MODAL ANALYSIS AND GEOCHEMISTRY OF PYROXENE ANDESITES NEAR SÁROSPATAK TOWN (TOKAJ MOUNTAINS, NE HUNGARY)

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Abstract: Volcanological origin of the pyroxene andesite hills near Sárospatak town has not cleared yet. Some authors regard them as subvolcanic bodies or dykes, while others supposed them to be remnants of a large lava flow. According to our studies, these hills are erosional remnants of several lava flows coming from the Tolcsva-Feketehegy volcanic centre situated in NW of Sárospatak town.

Key words: modal analysis, andesite, Tokaj Mountains

Introduction

The Tokaj Mountains (NE Hungary) is the southern part of the Prešov-Tokaj Range. The rocks of the mountains represent almost the entire calc-alkali volcanic series: andesite, dacite, rhyolite and their tuffs (Fig. 1). The mountains are built up by strongly eroded Sarmatian, Badenian, and Pannonian volcanic cones, laccoliths, lava flows, etc. In several cases, however, the original volcanic structure can be hardly recognised. The different interpretations of the geomorphologic features of the andesite hills near Sárospatak town clearly show the difficulties of volcanomorphological reconstruction in the mountains. Some researchers described these small andesite bodies as laccoliths (e.g., Lengyel, 1959), while others (e.g., Gyarmati, 1977) suggested them to be remnants of a former extent lava flow. To answer this question, field observations, microscopic modal analysis as well as geochemical analysis has being performed.

Methods

For the determination of the grain size distribution and mineralogical composition of the andesitic rocks of the hills, the modified Rosiwal's linear methods was applied Járai et al., 1997) using a NIKON Microphot-SA polarizing microscope. The measured values of each mineral constituent were divided into the following classes: <10 μm (regarded as groundmass), 10–100 μm, 100–500 μm, 500–1000 μm, and >1000 μm. The major element content of the samples was determined by classic method. The rare earth elements were analysed by inductively coupled plasma-mass spectrometry (ICP–MS) on a Hewlett-Packard 4500 at the Bálint Analitika Ltd., Budapest.

Results

The field observations were mainly performed in abandoned quarries. The jointing structure of the andesitic bodies does not show concentric and radial fractures ("onion-skin") typical for laccoliths. Moreover, slab jointing and coarse blocks characteristic for lava flows occur. One case, transition of slab jointing into a chaotic structure resembling an accumulated lava front can be also observed.

The field experiences are supported by the microscopic studies. The texture and the mineralogical composition of the samples coming from different andesitic bodies are quite uniform. Accordingly, their major and rare earth element compositions are also very similar (see Table 1 and 2). The REE pattern of the samples is also uniform. Their lines make a distinct group that differs from the line of another andesite from the Tokaj Mountains. The grain-size distribution and the silica content of the samples were evaluated in a groundmass versus SiO_2 diagram, which can be used for distinction of volcanic and hypabyssal rocks (Rózsa and Papp, 1996). Each point of the samples fall into the volcanic field.

Conclusions

On the basis of our studies, subvolcanic origin of the andesitic hills near Sárospatak town can be excluded, and they can be hardly regarded as dykes. Evaluations of the field observations as well as the microscopic and geochemical analyses suggest that these pyroxene andesite bodies are remnants of a former lava field formed by

several lava flows. The possible direction of these lava flows indicates that they came from the Tolcsva-Feketehegy (NW of Sárospatak), which is supposed to be a volcanic centre (Zelenka, 2000).

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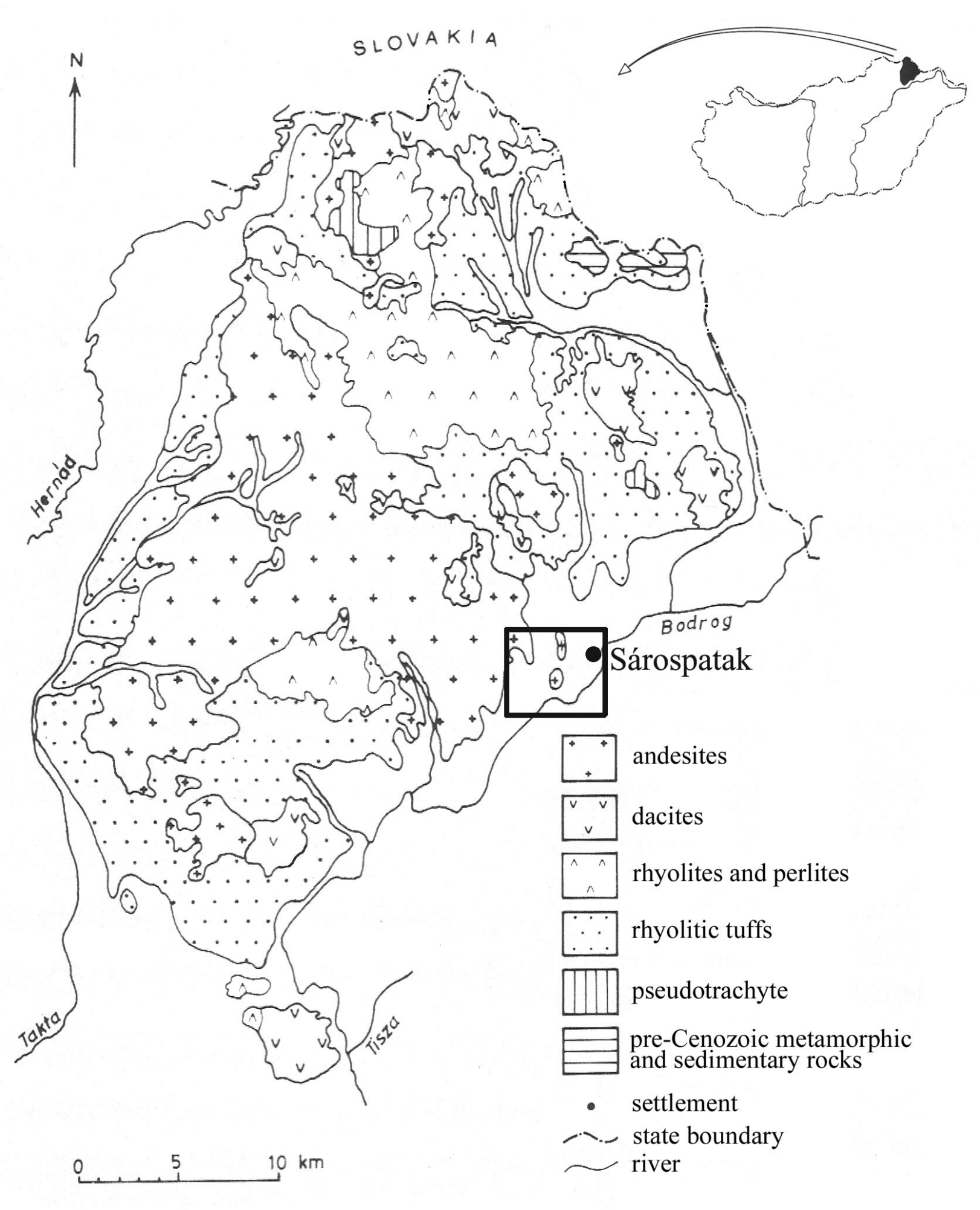
Figure 1: Geological sketch map of the Tokaj Mountains.


SLOVAKIA
N
Hernád
Bodrog
Sárospatak
Takta
Tisza
andesites
dacites
rhyolites and perlites
rhyolitic tuffs
pseudotrachyte
pre-Cenozoic metamorphic and sedimentary rocks
settlement
state boundary
river
0
5
10 km