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Volcanic history and petrography of the Pliocene Etrüsk Stratovolcano, E Turkey

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The Pliocene Etrusk volcano, with its 3100 m elevation and ∼500 km2 area, is one of the major centers of the collision-related volcanism in E Anatolia. It is located in the northeast of Lake Van, sitting almost on the culmination of the "Lake Van dome" structure forming the vertex of the eastern Turkish high plateau (Sengor et al., 2008). A ∼5-km-wide horseshoe-shaped caldera, open to the south, is located in the center of the volcano. Apart from two trace element analyses and two K/Ar dates, there are virtually no data available in the literature on this major eruption center. Our study intends to fill this gap with a detailed petrographical, geochemical and geochronological study. Our new K/Ar age determinations indicate that the main volcanic edifice of the Etrusk volcano was formed in period between 4.3 and 3.9 Ma, with the eruption of several intermediate to acid lavas from a central vent. This phase ended up with the formation of a small collapse caldera that produced pyroclastic material emplaced on the earlier lavas. The final impulse of the volcano activity from the Etrusk volcanic center was the eruption of a post-caldera rhyolitic lava flow from the southern flank of the volcano (∼3.8-3.7 Ma). After about 2.7 Myr of magmatic quiescence, during the Quaternary time between ∼1 and 0.43 Ma, basalts erupted from the SW flank of the Etrusk volcano. They were generated predominantly from a ∼N-S extending fissure, as well as from a scoria cone (Karniyarik hill) and a maar-shaped volcanic center (i.e. Düzgeyikçukuru).
Edifice-forming products of the Etrüsk stratovolcano are represented by sanidine-plagioclase-biotite-clinopyroxene-phyric trachytes and plagioclase-clinopyroxene-orthopyroxene-phyric trachyandesites containing sporadic olivine phenocrysts. K-feldspar is the most abundant mineral phase in trachitic lavas of the Etrüsk volcanic system. Post caldera lavas, on the other hand, have relatively more evolved compositions ranging from trachydacite to rhyolite. All these units and also caldera walls are cut by a set of radial dykes. Both trachydacitic/rhyolitic lavas and radial dykes are made up of plagioclase, biotite and quartz phenocrysts. Some textures in the intermediate and felsic lavas (e.g. glass inclusions and sieve texture in plagioclase phenocrysts etc.) suggest that magma mixing might have been an important process in the magma chamber beneath Mt. Etrusk although such textures can also be related to the variations of volatile content of the magma. The Quaternary eruptions on the W flank of the Etrusk volcano are represented by plagioclase-olivine-clinopyroxene-phyric basalts.
Our geochemical database indicates that the edifice-forming trachitic lavas are alkaline in character whereas overlying thracyandesites and post caldera thrachydacites/rhyolites plot on the subalkaline-alkaline divide on TAS diagram, displaying transitional characteristics. Quaternary fissure eruptions in the SW of the volcano classify as subalkaline basalts. All these lavas display enrichment in LIL and LREE elements relative to HFS and HREE respectively. These characteristics may be a reflection of the composition of mantle source region, although the effects of magma chamber processes (e.g. AFC and mixing) on magma composition cannot be ruled out.

REFERENCE

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