

## **THE PERMIAN—TRIASSIC BOUNDARY IN THE PARANÁ BASIN IS A SEISMITE-TUSNAMITE COUPLET CREATED BY THE ARAGUAINHA IMPACT EVENT**

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The nature of the Permian-Triassic boundary in the Paraná Basin has been the subject of many decades of research, but this task has been complicated by faunal endemism and the restricted, non-marine basins that mark the late Paleozoic history of the basin. Coupled with recent geochronological study of the Permian-Triassic Araguainha impact event in the northern Paraná Basin, we report the recent discovery of widespread seismites that mark the uppermost tens of meters of the late Permian PassaDois Group. Seismites are observed within a ~1000 km radius of the site of the late Permian-early Triassic Araguainha impact structure, South America's largest astrobleme. Seismites include swarms of clastic dykes, thixotropic wedges, and extensive intraformational breccias within the Corumbataí Fm. and laterally correlative Teresina Fm. Seismites affect a horizon that diminishes in depth with distance from the crater, from >80 m thick at a site 50 km distance from the target site, to a few tens of meters at sites ~850 km distance. Immediately overlying the seismite horizon is an event bed up to 4 m thick lying atop a scoured, erosive base. The event bed is named the Porangaba bed for its type locality, and it comprises a debrite: an unsorted, matrix-supported conglomerate with centimeter to meter-scale clasts arrayed in a coarsely, upward-fining pattern. A second clast-rich horizon marks the upper portion of the debrite bed in some localities. The debrite bed is interpreted as having been deposited by a tsunami wave that was created by the bolide impact and transient cavity collapse. The repetition of clast-rich horizons may reflect the passage of more than one tsunami wave. The presence of shocked zircon grains at several sites within the event bed points to a genetic link to the Araguainha impact site. Furthermore, SHRIMP U-Pb dating of detrital zircons from the event bed indicate a maximum depositional age of  $253.2 \pm 3.0$  Ma. A thin paleosol at the top of the bed and a conformable contact with the early Triassic Piramboia Fm. indicate that this impactogenic seismites and tsunami are the chronostratigraphic divisor between the Paleozoic and Mesozoic in the Paraná Basin.