



Origin of the Rheic ocean: rifting along a Neoproterozoic suture?

J. B. Murphy (1) G. Gutierrez-Alonso (2), J. Dostal (3), J.D. Keppie (4), R.D. Nance (5), C. Quesada (6), J. Fernandez-Suarez (7)

(1)Dept. of Earth Sciences, St.Francis Xavier University, Antigonish, Nova Scotia, B2G 2W5, Canada; (2)Departamento de Geología, Universidad de Salamanca, 33708 Salamanca, Spain ; (3)Dept. of Geology, St. Marys University, Halifax, Nova Scotia, B3H 3C3, Canada; (4)Instituto de Geologia, Universidad Nacional Autonoma de Mexico, 04510 Mexico D.F. Mexico; (5)Dept. of Geological Sciences, Ohio University, Athens, Ohio, 45701; (6)IGME, Dirección de Geología y Geofísica, c/ La Calera, 1 28760 TRES CANTOS Madrid, Spain ; (7)Departamento de Petrología y Geoquímica, Universidad Complutense, 28040 Madrid, Spain.

The Rheic Ocean was formed in the Late Cambrian-Early Ordovician by the rifting of peri-Gondwanan terranes, such as Avalonia and Carolina, from the northern margin of Gondwana, and was consumed by Carboniferous continent-continent collision during the formation of Pangea. Other peri-Gondwanan terranes (e.g., Armorica, Ossa Morena, NW Iberia, Saxo-Thuringia, Moldanubia) remained along the Gondwanan margin at the time of Rheic Ocean formation and were located in the footwall of the asymmetric rift. Differences in the Neoproterozoic histories of these peri-Gondwanan terranes suggest the location of the Rheic Ocean rift may have been inherited from Neoproterozoic crustal structures. Crustally-derived, Neoproterozoic-Silurian igneous rocks in Avalonia and Carolina are characterized by positive initial ε_{Nd} values ($t = 610$) and depleted mantle model ages (T_{DM}) between 0.8-1.1 Ga. This indicates they were formed by recycling a juvenile ca. 1 Ga source in the interpreted peri-Rodinian oceanic lithosphere, and were accreted to the northern Gondwanan margin prior to voluminous Neoproterozoic arc magmatism. On the other hand, crustally-derived igneous rocks in Armorica, Ossa Morena, Saxo-Thuringia, Moldanubia show strongly negative initial ε_{Nd} values and ca. 2.1 Ga T_{DM} model ages. These closely match those of the Eburnian basement of West African suggesting they reflect recycling of ancient (2-3 Ga) West African crust. Therefore, the basements of terranes initially rifted from

Gondwana to form the Rheic Ocean were previously accreted to the Gondwanan margin during Neoproterozoic orogenesis, suggesting that the initial rift leading to the development of the Rheic Ocean was located near the suture between the accreted Neoproterozoic terranes and cratonic northern Gondwana. Opening of the Rheic Ocean coincides with the onset of subduction in its predecessor, the Iapetus Ocean, suggesting geodynamic linkages between the destruction of Iapetus and the creation of the Rheic oceans.