REFINED $^{40}Ar/^{39}Ar$ AGES FOR THE PAASSELKÄ (FINLAND) AND CLEARWATER WEST (CANADA) IMPACT STRUCTURES.

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Introduction: Previous $^{40}Ar/^{39}Ar$ dating of the ~10 km Paasselkä impact structure (Finland) yielded a Triassic pseudo-plateau age of 228.7 ± 3.0 (3.4) Ma (2σ) obtained from recrystallized feldspar melt particles [1;2]. The Clearwater West (~36 km) and East (~26 km) impact structures (Québec, Canada) are generally considered a doublet crater system, which relies on a set of older K/Ar and Ar/Ar dates around ~285 Ma for Clearwater West [3;4] and a similar single Rb-Sr age for Clearwater East [3].

Samples and Analytical Procedure: Optically fresh recrystallized feldspar melt domains in a partially molten crystalline target rock clast from the Paasselkä impact structure [2] and optically fresh samples of impact melt rock (drill core chips; DCW-77) from the ~36 km Clearwater West impact structure, respectively, were chosen for dating. $^{40}Ar/^{39}Ar$ step-heating analysis was carried out at the University of Heidelberg [e.g., 1] and ages calculated according to the K decay constant by [5].

Dating Results: $^{40}Ar/^{39}Ar$ step-heating analysis of the Paasselkä melt aliquot yielded a Late Triassic plateau age of 228.7 ± 1.7 (1.8) Ma (2σ; MSWD = 0.32; *P* = 0.93) for ~79% of ^{39}Ar released (Fig. 1, left). An age of 231.0 ± 1.7 (1.8) Ma is calculated using the revised K decay constant of [6]. For Clearwater West, the new $^{40}Ar/^{39}Ar$ dating attempt yielded an Early Permian plateau age of 283.4 ± 1.6 (1.9) Ma (2σ; MSWD = 0.85; *P* = 0.60) for ~98% of the ^{39}Ar released (Fig.1, right). A second melt rock aliquot gave a concordant plateau age of 284.4 ± 1.6 (1.7) Ma (2σ; MSWD = 0.48; *P* = 0.95; ~88% of ^{39}Ar; not shown), resulting in a combined weighted mean age of 283.9 ± 1.2 Ma (2σ; MSWD = 0.65; *P* = 0.42). The recalculated mean age for Clearwater West using the revised K decay constant of [6] is 286.7 ± 1.2 Ma (2σ).

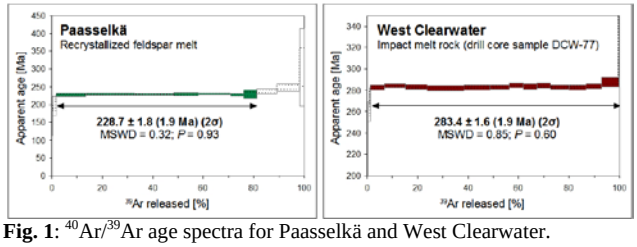

Fig. 1: $^{40}Ar/^{39}Ar$ age spectra for Paasselkä and West Clearwater.

The newly obtained plateau age for the Paasselkä impact confirms previous dating results [1] with improved statistical robustness. The new age for Clearwater West further refines earlier dating results for this impact structure [e.g. 3;4].

References: [1] Schmieder, M. et al. 2010. Meteoritics Planet. Sci. 45:572-582. [2] Schmieder M. et al. 2008. Meteoritics Planet. Sci. 43:1189-1200. [3] Reimold W. U. et al. 1981. Contrib. Mineral. Petrol. 76:73-76. [4] Bottomley et al. 1990. Proc. 20th Lunar Planet. Sci. Conf., p. 421-431. [5] Steiger, R. H. and Jäger, E. 1977. Earth Planet. Sci. Lett. 36: 359-362. [6] Renne, P. R. et al. 2010. Geochim. Cosmochim. Acta 74:5349-5367.