LATE CENOZOIC IMPACT RECORD IN THE ARGENTINE PAMPAS SEDIMENTS

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The vast loess-like sediments of Argentina provide a unique depositional and lithologic environment for generating and preserving impact-generated glasses (1,2,3). Such glasses are commonly called "escorias" and can easily be misinterpreted as anthropogenic slag or even volcanic glass. Their stratigraphic setting, age (radiometric and magnetostratigraphic), and petrographic indicators of transient high temperatures, however, all indicate their origin by impact. At least 7 different layers of impact glass are now recognized including Holocene (6 ± 2 ka), Pleistocene (114 ± 26 ka, 230 ± 30 ka, and 445 ± 21 ka), Pliocene (3.27 ± 0.08 Ma), and late Miocene (5.33 ± 0.05 and 9.23 ± 0.09 Ma) in age based on $^{40}Ar/^{39}Ar$ dating (3). The glass fraction ranges from clast free (< 109 vol.) to clast rich (80% vol.) with unmelted clasts are predominantly quartz grains and feldspars. Although they could be classified as impact-melt breccias, their unique appearance may warrant a new term "pampasites" reflecting distinctive glasses created by melting of porous loess substrates. In this case, embedded clasts are simply minerals undergoing various degrees of melting from the loessoid sediments.

In addition to evidence for rapid extreme heating and quenching (e.g. baddeleyite, diaplectic glass, and ß cristobalite), these glasses contain geochemical signatures of materials from depth. Such signatures include elevated relative abundances of MgO, CaO, Na_2O, and P_2O_5 most likely representing incorporation of Miocene marine sequences at depth. This inference is reinforced by systematic changes in key trace and rare-earth element ratios (Th/Sc, Rb/V, La_n/Yb_n, and Zr/HF). Glasses from Rio Cuarto, however, indicate a near-surface provenance (4,5).

The source craters for these impact glasses have not been identified, with the possible exception of Rio Cuarto (1). While the loessoid sediments provide an ideal archival setting, craters would have been rapidly destroyed. Major landscape changes appear to be correlated with at least two events and could signify a nearby crater. Almost 20 craters larger than 1 km in diameter should have formed in these sediments over the last 10 Ma. Consequently, more pampasites should be found at other levels but careful radiometric dating will be necessary in order to establish if they represent a new occurrence or distal materials from a known event. As described elsewhere (5), dated impact glasses provide critical benchmarks for refining (and revising) the stratigraphic record in the important fossil-bearing sediments of Argentina.

References: [1] Schultz *et al.* 1994. *Geology*. 889-892. [2] Schultz *et al.* 1998. *Science*. 282:2061-2063. [3] Schultz *et al.* 2004. *EPSL*. 219:221-238. [4] Aldahan *et al*. 1997. *Geol. Forsch. Fortschr.* 119:67-72. [5] Zarate *et al.* 2004. *MAPS*. This volume.