A refined age for the Gow Lake impact structure using $^{40}Ar/^{39}Ar$ geochronology

ANNEMARIE E. PICKERSGILL[1,2*], DARREN F. MARK[1], MARTIN R. LEE[2], GORDON R. OSINSKI[3]

[1]NERC Argon Isotope Facility, Scottish Univ. Environmental Research Centre, East Kilbride G75 0QF, UK (*correspondence: a.pickersgill.1@research.gla.ac.uk)

[2]School of Geographical & Earth Sciences, Univ. of Glasgow, Glasgow G12 8QQ, U.K.

[3]Centre for Planetary Science & Exploration/Dept. of Earth Sciences, Western Univ., London N6A 3K7, Canada

The impact of large meteorites with the Earth's surface has been an important determinant of geological and biotic evolution. In order to fully understand these effects it is essential to obtain accurate and precise ages for these events. $^{40}Ar/^{39}Ar$ geochronology is widely and effectively used to date impact craters as it requires only a small amount of sample material and all measurements can be carried out with one analysis [1,2]. The Gow Lake impact structure is located in Saskatchewan, Canada. It preserves an almost complete stratigraphic sequence of impactites which provides insight into the stratigraphy of impact generated rocks from a relatively homogenous crystalline target [3]. Previous attempts to date Gow Lake have yielded inconclusive results, with an age range of 100-250 Ma [4, 5].

One glassy impact melt rock appears unaltered, with minimal clast content. Glass contains cogenetic plagioclase crystallites, and slight perlitic fracturing.

We used the CO_2 laser step-heating technique with an ARGUS multi-collector noble gas mass spectrometer, targeting handpicked single grains of pristine impact-generated glass. Measurements yielded four good plateaux resulting in a middle Triassic impact age of 238.8±5.2 Ma (2.2% 2σ). It is rare to get consistent results from melt rocks derived from granite such as those at Gow Lake. Such thorough Ar release during the melting event suggests the presence of water in the melt which allowed Ar to be completely degassed.

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