

THE PRE-SILURIAN RIACHÃO BASIN, A NEW PERSPECTIVE INTO THE BASEMENT CONFIGURATION OF THE CRATONIC PARNAÍBA BASIN, NE BRAZIL

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The basement configuration of the cratonic Phanerozoic basins of Brazil is important for the understanding of their genesis and tectonic evolution. Recent studies revealed a major pre-Silurian unconformity defining the base of the Parnaíba basin and three crustal blocks underlying it, as well as a complex series of graben structures of Eo-Cambrian age or older. The seismic reflection data presented here supports a new interpretation of the structure and stratigraphy immediately below the pre-Silurian unconformity and informs its tectonic context. The interpretation of 1276km of new, regional 2D seismic reflection data and potential field data in the mid-western part of the Parnaíba cratonic basin revealed the presence of a pre-Silurian remnant basin, named here the Riachão Basin. In the study area, the basin is about 120km wide, with a minimum area of 15,000km² and a maximum thickness of 4km. Four exploration wells have penetrated the Pre-Silurian unconformity and show the Riachão sediments to be Pre-Silurian, clastic and at least 1 km thick (1-VG-1R-MA). We propose that the Riachão Basin is formed by three seismic stratigraphic sequences: Riachão I, II and III, bounded by basement uplifts. The sequences are defined on the basis of seismic facies, seismic event terminations and their relative juxtaposition. The top and the base of the Riachão Basin are defined by two regional erosional unconformities, the Pre-Silurian Unconformity and the top of pre-Riachão basement. The Riachão I sequence is characterized by continuous, parallel and high amplitude reflectors and has a maximum thickness of 800m. The base is defined by the erosional unconformity above the Pre-Riachão Basement. The whole sequence defines a gentle arch. Both Riachão II and Riachão III sequences have a broadly wedge shape form; Riachão II has a maximum thickness of 2km and thins to the east; and the overlapping Riachão III has a maximum thickness of 2.25km and thins to the west. The Riachão II sequence onlaps the top of Riachão I and thins over the central arch, whilst the Riachão III onlaps Riachão II. The western boundary of the basin is defined by a major basement uplift that folds the pre-Riachão basement and Riachão I and II sequences into a major east facing monocline. To the east of the basin, a similar structure is interpreted facing westward and elevating the Riachão III sequence. It is proposed that the Riachão basin is the remnant of a significantly larger basin that developed during late Brasiliano times. Exploration well and potential field data indicate that the basin extends both north and south from the study area. The driving mechanism of the basin is unclear. However, the seismic stratigraphic interpretation indicates Riachão II and III could be remnants of marine, clastic, foreland basin sequences of opposed polarity. In this context the Riachão I is interpreted as a carbonate marine sequence and precursor to the main foreland subsidence and clastic sediment input. This study is part of the BP funded Parnaíba Basin Analysis Project (PBAP), conducted by a partnership between Observatório Nacional/MCTI and the University of Oxford.

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