



Depositional ages of Paleozoic and Mesozoic pre-rift supersequences of the Recôncavo Basin in northeastern Brazil: A Rb–Sr radiometric study of sedimentary rocks

D.R. Silva^{a,b,*}, A.M.P. Mizusaki^a, E.J. Milani^c, M. Pimentel^a

^a Universidade Federal do Rio Grande do Sul, Instituto de Geociências (IG-UFRGS) – Avenida Bento Gonçalves, 9500 – CEP 91501-970 Porto Alegre, RS, Brazil

^b CPRM/Serviço Geológico do Brasil – Superintendência Regional de Porto Alegre – Rua Banco da Província, 105 – CEP 90840-030 Porto Alegre, RS, Brazil

^c PETROBRAS – Cenpes, Avenida Horácio Macedo, 950, Cidade Universitária, Rio de Janeiro, RJ, Brazil

ARTICLE INFO

Article history:

Received 23 February 2011

Accepted 30 December 2011

Keywords:

Recôncavo Basin

Sedimentary rocks

Pre-rift supersequence

Paleozoic supersequence

Rb–Sr method

Depositional age

ABSTRACT

The relative dating of sedimentary rocks can be carried out either from fossils or by stratigraphic correlation. In the absence of fossil content with unequivocal age significance, or in cases in which correlations are neither possible nor conclusive, the task of estimating the depositional age of a sedimentary rock is inviable. Rb–Sr whole-rock isochron method, combined with granulometric and X-ray diffraction studies, has been successfully used to date the deposition of fine-grained sedimentary rocks. In the present study, samples of argillites and siltstones of the Paleozoic and pre-rift sections of the Recôncavo Basin, in the northeastern coast of Brazil, have been investigated. Samples from the Afligidos (Cazumba Member), Aliança (Capianga Member) and Itaparica formations, yielded ages of 290 ± 21 Ma (Permian), 224 ± 32 Ma, and 226 ± 6 Ma (Neotriassic), respectively, which were interpreted as their original depositional ages. The age results for the units of the pre-rift section (Aliança and Itaparica formations) present significant implications to the paleogeographic model previously established for the Recôncavo Basin and other correlated basins, since these sedimentary units were traditionally considered to be Neojurassic.

© 2012 Elsevier Ltd. All rights reserved.

1. Introduction

Relative dating of sedimentary rocks can be achieved either from their fossil content or by stratigraphic correlation. In the cases in which fossil content with unequivocal age significance is absent, or when stratigraphic correlations are neither possible nor conclusive, the task of estimating the depositional age of a sedimentary rock becomes inviable. Radiometric dating techniques usually applied to igneous and metamorphic rocks have been used to date either the depositional or the diagenetic age of fine-grained sedimentary rocks (Cordani et al., 1978; Thomaz Filho and Lima, 1979; Silva et al., 2006a).

Rb–Sr radiometric dating of sedimentary rocks has achieved geologically significant results, when some constraints are

observed, such as: stratigraphic control of the samples, low silt/clay ratio, and mineralogy of the fine fraction of samples rich in expansive clay minerals (smectite, interstratified illite-smectite and degraded illite) (Whitney and Hurley, 1964; Byscae and Dasch, 1971; Cordani et al., 1978; Morton, 1985; Mizusaki, 1992). Although there are still some questions regarding the use of this technique for sedimentary rocks, many significant results have been described in the literature (Clauer, 1979; Mizusaki et al., 1998, 2002; Silva et al., 2006b).

The Brazilian continental margin is an example of a passive continental margin, in which the tectono-sedimentary phases of pre-rift, rift, and drift are well known. A classical pre-rift example is the basal section of the Recôncavo Basin, which does not include the necessary elements to support the precise biostratigraphic dating of the sedimentary units due to the endogenous nature of the non-marine ostracod micropaleontological content, associated with sparsely varied and low palynomorph content (Arai et al., 1989).

A Paleozoic sequence is also described in this basin (Silva et al., 2007), with units deposited under arid paleoclimate in an intracratonic basin context before the pre-rift stage. The ages assigned to

* Corresponding author. Universidade Federal do Rio Grande do Sul, Instituto de Geociências (IG-UFRGS) – Avenida Bento Gonçalves, 9500 – CEP 91501-970 Porto Alegre, RS, Brazil. Tel.: +55 51 3308 6379; fax: +55 51 3308 6340.

E-mail addresses: diogo.rodrigues@cprm.gov.br (D.R. Silva), ana.mizusaki@ufrgs.br (A.M.P. Mizusaki), ejmilani@petrobras.com.br (E.J. Milani), marcio.pimentel@ufrgs.br (M. Pimentel).

the Paleozoic are also subject of discussion due to their poor fossil records (Milani et al., 2007).

Given the importance and significance of determining absolute ages of the Paleozoic and pre-rift sedimentary sections, which serve as a link to sections with international references, it seems to be interesting to follow this line of research.

In this regard, we analyzed samples of fine-grained siliciclastic rocks from the Paleozoic and pre-rift sections of the Recôncavo Basin, a geologically well known region, but with large gaps of knowledge with regard to the depositional ages.

2. Basal section of the Recôncavo Basin

The Recôncavo Basin is located in northeastern Brazil and it is exposed over an area of 11,500 km² (Fig. 1). It is limited to the north and northwest by the Aporá High, to the south by the Barra fault system, to the west by the Maragogipe Fault, and to the east by the Salvador fault system.

The structural configuration of the basin is related to extensional stresses resulting from the breakup of Gondwana during the Early Cretaceous, bringing about the opening of the Atlantic Ocean and the development of the Brazilian continental margin.

The tectono-sedimentary development of the Brazilian continental margin from the Gondwana Mesozoic breakup (called Wealdenian Reactivation, Almeida, 1967), has been described by different authors (e.g. Asmus and Porto, 1980; Chang et al., 1990).

According to Silva et al. (2007), the sedimentary package of the Recôncavo Basin is formed by four supersequences: Paleozoic, pre-rift, rift, and post-rift. In the present study the sedimentary units of the Paleozoic and pre-rift supersequences, representing the basal portion of the basin, are investigated (Fig. 2).

In the Paleozoic supersequence, the studied unit is represented by the Cazumba member of the Afligidos Formation. It was deposited in an intracratonic basin under arid paleoclimate. The facies associations that characterize the Paleozoic units represent a regressive trend, with transition from shallow, marginal marine sedimentation to isolated evaporite basins, continental *sabkha* environments and, lacustrine systems (Aguar and Mato, 1990). In the Cazumba Member, red lacustrine pelites and mudstones prevail, with anhydrite nodules at the base of the section. The age of the Cazumba Member is subject of discussion due to its poor fossil record. According to Caixeta et al. (1994), the deposition of the Afligidos Formation is limited to the Permian.

The pre-rift supersequence comprises deposits related to the initial stage of the crustal flexure. The sedimentary package accumulated in a broad and shallow basin of flexural origin; the origin of this depression is tectonically associated with the large-scale extensional process that led to the rift phase and continental rifting. At the time of the pre-rift sedimentation, normal faults were still rare and dislocations were inexpressive. The pre-rift supersequence corresponds to the Afro-Brazilian Depression of Cesero et al. (1972, *apud* Cesero and Ponte, 1997) and includes continental sediments, corresponding to fluvial deposits locally

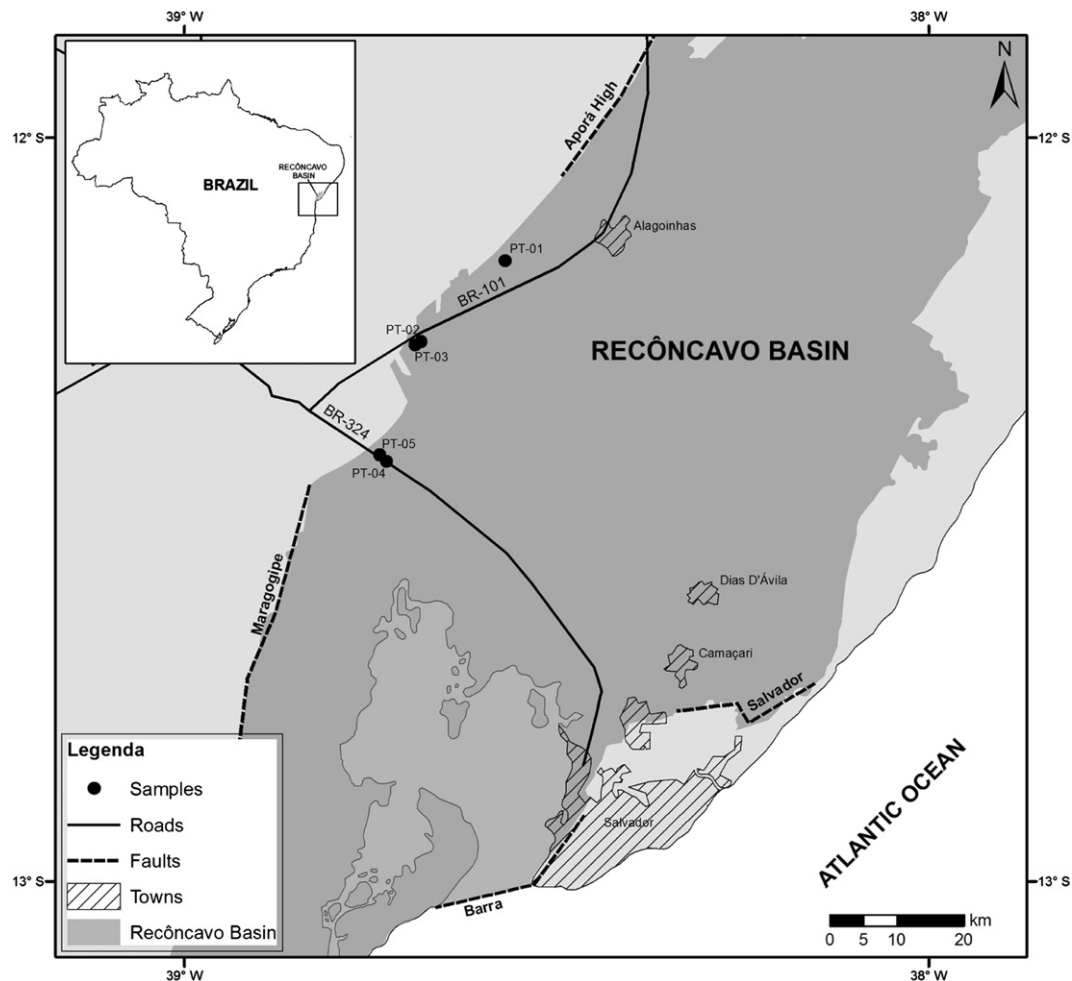


Fig. 1. Map of the Recôncavo Basin and location of the sampling sites.

Download English Version:

<https://daneshyari.com/en/article/4682538>

Download Persian Version:

<https://daneshyari.com/article/4682538>

[Daneshyari.com](https://daneshyari.com)