GENESIS AND MAGMATIC EVOLUTION OF THE PLIOCENE ALADAĞ VOLCANIC SYSTEM (KARS, NE TURKEY)

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The study area is located on the southern edge of the Erzurum-Kars Volcanic Plateau (EKVP). This part of the plateau is known to have been formed by the eruptions during the Zanclean (~4.5 Ma) period, related an earlier continental collision event between Eurasian and Arabian continents ~15 Ma ago. The EKVP is composed mainly of andesitic and dacitic lavas and their trachytic aquivalents intercalated with acidic ignimbrites and tuffs. In the northwest of the study area, an eroded stratovolcano is present which is possibly coeval with the plateau. It consists of a thick sequence of rhyolitic lavas, tuffs, ignimbrites and perlitic-obsidian. The largest volcanic edifice in the study area is the Greater Aladağ Stratovolcano, which is composed of intermediate lavas with andesitic-dacitic-trachyandesitic compositions, erupted ~3.5 Ma (i.e. Piacenzian). A small volcanic cone, named in this study the Lesser Aladağ volcano, sits on the north flanks of the Greater Aladağ volcano. It consists of relatively more basic lavas: basaltic-andesites and basaltic trachyandesites. On the southeastern slope of the Greater Aladağ volcano, rhyolitic lava domes, cutting the Aladağ lavas are exposed.

The volcanic products in the study area are calc-alkaline in character with a clear subduction signature. Results of our petrological modelling studies have revealed that the fractional crystallisation combined with assimilation (i.e. AFC) was the dominant magmatic process. Our MELTS model studies indicate that the magmas that fed the Aladağ volcanic system were crystallised in two separate magma chambers located at two different depths in the upper crust, under pressures between 0.5 and 2 kbar. Our assimilation models based on the equations of DePaolo (1981) and Aitcheson & Forrest (1994) indicate that AFC was an important process for the intermediate and acid volcanic products in contrast to the basic volcanic units, which show negligible AFC. Our partial melting models indicate that the primitive basaltic magmas might have been derived from either a spinel peridotite or a phologopite spinel peridotite with melting degrees between 0.7% and 2%.