

A TEST OF THE IMPACT-MASS EXTINCTION HYPOTHESIS AT THE TRIASSIC-JURASSIC BOUNDARY.

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Introduction: To test the impact-mass extinction hypothesis for the Triassic-Jurassic boundary transition, we located the T-J boundary at two localities using stratigraphic, paleontologic, and carbon isotopic criteria [e.g., 1,2]. One of those sections occurs in Muller Canyon, Nevada, and is a candidate Global boundary Stratotype Section and Point (GSSP). We examined those strata and bounding strata for shocked quartz and soot.

Sedimentary Lithologies: The T-J boundary occurs within the Muller Canyon Member of the Gabbs Formation. The section is composed of siltstones deposited in a relatively near-shore environment and is variably calcareous. The lower part of this section is composed of decimeter- to meter-thick beds that transition to centimeter- to decimeter-thick beds that are commonly laminated. The boundary is located near this transition and is associated with ~1.8 per mil negative $\delta^{13}\text{C}_{\text{org}}$ anomaly [2].

Search for Shocked Quartz: Twenty bulk samples were disaggregated and processed in ultrasonic baths to float and decant clay particles. Mild acids were used to remove carbonate, leaving silt- to sand-size insoluble residues that were examined for shocked quartz and any other petrologic indicator of impact, using the same techniques applied previously in K-T boundary studies [e.g., 3]. A total of 19,927 grains were examined in the survey. The samples were dominated by quartz, with some feldspar, and minor amounts of other phases. No significant evidence of impact was found, whereas 14 to 27% of grains in K-T boundary residues examined in same way are shocked quartz [3].

Search for Soot: Eight bulk samples were also analyzed for soot. These included a background sample below the boundary, 3 samples immediately below the negative carbon isotope anomaly, 3 samples within the anomaly, and a background sample higher in the section. The same techniques used to isolate soot in K-T boundary samples [4] were applied. No increase over background values was detected in the boundary units, compared to enhancements $>10^3$ seen in K-T boundary sections [e.g., 4]. Indeed, none of the samples had any detectable soot and an upper limit of 4 ppm is calculated.

Conclusions: We were unable to detect a significant quantity of impact debris or one of the possible measures of impact-generated environmental effects. Thus, we are unable to provide any support for the impact-mass extinction hypothesis. This lack of support for the impact-mass extinction hypothesis should not, however, be over-interpreted: it is not proof that an impact did not occur. Additional samples along strike at this locality and additional T-J sections at other localities need to be examined before any firm conclusions can be drawn. It may be prudent, however, to also consider other causes for the mass extinction.

References: [1] Ward P. D. et al. 2004. *Earth & Planetary Science Letters* 224:589-600. [2] Ward P. D. et al. 2007. *Palaeogeography, Palaeoclimatology, Palaeoecology* 244:281-289. [3] Kring D. A. et al. 1994. *Earth & Planetary Science Letters* 128:629-641. [4] Wolbach W. et al. 1988. *Nature* 334:665-669.