

Late Cretaceous mantle plume activity in Ceno-Tethys: Evidenced by intra-plate volcanism in the Naik Area, Balochistan, Pakistan

Rehanul Haq Siddiqui¹ and M. Qasim Jan²

¹Geoscience Advance Research Laboratories, Geological Survey of Pakistan, Shahzad town, Islamabad, Pakistan

²National Centre of Excellence in Geology, University of Peshawar, Pakistan

Basaltic pillow lavas near the Naik village in Balochistan are found in the tectonic slivers of the Bagh complex in the north of the Muslim Bagh ophiolite complex (Fig. 1). Two lenticular bodies of porphyritic and amygdaloidal basalt are found intercalated within the Hyaloclastite mudstone units of the Bagh complex (Siddiqui et al., 1996). The K-Ar ages of the volcanic rocks included in the Hyaloclastite-mudstone unit is about 81 Ma (Sawada et al., 1995). The lower basaltic flow is pillowed (30 cm to 1 m in diameter). The size of the pillow lava body is 30x300 m. The upper body of basaltic flow is massive in nature and 15x150 m in size.

The volcanics are amygdaloidal in nature and exhibit porphyritic, cumulo-phyrlic and intergranular textures. Their principal constituents include titaniferous augite, aegirine augite, hornblende, phlogopite, plagioclase (An₃₇₋₈₈), devitrified volcanic glass, nosean and olivine. Wide range of anorthite contents in the plagioclase is due to albitization. Apatite ilmenite magnetite and hematite occur as accessories and chlorite, calcite, stilbite, antigorite and clay are secondary. The volcanics are mainly basanites and tephrites, mildly to strongly alkaline, and akin to the intra-plate volcanic rock series. Low Mg # and low Cr, Ni and Co contents of the analyzed rocks suggest that the parent magma of the volcanics was not directly derived from a mantle source, but resulted from fractionation in an upper level magma chamber, en-route to eruption. Their LILE and HFSE, enriched primordial mantle-normalized patterns with marked positive Nb anomalies confirm their within-plate geochemical signatures and extraction from an enriched mantle source. The Zr versus Zr/Y relations suggest that the volcanics were derived from 10-15% melting of an enriched mantle source. It is suggested that these Late Cretaceous intra-plate volcanics may be related to the mantle plume activity of the Reunion hotspot, and were erupted during the passage of Ceno-Tethys ocean floor prior to the passage of the Indian plate over it.

References

- Sawada, Y., Nagao, K., Siddiqui, R.H. & Khan S.R., 1995. K-Ar ages of mesozoic Igneous and metamorphic rocks from the Muslim Bagh area, Pakistan. *Proc. Geosc. Coll.* 12 73-90.
- Siddiqui, R. H. & Aziz, A. M., 1996. Geology, Petrochemistry and tectonic evolution of Muslim Bagh Ophiolite Complex *Proc. Geoscience Coll.* Vol. 16, 11-44.
- Siddiqui, R.H., Mengal, J. M., Hoshino, K., Sawada, Y. & Brohi I. A., 2011. Back-Arc Basin Signatures from the Sheeted Dykes of Muslim Bagh Ophiolite Complex, Balochistan, Pakistan. *Sindh University Research Journal*, 43, (1) 51-62.

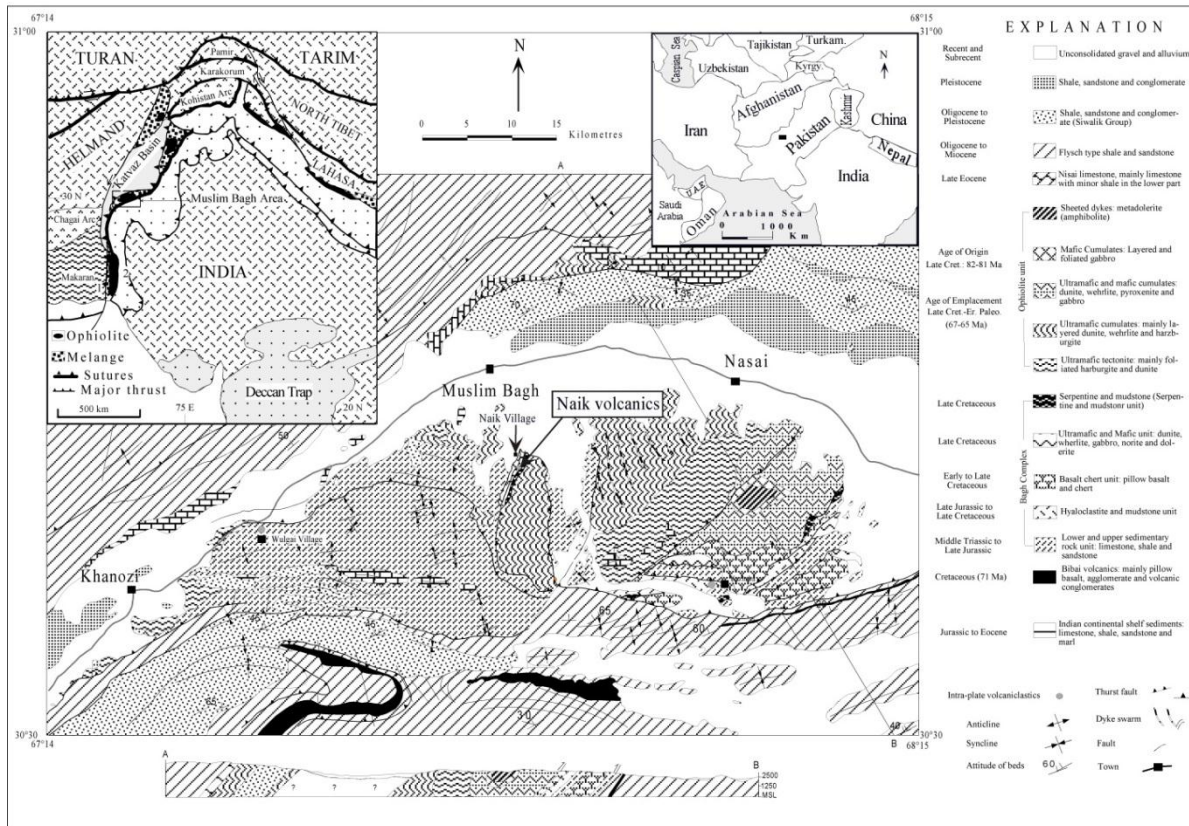


Fig. 1. Geological map of the Muslim Bagh area showing the location of the Naik volcanics, Balochistan, Pakistan (modified and reproduced after Siddiqui et al., 2011).