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SIMULATION OF MIGRATION OF NITRATE CONTAMINATION IN EPIKARST GROUNDWATER: A COLUMN LABORATORY METHOD

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The epikarst is a part of the karst outcrop that is located within the unsaturated zone of karst aquifer and represents a complex point of contact and mixing of unconsolidated material from the terrain surface, remains of carbonate rocks altered by corrosive water, flora and fauna, and their remains, which is partially saturated with groundwater. The study area for the applied multidisciplinary research was the karst massif of Suva Planina Mountain (Serbia), that is the part of the Carpathian-Balkan Mountain range. Among many other conducted research, the Na-fluorescein dye tracing test at Peč cave determined the velocity of the epikarst (subsurface) flow, while the experiment with contaminant, at the same location, defined the velocity of the contaminant migration. The data collected in the field, during the dye tracing experiment and experiment with "light" contaminant, were used for the design and development of a physical model of epikarst for experiments in laboratory conditions. During the experiment in the model of epikarst in laboratory conditions a contaminant of chemical origin: Ammonium nitrate, artificial nitrogen-based fertilizer was used. The concentration of nitrate in the contaminant (water solution) was 1160 mg/l and the specific electrical conductivity was 3070 μS/cm. During the experiment, nitrate concentration and specific electrical conductivity values were monitored every two hours until the epikarst model was completely discharged. The diagram of specific electrical conductivity showed that models of different epikarst composition react differently to the contaminant. However, in both models, the specific conductivity had an increased value in the first sample taken after the contaminant was introduced in the model. Mixing of two solutions (contaminated water and water in the model) resulted in quickly established balance. In terms of nitrate concentration in models, increased concentration has been recorded as well. Theoretically, the equilibrium concentration of nitrate in the models, in which the contaminant and "pure" water are mixed, is achieved, while small discrepancies originate from the present adsorption of nitrate on limestone rocks, but also from the mobilization of nitrate from soil particles. Experiments in the synthetic model of epikarst

have shown that it is possible to simulate the groundwater seepage through epikarst in conditions as natural one at the Peč cave site.

Key words: epikarst, model, nitrate, electrical conductivity