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PRELIMINARY CHARACTERIZATION OF THE KARST GROUNDWATER FLOW OF SUVA PLANINA MOUNTAIN (EASTERN SERBIA)

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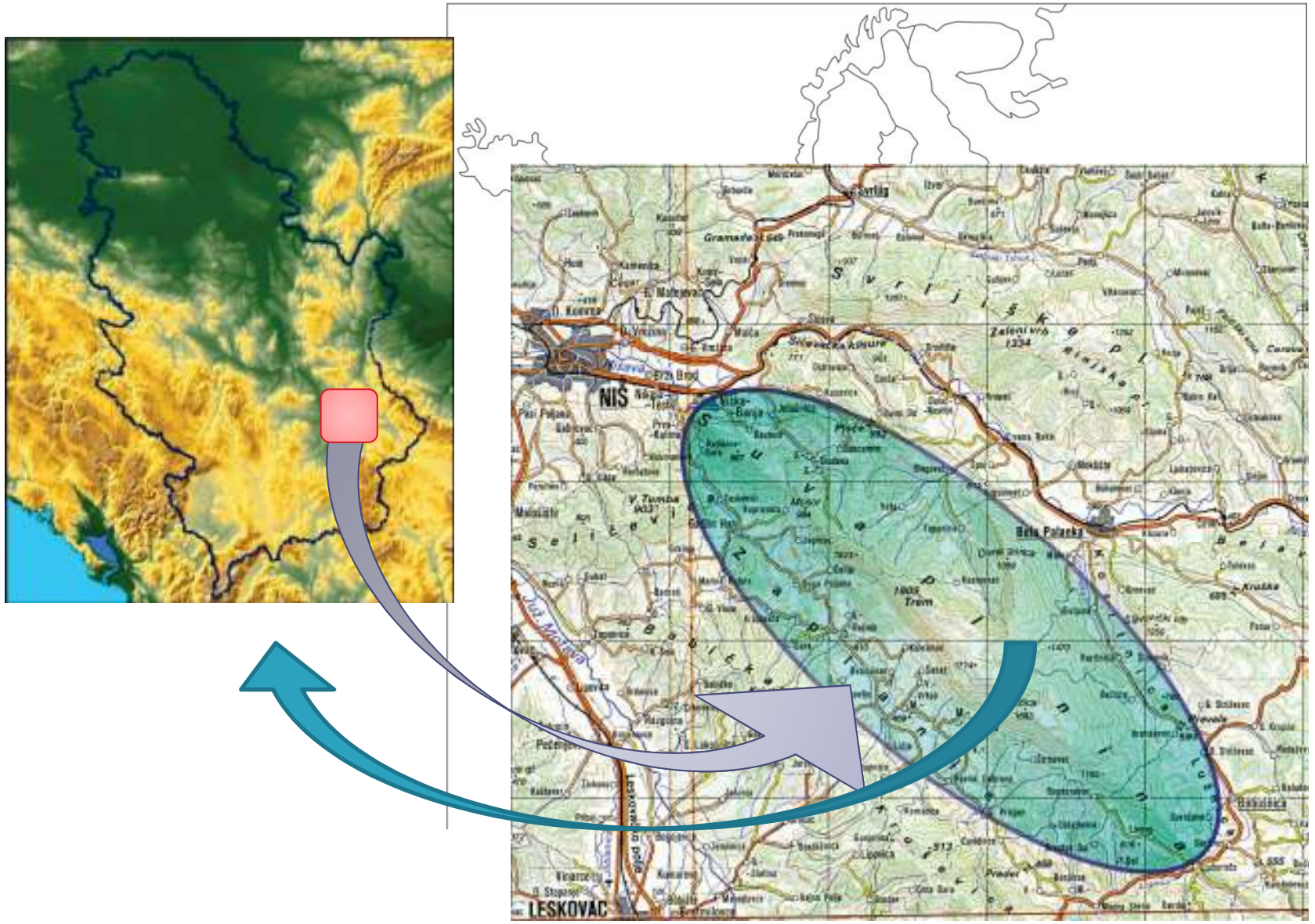


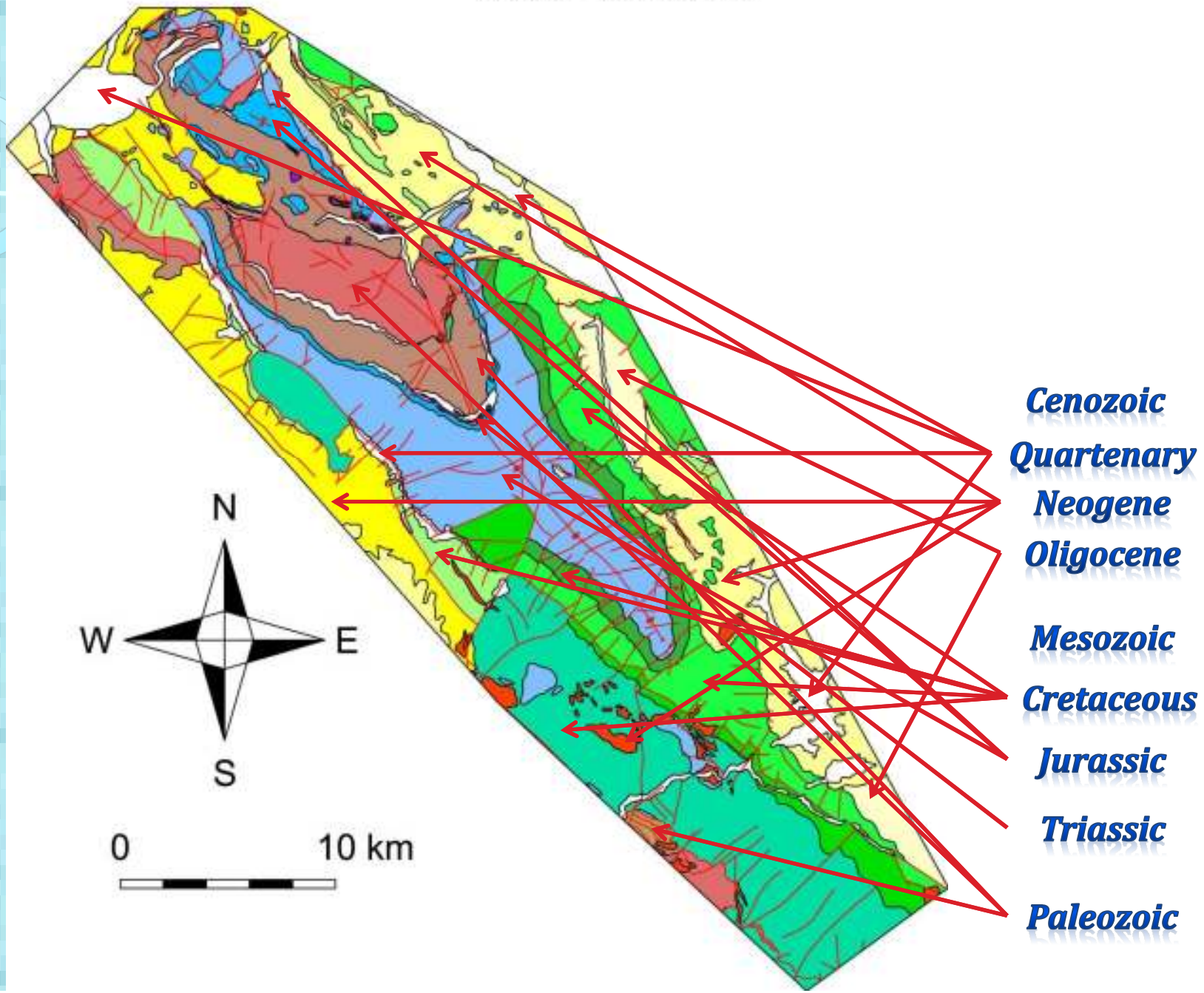
Geographical position of Suva planina Mt.

Suva planina Mt. generally lies in the NW-SE direction. From the North and the North-West, the Nišava river borders Suva planina Mt., the Koritnička R. forms the Eastern border, and the Southern and the South-Eastern borders are formed by the Lužnička R.

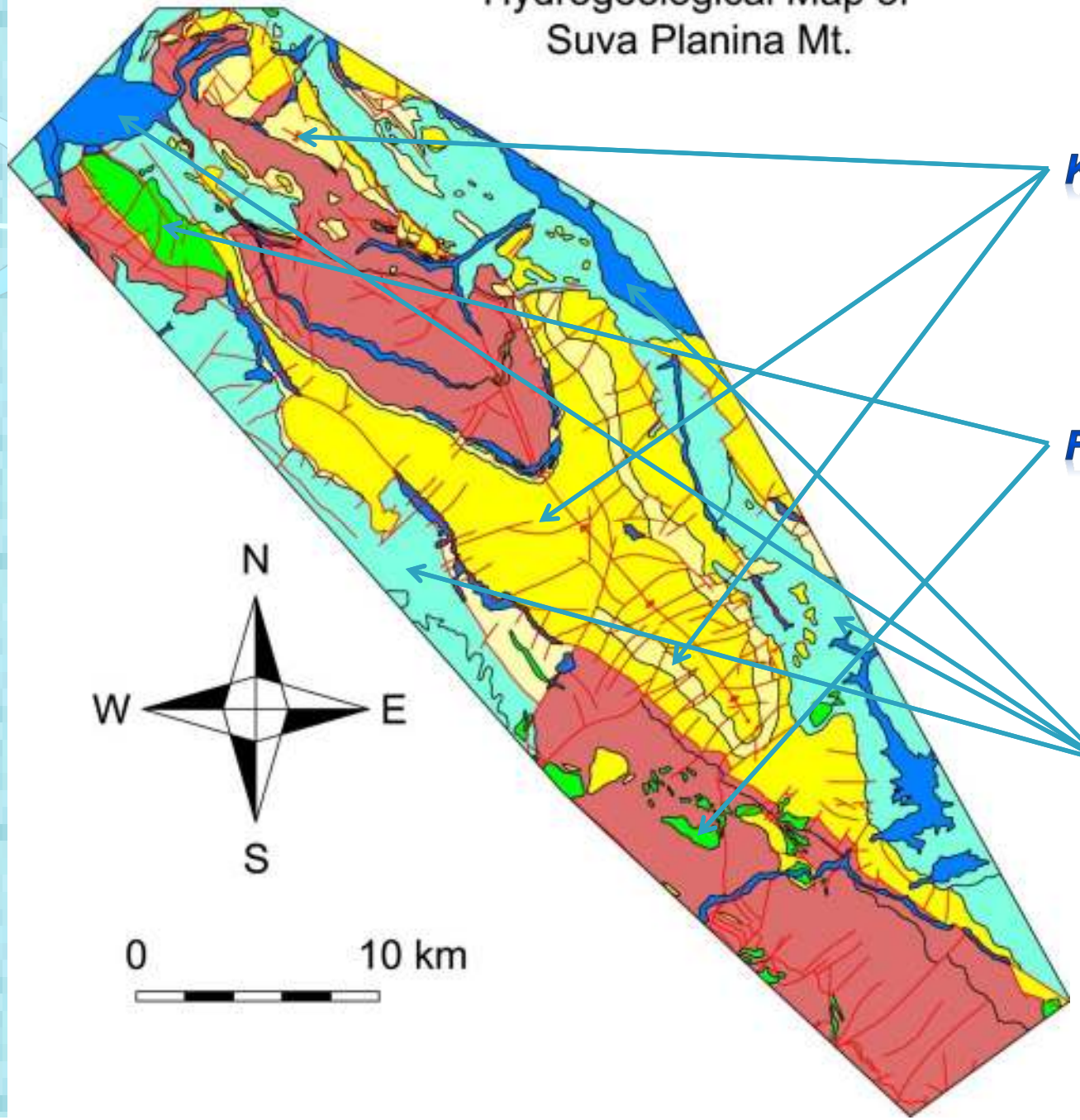
The name ("Suva" means "dry") stems from the fact that there are only few springs overall mountain.

Though there are practically no permanent rivers in Suva planina Mt., a slightly higher discharge from the Rakoš česma spring forms a sinking stream. However, there are several large springs at the foothill of the mountain result from karstic process, created groundwater pathway and existing barrier of impermeable rocks.

Geological Map of Suva Planina Mt.



Preliminary Hydrogeological Map of Suva Planina Mt.



Karstic aquifer

Fissured aquifer

Intergranular aquifer

Methods

The most recent survey of the area has been carried out during the summer of 2013 in order to collect new data on karst springs draining the karst massif.

Several parameters has been measured in the field, however for the purpose of this paper an analysis of pH values and oxidation-reduction potential has been singled out, with reference to the electrical conductivity as a parameter that reflects the mineralization of groundwater.

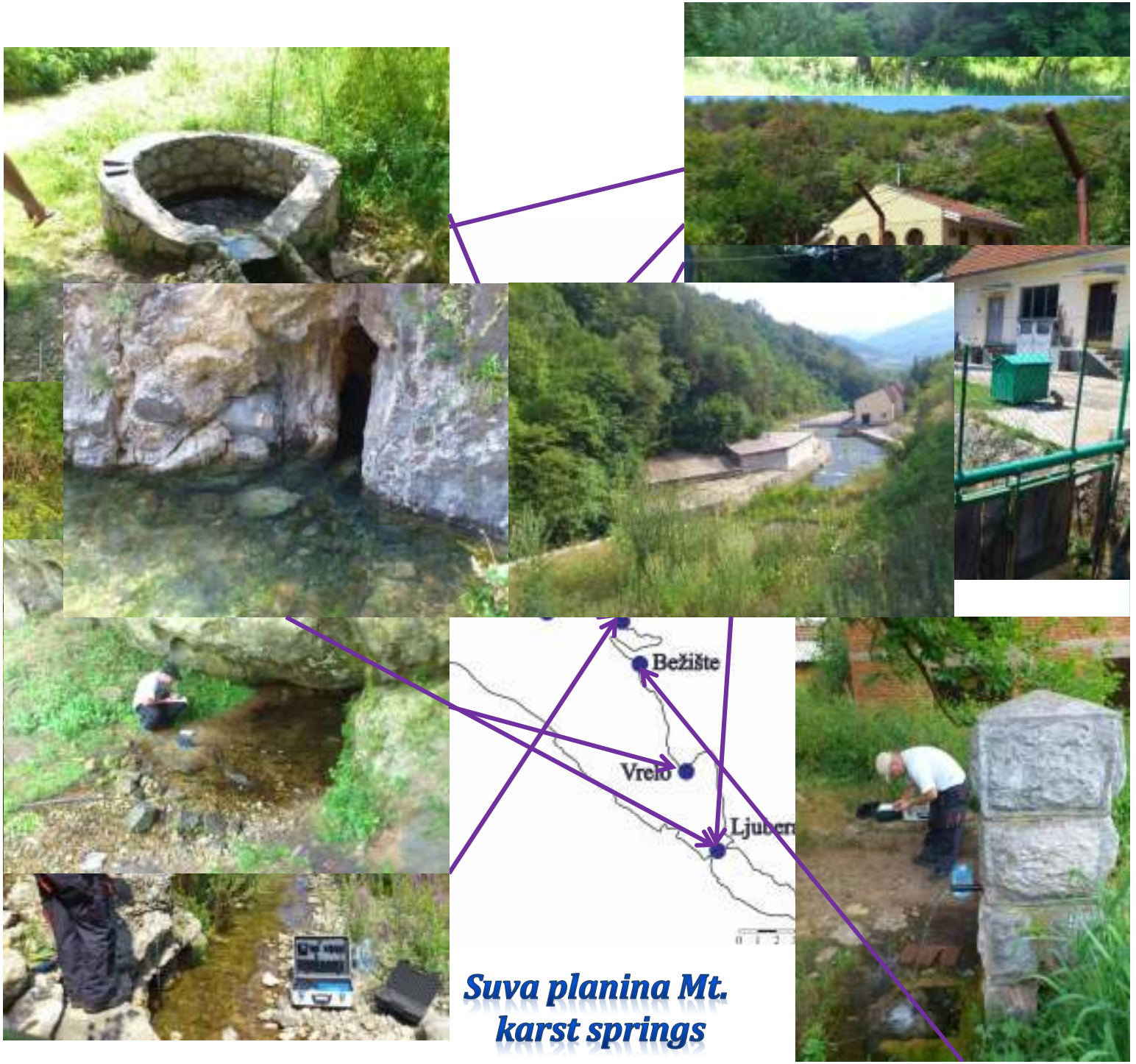
Measurements were made on the springs with free flow and on the outflows of the tapped spring where that was possible.

Karst springs that drain Suva Planina Mt. that have significant yield are:

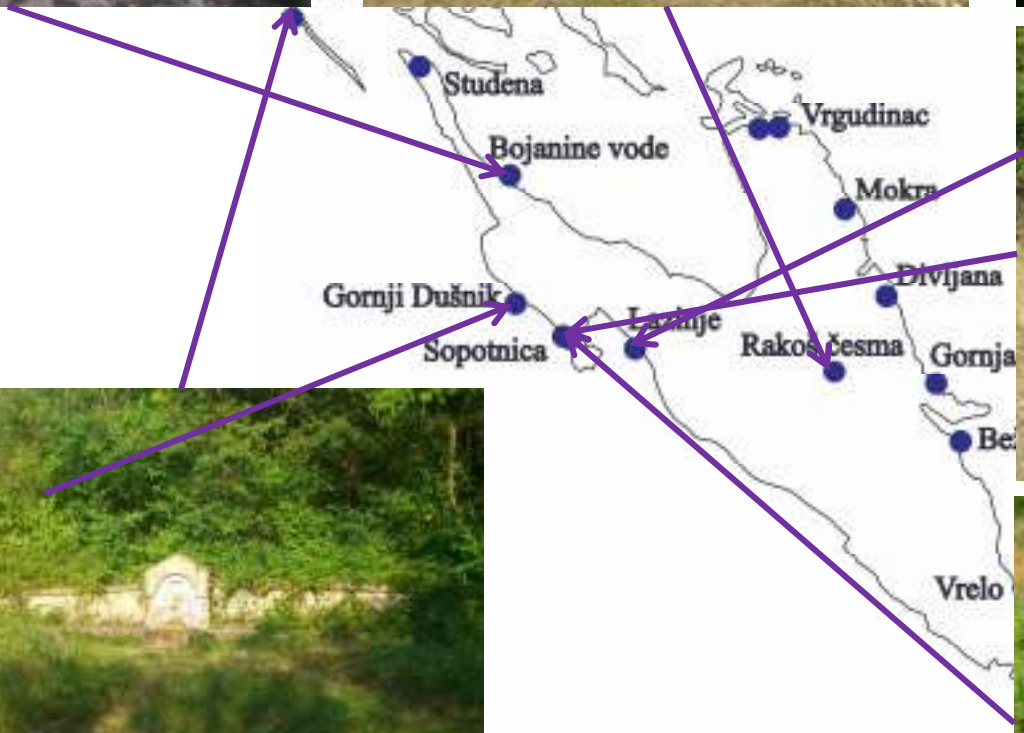
- Mokra, Divljana, Gornja Koritnica, Vrelo, Bežište (on the eastern side),
- Ljuberađa (on the south side),
- Ropot, Laznica, Sopotnica, Gornji Dušnik (on the west side),
- Ostrovica, Vrgudinac, Golemo vrelo (on the north side), and
- Bojanine Vode and Rakoš česma (on the Suva Planina Mt. itself).

The most of karst springs are formed as a result of contact of karstified Jurassic and Cretaceous limestone with impermeable sediments of Neogene period, as we could see on the hydrogeological map.

Contour line of carbonate rocks of Suva planina Mt. with locations of karst springs



Suva planina Mt. karst springs



Suva planina Mt.
karst springs

Table 1 – Spring names, locations, temperatures of water and electrical conductivity

Spring name	No	y (m)	x (m)	z (m)	T_{water} (°C)	Ec (µS/cm)
Ostrovica spring	1	7590292.34	4798287.54	230	21.80	626
Vrgudinac spring	2	7601459.31	4788963.33	399	16.50	530
Vrgudinac karst spring	3	7600624.75	4788938.61	446	14.90	531
Gornja Koritnica karst spring II	4	7607883.18	4778435.02	464	18.00	494
Gornja Koritnica karst spring III	5	7607880.24	4778478.18	460	11.10	482
Gornja Koritnica karst spring IV	6	7607902.25	4778515.57	457	17.00	407
Bežište spring	7	7608847.57	4776064.42	572	10.00	526
Bežište tapped spring	8	7608869.1	4776132.66	567	10.20	550
Provaljenik tapped spring	9	7611159.72	4772076.74	616	15.30	655
Vrelo karst spring	10	7612993.75	4771023.36	578	12.60	555
Ljuberađa karst spring	11	7613240.38	4766035.89	473	15.30	444
Lazinje karst spring	12	7595568.62	4779912.08	856	10.40	278
Sopotnica karst spring I	13	7592799.89	4780414.27	572	10.30	405
Sopotnica karst spring II	14	7592634.58	4780442.89	557	12.60	396
Gornji Dušnik karst spring	15	7590977.73	4781665.54	511	10.20	321
Koritnik tapped spring	16	7582110.53	4793449.51	636	12.70	635
Bojanine vode spring	17	7590495.19	4786910.89	875	8.70	385
Rakoš česma karst spring	18	7603902.94	4779040.05	1283	13.00	356

The value of *electrical conductivity* of water in the karst springs and springs of Suva planina Mt. ranges from *278 to 655 µS/cm*. The *pH value* ranges from *7.08 to 8.43*. *Oxidation-reduction potential* is in the value range of *+17.5 to +226.0 mV*.

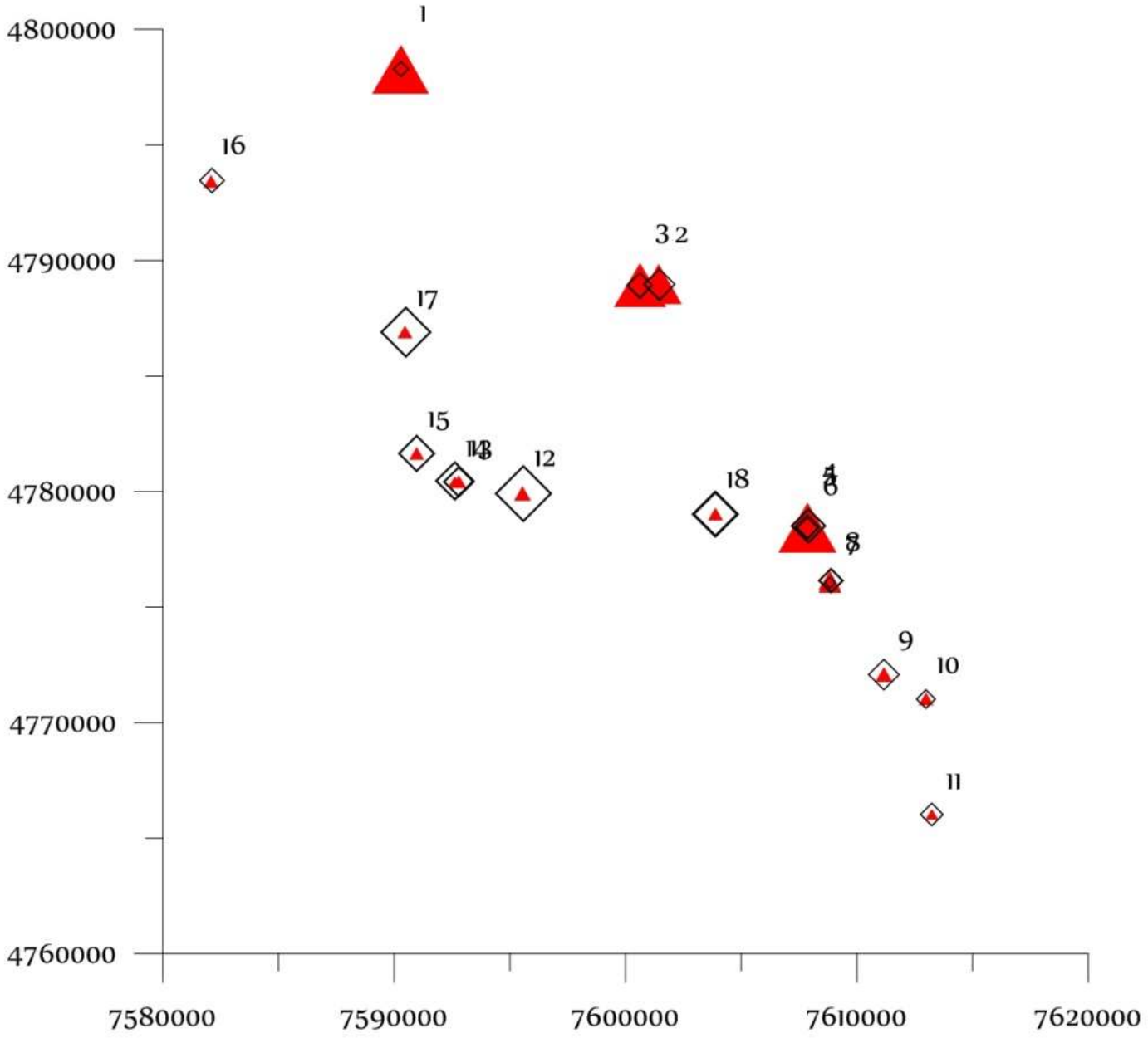
Due to the extremely low water at the time of field measurements, it was not possible to determine these parameters for the karst springs Divljana and Mokra that are tapped for Niš city water supply system. There were no outflows from tapping structures.

Suva planina Mt.
karst springs

Regarding Suva planina Mt., the highest oxidation-reduction potential of groundwater were measured at the northern karst springs Ostrovica, Vrgudinac and Gornja Koritnica, indicating the formation of a different chemical composition of the groundwater from the rest of Suva planina Mt.

The groundwater from springs on the southern and western sides of Suva Planina Mt. has all the characteristics of karstic water: low mineralization and the temperature of groundwater is in accordance with local climatic conditions.

In the groundwater from the eastern springs pH index is similar to groundwater from Gornja Koritnica. Redox potential is significantly smaller and indicating deeper circulation and longer residence time of groundwater.



Spatial distribution of measured values of pH index (white symbols) and redox potential (red symbols) of Suva planina Mt. (size of symbol indicates value of parameter)

Conclusions

Data acquired during field investigation of Suva planina Mt. provided some insights of karst groundwater flow and existence of several flow directions of infiltrated water observed in Suva planina Mt.

Measured chemical parameters gave some indices that water yielded from springs on the northern and eastern slopes of Suva planina Mt. had different, deeper, pathways than water of all other investigated springs.

Measured parameters also showed that springs in the upper parts of Suva planina Mt., which drains shallow karst aquifer, have similar physical and chemical characteristics, despite their locations.

Detail hydrogeological study of Suva Planina Mt. envisages continuous monitoring of quantitative and qualitative parameters of selected springs along the foothills.

Researching karstification process and groundwater movement will provide necessary data for better and sustainable water use and supply of the cities in vicinity of Suva Planina Mt. or further settlements such as Niš, the third largest city in Serbia.