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Os isotope systematics of Mirdita ophiolite, Albania: implications for the upper mantle evolution during arc formation

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Suprasubduction zone (SSZ) ophiolites provide insights into crustal and upper mantle structure and temporal and spatial evolution of oceanic lithosphere during arc formation. Multiple episodes of melting after the initiation of subduction are recorded in geochemical features of the SSZ ophiolitic rocks. Among geochemical tracers, the Os isotope is a powerful tool to investigate chemical evolution of the oceanic lithosphere. Upper mantle possesses unradiogenic Os isotopic compositions ($^{187}Os/^{188}Os$ ~ 0.125), while subducted oceanic crust and sediment have the elevated Os isotope ratios ($^{187}Os/^{188}Os$ > 0.5). Such significant contrast of Os isotopic compositions between upper mantle and subducted components can be used as a powerful tool to constrain contribution of slab component to the mantle source.
We have studied the crustal and mantle units in the Jurassic Mirdita ophiolite in Albania through the Os isotopes. The Mirdita ophiolite occurs in a nearly 40-kmwide belt bounded by the conjugate passive margin sequences of the Apulia (west) and Pelagonia (east) microcontinents. Mafic-ultramafic massifs in the western Mirdita ophiolite (WMO) consist mainly of lherzolite and plagioclase lherzolite, whereas those in the east Mirdita ophiolite (EMO) contain harzburgite and dunite with major chromite deposits.
We analyzed the Os isotopic compositions of chromitite-dunite unites, harzburgites, wehrlites, pyroxenites in the WMO and lherzolites in the EMO. Lherzolites in WMO have unradiogenic Os isotope ratios ($^{187}Os/^{188}Os$: 0.124-0.126), which is DMM signature and indicates insignificant melt migration produced by subduction. On the other hand, the mafic-ultramafic massifs in the EMO possess more radiogenic Os isotopic compositions ($^{187}Os/^{188}Os$: 0.125-0.131) than the rocks in the WMO. The elevated Os isotope ratios were possibly resulted from the reaction between the host peridotite and the migrating melt with radiogenic Os derived from subducted lithosphere.

Keywords: Os isotope, Albania ophiolite, arc formation, upper mantle, oceanic crust evolution