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# Ophiolitic peridotites in Xigaze (Tibet): Constraints on modes of melt transport in the mantle

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The Xigaze ophiolite (Tibet), which occurs in the central segment of the Yarlung Zangbo Suture Zone, exposes a complete portion of a mantle sequence that consists essentially of fresh as well as serpentinized peridotites. We studied a sequence beneath the crustal section that exposes fresh, Cpx-bearing harzburgites and dunites that are underlain by serpentinized Cpx-bearing harzburgites and dunites. The rocks at the bottom are crosscut by dykes that have undergone different degrees of rodingitization. The modal compositions of peridotite from both fresh and serpentinized sections plot in abyssal upper mantle fields, with clinopyroxene modes less than 5 vol. %. Although harzburgites and dunites indicate that melt has been lost relative to primitive mantle compositions, the trace element patterns carry signatures of enrichment in incompatible elements, such as (i) "bowl-shaped" patterns of trace elements in silicate-Earth normalized spider diagrams, (ii) positive anomalies in highly incompatible trace elements such as Rb, Th, U, Ta, and (iii) enrichment of LREE in the clinopyroxenes from dunites and harzburgites. These features are indicative of complex melt transfer processes and cannot be produced by simple melt extraction. Petrographic studies reveal that harzburgite and dunite contain interstitial polyphase aggregates of olivine + Cpx + spinel + Opx and olivine + Cpx + Spinel, respectively. Experimental studies (e.g. Morgan and Liang, 2003) suggest that these aggregates represent frozen melt-rich components, indicating that fertile melt was percolating through the depleted harzburgite – dunite matrix. Presence of such "melt pods" would explain the trace element enrichment patterns of the bulk rock, as well as features such as reverse zoning (core: Cr, $Fe^{2+}$ rich, rim: Al, Mg rich) of spinels in polyphase aggregates in fresh dunites. These results show that melt extraction from the mantle is not a single stage process, and that evidence of multiple melt pulses that propagated through a rock are preserved in the petrographic features as well as in the form of chemical signatures that indicate refertilization of initially depleted rocks.