



REVIEW ARTICLE

Tectono-magmatic evolution of the Ladakh and Karakoram, Trans-Himalaya, Northwest India

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Received: 7 January 2024 / Accepted: 18 February 2024
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Abstract

This article highlights the recent scientific findings on the petrological and tectono-magmatic studies of ophiolites, blueschists, eclogites, volcanics, and granitoids of the Ladakh and Karakoram, Trans-Himalaya, northwest India. A wealth of mineralogical, petrological, geochemical, geochronological, and isotopic data became available on these diverse tectono-magmatic units. All such studies provided an understanding of the geochemical and geodynamic aspects such as subduction-initiation and cessation, subducting slab-dehydration, mantle-wedge metasomatism and melting, nature of the sub-arc lithospheric mantle, complexity in the active margin magmatism, crust-mantle interaction, and continent–continent amalgamation in the context of the India–Eurasia continental plates.

Keywords Ophiolites · Blueschists · Eclogites · Volcanics · Granitoids · Trans-Himalaya

Introduction

During the last half a decade, significant research output on petrology, high-quality mineral chemistry, precise geochronology, and radiogenic isotope geochemistry contributed immensely to understand the nature and geodynamic evolution of the Ladakh and Karakoram Trans-Himalaya. The Late Cretaceous to Early Tertiary collision of the India–Eurasia continental plates initiated the Himalayas—one of the youngest mountain belts. The intervening suture zones host the complex geological record that existed before the India–Eurasia continent–continent collision. Investigating Himalayan rocks may therefore provide valuable information on the building blocks of the orogen and the over- all history of the India–Eurasia convergent system. Along the suture zones remnants of subducted slabs, island arcs,

accretionary prism complex, pelagic sediments, and ophiolitic slices are preserved, and formed in the context of the Neo-Tethys Ocean during the Jurassic to Cretaceous Period. The origin and evolution of these diverse tectono-magmatic units often remain unclear because of the knowledge gaps regarding their age, provenance, petrogenesis, and paleo-tectonic settings.

In Ladakh, some of the ophiolitic complexes preserve crustal and/or mantle rocks, such as the Nidar-Karzog ophiolite complex, Spongtang ophiolite complex, Dras, Thasgam, Suru Valley, Shergol, and Khangral-Chiktan dismembered ophiolitic slices (Bhat et al. 2021, 2023a). While others are highly dismembered and are present as melanges e.g., the Shergol Ophiolitic Melange (SOM) of western Ladakh, and the Zildat Ophiolitic Melange (ZOM) of eastern Ladakh (Bhat et al. 2023b). During 2020–2024, a number of research findings on the petrological, geochemical, and isotopic studies of ophiolites, blueschists, eclogites, volcanics, and granitoids of the Ladakh and Karakoram, Trans-Himalaya, northwest India have been deliberated. However, so far, a comprehensive report of these findings has not been documented. Therefore, this report provides a picture of the research contribution on different tectono-magmatic units of the Ladakh and Karakoram, Trans-Himalaya, which have been essentially published in peer-reviewed journals. Each tectono-magmatic unit is treated separately in the subsequent sections below.

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