Discovery of shocked zircons confirms a Cryogenian impact origin of the Beaverhead Structure in central Idaho

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The Beaverhead Impact structure is recognized as the 9th largest impact in the geologic record based on geophysical imaging and the spatial extent of shatter cones and other distal structures. It is estimated to have a diameter of 60 – 100 km [1]. Little else was known about this impact as no in-place impactites had been identified. Core samples from two drill sites in the center of the geophysical anomaly are hypothesized to contain impact breccia materials, whereas these units were interpreted as either tertiary magmatic porphyries or glacial diamictites and dated at 664 +/- 6 Ma [2].

Core samples located 20 km apart within the footprint of the geophysical anomaly were analyzed petrographically and show textures associated with an impact origin, including deformed clasts and auto-brecciation in a fine grained matrix. Laser Raman spectroscopy confirms the transition from zircon to its high-pressure polymorph reidite. Quartz grains from clasts have multiple sets of planar lamellae.

U-Pb geochronology was conducted in-situ in thin sections from two samples from each drill core. These samples yield coherent ages between drill cores of 681±18 Ma and 689±35 Ma. An additional age of 754±24 is interpreted as the target rock age, which was a combination of platform sediments and Precambrian basement.

[1] McCafferty (1995) Thesis, Colorado School of Mines, [2] Lund et al. (2011) *GSA Mem*. **36**, 437-447.