Geochemistry, Petrogenesis and Tectonic environments of JAL-NIAT amphibolites, Southeast Kohistan, Pakistan

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The intra-oceanic Kohistan island arc was initiated during the Cretaceous as a result of northward movement of the Indian Plate and sandwiched between Indian plate and Eurasian plate. The Kohistan sequence represents rocks of a young arc crust comprising amphibolites, diorites, metanorites and associated volcanic rocks. Amphibolites are prominently found along the southern belt of Kohistan sequence which extends from Afghanistan though Bajaur, Dir, Swat, Indus Valley, Babusar up to Nanga Parbat.

Kamila Amphibolite Unit (KAU) a strip (maximum 50×50 Km) of amphibolites constitutes the southeastern part of Kohistan and confined between Main Mantle Thrust (MMT) in south and Chilas Complex in north, along the southern part of Kohistan terrain (Fig 1). It lies on Jijal complex along MMT in Indus valley. The amphibolites are distinguished by mafic-ultramafics rocks of Sapat Complex at the base from MMT, the Spat Complex is composed of a variety of lithologies including dunite, pyroxenites, peridotites, chromitite, gabbros and anorthosite and these ultramafic rocks generally occur as lensoid bodies within the layered and isotropic gabbroic rocks.

Kamila Amphibolite Unit, part of Kohistan terrane represents thick pile of meta-volcanics with mafic-ultramafic base (Spat Complex) along the Main Mantle Thrust. KAU is intruded by diorites, granitoids and trondjhemites of Thak intusive complex. KAU is subdivided into four distinct units on the basis of distinct characters and new data from this study; Babusar amphibolites, Niat amphibolites, Jal amphibolites from south to north respectively with a thin slice of Sumal amphibolites within Jal-Niat amphibolites (Fig 1). Jal-Niat amphibolites are generally fine grained, banded and strongly foliated and fall in tholeiite group and show enrichment in HFSE (Zr, Y, P, Nb) and depletion in LILE (Rb, Pb, Th, K). MgO versus Zr plot indicate primitive to more evolved compositional pattern through intermediate stage. HFSE enrichment deciphers more heterogeneous and enriched mantle source like MORB for Jal-Niat amphibolites. Average concentration of TiO_2 (1.99 wt% for Niat amphibolites and 1.56 wt% for Jal amphibolites) and K_2O (0.14 wt% for Niat amphibolites and 0.20 wt% for Jal amphibolites) exhibit MORB like composition where as average Y/Nb ratio (8.9 for Niat amphibolites and 8.4 for Jal amphibolites) are close to N-MORB(12). Zr/Y vs Zr plot characterized the studied rocks as MORB and fall in ocean floor basalt (OFB) on Ti/100, Zr, Sr/2 triangle.

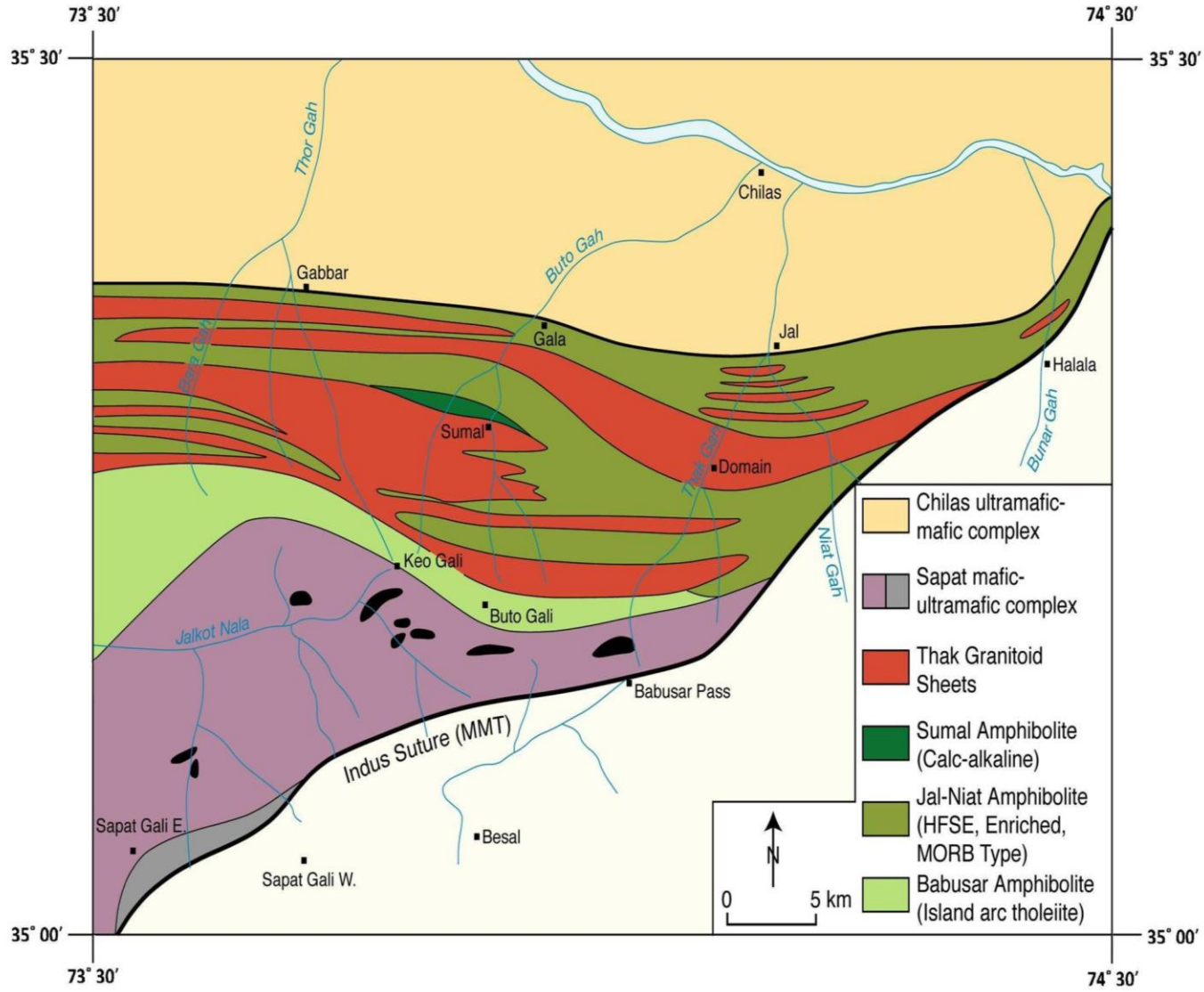

Figure 1. Geological Map of Kamila Amphibolite Unit bounded by MMT in south and Chilas Complex in north.