Unveiling the blueschist rocks from the northern Central Iran Zone

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Iran's crustal blocks, notably the Central Iran Zone (CIZ), preserve a complex record of the geodynamic evolution of the region, linked to the opening and closure of the Paleo-Tethys and Neo-Tethys oceans during the Phanerozoic. Ophiolites in Iran along the boundaries between crustal blocks record the presence of back-arc ocean crust and, indirectly, collisions related to subduction.

Recent geological mapping and sampling in the Kalat-e-Reshm area in the northern CIZ, have identified blueschists, coupled with greenschists and serpentinites in a north-trending package of volcano-sedimentary rocks. The age of the rocks is poorly constrained but are interpreted to be Silurian-Ordovician in age. The assemblage of rocks is a tectonic mélange complex, like the Cretaceous Sabzevar [1] and the Late Permian Anarak ophiolites [2 & 3], that record subduction of Neo-Tethys, and Paleo-Tethys, respectively. However, these newly identified blueschist rocks are potentially the oldest in Iran.

The blueschist rocks mainly contain glaucophane, plagioclase (albite), titanite, magnetite, and quartz, calcite, and apatite as accessory minerals. Whole rock geochemical analyses indicate that the parental rocks of the blueschists are alkali basalts and trachyandesites (SiO₂: 45.60-56.60 wt.%; MgO: 1.39-3.80 wt.%; Fe₂O₃: 11.20-31.40wt.%). Most samples show elevated concentrations of Ba, Sr, and Ni, Zn and HFSE (e.g., Ti, Zr, and Nb), Nb/La>1 suggests mantle-derived material for blueschists. The positive anomaly of LILE (e.g., Cs, Rb, Ba, Sr) in primitive mantle-normalized spider diagrams indicate the role of forearc subduction processes in evolution of the source rocks that produced the blueschists.

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