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The Grenville-age basement of the Andes

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ABSTRACT

The analysis of the basement of the Andes shows the strong Grenville affinities of most of the inliers exposed in the different terranes from Colombia to Patagonia. The terranes have different histories, but most of them participated in the Rodinia supercontinent amalgamation during the Mesoproterozoic between 1200 and 1000 Ma. After Rodinia break-up some terranes were left in the Laurentian side such as Cuyania and Chilenia, while others stayed in the Gondwanan side. Some of the terranes once collided with the Amazon craton remained attached, experiencing diverse rifting episodes all along the Phanerozoic, as the Arequipa and Pampia terranes. Some other basement inliers were detached in the Neoproterozoic and amalgamated again to Gondwana in the Early Cambrian, Middle Ordovician or Permian times. A few basement inliers with Permian metamorphic ages were transferred to Gondwana after Pangea break-up from the Laurentian side. Some of them were part of the present Middle America terrane. An exceptional case is the Oaxaquia terrane that was detached from the Gondwana margin after the Early Ordovician and is now one of the main Mexican terranes that collided with Laurentia. These displacements, detachments, and amalgamations indicate a complex terrane transfer between Laurentia and Gondwana during Paleozoic times, following plate reorganizations and changes in the absolute motion of Gondwana.

RESUMEN

El análisis del basamento de los Andes muestra fuertes afinidades grenvillianas en la mayoría de los asomos expuestos en los diferentes terrenos desde Colombia a Patagonia. Los terrenos tienen diferentes historias, pero la mayoría de ellos participó en el amalgamamiento del supercontinente de Rodinia durante el Mesoproterozoico entre los 1.200 y 1.000 millones de años. Después de la fragmentación de Rodinia, algunos terrenos quedaron del lado de Laurentia tales como Cuyania y Chilenia, mientras que otros quedaron del lado de Gondwana. Algunos de ellos, una vez colisionados con el cratón Amazónico permanecieron unidos, experimentando diversos episodios de rifting todo a lo largo del Fanerozoico, tales como los terrenos de Arequipa y Pampia. Otros fragmentos de basamento fueron despegados en el Neoproterozoico y amalgamados nuevamente a Gondwana en el Cámbrico inferior, Ordovícico medio o Pérmico. Unos pocos fragmentos de basamento con edades metamórficas pérmicas fueron transferidos a Gondwana después de la fragmentación de Pangea procedentes de Laurentia. Algunos de ellos fueron parte de los terrenos mexicanos presentes. Un caso excepcional es el terreno de Oaxaquia que se despegó del margen gondwánico y es ahora uno de los principales terrenos mexicanos que colisionaron con Laurentia. Estos desplazamientos, despegues y amalgamamientos indican una transferencia compleja de terrenos entre Laurentia y Gondwana durante los tiempos paleozoicos, controlados por reorganizaciones de las placas y cambios en el movimiento absoluto de Gondwana.

1. Introduction

The early proposal of Moores (1991) who postulated through his SWEAT hypothesis that the North American Grenville continued in eastern Gondwana, led to one of the first reconstructions of the Rodinia Supercontinent presented by Hoffman (1991). The new paleogeography advanced by Hoffman (1991) displaced Baltica as the conjugate margin of the Appalachians, and located western Gondwana as a counterpart of the present eastern margin of Laurentia. In this reconstruction the Amazon craton, mainly based on the extension of the Mesoproterozoic Sunsas orogen in its western margin, was located as the conjugate margin of the Grenvillle

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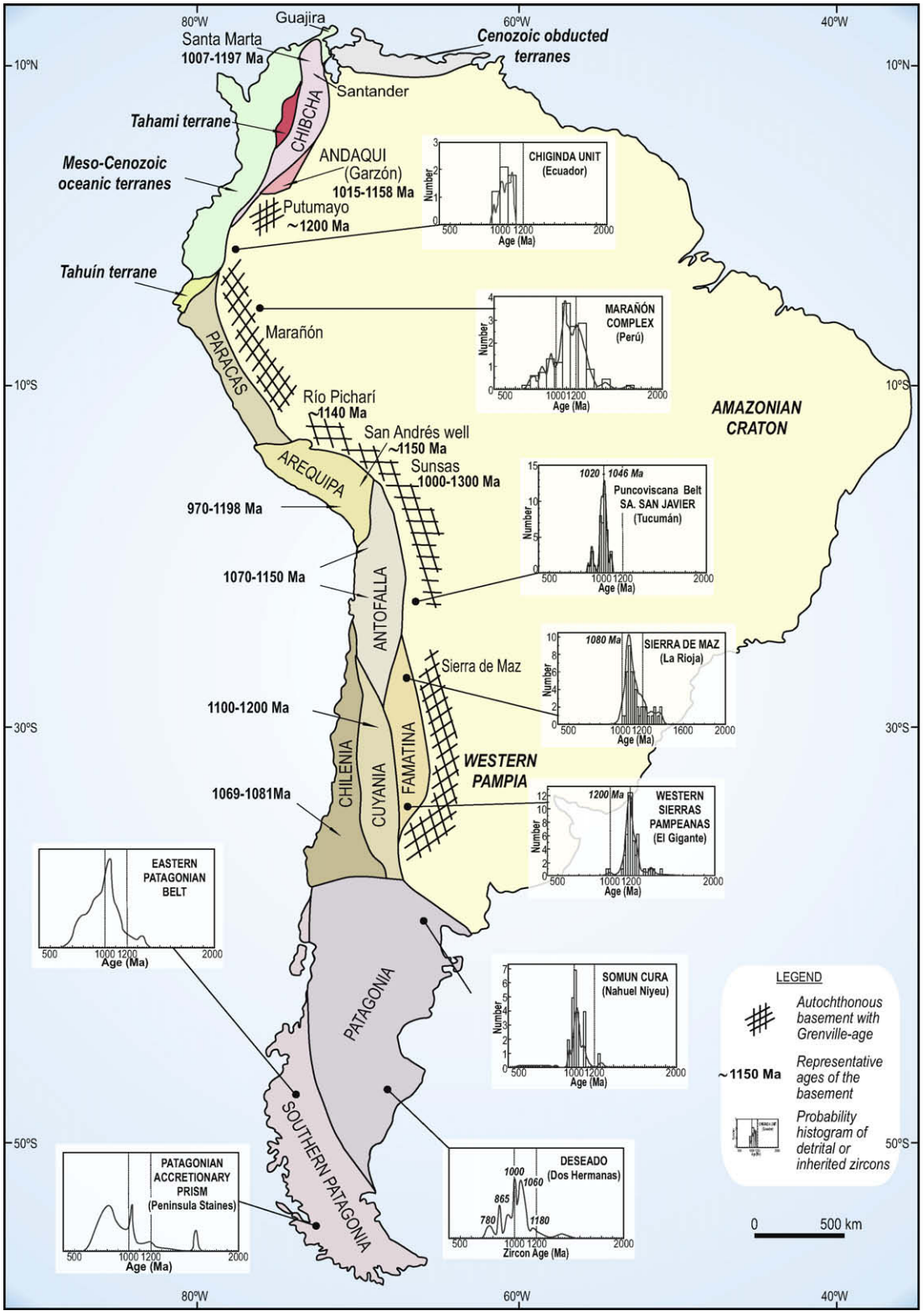

Fig. 1. Different basement blocks that composed the pre-Andean basement of the Andes with indication of the proposed autochthonous margin of South America, based on Ramos (2009) and different sources discussed in the text.

platform of the Appalachians. This innovative proposal on the Laurentia–Gondwana connection opened almost 20 years of active research in the Andean basement to evaluate the validity of the extension of a Grenville-age basement in western South America.

The purpose of this paper is to review the present status of the Laurentia–Gondwana connection based on the present knowledge on the age and composition of the different terranes that compose the Andean basement. The striking results presented in Fig. 1, not