The role of segmented magma-rich rifted margins in convergent settings: insights from the Demerara Plateau and Guyana-Suriname margins

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The pre-collision template of a convergent setting often results from an earlier extensional history characterized by rift basins or passive margins (magma-poor, magma-rich or transform margins). Fossil magma-poor rifted margins have been recognized in mountain belts and their role in subduction nucleation and subsequent formation of orogens has been extensively studied. However, little is known about the tectonic control of magma-rich rifted and transform margins in convergent settings.

We use the Demerara Plateau and Guyana-Suriname margins to investigate; (i) the nature and architecture of segmented magma-rich rifted margins and (ii) how an earlier segmented magmatic rifting event may control the onset of convergent tectonics.

To achieve our aim, we interpret reflection seismic data and apply two quantitative techniques (gravity anomaly inversion and joint inversion of gravity and seismic Moho depths) to determine Moho depth, basement nature and thickness, and insights into SDRs (Seaward Dipping Reflectors) composition. This allows us to distinguish and map first order margin domains as well as interpret structural lineaments along the Demerara Plateau and Guyana-Suriname margins.

In the NW offshore Guyana, identified domains consist of 30-15 km thick continental crust (the proximal and necking domains), a magma-poor OCT and Jurassic Central Atlantic oceanic crust. In contrast, offshore in the SE Guyana and Suriname, we determine a Jurassic magma-rich OCT while in the Demerara Plateau a large SDRs domain followed more distally by Cretaceous Equatorial Atlantic oceanic crust are observed. We interpret major tectonic structures consisting of NNW-SSE oriented Jurassic rift transfer zones crosscut by a younger NW-SE transform fault of Late Jurassic to Early Cretaceous age.

Shortening in the northern Demerara Plateau is observed and interpreted as being caused by the reactivation of a Jurassic transfer zone during a change of plate kinematics related with the opening of the Equatorial Atlantic. This may record an aborted convergent plate boundary. Our study provides insights on how a segmented magma-rich rifted margin may control the initiation and dynamics of a more mature convergent system such as subduction.

Mots-Clés : Magma-rich rifted margins, transform faults, Demerara Plateau, Guyana-Suriname margins