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Paleoclimate reconstruction using cave deposits from Romania and Bulgaria: Preliminary results of joint research project

Палеоклиматични реконструкции с използване на пещерни отложения от Румъния и България: предварителни резултати от съвместен научен проект

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In recent decades, the importance of the cave sediments as indicators for paleoclimatic and paleoseismological reconstruction has increased. Caves are known as repositories for a vast array of deposits that bear paleoclimatic and paleoenvironmental significance. The karst caves are a relatively constant environment where records of climatic and tectonic changes are well preserved through the Quaternary. Nowadays the speleothems, cave sediments, and fossil remains from caves are between the most correct proxy records to reconstruct the past climate changes and paleoseismic events.

The beginning of the exploration of the caves in Bulgaria and Romania began in the late 19th and early 20th centuries and was related to the famous names of Karel and Herman Škorpil and of Emil Racoviţă, respectively. The research of the brothers Škorpil on the underground rivers and caves in Bulgaria is between the first published karst monographs in the Édouard-Alfred Martel's famous French journal "Spelunca" in Paris (Škorpil, Škorpil, 1898). The founder of Romanian speleology Emil Racoviţă introduced the term "biospeleology" in the literature and formalized the study of cave fauna as a new science (Racovitza, 1907).

In 2018, a joint research project started between the Geological Institute of the Bulgarian Academy of Sciences and the Institute of Speleology of the Romanian Academy of Sciences. The project is the first dealing with paleoclimatic changes based on cave deposits between the two Academies. The project leaders Dr. Silviu Constantin and Dr. Konstantin Kostov have been known each other since 1991 after common cave expeditions in Romania and Bulgaria and several subsequent scientific meetings. This report presents the preliminary results of the joint fieldwork of the two teams in the caves Mishin Kamik and Duhlata, Bulgaria.

The Mishin Kamik Cave is entirely phreatic cave with total length of 695 m. The cave is developed in Lower Cretaceous limestone. The entrance is situated near the village of Gorna Luka, on the right bank of Prevalska Ogosta River, NW Bulgaria, 30 m above the local base level. The formation of the cave can be associated with the sharp incision of the river at the beginning of the Quaternary. It is a protected national geosite since 1962.

This maze cave has two main directions – west and south. The labyrinth character is mainly due to the numerous columns that fill two large chambers. The average height of the galleries is 2.2 m. The speleothems are represented by stalactites, stalagmites, columns, draperies and rimstone dams. Most of them are massive and dry (Kostov et al., 2018).

A characteristic feature of Mishin Kamik Cave is the presence of buried speleothems, such as small stalagmites up to 5 cm high and flowstone with thickness up to 10 cm, which implies multiphase speleogenesis – an alternation of dry and humid periods with intense speleothem deposition. Sedimentological profile with depth of 67 cm at the entrance parts of the cave was sampled and submit-

Fig. 1. Sampling of speleothems in Mishin Kamik Cave, NW Bulgaria

ted to grain-size analyses. An alternation of clayey silts and sandy-clayey silts with silty sands represents the sedimentary fill of the cave and proves the alternation of dry and humid periods. Samples of small buried stalagmites and flowstone were taken for further analyses (Fig. 1).

The longest Bulgarian cave Duhlata is located in Bosnek karst region on the south slope of Vitosha Natural Park. The carbonate rocks of Bosnek region cover an area of 23 km² and are about 200 m thick (Shanov et al., 2001). The small main entrance of the cave is on the right bank of Struma River, 6 m above the river. The total length of the surveyed galleries of this complicated multileveled maze system is 18 200 m with denivelation of 70 m. The cave is developed in Middle Triassic limestone and is a protected natural monument since 1962.

Duhlata is still active cave – seven underground rivers are established in the system, drained by the spring in the village of Bosnek with attitude of 918 m a.s.l. The sediments are presented by fluvial deposits (sands and clay) and variety of different speleothems: stalactites, stalagmites, flowstones, helictites, anthodites, etc. In Duhlata Cave we performed sampling of speleothems suitable for paleoclimatic studies – flowstone with thickness up to 5 cm. The samples are taken from deep parts of the cave where the temperature is almost constant.

In order to clarify the genesis of both caves, their sediments and paleoclimatic conditions, further detailed studies, as well as absolute U/Th dating of collected speleothem samples, are necessary.

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