A review of the eclogite-facies metamorphism of the Paleozoic Acatlán Complex, southern Mexico

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The Acatlán Complex (southern Mexico) represents one of the few localities in Mexico where eclogites and eclogite-facies rocks have been described (Ortega-Gutiérrez et al., 2018). This polymetamorphic complex comprises a suite of high-pressure (HP) lithologies (*e.g.*, eclogite, and Grt–Ph–Rt metagranitoid) interlayered with low-grade metamorphic ultramafic rocks. Here, we review some important petrological and geochronological characteristics of the eclogite-facies metamorphism in the Paleozoic Acatlán Complex, primarily focusing on the eclogites and metagranitoids from the HP unit of the complex—the Piaxtla suite. Eclogites display a peak mineral assemblage of Grt + Omph + Rt ± Ph ± Qz; this assemblage is replaced by amphibolite- and greenschist-facies retrograde assemblages. Peak eclogite-facies pressure and temperature (*P*–*T*) conditions are ~2.2 GPa and ~690 °C. Estimates of *P*–*T* conditions for retrogressed eclogites suggest that the Piaxtla suite reached early retrograde metamorphism at < 1.6 GPa and < 600 °C. Lu–Hf garnet–whole-rock geochronology from an amphibolitized eclogite suggest that eclogite-facies metamorphism took place at c. 353 Ma, consistent with some U–Pb zircon ages. However, other workers have suggested that earlier eclogite-facies events in the Piaxtla suite occurred at c. 490–477 Ma, based on U–Pb ages of detrital zircons and post-metamorphic granites.

The metagranitoids (referred as Esperanza granitoids) comprise peraluminous augen gneisses with continental arc signatures that have been metamorphosed at eclogite-facies conditions. Peak *P*–*T* estimates suggest that gneiss and hosted eclogites experienced coeval eclogite-facies metamorphism at ~1.5–1.7 GPa and ~730–830 °C. Zircon U–Pb ages from the gneiss of c. 474–440 Ma have been interpreted to represent the eclogite-facies metamorphism or to represent the crystallization age of the igneous protolith. Amphibole ^{40}Ar–^{39}Ar ages of c. 430 Ma from an amphibolitized eclogite are interpreted to date the minimum timing of eclogite-facies metamorphism. Nonetheless, this c. 430 Ma age agrees within uncertainty with a 418 ± 18 Ma U–Pb monazite age and a c. 440 ± 14 Ma U–Pb zircon age obtained from a gneiss, also interpreted as the age of the eclogite-facies metamorphism and decompression melting of the HP metasediments. The main problem that still stands despite decades of research on the Acatlán Complex is finding a tectonic model that better explains the geological complexity of a long-lived orogen spanning the opening and closure of the major oceans that once separated Gondwana from Laurentia.

Ortega-Gutiérrez, F., Elías-Herrera, M., Morán-Zenteno, D. J., Solari, L., Weber, B., & Luna-González, L., 2018. The pre-Mesozoic metamorphic basement of Mexico, 1.5 billion years of crustal evolution. *Earth-Science Reviews*, 183, 2-37.