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Gondwanan, perigondwanan, and exotic terranes of Southern South America

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Introduction

The existence of fault bounded continental blocks, with peculiar Paleozoic histories and distinct faunal affinities, led to the recognition of a series of Paleozoic terranes amalgamated during the latest Proterozoic to the Late Paleozoic in southern South America1, part of Western Gondwana. Based on faunal affinities and paleomagnetic data, some of these terranes have been interpreted as derived from Laurentia or been allochthonous to the Gondwana supercontinent. The purpose of this contribution is to analyze some characteristic of the basement of these terranes, which have been classified in three different types: the Gondwanan, Perigondwanan, and exotic terranes (see figure 1).

The Gondwanan terranes

These terranes aggregated during the brasiliano or pampean orogenies, with the main deformation during the latest Proterozoic, remained after amalgamation, sutured to Gondwana during the Phanerozoic. One of the most typical examples of this type is the Pampia terrane[2]. This huge continental basement block after an important period of east-dipping subduction at about 700 Ma[3], remained sutured ever since late Proterozoic times to the rest of cratonic South America. The Córdoba terrane is another example of a Gondwanan terrane, accreted at the end of the Proterozoic, with an important postcollisional suite of granites of early Cambrian age (approx. 530 Ma). Both terranes are typical interior orogens (sensu[4]), which are preserved in granulite and high amphibolite facies, developed during the late brasiliano deformation.

The Perigondwanan terranes

There are several terranes that have been accreted to cratonic South America during the pampean orogeny, but soon after the docking have been split away. Later on, some of them amalgamated again to the Gondwana margin in the early Paleozoic, while others have been sutured to Laurentia or to other continental blocks. A good example of this type of terranes is the Arequipa-Antofalla block[1]. In spite of the strong deformation that is preserved in the Puncoviscana belt, which occurred during the latest Proterozoic-earliest Cambrian (approx. 540 Ma), this belt is preserved as a peripheral orogen (sensu[4]), that account for the first amalgamation of the Arequipa-Antofalla block to the rest of Gondwana. There is good evidence that from the early Cambrian up to the early Ordovician this block has been separated again from Gondwana. Paleomagnetic data[5], intrusive alkaline mafic suites emplaced in the Cambrian platform deposits[6], and the sedex exhalative mineral deposits of La Colorada and Aguilar mines of early Ordovician age[7], are indicative of the extensional regime that separated this block from cratonic South America. Final amalgamation to Gondwana was produced in middle to late Ordovician times.

Other examples of this type of terranes are the Carolina[8] and the Avalonia terrane[9], that have been amalgamated to Laurentia in early Paleozoic times.

A common feature of these terranes is the strong imprint of the brasiliano (pampean) deformation. Most of these terranes support a typical Gondwana fauna in the Paleozoic cover.

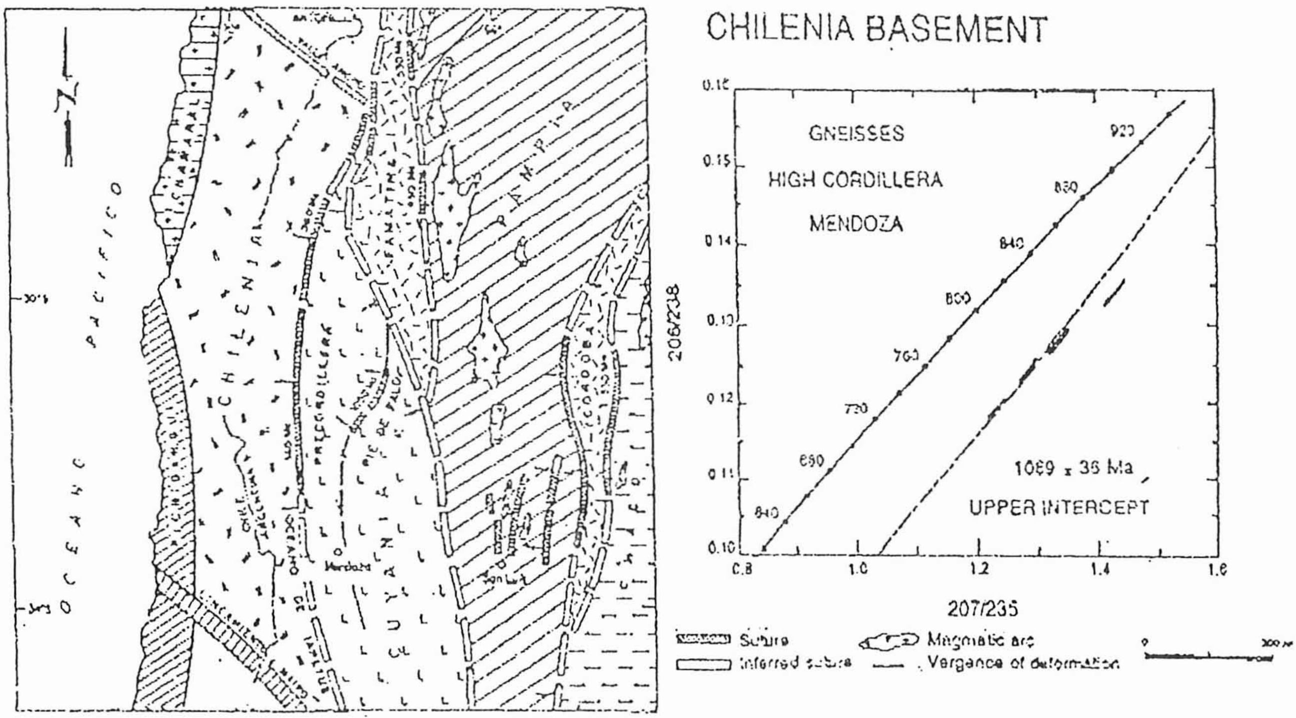

Figure 1: Terrane map of southern South America and U/Pb age of the basement of Chilenia.

The exotic terranes

There are some continental blocks that have been sutured to Gondwana during the early Paleozoic, that record in their basement a complex Precambrian history. The present geochronological data set of these blocks does not register any important deformation during the late Proterozoic. The absence of brasiliano deformation, the presence of typical *Ollenelus* fauna in some of these blocks[10], and the peculiar lead isotope depleted signature of the basement[11], show a strong Laurentian affinity for some of these terranes.

Cuyania, a composite terrane that comprises the basement of the Argentina Precordillera (see recent revision[12]) and the Pie de Palo terranes, has a typical strong Pb-isotope signature. This is similar to the Texas basement of the Ouachitas embayment[13,11], and reinforces the proposed derivation of Cuyania terrane from this sector south of the Appalaches. The geochronologic data indicate Grenvillian ages in the high amphibolite grade metamorphic rocks as well as in the orthogneisses of the Pie de Palo basement[14]. Data obtained in xenoliths from the Miocene volcanic rocks in the Ullúm area of Precordillera, corroborate these Grenvillian ages. Recently, new early Cambrian paleopoles were obtained for the Cuyania terrane that indicate a paleolatitude compatible with the location of the Ouachitas embayment[15], at the same time. These paleopoles are exotic to cratonic South America.

New ages obtained for the Chilenia terrane (figure 1) show a remarkable similarity with basement ages of Cuyania. Although there is not yet available information on the lead-isotope signature of Chilenia these new Grenvillian ages, as well as the absence of brasiliano deformation are pointing out Laurentian affinities for the Chilenia terrane.

Based on the previous classification of terranes it may be concluded that the different continental blocks of southern South America can be subdivided in autochthonous, parautochthonous, and allochthonous terranes to the Gondwana supercontinent.

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