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Thermal modelling of a transform-divergent interaction zone, the Demerara Plateau, French Guiana margin: architecture of oceanic and continental crusts

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The crustal architecture of passive margins is a key to constrain their origin and subsequent evolution, as well as their thermal subsidence. The square shaped continental Demerara Plateau, French Guiana margin, surmounts Central and Equatorial Atlantic oceanic crusts surrounding it. Bounded to the northeast by a WNW-ESE-trending transform fault segment and to both the west and the east by N-S divergent fault segments, the Demerara Plateau is a complex transform-divergent interaction zone. The aim of this study is to refine the crustal architecture of this region as derived from gravity and seismic data, by thermal modelling, and by using surface heat flow data as an additional constraint.

Previous studies show that the transform transition domain from continental to oceanic crust occurs across a region of approximately 70-km wide, where the Moho deepens abruptly from 25-27 km beneath the plateau (thinned continental crust), to 11-12 km in the abyssal oceanic domain (3-4 km thick oceanic crust).

During the IGUANES cruise (onboard R/V L'Atalante in 2013) 10 surface heat flow measurements crossing the plateau have been carried out. These data are combined with borehole heat flows values around. Measures indicate that surface heat flow values range between 47 and 80 mW/m^2 (with an uncertainty on the measurements of $\sim$4mW/m^2 on average), and slightly decreases in the continental domain toward the ocean. Preliminary 1D thermal modelling results indicate that these heat flow values are consistent with crustal and sediment thicknesses observed on the Plateau. Along the transform domain, at the transition towards the oceanic crust, heat flow values are lower than model results, if we consider an oceanic crust of more than hundred million years and with a thickness of around 3-4 km. We examine, using a 2D approach, whether this low heat flow could be reasonably accounted for by thermal exchange between oceanic and continental lithospheres.