



Evidence for pre-Cretaceous history and partial Neogene (19–9 Ma) reequilibration in the Karakorum (NW Himalayan Syntaxis) from ^{40}Ar – ^{39}Ar amphibole dating

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Received 9 April 2004; revised 26 January 2005; accepted 19 April 2005

Abstract

Amphiboles and a biotite from amphibolites and amphibolitic gneisses of the Karakorum Metamorphic Complex (KMC, NW Himalaya), were dated using the $^{40}\text{Ar}/^{39}\text{Ar}$ method. Isotope correlations were compared to electron-microprobe analyses. Both Al^{IV} and Al^{VI} contents of amphibole increase from the south near the Shyok Suture Zone to the Dassu-Askole Area in the north, with an increase in metamorphic grade (from anchizone to upper amphibolite facies). In the lower metamorphic zone, discordant age spectra were obtained. They are related to epidote-amphibolite overgrowth of amphibole rims on older (Precambrian to Mesozoic) magmatic cores. In the Shyok Suture Zone Ar/Ar ages of 38–62 Ma are contemporaneous with the emplacement of the Ladakh Batholith granodiorites, while middle Cretaceous magmatic Ar/Ar ages (~ 120 Ma) are locally preserved in tschermakite relics. In the Southern Karakorum basement, a minimum Ar/Ar age of 651 Ma was preserved, while an age of 208.5 ± 2 Ma was preserved in Panjal Trap-like diorites. At the margin of the domes zone, more recent metamorphism resulted in mineral growth at 20–5 Ma. In the domes zone, amphibole Ar/Ar ages of 17 Ma (Askole) and bimodal age spectra of 15–17 and 9–13 Ma (Dassu) extend towards the east the zone of Neogene amphibolite to granulite facies metamorphism known in the Nanga Parbat Syntaxis.

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Keywords: Karakorum; Ladakh; Himalaya; Ar–Ar dating; Amphibole

1. Introduction

The NW Himalayan Syntaxis consists of an assemblage of three major tectonic units (Fig. 1): (1) the Nanga Parbat-Haramosh spur of Indian crust (NW Himalaya), (2) the Kohistan-Ladakh arc and (3) the Karakorum (Asian) crust. This area is characterized by very rugged relief correlated with very young (Mio-Pliocene) high temperature metamorphic rocks (Pêcher and Le Fort, 1999). Much of the metamorphism of the Nanga Parbat Haramosh (NPH) massif is of amphibolite grade and is pre-Miocene to early

Miocene in age. However, (Treloar et al., 2000), Zeitler et al. (1993) proposed a ca. 3 Ma age for the low-pressure high-temperature K-feldspar cordierite (granulite facies) gneisses exhumed within the core of the N–S Nanga Parbat Haramosh (NPH) fold. Numerous small plutonic bodies and granitic dikes younger than 10 Ma are documented throughout the NPH massif, some of which are assigned ages younger than 3 Ma (Zeitler et al., 1993; Gazis et al., 1998; Schneider et al., 1999). Similar to the NPH massif, very young granulite facies rocks (6–7 Ma) have also been described in the Karakorum region (Rolland et al., 2001). The SE Karakorum region represents a transect from mid to upper crustal levels, with pre-Miocene M1 metamorphic conditions ranging from <400 °C and <4 kbar along its

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