ABSTRACT

High-pressure (HP) metamorphic rocks occurs as a highly tectonised unit within serpentinite matrix mélanges in the western belt of the Nagaland Ophiolite Complex. These mélanges occur in two metamorphic sequences with contrasting thermal history: (a) HP/MT (medium temperature) and (b) HP/LT (low temperature). A medium-grade amphibolite unit from the HP/MT metamorphic sequence records two overprinting metamorphic cycles (M_1–M_2). These cycles with looping counterclockwise *P-T* paths are part of a single tectonothermal event. The M_1 metamorphic cycle records peak metamorphism transitional between amphibolite and hornblende-eclogite facies at 13.8 ± 2.6 kbar, 625 ± 45 ^{o}C (error two sigma values) and subsequent cooling and partial exhumation to greenschist facies. The M_2 metamorphic cycle reflects peak metamorphism in the epidote blueschist facies condition at 14.4 ± 2 kbar, 540 ± 35 ^{o}C and their final exhumation to greenschist facies condition. The M_1 metamorphism records the first evidence for initiation of subduction of the Neo-Tethys from the eastern segment of the Indus-Tsangpo suture zone. Reburial and final exhumation during M_2 are explained in terms of material transport in a large-scale convective circulation system in the subduction channel as the latter evolves from a warm nascent to a cold and more mature stage of subduction.

A blueschist unit from the HP/LT metamorphic sequence stabilized lawsonite blueschist and epidote blueschist at metamorphic peak. Based on *P-T* pseudosections calculations, peak *P-T* conditions of lawsonite blueschist are estimated at ~11.5 kbar, ~340 ^{o}C and epidote blueschist at ~10 kbar, ~325 ^{o}C. Reconstructed metamorphic reaction pathways integrated with the results of *P-T* pseudosection modelling define a near-complete, hairpin, clockwise *P-T* loop for the blueschists. Apparent low thermal gradient of 8 ^{o}C km^{-1} corresponding to a maximum burial depth of 40 km and the hairpin *P-T* trajectory together suggest a cold and mature stage of an intra-oceanic subduction zone setting for the Nagaland blueschists.

This study provides new insights into the complexity of subduction channel dynamics. This Neo-Tethys example shows that multiple burial and exhumation cycles involving the first subducted oceanic crust may be more common than presently known.

Key words: Nagaland Ophiolite Complex; amphibolite; lawsonite/epidote blueschist; polyphase metamorphism; counterclockwise metamorphic *P-T* path.