AN EARLY JURASSIC $^{40}AR/^{39}AR$ AGE FOR THE PUCHEZH-KATUNKI IMPACT STRUCTURE (RUSSIA) – NO CAUSAL LINK TO AN EXTINCTION EVENT.

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Introduction and Results: The previously published age range of ~164-203 Ma [1] for the 40-80 km Puchezh-Katunki impact structure (located ~400 km northeast of Moscow, Russia) makes it a possible trigger for at least two different biotic crises, namely the end-Triassic mass extinction (201.56 Ma [2]) and the Pliensbachian/Toarcian and Early Toarcian extinctions (182.7-183.0 Ma [3]; see also discussion in [4]).

Here, we present new $^{40}Ar/^{39}Ar$ step-heating analyses for five impact melt rock samples from the Vorotilovskaya deep drillhole (Fig. 1; see [1] for details on the drilling). The samples were taken at 931 to 1251 meters depth and are holocrystalline and hypocrystalline impact melt rocks, some with flow texture (931 m and 1018 m), and with clasts (undigested and/or semi-digested) dominated by lithic fragments and single mineral grains, mostly of quartz (often microcrystalline) and feldspar (often in fibrous aggregates). The matrix in samples from 1144, 1218 and 1251 m is dominated by needle-shaped plagioclase (up to ~2.5 mm in length) and pyroxene crystals.

Of the five dated samples, the 1218 m sample yields a well-defined plateau with an age of 192 ± 0.8 Ma, and two samples (1018 m and 1251 m) yield mini-plateaux (all results within 95% confident limits). Samples from 931 and 1144 m resulted in disturbed spectra, interpreted to be the result of contamination by unequilibrated clasts.

The currently commonly quoted age of the structure is Bajocian (see [1] and references therein). This age is based on palynological data from the crater sediments. However, a revision of the palynology suggests significantly older ages, Pliensbachian-Toarcian, indicating that the ages of the crater sediments need to be re-evaluated.

Conclusions: We propose a revised age of 192.0 ± 0.8 Ma (i.e., the age indicated by the plateau in run A of the sample from 1218 m) for the formation of the Puchezh-Katunki impact structure based on petrographic observations of the studied samples in combination with analysis of the Ar-Ar spectra. This age does not correlate with any known extinction event, however, it may correspond to the Sinemurian-Pliensbachian climate perturbation [5]. Detailed studies of the stratigraphic record are required for evaluating whether the formation of the Puchezh-Katunki impact structure was associated with any effects on the ecosystem. The presented results may help to pin-point the stratigraphic location for such a study.

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References: [1] Masaitis V. L. and Pevzner L. A. (eds.) 1999. *Deep drilling in the Puchezh-Katunki impact structure*, 392 p. [2] Blackburn T. J. et al. 2013. *Science* 340:941–945. [3] Sell B. et al. 2014. *Earth and Planetary Science Letters* 408:48–56. [4] Pálfy J. 2004. In Dypvik H., Burchell M., and Claeys P. *Cratering in marine environments and on ice*, pp 135–148. [5] Korte C. and Hesselbo S. P. 2011. *Paleoceanography* 26:PA4219.

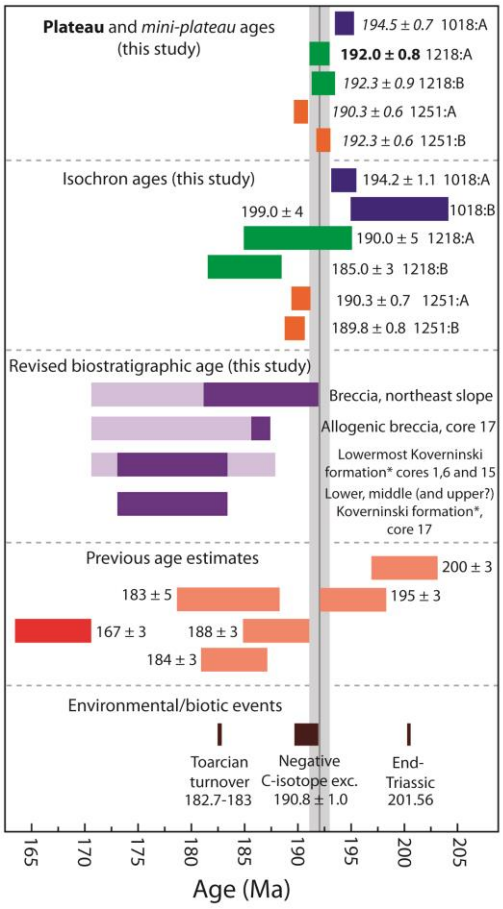

Fig. 1. Summary of results from $^{40}Ar/^{39}Ar$ analysis with plateau, mini-plateaux, and inverse isochron apparent ages (data at 2σ, all ages in million years). Biostratigraphy; light purple intervals of boxes indicate maximum possible age ranges for taxa, and purple intervals show the most likely age ranges for taxa. Biotic and climate events possibly associated with the Puchezh-Katunki impact are shown in brown, and previous age estimates of the impact are shown in red (commonly quoted age), and light red (K-Ar ages presented in [1], these ages were at the time considered the result of contamination by old Archean target rocks by the authors). All boxes display age ranges including errors. Note that the letter A or B following the sample name denote replicate runs. *Crater lake sediments.