DETAILED INVESTIGATIONS OF THE SUBO 18 (ENKINGEN) DRILL CORE FROM THE RIES CRATER, SOUTHERN GERMANY. W.U. Reimold[1], B.K. Hansen[1], I. McDonald[2], C. Koeberl[3], J. Jacob[1], D. Stöffler[1], and C. Meyer[1], [1]Museum für Naturkunde, Leibniz-Institute at Humboldt University Berlin, Invalidenstrasse 43, 10115 Berlin, Germany (uwe.reimold@mfn-berlin.de), [2]School of Earth and Ocean Sciences, Cardiff University, Park Place, Cardiff CF10 3YE, U.K; [3]Department of Lithospheric Research, University of Vienna, Althanstrasse 14, A-1090 Vienna, Austria.

The Ries Crater is one of the best preserved and best studied impact structures in the world, especially with respect to its preserved impact breccia crater fill and extensive deposits of extra-crater breccias (Bunte Breccia, suevite, and distal tektite deposits). Furthermore, a series of boreholes has made the impact breccia deposits accessible for 3D investigations. In 2008, a further cored hole was sunk near the village of Enkingen (SE Ries) by the Bavarian Department of Environmental Studies, accessing the crater breccias at the inner slope of the crystalline ring. The SUBO 18 drill core was initially obtained to investigate the cause of a significant local magnetic anomaly [1] but proved to be a valuable addition to the Ries core record. The 100 m drill core comprises 21.2 m crater sediment above impact breccia (suevite to -86.24 m with varied contents of melt fragments, above a rather massive impact melt rock to end-of-hole).

Core logging recorded, inter alia, the downhole variation of groundmass, melt particle, and crystalline/sedimentary clast proportions, and their average grain sizes. General increases of melt proportion, and melt particle size, as well as the concomitant increase of maximum crystalline clast size with depth became obvious. Only the lowermost section contained a notable but very small component of sedimentary clasts.

The suevite package is characterized by significant variation in melt particle content, with local accumulations of densely packed and frequently sub horizontally aligned melt particles. These can become so densely packed locally that they can hardly be separated visually and to the less careful observer may resemble massive impact melt rock. Similarly it appears that the lowermost massive, melt dominated section also contains thin seams of what appears like remnant stringers of suevitic groundmass. Thus, a complete transition from melt-poor to melt-rich and melt-agglomeratic impact breccia was intersected.

A detailed study by ASEM of the finest-grained materials in the submicroscopic groundmass in suevite samples from throughout the package in SUBO 18 showed that it is composed of secondary phyllosiliate and carbonate. However, textural evidence from clasts in melt-poor, melt-rich, and melt-dominated sections demonstrates that thermal effects are limited in the former, enhanced in the second, and dominant in the latter type of breccia. This is interpreted to indicate that typical melt-poor suevite has a groundmass dominated by unaltered clastic material, whereas the other two types contain more and more melt both in the clast content and in the fine-grained to submicroscopic groundmass. Micro-clasts and -melt particles are well separated. No evidence to suggest that suevite groundmass could represent a melt matrix was detected, in contrast to recent postulates [2,3].

For selected samples from the Enkingen core modal analyses, including a record of shock degrees for quartz and feldspar clasts, were obtained. Overall, it can be concluded that the target volume excavated and mixed into these impact breccias was dominated by crystalline basement-derived material, with only a minor sedimentary component. This is consistent with the macro- and mesoscopic observations made and on drill cores. No trends in modes and clast populations against depth in the borehole could be established. In contrast to the Nördlingen 1973 drill core where a distinct occurrence of accretionary lapilli was noted in the uppermost suevite part (around 296.5 m), no such particles were observed in the Enkingen drill core. The Enkingen suevites are seemingly rather similar, also with regard to dominant shock degree of the micro-clast fraction. These statistics do not provide any hint at different processes related to the formation and deposition of different levels of this suevite package.

Finally, representative samples of impact breccias from the Enkingen core were subjected to major and trace element analysis by XRF and INA analysis. No significant variation with respect to any major element abundances is noted for the entire length of core investigated. Nickel sulfide fire assay with ICP-MS was used to investigate PGE abundances and patterns/ratios in selected samples from the core. Four samples show Ir (0.37-0.88ppb) and Ru (0.56-1.08ppb) significantly above background (Ir <0.1ppb, Ru <0.24ppb) and with chondritic Ru/Ir, suggesting that a small chondritic projectile component (~0.1%) could be present. This is obviously in contrast to previous findings where in the absence of a meteoritic signature an achondritic projectile was favored for the Ries impact [4, and refs therein]. Further data reduction is in progress.

Refs: [1] Pohl, J. et al., GSA SP 465, in press; [2] Osinski, G.R., 2004, EPSL 226, 529-543; [3] Osinski, G.R. et al., 2004,MAPS 39, 1655-1684; [4] Tagle, R. & Hecht, L., 2006, MAPS 41, 1721-1735.