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Structure and Evolution of an obliquely rifted Margin, the Santos Basin, SE Brazil

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It is increasingly recognised that much of the structural complexity found in rifted passive margins can be related to the influence and reactivation of pre-existing basement structures, many of which lie significantly oblique to the regional extension vector. The passive margins of Brazil and Angola display complex variations in margin trend, width and structure along strike. The contrasting style between the neighbouring Campos (orthogonal) and Santos (oblique) Basins of SE Brazil are a perfect example of this variation. Thanks to hydrocarbon exploration in Campos Basin the rift architecture of this basin is well known. In comparison the rift architecture of the Santos Basin is relatively under explored.

Detailed studies of 2D seismic and regional geophysical data have been used to build up an early Cretaceous rift model for the Santos Basin. These have then been integrated with existing data for adjacent margins (e.g. Campos), regional plate reconstruction models used to restore rifts from the conjugate margins, and onshore geological and remote sensing studies for Brazil and Angola.

The rift architecture of the Santos basin is characterised by N-S to NEE-SWW trending faults. These intra-basin faults may be segmented into distinct dip domains separated by ESE-WNW and ENE-WSW (margin parallel) transfer zones. The latter margin parallel set are only apparent in the NW of the basin. Localised basement inheritance is also apparent in near shore and onshore areas, but not in deep water,

therefore leading us to define zones of basement-controlled rifting at the margin edge and extension-controlled rifting in deepwater areas (rift partitioning?). The extensive Aptian salt basin extends across the basins of the Central South Atlantic, forming a perfect marker horizon. This salt basin is believed to be coincident with the onset of sea-floor spreading in the Campos and Kwanza basins. However, in deepwater Santos a late phase of rifting appears to continue at this time, offsetting the base salt strata. We suggest that this rifting is coincident with the onset of sea floor spreading in the Campos basin, and therefore the transition from rift to drift occurs later in oblique margin segments. This may also explain why the ocean-continent boundary is so difficult to place in deep water Santos.