



Contents lists available at ScienceDirect

Journal of South American Earth Sciences

journal homepage: www.elsevier.com/locate/jsames

Paleoenvironments and age of the Talampaya Formation: The Permo-Triassic boundary in northwestern Argentina



E.L. Gulbranson^a, P.L. Ciccioli^{b,*}, I.P. Montañez^c, S.A. Marensi^b, C.O. Limarino^b, M.D. Schmitz^d, V. Davydov^{d,e}

^a Department of Geosciences, University of Wisconsin-Milwaukee, WI, USA

^b IGEBA-Departamento de Geología, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Pabellón 2, Ciudad Universitaria, Buenos Aires, C1428EHA, Argentina

^c Department of Earth and Planetary Sciences, University of California-Davis, Davis, CA, USA

^d Department of Geosciences, Boise State University, ID, USA

^e Kazan Federal University, 18 Kremlyovskaya St., Kazan, Republic of Tatarstan 420008, Russia

ARTICLE INFO

Article history:

Received 18 March 2015

Received in revised form

27 July 2015

Accepted 14 August 2015

Available online 24 August 2015

Keywords:

Talampaya Formation

Late Permian paleoclimates

Permian–Triassic boundary

ABSTRACT

The Talampaya Formation is the basal unit of the Ischigualasto-Villa Unión rift system and has been traditionally assigned to the Triassic based on stratigraphic relationships. A median U–Pb age of 252.38 (+0.09/–0.22) Ma was obtained from volcanic zircons collected from a tuff bed close to the top of this unit at the Bordo Atravesado locality in the Cuesta de Miranda area (La Rioja, Argentina). This radiometric age is very close to the accepted Permian–Triassic boundary indicating that, at least in this locality, sedimentation occurred during the Late Permian but may have extended into the earliest Triassic. This new evidence indicates that the onset of the extensional event that gave rise to the rift basins in western Argentina started during the Permian. Detailed sedimentological studies of the 260 m thick Talampaya Formation allowed subdividing the succession into seven facies associations grouped into three evolutionary stages indicating that sedimentary environments initially evolved from alluvial fans to a braided river system. Subsequent intrabasinal volcanism associated with sediment deposition by low-to moderate-sinuosity rivers is recorded in the lower third of the column. The middle and upper part of the unit captures the evolution from ephemeral fluvial systems with an eolian interval to an ephemeral clastic lake with intermittent volcanic ash deposits. These changes indicate a progressive lowering of the landscape and a transition towards arid or semiarid conditions.

© 2015 Elsevier Ltd. All rights reserved.

1. Introduction

Over the last two decades, there has been a great deal of interest focused on understanding the patterns and timing of extinction and recovery and plausible trigger(s) and kill mechanisms of the end-Permian biotic crisis, the largest extinction of the Phanerozoic (Burgess et al., 2014). In order to address this scientific problem, precise age models must be developed to constrain the timing and

duration of the extinction in different parts of the world and to relate the event to its possible causes.

Thick sequences corresponding to the late Paleozoic Paganzo Basin and the Triassic Ischigualasto-Villa Unión Basin crop out extensively in the southwest of the La Rioja Province, northwestern Argentina. These basins developed in quite different geotectonic settings. The Paganzo Basin has been described either as a foreland, intracratonic or intermontane basin related to the collapse of the Protoprecordillera Orogen while the Ischigualasto-Villa Unión Basin is a rift with a well defined NW–SE trend. The upper part of the Late Paleozoic Paganzo Basin and the lowermost strata of the Triassic Ischigualasto-Villa Unión Basin mainly consist of red beds deposited in similar environments making them difficult to differentiate in the field. Red beds of the Paganzo Basin include the latest Carboniferous to early Permian succession (Limarino and Césari, 1987; Gulbranson et al., 2010) De la Cuesta (Turner, 1960) and the

* Corresponding author. Departamento de Ciencias Geológicas, Instituto de Geociencias Básicas, Aplicadas y Ambientales de Buenos Aires (IGEBA), Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Pabellón 2, 1° piso, Ciudad Universitaria, C1428EHA, Buenos Aires, Argentina.

E-mail addresses: gulbrans@uwm.edu (E.L. Gulbranson), ciccioli@gl.fcen.uba.ar (P.L. Ciccioli), ipmontanez@ucdavis.edu (I.P. Montañez), smarensi@hotmail.com (S.A. Marensi), limar@gl.fcen.uba.ar (C.O. Limarino), markschmitz@boisestate.edu (M.D. Schmitz), vdavydov@boisestate.edu (V. Davydov).