

THE FORMATION OF LARGE CONTINENTAL BASINS: INTRODUCTION TO A CASE STUDY OF THE PARNAÍBA BASIN, NE BRAZIL –*THE PARNAÍBA BASIN ANALYSIS PROJECT (PBAP)*

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Large continental basins (LCB's) of Phanerozoic age cover some 25% of the world's continental crust. Also known as cratonic, intracratonic and sag basins, these major components of continental crust share several features in common. They typically are equant to sub-circular in shape; they unconformably overlie regional peneplain surfaces; they are characterized by long (300 Ma), slow, subsidence histories and shallow water to continental sedimentation; they have flat-lying sediments showing only local deformation; and they are marked by regional, free-air gravitational lows. These basins are also sources of significant water, petroleum and mineral resources. In spite of their various labels, LCBs appear to form on thick and thin, and old and relatively young lithosphere, with a variety of crustal types and ages. The PBAP project identified the Parnaíba basin of NE Brazil, as a typical example of an LCB. The project, sponsored by BP and involving 7 Brazil and UK universities, has undertaken a detailed basin analysis of Parnaíba to characterize it and illuminate the controls on its formation. The scientific intent has been to improve our understanding of the basin forming process of Parnaíba, and to draw broader conclusions about LCBs more generally. Seismic reflection and refraction, passive seismic, potential field and magneto-telluric studies have been carried out along a 1400 km transect across the basin. In addition, oil industry seismic and potential field data, supplied by the ANP, has enabled the analysis to be broadened to the whole basin. These geophysical methods have examined the nature of the sub-basin crust and mantle. They have defined distinct crustal blocks beneath and adjacent to the basin and illuminated the tectonic history of that basement. In particular the diverse basement fabrics, an irregular Moho of 34-45 km depth with Moho steps associated with the transition between blocks. One of these block boundaries and Moho steps correlates well with the Transbrasiliano Lineament, a continental scale transcurrent fault zone. A lower crustal igneous fabric has been identified beneath the basin by at least three techniques. The stratigraphic and magmatic history of the basin has been analysed and attempts made to precisely define the subsidence history of the basin through the backstripping of petroleum exploration wells. The magmatic components of the basin have been analysed both to understand their structural and stratigraphic significance and as a means to understand the mantle beneath the basin and its implications. In addition the active tectonics and current drainage the basin patterns have been analysed to clarify the basins current tectonic activity. The outcome of the project is an understanding of the crustal and lithospheric structure of the Parnaíba basin and it's implications for the basin history, stratigraphy and formation mechanism. Whilst the results sit well in the context of a long history of publications on the region, many new insights are evident from the project of geodynamic, tectonic and resource significance.

PALAVRAS-CHAVE: Parnaíba Basin, Large Continental Basins.