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Miocene IOCG Deposits Associated with the Trans-Mexican Volcanic Belt

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The Cu- and Au-rich Tatatila-Las Minas IOCG skarn deposits are circumscribed to the earliest stages of the Trans-Mexican Volcanic Belt (TMVB). These deposits were formed as skarns between Mesozoic carbonate rocks and Miocene intermediate to acid hypabyssal rocks. New U-Pb zircon and $^{40}\text{Ar}/^{39}\text{Ar}$ ages provide evidence for four epochs of magmatic activity in the area: (1) Triassic, in association with the Paleozoic basement to the Mesozoic series, (2) late Oligocene to early Miocene suite of pre-TMVB intrusives, (3) middle to late Miocene suite of TMVB-related intrusives, and (4) Pliocene intrusive and extrusive rocks of the TMVB. The obtained ages range between 24.60 ± 1.10 and 19.04 ± 0.69 Ma for stage 2 and between 17.80 ± 0.50 and 13.80 ± 1.40 Ma for stage 3. Stage 2 corresponds to a previously unknown magmatic stage in the area. Only stage 3 rocks are associated with the IOCG skarn mineralization, whose retrograde stages have been dated at 12.44 ± 0.09 and 12.18 ± 0.21 Ma. Therefore, the ages of stage-3 intrusive rocks are interpreted as part of the prograde skarn associations (~ 15.4 to <14 Ma). The petrogenetic affinity of stage-2 and stage-3 rocks is about the same—their main difference has to do with higher Y and Yb contents in stage-3 rocks, which is suggestive of an interaction of their parental magmas with alkaline magmas that are likely to belong to the conterminous and contemporaneous Eastern Mexico Alkaline Province. Petrological indicators in Cenozoic rocks point to intermediate to acid granitic rocks emplaced in a subduction-related continental arc with high-silica adakitic signatures due to deep-seated magmas that underwent crustal contamination to some degree.