

NEOGENE VOLCANISM IN OAS MTS., EASTERN CARPATHIANS, ROMANIA

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Abstract: Oas Mts., the northernmost part of Neogene volcanic chain of Romanian Eastern Carpathians, consist of a thick pile of volcanics and sedimentary deposits. Buried acidic pyroclastics record a Badenian-Sarmatian explosive (extensional type) volcanism. Intermediate (arc-type) volcanism, the main phase, developed during Sarmatian and Pannonian (12.9-9.5 Ma), is represented by pyroxene dacites and andesites. Domes, volcano-tectonic depression effusive fillings and effusive cones are the typical structures.

Keywords: calc-alkaline volcanism, dome-building, hyaloclastites, Neogene, submarine

1. Geological setting

Oas Mts. represent the northernmost part of the Neogene-Quaternary volcanic chain of Romanian Eastern Carpathians (Fig.1). Its pre-Neogene basement is composed of Inner and

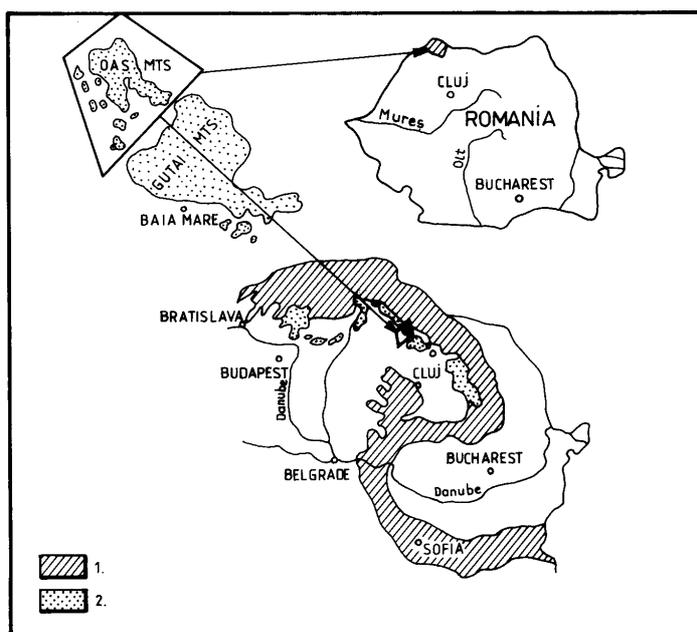


Fig. 1 Sketch of the Carpatho-Balkan Orogenic Belt, Romania and Oas-Gutai Mts.;

1. Carpathian and Balkanic units related to Alpine Orogenic and Flysch Belts;
2. Neogene volcanic rocks

Median Dacides (Precambrian metamorphic formations) and Pienides (overthrust nappes mainly composed of Paleogene flysch-type deposits), as major units (Sandulescu et al, 1993). The Neogene sedimentary cover consists of Badenian deposits identified only in boreholes, Sarmatian and predominantly Pannonian deposits, well-developed all over the area, formed in the frame of the evolution of the Neogene Oas Basin.

Volcanic evolution is directly connected to the Miocene tectonics of the Carpatho-Pannonian Region, involving the subduction of the European Plate beneath Alcapa and Tisza-Dacia microplates and the hinterland extensional reply in the Pannonian Basin (Csontos, 1995). Oas Mts. have been built up from Badenian to Pannonian and consist of a thick pile of acidic and intermediate volcanics, interlayered with sedimentary deposits.

2. Volcanic activity

Two types of volcanism had developed in Oas Mts.: a buried acidic calc-alkaline (extensional-type) one of explosive origin and an intermediate calc-alkaline (arc-type) one of extrusive and intrusive origin. The arc-type intermediate volcanism represents the main phase of the volcanic activity, responsible for most of the outcropping volcanic structures of Oas Mts.

2.1. Time and space evolution

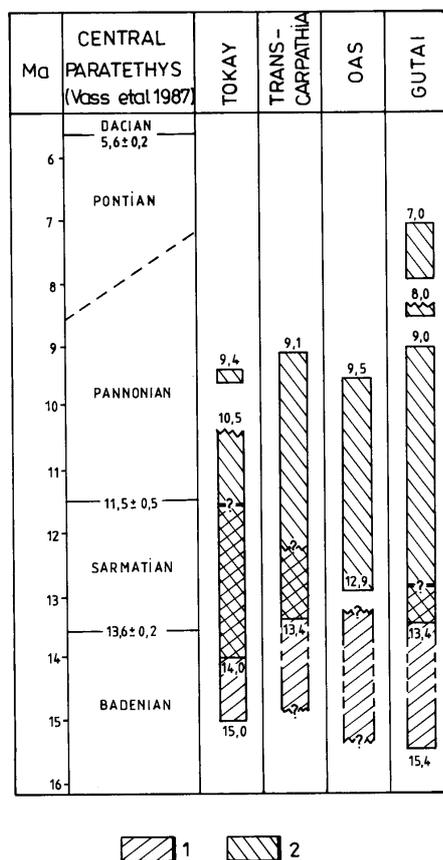


Fig. 2 Geochronological evolution of Neogene volcanism from Oas Mts. and neighbour regions;

1. Acidic calc-alkaline volcanism;
 2. Intermediate calc-alkaline volcanism;
 K-Ar ages are from: Edelstein et al, (1993), Pécskay et al (1994, 1995, 2000), Kovacs et al, (1997)

Acidic volcanism had developed in the central part of Oas Mts. and spread in time from Upper Badenian to Early Sarmatian, according to paleontological data (Fulop, Crihan, in press). It has been identified exclusively in boreholes, as volcanoclastics of pyroclastic origin.

Intermediate volcanism had developed in the whole area of Oas Mts., during Sarmatian and Pannonian (12.9-9.5 Ma, Pecskey et al, 1995a, b, Kovacs et al, 1997a, b-Fig. 2). The only two occurrences of Sarmatian volcanics are Magura-Batarci dacitic extrusive dome of 12.9 Ma and Calinesti "Tuff" (dacitic pyroclastic flows of 12.0 Ma). The main volcanic activity took place during a very short time interval (11.0-9.5 Ma) including extrusive and intrusive events. The paroxysm of the volcanism in Oas Mts. is contemporaneous with the climax of Gutai Mts. volcanism and partly of Tokay Mts. and Transcarpathia volcanic activity.

2.2 Petrology

Acidic buried volcanics consist of rhyolitic volcanoclastics. The intermediate volcanics are represented by basaltic andesites, andesites and dacites; the only rhyolites form Orasu Nou extrusive dome. Pyroxene andesites and dacites are predominant; as a peculiarity, dacites, components of most of the extrusive domes, have an exclusive pyroxene character.

The shallow-level intravolcanic and subvolcanic intrusions have a varied petrographic character: andesites, basaltic andesites, dacites and porphyry microdiorites, monzodiorites and quartz diorites with pyroxene or with pyroxene and amphibole (Jude, 1977).

The calc-alkaline predominant medium-K character of the intermediate arc-type volcanism is emphasized by major elements geochemistry. Fractional crystallization and crustal assimilation ($^{87}\text{Sr} / ^{86}\text{Sr}=0.7057-0.7120$, Rb=50-170, Seghedi et al, 1995) were the major processes involved in the petrogenesis of Oas Mts. volcanics.

2.3. Volcanological features

An ignimbritic volcanism had been responsible for the first volcanic products of Oas Mts. (buried acidic volcanism). Most of the acidic volcanoclastics represent

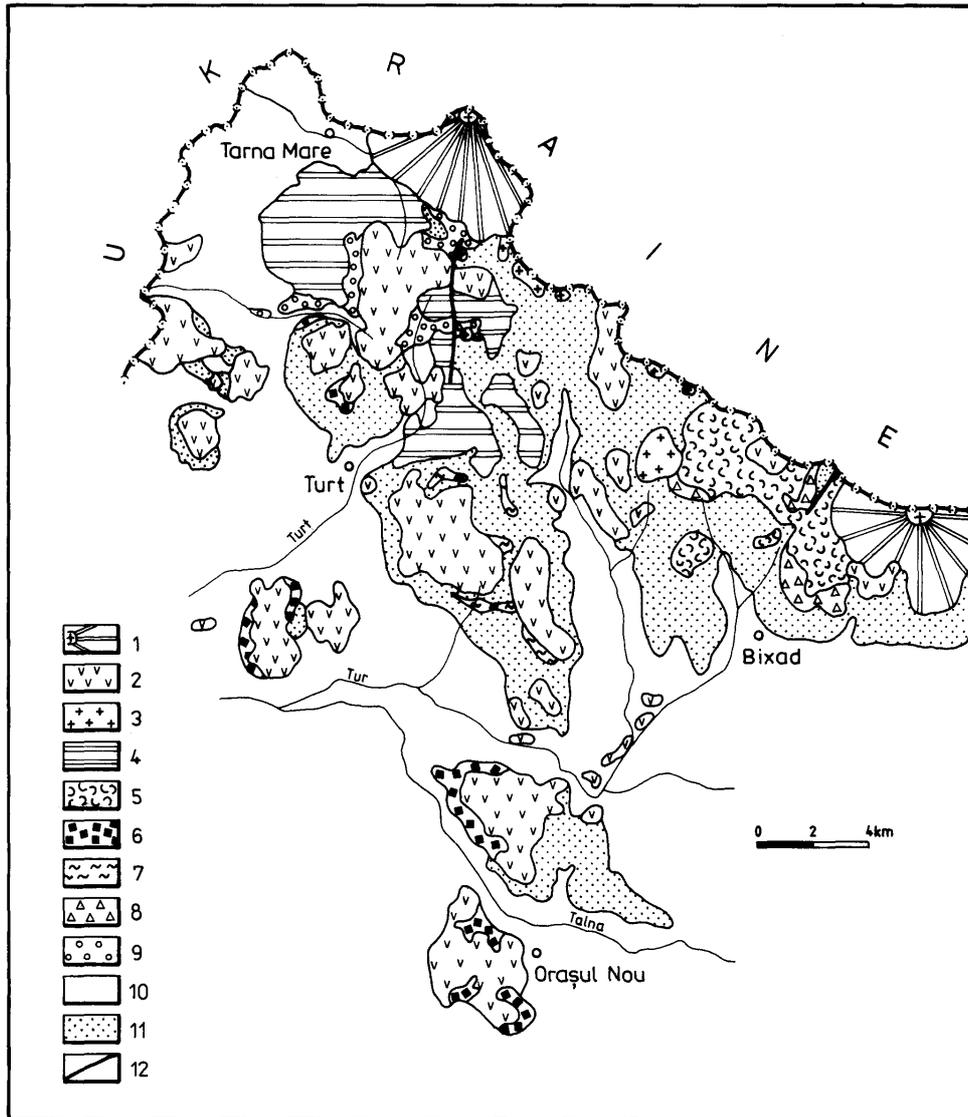


Fig. 3 Volcanological map of Oas Mts.: 1. Effusive cones; 2. Extrusive domes; 3. Intrusions; 4. Volcano-tectonic depression effusive filling; 5. Lava flows (unknown centres); 6. Hyaloclastic deposits; 7. Pyroclast-rich mass flow deposits; 8. Coarse volcanoclastics; 9. Fine volcanoclastics; 10. Quaternary; 11. Neogene sedimentary deposits; 12. Faults.

post-volcanic resedimented mass-flow deposits, recording the emplacement of pyroclastic debris in marine, quiet waters, some time after the explosive events. A single Sarmatian event had been recorded by syn-eruptive resedimented pyroclastic flow deposits. The resedimented, subaqueous character of pyroclastics was emphasized by facies characteristics and direct spatial connections with sedimentary deposits (Fulop, Crihan, in press).

The intermediate volcanism was connected to dome-building, effusive cones and volcano-tectonic depressions effusive filling, developed mainly in submarine environment. The dome-building phase was dominant: domes, dome-coulees and complexes of domes, composed mainly of acidic volcanics, form the outstanding feature of Oas Mts. (Fig. 3). Associated volcanoclastics are represented by in situ and resedimented hyaloclastites, primary and reworked pyroclastic flows, often interbedded with sedimentary deposits; they show a wide range of processes, from quench fragmentation to phreatomagmatic explosions and emplacement mechanisms focused on mass flows and involving water (Fulop, Kovacs, 2000).

Thick andesitic lava flows and associated intravolcanic intrusions are related to some volcano-tectonic depressions from the north-central part of the volcanic area.

Less extended lava flows and associated volcanoclastics connected to effusive cones (crossing the border to the Transcarpathian region, in Ukraine) show processes derived from magma-water interaction and water-supported mass flow transport mechanisms.

Conclusions

Acidic calc-alkaline (extensional-type) volcanism of pyroclastic origin represents the first volcanic events from Oas Mts. Its products form thin layers encapsulated by mudstones, identified exclusively in boreholes, in the central part of the area (Upper Badenian-Early Sarmatian).

Oas Mts. were built up during Sarmatian and Pannonian, by intermediate calc-alkaline (arc-type) volcanism, combined with sedimentary processes. The intermediate volcanics consist mainly of medium K pyroxene andesites and dacites, with associated porphyritic type intrusions. Dome-building, associated with specific processes derived from the interaction with the subaqueous environment, was the dominant volcanic phase.

The paroxistic volcanic activity (11,0-9.5 Ma) of Oas Mts. corresponds with the climax of volcanism from Gutai Mts. and partly of the adjacent areas (Tokay, Vihorlat, Transcarpathia).

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