



Provenance of the Passo Feio complex, Dom Feliciano Belt: Implications for the age of supracrustal rocks of the São Gabriel Arc, southern Brazil



Carina Graciniana Lopes^{a, b, *}, Marcio Martins Pimentel^c, Ruy Paulo Philipp^b, Leonardo Gruber^b, Richard Armstrong^d, Sergio Junges^c

^a CPRM, Brazilian Geological Service, Salvador, Bahia 41213-000, Brazil

^b Instituto de Geociências, Universidade Federal do Rio Grande do Sul, Porto Alegre, Rio Grande do Sul 91501-970, Brazil

^c Instituto de Geociências, Universidade de Brasília, Brasília, Distrito Federal 70910900, Brazil

^d RSES, Australian National University, Canberra, Australia

ARTICLE INFO

Article history:

Received 30 June 2014

Accepted 18 November 2014

Available online 27 November 2014

Keywords:

Provenance

Passo Feio complex

São Gabriel Arc

U–Pb

Dom Feliciano Belt

Mantiqueira Province

ABSTRACT

The Passo Feio complex (PFC) is a sequence of metapelite, amphibolite, metavolcanic/metavolcanoclastic rocks, marble, calc-silicate rocks, quartzite and magnesium schist. It is part of the São Gabriel Terrane, a Neoproterozoic juvenile arc formed during the early stages of evolution of the Neoproterozoic Dom Feliciano Belt (DFB), in southern Brazil. This belt corresponds to the southernmost portion of the Mantiqueira Province, an important Neoproterozoic orogenic system exposed in the NNE direction along the southeastern coast of Brazil. The geotectonic significance of the original Passo Feio basin in the tectonic evolution of São Gabriel Terrane is not well understood. It has been considered as part of a passive margin sequence or as a back-arc sequence. Geochronological and isotopic data are very scarce for the Passo Feio rocks and this has hampered the better understanding of its significance in the Neoproterozoic tectonic evolution of southern Brazil. In the present study the age and significance of metasedimentary rocks of the PFC were investigated. The provenance study was carried out in four metapelite samples from the southern and northern Passo Feio complex, using U–Pb dating of detrital zircon. The results showed varied provenance patterns and zircon ages range from 3637 to 803 Ma. Paleo- and Mesoproterozoic detrital zircon grains are present in all samples, but an important Neoproterozoic population has been identified in one of them. 3.5 Ga old zircon grains form the oldest population of detrital zircon ever reported in southern Brazil. Paleoproterozoic/Archean terranes within the Rio de la Plata Craton may represent the main source of detrital sediments and this suggests that part of the Passo Feio complex might have been a passive margin sequence, developed along the northeastern margin of that paleocontinent. However, the presence of a Neoproterozoic zircon population is not consistent with derivation solely from the craton and indicates contribution from younger sources, such as the Neoproterozoic São Gabriel Arc itself. This Neoproterozoic zircon population with ages ranging from 948 to 803 Ma, suggests that the onset of the magmatic/tectonic evolution of the São Gabriel Arc might have started as early ca. 0.95 Ma.

© 2014 Elsevier Ltd. All rights reserved.

1. Introduction

The pioneer geological mapping projects in the Passo Feio area were carried out by [Ribeiro and Bocchi \(1966\)](#) and [Ribeiro \(1970\)](#) who described a detrital metasedimentary sequence included it

in the so-called Vacacaí Formation. Later on, [Bitencourt \(1983\)](#) defined the Passo Feio complex (PFC) as a volcano-sedimentary sequence, including also amphibolite and metavolcanic/metavolcanoclastic rocks interlayered with the metasedimentary rocks.

The complex is part of the Neoproterozoic São Gabriel Terrane, which comprise juvenile rock associations generated in a Neoproterozoic arc system in Rio Grande do Sul state, southernmost Brazil ([Fig. 1](#)). It was formed during the early stages of evolution of the Neoproterozoic Dom Feliciano Belt, in the southern portion of

* Corresponding author. CPRM, Brazilian Geological Service, Salvador, Bahia 41213-000, Brazil.

E-mail address: carinalopes.geo@gmail.com (C.G. Lopes).

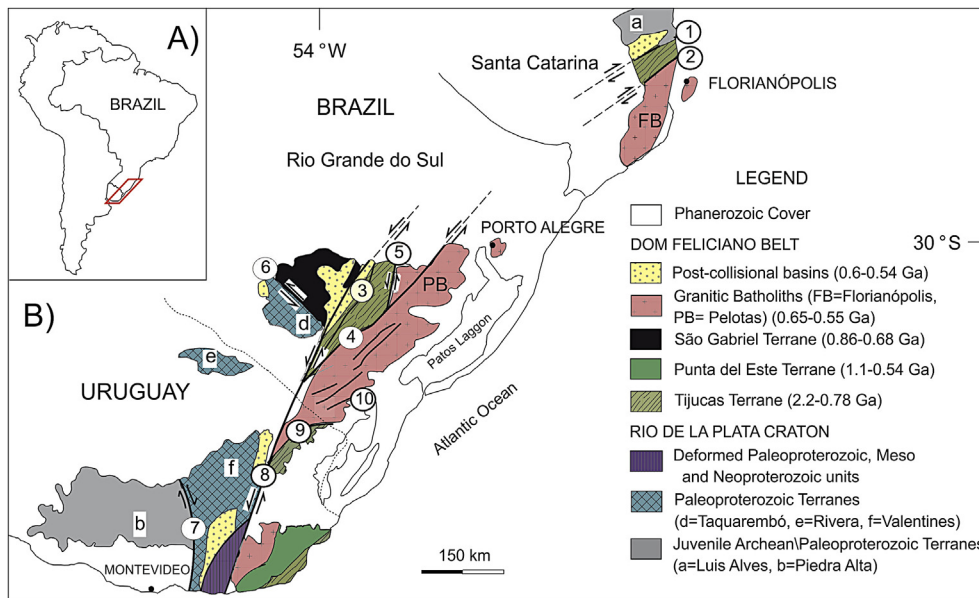


Fig. 1. A) Location of the study area in South America B) Major geotectonic units in southern Brazil and Uruguay. Shear zones: 1 – Itajaí-Perimó, 2 – Major Gercino, 3 – Santana da Boa Vista, 4 – Dorsal de Canguçu, 5 – Passo do Marinheiro, 6 – Ibaré, 7 – Sarandi del Y, 8 – Sierra Ballena, 9 – Cerro Amaro, 10 – Arroio Grande. Modified from [Oyhantçabal et al. \(2010\)](#) and [Philipp et al. \(2014\)](#).

the Mantiqueira Province ([Almeida, 1977](#)), as a result of plate convergence and closure of the Adamastor Ocean.

The Passo Feio complex has been considered to be either part of a passive margin sequence ([Fragoso-Cesar, 1991](#)) or of a back-arc sequence ([Fernandes et al. 1992](#)). However, the available geological, geochemical and structural data are not conclusive and its role in the tectonic evolution of the São Gabriel Terrane remains uncertain.

Geochronological and isotopic data are also very scarce for the Passo Feio rocks. Previous U-Pb zircon provenance work was carried out by [Remus et al. \(2000\)](#) on one sample of albite-muscovite-chlorite schist (CERR-wr) from the northwestern part of the Passo Feio complex. In this sample the zircon ages range from Archean to Neoproterozoic indicating that the Passo Feio complex was originated from erosion of continental sources of varied ages and nature.

The main objective of the present study was to investigate the provenance of four samples of metapelites of the PFC using LA-ICPMS and SHRIMP U-Pb ages of detrital zircon grains, and constrain the depositional age and tectonic setting of the original sediments.

2. Geological setting and previous data

The Mantiqueira Province ([Almeida, 1977, 1981](#)) is a Neoproterozoic NE–SW orogenic system running parallel to the southern and eastern Brazilian coast extending for more than 3000 km from the Bahia State in NE Brazil to Uruguay. It represents a Neoproterozoic orogenic system encompassing the Araçuaí, Ribeira and Dom Feliciano orogenic belts, formed during the Neoproterozoic assembly of Gondwana ([Heilbron et al. 2004b](#)).

The Dom Feliciano Belt (DFB) was formed by the collision between Kalahari and Rio de La Plata cratons at the end of the Neoproterozoic. Two distinct events may be recognized in the process of continental assembly: (i) the development of the São Gabriel Arc (Passinho and São Gabriel events) and (ii) the formation of the Dom Feliciano Arc. ([Alkmim et al., 2001](#); [Chemale Jr. et al., 1995](#); [Fernandes et al., 1992](#); [Silva et al., 2005](#); [Hartmann et al., 2007](#)).

The São Gabriel Arc is exposed in the western part of the Dom Feliciano Belt, to the east of the Rio de La Plata Craton (the Taquarembó Terrane) ([Hasui, 2010](#)). In Rio Grande do Sul, the São Gabriel Terrane includes the petrotectonic associations generated by this arc system ([Fig. 1](#)). The boundary of this terrane with Rio de La Plata Craton is marked by the Ibaré Shear Zone ([Fig. 1](#)). The younger Dom Feliciano Arc system is exposed in the eastern part of the Dom Feliciano Belt, and is limited to the west by the Sierra Ballena Shear Zone.

Due to intense deformation, the internal stratigraphic organization of the São Gabriel Terrane is poorly understood. Nevertheless it can be divided into the following petrotectonic associations: i) Imbicui orthogneisses, ii) Cambaí orthogneisses; iii) supracrustal rocks comprising sedimentary and volcano-sedimentary sequences metamorphosed under amphibolite facies (Cambaizinho, Palma, Bossoroca and Passo Feio complexes); iii) Cerro da Mantiqueira ophiolite and other mafic–ultramafic complexes and iv) post-collisional volcano-sedimentary sequences and granites. These different units represent diverse tectonic environments such as passive margin, back arc, ocean floor remnants (ophiolites), and volcano-sedimentary/plutonic arc sequences ([Hartmann et al., 2000, 2007](#); [Chemale Jr., 2000](#); [Lena, 2013](#)).

There is much controversy about the tectonic evolution of São Gabriel Arc. It is agreed, however, that it represents the initial stages of Neoproterozoic convergence which built up the Mantiqueira Province. [Heilbron et al. \(2004a\)](#) considered it as representative of a long-lived accretionary event, extending mostly from ca. 880 Ma to 700 Ma, with a metamorphic peak at 700 Ma.

The oldest magmatic event recognized in the São Gabriel Arc comprises the development of a primitive 900 Ma old island arc ([Chemale Jr. 2000](#)). It is represented by dioritic to tonalitic orthogneisses described by [Leite et al. \(1998\)](#) and [Philipp et al. \(2014\)](#). They are exposed in the southern portion of the Lavras do Sul region, in the southwesternmost part of the São Gabriel Terrane. [Chemale Jr. \(2000\)](#), [Saalmann et al. \(2005\)](#) and [Hartmann et al. \(2007\)](#) referred to this as the Passinho event, representative of the earliest island arc magmatism.

Download English Version:

<https://daneshyari.com/en/article/4682256>

Download Persian Version:

<https://daneshyari.com/article/4682256>

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