G122-007 **Room: 101B** **Time: May 25 10:45-11:00**

Pressure-Temperature conditions and paths of metamorphic rocks in far-eastern Nepal: Do they are explained by the channel flow?

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We discuss the pressure-temperature (P-T) conditions and P-T paths of middle- to high-grade metamorphic rocks along the Tamor section in far-eastern Nepal. The Main Central Thrust (MCT) zone is a brittle-ductile shear zone between the upper MCT (UMCT) and lower MCT, and the discontinuities in Nd isotopic ratio occur at the UMCT between the Higher Himalayan Crystallines (HHC) of structurally upper level and Lesser Himalayan metasediments (LHS) of lower level (Imayama and Arita, 2007 in press). The HHC consists mainly of metapelites, migmatitic gneisses and rare metabasite, the total thickness of which reach 25-30 km. Metamorphic foliation strikes NW-SE and dips towards the north. Mineral lineations of biotite and sillimanite are NNE-SSW to E-W trending.

From the MCT zone to HHC along the section, index minerals in metapelites change structurally upwards as follows: Grt-in, St-in, Ky-in, Fib-in, Ms-out, Sil-in and Crd-in. Directly below the Crd-in isograd, the High Himal Thrust (HHT), which is a shear zone within the HHC, occurs (Goscombe et al., 2006). Around the HHT, retrograde minerals such as Chl replacing Grt and Bt are seen in outcrop and thin sections. Cordierite surrounds Grt rim and includes Sil, and hence it is inferred that Crd formed during retrograde or decompressional stage. AlIV in zoned amphibole in Grt-Cpx metabasites near the HHT decreases from core to rim, indicating its retrograde growth.

The Grt-Bt thermometric results of metapelites show progressive increase of temperature upward to Ms-out isograd (ca. 612 to 740 ^{o}C), and become nearly constant beyond the isograd. Pressure estimates using Grt-Bt-Qtz-Pl and Grt-Als-Qtz-Pl barometry indicate the pressure gap across the UMCT (ca. 8.6 to 12.3 kbar) and low pressures (ca. 4.5 to 6.5 kbar) in structurally higher units of the HHC. These results are roughly consistent with mineral assemblages inferred from P-T grids of Spear (1999).

Assessing the equilibrium state in rocks and estimating the H2O activity in fluid were performed by winTWQ program. For the MCT zone and lowest HHC, the equilibrium curves for mineral assemblages including eastonite content in Bt show a good correlation. The equiliburia for the Grt-Cpx metabasite and Crd-paragneiss near the HHT show a good correlation in the case of XH2O = 0.3 rather than XH2O = 1.0 in CFMASH and CKMASH systems, respectively.

Gibbs methods were applied to Grt growth zoning to estimate P-T path. In the MCT zone, Grt show an adiabatic P increase path (dT = 13 ^{o}C, dP = 3.0 kbar). Whereas, Grt form the lowest HHC grew under increasing P and T (dT = 22 ^{o}C, dP = 1.2 kbar), which is followed by increasing T and decreasing P (dT = 24 ^{o}C, dP = -1.5 kbar). P-T conditions on the onset of Grt growth are estimated at T = 599 ^{o}C, P = 5.6 kbar (MCT zone) and T = 585 ^{o}C, P = 12.0 kbar (lowest HHC), respectively.

Different P-T paths show heat and material transfer to the UMCT. In addition, peak pressure directly above the UMCT might be consistent with those inferred from the model of channel flow (Jamieson et al., 2004). On the other hand, the discontinuities in Nd isotopic ratio across the UMCT support the idea that the UMCT is a material boundary. The idea implies that the HHC and the MCT zone (the LHS) were separately closed systems during Himalayan metamrphism in the Tertiary. In other words, heat could be transferred across the UMCT, and material could only within system, but couldn't across the UMCT. As a result, continuous inverted metamorphism and pressure gap are found across the UMCT. In contrast, the HHT is characterized by the occurrence of retrograde mineral and the low mole fraction of H2O in fluid, suggesting a prolong faulting during exhumation.

Imayama and Arita, 2007, Tectonophysics, in press; Goscombe et al., 2006, Gondowana Res., 10, 232-255; Spear et al., 1999, Contrib. Mineral Petrol., 134, 17-32; Jamieson et al., 2004, JGR, 109 (B06407).