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Diverse Geochemical Record of Ophiolite Factories of the Mesozoic Tethys in the Alpine - Mediterranean - Tibetan Orogenic Belts

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The Alpine, Mediterranean and Tibetan Orogenic Belts (AMTOB) are the cradle of Mesozoic ophiolites in the world that developed during the rift–drift, seafloor spreading, and subduction tectonic stages of the Neotethys evolution. The onset of the development of the Neotethyan oceanic realm was during the Permo-Triassic, as evidenced by the widespread occurrence of calc-alkaline basalts, basaltic andesites & dacites; alkaline basalts, trachyandesites & trachytes; and subalkaline basalts with P-MORB, E-MORB and N-MORB compositions of this age throughout the AMTOB. Remnants of these earliest Neotethyan oceanic rocks occur in sub-ophiolitic mélanges. The next phase of Neotethyan seafloor spreading occurred in the Middle to Late Jurassic and formed Hess-type oceanic lithosphere with G-MORB to N-MORB affinities, derived from DMM beneath different sub-basins within the entire Neotethys. While the northerly motion of Apulia caused significant shortening and halted intraoceanic magmatism in Western Neotethys, continued seafloor spreading in Eastern Neotethys produced N-MORB to P-MORB oceanic lithosphere with seamount chains–oceanic plateaus, the remnants of which exist in the Mediterranean–Tibetan orogenic belts (MTOB). Collisions of Gondwana–derived ribbon continents, seamount chains, and intraoceanic arc–trench systems with incoming passive margins resulted in the emplacement of SSZ ophiolites (i.e., Inner–Tauride, Turkey; Inner–Zagros, Iran; Yarlung–Zangbo, Tibet ophiolites), and in the closure of Neotethyan sub-basins. The SSZ ophiolites in the MTOB include mainly backarc (BA) and forearc (FA) ophiolites with BA–types making up ~43% of all SSZ examples, which developed during the Cretaceous. SSZ ophiolites along the main suture zones in the MTOB display variable subduction influence in their geochemical fingerprints reflecting: (1) lateral variations in slab-dip angles along–strike of convergent margins; and (2) variable amounts of subducted sediments, hydrous melts, and subduction–important elements (Th) incorporated into melt columns above subduction zones. Geochemical signatures of upper crustal rocks of SSZ ophiolites in the MTOB show a general progression from FAB to IAT, Boninitic and CA compositions through time (within <12 my). This progression is also marked by the existence of extremely refractory harzburgites in the Late Cretaceous ophiolites. The ophiolite–bearing suture zones in the AMTOB do not represent final, continent–continent collision fronts, which invariably developed long after ophiolite emplacement.