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New constraints on the India-Asia collision (ca.50 Ma): record from Eastern Himalayan Syntaxis Eclogite-facies metamorphic rocks

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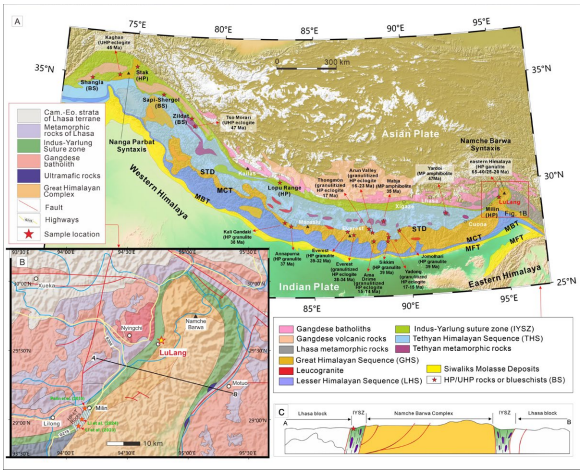

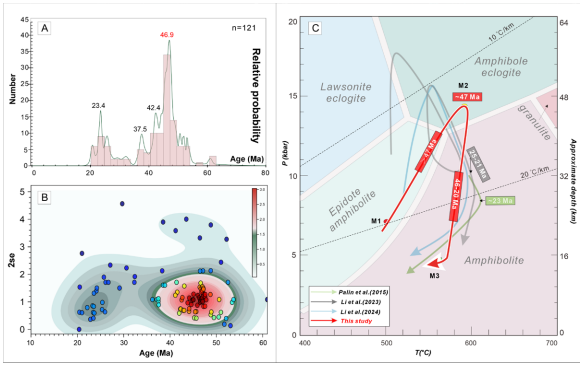

Eclogite-facies rocks exposed within the Himalayan Range can be used to constrain the timing and characteristics of the India-Asia collision, which remains strongly debated. Many collision-related high-pressure (HP) and ultrahigh-pressure (UHP) lithologies are exposed around the western Himalayan syntaxis and in the west-central Himalaya; however, the rarity of similar units in the eastern Himalaya limits our understanding of the along-strike geodynamic evolution of India–Asia collision and the characteristics of subduction of Neo-Tethyan oceanic lithosphere. Here, we document collision-related, low-temperature eclogite-facies metapelites from the easternmost Indus-Yarlung suture zone, southern Tibet, which retain vital records of the timing of the initial India–Asia collision in this region. Petrology and phase diagram modeling indicate that the eclogite-facies metapelite experienced cold subduction along a low thermal gradient of ~12 ℃/km, reaching peak conditions of ca. 1.4 GPa and ca. 590 ℃ in the amphibole-eclogite facies. These units were later partially retrogressed to lower amphibolite-facies conditions during exhumation. Zircon and monazite U-Th-Pb chronology reveals peak eclogite-facies ages of ca. 47 Ma, indicating that the collision between the Indian and Asian continents in the eastern Himalayan syntaxis is constrained to have occurred a few million years earlier, at around 50 Ma. This age places the first constraint on the timing of subduction-related HP metamorphism in the eastern Himalayan syntaxis and is consistent with eclogite-facies metamorphism in Kaghan, Tso Morari (Kaneko et al., 2003; Donaldson et al., 2013) in the western Himalaya, and Yardoi (Ding et al., 2016) in the east-central Himalaya. This demonstrates that the initial India-Asia collision took place quasi-synchronously in both regions, although the maximum depth of subduction of continental material differed. This may indicate a significant change of slab dip angle along the orogenic strike during the closure of the Neo-Tethys Ocean, which must be considered in future geodynamic simulations of the evolution of the orogen.