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Geochemical and geochronological evolution of mafic-felsic volcanic rocks prior to the collision with Eurasia: Evidence from the northwestern Ladakh Himalaya, India.

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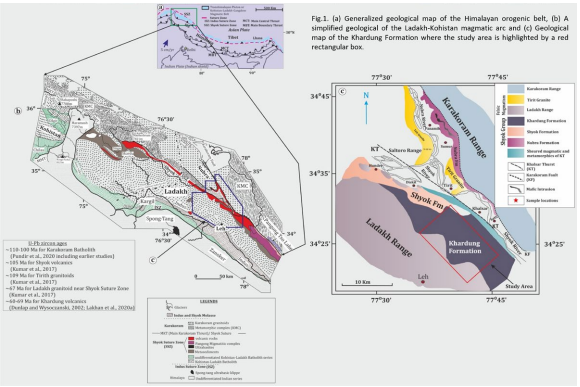

Fig.1. (a) Generalized geological map of the Himalayan orogenic belt, (b) A simplified geological of the Ladakh-Kohistan magmatic arc and (c) Geological map of the Khardung Formation where the study area is highlighted by a red rectangular box.

Contributions to geology, geochemistry and geochronology of the Ladakh Himalaya have impacted the understanding of the development of suture zones and pre- and post-collisional magmatism [1, 2]. The Shyok suture zone is sandwiched between the Ladakh block in the south and the Karakoram block in the north. There are pockets of magmatic rocks having different geochemical evolutionary histories, formed at different geological time scales in the Shyok suture zone. One of the most widespread volcanic suites exposed in the northwest Ladakh Himalaya is the Khardung volcanic suite that sits on the northern tip of the northwestern Ladakh block. This volcanic suite comprises basalt, basaltic andesite, andesite, dacite and rhyolite. These closely associated volcanic rocks exhibit calc-alkaline affinity, with the felsic rocks forming the voluminous bulk. Their chemistry shows enrichment in large ion lithophile elements (Rb, Sr, Ba, U, Pb) and depletion in high field strength elements (Nb, Ta, Hf, Ti) with increasing Eu negative anomaly from mafic to felsic rocks. Bulk-rock liquid line of descent (LLD) modelling showed fractional crystallisation as a predominant mechanism in their petrogenesis. The calculated zircon saturation temperature (T_{Zr}) in mafic magmas (745^{o}C) is higher than the felsic magmas (682^{o}C). Zircon age of 69 Ma-68 Ma for the mafic rocks, and a younger 59 Ma-64 Ma age for the more evolved dacite and rhyolite are consistent with their generation in the late stage of magmatism in an active continental marginal setting. This event occurred during the Late Cretaceous and the Paleocene Epoch due to the subduction of the Neo-Tethyan oceanic slab underneath the Eurasian plate boundary prior to the main collision between India and Eurasia.

[1] Goldschmidt, Ahmad et al. (2008), Tectonophysics 451, 206-224.

[2] Goldschmidt, Weinberg and Dunlap (2000), The Journal of Geology 108, 303-320.