Geophysical Research Abstracts
Vol. 15, EGU2013-10182, 2013
EGU General Assembly 2013

Earth's Archean Impact Record In The ICDP Drilling "Barberton Mountain Land".

Jörg Fritz (1), Ralf-Thomas Schmitt (1), Uwe Reimold (1), Christian Koeberl (2), Ian Mc Donald (3), Axel Hofmann (4), and Beatrice Luais (5)

(1) Museum für Naturkunde, Berlin Germany, (2) University of Vienna, Austria, (3) School of Earth and Ocean Sciences, University of Cardiff, Wales, UK, (4) University of Johannesburg, South Africa, (5) CRPG- CNRS – Nancy, France

The marine meta-sedimentary successions in the "Barberton Mountain Land" are formed by Archean volcanic and sedimentary rocks including the oldest known impact ejecta layers on Earth. The chemical signature (high iridium concentrations, chromium isotopic ratios) of some of these up to tens of cm thick Archean spherule layers advocate that these ejecta deposits represent mainly extraterrestrial material [1]. These ejecta layers contain millimetre sized spherules that are larger and accumulated thicker layers compared to any impact ejecta layer known from Phanerozoic sediments, including the global ejecta layer of the Chicxulub impact catering event terminating the Mesozoic era of Earth's history [2].

The Archean spherule layers are interpreted as products of large impacts by 20 to >100 km diameter objects [3, 4]. Identifying traces of mega-impacts in Earth's ancient history could be of relevance for the evolution of atmosphere, biosphere, and parts of the Earth's crust during that time. In addition, recognizing global stratigraphic marker horizons is highly valuable for inter-correlating sedimentary successions between Archean cratons [5]. However estimates regarding size of the impact event and correlations between the different outcrops in the Barberton mountain land are complicated by post depositional alterations of the tectonically deformed sediments [6, 7]. The relatively fresh samples recovered from below the water table during the 2011-2012 ICDP drilling "Barberton Mountain Land" are promising samples to investigate and to discriminate primary and secondary features of these rare rocks.

We plan to conduct 1) petrographic, micro-chemical and mineralogical characterization of the impact ejecta layers, 2) bulk chemical analyses of major and trace elements, and 3) LAICP- MS elemental mapping of platinum group element (PGE) distributions. and elemental analyses of moderately siderophile elements. This aims at 1) characterization of the ejecta layers, 2) identification of the phases hosting the extraterrestrial PGE signature, 3) discrimination of the primary geological evidence of the impact event from those characteristics that resulted from syn- and post-sedimentary alteration.

Acknowledgement: Financial support by the DFG - RE 528/14-1.

References: [1] Lowe D. R. et al. (2003) Astrobiology 3, 7-47. [2] Simonson B. M. and Harnik P. (2000) Geology 28, 975-978. [3] Lowe D. R. and Byerly G. R. (1986) Geology 14, 83–86. [4] Melosh H. J. and Vickery A. M. (1991) Nature 350, 494–497. [5] Byerly G. R. et al. (2002) Science 297, 1325-1327. [6] Reimold W. U. et al. (2000) Impacts and the Early Earth. Eds.: Gilmour I., Koeberl C. Lecture Notes in Earth Sciences 91, Springer-Verlag, Berlin, pp.117-180. [7] Hofmann A. et al. (2006) GSA Special Paper 405, 33 - 56.