

Paleo-geomorphic evolution of the Ciomadul volcano (East Carpathians, Romania) using integrated volcanological, stratigraphical and radiometric data

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Ciomadul volcano is the youngest eruptive center of the Carpatho-Pannonian Region (CPR), located at the southernmost end of the Intra-Carpathian Volcanic Range, and within this, the Harghita Mountains in the East Carpathians. As a result of multi-disciplinary, ongoing studies (Karátson et al. 2013 and in review; Magyari et al. 2014; Veres et al. in prep.; Wulf et al. in review), we have obtained a number of constraints on the paleo-geomorphic evolution of the volcano. Our studies clarified that this volcano, a lava dome complex with a twin-crater (i.e. the older Mohos peat bog and the younger St. Ana lake), produced frequent explosive eruptions between 50 and 29 ky. As a result, a set of superimposed volcanic landforms were created, the chronology of which in some cases can be well constrained, in other cases further studies are required to infer their timing.

Ciomadul evolved as a moderately explosive dacitic dome complex possibly for several hundred ka (see controversial chronology in Karátson et al. 2013, Harangi et al. 2015 and Szakács et al. 2015), resulting in a set of adjoining lava domes and a central complex. There is no evidence for crater-forming eruptions during that time, although the possibility of moderate explosions cannot be ruled out. Field relations show that the first explosive products are phreatomagmatic tuff series, called Turia type, dated at ca. 50 ka. These tephra units could be linked to the formation of a "Paleo-Mohos" crater, and possibly to the northern half-caldera rim which consists of massive lava dome rock and hosts Ciomadul Mare, the highest point of the volcano (1300 m). After this first explosive activity, volcanism seems to have migrated toward the W, at the site of the later St. Ana crater. Following plinian eruption(s) at ca. 47-43 ka, the explosive activity went dormant, and a lava dome might have grown up in a possibly small "Proto-St. Ana" crater. At 31-32 ka, a succession of violent magmatic explosive eruptions occurred, called "TGS" (Targu Seciuesc) eruptions. Noteworthy, these products can be pointed out from drilling in the Mohos crater, inactive by that time, the tuff units being intercalated between lacustrine deposits. The TGS eruptions, further shaping St. Ana crater, started with lava dome disruption and pumiceous block-and-ash flows, and possibly terminated by a plinian event distributing pumice fall to the SE. Finally, after some ka dormancy, the youngest eruption of Ciomadul, again of phreatomagmatic type, took place at ca. 29 ka ("Latest St. Ana" eruption). Its products can be also recovered from Mohos crater, and at the same time they drape the landscape to the S and E. That this eruption was a really violent, crater-forming event, accounting for the relatively large crater of present-day St. Ana (~1600 m), can be explained by the wide distribution of this latest tephra, identified as far as 350 km from vent near Odessa ('Roxolany tephra').