

The Permo-Triassic history of magmatic rocks of the Northern Andes (Colombia and Ecuador): supercontinent assembly and disassembly

R. Spikings¹, D. Villagomez¹, R. Van der Lelij², A. Paul³, W. Winkler⁴

¹Department of Earth Sciences, University of Geneva, Switzerland

²Norges Geologiske Undersøkelse, Trondheim, Norway

³School of Geosciences, The University of Edinburgh, Scotland

⁴Geological Institute, ETH Zürich, Switzerland.

Northwestern South America and its conjugate margins record the Permian assembly of Pangaea, its Triassic fragmentation and opening of the Proto-Caribbean Ocean, and the onset of the Andean cycle at ~209 Ma. We review Permian and Triassic magmatic rocks exposed in the cordilleras and dispersed inliers in Colombia and Ecuador, and present a large geochronological, geochemical, isotopic and thermochronological database. These data are used to develop a model for the evolution of rocks within Colombia and Ecuador during the formation and destruction of Pangaea. Similar data has been assembled from studies of the southern North American and western Caribbean plates, as well as Venezuela and further south within South America, and a large-scale reconstruction for western Pangaea is provided. Permian magmatic rocks in Colombia and Ecuador (288 – 253 Ma) formed within a continental arc system which extended from at least southern North America to southern Peru. The Permian arc within northwestern South America was dismembered during Cenozoic interactions with the Caribbean Plate, causing some blocks to be transferred eastwards. Compression and regional metamorphism at ~250 Ma is best recorded in the Sierra Nevada de Santa Marta, and represents the final stages of amalgamation and thickening of western Pangaea. Continental rifting prevailed within southern North America and the entire western margin of South America during 245 – 216 Ma. Significant back-arc extension in northwestern South America lead to a rift-to-drift transition in Colombia and Ecuador, forming oceanic lithosphere of the Proto-Caribbean. Rifting failed south of the Huancabamba Deflection, and is preserved as Triassic basins in Peru, western Argentina and Chile. Triassic rifting represents the early fragmentation of western Pangaea, and the attenuation of its margin may be a prelude to complete separation by enhancing mantle upwelling, inducing a large igneous province and weakening the crust within a tensile regime.