MIDDLE MIOCENE ACIDIC VOLCANISM FROM MARAMUREŞ BASIN (NORTHERN ROMANIA)

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Abstract: Maramures Basin is situated in the northern part of Romania, eastern from Gutai Mts. It is covered by Badenian and Sarmatian sedimentary deposits, interlayered with sequences of acid volcaniclastics of pyroclastic origin. Preliminary results on the Badenian acid volcaniclastics, known as "Barsana zeolitic tuff", emphasize complex intrabasinal relationships between syn- eruptive and post- eruptive resedimented pyroclastics generated by magmatic explosions.

Key words: Badenian, Barsana tuff, magmatic explosions, pyroclastic flows, fallout tuff, resedimented

Geological setting

Maramures Basin represents a major geological unit situated in the northern part of Romania, eastern from the volcanic ediffice of Gutai Mts. (Fig. 1) The area is dominated by Paleogene

and Neogene deposits. The Paleogene deposits belong to Petrova Nappe and consist of Eocene (Middle and Upper) flysch (Sandulescu et al, 1993). Neogene deposits are represented by Badenian and Sarmatian deposits. Badenian deposits, with a total thickness of 1000 m, are composed of mudstones and sandstones interlayered with thick sequences of acid volcaniclastics of pyroclastic origin. Locally, they contain lenses of salt and gypsum. Sarmatian deposits consist of mudstones with thin intercalations of sandstones and acid volcaniclastics of pyroclastic origin. The area bears the influence of local tectonics, which folded and uplifted the Paleogene deposits and filled the lower areas with Neogene deposits. There is also an extensional tectonics, which may be integrated in the areal tectonics of the Carpatho-Pannonian Region.

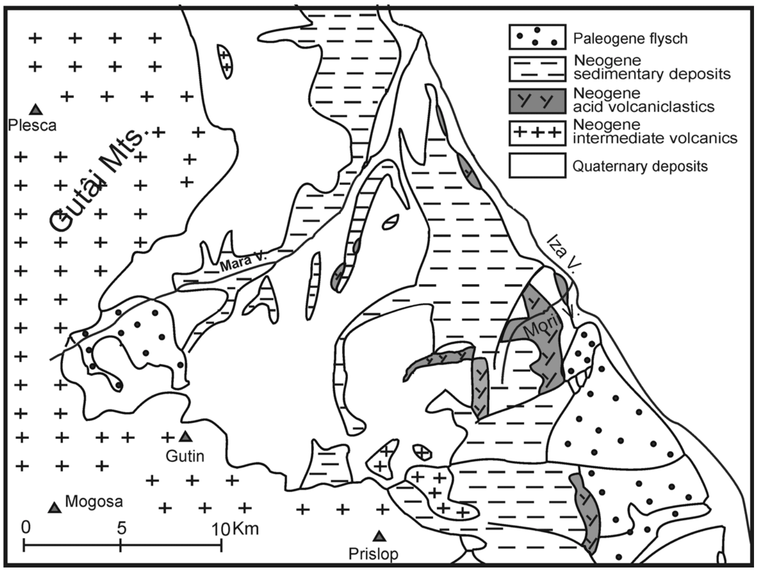

Fig. 1 Geological sketch of Maramures Basin

Aim and method

The paper presents some preliminary data from a more complex study about the so-called “Barsana tuff” from Maramures Basin. It is focused on Badenian volcaniclastic and sedimentary deposits from Morii valley, central part of the basin (Fig.1). This study puts an emphasis on the origin of the tuffs, on the involved genetical processes and the subsequent depositional mechanisms in submarine environment. The facies analysis combines the fieldwork with a detailed microscopical study and microfaunal determinations, in order to connect volcanological and sedimentological processes with the inferred depositional environment.

Preliminary results

The fieldwork emphasized a thick succession of co- genetic acid volcaniclastics of pyroclastic origin and sedimentary deposits. The succession has been divided into three different megasequences, based on lithology and spatial relationships (Fig. 2).

The lower megasequence is composed of lapilli tuffs which form a thinning and fining upwards sequence, gradationally covered by coarse and fine tuffs (Fig. 2a). The terminology reflects the pyroclastic origin of the components and the different grainsizes. These components are pumice clasts, crystals of plagioclase, quartz and biotite, glass shards, compact vitric clasts and accidental quartzites. Most of the glass shards have needle- like shapes, suggesting fragments from fibrous pumice clasts but cuspate, X- and Y- shaped morphologies are also present (Fig. 6).

Lapilli tuffs form at least five units with 15 m visible thickness, each unit sharply separated from the other and preserving remnants of plants on stratification (Fig. 3). They are unsorted, matrix- supported rocks composed of pumice clasts and crystal- rich matrix (Fig. 5), with abundant soft mud clasts and massive structure.

Lapilli tuffs units are grading into coarse tuffs and fine tuffs, respectively (Fig. 4). The coarse tuffs are enriched in crystals showing good sorting and massive structure. They represent transitional terms to fine tuffs, finely laminated well-sorted zeolitic tuffs (Fig. 6), having tens of meters of visible thickness.

Lapilli tuffs show the internal organization of pyroclastic flows and the lithology of ignimbrites but lack the evidence of hot state deposition. They are resedimented pyroclastic flows (McPhie et al, 1993), the syn- eruptive subaqueous equivalents of subaerial ignimbrites, transformed from gas-supported to water- supported mass flows (Cas and Wright, 1991) and emplaced by progressive aggradation. The continental origin is supported by the plant remnants and the subaqueous emplacement is assessed by the hydroplastic interaction with the underlain mudstones, proved by the abundant, oriented soft mud clasts.

The coarse and fine tuffs are fallout deposits emplaced from the ash cloud that overlain the basal flows. The flow separation is stronger in subaqueous environment, allowing the upper concentration of ash into the ash cloud. The hydraulic sorting is therefore responsible for the sequence of crystal- rich and zeolitized glass shards- rich layers, emplaced from the ash cloud.

The second megasequence, with more than 20 m thickness (Fig. 2b), is composed of three terms, less than 1 m thick each one: massive sandstones, a sequence of mudstones and sandstones finely interlayered and mudstones which incorporate the other two; they seem to form rithmic alternations but actually they are interfingering suggesting a dynamic interaction in a plastic state. The massive tuffaceous sandstones contain soft mud clasts and preserve basal loadcasting structures suggesting channelized post- eruptive resedimented fluidized mass flows (Lowe, 1976; McPhie et al, 1993). The rithmic alternations of finely grained sandstones and mudstones, 1- 2 cm thick each layer and preserving plant remnants on lamination, suggest overbank deposits. They show hydroplastic structures suggesting their remobilization in an unconsolidated state. The second megasequence is probably the result of submarine slumping and sliding of both channel and overbank deposits.

The third megasequence is composed of fine zeolitic tuff, similar with the last term of the first megasequence (Fig. 2c). It shows loadcast structures and contains mud pebbles. Some diffuse water- escape structures pass to a massive structure and an upper horizontal lamination. Laterally, blocks of laminated tuff are incorporated in mudstone matrix. The third megasequence seems to be the result of submarine slumping and sliding, entraining both the pyroclastic debris (zeolitized glass shards) and lithified zeolitic tuffs.

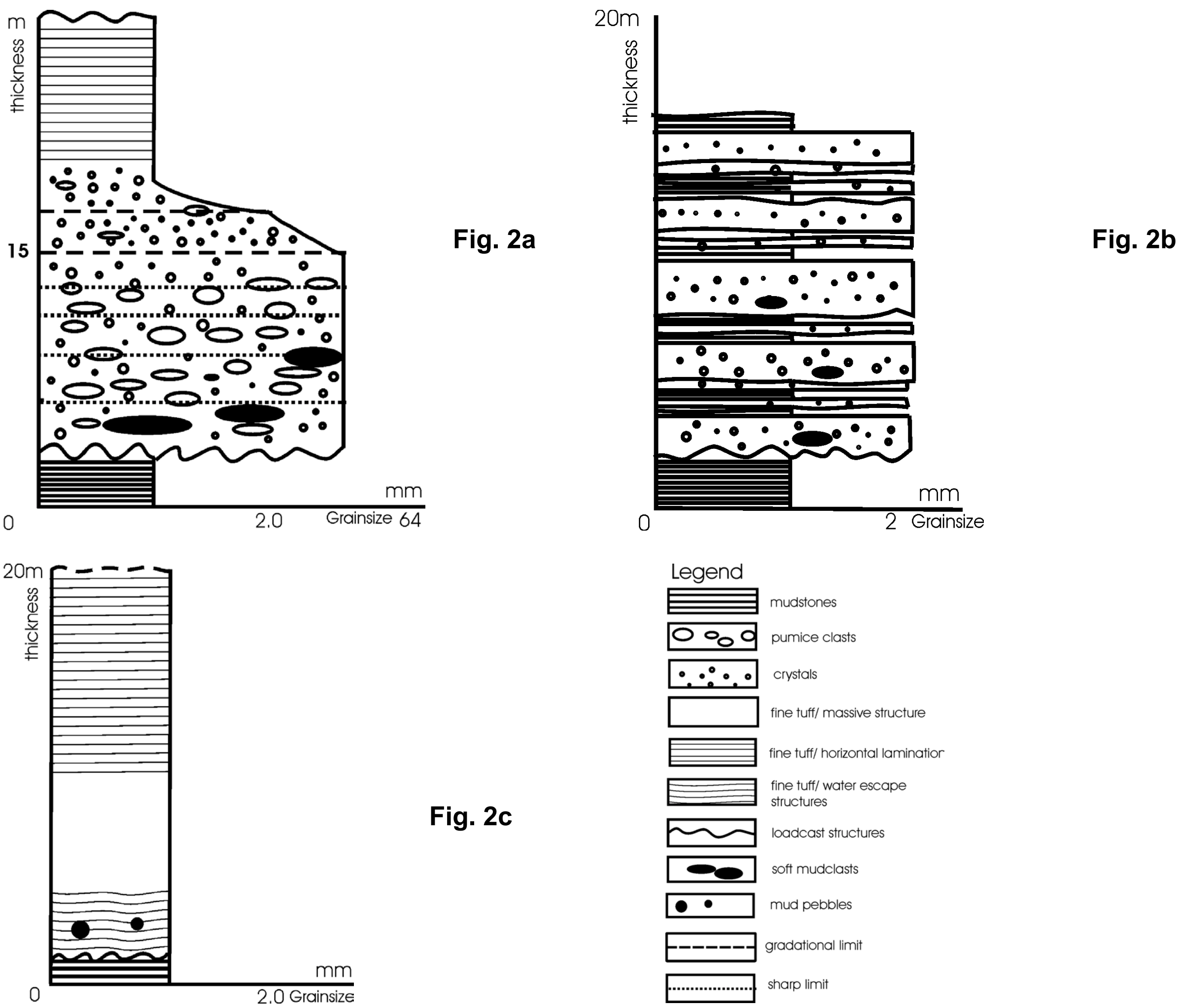

Fig. 2 Lithological columns of the three megasequences from Morii valley, Maramures Basin

Conclusions

The fieldwork on Morii valley and the microscopical study allow forwarding some conclusions concerning pre- eruptive mechanisms, type of explosions and the impact of the submarine environment on transport and emplacement.

Magmatic explosions involved an acidic, volatile- rich magma that vesiculated in depth and modified the original shapes of the vesicles during a long subsequent flow, prior to explosions (Heiken, Wohletz, 1991). Pyroclastic flows/ ignimbrites have been generated but they underwent strong flow transformation mixing with water during the submarine emplacement and becoming syn- eruptive resedimented pyroclastic flows. The coarse and fine tuffs are the expression of deposition from the stratified ash cloud, progressively enriched and hydraulically sorted.

The deposition of the fine ash was interrupted by a megasequence triggered by post- eruptive slides and slumps of channel and overbank deposits. Finally, the submarine slumping and sliding entrained large amounts of zeolitized ash and zeolitic tuffs, ending the complex succession from Morii valley.

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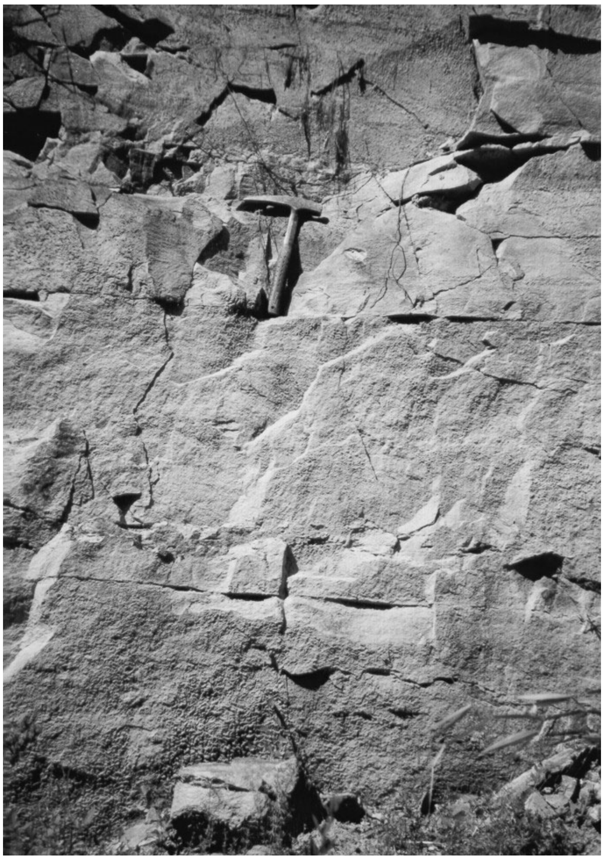

Fig. 3 Three units of lapilli tuffs
(resedimented pyroclastic flows)

Fig. 4 Fine and coarse fallout tuffs

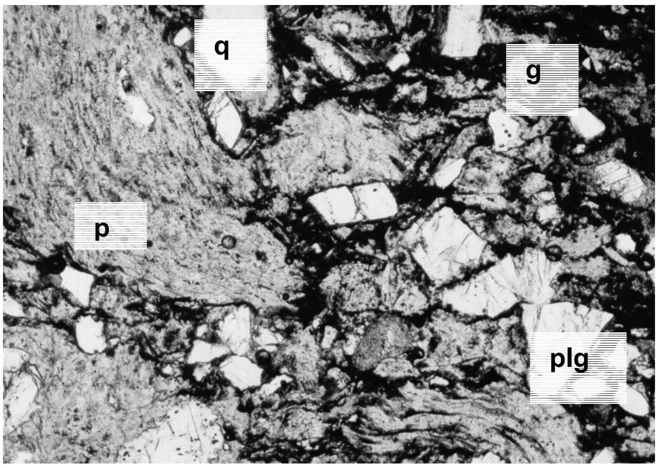

Fig. 5 Microphotograph of lapilli tuff: pumice clasts (p), quartz (q), plagioclase (plg) and glass shards (g); NII, 50 X

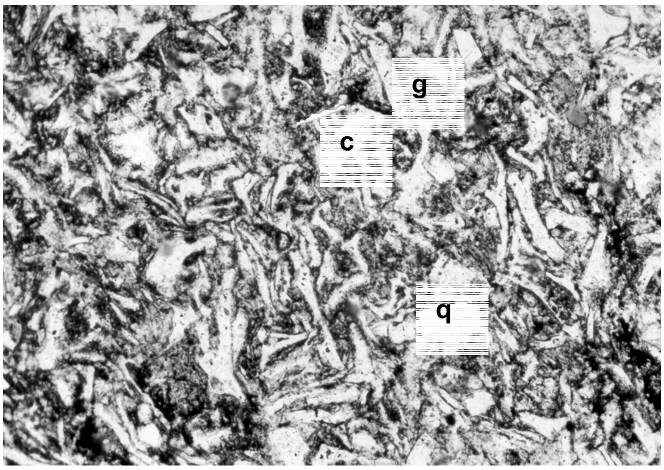

Fig. 6 Microphotograph of fine tuff: needle- like glass shards (g), cuspate glass shards (c), quartz (q); NII, 25 X