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Architecture of a Fossil Slab-Mantle wedge Interface of a Nascent, Ultra-hot Subduction Zone within the Eastern Arm of the Neo-Tethys: New insights from Metamorphic Sole Rocks in the Nagaland-Manipur Ophiolite Belt, NE India

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We have mapped a sequence of metamorphic sole rocks of basaltic compositions and contact wedge mantle peridotite from a Neo-Tethyan ophiolitic mélange exposed near the Tusom CV area, in the Nagaland-Manipur Ophiolite Belt (NMOB), NE India. Despite the disrupted occurrence of peridotites and sole rocks, we have reconstructed a near continuous sequence from mildly deformed mantle peridotite of spinel lherzolite to clinopyroxene-bearing, spinel harzburgite compositions (175-425m wide, 500-2500m long) at the top to high- to ultra-high-temperature (HT-UHT) sole rocks (~50-250m wide and consisting of high-pressure (HP) mafic granulites and garnet- and clinopyroxene-bearing amphibolites) and low-temperature (LT) sole rocks (~350-450m wide and comprising clinopyroxene-free garnetiferous amphibolite, non-garnetiferous amphibolite, epidote amphibolite) and weakly metamorphosed to unmetamorphosed sediments of quartzitic compositions, structurally downward. Mantle peridotites in contact with HT-UHT sole rocks are highly deformed and occur as finely banded mylonites. On the basis of dense sampling and integrated petrographic, mineral chemical, conventional thermobarometry, and phase equilibrium modelling studies, we establish a regionally expansive inverted thermal structure at mantle depths (~35-45 kms). We report peak P-T trends, structurally downward, from T ~ 1000-1100^{o}C, P ~1.3-1.4 GPa (mantle peridotite) through ~925-935^{o}C, ~1.4 GPa (UHT mafic granulite), ~875^{o}C, ~1.4 GPa (HT mafic granulite), ~750^{o}C, ~1.19 GPa (garnet- and clinopyroxene-bearing amphibolite), ~675-740^{o}C, ~0.98-1.27 GPa (garnetiferous to garnet-free amphibolite) to ~630-650^{o}C, ~1.4 GPa (epidote amphibolite). The findings reveal (a) a comprehensive record of a fossil slab-mantle wedge interface of a nascent, ultra-hot subduction zone within the eastern arm of the Neo-Tethys, (b) a near-isobaric metamorphic field gradient as opposed to a general observation of decreasing pressure gradient, structurally downward, in many metamorphic sole sequences globally, (c) sequential accretion of different slices of slab rocks beneath the wedge mantle peridotite (from UHT granulites to epidote amphibolites) at depths between 35 and 45 kms, synchronous with progressive cooling and maturation of the subduction channel.