

Republic Hydrometeorological Service of Serbia

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EMERGENCY CLIMATOLOGICAL BULLETIN OF DAILY PRECIPITATION

1-23 MARCH 2016

Belgrade, 23 March 2016

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Department of National Center for Climate Change, Climate Model Development
and Disaster Risk Assessment

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Record-breaking March daily precipitation sums at Zlatibor, Pozega and Sjenica on March 7, 2016

Synoptic situation

The period from 1 to 4 May was characterized by prevalence of the cyclone circulation formed in the Genoa Bay. Its center and accompanying frontal zone emanating from Tyrrhenian Sea transferred across the southern of Apennine toward south of the Balkan Peninsula. This synoptic situation caused cloudy weather, with scattered rain and showers across most of Serbia. Most precipitation was recorded in western and southwestern Serbia.

The deepening of the cyclone took place on March 22, developed at all attitudes with slow transfer of its center from southern Apennine toward southern Balkans with backwashing of warm front across central parts of the Balkans. Following the synoptic situation, the weather in Serbia was cloudy accompanied by rain, on the mountains with wet snow, in southern areas with showers and thunderstorms. Moderate and strong wind, mostly easterly, in the lower Podunavlje and southern Banat, occasionally with stormy gusts.

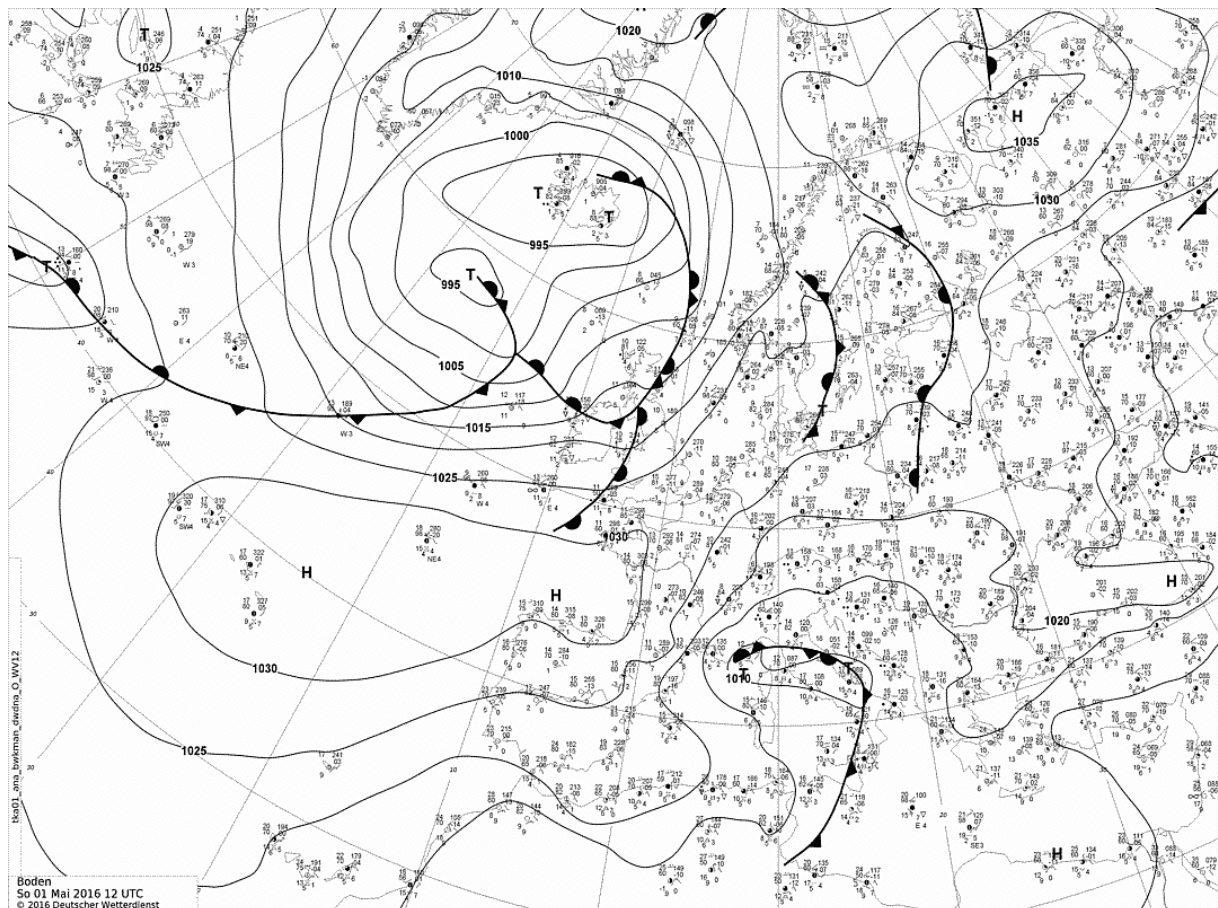


Figure 1a. Synoptic situation for 1 May 12:00 UTC (formation of the Genoa cyclone)

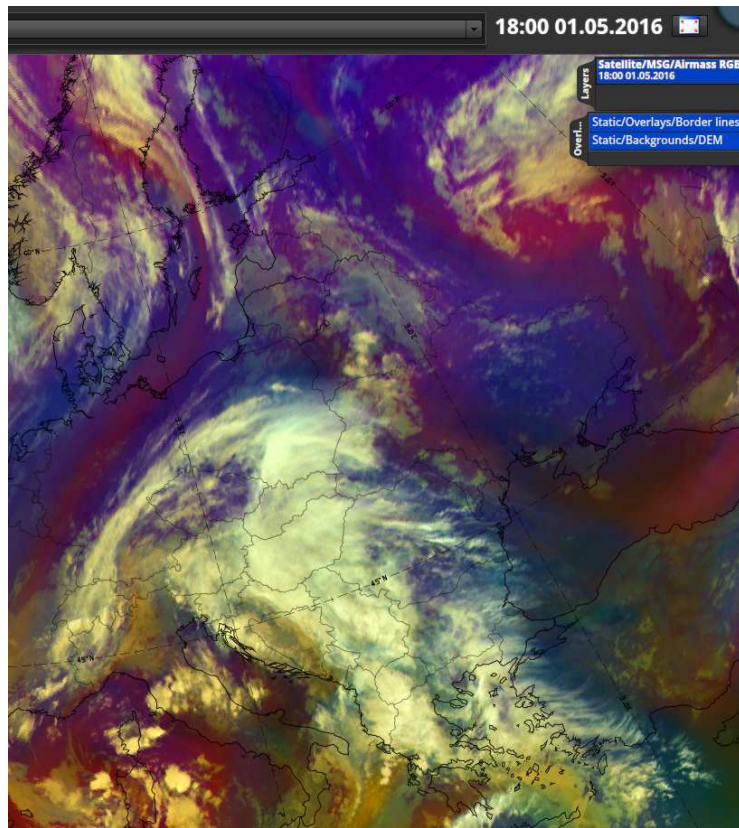


Figure 2a. Satellite image for 1 May 18:00 UTC

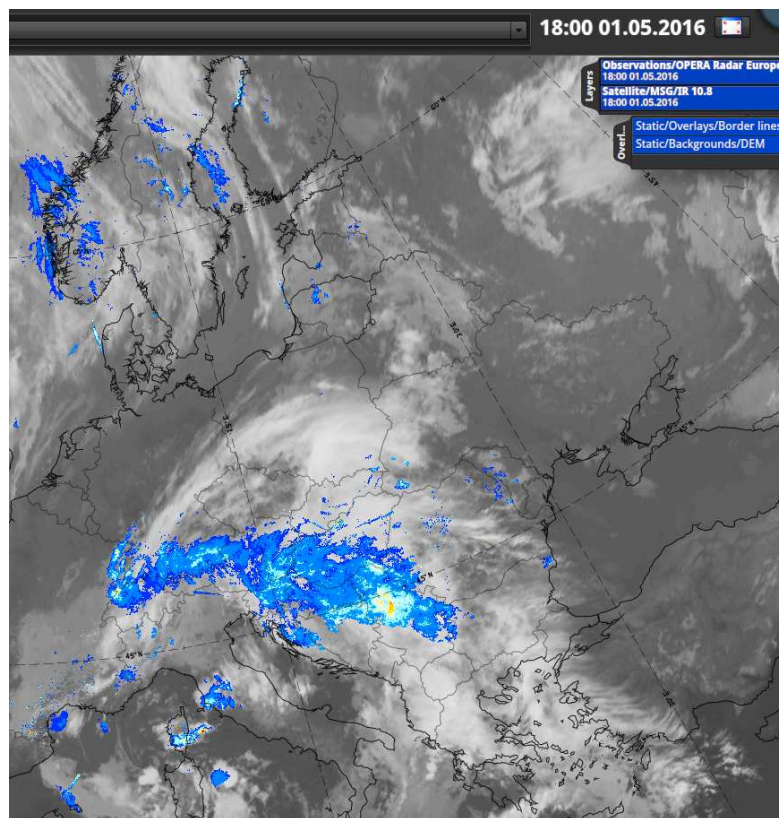


Figure 3a. Radar image for 1 May 18:00 UTC

CLIMATOLOGICAL ANALYSIS OF PRECIPITATION

Changes in the intensity and frequency of the occurrence of climate extremes were registered as a result of global climate change.

Certain extreme weather and climate events have occurred more frequently in recent decades, and the situation in Serbia proved to be very sensitive to natural disasters, floods, landslides, forest fires, droughts, heat waves both throughout history and nowadays.

Over the course of the last 32 years in Europe, 325 floods took place at large rivers, out of which 200 floods occurred in the last 12 years. Significant floods in Serbia were recorded in 1980, 1981, 1988, 1999, 2002, 2005, 2006, 2009 and 2014. Climate indices related to the extreme precipitation episodes show positive trends for the 1961-2015 period at most places in Serbia.

Projections of the maximum annual precipitation totals obtained from 6 regional climate models, indicate increase of the precipitation intensity along with the increased variability of the precipitation in early summer months, as well as significant increase of the maximum annual runoffs in the catchment of the River Kolubara for the 2001-2030 and 2071-2100 period relative to the 1961-1990 period.

The wettest year on record for Serbia is 2014. Maximum annual precipitation sums were exceeded at 12 main meteorological stations. In May 2014, three-day precipitation sums in Podrina-Kolubara region, Macva and Tamnava exceeded 1000-annual three-day sums.

Table 1. Precipitation sums expressed in mm, average values of the monthly precipitations sums in March for the 1981-2010 base period and percent of precipitation occurrence for 1 – 23 March

station/district	1 Mar.	2 Mar.	4 Mar.	5 Mar.	7 Mar.	8 Mar.	10 Mar.	11 Mar.	12 Mar.	13 Mar.	14 Mar.	15 Mar.	16 Mar.	17 Mar.	22 Mar.	23 Mar.	sum (mm)	Mar. sums	%
Zlatibor / Zlatibor	12.6	18	2.7		80.3		4.8	21.1	1.9	8.7	10.9	5.6			5.4	19.3	191.3	73.4	261
Pozega / Zlatibor	7.7	9.5	0.3		76.6		1.3	14.7	5.5	3.9	1.6	0.6			7.9	17.0	146.6	45.8	320
Sjenica / Zlatibor	12.4	1.2	0.9		71.4	0.1	1.2	19.2	1.1	3.7	0.8	0.8	0	0	2.9	4.9	120.6	46.1	262
Kopaonik / Rasina	13.6		4.4	0	16.7	42.1	6.1	26.3	1.1	8.8	7.7	0.4	0.1	0.1	10.1	2	139.5	74.9	186
Kraljevo / Raska	4.7	3.6	0.4		37.5	3.9	6	18.9	2.6	5	5.7	0.3			9.6	14.9	113.1	52.9	214
Sm.Palanka / Podunavlje	8	11.9	5.7	0.7	34.2	1.9	3.9	11.3	5.5			0.7			11.2	14.9	109.9	43.6	252
Loznica / Macva	16.4	0.5	6		3.6	7.7	0.4	13.5	18.1		1.6	0	0		21	30.9	119.7	65.7	182
Kaona/ Moravica	4.8	4.6			54.6	0.4	8.2	34.4	3.2	11	15.6		2			23	161.8	82.2	197
Tutin / Raska	12		1.5		51	39	7	35	1.2	10.5	15.3	3.7	0.3		0.5	0.6	177.6	47.2	376
Novi Pazar / Raska	10.5		0.8		29.1	45.4	3.4	25.6	1.2	11.2	5.1	0.5			2.6	0.6	136	44.4	306
Brus / Rasina	6.7		0.6		5.7	12.7	10	36.5	4	12.5	26.5				2.6	4.2	122	40.5	301
Blazevo / Rasina	15.1		0.6	0.1	6.1	28.7	6.1	29.2	0.7	12.6	17.4		0		8.7	3.4	128.7	61.6	209

*omitted are days without precipitation

Registered precipitation sums per day in the period from 7 to 23 March

7 March – the highest precipitation totals observed. Precipitation sums measured from 7 UTC on March 6 to 7 UTC on March 7, 2016 surpassed the average March precipitation sums. Precipitation sums recorded at these stations rank as the highest daily precipitation sums on record in March.

- Zlatibor received 80.3mm of precipitation, the previous daily record of 56.7mm was observed on March 6, 2015
- Pozega received 76.6mm of precipitation, the previous daily record of 46.0mm was observed on March 29, 1927
- Sjenica received 71.4mm of precipitation, the previous daily record of 42.1mm was observed on March 15, 2013

The highest totals at the precipitation and climatological stations were observed at the following stations: Segmenjevo (Zlatibor District - 92.0 mm), Sljivovica (Zlatibor District – 87.5 mm), Bjelusa (Zlatibor District – 87.0 mm), Negbina (Zlatibor District -78,5 mm), Gornji Banjani (Moravica District -74.1 mm), Skrzuti (Zlatibor District – 73.5 mm), Nova Varos (Zlatibor District – 72.0 mm), Preljina (Moravica District - 71,0 mm), Ponorac (Zlatibor District - 70,5 mm), RS Sjenica (Zlatibor District - 70,2 mm).

Precipitation of March 7 had a 35-year return period in Pozega, 25-year at Zlatibor, and 100-year return period in Sjenica, and on the precipitation stations, 20-year in Negbina, 200-year in Segmenjevo and 50-year return period in Bjelusa (on the basis of Gumbel distribution).

8 March – less precipitation compared to the previous day. The highest precipitation sums at the main meteorological stations were recorded at Kopaonik - 42,1 mm, Kursulija - 24,6 mm, Vranje - 24,2 mm.

The highest precipitation totals at precipitation and climatological stations were recorded at: Lopuznje (Raska District – 47.2 mm), Novi Pazar (Raska District – 45.4 mm), Tutin (Raska District – 39.0 mm), Kriva Reka (Rasina District – 37.0 mm), Vranovina (Raska District – 36.8 mm), Josanicka banja (Raska District - 35.5 mm).

9 March – any notable precipitation sums were not observed

10 March – The highest precipitation sums at the main meteorological stations were recorded in: Negotin – 15.8 mm, at Crni Vrh -12.6 mm, and Dimitrovgrad – 9.7 mm.

The highest precipitation totals at precipitation and climatological stations were recorded in Popovica (Bor District – 21.7 mm), Mihajlovac (Bor District -18.8 mm), and Jabukovac (Bor District -18.5 mm).

11 March – entire country observed **slightly more precipitation compared to the previous day.** The highest precipitation sums at the main meteorological stations were recorded at Kopaonik - 26,3 mm, Zlatibor 21,1 mm, and Kursumlija -19,4 mm.

The highest precipitation totals at precipitation and climatological stations were recorded in Stava (Toplica District – 46.8 mm), Osonica (Zlatibor District – 44.0 mm), Kriva Reka (Rasina District – 39.0 mm), and Kamenica (Rasina District – 37.8 mm).

12 March – less precipitation compared to the previous day. The highest precipitation sums at the main meteorological stations were recorded in Loznica -18,1 mm, Zrenjanin - 11,4 mm, Valjevo - 6,3 mm;

The highest precipitation totals at precipitation and climatological stations were recorded in Dvroska (Macva District – 17.0 mm), Krupanj (Macva District – 15.0 mm), Zavlaka (Macva District – 14.6 mm).

13 March – less precipitation compared to the previous day. The highest precipitation sums at the main meteorological stations were recorded in Kursumlija – 10.9 mm, Kopaonik – 8.8 mm, Zlatibor – 8.7 mm.

The highest precipitation totals at precipitation and climatological stations were recorded in Lukovo (Toplica District – 21.8 mm), Trnovci (Rasina District – 15.0 mm), Kovilj (South Banat District – 14.5 mm).

14 March – precipitation sums similar to yesterday. The highest precipitation sums at the main meteorological stations were recorded in Kursumlija – 17.7 mm, Zlatibor – 10.9 mm, Leskovac – 9.0 mm.

The highest precipitation totals at precipitation and climatological stations were recorded in Stava (Toplica District – 34.2 mm), Lukovo (Toplica District – 27.9 mm), Borince (Jablanica District – 26.7 mm), Brus (Rasina District – 26.5 mm).

15 March – small precipitation totals. The highest precipitation sums at the main meteorological stations were recorded at Zlatibor of 5.6 mm. Precipitation sums below 1mm were observed at several more main meteorological stations.

The highest precipitation totals at precipitation and climatological stations were recorded in Negbina (Zlatibor District – 9.5 mm), Vrmbaje (Moravica District – 7.2 mm), Bjelusa (Zlatibor District – 6.5 mm).

16 March – slight precipitation. The highest precipitation sums at main meteorological stations were observed on Palic - 2.8 mm and Sombor - 2.1 mm. Precipitation sums below 1 mm were observed at several more main meteorological stations.

The highest precipitation sums at precipitation and climatological stations were observed in Kovilj (South Banat District) and Horgos (North Banat District) of 3.2 mm.

17 March – any notable precipitation sums were not observed

18 – 21 March – no precipitation was observed

22 March – precipitation observed across the entire country. The highest precipitation sums at the main meteorological stations were measured in Loznica – 21.0 mm, Palic-12.6 mm, Smederevska Palanka and Valjevo -11.2 mm.

The highest sums at the precipitation and climatological stations were observed in Sinosevic (Macva District - 31.0 mm), Varna (Macva District) and Lesnica (Macva District - 27.5 mm), Predvorica (Macva District - 27.0 mm).

23 March – more precipitation compared to the previous day. The highest precipitation totals at the main meteorological stations were observed in Loznica - 30.9 mm, Zajecar - 26.1 mm, Cuprija- 21.9 mm, Kragujevac -21.3 mm and Valjevo - 20.2 mm.

The highest precipitation sums at the precipitation and climatological stations were observed in Sinosevic (Macva District - 36.0 mm), Grosnica (Sumadija District - 30.0 mm), Banja Koviljaca (Macva District - 29.8 mm), Lipolist (Macva District - 29.0 mm).

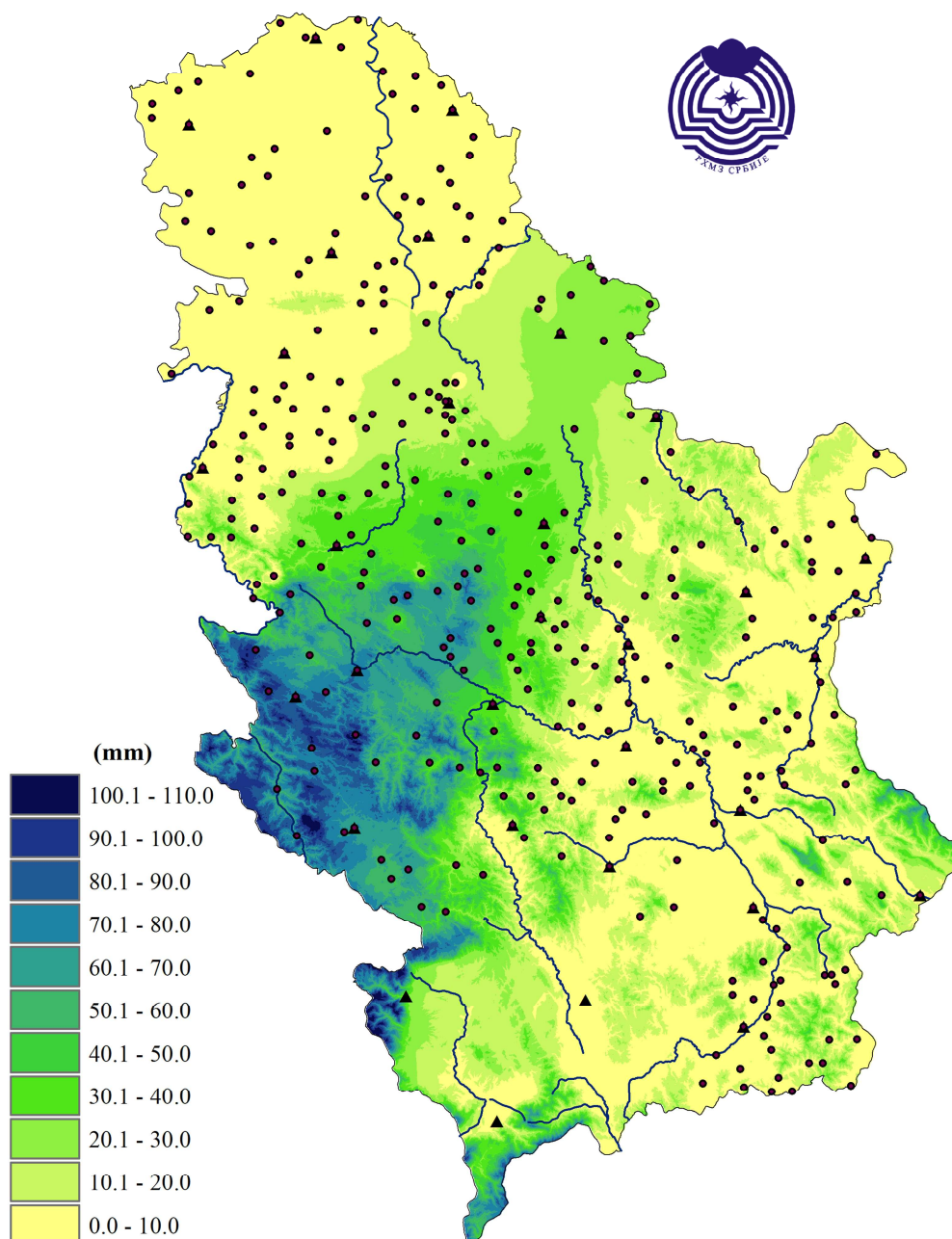


Figure 1. Precipitation sums in Serbia measured on March 7, 2016 (precipitation from 7 UTC 06/03 to 7 UTC 07/03/2016) at 363 meteorological stations where precipitation is measured (28 main meteorological stations, 49 climatological and 286 precipitation stations)

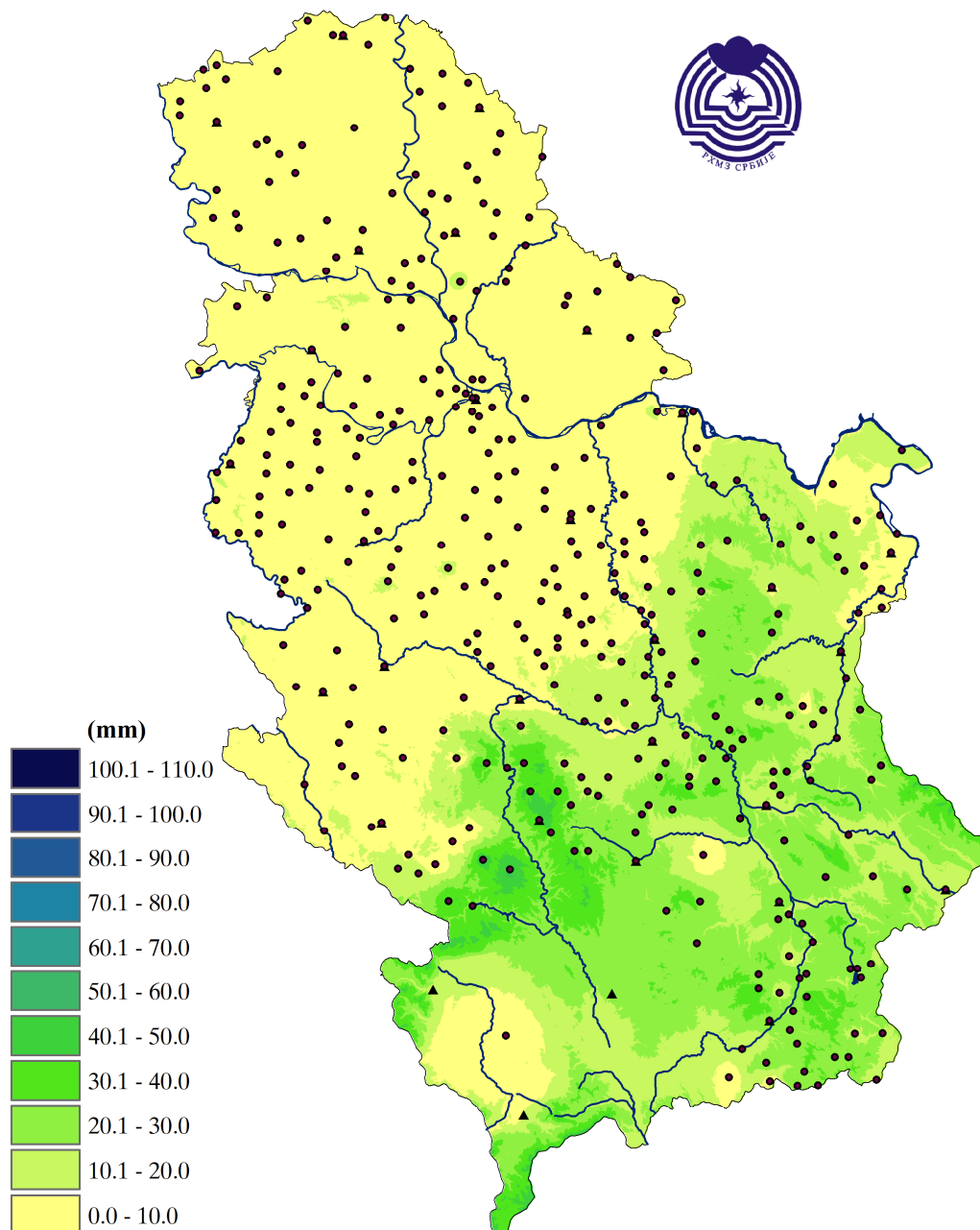


Figure 2. Precipitation sums in Serbia measured on March 8, 2016 (precipitation from 7 UTC 07/03 to 7 UTC 8/03/2016) at 363 meteorological stations where precipitation is measured (28 main meteorological stations, 49 climatological and 286 precipitation stations)

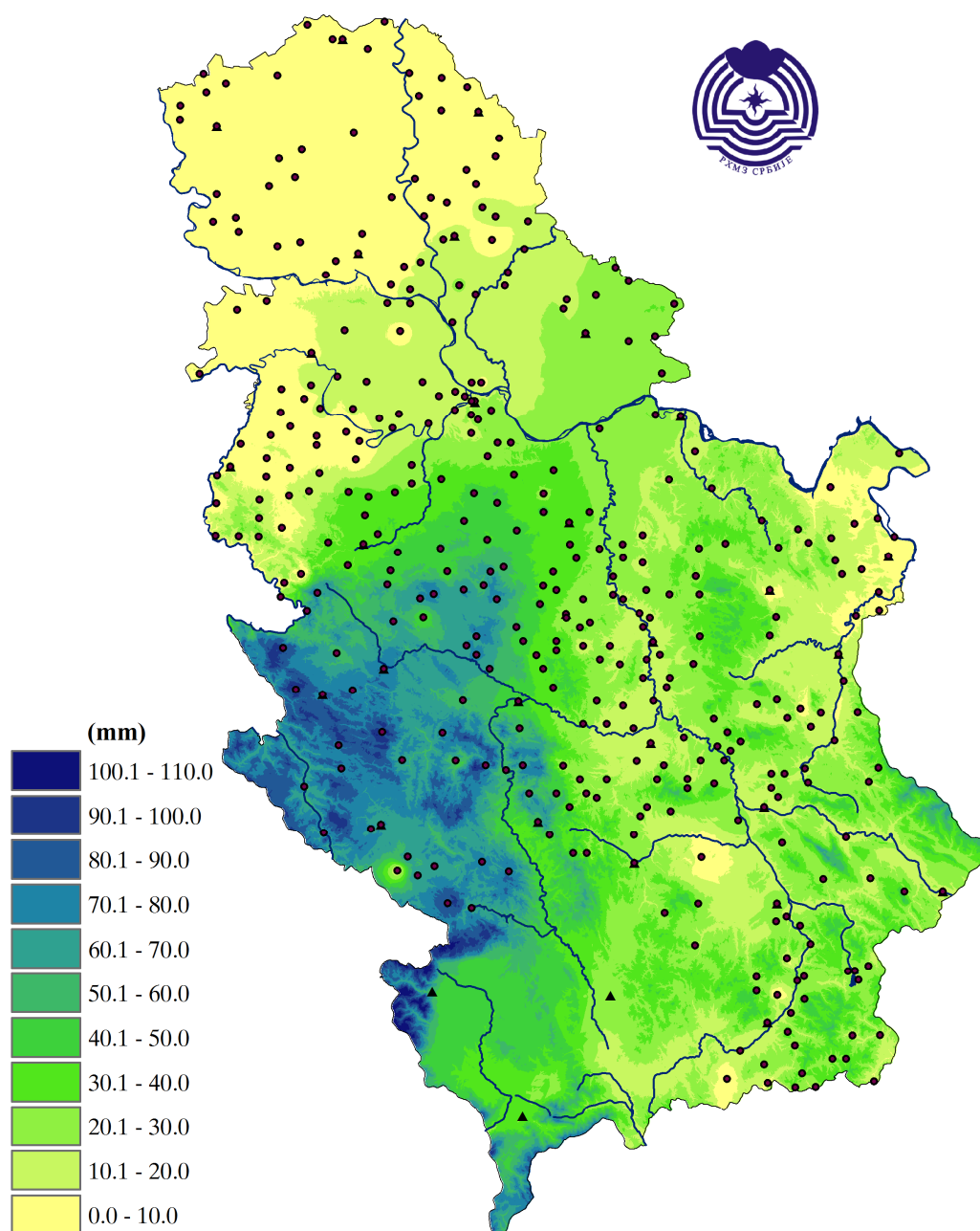


Figure 3. Precipitation episode in Serbia for 7 and 8 March 2016 (precipitation from 7 UTC 06/03 to 7 UTC 08/03/2016) at 363 meteorological stations where precipitation is measured (28 main meteorological stations, 49 climatological and 286 precipitation stations)

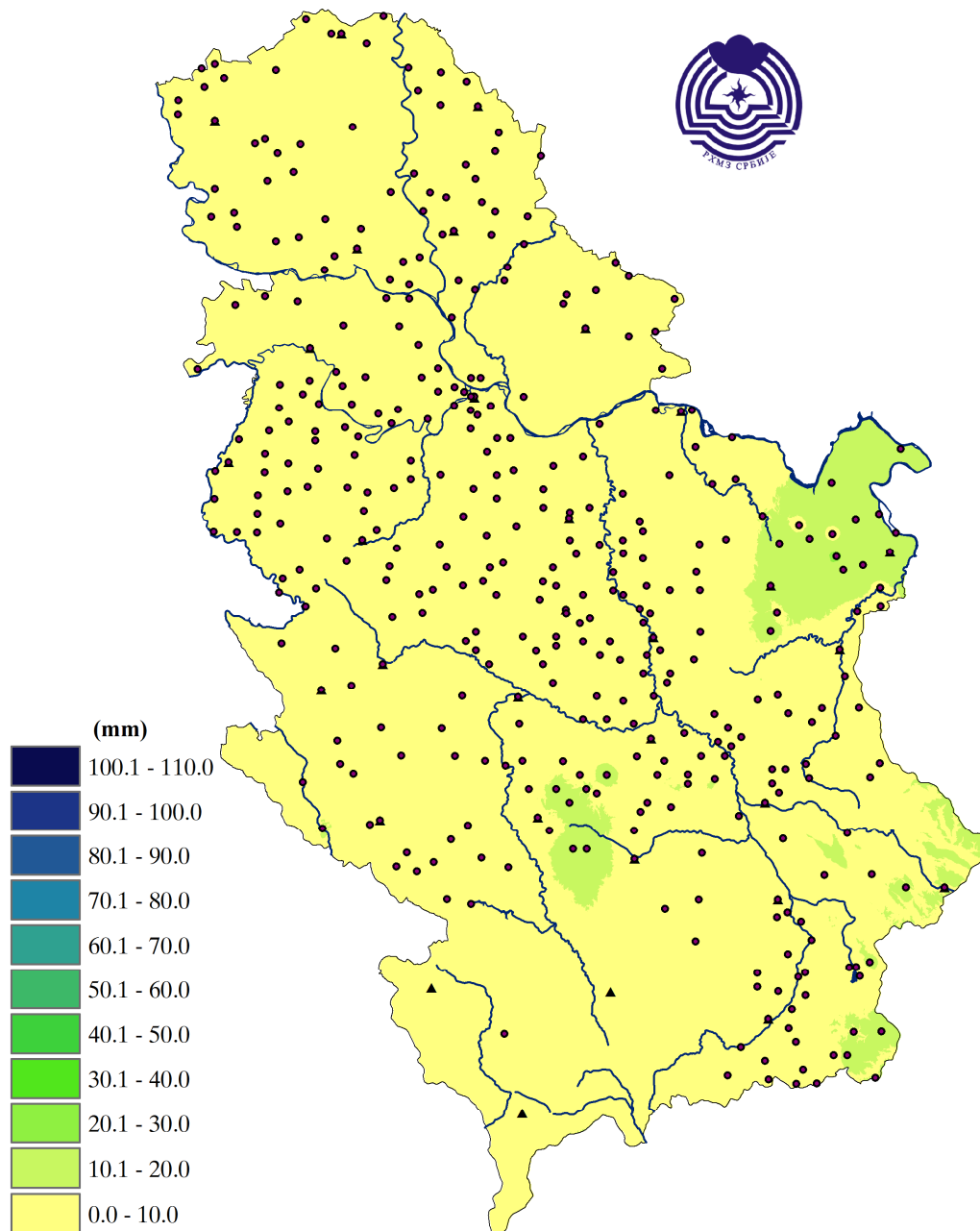


Figure 4. Precipitation sums in Serbia measured on March 10, 2016 (precipitation from 7 UTC 09/03 to 7 UTC 10/03/2016) at 363 meteorological stations where precipitation is measured (28 main meteorological stations, 49 climatological and 286 precipitation stations)

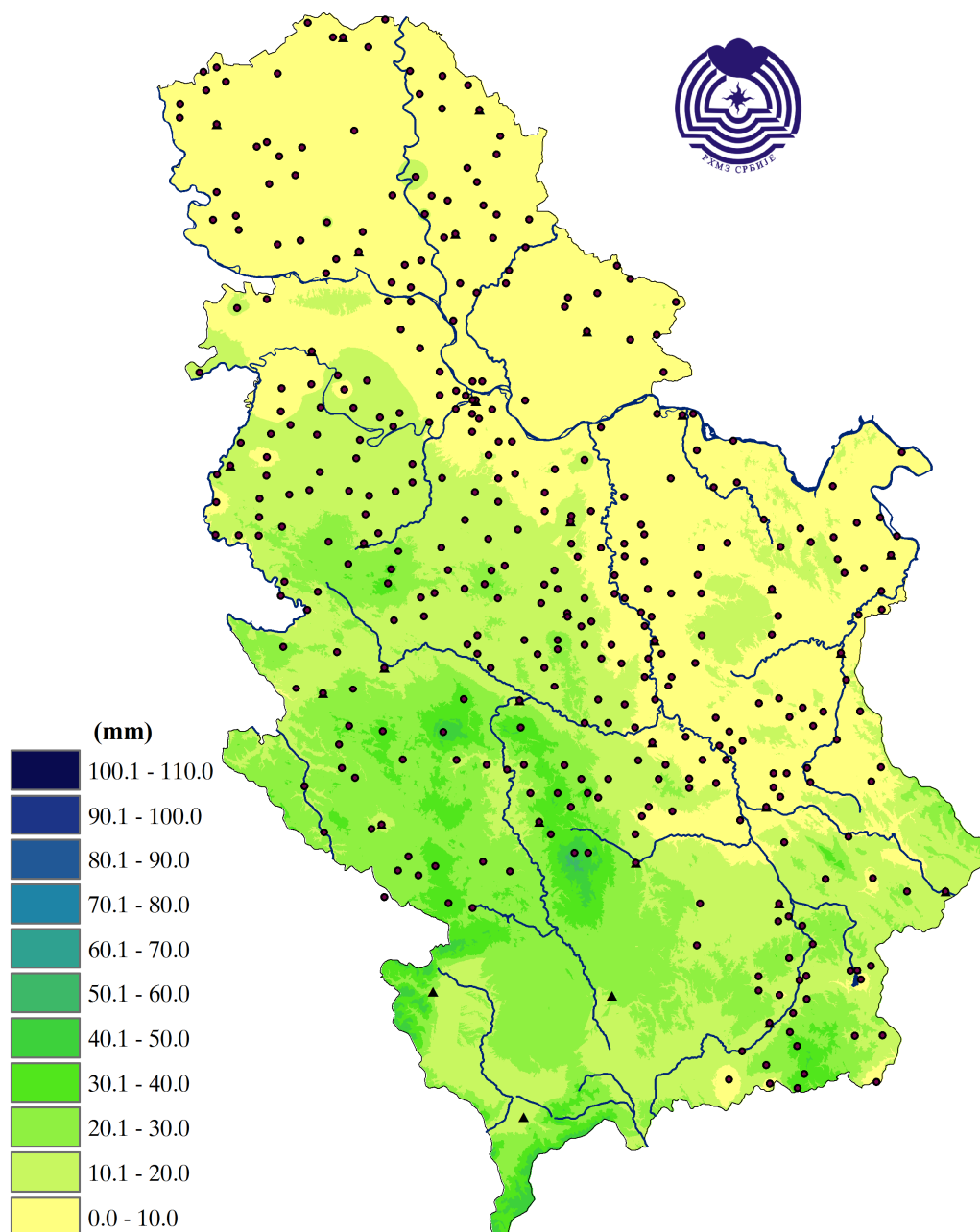


Figure 5. Precipitation sums in Serbia measured on March 11, 2016 (precipitation from 7 UTC 10/03 to 7 UTC 11/03/2016) at 363 meteorological stations where precipitation is measured (28 main meteorological stations, 49 climatological and 286 precipitation stations)

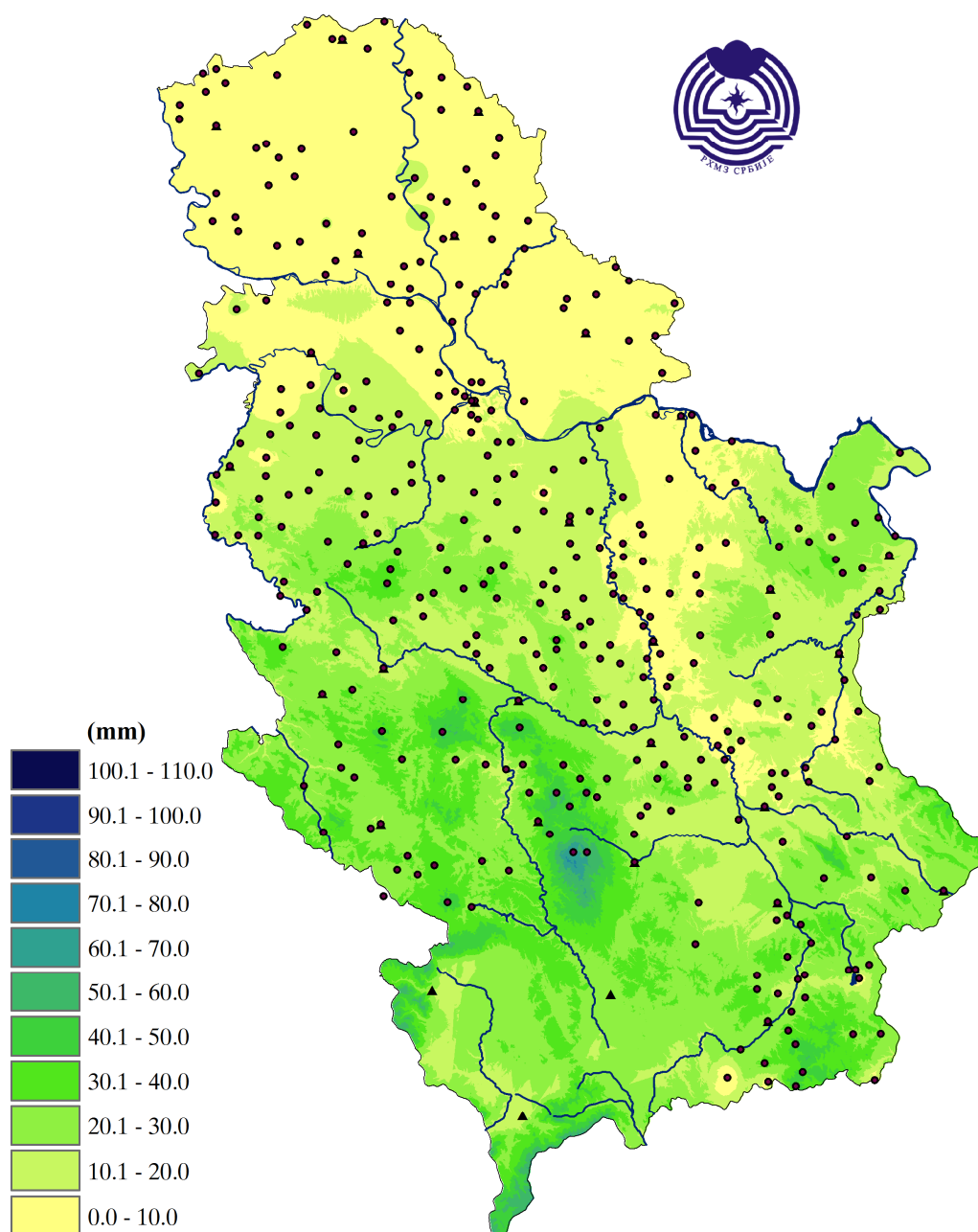


Figure 6. Precipitation episode in Serbia for 10 and 11 March 2016 (precipitation from 7 UTC 09/03 to 7 UTC 11/03/2016) at 363 meteorological stations where precipitation is measured (28 main meteorological stations, 49 climatological and 286 precipitation stations)

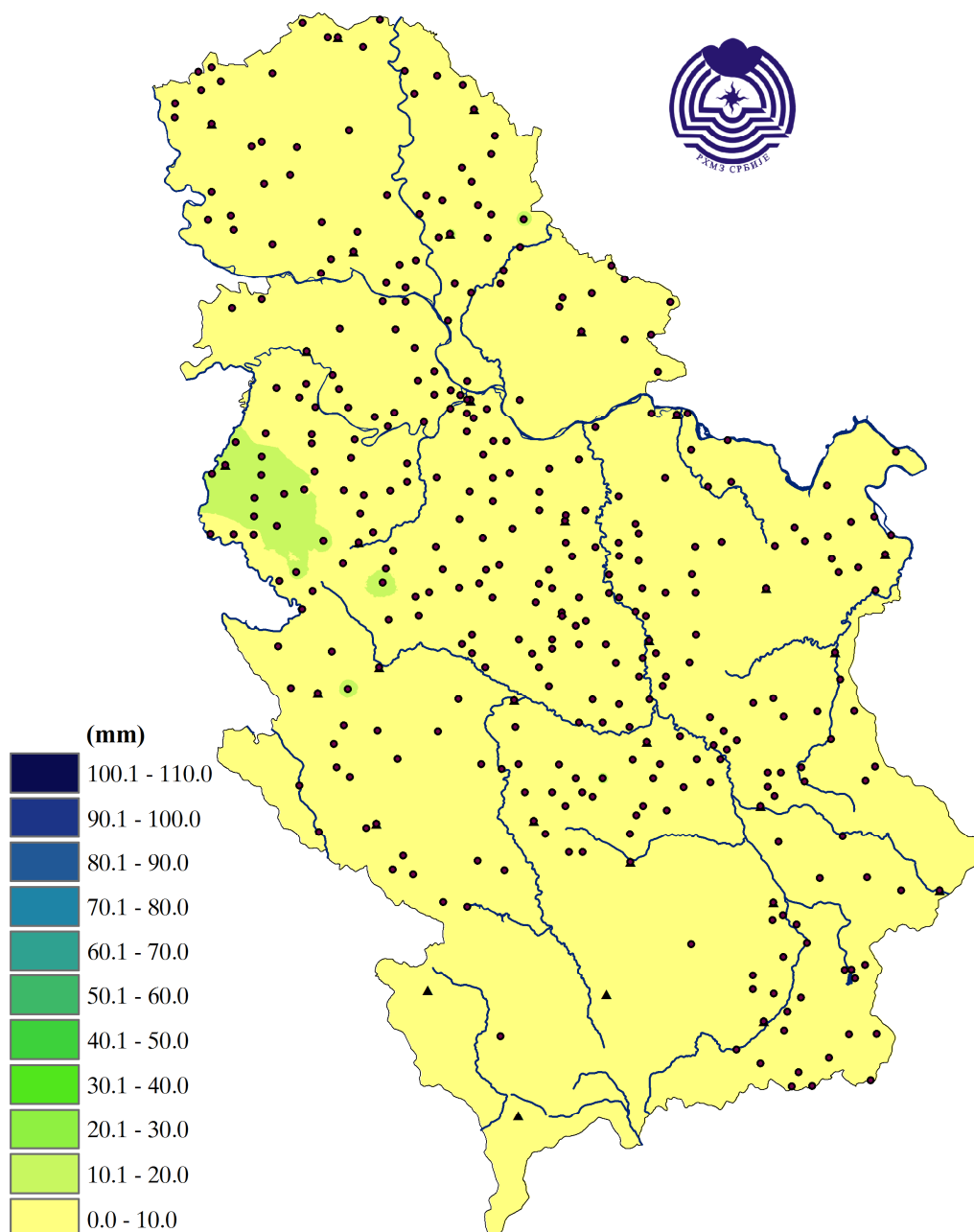


Figure 7. Precipitation sums in Serbia measured on 12 March 2016 (precipitation from 7 UTC 11/03 to 7 UTC 12/03/2016) at 363 meteorological stations where precipitation is measured (28 main meteorological stations, 49 climatological and 286 precipitation stations)

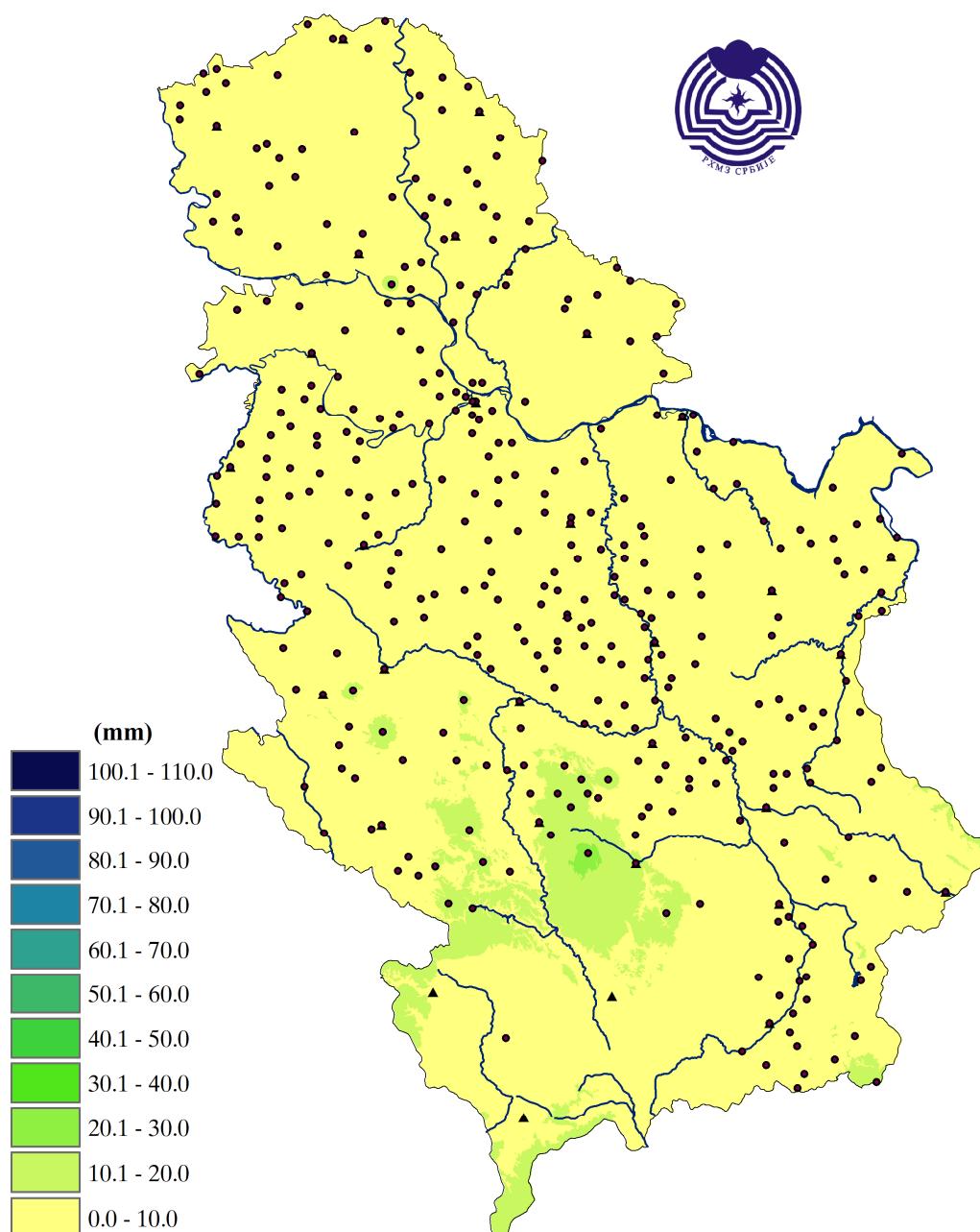


Figure 8. Precipitation sums in Serbia measured on 13 March 2016 (precipitation from 7 UTC 12/03 to 7 UTC 13/03/2016) at 363 meteorological stations where precipitation is measured (28 main meteorological stations, 49 climatological and 286 precipitation stations)

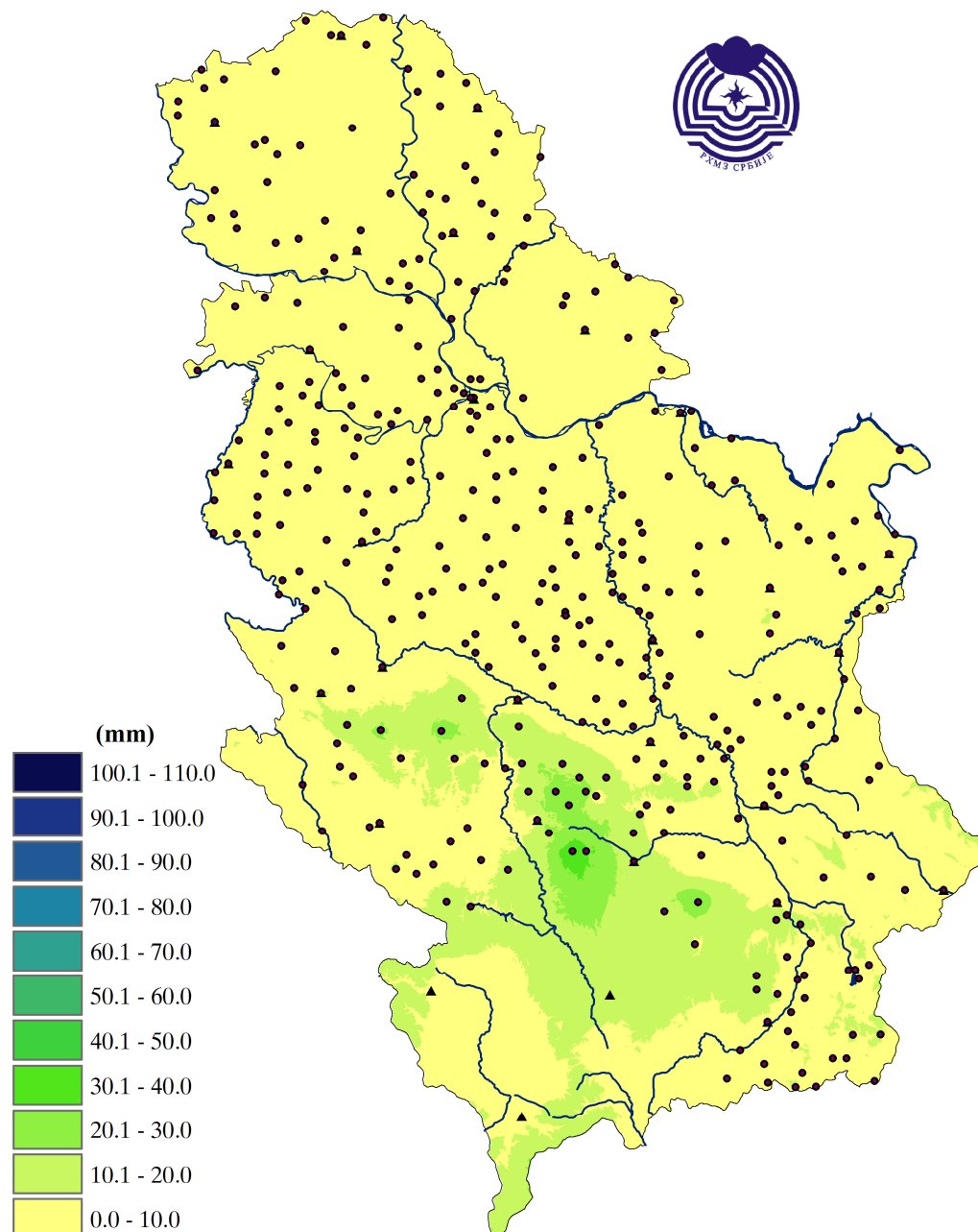


Figure 9. Precipitation sums in Serbia measured on 14 March 2016 (precipitation from 7 UTC 13/03 to 7 UTC 14/03/2016) at 396 meteorological stations where precipitation is measured (28 main meteorological stations, 50 climatological stations and 318 precipitation stations)

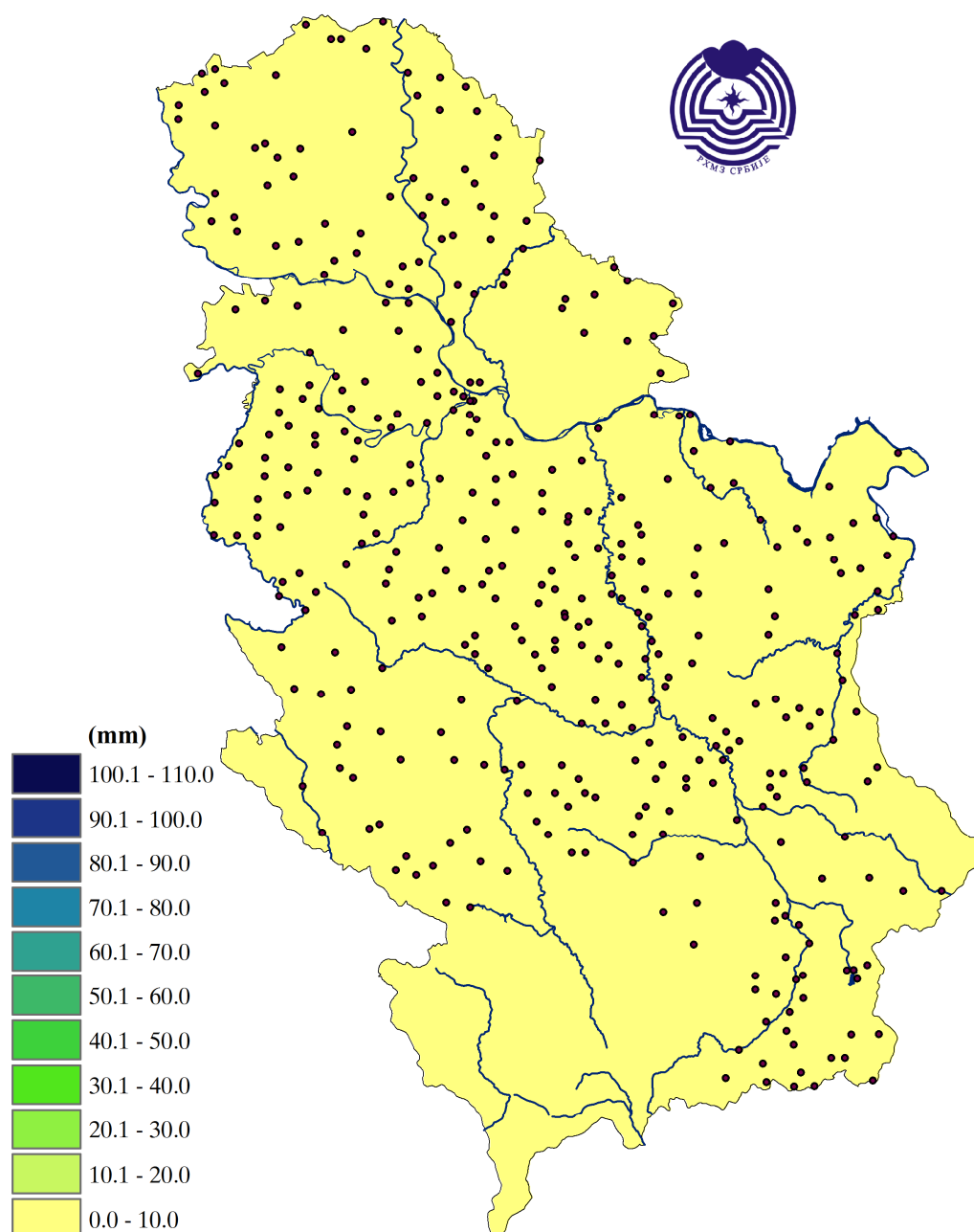


Figure 10. Precipitation sums in Serbia measured on 15 March 2016 (precipitation from 7 UTC 14/03 to 7 UTC 15/03/2016) at 396 meteorological stations where measurements of precipitation take place (28 main meteorological stations, 50 climatological and 318 precipitation stations)

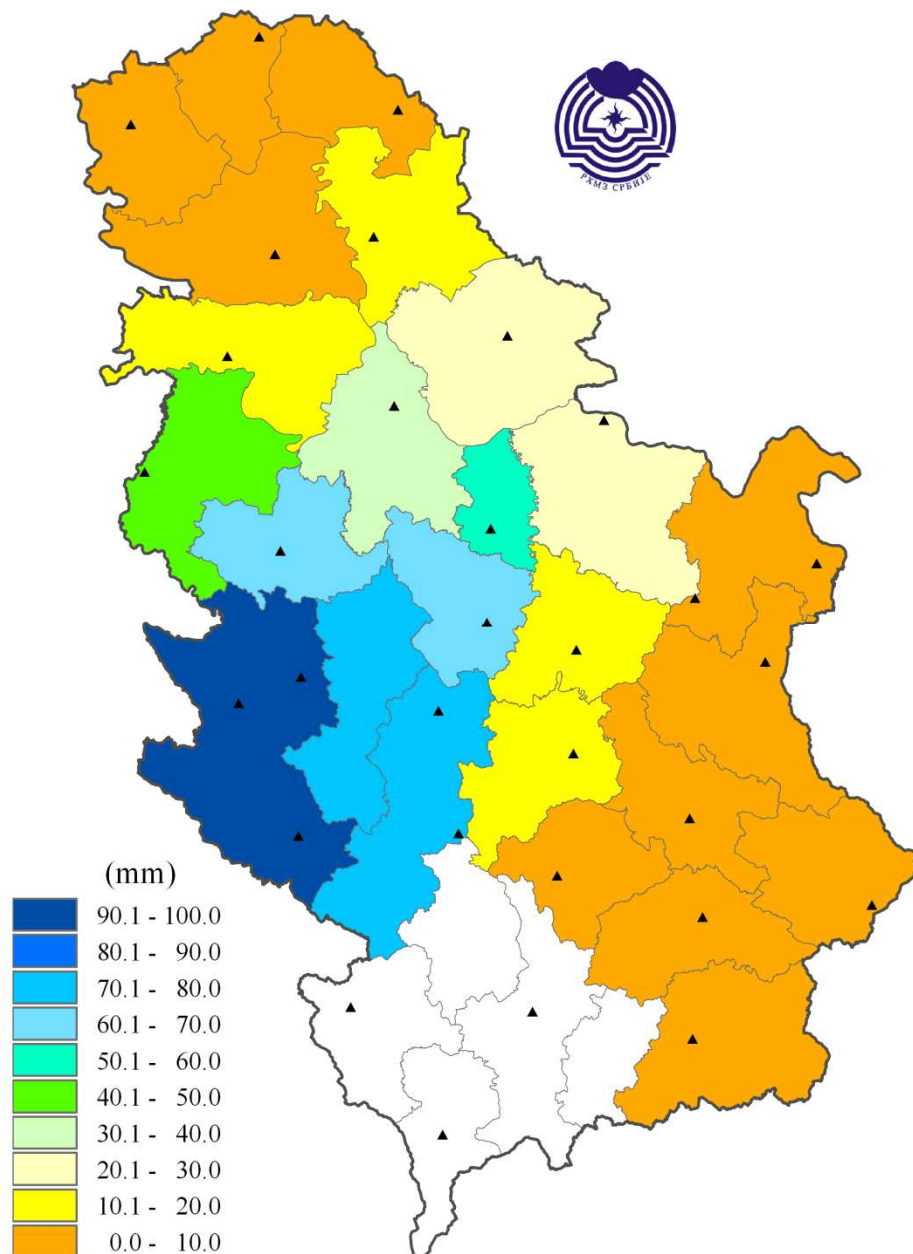


Figure 11. Precipitation sums in Serbia measured on 7 March 2016 (precipitation from 7 UTC 06/03 to 7 UTC 07/03/2016) across districts

Cumulative precipitation sums for the period from 1 to 23 March at Zlatibor were 303% of March average (March average for the 1961-1990 period)

Cumulative precipitation sums for the period from 1 to 23 March in Sjenica were 313% from March average (March average for the 1961-1990 period)

Cumulative precipitation sums for the period from 1 to 23 March in Pozega were 301% from March average (March average for the 1961-1990 period).

Cumulative precipitation sums for the period from 1 to 23 March in Loznica were 211% from March average (March average for the 1961-1990 period).

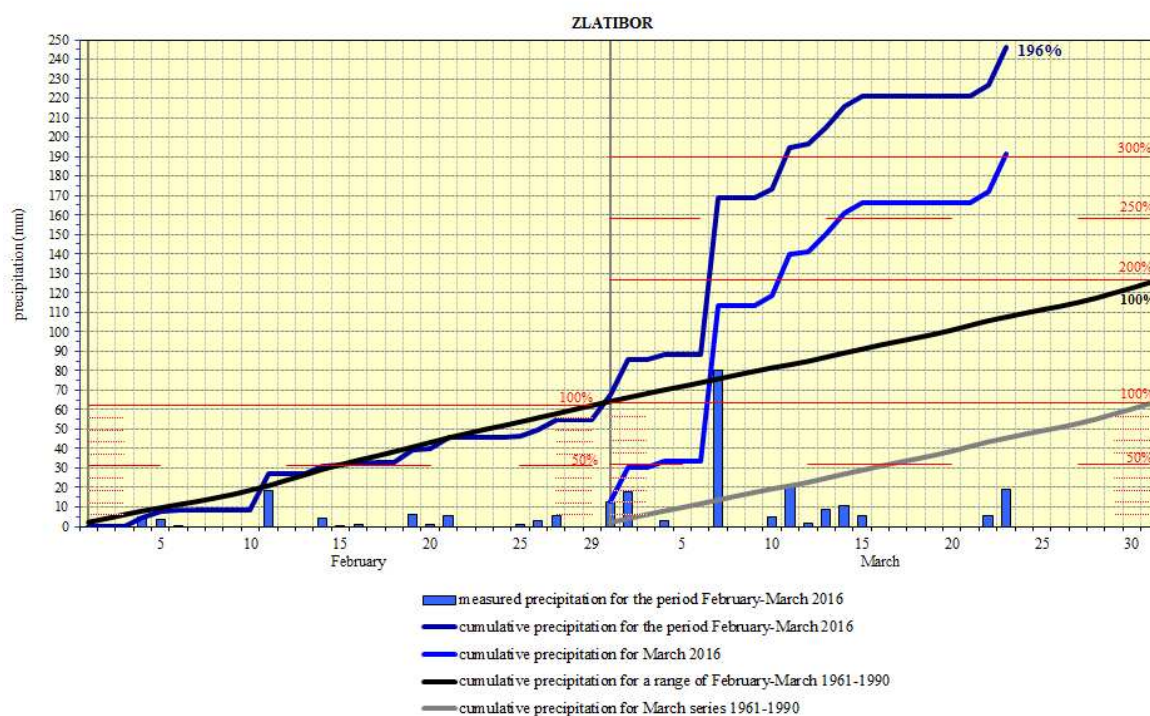


Figure 12. Cumulative precipitation sums for Zlatibor and percentage departure from normal

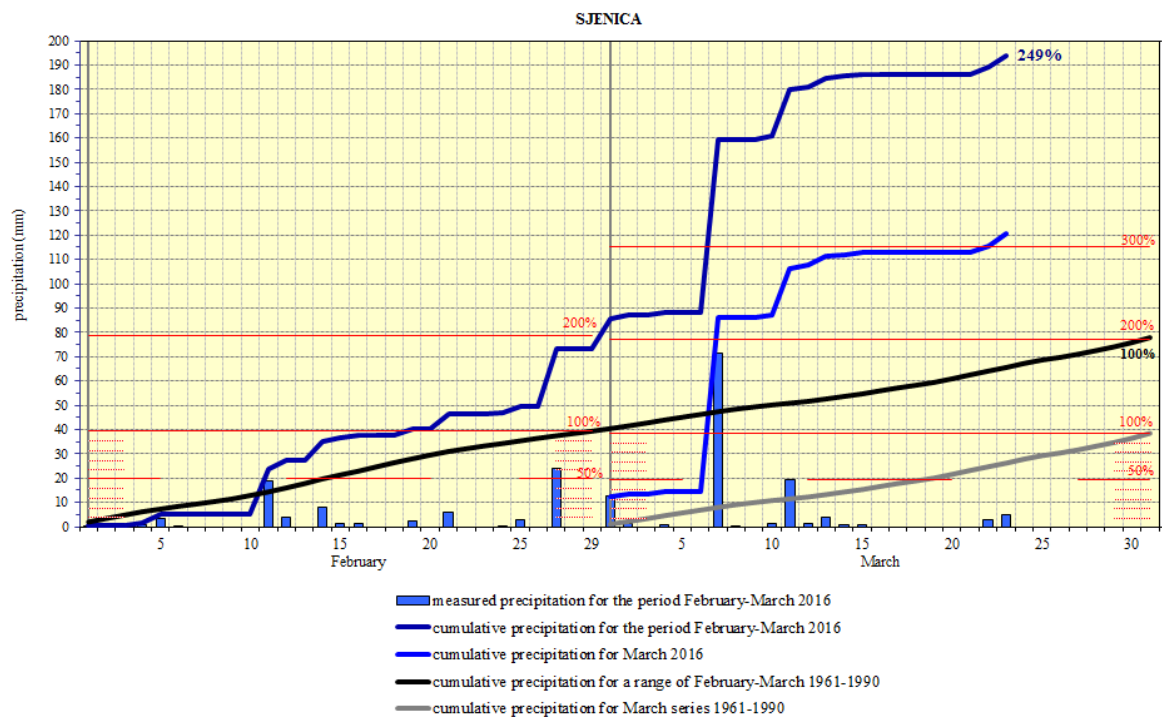


Figure 13. Cumulative precipitation sums for Sjenica and percentage departure from normal

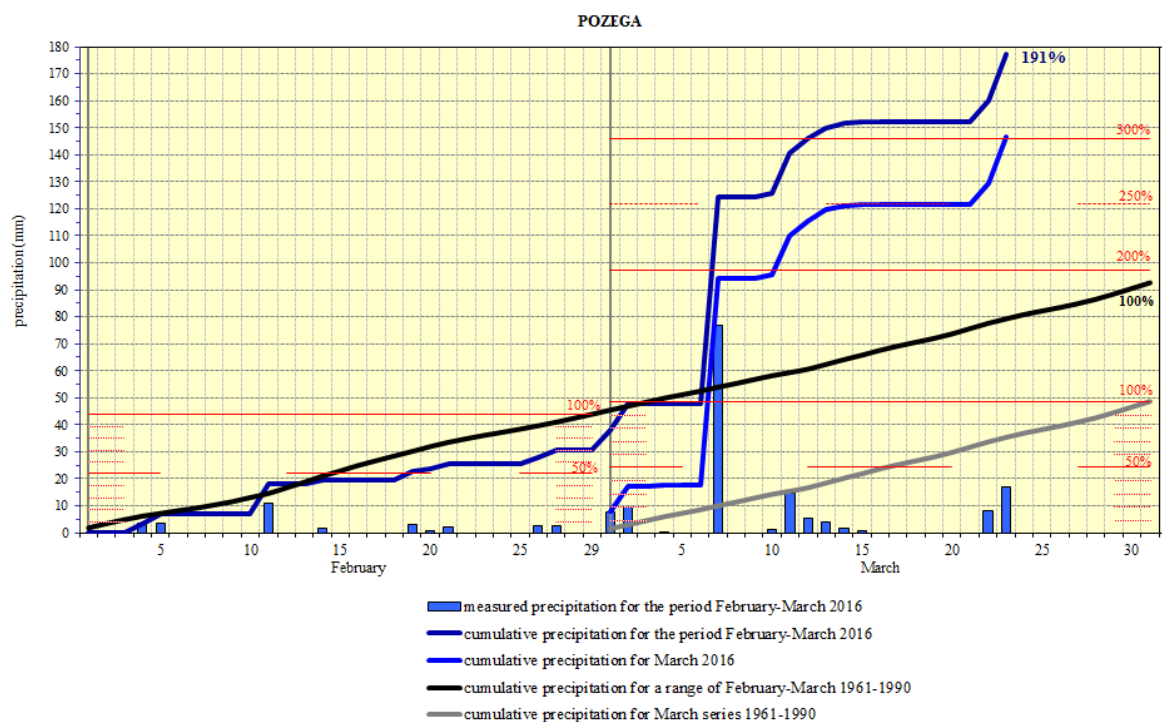


Figure 14. Cumulative precipitation sums for Pozega and percentage departure from normal

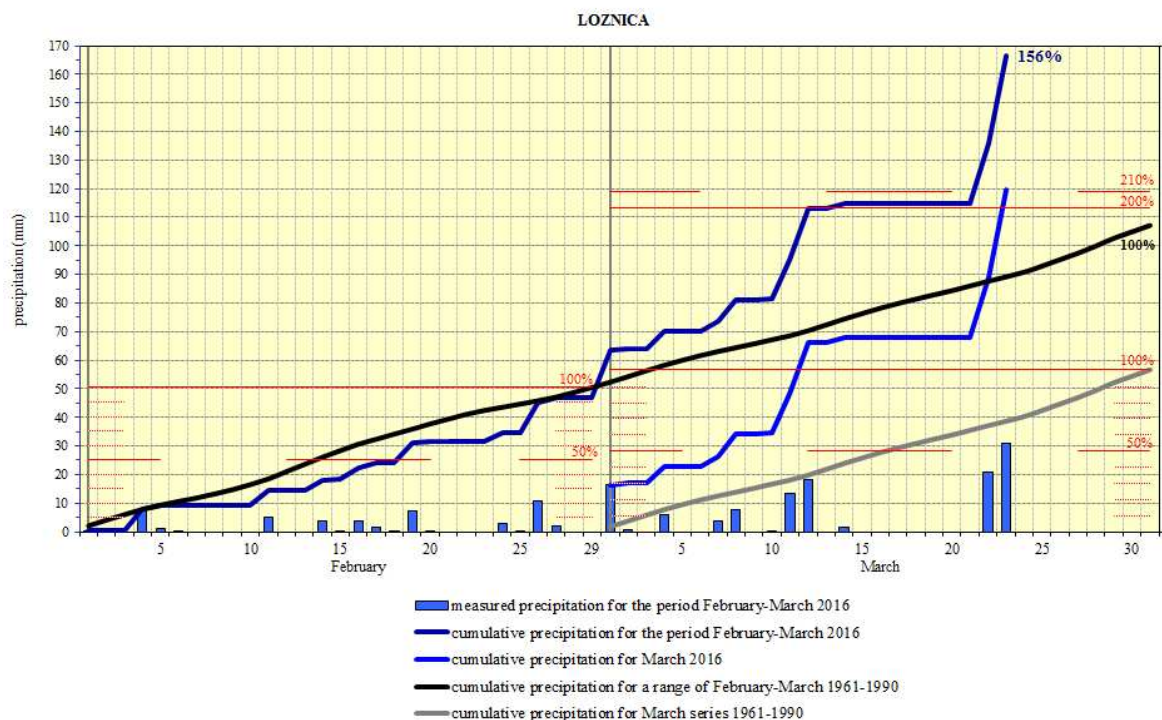


Figure 15. Cumulative precipitation sums for Loznica and percentage departure from normal

Following dry December, January and February in Sjenica were characterized by above-average precipitation sums, with the trend continuing also through March.

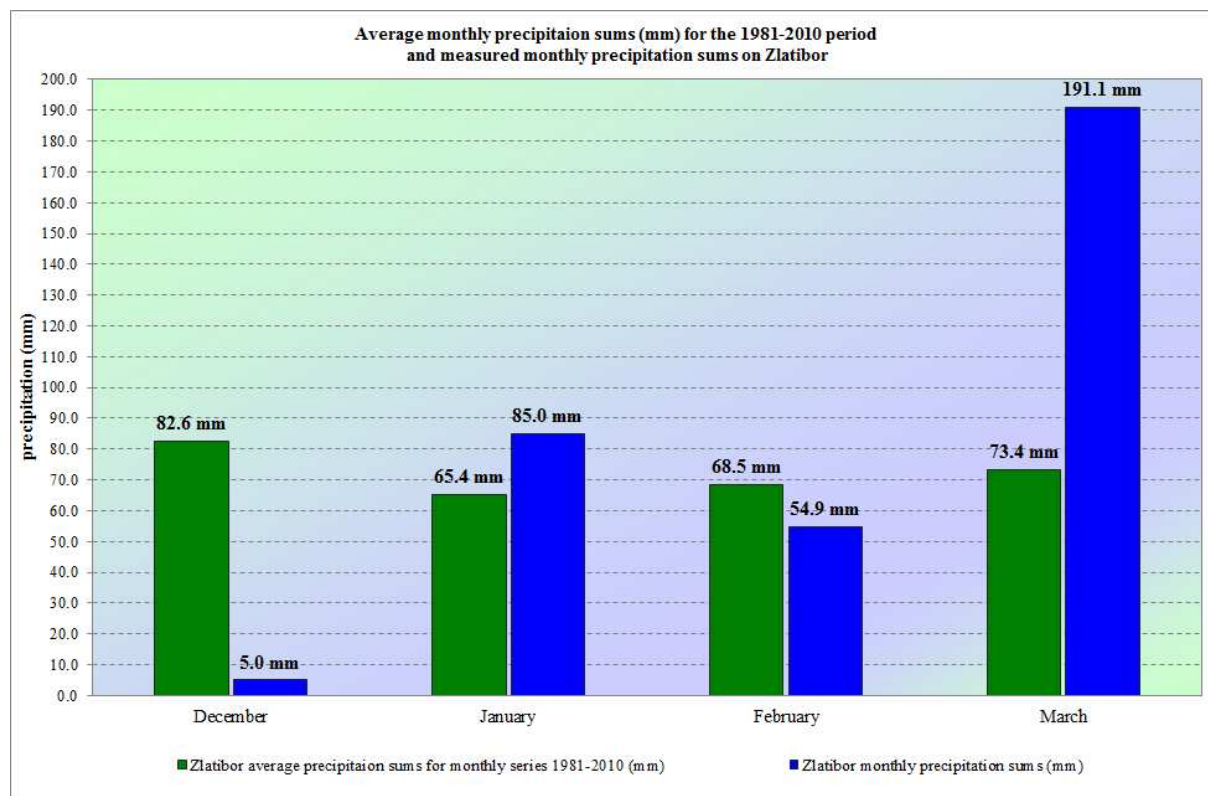


Figure 16. Precipitation sums at Zlatibor for December – March 2016

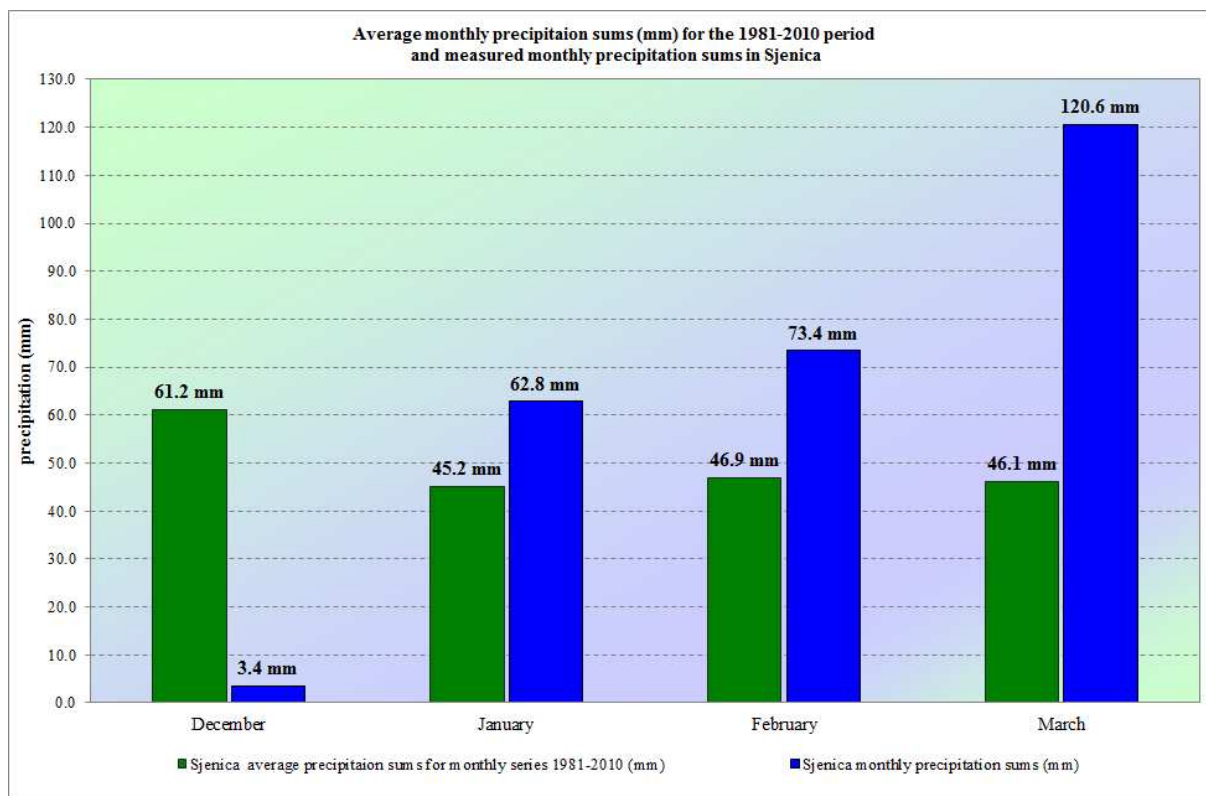


Figure 17. Precipitation sums in Sjenica for December – March 2016

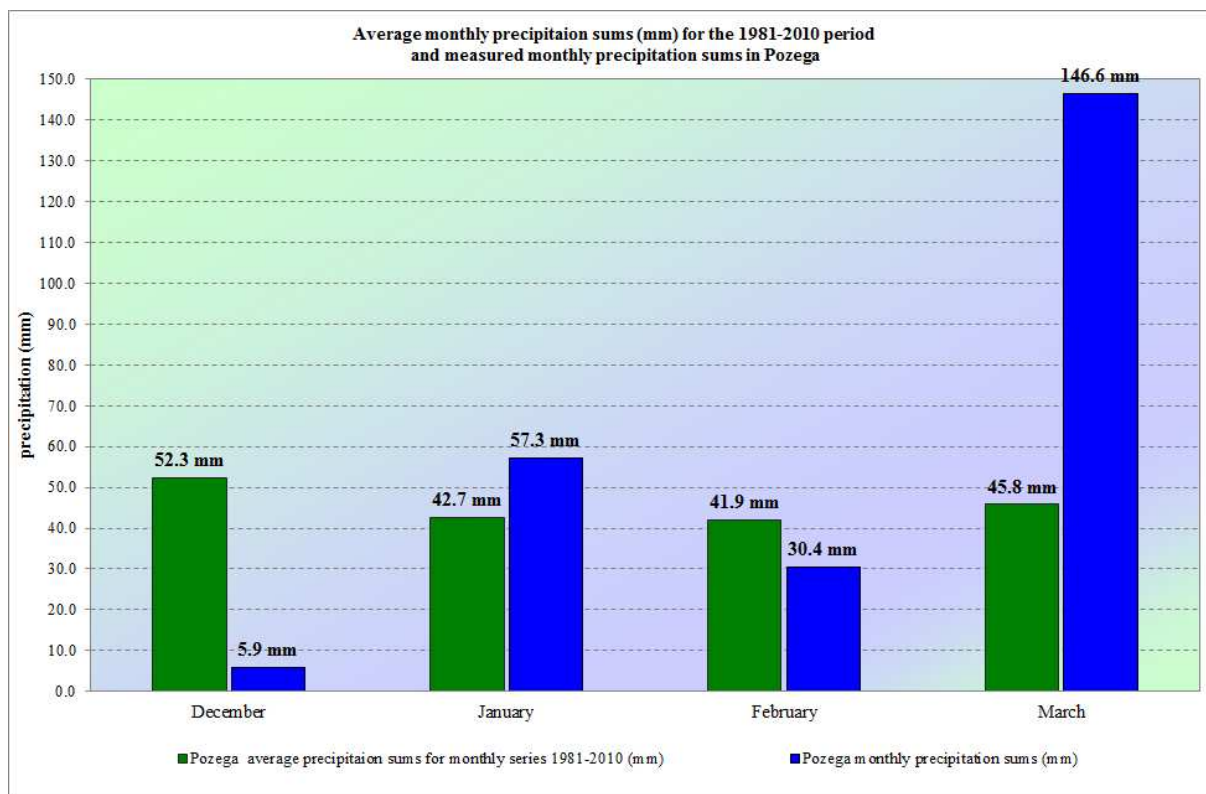


Figure 18. Precipitation sums in Pozega for December – March 2016