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A Forearc (Guleman, Elazığ) Ophiolite: Evidence from Peridotite Mineral Geochemistry

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1 Abstract

The Guleman ophiolite, one of the most important ophiolitic massifs of the Southeast Anatolian Ophiolitic Belt, consists of a core of serpentized mantle rocks overlain by an ultramafic sequence, layered and isotropic gabbro, and sheeted dykes. The ophiolite structurally overlies the Lower Miocene Lice Formation and is overlain by young sandstones and shales of the Upper Maashtrichtian-Lower Eocene Hazar Complex and Middle Eocene Maden Complex. The Guleman ophiolite tectonically overlies Precambrian to Upper Triassic Bitlis metamorphic massif.

The mantle peridotites compose mainly of fresh and in place serpentized harzburgite tectonite with local bands and lenses of dunites with large-sized chromitite pods. The Guleman peridotites commonly show porphyroclastic texture, high-temperature fabrics such as kink-bands in olivines.

According to microprobe analyses, the harzburgite and dunite have low CaO and Al₂O₃ abundance similar to Mariana forearc, and their average Cr- (=Cr/(Cr+Al) atomic) ratio of Cr-spinels is surprisingly high (>0.63) besides Fo content of olivine is between 90.9 to 92.3 in peridotites. According to Mg[#] (Mg/(Mg+Fe²⁺)) versus Cr[#] in spinel diagram, the degree of partial melting is higher than 35% and spinel values plot in the forearc peridotites field. The Guleman harzburgites have low CaO, Al₂O₃ and TiO₂ contents in orthopyroxene and clinopyroxene lamellae, resembling those of depleted harzburgites from modern forearcs and different from moderately depleted abyssal peridotites.

Consequently, we propose that the Guleman peridotites form in a forearc setting during the subduction initiation that developed as a result of northward subduction of the southern branch of the Neo-Tethys in response to the convergence between Arabian and Anatolian plates.

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