



Formation of Secondary Lherzolite and Refertilization of the Subcontinental Lithospheric Mantle: The Record of Orogenic Peridotites

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Correlations observed between major and minor transition elements in tectonically-emplaced orogenic peridotites have classically been ascribed to variable degrees of melt extraction. There is a growing body of evidence indicating that these chemical variations mostly reflect melt redistribution and near solidus reactions superimposed onto previous melting depletion events. Here we will assess this hypothesis using a large database of peridotites from orogenic peridotites in the westernmost Mediterranean (Ronda and Beni Bousera peridotites). We show that lherzolite samples show some trends in major elements and modal variations that are inconsistent with their interpretation as depleted MORB mantle (DMM). These trends are more consistent with the secondary formation of lherzolites by refertilization processes involving a least two different near-solidus, melt-processes: refertilization by pyroxenite-derived melts and by hydrous melts leading, respectively, to secondary lherzolites with OI/Opx and Cpx/Opx ratios greater than those expected from residues from a primitive upper mantle source. Together with their N-MORB, LREE-depleted pattern, their fertile lherzolitic composition may have been acquired as a result of melt-rock interaction processes associated with the thermomechanical erosion of lithospheric mantle by asthenosphere. Major refertilization of depleted subcontinental mantle is an alternative to the small degrees of melt extraction to account for LREE depletion in otherwise fertile orogenic lherzolites.