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Gravity anomalies, crustal structure, and flexure at the NE Brazil rifted continental margin

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During November/December 2003, we carried out a marine geophysical survey of the rifted continental margin offshore NE Brazil onboard RRS *Discovery*. The survey included 620 line km of coincident multi-channel seismic reflection and wide-angle seismic refraction data that were acquired along two transects of the margin in the region of the Amazon deep-sea fan. The wide-angle data, which were recorded by 27 ocean bottom instruments deployed at 12.5-25.0 km intervals, have been used to determine a P wave velocity model of the crust and upper mantle. The model shows that the middle Amazon fan is underlain by $>$12 km of sediments which can be divided into an upper and lower layer with seismic velocities between 1.6-4.0 and 3.6-4.6 km/s respectively. The sediments overlie a 5 km thick oceanic crust with seismic velocities between 4.5-7.5 km/s. This is unusually thin when compared to compilations elsewhere in the Atlantic. We have used the velocity model, together with existing commercial seismic reflection data, to estimate the distribution of sediments beneath the upper and lower Amazon fan. The data show two main depocentres: an early one associated with the Cretaceous to mid-Miocene margin and a later one associated with the mid-Miocene to Recent superposition on the margin of the Amazon fan. The later depocentre is displaced by $\sim$50 km seaward of the early one. We have used a sediment thickness grid, together with combined 3-D flexural backstripping and gravity anomaly modelling techniques, to estimate the temporal and spatial distribution of the elastic thickness of the lithosphere, T_e, in the Amazon fan region. Preliminary results show that the early margin sediments loaded a relatively weak lithosphere with a $T_e \sim$ 10 km while the later Amazon fan sediments loaded a relatively strong lithosphere with a $T_e \sim$ 45 km. The gravity anomaly modelling also implies that the region of unusually thin oceanic crust extends landward to beneath the upper Amazon fan and outermost shelf of the NE Brazil margin. We discuss here the significance of these results and their implications for the structure, evolution and thermal and mechanical properties of rifted margins.