

SOURCES OF DETRITAL ZIRCONS IN CAMBRIAN TO SILURIAN SANDSTONES IN NW ARGENTINA – A STUDY IN PROGRESS

Carita Augustsson¹, Tobias Rüsing¹, Mareike Büld¹, Heinrich Bahlburg¹, Jasper Berndt², Ellen Kooijman², Udo Zimmermann³

¹Geologisch-Paläontologisches Institut, Corrensstrasse 24, 48 149 Münster, Germany (augustss@uni-muenster.de)

²Institut für Mineralogie, Corrensstraße 24, 58 149 Münster, Germany

³Institut für Petroleumstechnologi, Universitetet i Stavanger, 4036 Stavanger, Norway

RESUMEN

Estudiamos zircones detríticos de unidades sedimentarios de edad paleozóico inferior del noroeste argentino (Grupo Mesón, Formación Las Vicuñas, Complejo Turbidítico de la Puna, Formación Salar del Rincón). Sobre todo se encuentran zircones con edades U-Pb de < 600 Ma, 600-900 Ma, ca. 1 Ga y ca. 2 Ga. Los edades indican transporte sedimentario de diversas partes del continente Gondwana.

INTRODUCTION

In an ongoing study, we trace the source areas of the early Paleozoic sedimentary rocks in NW Argentina (Fig. 1). We concentrate on the analysis of detrital zircons to reveal the importance of different plate tectonic units as source areas with time. We use zircon morphology – rounding, shape, size and zoning – from cathodoluminescence and back-scatter images as well as *in situ* LA-ICPMS U-Pb isotope data in order to obtain information on the abrasion and transportation conditions as well as the specific provenance of the detrital zircons of Cambrian to Silurian sandstones (cf. Augustsson et al., 2006). The data will be used to improve the paleogeographic reconstructions for the early Paleozoic of western Gondwana.

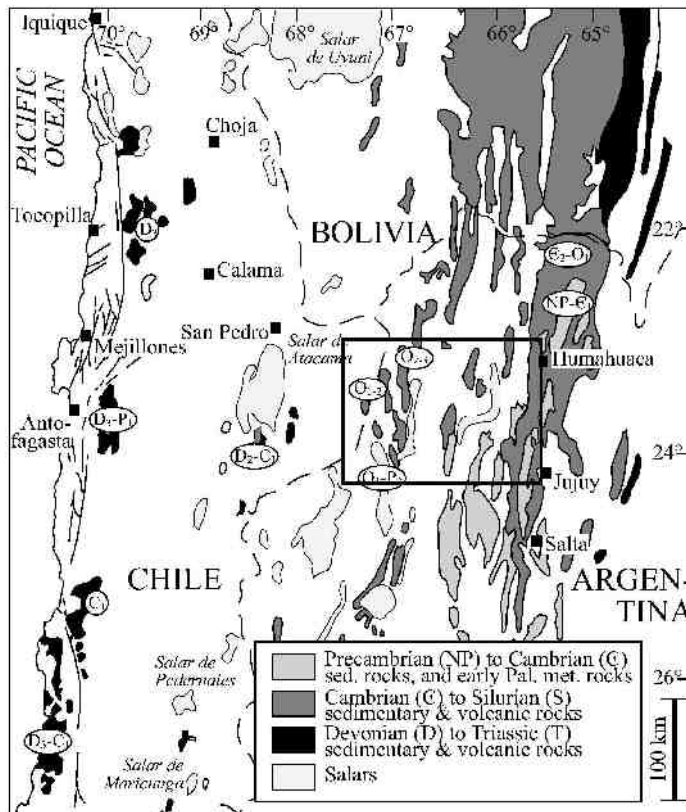


Fig. 1. NW Argentina, N Chile and S Bolivia with the study area in the marked square. Map modified from Bahlburg & Hervé (1997).

We will present results from siliciclastic sandstones from the former Gondwana margin at ca. 23-24°S and 65-67°W. The Lower to Middle Cambrian Mesón Group and the uppermost Ordovician to Early Silurian (Hirnantian to Llandovery) Salar del Rincón Formation were deposited at a time when Gondwana is assumed to have had a passive margin to the west of present-day NW Argentina (Fig. 2). The Lower Ordovician (early Tremadocian) sedimentary rocks of the Las Vicuñas Formation and the Middle Ordovician (Dapingian to Darriwilian) Lower Turbidite System of the Puna Turbidite Complex were deposited in a retro-arc foreland position behind a magmatic arc in present-day NW Argentina and N Chile (Bahlburg, 1991; Fig. 2).

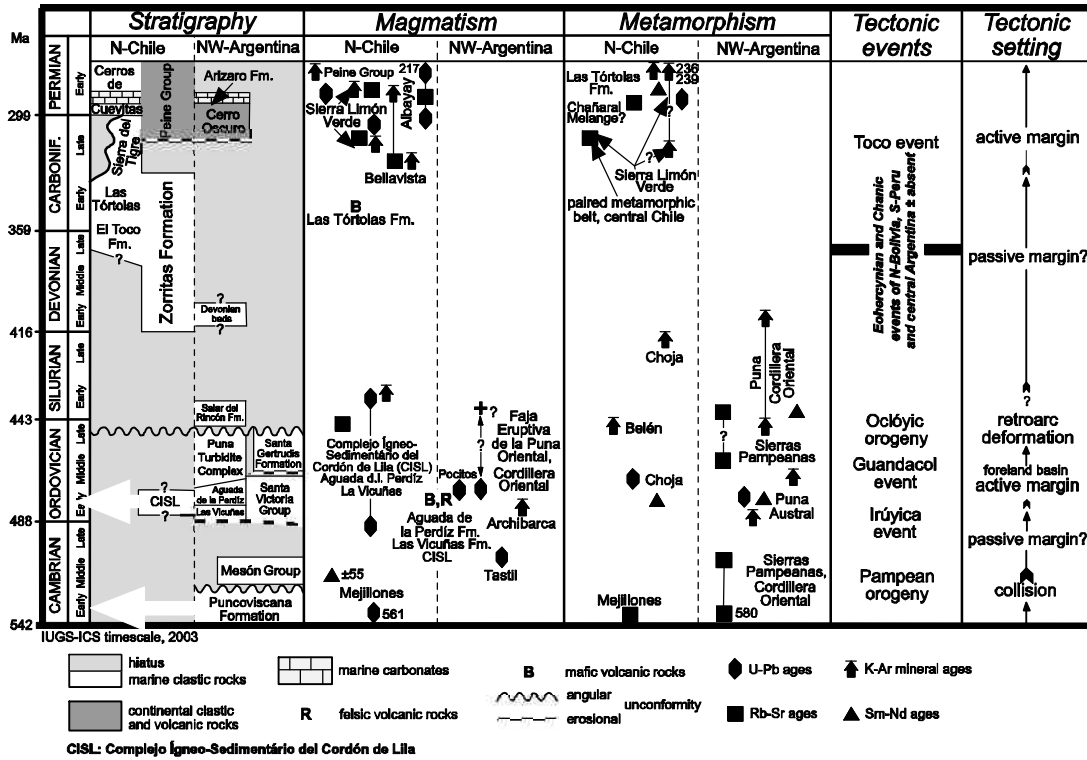


Fig. 2. Stratigraphy of the Palaeozoic of N Chile and NW Argentina. Modified from Bahlburg & Hervé (1997).

MESÓN GROUP

A total of ca. 1300 studied detrital zircons from six sandstones from the Lower to Middle Cambrian Mesón Group are dominantly oscillatory zoned, which is indicative of a magmatic origin (Rubatto & Gebauer, 2000). Most zircon grains are ca. 100 µm long, elongated and subrounded. The zoning of 10-30 % of the zircons in each sample indicates multiple growth phases. The U-Pb dating of detrital zircons from the Mesón Group is currently in progress and we will present our first U-Pb ages from > 100 zircon grains from two sandstones at the congress.

LAS VICUÑAS FORMATION

The < 50 analyzed zircons of a volcanoclastic sandstone of the Lower Ordovician Las Vicuñas Formation are mainly ca. 60 µm long and euhedral to subangular. The grains are oval to elongated. Cathodoluminescence images reveal that most zircons are oscillatory zoned and record only one growth phase. U-Pb dating reveals both zircons formed contemporaneously to deposition (probably volcanic zircons, <500 Ma), and recycled grains (> 500 Ma, mostly discordant).

LOWER TURBIDITE SYSTEM (PUNA TURBIDITE COMPLEX)

A total of ca. 600 zircon grains from six sandstones of the middle Ordovician Lower Turbidite System of the Puna Turbidite Complex in the northern Argentine Puna were studied. They are mainly oval to elongated, 100-150 μm in length and subangular to rounded. Cathodoluminescence images reveal that most analyzed zircons are oscillatory zoned. Less than 10 % of the grains are of metamorphic origin. Zircons commonly indicate only one growth phase. Preliminary $^{238}\text{U}/^{206}\text{Pb}$ ages of ca. 100 randomly selected grains are mostly < 800 Ma with minor input from sources of “Grenvillian” (ca. 1 Ga) and Transamazonian (ca. 2 Ga) age.

SALAR DEL RINCÓN FORMATION

Until now ca. 30 dated zircons of the uppermost Ordovician to Early Silurian Salar del Rincón Formation have been U-Pb dated. The zircons have dominant U-Pb age peaks at 500-700 Ma, representing the Brazilian orogeny, a ca. 2 Ga age peak, and a minor age peak at ca. 1 Ga. Our first data indicate an absence of Ordovician magmatic zircons, which had formed in the coeval magmatic arc.

CONCLUSIONS

Except for the volcanically influenced Las Vicuñas Formation with silt-sized, euhedral zircons, most zircons are elongated grains of very fine to fine sand size that have been rounded due to abrasion during transport. Hence, the morphology points to similar transport, abrasion and sorting histories. The oscillatory zoning and the U-Pb ages indicate main input from source areas dominated by magmatic rocks of similar ages, despite alternations between active- and passive margin settings with time along the NW Argentine margin of Gondwana. Young zircons (ca. \leq 600 Ma) may have been transported from present-day northwestern Argentina, whereas the Río de la Plata craton as well as the Amazonian craton may have contributed with “Grenvillian” and Transamazonian aged zircons. The relatively young zircon ages of the middle Ordovician Lower Turbidite System indicate that the cover rocks of the contemporaneous western arc delivered zircons to the depositional basin. In the Silurian, the Ordovician magmatic arc rocks seem not to have been available as source for the sediments of the Salar del Rincón Formation.

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