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Petrologic Evolution of Karayazı Basaltic Plateau: Mixture of melts-derived from both spinel and garnet lherzolite

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Collision-related volcanism in Eastern Anatolia spreads in a wide zone from the Erzurum-Kars Plateau in the northeast to the Karacadağ in the south. Volcanic activity in the region started 15 Ma ago (Middle Miocene) in the south of region following the continent-continent collision between Arabian and Eurasia plates, and continued up to historical times. Voluminous basaltic lava plateaus and basaltic lavas from local eruption centers occurred as a result of high production level of volcanism during the Pliocene time interval. Karayazı basatic lava area located in the Northeast of Turkey is one of the most important and largest basaltic plateau in the East Anatolia. This area which is named to be Karayazı basaltic plateau has covered an area of approximately 200 km2. Lavas of the Karayazı basaltic plateau are characterized with alkali and subalkali basalt erupted from different centers up to from Miocene to Quaternary times.

Lavas of the Karayazı basaltic plateau is characterized by alkali olivine basalts and subalkali basalts. These lavas are composed of olivine, plagioclase, augite and titanoaugite crystals and display porphyritic to aphyric textures. Sr, Nd and Hf isotopic compositions of the basaltic plateau vary between 0.703396-0.704976, 0.512730-0.512918 ve 0.282002-0.283029, respectively. MORB pattern of the lavas and isotopic composition imply that alkali and subalkali basalts erupted from Karayazı plateau could have been derived from a mantle source that had previously been enriched by a distinct subduction component.

A partial melting model was conducted to evaluate partial melting processes in mantle source of the alkali and subalkali basalts. Results of this model suggest the presence of both strongly spinel and slightly garnet peridotite in the source, a partial melting degree of 2-10 % and mixing of the derivative melts from them in the genesis of the Karayazı basaltic volcanism. All these findings indicate that the source region of the Karayazı basaltic volcanism might have been a mixture of melts derived from both astenospheric and lithospheric mantles, containing a distinct subduction signature.

Key Words: East Anatolia, Karayazı basalt plateau, Melting, Spinel, Garnet