VULCANOKARST: A ROMANIAN CONTRIBUTION TO SPELEOLOGY

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Abstract

The term vulcanokarst has been introduced in the scientific literature by Naum and coworkers (1962) in a pioneering article published in Romanian entitled “The vulcanokarst in the Calimani Massif (East Carpathians)”. The sense of the term “karst” has been broadened towards the domain of volcanic rocks by this conceptual contribution. The authors describe geomorphologic features observed on volcanic rocks (lava flows and pyroclastics) which they identify with karst. Features belonging to both exokarst (“surface karst” in author’s terminology) and endokarst (“deep karst”) have been recorded. The “surface karst” develops on ancient (ca. 7 Ma old) weathered pyroxene andesite lava flow surfaces and along platy cooling joints by enlargement of fissures and other mechanical discontinuities. Alveolar voids lending a cellular appearance to the rocks - actually gas-escape vesicles of the lava - are mistakenly interpreted as a result of alteration and removal of feldspar crystal. It is disputable to what extent gas-vesicles in lava are enlarged by dissolving action of water. Other surface karst features include “dolinas” 5-7 m across, 2-3 m deep, developed on pyroclastic rocks affected by strong silicic and argillic hydrothermal alteration processes as a result of collapse of the roofs of subsurface voids. "Deep karst" consists of caves encountered in pyroclastic rocks strongly affected by hydrothermal alteration processes. Three main caves - Chaos Cave (48 + 77 m long, up to 6 m high), Chocolate Cave (33 m long, up to 2.5 m high) and Ruins Cave (>60 m long, 3-30 m wide, 2-2 m high) - and their formations have been described in great detail. Spectacular constructional features such as limonite crusts, stalactites, stalactites and draperies, were present in the Chocolate Cave. The origin of the limonite formations is explained by leaching of Fe-rich minerals of the andesite by CO_2-charged infiltration waters, oxidation of Fe^{2+} and its dissolution in the bicarbonate waters, and subsequent deposition of Fe-hydroxide gel by oversaturation and evaporation.
Although more descriptive than explanatory, the paper by Naum et al. (1962) correctly identifies the possibility of karst process development in volcanic rocks. At our present-day knowledge one can explain more accurately the formation of voids by dissolution of volcanic rocks, either lava or pyroclastic in origin, by hydrothermal solutions through acid leaching, using original rock permeability.
Unfortunately, the caves, as the most important testimony of the vulcanokarst at its type locality, described by Naum et al. (1962), have been destroyed during sulfur exploration work in the Calimani Mts. during the 70' s.

Reference

- NAUM T., BUTNARU E., GIURESCU M., 1962: *Vulcanokarstul din masivul Calimanului (Carpatii Orientali)*. An. Univ. Bucuresti, Ser. St. Nat., Geologie-Geografie, 32, p. 143-179