RIES CRATER, GERMANY: THE ENKINGEN MAGNETIC ANOMALY AND ASSOCIATED DRILL CORE SUBO 18. Jean Pohl[1], Klaus Poschlod[2], Uwe Reimold[3], Claudia Crasselt[3], [1]Department of Earth and Environmental Sciences, University of Munich, Theresienstrasse 41, 80333 Munich, Germany, pohl@geophysik.uni-muenchen.de [2]Geological Service, Bavarian Environment Agency, Heßstrasse 128, 80797 Munich, Germany, [3]Museum for Natural History (Mineralogy), Humboldt-Universität, Invalidenstrasse 43, 10115 Berlin, Germany.

Introduction - The suevite in the Ries impact crater is characterized by an often strong, reverse remanent magnetization [e.g. 1, 2]. This results in negative magnetic anomalies showing the distribution of the suevite in the crater. Fig. 1 shows the ground magnetic anomalies of the total intensity. The main mass of the suevite (so-called crater suevite) is located within the inner crystalline ring of the crater and covered by post-impact lake sediments. The inner line corresponds to the 150 m isopach of the lake sediments after Ernstson (1974). The extension of the crater is indicated by the outer line showing the structural rim.

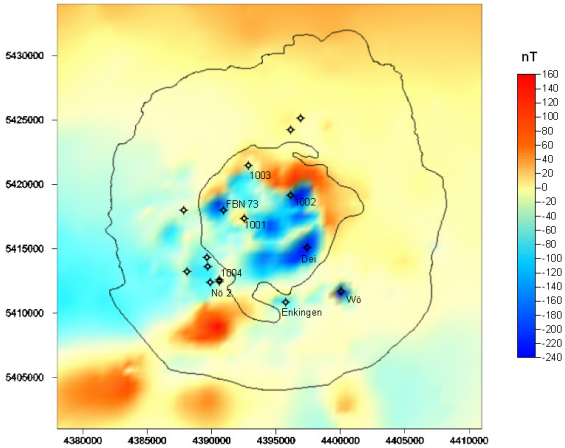

Fig. 1 Total magnetic intensity map for the Ries crater. Width of the area shown is 33 km. N is up.

Ejected suevite is found between the inner ring and the structural rim, and outside of the structural rim, with a thickness of ca. 10 to 20 m. A local magnetic anomaly (Wö) indicates the location of an 80 m thick suevite occurrence below 20 m of lake sediments drilled in 1965 (drill core Wörnitz-ostheim).

The Enkingen magnetic anomaly - Another local anomaly is located near the village Enkingen situated on the inner ring. A preliminary ground survey of this anomaly was done in 1970 [4]. A more detailed survey was carried out in 2006/2007. Fig. 2 shows the Enkingen total intensity anomaly. Village houses and other human constructions limited the survey to a certain extent. Also a thick gas pipeline produced a series of strong anomalies trending roughly N-S. In spite of these limitations the anomaly is well defined. The maximum amplitude is comparable to that of the Wörnitzostheim magnetic anomaly.

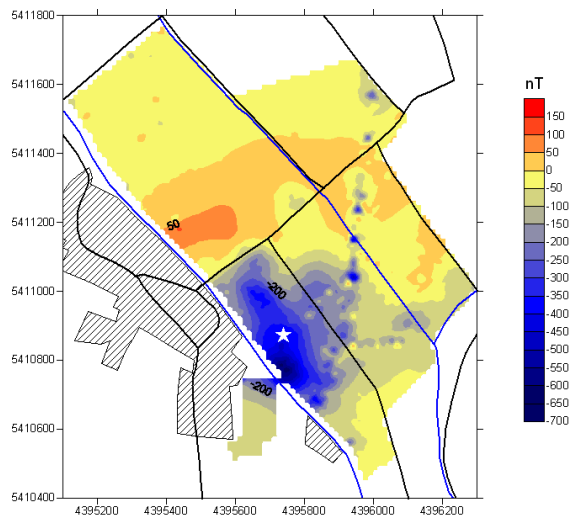

Fig. 2 Detailed map of the Enkingen magnetic anomaly and location of the SUBO 18 Enkingen borehole (star symbol). N is up.

The Enkingen drill core SUBO 18 - A drilling program of the Geological Service of Bavaria offered the opportunity to drill a 100 m deep cored hole in the area of the anomaly from November 29 to December 8 2006 with a core diameter of 10 cm. Core recovery was mostly close to 100 %, but limited parts of the cores disintegrated on recovery. The location of the drill hole is shown in Fig. 2.

The core stratigraphy involves: 0 to 4.5 m - fluviatile Quaternary deposits, clay and gravel; 4.5 to 21 m - Paleogene clays of the Ries crater lake; from 21 to 100 m suevite and impact melt rocks. The drill hole unfortunately did not penetrate into the expected crystalline basement rocks of the inner ring, but modelling of the magnetic source body indicates that the bottom of the hole was not far from the basement rocks. Granitic basement was

detected in a shallow bore hole south of Enkingen at a depth of 38 m [5]. The Enkingen suevite and melt body is located on the inner flank of the inner ring.

The suevite and impact melt rock section is highly diverse in terms of suevite types (by groundmass composition, particle size, induration, alteration state, carbonate presence or absence, clast population, clast grain size variations, and maximum clast contents). For example, melt fragment content varies from <10 to >60 %. Transition from suevite to massive impact melt rock is gradational. The bottommost 13 meters of massive impact melt rock are also very heterogeneous, both with regard to texture and clast content. Whereas crystalline rock derived clasts are the dominant clast species throughout the impact breccias, the lowermost part contains significant amounts of sedimentary clasts as well (estimated at 1-3 %, maximum). Detailed petrographic analysis of the core and first chemical studies are in progress.

Magnetic properties of the suevite core - Magnetic susceptibility along the core was measured with a portable kappameter (KT-5, Geofyzika Brno). For petrological investigations and remanence measurements, all coherent core sections were cut along their axis and inch cores were drilled for magnetic measurements where possible. Results of these measurements are shown in Fig. 3. The suevite has high, strongly varying negative magnetic remanence and magnetic susceptibility and very high Koenigsberger ratios (remanent magnetization versus induced magnetization). The amplitudes of the magnetic anomaly can easily be explained by the magnetization of the suevite. A remarkable fact is that the impact melt rocks at the lower end of the drill core have relatively low remanent magnetizations and higher magnetic susceptibilities.

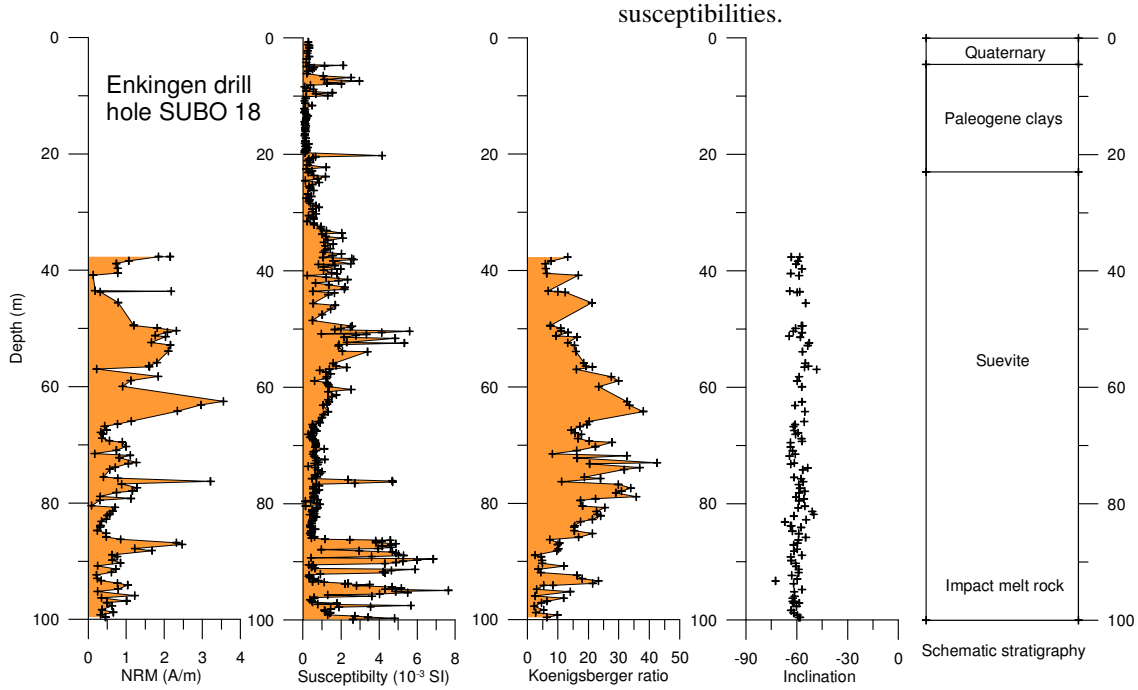

Fig. 3 Preliminary magnetic properties of the Enkingen SUBO 18 drill core. The Koenigsberger ratio is the ratio of the natural remanent magnetization (NRM) to the locally induced magnetization.

We will present a detailed discussion of the magnetic record and petrographic characteristics of the SUBO 18 core at the Large Meteorite Impacts conference.

References: [1] Pohl, J. 1965, Neues Jahrbuch für Mineralogie, Monatshefte 1965, 268-276. [2] Pohl et al. 1977 in: Impact and Explosion Cratering (Roddy et al., Eds.), 343-404. [3] Ernstson, K. 1974, J. of Geophysics 40, 639-659. [4] Engelhard L. 1971, Z. für Geophysik 37, 667-678. [5] Deffner, C. and Fraas, O. 1877, Begleitworte zur geognostischen Specialkarte von Württemberg, Bopfingen und Ellenberg, 36 p.