

**IMPACT GLASSES AS CHRONOSTRATIGRAPHIC BENCHMARKS OF THE LATE CENOZOIC PAMPEAN RECORD, ARGENTINA**

M. A. Zárate<sup>1</sup>, P. H. Schultz<sup>2</sup>, W. Hames<sup>3</sup>, C. Heil<sup>4</sup> and J. King<sup>4</sup>

<sup>1</sup>CONICET-UNLPAM, Avenida Uruguay 151, 6300 Santa Rosa, La Pampa, Argentina E-mail: [mzarate@exactas.unlpam.edu.ar](mailto:mzarate@exactas.unlpam.edu.ar)

<sup>2</sup>Department of Geological Sciences, Brown University, Providence, RI 02912-1846 USA, <sup>3</sup>Auburn University, Auburn, AL 36830 USA, <sup>4</sup>University of Rhode Island, Narragansett, RI 02882, USA.

The Late Cenozoic continental record of the Pampas is dominantly composed of massive sandy siltstones, usually reported as loess and loess-like (loessoid) deposits [1]. The abundant vertebrate fossil remains found in the sediments have been grouped into the Chasicoan, Huayquerian, Montehermosan, Chapadmalalan, Marplatan, Ensenadan, and Lujanian South American Land Mammal ages (SALMAS) on the basis of their relative degree of evolution [2] [3]. Until recently, the sequence was poorly time-constrained. However, the identification and characterization of meteorite impact glasses ('escorias') [4] [5] have recently provided a chronostratigraphic tool to chronologically calibrate the succession.

Within these deposits, five impact-glass horizons, extending from the Pleistocene to the late Miocene have been reported [5]. Glasses are usually highly vesicular occurring at relatively discrete layers. Secondary reworked impact glass facies are found stratigraphically above the primary layers. Evidence for an impact origin includes mineral constituents and textures, while the geochemical signature of each event suggests a variable depth of impact excavation [5].

Radiometric ages were obtained by high resolution <sup>40</sup>Ar/<sup>39</sup>Ar dating [4] [5]. The oldest impact glass horizon occurs within Chasicoan sediments yielding an age of 9.23±0.09 Ma. A more recent late Miocene impact glass layer of 5.33± 0.05 Ma was found in Huayquerian deposits near Bahía Blanca. A 3.27± 0.08 Ma impact glass horizon, traceable along several kilometers, occurs at the uppermost section of the Chapadmalalan beds near Mar del Plata. Two other Pleistocene impact glass layers were found at Centinela del Mar, about 60 km southwest of Mar del Plata in a succession bearing Marplatan and Lujanian fossil vertebrates. The upper glass horizon yielded an age of 445 ± 21 ka and the lower glasses 230±30 ka. The stratigraphic inconsistency of the ages is likely related to some local redeposition. When compared to previous chronological interpretations [3] [6], the impact glass layers provided independent ages that served to re-adjust the chronology attributed to the SALMAS, thereby suggesting different time interval for the fossil vertebrate associations.

**References:**[1] Zárate, 2003 *Quaternary Science Reviews* 22:1987-2006. [2], R. Pascual et al. 1965. *Anales Comisión de Investigaciones Científicas de la Provincia de Buenos Aires*, 6: 165-193. (3) A. Cione et al. 2000. *INSUGEO, Serie Correlación Geológica* 14: 191-237, [4] Schultz et al., 1998, *Science* 282:2061-2063 [5] Schultz, P.H et al. 2004. *Earth and Planetary Science Letters* 219:221-238. [6] J. Flynn, and C.C Swisher III, 1995. *Society for Economic Paleontologists and Mineralogists Special Publication* 54: 317-333.