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Synrift subsidence and magmatism of the Central South Atlantic passive margins based on long term 2-D thermo-mechanical modelling

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Here we use observations from the central South Atlantic conjugate margins to constrain the structural style of rifting and its relation with sedimentary basin evolution during the syn and early post-rift. Three synthetics transects from North (Gabon-Brazil) to South (Angola-Brazil) are used to constrain fault distribution, margin width, crustal thickness, distribution of magmatism, syn-rift sedimentary section thickness and paleo-environment from the start of rifting in the Berriasian (145 Ma) until the early post rift in the Aptian (113 Ma). This integrated study aims to understand variations in along strike structural style, magmatic output, and sedimentary basin evolution to assess the contribution of mantle processes on topography using forward 2-D thermo-mechanical modelling. We design a model setup that reproduces South Atlantic central segment main characteristics before rifting. We then explore scenarios of lithospheric thinning where strain weakening mechanisms, degree of depletion of lithopsheric mantle and crustal rheology are the main variables. The model accounts for decompression melting with feedbacks on temperature, viscosity and density of the mantle. The subsidence in the thermo-mechanical models is calibrated with a reference ridge elevation, where a 6 km thick oceanic crust is predicted, and explained by the different contributions on buoyancy of rifted passive margin during rifting. We discuss conditions to get magma-poor margins with/without exhumed mantle at the seafloor and conditions to reach a small topographic gradient and shallow water environment between the proximal and distal domains over more than 200 km of the wide margin during most of the syn-rift.