1879. with -4.1°C. Regarding to 1951-2018 period, the warmest year of this month was 1959, coldest one 2001; tmean 2019 (tg, 7,14,21h) varied from -2,2C (Hanpijesak) to 6,1C Trebinje. The highest tmean ranged from 7, 9°C (HanPijesak) to 16, 7°C (Zvornik) and the lowest tmean from -1, 2C Trebinje to -16,3C Sokolac. The coldest days over Srpska in average, according to lowest Tmax (climate index TXN) were from 13-18 December when this element reched below 0.02 percentage over the Eastern and Central areas.

January: The most common type of weather for Srpska, according to the classification based on the percentile of 2001-2018: **normal** (0, 44 percentile based on 1951-2018) in the North of the Republic; **cold to very cold** in Central and southern areas; extremely cold Focxa. The lowest Tmax -8.8C, at the station Cxemerno, (4. January) and the highest , 15.4 degrees Celsius, Srbac station (17. Jan); the largest absolute oscillation (Tmin-Tmax) marks Sokolac station, 26 degrees . The number of days with Tmax below 0°C (ice-days) ranged from 1 Banja Luka, Gradiska, Srbac to 18 days in Kalinovik; Trebinje, Bileća with no ice days (Southern of Srpska has influence of mediterannean climate). The number of days with Tmax below - 5C: Cxemerno, HanPiesak 6, Kalinovik 5, Sokolac 3, Gacko and Drinic 1 day. Tmin: the hottest morning, with 7,4 degrees C was in Trebinje, 28 January 2019; the coldest morning -19.7C Sokolac. Frost days: from 15 in Trebinje to 31 Sokolac; the number of days with Tmin<-5C from 1 Trebine to 24 days in Sokolac; Tmin<-10C up to 11days in Sokolac (mountain areas over 800m)

February:

The Most common type of waether, according to the percentile classification: from cold/ normal (central and south) to warm in the North of the Republic; the average air temperature (Tg) ranged from

minus 1,7C (Chemerno) to plus 7,8 C (Trebinje). The hottest day was 02nd February; coldest day 23rd February. The moving normal Tg of 1990-2019, like the last thirty-year climatological normal period, is characterized by the fact that the average positive deviation of Tg from the period of the population of 1950-2018 does not exceed the average negative deviation, which means that the drivers that lead to colder Februaries are balanced with the effects that lead to warmer Februaries. The linear trend of the individual years over the period 1951-2018 is an increasing from which the opposite conclusion is drawn for the last thirty-year normal.

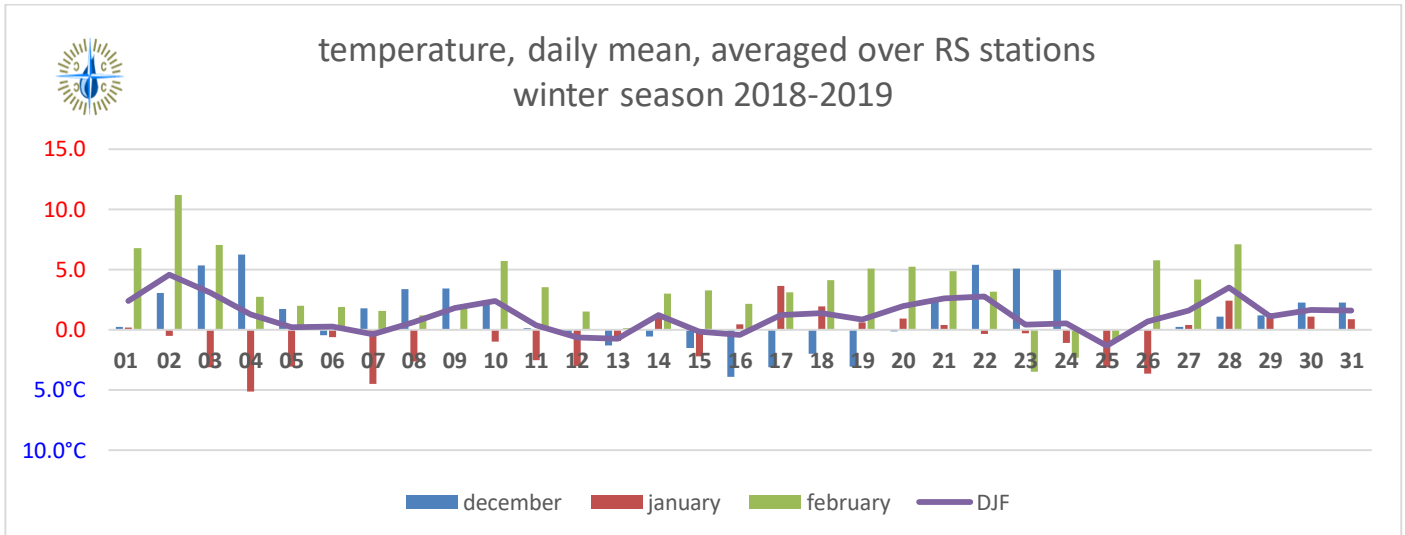
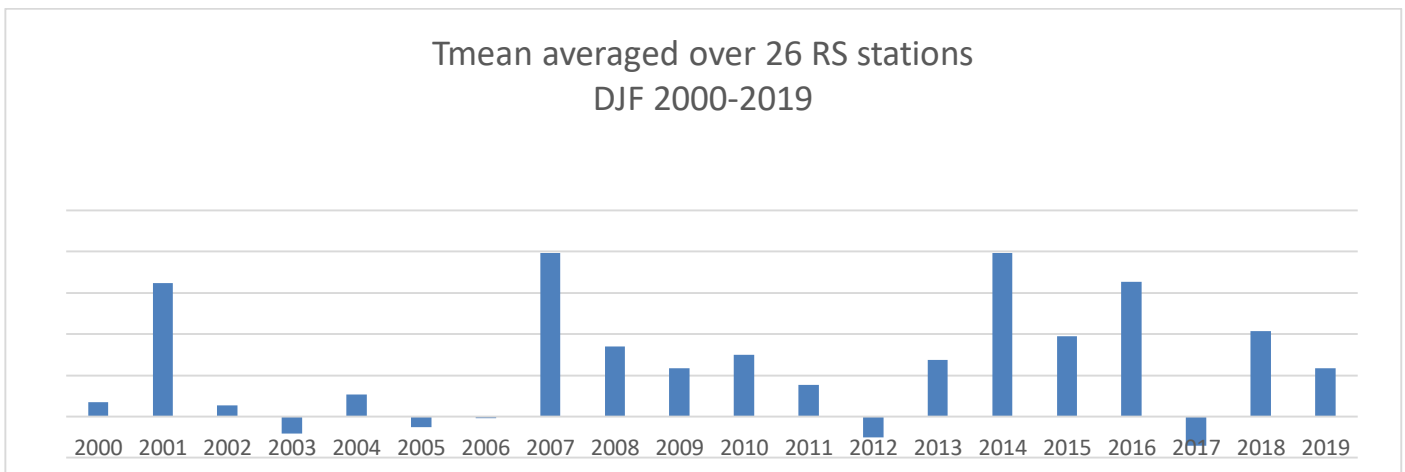


Figure 4: Daily resolution of Tg over RS for the winter 2019; according to mean temperature, (TG) the coldest days of January 4th, 7th, 26th ...the hottest ones on February 02nd, 28th, 3rd ... According to Tmax on 28 Feb, Banyaluka was among the hottest places over Europa.



February is the winter month of most braking record of lowest temperature (Tg, TX) over the 1951-2019 (8 from 12 years with extremely to very cold temperatures vs 6 of extremely to very warm) that belong to period of the 1981 up to the now.

Warmest climatological winter season over the period 2000-2019: 2007 and 2014, 2001 and 2016...Coldest ones: 2017, 2012, 2003...

Precipitation

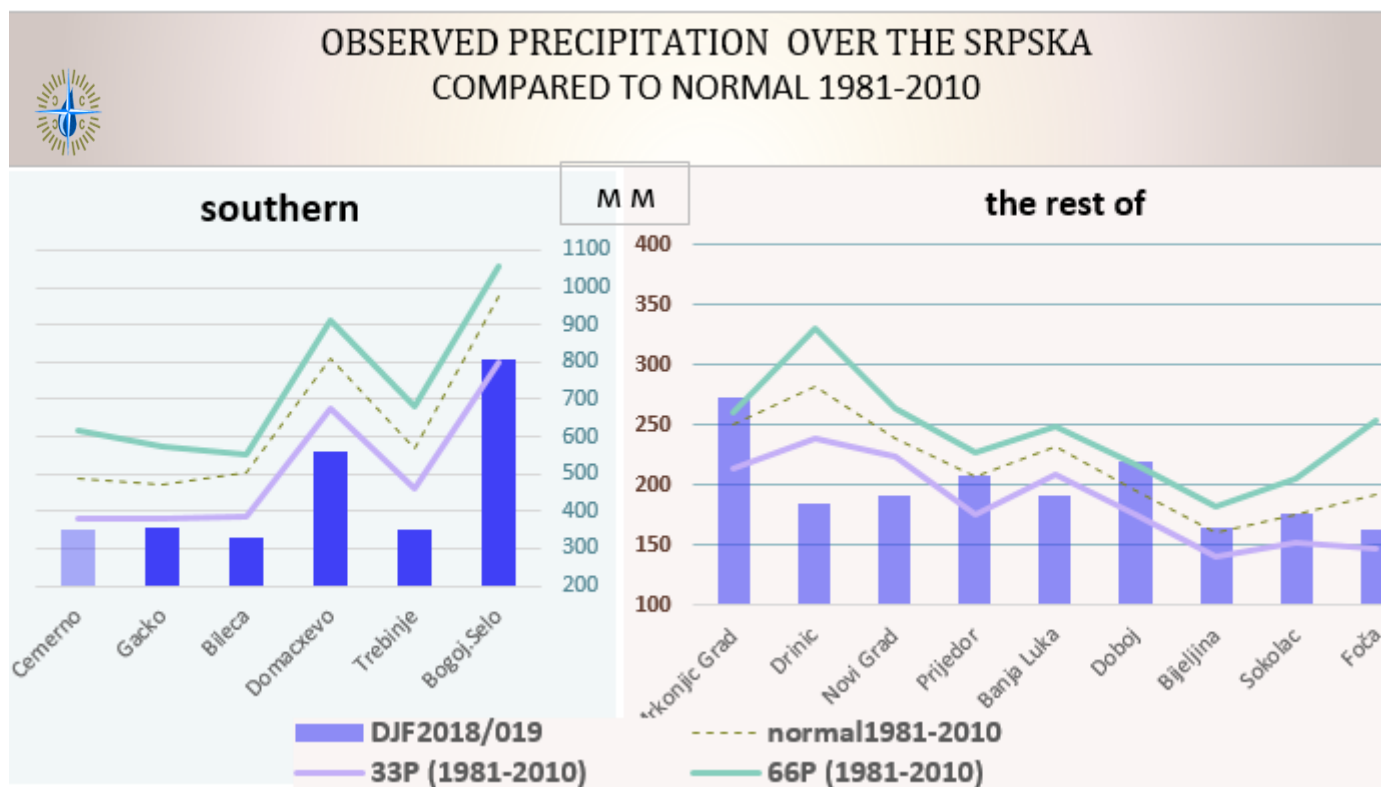


Fig 5: DJF precip 2018-2019 compared to normal 1981-2010 over RS stations

Table 2. DJF-2019 precipitation statistics over RS (ref 1981-2010); from dry to normal according to percentiles, below to above according to tercille categories

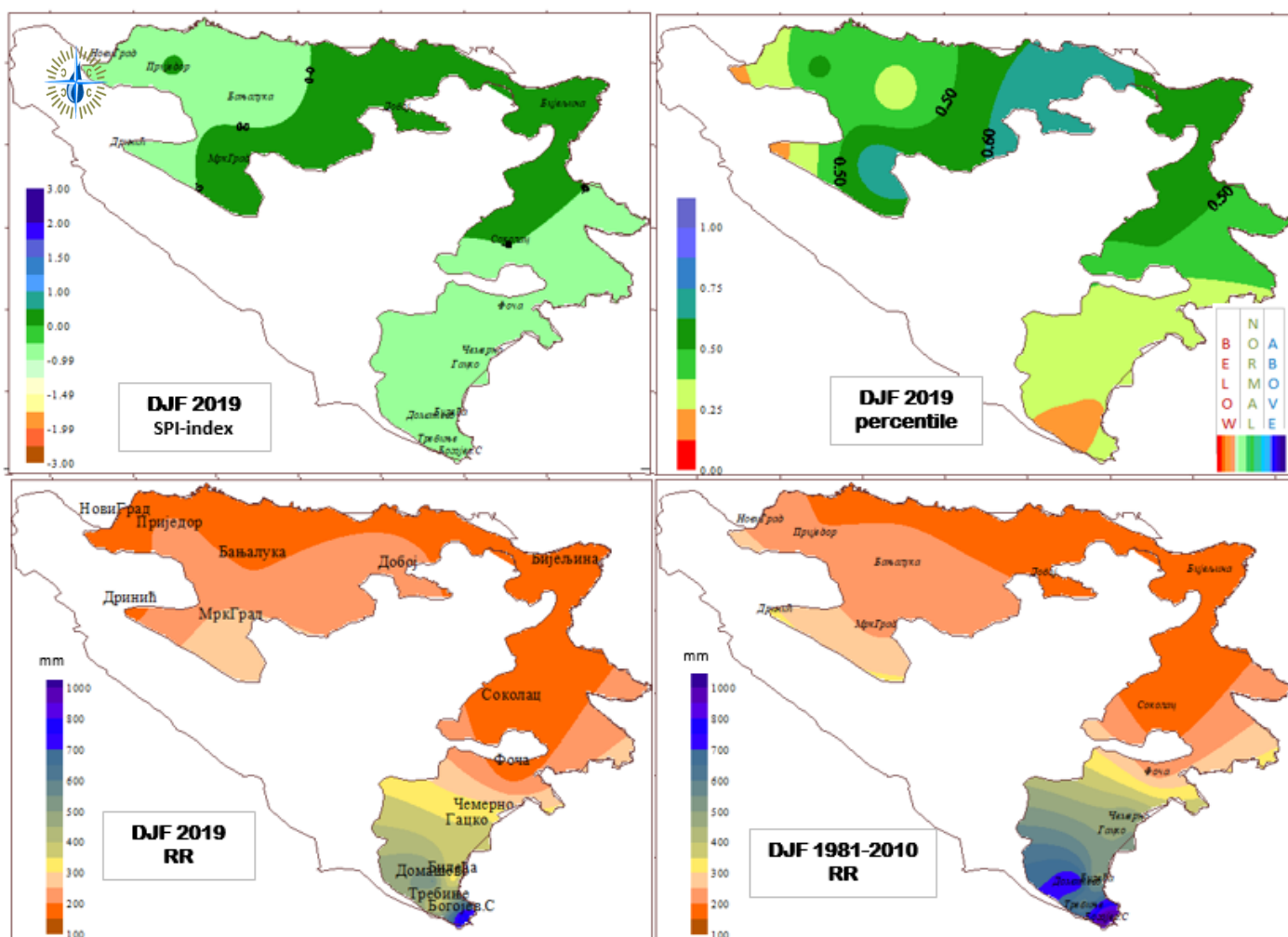
Station	djf1981 - 2010	NORMSDIST (z) (percentile)	djf 2019 (mm)	% djf 2019 (ref1981-2010)	suf/def %	lower tercille	upper tercille	median	tercille category
Бања Лука Bana Luka	224	0.67	256	114	14.3	209	250	232	above
Приједор Priedor	203	0.53	208	102	2	175	228	208	normal
Нови Град NoviGrad	236	0.30	191	81	-19	224	264	239	below
Добој Doboј	190	0.68	217	114	14	175	217	195	above
Бијељина Bijeljina	160	0.53	164	103	3	140	182	161	normal
Соколац Sokolac	175	0.51	177	101	1	150	207	179	normal
Билећа Bileca	477	0.23	327	69	-31	384	550	502	below
Гацко Gacko	486	0.29	357	74	-26	381	573	472	below
Чемерно Sxeterno	493	0.25	349	71	-29	381	615	488	below
Требиње Trebinje	563	0.18	352	62	-38	460	681	568	below
Дринић Drinic	302	0.16	184	61	-39	239	331	282	below
Фоча Focxa	217	0.37	184	84	-16	148	254	193	normal
Богојевић Село	1010	0.34	806	80	-20	801	1052	976	normal

Precipitation regime during the cold part of the year (october-march) much differs over the Southern, more than twice, in percentage, compared to the rest of RS (73% Southern, 27% the rest of RS-precip total).

December: The amount of precipitation for this month was 41mm in Zvornik to 132 mm in Gatsko, (213mm very southern) daily max ranged from 12mm (Gradishka) to 48 mm (Gatsko); Yksxici Lyubomir observed 80mm as daily max of rainfall (very southern).

January: The amount of precipitation for this month ranged from 40,4 (Gradishka) to 146, 7 mm (Rybnik); Bogoyevic Selo 249mm; daily maximum of precipitation from 6,7 mm (Visegrad) to 37,3mm (Prijeedor); 69mm Ygarci Cxvarici.

February: Precipitation amount ranged from 20mm (Northern) to 343mm (Southern); the highest daily rainfall: Trebinje 66 mm 4. day of February; Bogoyevic Selo 113mm (Feb- 2nd). The number of days with precipitation ranged from 3 to 16, whereas amounts exceeding 20 mm were recorded in Cxemerno 3days. Compared to last moving normal 1989-2018 these precipitation belong to the category of dry Banjaluka to normal (a bit more humid) Hanpijesak (central area). The standardized precipitation index ranged from -1,28 Banja Luka to 0,62 HanPiesak. Deficit of precipitation -75.6% Drinic a suficit to 30.3% in HanPiesak (percentiles 0.10 and 0.73 respectively).



**Rep.SRPSKA PRECIPITATION
2019/18**

Figure 6: SPI-index, Percentile ranks, precip mean based on 1981-2010period and precip 2019 over the RS stations for the climatological winter season (DJF)

Real precipitation in RS does not follow normalised distribution, so sometime classification according to percentile/tercille (standardized value ie SPI → NORMSdist) is different from real Percentile Rank towards empiric distribution.

2. High impact events:

-- According to 6 months SPI6-index, over most of RS occurred long lasting drought, slight to moderate, from sep2018 – feb2019

2.Verification of the SEECOF-20 & MedCOF-11 climate outlook for the 2019 winter

Country	Seasonal temperature (DJF)		Seasonal precipitation (DJF)	
	Observed	SEECOF20, MedCOF-11 climate outlook	Observed	SEECOF20, MedCOF-11 climate outlook
The Republika Srpska - Bosnia and Herzegovina	<i>above (warmer) over the northern area, near normal over the rest of RS - except the southern with colder pattern (below).</i>	no signal over the entire Republika except the southern where the normal and above conditions were predicted with 40% probabilities both	Below normal (dry) over the southern, Normal to above (slightly wetter) over the rest of.	40% probabilities for normal and above normal conditions except Southern where the probability for wetter pattern was 50%.

The outlook for DJF 2019 for both elements, mean temperature and precipitation had been partially correct for the most of area except the Southern where happened opposite.