

Geochemical, geochronological, and isotopic constraints on high-grade gneisses from the Mérida Andes, Venezuela: Implications for the Ediacaran–Cambrian tectonic setting of northwestern Gondwana

M. DANIELA TAZZO-RANGEL¹, BODO WEBER¹, RENEE GONZÁLEZ-GUZMÁN² AND DIRK FREI³

¹Centro de Investigación Científica y de Educación Superior de Ensenada BC (CICESE)

²CICESE

³University of the Western Cape

Presenting Author: mtazzo@cicese.mx

Isotopic, geochemical, and U–Pb zircon geochronological data are provided to constrain sedimentary sources and depositional age of high-grade paragneisses of the Iglesias Complex in the Mérida Andes in northern South America. Detrital zircons suggest a maximum depositional age of 540–530 Ma, whereas the age spectra reveal sources from Pan-African-Brasiliano belts (0.6–0.5 Ga), the Amazon Craton (2.5–1.2 Ga), and the Rodinia-type Oaxaquia–Putumayo basement (1.4–1.0 Ga). Reworking of such sources within the Gondwana continent is also suggested by Nd–Hf crustal residence ages between 2.0 Ga and 1.2 Ga. Post-depositional Pb loss during the Early Paleozoic and Permo–Triassic is assessed through U–Pb measurements in zircon rims and discordant analyses. Field evidence as well as geochemical and isotopic signatures are consistent with sillimanite-garnet micaceous pelitic-psammitic protoliths and hornblende-rich volcanoclastic protoliths. The former shows provenances from crustal felsic-intermediate sources ($\text{Th/Sc} < 0.8$; $\epsilon\text{Nd}_t -12.5$ to -3.8 ; $\epsilon\text{Hf}_t -12.1$ to -6.3), whereas the latter probably reflects mixing of siliciclastic sediments and igneous material from an immature volcanic arc ($\text{Th/Sc} 0.1$ – 1.4 ; $\epsilon\text{Nd}_t -3.6$ to -0.7 ; $\epsilon\text{Hf}_t -2.4$ to $+3.4$), suggesting the beginning of subduction of the Iapetus oceanic crust beneath northwestern Gondwana around 530 Ma. Sedimentary precursors were likely deposited during the latest Ediacaran–earliest Cambrian in an extensive continental shelf, fed by detritus draining from the topographic highs of the Pan-African-Brasiliano belts, across the Amazon craton and into the Iapetus Ocean. Thus, the main direction of sediment flow was opposite to the present-day transport, from the Andes Cordillera by the Pacific Ocean to the Amazon Fan in the Atlantic Ocean. Chemical trends also suggest close relation to river sediments and cold-climate weathering at high latitudes. Metasedimentary rocks in the Mérida Andes show similarities with equivalent units in Peri-Gondwanan crustal fragments now located in Colombia, Central America, and Mexico, except the Ediacaran metasedimentary units of the Maya Block. Ediacaran–Cambrian fossiliferous sedimentites in the Eastern Venezuela Basin and the Colombian foreland basin are possibly equivalent to the Iglesias Complex but remained unmetamorphosed, as its location was far from the subduction trench during the Early Ordovician climax of the Famatinian orogeny.