Small calc-alkaline volcanoes from the Oas-Gutâi Neogene volcanic area, Eastern Carpathians, Romania; contribution to the controversial monogenetic versus polygenetic classification

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The Oas-Gutâi Neogene volcanic area (OG) belongs to the inner volcanic arc of the Eastern Carpathians built up during complex Miocene subduction processes developed in the Carpathian-Pannonian region. A complex volcanism developed in OG during Miocene (15.4-7.0 Ma). The dominant intermediate calc-alkaline volcanic rocks (predominant medium-K andesites) are overlapping the previous felsic volcanic rocks (rhyolite ignimbrites). The small-sized volcanic forms (200 m to 5 km) related to the intermediate volcanism are mainly represented by solitary volcanoes surrounded by Neogene-Quaternary sedimentary deposits, generally emplaced outside of the main volcanic area, or by small volcanoes spatially associated with the large-sized, complex volcanic structures. These are extrusive domes, dome-coulées and cryptodomes comprised of andesites to rhyolites. The majority of the solitary volcanoes are monogenetic (simple-shape, small volume of magma, single petrographic rock-type) as those from Oas Mts., subaqueously emplaced along certain alignments (possibly tectonically-controlled fissures) oriented parallel with the volcanic arc. Others show petrographic complexity raising questions about the monogenetic or polygenetic genesis. In Oas Mts., the steep conical Jeleznic dome of ca. 4 km diameter, shows a discontinuous composition with pyroxene andesite in the western side and pyroxene hyalodacite in the eastern side. Two very small volcanic forms (ca. 300 m all together) joined in an extrusive dome (Turulung) are comprised of biotite dacite and pyroxene hyalodacite, respectively. In Gutâi Mts., two interconnected extrusive domes (Piatra Rosie-Dănesti), surrounded by Neogene-Quaternary sedimentary deposits, are comprised by pyroxene dacite and biotite dacite/ rhyolite, respectively. In the case of the small volcanoes developed inside the volcanic area and classified as "monogenetic", these show a well-defined morphology and specific volcanological and petrological features (e.g. Gutin and Breze extrusive domes). Others raise the question whether these are monogenetic or polygenetic: the Laleaua Albă small-sized (ca. 800 m) dome is comprised of a core of macroporphyric sanidine dacite (8.42$\pm$0.33 Ma) surrounded by an envelope of aphyric andesite (8.47$\pm$0.42 Ma); the Plesca Mare large-sized (ca. 3.5 km) dome is comprised of a well-developed biotite dacite (68.2 SiO_2) core, bordered by a biotite andesite (58.7 SiO_2). Although these features are the result of magma-mixing and -mingling processes, their eruptive history suggests at least two magmatic pulses/events possibly developed during the same near-continuous, short-lived volcanic activity. The problem of the "monogenetic" volcanoes in OG is aligned with the ongoing discussion about the criteria to be used to separate monogenetic versus polygenetic, as well as to define the size of so called "small monogenetic" volcanoes.