Lithospheric Extension of the Accretionary Wedge: An Example From the Lanling High-Pressure Metamorphic Terrane in Central Qiangtang, Tibet

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Deciphering the exhumation mechanism of high-pressure, low-temperature (HP-LT) metamorphic rocks can provide important insights into the tectonic evolution of oceanic subduction zones at active continental margins. Here we present a multidisciplinary study examining the exhumation tectonics of the Permo–Triassic eclogite-bearing Lanling HP-LT terrane within the Central Qiangtang metamorphic belt (CQMB). Field relations and microscopic observations show that the HP-LT rocks are separated from the Permian ophiolite mélange of the hanging wall by low-angle detachments and exhibit five stages of deformation. The pervasive top-to-the-SW and -S shearing structures imply that the Lanling HP-LT terrane was exhumed as a transtensional metamorphic core complex (mcc). The results of the petrological and mineralogical analysis and pseudosection modeling of eclogites indicate that the eclogites and blueschists are characterized by synexhumation mineral growth pulses with decompressional P-T trajectories. A compilation of previous geochronological data and our $^{40}\text{Ar}/^{39}\text{Ar}$ dating results of shearing structures in HP-LT rocks indicate a continuous exhumation at ca. 244–210 Ma. Moreover, the CQMB experienced lithospheric transtension, as shown by the Middle–Late Triassic geological events, which include mantle upwelling at ca. 237–230 Ma and abyssal basin development in the Anisian–middle Norian. These observations indicate that the CQMB is likely a autochthonous accretionary wedge resulting from northward subduction of the Paleo-Tethys Ocean beneath the North Qiangtang Block (NQB). Moreover, the transtension of the CQMB occurred in the late stage of the oceanic subduction, which was probably triggered by oceanic slab rollback.