

Geodynamic and geochemical characteristics of Quaternary basaltic volcanism in the NW of Iran

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The volcanic rocks crop out in Ooromieh dokhtar zone (NW of Iran). The oldest units are Precambrian gneiss, amphibolite and micaschist. The volcanic rocks have basic composition and alkaline trend. These alkali olivin basalts show mainly hyaloporphyritic, intergranular, microlitic and hyalin textures. The xenocrysts of quartz in many alkali basalts show disequilibrium textures, possibly magma-mixing processes. These alkali basaltes show Hawaian and Strombolian type eruption. Geochemical data suggest that the volcanites evolved by fractional crystallization and contamination with metamorphic and granitic rocks (AFC). According to geochemical and mineralogical composition, these basalts are relative comparable with Ararat lava flow in Turkey. Spider and REE diagrams show low degree of partial melting and crustal contamination (Fig. 1). Geodynamic research and tectonic setting show that these rocks are related to Quaternary extensional tectonic regime and have erupted along shear zone in pull-apart local basin.

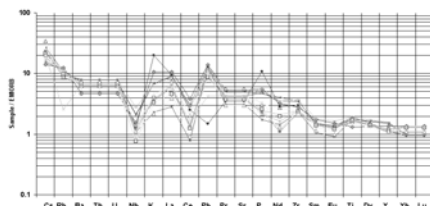


Figure 1

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Re-Os and PGE study of Philippine Sea Plate ocean island basalts: Constraining mantle sources

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Ocean island basalts erupted on the oldest part of the Philippine Sea Plate, have been interpreted as melting products of a mantle source containing a depleted MORB-source component and incompatible element enriched EMII-type material [1]. To provide further constraints on this model, we have analysed Os isotope ratios and platinum-group element concentrations in 3 alkali basalts and 2 olivine tholeiites from the Daito Ridge (DSDP Leg 58 Site 446).

Os abundances in the olivine tholeiites (22-60 ppt) are systematically higher than in the alkali basalts (7-12 ppt). Re contents vary between 729 ppt to 1114 ppt and are independent of sample petrology. Such high Re contents are typical of lavas that have minimal degassing during eruption [2]. The measured ¹⁸⁷Os/¹⁸⁸Os ratios in all samples are highly radiogenic (0.2169-0.7402).

Calculated initial ¹⁸⁷Os/¹⁸⁸Os ratios at the time of eruption (55 Ma, [3]) are slightly radiogenic (0.1348 to 0.1371) for the olivine tholeiites but significantly more radiogenic for the alkali basalts (0.2700 to 0.2958). These Os isotopic systematics require derivation of Os from 2 distinct reservoirs. The first possesses a composition very similar to the EMII material [4] while the second requires a relatively long-term Re/Os enrichment. Both reservoirs will be further characterized with platinum group element data.

References

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