Geochemistry and petrology of the Solhan (Bingöl) volcanics, Eastern Anatolia, Turkey

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Late Miocene to Pliocene basaltic volcanism in the Solhan region (city of Bingöl) began after the continent-continent collision between the Arabian and Eurasian plates. Our K-Ar dating results indicate that the aforementioned magmatic activity existed in that part of the region between 6 and 3.5 Ma. The Solhan basaltic lavas consist of olivine, augite, titanoaugite and plagioclase phenocrysts and micro-phenocrysts. The groundmass of these lavas contains the microcrystals of the same mineral assemblages set in a volcanic glass matrix. They display porphyritic, glomeroporphyritic, intersertal and hyalopilitic textures. Volcanic products contain alkaline and subalkaline lavas, ranging in compositions from basalts to andesites and trachyandesite. Our EC-AFC model calculations based on Sr, Nd and $\delta^{18}O$ isotopic compositions suggest that the least evolved basaltic samples were unaffected from the combined processes of fractional crystallization and crustal contamination in contrast to the evolved samples which include 2-6 % crustal assimilation rates. MORB and the primitive mantle normalized pattern of the lavas and isotopic composition imply that alkali and subalkali basalts erupted from the Solhan region could have been derived from a mantle source that had previously been enriched by a clear subduction component.

Results of our melting models indicate that the Late Miocene to Pliocene basaltic volcanics in the Solhan region were derived from a mantle source containing spinel, amphibole and garnet with melting degrees ranging between 0.7 and 1%. The percentage of spinel seems to have increased in the lerzolitic mantle source of the basaltic lavas in time. Accordingly, the chemical character of the lavas turned from alkaline to subalkaline in time. We argue that the temporal increase of spinel contribution and the melting degree in the mantle source region was responsible for the temporal transition from alkaline to subalkaline character in lava chemistry.