

Genesis and magmatic evolution of a newly discovered resurgent caldera in Eastern Anatolia, Turkey

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This study presents our preliminary findings and results on a newly discovered and the largest caldera in the Eastern Anatolian collision zone in the framework of a recent project (TUBITAK Project #108Y222). The Ağırkaya caldera, as we named, is situated between Lake Van and the city of Ağrı. It has a crater with a diameter of 17 km. Its circular footprint area covers ~2,800 km² which is twice as big as that of the Ararat volcano. There are a series of volcanos overlying the slopes of the Ağırkaya caldera e.g. Meydan, Etrüsk and the Girekol. Given that both the maximum altitude of the rim and its elevated crater base in the middle are ~3200 m, it is a resurgent caldera. The original pre-collapse height of the Ağırkaya volcanic cone has been calculated to be ~5000 meters, almost as high as that of the Ararat volcano. K/Ar datings (5.3-5.7 Ma) published have revealed that it is Messinian in age. The pre-caldera lavas consist of benmoreite, dacite, trachyte and rhyolite which are intercalated with pyroclastic fall and flow units (e.g. welded and unwelded ignimbrite flareups) of similar compositions. Quartz syenitic/monzonitic stocks intruded sporadically along the ring fracture of the caldera. Post-caldera lavas are represented by basalts, trachybasalts, basaltic-trachyandesites and trachyandesites.

~2/3 of the volcanic products are alkaline while the rest is calc-alkaline in character. Magmas were originated from a subduction-modified mantle, linked to a slab steepening & breakoff event preceded by a continental collision. Major and trace element (e.g. Al₂O₃, K₂O, Sr and Ba) variations and our petrologic models (FC, AFC and mixing) indicate that the crystallization was dominated by feldspars ± amphibole ± biotite in a shallow but large magma chamber during the Messinian. The fractionation was accompanied by the assimilation of a significant amount of crustal material while this hybrid magma in the chamber was episodically replenished by the primitive basic magma, which possibly triggered powerful pyroclastic eruptions.