Geophysical Research Abstracts
Vol. 18, EGU2016-5553, 2016
EGU General Assembly 2016

Partial melting and refertilization of mantle peridotites in the Xigaze ophiolite: constraints from whole-rock and mineral geochemistry

Chang Zhang (1,3), Chuan-Zhou Liu (1,2), Fu-Yuan Wu (1,2)

(1) State Key Laboratory of Lithospheric Evolution, Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100029, (2) CAS Center for Excellence in Tibetan Plateau Earth Sciences, Beijing 100101, (3) University of Chinese Academy of Sciences, Beijing 100049, China

Ophiolites along the E-W trending Yarlung-Tsangpo Suture (YTS), which separates the Indian plate from the Eurasian plate, have been regarded as relics of the Neo-Tethyan Ocean. The Xigaze ophiolite in the central YTS has been extensively studied. One of the most intact crust-mantle sequences is preserved in the Luqu (or Beimarang) ophiolite. Mantle peridotites of the Luqu ophiolite are dominated by harzburgites, with 55–65% olivine, 30–40% orthopyroxene, 1–5% clinopyroxene and 1–3% spinel. Minor lherzolites and dunites are also outcropped, and the mode contents of clinopyroxene in lherzolite can be locally up to 10%.
This contribution presented whole-rock major element and mineral chemistry including EMPA (Electronic Micro-Probe Analysis) and clinopyroxene in situ trace elements. Whole rock $Al2O_3$ (0.23–2.05%) and CaO (0.41–1.7%) contents are very low but show obviously inverse correlation with MgO (39.7–47.0%), indicating that the Luqu peridotites are residues of variable degrees of partial melting. This is supported by the Cr# (=molar Cr/(Cr+Al)) values of spinels which vary from 0.36 to 0.69. Meanwhile, the high Cr# values of spinels and homogenously high Mg# (= molar Mg/(Mg+Fe2+)) values of olivines, clustering at 0.91, indicate high degrees of partial melting. The low REE (rare earth elements) concentrations and chondrite-normalized distribution partterns of clinopyroxenes reflect ultra-depleted natures, with most showing LREE (light REEs) and MREE (medium REEs) depleted patterns and strong fractionations between MREEs and HREE (heavy REEs) ((Sm/Yb)N: 0.021–0.184). Based on the observations and analyses, a model of two-stage melting process was proposed that the primitive mantle underwent 2–8% melting in garnet stability field which was followed by 10–15% melting in spinel stability field.
The clinopyroxenes in some peridotites exhibit obvious enrichment of somestrongly incompatible elements (such as sodium and LREE) that reveal later refertilization process for the residues after partial melting. It is attributed to melt-rock reaction between exotic melt from deeper sources and the peridotites in Luqu ophiolite which possibly occurred after uplift of the peridotites. The irregular contacts between dunites and harzburgites and the increases of some incompatible elements (such as the CeN elevated to 0.18, whereas the majority clustering at 0.02) also demonstrate the existence of later enrichment reactions. Furthermore, ubiquitous pyroxenites, which range from clinopyroxenites through websterites to orthopyroxenites and intruded into the host peridotites, can be regarded as the reactive dikes.