GEOSITE "IRON GATE" ("DEMIRKAPIYA") IN RILA

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ABSTRACT. Geosite "Iron Gate" ("Demirkapiya") is situated on the territory of Samokov Municipality, Sofia District. It is in the glacier valley of Beli Iskar River between the summits of Golyam Skakavets (2705.9 m) and Musala (2925.4 m). Geosite "Iron Gate" is of aesthetic and scientific value. It includes the deepest part of the largest glacier valley on the Balkan Peninsula carved out by the Beli Iskar glacier during the Würm Ice Age. This is the deepest place in the valley called "Demirkapiya" or "Iron Gate", due to the impressive displacement of 1250 m between the riverbed and the surrounding peaks. The Beli Iskar River valley is a typical U-shaped glacier trough valley with steep slopes and rounded bottom and a length of 21 km between Kanara Cirque and Beli Iskar village. Side glacier moraines on both slopes of the valley are formed during the ice age and covered later by supraglacial moraines (scree slopes). They consist of angular or somewhat rounded particles, ranging in size from large boulders to glacial flour, obtained as a result of the rocks disintegration. The monolith granite of the Musala Body of the Rila-West Rhodopean Batholith is cut by numerous pegmatite, aplite and quartz veins, vein-like granite bodies and dykes of diorite and granite porphyry, suitable for demonstration of the principle of cross-cutting relationships in geology. Other important geoconservation features of the site are the glacial and periglacial landforms and deposits, which may serve for demonstration of the manner in which glaciers work. The area is on the territory of the National Park Rila with restricted measures, according to the requirements of such category protected areas.

Keywords: Geosite "Iron Gate", Geopark Rila

ГЕОТОП „ЖЕЛЯЗНА ВРАТА" („ДЕМИРКАПИЯ") В РИЛА

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РЕЗЮМЕ. Геотоп "Желязна врата" ("Демиркапия") се намира на територията на община Самоков, област София. Той е в ледниковата долина на р. Бели Искър между върховете Голям Скакавец (2705.9) и Мусала (2925.4). Геотоп "Желязна врата" е с естетическа и научна стойност. Той включва най-дълбоката част от най-голямата ледникова долина на Балканския полуостров, издълбана от белиискърския ледник по време на Вюрмската ледникова епоха. Това е най-дълбокото място в долината "Демиркапия" или "Желязна врата", поради внушителната денивелация от 1250 м между речното корито и околните върхове. Долината на река Бели Искър е типична U-образна ледникова долина със стръмни склонове и заоблено дъно и дължина 21 km между Канарския циркус и с. Бели Искър. Страничните ледникови морени по двата склона на долината са образувани по време на ледниковата епоха и покрити по-късно от супраглациални склонови морени. Те се състоят от ръбати или леко заоблени късове, вариращи от големи блокове до ледниково брашно, получени в резултат на разпадането на скалите. Монолитният гранит на Мусаленското тяло на Рило-Западнородопския батолит се пресича от множество пегматитни, аплитни и кварцови жили, жилоподобни гранитни тела и дайки от диорит и гранит-порфир, подходящи за демонстриране на принципа на секущите взаимоотношения в геологията. Други важни консервационни характеристики на територията са ледниковите и периглациалните ландшафти и отложения, които могат да служат за демонстрация на начина, по който действат ледниците. Районът е разположен на територията на Национален парк "Рила" с ограничени мерки, съгласно изискванията на тази категория защитени територии.

Ключови думи: Геотоп „Желязна врата", Геопарк Рила

Introduction

Geosite "Iron Gate" ("Demirkapiya") is situated on the territory of Samokov Municipality, Sofia District. It is in the glacier valley of Beli Iskar River between the summits of Golyam Skakavets (2705.9 m) and Musala (2925.4 m). Coordinates of the moraines near the road to Beli Iskar Dam are: 34T 0710994 E, 4673564 N. This point is situated 14 km south of Samokov town and 8 km south of Beli Iskar village.

Category

Geosite "Iron Gate" is of aesthetic and scientific value. This is the deepest place of the deepest and longest glacier valley on the Balkans - the Beli Iskar River Valley with a displacement of 1250 m against Musala Peak. The geosite includes supraglacial moraines developed on both slopes of the glacier valley.

Geological setting

The area has a simple geological structure. The first data about the native rocks belong to Viquenel (1852) who noted that the granite forms peaks with a height of 2500-3000 m and occupies the heights from which Maritsa River expires. On the watershed between Maritsa and Iskar, the author described white coarse-grained granite and gray granite.

Hochstetter (1870) also noted Rila granite as the largest granite massive in the old crystalline body of the Rhodopes.

Entering the Beli Iskar River Valley from the north, he described mica gneiss with layers of amphibolite gneiss, crystalline limestone, serpentine, and up the valley, "the rock becomes totally granite-like with large orthoclase crystals."

Бончев (1908) made the first serious contribution to the petrography of Rila. He described biotite granite in the valley of Beli Iskar (Sokolets and Demirkapiya). Granites east of Beli Iskar are described as part of the Western Rhodopes. As far as their age is concerned, he states: "It can not be said that they are of a younger geological age than the archaic one."

Later these granites are described as part of the so-called South Bulgarian Granite (Димитров, 1939) with Paleozoic age.

Яранов (1943) described the so-called "West-Rhodopean Batholith" on the territory of the West Rhodopes. According to the author, "this is a typical batholith, the largest one of the entire Balkan Peninsula", which is associated with the granite batholith of Rila.

The leucocratic granite that crops out in the area, belongs to the Musala Body of the Rila-West Rhodopean Batholith, characterized by Вылков et al. (1989) as a complicated igneous massive, with four phases of magmatic activity. The native rock representing the second phase is medium and coarse-grained biotite granite, intruded during the Lutetian Age of the Eocene (42-35 Ma ago) into the granodorite of the first phase and Precambrian metamorphic rocks. In turn, this granite is cut by granites and plagiogranites of the third phase and aplitoid and pegmatoid granites of the fourth phase forming small stock-like bodies or veins. Каменов et al. (1997), Пейчева et al. (1998) and Kamenov et al. (1999) combine the third and the fourth phases into a single third type.

Саров et al. (2011) described the granite according to the previous authors cited above as part of the Musala Body of the Rila-West Rhodopean Batholith.

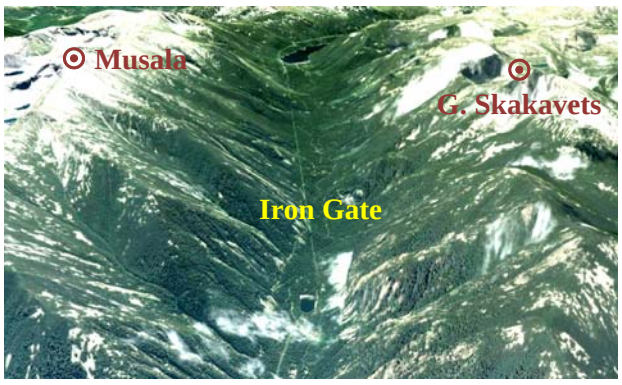

Fig. 1. Satellite image of the Iron Gate – the narrower part of the Beli Iskar glacier valley between the peaks Musala (2925 m) and Golyam Skakavets (2706 m)

According to these authors the Rila-West Rhodopean Batholith consists of two differing in age and tectonic position plutons. They believe that the granodiorites of the first petrographic type are part of an older (~80 Ma) sinmetamorphic pluton with calcium-alkaline character and mantle magma and consider the granites of the second and third petrographic types in age 42-35 Ma as genetically related phases of postmetamorphic pluton with high potassium-calcium-alkaline character.

Fig. 2. Outcrop of the granite of the Musala Body belonging to the second phase of the Rila-West Rhodopean Batholith along the way to Beli Iskar Dam

Geodiversity

Geodiversity of Rila was first reviewed in the light of the geopark development by Синьовски (2014), Sinnyovsky (2014, 2015) who outlined its petrographical and geomorphological diversity. The geopark potential of Rila Mountain, glacier formations and supraglacial activity in Rila were subject also of several other papers (Атанасова, Синьовски, 2015; Цветкова, Синьовски, 2015; Синьовски et al., 2017; Sinnyovsky et al. 2017).

The Beli Iskar Glacier valley is carved entirely in the medium- to coarse-grained biotite granite of the Musala body which is exposed on both slopes of the Beli Iskar River Valley between Musala Ridge to the east and Golyam/Malak Skakavets Ridge to the west. The granite is leucocratic, light grey to grey-white in colour with massive and equigranular structure. The texture is poikilitic and hypidiomorphic-granular. The main rock-forming minerals are plagioclase, K-feldspar, quartz, and biotite. Due to the good preservation and perfect outcrops of the rocks they are appropriate for demonstration of the mineral composition and magmatic crystallization processes leading to the formation of structures and textures in igneous rocks.

The monolith granite body in Beli Iskar River valley is cut by numerous pegmatite, aplite and quartz veins, vein-like granite bodies and dykes of diorite and granite porphyry, which may serve for demonstration of the principle of cross-cutting relationships in geology. The outcrops of fresh granite allows demonstration of the mineral composition and the processes of magma crystallization, resulting in the structures and textures of the igneous rocks (Fig. 3).

Fig. 3. Outcrops of fresh granite near Waterfall Lyutidol

Morphology

In addition to the remarkable petrographic peculiarities other important geoconservation features of the geosite are the glacial and periglacial landforms and deposits, suitable for demonstration of the manner in which glaciers work.

The geosite includes the deepest part of the largest glacier valley on the Balkan Peninsula carved out by the Beli Iskar glacier during the Würm Ice Age. It covers both slopes of the valley, where lateral moraines of the glacier are preserved, covered by Holocene supraglacial deposits - scree slopes (Fig. 4). This is the deepest place in the valley called "Demirkapiya" or "Iron Gate", due to the impressive displacement between the River Basin and the surrounding peaks.

Fig. 4. Scree slopes on the right bank of the Beli Iskar River composed of angular granite boulders

Цвијић (1897) first established traces of glacial activity on the Balkan Peninsula in Rila during his field trip in 1895. However, he believed that there are only cirques glaciers, but not valley glaciers of alpine type, because he did not investigated the Beli Iskar Valley. He had only doubts about the Cherni Iskar Valley, where he found glacial terraces. Later the glacial landscapes in the area are described in the works of Радев (1920), Делирадев (1928, 1932), Иванов (1954), Гловня (1958, 1963) and others.

The Beli Iskar River Valley is a typical U-shaped trough glacier valley with steep slopes and rounded bottom (Fig. 5). Its length is 21 km between Kanara Cirque and Beli Iskar village. Its accumulation zone includes also Beli Iskar and South Zelenivrah cirques. It has also been fed by numerous side cirques namely such as Kovach Cirque, East and West Nalbant Cirques, North Zelenivrah Cirque, Shishkovitsa Cirque, Devil's Cirque, Preka Reka Cirque, Darkev Cirque, Golyam Bliznak Cirque, South Skakavitsa Cirque, Trite Mushi, Golyama Skakavitsa and Sakan Dupka Cirques (Fig. 6), as well as several valleys with not well differentiated cirques such as Malak Bliznak, Toshov dol, Lyuti dol and others.

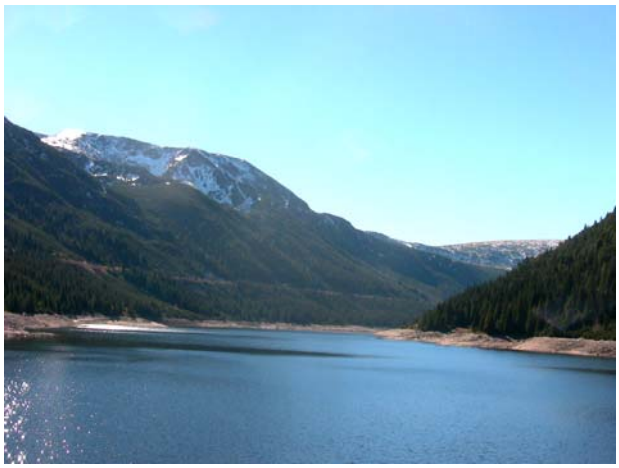

Fig. 5. U-shaped glacier valley of the Beli Iskar River

The side glacier moraines on both slopes of the valley are covered by supraglacial moraines (scree slopes) formed according to Matthes's (1930) scheme.

Fig. 6. Sakan Dupka Cirque between Golyam and Malak Skakavets peaks

The end moraine is located in the end of the valley south of Beli Iskar village. Originally, Цвијић (1897) considered as an end moraine the old rupee around Iskar River near Samokov, remaining from the extraction of spilled magnetite for the needs of traditional forge crafts. Later, his teacher Albrecht Penck (1925) found that the end moraine was at the village of Beli Iskar. The scree slopes are composed of unconsolidated and unsorted granite boulders ranging from several centimeters to

more than a meter in size (Fig. 7). The fine-grained material (sandy and clayey till fraction) is washed away by the surface water and the moraine debris are without matrix.

Interpretation

Around 11 000 years ago as the ice advance began to melt, glacial deposits or drift were left behind. The active processes are related to direct reworking of the rock material due to the glacier movement (glaciotectonism). The moraines formed in this way consist of somewhat rounded particles, ranging in size from large boulders to glacial flour, obtained as a result of the rocks disintegration. These are usually the ground moraines and lateral moraines formed below the glacier surface.

Fig. 7. Lateral moraines formed as a result of the placing of chaotic supraglacial debris on the ice surface due to the frost shattering of the steep side slopes that remain there after the glacier retreat

After melting of glacier in the end of the Pleistocene and the beginning of the Holocene, the rock boulders remained on the slopes of a glacier valley, where they continue to slow down as a result of frost weathering. These lateral moraines are formed as a result of so called “passive processes” of the placing of chaotic supraglacial debris on the ice surface due to the frost shattering of the steep side slopes that remain there after the glacier retreat (Fig. 7). The continuous accumulation of angular boulders on the glacial moraines leads to formation of the so called scree slopes or supraglacial moraines. They are angular and coarse-grained with centimeter to boulder size without matrix. These scree slopes or supraglacial moraines are formed as a consequence of the frost weathering which attacks the rock massive through the joints and leads to the separation of blocks by „plucking” called glacial quarrying in the manner described by Matthes (1930).

The modern post-glacial alluvial deposits in Beli Iskar River Valley, initially formed out as the ground moraine material of glacier, are subsequently reworked and rounded by the river stream. They are represented by poorly sorted sediments containing stones up to boulder size (Fig. 8).

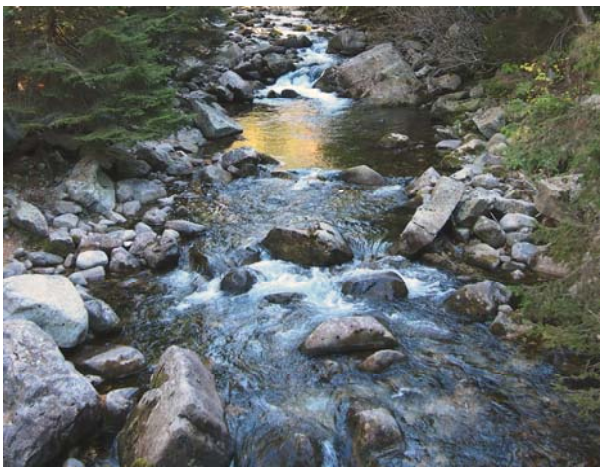

Fig. 8. The alluvial deposits are represented by poorly sorted sediments containing stones up to boulder size

Surrounding landscape

Green Ridge Moraines are formed as supraglacial lateral moraines on both slopes of the Beli Iskar Glacier. West of the geosite is situated Geosite Skakavitsa including the second highest peak in Skakavitsa share of Rila Mountain Golyam Skakavets (2706 m). West of the geosite is the beautiful alpine landscape of Skakavitsa – deep cirques formed the pyramidal peaks of Golyam Skakavets (2706 m) and Malak Skakavets (2670 m) and wooded eastern slope of Zeleni Rid (Green Ridge). In the floor of the valley flows Beli Iskar River, which together with Cherni Iskar River gives rise to the longest Bulgarian river – Iskar River. Two kilometers east of the geosite is situated Musala Peak (2925 m), the highest peak in the Balkans.

Sensitivity and protection measures

The geosite is located in a restricted area because of the status of Beli Iskar Dam as a source of drinking water. The area itself is on the territory of the National Park Rila with restricted measures, according to the requirements of such category protected areas. Quarrying and other mining activities are forbidden in the whole park area.

Access

The access to the geosite is easily feasible on the road from Beli Iskar village to Beli Iskar Dam which is asphalt paved up to the entrance of Rila central reserve. It is part of the mountain road traversed through Dzhanka Pass in the early 20 century to connect Samokov with Yakoruda, Belitsa and Razlog.

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