A REVISED $^{40}Ar/^{39}Ar$ AGE FOR THE ROCHECHOUART IMPACT STRUCTURE: NOT COINCIDENT WITH THE TRIASSIC-JURASSIC BOUNDARY.

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Introduction: The 40-50 km diameter Rochechourt impact structure in south-central France has previously been dated using the $^{40}Ar/^{39}Ar$ technique (203 ± 3 Ma) ([1] recalculated to the decay constants of [2], with full external uncertainty) to be coincident with a mass extinction at the Triassic-Jurassic boundary (201.3 ± 0.2 Ma) [3], at which ~70% of global species numbers were lost [4]. However, this $^{40}Ar/^{39}Ar$ age (± 1.5%) lacks the precision necessary for full evaluation of the temporal relationship between the Rochechouart impact and the Triassic-Jurassic boundary [5]. We have therefore re-examined the temporal relationship between the impact crater and Triassic-Jurassic boundary using high-precision $^{40}Ar/^{39}Ar$ geochronology [6].

Materials and methods: We analysed multiple aliquots of the 'Babaudus' impact melt rock ('Unit 5' in [7]). It has a quartzofeldspathic lithology, with a mean grain size of 25 µm, and the potassium-feldspar grains form an interlocking network (Figure (a), after [7]). The sample also contains common vesicles up to 3 mm long. Lithic clasts are rare, while the vesicles are variably stained by oxides/oxyhydroxides [7]. A sample of the 'Babaudus' impact melt rock was crushed (avoiding highly vesicular zones, the rare lithic clasts, or staining of the vesicles), washed in Millipore water+ethanol in an ultrasonic bath, and irradiated for 20 hours at the Oregon State University TRIGA reactor. The sample was analysed for argon isotopes at the Scottish Universities Environmental Research Centre, using a multi-collector GVI ARGUS-V mass spectrometer [7], and the decay constants and standard values of [2].

Results and discussion: Analysed separates are very K-rich, with little or no Ca, and have no evidence for lithic clasts (Figure b, c). The first gas released yielded ages of <200 Ma, indicating some Ar loss, most likely due to minor amounts of weathering products in the vesicles. The data yield statistically significant plateaus comprising ~60% of the ^{39}Ar released (Figure b, c). These plateau steps yield a reproducible and very precise $^{40}Ar/^{39}Ar$ age, with a two-sigma (full external) uncertainty of ± 0.2 Ma (0.1 % uncertainty). The new age is a factor of fifteen more precise but indistinguishable within uncertainty from the age of [1], but is nonetheless *c*. 5 Ma older than the Triassic/Jurassic boundary.

Conclusions: This new age for Rochechourt confirms that this impact event was not coincident with the Triassic/Jurassic boundary and was not the cause of the mass extinction.

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