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Adakitic- and lamproitic- like (?) source signatures in the Tertiary alkaline volcanics of Trabzon (NE Turkey) area: implications for petrogenesis and mantle source characteristics

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The Eastern Pontide Tertiary Volcanic Province (EPTVP) in NE Turkey is divided into two sub-provinces as a northern alkaline and a southern calcalkaline one on the basis of lithological and petrochemical differences. The Tertiary alkaline volcanics along the Black Sea coast in the Trabzon area are represented by (1) pyroclastics composing of breccias and tuffs; (2) basaltic dikes and sills, trachytic dikes, andesitic dikes and domes; (3) lavas composing of foid bearing brecciated lavas, pillow lavas and basaltic lavas (Yücel et al., 2009). Petrochemically, the volcanics have low to mildly alkaline affinities, and medium to high-K contents. Basaltic dikes and sills, basaltic lavas, pillow lavas, basaltic breccias are classified as basalt, trachy-basalt and basaltic trachy-andesite (BTB) suite; andesitic dikes and domes, trachytic dikes are described as trachyte and trachy-andesite (TT) suite; foid bearing brecciated lavas and foid bearing breccias are named as basanite-tephrite (BT) suite.

All these suites show subduction signature (fluids±melts) and some suites (especially BT suite) also exhibit enrichment in some incompatible elements, reflecting adakitic like source signature. The BT suite rocks differing from the BTB and TT suite rocks have high Sr/Y and La/Y ratios close to adakitic volcanics of Defant et al. (2002). Varying Sr/Y ratios and similar Y contents in all suite rocks may suggest different mantle source region but adakitic-like signature in the BT suite rocks may be related to (1) contribution of subduction melts and/or (2) lower crust assimilation-fractional crystallization (AFC). Adakitic indexes (Sr/Y, La/Yb, Na_2O, Sr, Al_2O_3) and Nb/Ta ratio versus SiO_2 fractionation index show varying degrees of correlations between the BT suite and other suites, revealing source signatures as well as AFC processes. Comparatively, high incompatible element (La, Ce, Sr, Ba, Th, Pb etc.) enrichment in the BT suite may be explained by a two staged enrichment in parental source; the first stage covers pre-collisional enriched mantle source component, and the second stage involves contribution of crustal melts/fluids to this enriched mantle source. The volcanics have common clinopyroxene and less phlogopite phenocrysts in modal mineralogy, and show generally potassic and locally low SiO_2 contents in composition; all of these features may correlate to those of collisional-post collisional orogenic lamproitic- potassic volcanics and/or –like source magmas. Al_2O_3, TiO_2, Nb, Zr, Th contents and K_2O/Na_2O ratio of the volcanics may reveal mainly subduction induced potassic volcanism. SiO_2 vs. CaO and K_2O/Al_2O_3, and Al_2O_3 vs. CaO lamproitic-potassic index corelations of the volcanics are similar to Group III Roman Province type of Foley et al. (1987). Furthermore, low K_2O/Al_2O_3 ratio ($<$0.6), and TiO_2($<$2%), Ni ($<$20 ppm) and Ba ($<$1100 ppm) contents of the volcanics may suggest "subduction related lamproitic-like potassic enrichment" rather than "a typical lamproitic parental magma".

Conclusively, adakitic- and lamproitic-like source signatures in Tertiary alkaline volcanics of NE Turkey may suggest an alkali metasomatism caused by metasomatic enrichment of lithospheric mantle by paleo-subduction induced fluids, and mixing of lower crust and upper mantle components in the collisional-postcollisional thickened crust-mantle transition zone, all of which will be better explained when ^{40}Ar-^{39}Ar dating and Sr-Nd-Pb isotopic data of the samples obtained.

References

Defant, M.J., Xu, J.F., Kepezhinskas, P.,Wang, Q., Zhang, Q. & Xiao, L. (2002) Adakites: some variations on a theme. Acta Petrological Sinica, 18, 129–142.

Foley, S.F., Venturelli, G., Gren, D.H. & Toscani, L. (1987) The ultrapotassic rocks: characteristics, classification, and constraints for petrogenetic models. Earth-Science Reviews, 24:81–134.

Yücel, C., Arslan, M., Temizel, İ. & Abdioğlu, E. (2009) Mineralogical-petrographical and volcanic facies characteristics of the Tertiary volcanic rocks between Trabzon and Giresun areas, Eastern Pontide Northern Zone, Turkey. 2^{nd} Int. Symp. on the Geology of the Black Sea Region Abstract Book, p.236.