CHICXULUB EJECTA BLANKET: THE SUEVITES OF THE UNAM 5 AND 7 DRILL CORES. F. Schönian[1], T. Salge[1], T. Kenkmann[1], D. Stöffler[1], A. M. Soler Arechalde[2] and J. Urrutia Fucugauchi[2], [1]Museum of Natural History, Humboldt-University of Berlin, Invalidenstr. 43, D-10115 Berlin, Germany, [2]Institute for Geophysics, UNAM, Mexico-City, e-mail: frank.schoenian@museum.hu-berlin.de.

Introduction: The impact breccias outside the Chicxulub crater in México, recovered by a drilling program of the Universidad Nacional Autónoma de México (UNAM), are the only known examples of the proximal ejecta blanket of a large multi-ring impact basin on Earth. They have been described briefly by [1] and [2] and where subdivided into a lower 'Bunte Breccia'-like unit and an upper Suevite.

We present a detailed description of the suevites of the UNAM 5 and 7 cores with special emphasis on: (a) matrix properties, (b) grain size distribution, (c) sedimentologic characteristics, and (d) distribution of sedimentary clasts, impact melt, and basement clasts. A subdivision of the suevitic breccias into 6 and 4 units is suggested for UNAM 5 and 7, respectively (Fig. 1).

UNAM 5 (105 km S' of impact center): UNAM 5 bottomed out in impactites and did not reach underlying bedrock ([1], [2], Fig. 1).

Lower Suevite (unit 6). The lower unit is a polymict, very poorly sorted breccia, with a well consolidated greyish brown to dark grey dolomitic matrix. It contains abundant sedimentary clasts, large yellowish ocre to pale grey melt fragments and rinds around clasts, and crystalline basement clasts of up to 180 mm Ø with variable degrees shock metamorphism (stages I-II-(III)). A faint grading can be observed in both subunits identified Fig. 1). Light-coloured melt is towards the top replaced by dark green to black melt lithologies. Broken clasts with melt-rinds indicate lateral shearing during deposition.

Middle Suevite (units 5, 4 and 3). Unit 6 is overlain by a polymict breccia with pale grey, massive dolomitic to dolomitic-clastic matrix that contains less sedimentary clasts and smaller crystalline fragments (shock stage II-III). Greyish green to greenish black melt forms rinds around clasts, occurs as large fragments, but is also finely dispersed within the matrix. This unit is followed by a carbonate-free, clast-supported breccia with a pale grey, clastic matrix, small and highly shocked basement clasts (max. 35 mm Ø; stages (II)-III), and chaotic, melt-rich 'breccia-in-breccia' structures. It grades into a less sorted, carbonate-free portion with rising amount of sedimentary clasts and variable degrees of shock (max. 70 mm Ø, stages I-II-III, Fig. 1). In the lower unit 3 the matrix displayss an increasing carbonate content. The breccia is completely unsorted, less consolidated and shows inverse grading with large, in part unshocked, basement clasts at its top (to 112 mm Ø, stages 0-I-(II)). The upper part of unit 3 resembles unit 5 (Fig. 1).

Upper Suevite (unit 2). The Middle Suevite is overlain by a dark greenish-grey, poorly consolidated suevite with a marly-sandy matrix that contains layers of dolomitic breccias at its base. Matrix content is variable (20-40 %) and the amount of sedimentary clasts is increasing. Melt occurs as single, often large, clasts and is very variable (yellowish, pale grey, dark green, black, and bottle-green). A faint stratification and irregular laminations, but no 'breccia-in-breccia' structures, can be observed in this unit (Fig. 1).

Redeposited Suevite (unit 1). With an abrupt lithological change, the Upper Suevite is overlain by a massive, unstratified conglomerate with reworked clasts of the former that displays grain size grading (max clast from 30 to 15 mm Ø). It is followed by a succession of conglomeratic sandstones, clay rich breccias with rip-up clasts, and cross-stratified sandstones (Fig. 1).

UNAM 7 (126 km SE' of impact center): UNAM 7 reached the bedrock of the Upper Cretaceous Icaiche Fm. [3]. The sharp contact between the anhydrite-dolomite sequence and the impact breccias is at 678.10 m (Box 220, [4]). The lower 28 m of the latter (unit 6b) are a consolidated dolomitic breccia with sedimentary clasts and rare green melt fragments.

Chaotic Megabreccia (units 6 and 5). The succession between 650.15 and 364.10 m of UNAM 7 is a chaotic megabreccia with blocks and megablocks of anhydrite of up to 34 m. Sedimentary clasts or blocks larger than 60 cm, are contributing to about 70 % of this sequence. The heavily dissolved and karstified blocks are interrupted by dissolution breccias and melt-bearing, impact breccias. The breccia between 364.10 and 348.80 m (unit 5) contains a higher amount of green melt fragments and irregular bodies of melt-rich, suevitic breccias (Fig. 1). It is transitionial between unit 6 and the suevites [5].

Lower Suevite (units 4 and 3). The base of unit 4, displays a well consolidated dolomitic matrix and contains abundant anhydrite fragments (Fig. 1). Unit 4 is characterized by a poorly consolidated, marly-sandy matrix (15-30 %) and a high content of green to grey-green altered melt fragments of up to 125 mm Ø (Fig. 1). It contains interlayers of dolomitic breccias and abundant anhydrite clasts. Light-coloured melt fragments are rare (3-8 %) and crystalline clasts are

highly shocked (5-10 %, up to 55 mm Ø, stage II-III). Unit 3 is better consolidated, slightly graded, has a pale grey to greenish-grey, dolomitic-clastic matrix and contains a higher amount of yellowish-ocre to greenish-yellow melt fragments (30-15 %). Basement clasts (up to 135 mm Ø; 3-8 %) display a high degree of shock metamorphosis (stages II-III).

Middle Suevite (unit 2). Unit 2 is a very heterogeneous breccia with a greenish grey to ocre grey, consolidated dolomitic matrix with finely dispersed green melt particles. Chaotic, melt-rich portions form 'breccia-in-breccia' structures and large melt particles of up to 110 mm are broken and interfinger with or are dissolved within the matrix. Sedimentary clasts are rare and crystalline fragments are variably shocked (max. 55 mm, stages II-III).

Upper Suevite (unit 1). The Middle Suevite is grading into a poorly consolidated breccia with pale-grey to ocre-grey, dolomitic-marly matrix and abundant large sedimentary clasts including an anhydrite block of 110 cm thickness (Fig. 1). The marl content of the matrix rises continuously, and size and amount of basement clasts diminishes towards the top of the sequence. Marly intercalations and irregular laminations occur in the graded subunit 1b and marl- and clay-rich sedimentary breccias are interbedded with better consolidated suevitic breccias at the top of the impactites ('Redeposited Suevite', unit 1a; Fig. 1).

Correlations: The units of the suevitic breccias of the UNAM cores may in part be correlated with the impactites identified within the crater (e.g. [5]). While unit 4 of UNAM 7 has no equivalent in other cores, unit 3 and unit 6 of UNAM 5 can be correlated with the basal, allogenic breccia of Yax-1 (ground-surged suevite, [5]). The melt-rich Middle Suevite of UNAM 5 (units 5, 4, and 3) and UNAM 7 (unit 2) might be correlated with the Middle and Upper Suevite from Yaxcopoil-1 (units 4/3). The 'Upper Suevites' represent fall-back suevites and are lateral equivalents of the 'Lower Sorted Suevite' of Yax-1 (unit 2, [5]).

Conclusions and discussion: Based on a variety of criteria it was possible to define clearly distinguishable units within the suevites of the UNAM drillcores: These provide the tool to reconstruct the sequence of events during the deposition of the ejecta plume material following the emplacement of the thick sedimentary megabreccia, represented by units 6 and 5 of UNAM 7, minutes after the impact. The transitional contacts and the presence of 'breccia-in-breccia' structures point towards the continuity of processes and indicate turbulent mixing and reworking. Within the Lower and Middle Suevite the degree of shock metamorphism, the amount of melt and sedimentary clasts, the carbonate content of the matrix and the depositional temperatures are closely related. A lateral shear component is indicated by broken melt clasts, elongated melt particles, and liquid flow structures within the matrix. The depositional temperature and internal shearing during the secondary lateral flow is less pronounced in UNAM 7 than in UNAM 5. The Upper Suevite of both cores represents late stage fall-back material that afterwards was redeposited either by a laminated mud-flow (UNAM 7) or in a turbulent, high-energy environment (UNAM5).

References: [1] Urrutia J. et al. (1996) *Geophys. Res. Lett., 23,* 1565-1568, [2] Rebolledo et al. (2000) *Int. Geol Rev. 42*, 928-940*,* [3] Lopez Ramos V. (1975) in: Nairn A. E. M., Stehli F.G: - *Ocean Basins and Margins,* 257-282, [4] Schönian F. et al. (2003), 3rd Int. Conf. Large Met. Impacts, Abstract #4132, [5] Stöffler et al. (2004), *MAPS*, 39, 1035-1067.

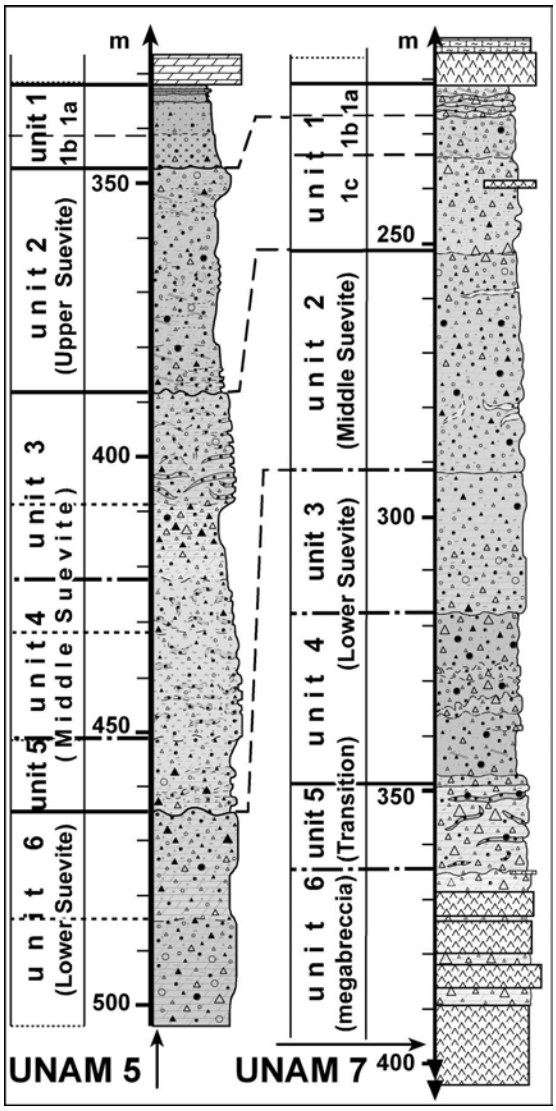

Fig. 1. UNAM 5 and 7 suevite petrography.