

SHOCK-MOLTEN SANDSTONE CLASTS IN IMPACT MELT ROCKS: AGE CONSTRAINTS FOR THE PAASSELKÄ IMPACT STRUCTURE (SE FINLAND). E. Buchner¹, J. Moilanen², T. Öhman³ and M. Schmieder¹ ¹Institut für Planetologie, Universität Stuttgart, Herdweg 51, D-70174 Stuttgart, Germany, elmar.buchner@geologie.uni-stuttgart.de, ²Pinkelkatu 6 B 48, FI-90520 Oulu, Finland, ³Department of Geosciences, P.O. Box 3000, FI-90014 University of Oulu, Finland.

Introduction: The ~10 km in diameter, deeply eroded Paasselkä impact structure [1-3] (Fig. 1), hosted by ~1.9 Ga Paleoproterozoic crystalline rocks of the Svecofennian Domain of the Baltic Shield (e.g., [4]), is the third largest of eleven impact structures currently known in Finland [5]. A recent geological summary of the Paasselkä impact structure and a petrographic-geochemical description of impact melt rocks is given by [3]. As no isotopic dating has been done for Paasselkä so far, only the Paleoproterozoic age of the target rocks is widely cited as the maximum age for the Paasselkä impact [1;3;6].

Shock-molten sandstone clasts in impact melt rocks: As noted earlier by [2], impact melt rocks recovered from the Paasselkä impact structure contain clasts of sandstones. In particular, domains of partially and selectively shock-molten sandstone in the melt rocks are made up of polycrystalline and fluidal (in places dendritic) silica and exhibit a relict overall sandstone fabric [3] in thin section and at the handpiece scale (Fig. 2).

Discussion and conclusions: The presence of partially molten (i.e., pre-impact) sandstone clasts in the impact melt rocks provides important constraints for the timing of the Paasselkä impact event. Thus, the clast-rich Paasselkä impact melt rocks represent a unique proxy for (sedimentary) target rock lithologies that were eroded elsewhere in the region, but preserved in the impact breccias. The oldest known, generally only slightly recrystallized siliciclastic rocks in Finland are Jotnian (~1.4-1.25 Ga) Mesoproterozoic Molasse-type sandstones (e.g., [4;7-9]) that originally covered large parts of the Baltic Shield; today, remnants of the Jotnian sandstones are restricted to tectonic graben structures and depressions [4]. The incorporation of sandstones into the Paasselkä impact melt rocks implies that the age of the impact is younger than the oldest siliciclastic rocks. Therefore, in contrast to the currently cited <1.9 Ga impact age (e.g., [1;3]), we suggest a new age of <1.4 Ga (Mesoproterozoic or younger) for the Paasselkä impact structure. ⁴⁰Ar/³⁹Ar dating of feldspathic glass particles separated from the impact melt rocks is currently underway in order to improve the Paasselkä impact age.

References: [1] Pesonen L. J. et al. (1999) *Meteoritics Planet. Sci.*, 34, A90. [2] Öhman T. et al. (2003) *LPS XXXIV*, Abstract #1571. [3] Schmieder M.

et al. (2008) *Meteoritics Planet. Sci.*, 43, 1189-1200. [4] Puura V. and Plado J. (2005) in Koeberl C. and Henkel H. (eds.) *Impact Tectonics*, 211-246. [5] Pesonen L. J. et al. (2005) *XXII Geofysiikan päivät, Geoph. Soc. Finland*, 165-169. [6] Earth Impact Database (2009), available online at <http://www.unb.ca/passc/ImpactDatabase> (accessed January 08, 2009). [7] Simonen A. (1971) *Geol. Rdsch.*, 60, 1406-1421. [8] Pesonen L. J. et al. (1989) *Tectonophysics*, 162, 27-49. [9] Puura V. and Flodén T. (1999) *Tectonophysics*, 305, 75-92.

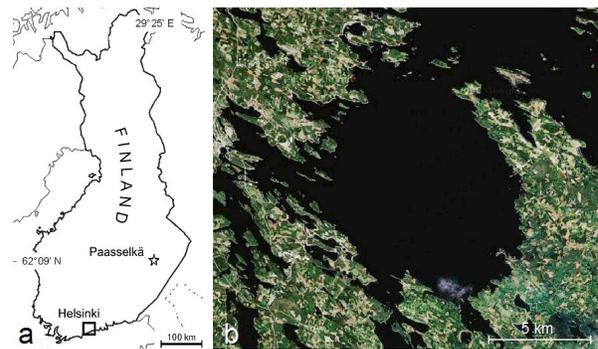


Fig. 1: a) Map of Finland and location of the Paasselkä impact structure; b) Landsat-5 TM satellite image view of Lake Paasselkä (modified after [3]).

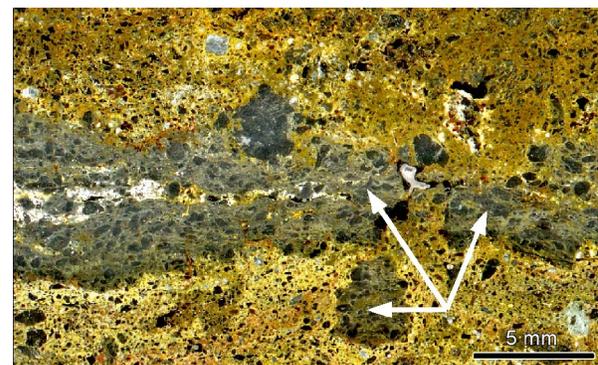


Fig. 2: Clast-rich impact melt rock from the Paasselkä impact structure with domains of partially molten and recrystallized sandstone (white arrows; polished section).