SUEVITE FROM HOHENALTHEIM: A NEW DEPOSIT FROM THE RIES CRATER, GERMANY.

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Introduction. During road construction work in summer 1997 a new deposit of suevite in the village of Hohenaltheim has been discovered. Hohenaltheim is located at 48°47'N and 10°32'E, 8 km SSE from the city of Nördlingen. The newly dicovered suevite is centered in the so called megablock zone between the inner ring and crater rim of the Ries crater. It belongs to the impactlithological unit of the fallout suevite.

Petrography and Geochemistry. We present the results of our preliminary study of several representative samples (see Figure 1) from the Hohenaltheim outcrop (SIE 97-132, Ho-D). First petrographical studies show that the clast population is dominated by sedimentary rocks esp. Jurassic limestones which is quite unusual for fallout suevites analyzed so far. Point counting (total number of counts: 14892) of clasts and glass bodies > 5 mm gave a modal composition of 74.1 vol% matrix, 13.5 vol% glass, 4.3 vol% crystalline clasts and 8.0 vol% sedimentary clasts. The comparison with an average fallout suevite consisting of 79.0 vol% matrix, 16.0 vol% glass, 4.3 vol% crystalline clasts and 0.4 vol.% sedimentary clasts [1] shows similarity except for the sedimentary rocks.

Whole rock density and porosity were determined by means of hydrostatic balance and pycnometer: density is $2,57 \pm 0,01$ gcm^{-3} and porosity is $12,6 \pm 0,1$ %. Comparable data for fallout suevites from Wörnitzostheim and Otting is given in [2]. Density and porosity for Wörnitzostheim suevite is 2,54 gcm^{-3} and 27,6%, for Otting suevite 2,54 gcm^{-3} and 23,2%. Bulk samples have been cut into slices of 5-7 mm thickness and used for separating glass and matrix by mechanical means. The chemistry of the whole rock and the separated components glass and matrix was studied with x-ray fluorescence spectroscopy on glass tablets and with IR-spectroscopy for CO_2. Major element chemistry is shown in Table 1.

Discussion. Ries ejecta have been studied thoroughly over the past decades and we know that Malmian limestones are the dominant component (80-90%) in the sedimentary rocks of the fallout suevite although these inclusions comprise less then 1.2% of the total rock [3]. The abundance of sedimentary clasts is also recognizable in major element chemistry. Comparison with average fallout suevite chemical composition shows that the Hohenaltheim suevite is lower in SiO_2 and much higher in CaO and CO_2. The high content of CaO and CO_2 is even visible in the analyzed glass bombs. A possible explanation might be found in the pre-impact morphology and -stratigraphy of the Nördlinger Ries. Obviously, Hohenaltheim was located in a region where Malmian rocks were present prior to the impact. The Hohenaltheim suevite consequently is derived from a part of the ejecta plume where a huge amount of sedimentary target rocks had been incorporated. This might indicate that impact melt does not only derive from shock fused basement rocks. It can be assumed that some fraction of limestone from the upper target area has been mixed into the impact melt, in a specific region of the melt zone. The present impact cratering-model for the Ries crater leaves still the unanswered question why the fallout suevite is distributed discontinuously and the amount of admixed sedimentary target rocks is highly variable. Further studies will show if the suevite of Hohenaltheim is an exception among all fallout suevites of the Ries crater or if other similar deposits will be discovered in the future.

References: [1] Engelhardt, W. v. (1997) *Meteor. Planet. Sci.* **32**, 545-554 [2] Schüle, F. (1970) *Petrographische Untersuchungen am Suevit von Otting*, Master thesis, Univ. Tübingen, 41 pp. [3] Pohl, J., Stöffler, D., Gall, H. and Ernstson, K. (1977) in *Impact and explosion cratering* edited by Roddy, D. J., Pepin, R. O. and Merrill, R. B., 343-404 [4] Stähle, V. and Ottemann, J. (1977) *Geologica Bavarica* **75**, 191-217 [5] Engelhardt, W. v. and Graup, G. (1984) *Geol. Rundsch.* **73**, 447-481 [6] Stähle, V. (1972) *Earth. Planet. Sci. Lett.* **17**, 275-293

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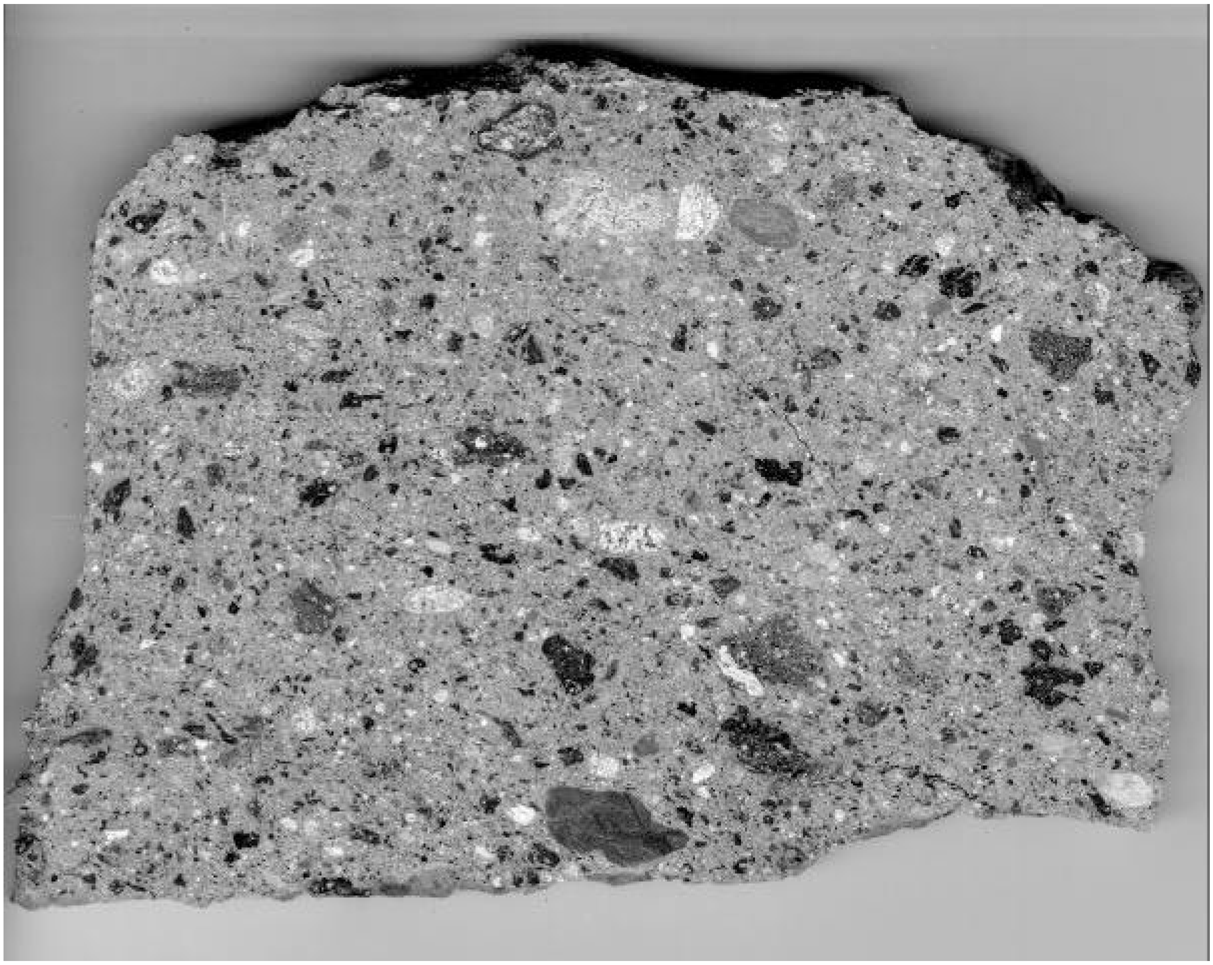

Figure 1: Section of a suevite sample (SIE 97-132) from Hohenaltheim. Maximum length is 17 cm.

Table 1: Chemical composition of Hohenaltheim suevite (average is column 1 & 2) in comparison with other Ries fallout suevites. * Total iron given as Fe_2O_3. # not determined. N is for number of samples.

	SIE 97-132 Average	Ho-D Average	Fallout Suevite Average [4]	SIE 97-132 Matrix	Fallout Suevite Matrix [5]	SIE 97-132 Glass	Glass from Suevite [6]
wt%							
SiO_2	52,5	54,2	61,08	53,90	59,81	58,10	64,03
TiO_2	0,51	0,51	0,85	0,51	0,90	0,65	0,79
Al_2O_3	11,5	11,6	14,32	11,60	20,21	15,40	15,25
Fe_2O_3*	4,02	4,03	4,57	4,02	9,19	4,10	5,80
MnO	0,19	0,14	0,11	0,17	n.d.	0,14	0,08
MgO	1,68	1,33	1,67	1,72	4,47	1,87	3,04
CaO	15,1	14,0	3,19	14,30	3,85	7,60	3,96
Na_2O	1,40	1,47	1,19	1,38	0,47	1,85	3,02
K_2O	1,52	1,82	2,50	1,46	1,11	2,63	4,01
P_2O_5	0,19	0,17	0,25	0,17	n.d.	0,30	0,20
CO_2	9,9	9,3	1,10	9,20	n.d.	3,60	n.d.
SO_3	0	0	0,58	0	n.d.	0	n.d.
L.O.I.	2,7	3,00	4,89	3,00	n.d.	3,70	n.d.
H_2O-	n.d.#	n.d.	2,58	n.d.	n.d.	n.d.	n.d.
total	101,21	101,57	98,88	101,43	100,01	99,94	100,18
N	3	3	4	3	5	1	88