Geophysical Research Abstracts
Vol. 17, EGU2015-14323, 2015
EGU General Assembly 2015

Petrological and geochemical constraints on the origin of mafic dykes intruding the composite Kaçkar Pluton from the eastern Blacksea magmatic arc, NE Turkey

Faruk Aydin (1), Simge Oguz (1), Rasim Baser (1), Ibrahim Uysal (1), Cüneyt Sen (1), Orhan Karsli (2), and Raif Kandemir (2)

(1) Karadeniz Technical University, Department of Geological Engineering, Trabzon, Turkey (faydin@ktu.edu.tr), (2) Recep Tayyip Erdoğan University, Department of Geological Engineering, Rize, Turkey

Geological, petrographical and geochemical data of mafic dykes intruding the composite Kaçkar Pluton from the eastern Blacksea magmatic arc (EBMA), NE Turkey, provide new insights into the nature of the metasomatizing agents in subcontinental lithospheric mantle beneath the region during the late Mesozoic-early Tertiary. Mafic dykes from the Çaykara and Hayrat (Trabzon), and also Ikizdere (Rize) areas from the northern margin of the EBMA consist of basalts, dolerites, lamprophyres (basic member) and lesser basaltic andesites and trachyandesites (evolved member). All dykes have no deformation and metamorphism. The outcrops of these dykes vary, with thickness from 0.2 to 10 m. and visible length from 3 to 20 m. In general, the mafic dykes dip steeply and cut directly across the Kaçkar Pluton, and show NW- and NE-trending, roughly parallel to the orientations of the EBMA main faults. Most of the dyke samples display subaphyric to porphyritic texture with phenocrysts of plagioclase (up to 10%), clinopyroxene (5-20%), amphibole (5-15%), and some contain variable amount of biotite (5-20%), lesser quartz (1-2%), and minor euhedral zircon, apatite and Fe-Ti oxides. The basic members of the mafic dykes have SiO_2 of 44.1-51.9%, MgO of 4.5-12.1%, and TiO_2 $>$mostly 0.8% (up to 2.3%) with K_2O+Na_2O of 1.3-6.6% with mostly subalkaline character. They are relatively high in mg-number (0.45-0.73) and transition metals (V=171-376 ppm, Co=22-45 ppm, Ni=3-148 ppm, and Sc=21-49 ppm). The evolved members of the dykes exhibit relatively higher SiO_2 (57.1–60.2%) and K_2O+Na_2O (5.6-9.0%), and lower MgO (2.2-5.9%) and TiO_2 (0.5-0.8%) contents than those from the basic dykes. Also, these samples have slightly low mg-number (0.41-0.65) and transition metals (V=99-172 ppm, Co=9-22 ppm, Ni=1-43 ppm, and Sc=9-20 ppm). In the Harker diagrams, all samples of the mafic dykes form a continuous array, and exhibit similar geochemical characteristics. In general, SiO_2 inversely correlates with MgO, $Fe_2O_3^t$, TiO_2, CaO and P_2O_5. Transition metals (Ni, Co, Sc) drastically decrease with decreasing SiO_2. Such characteristics support fractionation of Ol+Cpx+Amp+Fe-Ti oxides+Apatite from parental magmas. On the chondrite-normalized REE patterns, the all samples are enriched in LREEs, and show variable LREE/HREE fractionation ($(La/Yb)_N$=0.8–22.2) with slightly negative Eu anomalies (Eu/Eu*=0.7–1.3). On the N-MORB normalized diagrams, the samples from both dyke members are generally enriched in LILEs and depleted in HFSEs. They are also characterized by subparallel patterns with pronounced depletion of Nb and Ti. Slightly negative Eu anomaly and negative Sr anomaly in the spider diagram for some samples may be attributed to fractionation of plagioclase. Depletion in Nb and Ti, and negative correlation between P_2O_5, TiO_2 and SiO_2 are likely related to amphibole, Fe–Ti oxides and apatite fractionation. The LILE and LREE enrichment and HFSE depletion suggest that the mantle source of the mafic dyke samples has compositional similarity with metasomatized mantle wedge. High La/Nb (2-8), Ba/Nb (20-850) and Zr/Nb ratios (5-41) in the mafic dyke samples are clearly distinctive to the features for most intraplate volcanic rocks (La/Nb=0.5–2.5, Ba/Nb=1–20 and Zr/Nb$<$5), but similar to arc volcanics from the EBMA and worldwide.

Acknowledgments

This work was financially supported by the Scientific Research Projects Foundation of Karadeniz Technical University (grant 1149)