

Palynoassemblages in the sierra de Maz area, La Rioja province, Argentina: an older age for the base of the Guandacol Formation

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The Guandacol Formation, in the homonymous area, consists of an alternation between proglacial and postglacial marine strata, including deltaic and turbidite sandstones, black shales, and resedimented diamictites. In order to characterize the palynology at Cerro Guandacol, a systematic sampling was undertaken through the entire succession in the south of Sierra de Maz, La Rioja Province (Fig.1). Twenty one samples were taken and processed following standard palynological methods; just four associations were obtained with rather good preservation of palynomorphs. Another seven barely productive samples present only poor palynological remains, fungal hyphae and phytoclasts of terrestrial origin, with or without fine particles of amorphous organic matter. A sample from an ice-rafted debris unit taken from the base of the Guandacol Fm. yielded the first palynoassemblage (CICYTTP-Pl 513) of scarce palynomorphs composed of spores and *Botryococcus*. Among the spores, *Cordylosporites* sp. cf. *C. absimilis* is mostly recognized in the Tournaisian (Strunian?) of Brazil, *Densosporites regalis* is known from the Malimán Fm. (Tournaisian-early Visean of Precordillera (Amenábar et al. 2007) to the late Visean (Mag Zone) in Brazil (Melo and Playford, 2012), *Densosporites pseudoannulatus* is Strunian-Visean up to Mag Zone of Brazil (Melo and Playford, 2012, Playford et al., 2012), *Cristatisporites* sp. cf. *C. matthewsii*, recorded from the Malimán, El Ratón and Cortaderas formations (Amenábar et al., 2007; Pérez Loinaze, 2007; Amenábar and di Pasquo, 2008), *Cristatisporites peruvianus* is documented from the Tournaisian-Visean in the Malimán Fm. (Amenábar et al., 2007) and Brazil (Playford et al., 2012, Melo and Playford, 2012), and in the late Visean of Perú and Bolivia (Azcuy and di Pasquo, 2005), *Vallatisporites ciliaris*, and *Cristatisporites rollerii* Ottone and *Cristatisporites stellatus* are recorded in the Cortaderas and Guandacol formations and the latter in the El Ratón Fm. as well. A second assemblage (CICYTTP-Pl 477) is recovered from a confined turbidite deposit at the top of the lower of two mass transport deposits (MTD) at Sierra de Maz. Few species were confidently identified such as, *Apiculiretusispora tuberculata*, *A. variornata*, *Cristatisporites scabiosus*, *C. inordinatus*, *C. matthewsii*, *C. chacoparanensis*, *C. stellatus*, *Cyclogranisporites microgranus*, *C. rinconadensis*,? *Schopfipollenites* sp. Most of these species are known from the Malanzán and Guandacol formations (*Raistrickia densa*-*Convolutispora muriornata* SubZone a- (DMA SZ) (Fig.2). The remaining two assemblages (MP-P 8931 and 8926) are taken from a thin unit of shales with dropstones immediately overlying the upper of the two mass transport deposits at Sierra de Maz. Identified spores are *Calamospora* sp., *Cristatisporites stellatus*, *C. menendezii*, *Cristatisporites* sp., *Verrucosiporites* sp. Considering this information and previous palynologic data from the Cerro Bola area (Césari and Limarino, 2002; Valdez et al., 2013) and the well-established lithostratigraphic correlation between the successions at Cerro Bola and Sierra de Maz, we interpret that the first assemblage is the oldest for the Guandacol Fm., probably akin to the Tournaisian-Visean, and a younger Serpukhovian – ?Bashkirian age is suggested for the second one, correlated with the lower DMA SZ. The other two assemblages are also assigned to the DMA SZ. This conclusion endorses our previous interpretations from lithostratigraphic analysis, indicating that the Guandacol Fm. in its type section began accumulating long before other areas of the Paganzo Basin. Thus, this finding supports the definition of a Guandacol-La Peña sub basin that started evolving before the widespread intracratonic Paganzo basin and probably under a particular tectonic regime which enabled the preservation of the oldest glacial events in the basin.

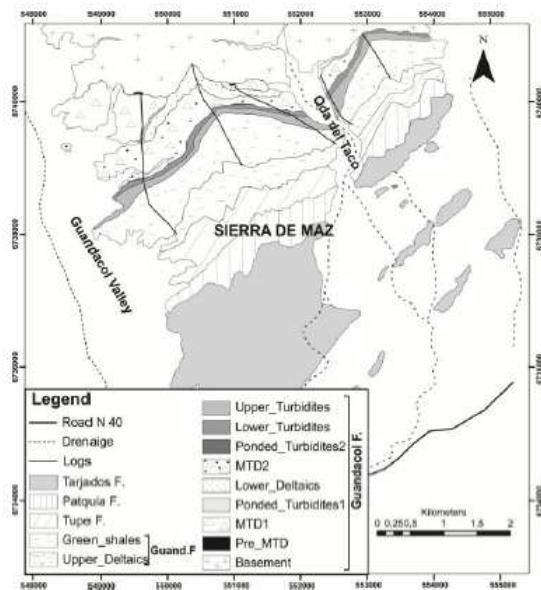


Figure 1. Geologic map of the Sierra de Maz, La Rioja Province.

Chronol.	Country		Argentina	N Argentina-S Bolivia	N Bolivia	Brazil	
	Basin	Western basins	Tarija	Madre de Dios	Paraná	Amazonas Solimoes Parnaiba	
Period/Eon/Stage	Ma	Césari et al. (2011) This study	Di Pasquo (2002, 2007)	Azcuy and di Pasquo (2005) di Pasquo (2009)	Melo and Playford (2012)		
Carboniferous	Pennsylvanian	Gzheh.	?	San Telmo	TE Z	?	
		Kasim.	?	Escarpment	MR Z	Cruciacolles miocenitas Zona	
		Mosc.	Paquia	Sa C	?	Alvaradozoriales circulares Zona	
		Bashk.	Tupe	Sa B	Copacabana	?	Blakes anicus Z
		Serp.	Guandacol	Sa A	Pando	AZ	Spironemacalles parvus Z
	Mississippian	Vis.	Corraleros	?	Yaurichambi	?	Speleobrietas triangulus Z
		Tour.	Malimán	?	Siripaca-Kaka	?	Cordilosa Magnictyris Z
			El Ratón	?	Kasa-Kaka	?	PD
			Guandacol	?	Ambo	?	BL
			Guandacol	?	Cumana-Toregua	VI Z	AL

Figure 2. Stratigraphic and biostratigraphic correlation from the Carboniferous of Argentina, Bolivia and Brazil.

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