



An explicit kinematic scenario for the Iapetus and Rheic Oceans

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The opening of the Rheic Ocean by the rifting of Avalonia, and the subsequent closure of the Iapetus Ocean by means of the three-way continental collision between Laurentia, Baltica and Avalonia, together constitute the most dramatic, defining and well-studied tectonic events of the early Paleozoic. Despite this, modern kinematic models of those interrelated events are still schematic and/or spatiotemporally disjointed. This is in large part due to the fact that: 1.) many of the available models were originally built to explain a specific region (i.e. Northern Appalachians, Northern Ireland and Scotland, Norwegian Caledonides, etc.) and have only been expanded to neighboring regions as a speculative note, and 2.) the models were not constructed upon a rigorous plate tectonic framework, wherein plate boundaries are specified and the kinematics of the entire lithosphere within the domain are explicitly defined through time. Although the lithosphere of the Iapetus and Rheic Oceans was long ago destroyed, the kinematics of those basins can still be surmised through the careful consideration of paleomagnetic data from the continents and terranes formerly flanking those oceans, and from geological observables along their margins. It is thus possible to explore the tectonic evolution of those basins with kinematic models that strictly conform to plate tectonic rules, both in space and time. Such an approach can plainly identify existing kinematic concepts that are tectonically untenable and those that work only in isolation. Here we briefly elaborate on this approach and present the results of a developing full-plate model of the Iapetus and Rheic Oceans for Late Cambrian to end-Silurian time, with a particular focus on the development of the Caledonide margins.