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Crustal Thickness and Composition of the São Paulo Plateau and Florianópolis Ridge, SE Brazilian Margin

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The São Paulo Plateau (SPP) and the Florianópolis Ridge (FR), located on the Santos segment of the SE Brazilian margin in the South Atlantic, are large positive bathymetric features with a combined lateral dimension of approximately 500 km. An important question is whether they are underlain by thinned continental crust or by anomalously thick magmatic crust. Each hypothesis has implications for the breakup of the South Atlantic and the evolution of the overlying saline Santos basin.

Integrated quantitative analysis consisting of gravity inversion, RDA (residual depth anomaly) analysis and flexural subsidence analysis has been applied to a deep long-offset seismic reflection line running NW-SE across the SPP and FR. Gravity inversion predicts crustal basement thicknesses in the range of 12 to 15 km for the SPP and FR, decreasing to 7-8 km thickness at the extreme SE end of the profile. The SPP and FR are separated by a region of thinner crust approximately 80 km wide. Thinning factors from subsidence analysis for SPP and FR are typically between 0.6 and 0.7.

RDA values close to zero and a thinning factor of 1 were obtained for the region with 7-8 km thick crust at the SE end of the profile which are all consistent with normal oceanic crust rather than previously interpreted exhumed mantle. This oceanic crust is highly tectonised and corresponds to the location of the Florianópolis Fracture Zone.

Flexural backstripping and reverse thermal subsidence modelling were performed to calculate palaeo-bathymetry at breakup and give 2.5 km below sea level at the SE end of the profile consistent with this region being oceanic crust. Flexural subsidence analysis applied to base salt shows that the observed base salt subsidence requires a component of syn-tectonic subsidence as well as post-rift thermal subsidence, and that the salt was deposited while the crust was still thinning.

Joint inversion of time seismic reflection and gravity data to determine the lateral variation in basement density by comparing seismic and gravity Moho in the time domain gives a basement density under the SPP and FR of between 2600 and 2700 kg/m³. The same method gives a basement density of 900kg/m³ for the oceanic crust at the SE end of the profile. The FR basement in the NW shows a basement density similar to that of the SPP while in its SE the basement density is much higher approaching 2950 kg/m³. We interpret the relatively low basement densities of the

SPP with respect to that of oceanic crust as indicating a continental rather than magmatic composition. A similar analysis to determine basement density applied to the Evain et al. (2015) seismic refraction profile in the same location also gives a SPP basement density that supports a continental composition.