Opposed accretionary orogens at the core of a supercontinent: Isotopic tracers of the orogens that assembled Rodinia

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Collisional orogens that culminated in the assembly of Rodinia were preceded by long-lived Mesoproterozoic accretionary orogens. Closure of the intervening Mirovoi Ocean prior to the amalgamation of Rodinia occurred through two-sided subduction, leading to the juxtaposition of accretionary orogens of Laurentia, Baltica, Amazonia, and Kalahari. Connections between Laurentia, Baltica, Amazonia, and Kalahari in the core of Rodinia are recorded by anchor terranes which mark piercing points between the four cratons constituting the core of the supercontinent at ca. 1.0 Ga. Long-lived accretionary orogens in Laurentia and Baltica record predominately radiogenic zircon εHf and whole rock Pb compositions, short crustal residence times and are characterized by the development of arc-backarc complexes, consistent with a retreating accretionary orogen. Conversely, the Mesoproterozoic orogens of Amazon and Kalahari cratons record unradiogenic zircon εHf values, ca. 0.3 Ga longer crustal residence times and more ancient whole-rock Pb signatures, consistent with incorporation of cratonic material in continental arcs of an advancing accretionary orogen. These advancing and retreating accretionary orogens were subsequently juxtaposed when Rodinia amalgamated. Subduction of the Panthalassa Ocean beneath Gondwana and development of the Terra Australis accretionary orogens which have existed throughout the Phanerozoic is analogous to the organization of accretionary orogens at the margin of the Mirovoi Ocean. The ultimate juxtaposition of advancing and retreating accretionary orogens at the core of the supercontinent Rodinia leads us to speculate that contrasting accretionary orogens in two-sided subduction tectonic regimes may provide a mechanism for ocean closure and supercontinent assembly.