Two types of chromitites in a Tibetan ophiolite produced by two-stage accretion of Tethyan arc lithosphere

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The Yarlung Zangbo (YZ) ophiolites in south Tibet (China) have shown great potential to investigate the upper mantle down to ~410-660 km[1]. However, uncertainties on the evolution of the ophiolites have obstructed the understanding of deep-mantle information hidden in them. Here, we describe two types of chromitites from the Zedang ophiolite in the YZ suture, to reveal a two-stage accretion history of the Tethyan arc lithosphere.

Type I (massive and nodular chromitites) has high Cr# (0.66-0.80) in chromite; Type II contains low-Cr# (<0.66) chromite disseminated with silicates. The high-Cr# type is closely similar to the podiform chromitites in forearc-type ophiolites, formed by reaction between boninitic melts and harzburgites in a mature forearc region. The ultrahigh-pressure textures in the chromitites suggest they were later subducted to the Mantle Transition Zone, and then exhumed with the Jurassic accretion of the Tethyan arc lithosphere[1,2].

The chromites in the low-Cr# chromitites have contents of Al_2O_3, TiO_2 and Ga between spinels crystallized in forearc tholetiitic magmas and those in the Zedang harzburgites. Compositions of pyroxene, amphibole and phlogopite inclusions in chromite show signatures of crystallization from hydrous forearc basalts. Clinopyroxene relics in the related dunites have metasomatic trace-element patterns similar to those in the Zedang harzburgites. The migration of basaltic magmas through the Jurassic harzburgite lithosphere during subduction initiation of the Neo-Tethyan slab in a new cycle at ~130-120 Ma[2] can cause the interaction between forearc tholetiitic magmas and the harzburgites, producing the low-Cr# chromitites and dunites.

Therefore, the two types of Zedang chromitites have revealed both Jurassic and early Cretaceous episodes of accretion of the Tethyan arc lithosphere.

[1]Griffin et al. (2016) *J. Petrol.*, in press. [2]Xiong et al. (2016) *EPSL* **438**, 57-65.