



## Age constraints for the northernmost outcrops of the Triassic Cuyana Basin, Argentina

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### ABSTRACT

Age constraints on the Cerro Puntudo Formation at the northernmost exposures of the continental Triassic Cuyana Basin are presented based on palynological data and U-Pb zircon dating. The lacustrine facies of the upper part of the Cerro Puntudo Formation contains a palynological assemblage with low diversity that is dominated by spores of ferns and lycopsids with subordinated inaperturated forms of uncertain affinity. The U-Pb SHRIMP zircon age of  $243.8 \pm 1.9$  Ma (Anisian), obtained from juvenile magmatic zircons in a tuff interbedded in the same beds, provides the first chronostratigraphic date of the Cuyana Basin infilling at its northernmost exposures. According to additional dates already known from the southern part of the basin, a new stratigraphic correlation is proposed thus restricting the first tectono-sedimentary sequence (Synrift I depositional event of Kokogian et al. (1993)) to the Anisian. This depositional event has already been recorded in the Cacheuta and Rincón Blanco sub-basins, but it is for the first time now constrained across the whole basin.

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### 1. Introduction

Triassic sedimentation along the southwestern margin of Gondwana (Argentina and Chile) was controlled by an extensional tectonics with the development of NW–SE trending narrow hemigrabens. This event occurred approximately at the Permian–Triassic boundary, during the final stages of the Gondwanides event (e.g., Uliana and Biddle, 1988). The Cuyana Basin constitutes one of the most important volcano-sedimentary records that is widespread recorded by extensive outcrops along the Precordillera (Mendoza and San Juan provinces). The basin comprises at least two sub-basins and its infilling spans nearly the whole Triassic and has been extensively studied due to its hydrocarbon accumulation (e.g., Kokogian and Mancilla, 1989; Legarreta et al., 1992; Spalletti et al., 2008).

The northernmost exposures of the Cuyana Basin are restricted to the Cerro Puntudo locality on the western flank of the Precordillera in the San Juan province. These exposures record the sedimentation near the northern end of the basin related to a fault

tip end (López-Gamundí and Astini, 2004). Due to the lack of continuous outcrops and the scarcity of fossil information, correlations between the Cerro Puntudo succession and southern sections of the Cuyana Basin has relied primarily on lithostratigraphy and equivalent vertical distribution of depositional environments among outcrops (e.g., Strelkov and Álvarez, 1984; López-Gamundí and Astini, 2004). Thus, the presence of a distinctive lacustrine interval in the middle part of the sequence, which was considered the period of the highest accommodation space of the basin, was used to correlate the Cerro Puntudo column with the lacustrine deep deposits that crop out south of Cerro Puntudo at Quebrada del Tigre, on the northern margin of the San Juan River (López-Gamundí and Astini, 2004). Moreover, another correlation with deep lacustrine facies at the Rincón Blanco area (Ciénaga Larga), farther south, was also proposed (López-Gamundí and Astini, 2004).

More recently, U-Pb SHRIMP ages on beds that crop out at the Potrerillos locality have constrained the initial infilling of the basin (Synrift I and the beginning of Synrift II of Kokogian et al., 1993) to the Middle Triassic (Ávila et al., 2006; Spalletti et al., 2008), although correlations between this sections with others non laterally connected along the entire basin still remained debatable.

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E-mail address: [amancu@mendoza-conicet.gov.ar](mailto:amancu@mendoza-conicet.gov.ar) (A.C. Mancuso).

The aims of this paper are to present the first precise radiometric data on beds of the northernmost outcrops of the Cuyana Basin at the Cerro Puntudo area and to provide a new chronostratigraphic horizon for correlations along the basin. Palynological data from stratigraphic levels directly below the dated bed could serve as an independent correlation tool for unconnected deposits of the basin as well as for other Triassic successions of western Argentina.

## 2. Geological setting

In Southwestern South America several extensional rift-related basins developed during the Triassic. These basins evolved with NNW–SSE trend, along the western Gondwanan margin, as a consequence of a strong fabric control of the basement (e.g., Martínez et al., 2006) and an extensional event associated with the pre-breakup of Pangea (Uliana and Biddle, 1988). The westernmost depocenters documented a connection to the sea, whereas most of the Argentinean Triassic sedimentation was exclusively non-marine (Uliana and Biddle, 1988). The Cuyana Basin was the largest Triassic depocenter of western Argentina and its outcrops are exposed along both flanks of the Precordillera (Fig. 1). This basin includes at least two half-grabens, the southern and northern sub-basins, which suggest different master fault polarities (e.g., Ramos and Kay, 1991; Legarreta et al., 1992; Barredo, 2005). Some authors (e.g., Baldis et al., 1982) have considered that both depocenters represent independent geological histories. However, Strelkov and Álvarez (1984) linked both depocenters by lithological similarities and proposed an equivalent infilling history for the entire Cuyana Basin. In the northern hemigraben, sedimentation is documented by two sedimentary cycles that are also represented in the Uspallata hemigraben and were related to two synrift phases, the Synrift I and II, as was proposed by Kokogian et al. (1993).

The northernmost outcrops of the Cuyana Basin are developed at the Cerro Puntudo area (Fig. 1) and were first recognized by Xicoy (1962). Subsequently, Mombrú (1973) studied the succession and divided the Triassic column into two units, the Cerro Puntudo and El Relincho formations, which discordantly covers the Permo-Triassic Choiyoi Group (Mombrú, 1973; Strelkov and Álvarez, 1984; Sessarego, 1988). The Triassic succession is tectonically truncated at top.

## 3. Sedimentary cycles of Cerro Puntudo area

The first sedimentary cycle (Cerro Puntudo Formation) begins with a thick package of more than 500 m alluvial fan conglomerates and braid-plain cross-bedded coarse sandstones (Fig. 2). This package is mainly composed of an alternation of massive red clast-supported conglomerates and subordinated sandstones (Fig. 3A). The succession passes upward to a braided fluvial system dominated by red and reddish-brown conglomerates and sandstones that are arranged in lenticular beds with cross-bedded stratification (Fig. 3B). The coarse alluvial fan facies typically display a dispersion of the paleocurrents with mainly a southward direction (Mombrú, 1973; Strelkov and Álvarez, 1984; Sessarego, 1988; López-Gamundí and Astini, 2004). These alluvial deposits suggest an abundant sediment supply and a relatively low accommodation space in the basin (Fig. 2), controlled by tectonic processes during Synrift I initiation (e.g., Kokogian et al., 1993; Prosser, 1993; Gawthorpe and Leeder, 2000; Withjack et al., 2002).

Sheet-floods and an ephemeral fluvial system, characterized by red fine-grained sandstones and white mudstones, are developed over the braided fluvial deposits (Fig. 3C). This fluvial facies can be related with equal rates of sediment supply and generation of accommodation space (Fig. 2) (e.g., Prosser, 1993;

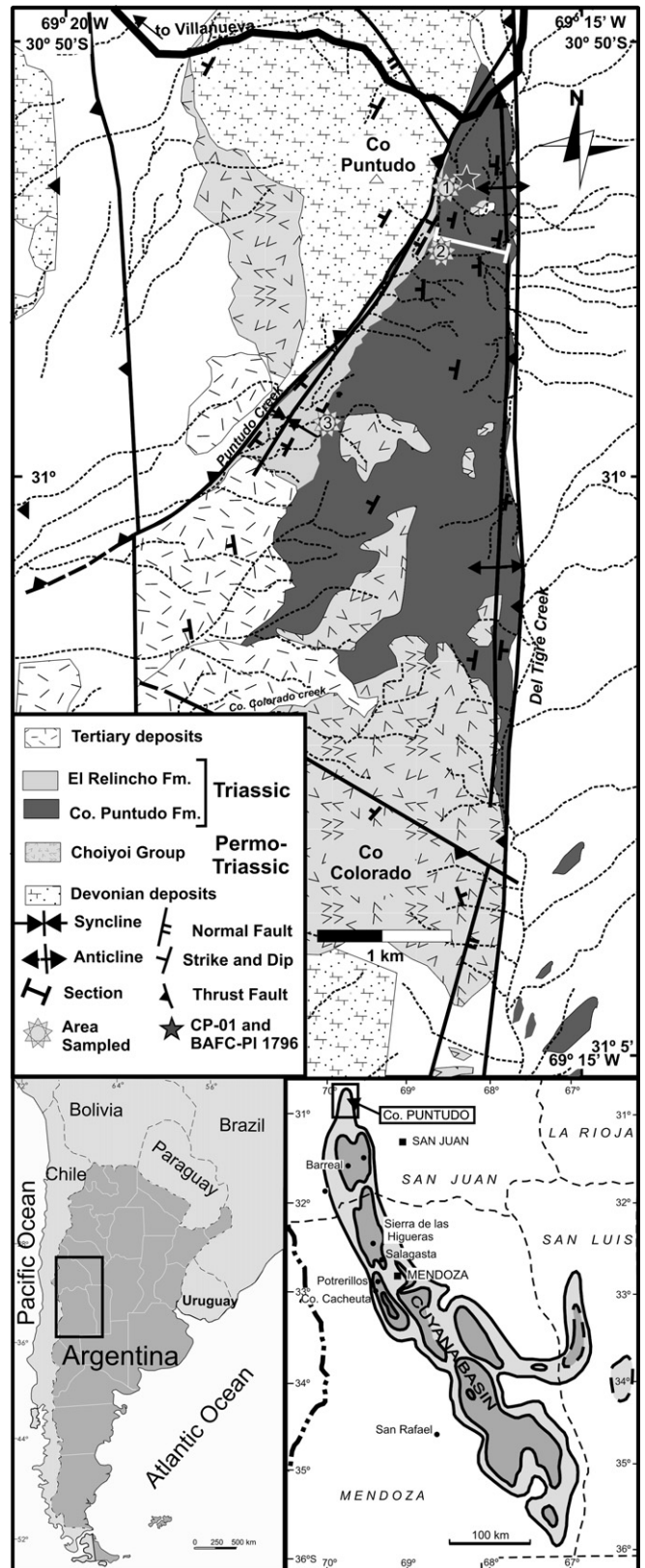


Fig. 1. Location map of Cuyana Basin, and the geologic map of the Cerro Puntudo area (modified from Stipanovic and Marsicano, 2002; Krapovickas et al., 2008). The star marks shows the area sampled and the location of the dating (CP-01) and palynological samples (BAFC-PI 1796).

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