Table A1 Simplified core log for the SUBO 18 (Enkingen) drill core.

21.00 - 21.06	marly limestone
21.06 – 21.19	marl
21.09 – 22.10	brownish-greenish suevite
22.10 – 23.18	suevite (less altered than above)
23.18 – 23.24	shale clast
23.24 – 23.52	crumbly suevite (carbonate bearing till 23.71m)
23.52 – 24.00	coherent suevite (light-gray)
24.00 – 24.85	coherent suevite (light-gray, local small limestone clasts)
24.85 – 26.50	lumpy suevite
26.50 – 28.00	suevite with large cryst. Clasts
28.00 – 28.50	coherent suevite
28.50 – 29.00	coherent suevite
29.99 – 29.50	fragmented suevite
29.50 – 30.00	pebbly suevite
30.00 – 30.50	melt-rich suevite
30.50 – 31.00	brownish-greenish to yellowish suevite
31.00 – 31.50	suevite (greyish-yellow)
31.50 – 32.00	suevite (greenish)
32.00 – 37.50	streaky gray/green breccia (altered melt breccia?)
37.50 – 38.30	melt-rich suevite
28.30 – 39.00	suevite (greenish-yellowish)
39.00 – 39.50	suevite like above but less melt
39.50 – 40.00	suevite
40.00 – 40.50	suevite (yellowish-greenish)
40.53 – 40.80	crumbly suevite (greenish)
40.80 – 40.92	gray gneiss clast
40.92 – 41.00	suevite
41.00 – 42.00	suevite (light-gray, locally Fe-stained)
42.00 – 43.00	suevite (light-gray, locally Fe-stained)
43.00 – 43.45	crumbly suevite
43.45 – 43.60	melt crusted cryst. Clast
43.60 – 44.00	coherent suevite (light-gray)
44.00 – 44.10	greenish altered suevite
44.10 – 45.00	washed out suevite
45.00 – 46.00	washed out suevite
46.00 – 47.00	washed out suevite
47.00 – 49.37	washed out suevite
49.37 – 51.63	suevite (light pink coherent)
51.63 – 52.17	washed out suevite
52.17 – 52.90	coherent suevite
52.90 – 53.62	rubble and sand after suevite
53.62 – 54.00	suevite (coherent, pinkish)
54.00 – 57.00	crumbly suevite
57.00 – 58.80	crumbly suevite (whitish-pinkish)
58.80 – 59.00	massive melt fragment
59.00 – 65.87	suevite (crumbly, whitish-pink)
65.87 – 66.85	coherent suevite
66.85 – 67.40	pebbly suevite relics
67.40 – 69.00	melt-rich suevite

69.00 – 75.40	suevite
75.40 – 76.56	impact melt breccia (massive)
76.56 – 79.34	suevite (variable density of melt)
79.34 – 79.78	gneiss clast
79.78 – 80.31	suevite (pinkish)
80.31 – 80.55	leucogneiss clast
80.55 – 80.85	suevite (pinkish)
80.85 – 81.00	impact melt fragment (massive)
81.00 – 82.43	suevite (pinkish)
82.43 – 82.60	suevite (very dense)
82.60 – 82.90	suevite (pink-gray)
82.90 – 83.07	melt agglomerate (similar to rhyolite in appearance)
83.07 – 84.54	melt dominated impact melt breccia (dark-red)
84.54 – 85.76	suevite (gray-greenish to locally pinkish)
85.76 – 86.24	transition to reddish massive impact melt rock
86.24 – 8820	impact melt rock (massive, dark-red)
88.20 – 90.36	impact melt rock (coherent, clast rich, dark-grey/greenish)
90.36 – 91.13	impact melt rock (clast rich, yellowish-greenish)
91.13 – 92.20	impact melt rock (red – gray/green marbled)
92.20 – 93.53	impact melt rock (greenish-yellow)
93.53 - 94.27	impact melt rock (reddish, gray streaked)
94.27 – 95.00	impact melt rock (dark-gray/greenish)
95.00 – 96.15	impact melt rock (red)
96.25 – 97.08	impact melt rock (yellowish or dark-gray streaks)
97.08 – 98.90	impact melt rock (red/dark-gray/yellow streaks)
98.90 – 99.98	impact melt rock (half yellowish/greenish, half red)

Table A2. Descriptions of SUBO18 (Enkingen) drill-core samples (including information from Appendix A2, Pohl et al., 2010); abbreviations: GM = groundmass; MF = melt particle; M = melt (in melt agglomerate); CC = crystalline clast (dimensionless proportion values correspond to %).

21.20 m Gneiss clast with impact melt rim (pebble-sized clast in suevite)

Circa 1.5 cm large gneiss clast of intermediate composition, surrounded by an up to 0.5 cm wide melt rim. Along thin section edges, typical suevite matrix occurs. It contains millimeter sized melt clasts with well-rounded to – rarely – perfectly round shapes. Besides this mantled clast, no accretionary lapilli could be observed. The melt around the gneiss clast is fluidal-textured and could have been accreted during atmospheric transport in the ejecta plume. Along its outer margin, the gneiss clast is locally melted. Tiny clasts of felsic to intermediate granitoid material, similar in composition to the large clast, are enclosed in melt just outside of the clast-melt contact. Their roundish shapes suggest thermal softening and "rolling". Like the groundmass of the suevite along the section edges, the melt zone is completely altered to secondary phyllosilicate. Clast material in the melt zone is extensively annealed – in contrast to the clast population in the suevite groundmass, which is mostly unannealed.

In the suevite zone along the section edge, melt fragments are of variably roundish to angular forms; they are all < 2 mm in size. The groundmass here is completely altered to phyllosilicate. Crystalline clasts are mostly angular and clearly granitoid derived (quartz, feldspars, biotite). A similar clast population is observed within melt fragments. The overwhelming majority of clasts is unshocked or, at best, weakly (1 set of PDF) shocked. Melt fragments in this zone are also completely altered to secondary minerals. Clast size in suevite is < 4 mm. GM 30, MF 45, CC 25.

21.58 m Altered suevite

Suevite groundmass and the matrices of melt fragments are completely altered to secondary phyllosilicate (based on electron microprobe analysis, likely smectite and illite/montmorillonite). The clast population of this sample includes only crystalline rock clasts and mineral fragments derived from crystalline rock (namely, quartz, feldspars). Abundant aggregates of tiny, euhedral pyrite crystals occur in the groundmass.

23.22 m Melt-rich suevite

All melt fragments have been converted to smectite. Veins and pockets of secondary carbonate (calcite) occur. A single droplet-shaped melt particle is noted. Only calcite, quartz, and feldspar clasts, as well as carbonate and granitic (rare) lithic clasts form the clast population. Groundmass carries minor pyrite, perhaps also some magnetite from dissociation and alteration of mafic minerals. The groundmass itself is also completely replaced by secondary phyllosilicate. Most clast shapes are irregular and rounded, although a few angular shapes also occur. A several cm sized shale clast occurs between 23.18 and 23.24. A few melt clasts contain remnants of a biotite-rich lithology (granitoid). GM 30, MF 50, CC 20.

23.48 m Melt-rich suevite

Altered melt fragments up to 1 cm size occur in completely phyllosilicate (+ minor carbonate)-replaced matrix. Shapes of melt fragments are mostly rounded and often show plastic deformation (bending, contortion). Many altered melt fragments nevertheless still display fluidal texture. Suevite groundmass also displays some vesicles that are filled with carbonate. Melt fragments are rather clast-poor. There are a few that contain rare clasts of diaplectic glass (quartz or feldspar). The clast population in suevite groundmass is dominated by quartz and feldspar (both plagioclase and alkali feldspar), besides some biotite and oxidized remnants of (possibly other) mafic minerals. Lithic clasts are not abundant but exclusively derived from granitoid precursors. Clasts are mostly unshocked or weakly shocked (1 set of PDF), although rarely melt clasts are also noted within larger melt fragments. GM 30, MF 45, CC 25.

23.55 m Suevite with 4-cm-wide melt nodule

The melt nodule is compact. It displays fluidal texture with schlieren that can be longer than 2 cm. It is quite vesicular and clast-poor. Contains some devitrified melt clasts composed of extremely fine-grained silica. Other clasts are all very fine-grained and > 95% are unshocked. They are all derived from granitic precursors.

The suevite is melt-rich and contains up to 1x0.3 cm sized clasts. Groundmass is completely altered to phyllosilicate. Besides melt fragments, only unshocked or weakly shocked felsic (quartz, feldspar minerals) clasts are noted. A 3 mm sized, altered mafic clast and several smaller ones are noted that are distinct from the more abundant biotite clasts or biotite-derived oxidized relics. GM 25, MF 40, CC 35.

25.53 m Melt-rich suevite and granodiorite clast

The sample consists of a sliver of altered suevite that rims a >3 cm granodiorite clast. Melt fragments are completely converted to smectite. The clast was largely melted. There are tiny euhedral magnetite crystals, in places accumulations thereof, after biotite. The suevite groundmass is altered to smectite. Clast types are mostly quartz and feldspars, as well as some granitoid clasts. A large quartz clast has strongly reduced birefringence and is obviously approaching diaplectic glass state. GM 30, MF 45, CC 25.

25.68 m Melt-rich suevite

Strongly altered suevite. All melt is completely converted to smectite. Melt fragments are mostly angular. Carbonate, quartz, and feldspar clasts are noted. Minor euhedral magnetite crystals, sometimes in aggregates, after mafic precursor minerals. Clasts are mostly quartz and feldspars, besides rare granitic clasts. Of the latter, most are unshocked to only weakly shocked (fractured). One, 1-cm-sized granitoid clast is partially melted. Melt particle shapes are angular to elongate-with-rounded margins. GM 25, MF 50, CC 25.

29.45 m Macroscopic ID: Impact melt-rich suevite – however, SEM analysis confirmed: impact melt rock!

One of several, up to a few centimeter sized melt nodules in typical though altered suevite. This specimen can be described as a melt-rich suevite, with estimated 45 vol% melt fragments of cm to <0.1 mm sizes. By optical microscopy, numerous very small particles are noted – raising the question whether a major proportion of the submicroscopic groundmass is in fact constituted of melt, or whether melt even represents the groundmass phase. Most sizable melt particles are extensively altered (brown staining; radial/spherulitic aggregates of secondary phyllosilicate). Many melt fragments have spheroidal or droplet-shaped geometries. Some melt is seen to surround crystalline clasts in the fashion of accretionary lapilli. Many melt clasts have schlieren texture with alternating colorless and brownish zones. Some melt fragments contain tiny inclusions of droplet-shaped melt.

Most clasts are granitoid-derived quartz, feldspar (K-feldspar as well as plagioclase), mica (partially oxidized) and mineral aggregates of these minerals. All crystalline clasts are < 4 mm in diameter. Groundmass contains some aggregates of tiny pyroxene crystals, either representing recrystallized or brecciated precursor grains of originally larger size. Small amounts of hematite and goethite have been noted, likely mostly the result of alteration. No carbonate was identified. Shock metamorphism ranges from unshocked to rare local melting of minerals. Estimated composition of this sample is GM 25, MF 45, CC 30.

30.68 m Melt-rich suevite

Groundmass and melt fragments are completely converted to secondary phyllosilicates. Very small (accessory) opaque component that involves tiny specks of magnetite after strongly shocked and partially melted mafic minerals. Rounded melt particles are much more abundant than angular ones. Melt particles are conspicuously poor in micro-clast content. Mineral clasts are mostly quartz and feldspar, and lithic clasts are generally granitoid derived. One of the latter is partially converted to diaplectic glass. A well-developed teardrop shape is noted. GM 25, MF 50, CC 25.

31.20 m Melt-rich suevite

This ca. 8 cm wide core specimen consists of one 4-cm-sized, irregularly shaped melt fragment and a second portion comprising numerous melt fragments, a few up to 4 mm wide crystalline clasts, and up to 5 mm long and wide groundmass pockets. Melt fragments have two types of shapes: (1) highly angular and shard-like or (2) elongated schlieren-shapes to ovoid or roundish, and even distinct droplet shapes. The latter attests to a definite melt component derived from the vapor plume. The relatively rare droplets are generally quite small - in the sub-1 mm size range. Groundmass pockets also contain abundant small melt fragments. Most melt fragments are significantly altered to secondary phyllosilicate. Some larger fragments show partial to complete conversion to chert-like silica. MF proportion is estimated at 55 vol%, CC at 25 vol%, and GM at 20 vol%. Groundmass is completely altered to a submicroscopic, dense mass of secondary phases, with the majority of this being phyllosilicate. Hardly any carbonate is noted in the groundmass, and carbonate clasts are also rare. In fact, no unambiguously sediment-derived clasts have been noted, although some of the finest-grained quartz could be sandstone-derived. The bulk of the mineral clast component consists of quartz, with many grains showing PDF. A handful of diaplectic glass clasts were observed. Besides quartz, some K-feldspar and rare plagioclase clasts occur. Strongly oxidised clasts after biotite are abundant. Most mineral clasts are derived from felsic precursor lithologies, most likely fine- to medium-grained biotite granite. Opaque minerals in the sample involve generally tiny specs of pyrite, either irregular forms that are often observed in elongated tails (due to break-up of larger clasts?) or more rarely idiomorphic crystals. Some melt fragments are characterised by schlieren enriched in tiny, sometimes euhedral pyrite crystals. No oxide minerals have been identified in groundmass but several pyrite clasts in altered melt fragments are locally oxidized to goethite.

31.92 m Melt fragment (from suevite)

Most of the thin section area is covered by part of an even larger melt fragment. Only at one edge of the section a 7x2 mm sliver of a weakly shocked (no PDF in quartz) granite clast occurs. The melt fragment contains numerous weakly shocked biotite clasts, and appears to be formed from a felsic (biotite-granitoid?) precursor. Felsic minerals are completely melted. The melt clast contains ca 1.5 vol% of magnetite crystallites after decomposed biotite.The melt particle is completely converted to a frothy (high proportion of pore-space – with many pores being well-rounded) mix of smectite and patchy development of secondary silica. GM 20, MF 55, CC 25.

33.75 m Suevite

Altered, groundmass-supported suevite; contains up to centimeter-sized, well-separated, mostly fluidal-textured melt fragments. Melt is altered to smectite. Groundmass is completely replaced by secondary carbonate, and in patches also smectite. Some small melt fragments have droplet or sperm-cell shapes. A few melt fragments are angular. Some display schlieren layering, whereby some brownish bands have relics of Fe-oxides after biotite. Likely this precursor (target) lithology was a banded biotite-rich gneiss. A second thin section of this sample has a > 1 cm wide, weakly shocked granite clast. This section also exhibits far less carbonate replacement of groundmass – rather this groundmass is replaced by smectite. The opaque mineral is < 1 vol% and comprises mostly ± 0.5 mm size crystals of pyrite formed within the calcareous matrix. GM 35, MF 40, CC 25.

33.95 m Suevite with up to 2 cm sized melt nodules

Suevite groundmass is completely replaced, in part by phylloslicate and in patches by carbonate. The largest melt fragments are ovoid or amoeboid in shape and appear distinctly flattened. Smaller ones are either rounded or angular (shards). Larger melt fragments are also characterized by schlieren (fluidal) texture. Melt fragments are generally clast-poor and the clast population is quartz dominated. Rare lithic clasts are granitoid derived. The clast population of the suevite groundmass is similar but contains some additional biotite (some of which contains pyrite), and traces of a fine-grained, equigranular quartzitic material possibly representing a sediment component. Some lithic clasts display annealing and quartz ribbons are derived from a felsic gneiss (possibly mylonitic). Shock deformation of clasts is mostly not existent or, at best, weak. GM 35, MF 30, CC 35.

34.77 m Melt-rich suevite

Although there is a lot of melt, this suevite is nevertheless groundmass-supported. Both melt fragments and groundmass are completely altered to smectite. The main clast population comprises granite derived fragments of quartz, feldspars, and biotite. There are also a few carbonate clasts. Melt is mostly fluidal-textured, and shows abundant brown schlieren indicating significant melting of mafic minerals. A few melt fragments contain secondary calcite. Clasts in melt fragments are relatively rare and fine-grained and are mostly quartz and feldspars, besides some biotite. There is, however, one several millimeter wide, melt-mantled, strongly altered mafic clast. Some secondary pyrite is associated with calcite, and some fine-grained magnetite was formed after biotite. Most mineral clasts are unshocked or weakly shocked, but a few lithic clasts display quartz crystals with multiple sets of PDF. GM 30, MF 35, CC 35.

36.10 m Suevite

Groundmass-supported, altered suevite. Melt fragments are altered to smectite, but, locally, there is also occurrence of magnesian chlorite. Groundmass is altered to smectite and local patches of secondary calcite. Nearly the entire thin section comprises a > 4 cm lithic clast of biotite granite-gneiss. It contains ca. 2 vol% mostly euhedral pyrite, mainly associated with biotite. A part of one edge of the large clast is mantled by melt that is completely replaced by smectite. The suevite does not carry any oxides or sulfides. A sliver of melt attached to the gneiss clast carries an accessory amount of sulphide, no oxides. Clasts in the suevite comprise mostly quartz and feldspar which are either unshocked or only weakly shocked. GM 50, MF 20, CC 30.

37.77 m Suevite

Groundmass-supported; contains an 0.5 cm sized granitic clast that is weakly shocked (< 10 GPa shock pressure, as indicated by the shock extension fractures in quartz that constitute the only shock deformation). Both melt and groundmass are extensively altered, melt to chlorite and smectite. Carbonate occurs in the groundmass and as infill of some vesicles in melt fragments. Sulfide amounts to < 1 vol%, overall, and forms mostly euhedral crystals (pyrite) in groundmass; also fills some microfractures cutting both groundmass and melt fragments. Oxide mineral crystallites are rather rare. A few larger rutile crystals are brecciated. Magnetite occurs as tiny specks scattered throughout the groundmass. Besides the presence of melt fragments, thermal overprint on clasts is very limited. All clasts are derived from crystalline precursor rocks. There are two cm-long and several mm wide melt fragments. Clasts in these are in part melted. The remaining crystalline clasts are quite rare and generally small. They consist of quartz, feldspars, and even rarer, of granite. Remnants of biotite are abundant. The clast population in the suevite groundmass is similar. Smaller melt fragments are mostly rounded but often elongated and show fluidal textures. Alkali feldspar and plagioclase clasts occur in equal proportions. Feldspar in clasts is generally strongly altered. There is a 1 cm sized, weakly shocked granite clast. GM 25, MF 40, CC 35.

38.95 m Melt-rich suevite

Altered. Large melt fragments occur in carbonate-replaced groundmass. Melt is altered to smectite; locally, occurrence of secondary carbonate. In the melt fragments are very small amounts of tiny magnetite crystals. Melt fragments are up to 1.5x0.5 cm in size and often fluidal-textured. The generally tiny clasts in the melt fragments are mostly unshocked, to a small degree weakly shocked, and highly angular. Quartz fragments dominate over feldspar fragments. There is, however, a small clast component that is annealed. These clasts could have been diaplectic glass or melt fragments. Melt fragment shapes are angular to well-rounded, with the latter variety often showing elongated forms. Some of these have well-aligned, elongated vesicles. Some spherical or dumbbell melt fragment shapes are noted. Clasts in suevite groundmass are either granitic or mineral clasts likely derived from granitic precursor rock. Biotite clasts are prominent. A partially melted amphibolite-biotite gneiss clast shows several amphibole crystals cut near-perpendicular to an optic axis. It is this orientation and not elevated shock degree that meakes them appear nearly isotropic. Several limestone clasts are recorded. GM 30, MF 40, CC 30.

39.95 m Granitic gneiss clast; sliver of suevite

The clast population of the sectioned narrow suevite zone is comparatively finer grained than that of previous samples, with regard to both melt fragments and clasts. Suevite contains clusters of fine-grained, secondary pyrite. Groundmass is altered to smectite. Most clasts are medium- to fine-grained quartz and feldspar, of which the vast majority is unshocked or only weakly shocked. MF 25, GM 30, CC 45. The large gneiss clast is cut by 0.5 mm wide fractures that are filled with pyrite. The clast is weakly to moderately shocked – quartz displays shock extension fractures and, locally, up to 2 sets of PDF.

40.93 m Altered melt nodule

The sample is a single, > 5x3 cm melt nodule. It is completely altered to phyllosilicate, with a locally globular structure. There are a several patches of pyrite of, in part euhedral crystal shapes. It is possible that this signifies cross-sections through pyrite-filled veinlets. The clast population has been essentially assimilated by melt matrix, with only rarely silica or biotite-derived remnants recognizable.

42.33 m Melt fragment in suevite

A large (> 5 x 2 cm) melt fragment in suevite. Latter has a very fine-grained (silt sized) clast population. Melt fragments are altered to Mg-chlorite, smectite, and finest-grained (chert-like) silica. In the large melt fragment incipient formation of felsic microlites is noted. Suevite groundmass is altered to smectite. Traces of secondary pyrite and of magnetite occur and are alteration products after mafic precursor minerals. A pyrite-filled, sub-mm wide veinlet cuts across the large melt fragment and is filled by pyrite. Suevite at the margin of the thin section is clast-rich but clast sizes are seriously limited (< 1 mm). Quartz is the dominant mineral clast type; shocked (1 set of PDF) clasts are very rare. In the melt fragments, clasts are essentially all annealed – only rare crystalline clasts are left and a few ballen quartz remnants. All these clasts are felsic (mostly micro-quartzine material).

43.65 m Suevite

Altered suevite - groundmass-supported. Groundmass is strongly replaced by calcite. Melt fragments are altered to Mg-chlorite, smectite and chert-like silica. Groundmass contains ca. 1 vol% of secondary pyrite. GM 40, MF 35, CC 25. Contains a 1x 0.3 cm melt clast. It is extremely clast-poor, and thoroughly altered to phyllosilicate (with stringers and patches of silica and local pyrite stringers. A > 2x2 cm melt clast is completely replaced by carbonate. Suevite groundmass contains mostly quartz/quartzite clasts that are highly angular and generally well separated by matrix. Melt fragments are angular to well-rounded (i.e., they are elongated with rounded edges), even at small sizes. Shocked lithic clasts are rare and indicate < 20 GPa shock pressures (only rarely 2 sets of PDF in quartz).

48.66 m Grain mount of suevite relics

Unconsolidated remnants of suevite, comprising chlorite or smectite replaced melt, as well as calcite-bearing remnants of groundmass. Magnetite crystallites after biotite. Some fractures in lithic clasts that are overwhelmingly derived from granitic precursors are filled with magnetite. Some pyrite occurs with secondary carbonate. Crystalline clasts are mostly weakly shocked but a few quartz clasts have 2 sets of PDF. Some melt clasts are distinctly banded and probably derived from banded gneiss.

49.66 m Suevite

Altered; carbonate-replaced groundmass. Melt fragments are completely altered to smectite and silica, and are oxidized to reddish schlieren containing goethite. Some highly vesicular melt fragments show calcite vesicle fill. There are specks of magnetite after dissociated mafic minerals. Only a very small opaque mineral component (< 0.5 vol%) but noticeably of extremely fine particle size. GM 40, MF 35, CC 25. Lithic clasts are mostly of granitic origin but there are some quartzite clasts as well that could be derived from a supracrustal lithology. Melt fragments are strongly altered and, partially, carbonate replaced. Most mikneral clasts are unshocked or weakly shocked (< 15 GPa).

53.90 m Suevite

Altered; groundmass completely carbonate-replaced. Melt fragments are chloritized and contain a lot of secondary oxide minerals. Calcite occurs also as vesicle fill in melt fragments. Relatively coarser grained (in comparison to previous samples; but still fine-grained) pyrite occurs as vesicle fill and fracture fill; otherwise, very fine-grained opaques (goethite as well as pyrite) are scattered throughout the groundmass. GM 40, MF 35, CC 25. Most larger lithic clasts in sizable melt fragments but – even – in smaller melt fragments as well – are completely annealed. Vesicles in melt fragments are filled with carbonate or finest-grained silicious material. A 1 cm sized granite clast is brecciated but the individual parts can be readily combined to indicate that they were only slightly separated. Separations are filled with secondary carbonate. Relatively abundant biotite clasts are completely oxidized. Melt fragments have irregular but locally marginally rounded to elongate rounded to angular forms.

53.95 m Melt-rich suevite

Up to 2 cm long and 0.5 cm wide melt fragments are set into a groundmass that is completely replaced by calcite and cherty silica. Melt fragments are comprehensively altered to Fe-oxides + silica + pyrite + goethite, or to carbonate. Pyrite forms fine-grained granular aggregates. Silica occurs as microcrystalline chert. Groundmass comprises medium-grained, calcite fragments. Rare subangular, crystalline basement-derived clasts are noted. Very fine-grained aggregates of pyrite crystals occur locally in the groundmass as well, or form layer aggregates that represent primary, brecciated clasts still recognizable by their angular forms. Crystalline clasts in suevite groundmass range in size up to 0.5 cm and are mostly granite-derived. Clasts in MF are extensively annealed, and original crystalline clasts are rare. They are invariably derived from granitoid precursors. Several granite types are recognized, including both fine-grained and medium-grained varieties, as well as biotite-poor and –rich types. Several carbonate clasts occur, and a fine-grained quartzite clast was noted that could be of sedimentary origin or derived from a gneiss. Most crystalline clasts are unshocked or weakly shocked, but a sizable granite clast displays moderate shock degree (multiple sets of PDF in quartz). MF 40, GM 30, CC 30.

58.90 m Impact melt pod in suevite

Completely altered, vesicular melt. Vugs are filled with spherulitic growths of silica or may be rimmed with calcite. Melt is partially devitrified and has abundant acicular, felsic microlites (likely feldspar). Matrix is generally strongly altered. Some vesicles are filled with secondary pyrite, carbonate or chalcedony. Some very fine-grained magnetite after oxidized mafic clasts. Contains some goethite, too. A large, 1.5x0.4 cm sized granitoid clast is completely melted and partially consists of a frothy, vesicle-rich melt. Remnants of original grains can still be recognized attesting to the original medium-grained nature of this clast. Other lithic clasts are entirely annealed.

63.10 m Clast-rich suevite

Altered suevite. Distinctly unimodal fine-grained to medium-grained clast population. Melt fragments are widely altered to Mg-chlorite and silica. The finest fraction of the groundmass is altered to secondary phyllosilicate. It contains a large amount of disseminated, very fine-grained magnetite. GM 30, MF 30, CC 40. Melt fragments have highly convoluted shapes. A cm-sized clast is completely melted but seemingly had felsic and mafic bands. Crystalline clasts are all derived from granitoid precursors. Again, shocked clasts (< 15 GPa) are very rare.

66.56 m Melt-rich suevite

Altered groundmass; clast-dominated (but this involves both melt fragments and crystalline clasts). A centimeter-sized melt fragment exhibits felsic microlites, attesting to somewhat prolonged cooling. Much of the intra-melt clast content is annealed. These clasts consist mostly of finest-grained cherty silica. Alteration products of groundmass and melt fragments are phyllosilicates including montmorillonite. A lot of very fine-grained magnetite in the groundmass. GM 25, MF 50, CC 25. Clasts in suevite groundmass consist mostly of granitoid-derived material, with a notable presence of altered (possibly prior to impact) alkali feldspar. Shocked (< 15 GPa) clasts are rare.

68.00 m Melt-rich suevite – melt agglomerate

Very densely packed melt fragments with interstitial stringers of groundmass altered to smectite. Melt fragments are also altered to smectite and oxide minerals. There are abundant pods and microfracture fills of pyrite, and some goethite as well as some fine-grained magnetite occur in melt fragments. But there is much less of the latter than in the samples above. GM 15, MF 70, CC 15. Most lithic clasts are granitoid-derived. They are extensively annealed and some even melted. Remaining crystalline clasts are rarely shocked.

68.47 m Melt agglomerate

Similar to the 68.00 m sample; but 68.47 m has comparatively more melt and less groundmass stringers; also the proportion of annealed clasts (mostly felsic**)** is higher. Microfractures are filled with secondary pyrite, and so are some vesicles in melt fragments. Some very fine-grained magnetite after dissociated mafic minerals. Felsic bands in the melt groundmass show abundant microlites of feldspar. Crystalline rock derived mineral clasts (essentially quartz and feldspar) are fine-grained and mostly unshocked; feldspar is commonly altered. Single sets of PDF in quartz or alkali feldspar are rare. Remnants of ballen silica, which is partially annealed to the chert-like type of Ferriere et al. (2009, 2010), were noted. GM < 5, M 75, CC 20.

71.80 m Highly shocked biotite-gneiss clast

Locally melted; the original mafic minerals are strongly oxidized. Very fine-grained magnetite. Shock metamorphic grade is highly varied – from unshocked to quartz with single or two sets of PDF, limited conversion of quartz and feldspar to diaplectic glass, and local melting.

73.07 m Granite clast

Medium to coarse-grained granite, strongly altered, with oxidized mafic minerals. Quartz and feldspar minerals exhibit single or multiple sets of PDF. Sample contains fine-grained pyrite crystals that are locally oxidised, and traces of magnetite.

73.78 m Granite clast with melt coating

Reddish oxidized melt thickly coating a > 3x1.5 cm, partially melted granite clast. The majority of clasts in the melt are felsic and annealed. Remnants of smectitic groundmass of the surrounding suevite is recognizable along the edges of the thin section. Pyrite blebs are abundant in the clast. Magnetite crystallites are extremely fine-grained and disseminated throughout the section. Unshocked clasts, as well as several with single and double sets of PDF, and one with ballen silica texture plus PDF occur. Melt contains numerous roundish vesicles. A melted and, thus, plasticized granitoid clast shows garben texture of new crystal growth within feldspar crystals. Quartz crystals are finest-grained recrystallized (annealed). The large granite clast is largely melted to a frothy mass – whereby remnant extinction still delineates original crystals. Crystalline remnants show local development of the cherty ballen silica type. Brown blebs of oxides indicate the locations of former biotite or amphibole crystals.

75.90 m Impact melt agglomerate

Individual flädle-like, flattened melt fragments are clearly recognizable. They are generally altered to a reddish tint (incipient development of goethite). Pyrite occurrence is limited to some clasts or fills of obliquely cut fractures. Magnetite is extremely fine-grained and ubiquitous. Reddish melt is partially devitrified (incipient but quite widespread microlite development). Numerous vugs of roundish to ovoid shapes are filled with chert-like silica. Clasts are essentially granitoid-derived and have shock metamorphic states ranging from unshocked to single sets of PDF in quartz to melted. Feldspar clasts are strongly altered. GM 5, MF 75, CC 20.

76.32 m Melt agglomerate

Similar to previous two samples, but contains comparatively somewhat more suevitic groundmass. Groundmass is completely carbonate replaced. Melt fragments are oxidised to dark-red color, and contain some secondary carbonate and goethite. Oxide minerals are extremely fine-grained and disseminated throughout. GM 20, MF 70. CC 10. Vesicles are filled with chert-like silica. Some clasts have been melted and recrystallized to garben of a felsic mineral (plagioclase?). Lithic and mineral clasts are entirely granitoid derived.

78.75 m Suevite

Groundmass-dominated. Melt fragments are oxidised to dark-red color. Otherwise, this material resembles the suevite around 53.90 m. Groundmass is altered to phyllosilicate. It is very rich in rather fine-grained clasts. Contains a lot of extremely fine-grained oxide particles. Melt fragments are locally rimmed by blebs of secondary pyrite and do not contain oxides. However, many melt fragments are brown and clearly derived from mafic precursor(s). Oxide only occurs in groundmass. Most, especially the fine-grained, mineral clasts are granitoid-derived. A 2x3 mm sized carbonate clast (angular and completely recrystallized) could be derived from a sedimentary target rock. Alkali feldspar clasts are abundant and generally altered. A large (1.5 x 0.7 cm), fine-grained granite clast is locally brecciated (containing a mm wide, altered veinlet that could have been a pseudotachylitic breccia). Quartz clasts with PDF are very scarce. GM 50, MF 30, CC 20.

80.03 m Impact melt rock

Individual melt fragments – as found in the agglomerates – are not recognizable. This sample has a conspicuous mafic (greenish to brownish) clast (dioritic, amphibolitic) dominated population. These clasts are partially or largely assimilated by melt matrix. Of course, granite-derived clasts occur as well. Melt is largely devitrified with abundant microlites. Where mafic clasts have been melted they show microlites of chlorite (after pyroxene or amphibole?). Some quartz clasts are well rounded but in their interior not melted/annealed. High thermal gradients and local quenching seem to be indicated by that. A few quartz clasts show multiple sets of PDF. Ballen silica is annealed. Some vugs are filled with zeolite. Microcrystals of oxide minerals are also abundant. Magnetite is present but partially oxidized to goethite. There is also rutile. M 90, CC 10.

80.83 m Impact melt rock

Aphanitic, dark red to gray melt rock. Microlites are rare. Most clasts are annealed. Likely they originated from granitic precursors. Pyrite occurs as fracture fill and in form of nodules in impact melt, but also coupled with an isotropic oxide (magnetite?) in vesicle fills. Zeolite occurs as filling of vesicles. Shock metamorphism degrees are overwhelmingly unshocked or weakly shocked – although the strong annealing of clasts could support the suspicion that there was a large proportion of highly shocked clasts that were preferentially annealed. Annealed ballen silica clasts are prominent. Quartz clasts showing PDF are partially toasted. M 80, CC 20.

82.42 m Suevite

Groundmass-supported. Groundmass is completely replaced by carbonate. Reddish melt fragments are well separated and completely replaced by secondary phyllosilicate and finest-grained silica. Ballen silica is abundant in clasts within melt fragments. Extremely fine-grained, isotropic oxide, likely magnetite, is abundant in groundmass. Blade-shaped, low refractive index crystals occurring in some schlieren are likely zeolite. A granite fragment is composed of ballen silica grains between strongly altered, partially annealed feldspar grains. Quartz clasts with PDF (single sets only) are rare. GM 35, MF 40, CC 25.

82.50 m Suevite

Groundmass-supported, carbonate cemented. A > 4 cm size melt fragment is noted. Pyrite is the only opaque phase in the groundmass. Melt fragments are aphanitic with only rare, scattered microlites. Annealed clasts are somewhat less abundant than in previous samples. Pyrite occurs as stringers and small pods, and also fill some penetrative microfractures. Sample is devoid of oxide minerals. The color of melt is greenish; less distinct pinkish stringers could indicate agglomeration of smaller melt particles. Clasts are granitoid-derived and highly varied in size (< 1 mm to > 2 cm). Remnant phases after biotite are abundant. Melt particles are mostly dark-brown (i.e., mafic). Ballen silica occur in the form of angular clasts. Crystalline clasts are mostly quartz or feldspar, and the overall majority is unshocked. Quartz with PDF is very rare – probably because clasts shocked to higher degrees were preferentially melted (see Buchanan and Reimold, 2002). A 6x6 mm granite clast shows decomposition of biotite to oxides; only locally do single sets of PDF and/or planar fracturing occur in quartz. GM 35, MF 40, CC 25.

82.92 m **Suevite**
Groundmass-supported, similar to 82.42 m, but with greenish instead of reddish oxidized melt fragments. The groundmass is carbonate-cemented. Carbonate also fills some vesicles in melt. Melt fragments are well aligned to subparallel. Some vesicles are filled with sphalerite. There are about 1.5 vol% of scattered pyrite grains; only traces of oxide minerals. Pyrite also fills some microfractures. Crystalline clasts are derived form granitoids and are unshocked or only weakly shocked. GM 30, MF 50, CC 20.

82.95 m **Melt-rich suevite**
Groundmass is largely replaced by carbonate. Melt fragments are strongly altered and contain numerous tiny, secondary pyrite crystallites. Frequently these are concentrated in millimeter wide schlieren within melt fragments. In addition, aggregates of tiny hematite and goethite crystals occur in patches. Crystalline clasts derived from granitoid precursors range in size to > 1 cm. Feldspar is strongly altered, quartz frequently strongly fractured. Crystalline clasts in melt fragments are strongly annealed, and some are at least marginally melted (and then were annealed). Remaining crystalline clasts are mostly quartz and feldspar derived from granitoid precursors. A 4x2 mm granite clast is weakly shocked and displays strong cataclasis. Clasts are generally unshocked or weakly shocked. Several highly shocked zircon crystals with finest-grained microtexture (obviously the well-known granular shock texture) are noted. MF 50, GM 25, CC 25.

83.75 m **Melt agglomerate**
Greenish melt fragments are mostly oriented subparallel. They are separated by narrow interstitial stringers or bands of clast-rich suevitic groundmass. Melt is partially devitrified and carries abundant microlites. Melt is generally greenish, but there is one light-reddish band that contains significant goethite. Pyrite occurs as scattered grains in groundmass and also as infill in microfractures. There is very little oxide mineral, as well as a little sphalerite. The sample contains a 1.5x0.4 cm granitic clast that is nearly completely melted (resembling frothy pumice). Remnant crystalline material shows varied degree of shock metamorphism from unshocked state to partially melted crystals. Most smaller clasts are fully annealed, angular or strongly deformed (extended). Ballen silica clasts do occur. Vesicles have internal rims of carbonate. GM 15, MF 70, CC 15.

85.05 m **Melt agglomerate**
Strongly altered (smectite, minor carbonate). Melt is greenish to pinkish. The majority of clasts is annealed or partially melted. There are lots of pyrite but also a significant amount of oxide crystallites occurring throughout melt. Oxides include some rutile but are mostly magnetite and its alteration product. Pyrite fills in some microfractures. Sample contains several large (up to 0.7x0.3 cm) angular clasts entirely composed of oxidized biotite or oxidized biotite+carbonate. All other clast material is of granitic origin. It is variably shocked (unshocked to partially melted). A distinct precursor rock type is a fine-grained granitic gneiss. GM 20, MF 60, CC 20.

87.55 m **Impact melt** (2 thin sections)

Greenish-reddish mottled melt is strongly devitrified (microlites) and clasts are annealed or melted. Crystalline clasts are mainly derived from granitoids. A > 2x1.5 cm clast is derived from a medium-grained biotite-rich gneiss. It is largely melted and breakdown of its minerals has caused significant volatile phase, resulting in a network of pores. This sample has a significant clast component derived from dioritic gneiss. Some secondary carbonate occurs. Oxide microcrystals are abundant, partially altered to goethite. Only in one of the two thin sections of this sample was a trace of sulfide noted. M 70, CC 30.

88.95 m Impact melt

Greenish, altered melt. Contains a lot of secondary carbonate, also as vesicle fill. Melt is extensively devitrified and carries abundant microlites. Clasts are mostly granitoid derived. Many are fully, or at least partially (outlines of original crystals are often still recognizable), melted. Individual melt bodies that are part of the impact melt rock can be locally discerned. Most sizable clasts are partially altered to carbonate (presumably the feldspar component). Crystalline clasts are generally fine-grained and often arranged in schlieren/bands (likely the remnants of clastrich suevitic groundmass). Sample contains a 1x1 cm granitic clast that is partially melted to frothy, pumice-like material. Ballen silica clasts are abundant. There is hardly any sulfide but a significant amount of oxide microcrystals. GM 10, MF 65, CC 25.

89.71 m Impact melt

Greenish and altered melt that contains a lot of secondary carbonate. The melt matrix is microcrystalline (intersertal, garben/spherulitic texture). The majority of clasts is derived from fine- to medium-grained granitoid(s), but there is also a fine-grained, carbonate-cemented population that could represent a sandstone variety of the supracrustal target portion. The majority of lithic clasts is unshocked or weakly shocked (reduced birefringence, undulous extinction, rare planar fractures), and quartz clasts with single sets of PDF are exceedingly rare. Thermal alteration is noted along margins of a considerable number of grains. No sulphide could be observed, only scattered, rare magnetite and traces of hematite. GM 20, MF 70, CC 10.

91.08 m Impact melt rock

Greenish, altered melt rock. The groundmass is aphanitic, and completely altered to phyllosilicate. A large clast of granodioritic gneiss (also strongly altered). No carbonate was observed. Clasts are mostly annealed; most are granitoid-derived. Many melted clasts have mafic reaction rims to groundmass. Carbonate alteration is widespread. Vesicles are frequently internally rimmed by double layers of carbonate and phyllosilicate, respectively. There is abundant ballen silica, partial to complete melting of clasts, and local presence of checkerboard feldspar, all of which testify to the high temperature that this melange has experienced upon mixing of melt and clasts. At least 5 vol% secondary pyrite occurs and there are ubiquitous, tiny oxide crystallites that altogether do not amount to significant volume. GM 10, MF 80, CC 10.

91.33 m Melt agglomerate

Greenish-reddish mottled variety. There are distinct remnants of suevitic groundmass in the form of very narrow stringers. Strongly altered sample, also containing some secondary carbonate. Many clasts were melted and are extensively recrystallized. Traces of sulfide, as well as ubiquitous tiny magnetite crystals. Traces of hematite, too. The groundmass is partially crystallized. Larger clasts are clearly derived from granitoid precursors. GM 10, MF 70, CC 20.

92.12 m Impact melt agglomerate

Reddish/greenish streaked variety. Microscopically the sample appears as a melange of schlierig melt groundmass and clastic material. The groundmass is aphanitic but completely replaced by secondary phyllosilicate. Some schlieren show microcrystallization textures – either representing melted clastic material or very hot melt bodies. Pyrite is a minor component – the tiny oxide laths are ubiquitous though. Not clear whether magnetite or hematite – too small to identify optically. GM < 5, MF 80, CC 15.

92.30 m Impact melt rock

Light pinkish in color. Contains a large clast of fine-grained leucogneiss. Groundmass is partially crystallized – although the sample is quite clast-rich. The clast population is granitoid-dominated material (significant quartz-feldspar intergrowths). Large vugs occur and are internally rimmed by zeolite crystals. Several vol% pyrite, mostly in the form of fine-grained crystallized blebs. Microlaths of oxide are ubiquitous but much rarer than in previous samples. M 80, CC 20.

93.68 m Impact melt agglomerate

Massive, reddish variety. It still allows to recognize the individual melt blobs of elongated, ovoid shapes. Felsic clasts are of amoeboid shapes (partially assimilated into melt groundmass) and often rimmed by altered, brownish reaction rims. Larger lithic clasts are granitoid-derived. Clastic material is significantly annealed and even partially melted. Traces of secondary carbonate throughout. A single relatively larger bleb of fine-grained pyrite. Microcrystals of pyrite and magnetite are ubiquitous, but they are very tiny and thus do not amount to significant volume. Large vugs of irregular, amoeboid shapes are filled by carbonate and/or zeolite, and sometimes even phyllosilicate. GM < 5, MF 75, CC 20.

94.39 m Impact melt agglomerate

Greenish material, with light pinkish streaks. In these, melt is impregnated by secondary carbonate. This sample is a clast-rich melange of melt bodies, large melted and up to 1 cm sized clasts, vesicles filled with secondary phases (especially carbonate), and other clastic phases (mostly granitoid-derived, shocked to varied degrees). Contains a several mm wide doleritic clast. Groundmass is not crystallized. No sulphide noted, but tiny laths of oxide are ubiquitous. GM 5, MF 75, CC 20.

95.35 m Impact melt rock

Streaky, reddish-greenish material. Secondary carbonate is prominent. Contains a < 2x0.8 cm, granitic, largely melted clast that is full of carbonate-lined vugs and cut by carbonate-filled fissures. Such vugs and veinlets occur throughout the melt rock. Most clasts are annealed; there is significant checkerboard feldspar and vermicular quartz – indicating strong heating of clasts. Many clasts are elongated (plasticized) and rounded. The entire sample shows streaking (flow banding or dense packing of subparallel, flattened melt bodies?). Larger clasts, even when partially melted, can be recognized as quartz-feldspar aggregates and, thus, are likely of granitoid origin. Patches of melt are entirely microcrystalline (plumose aggregates of microcrystals) testifying to prolonged cooling. No sulphide. Ubiquitous oxide microcrystals – both magnetite and hematite. GM 15, MF 70, CC 15.

96.75 m Impact melt rock (possibly melt agglomerate)

Greenish-light gray variety. No carbonate. Clast-rich, and most clasts occur in narrow stringers (which could represent remnants of suevitic groundmass). Clasts are likely derived mainly from granitoid precursors. A few intermediate to mafic (strongly altered) precursor varieties are, however, also indicated. There are 5 vol% pyrite, some of which is infill of microfractures. Tiny, often lath-like oxide crystals are ubiquitous. Due to lack of red oxidation and internal reflections, these small crystals are thought to be mainly magnetite. The sample is similar to the previous samples, with respect to the partial to complete melting of clasts, presence of vugs with carbonate/phyllosilicate/zeolite/pyrite fills. Numerous feldspar clasts are in the process of being thermally converted to checkerboard feldspar. Mafic mineral clasts (especially biotite, judged from rare relics) are completely converted to oxodic phases. M 80, CC 20.

97.61 m Melt agglomerate

Distinct stringers of suevitic groundmass between subparallel oriented, tightly packed, flädle-like melt blobs. Melt is strongly altered to phyllosilicate and finest-grained silica. Most clasts are from crystalline rock, namely granitoid precursors, but there is also a distinct sandstone clast component, with varied cement of either carbonate or phyllosilicate. Crystalline clasts are often partially melted (embayements at the margin) and otherwise at least partially annealed. The majority of mineral clasts is unshocked or weakly shocked. Many crystalline clasts display distinct fluid inclusion rich zones – indication for extensive tempering of these clasts at high temperature. The sample has a greenish color. No traces of sulfide. Some tens of micrometers large oxide particles in melt have euhedral outlines but otherwise globular texture indicating that the primary crystals were at least partially melted. These particles are thought to be magnetite, with minor alteration to goethite. Microlaths, short-prismatic crystallites and tiny octahedral particles are likely magnetite (isotropic), but there is some rutile in the matrix as well (light internal reflections). GM 5, MF 75, CC 20.

98.50 m Impact melt agglomerate

Greenish melt blobs in the form of elongated "flädle", with ca. 20 vol% pinkish suevitic groundmass in between. Melt is strongly altered to fine phyllosilicate. No carbonate observed. Clasts are far less annealed than in samples above, but some show marginal reaction rims to groundmass. There are quite a few lithic clasts, all of which are granitic. Quartz and feldspars dominate the mineral clast component. Crystalline clasts are generally unshocked or only weakly shocked. Accessory, fine-grained pyrite is ubiquitous throughout the section, commonly also filling microfractures. Really tiny (!) oxide crystallites of lath or stubby shapes are abundant. GM 20, MF 65, CC 15.

98.67 m Impact melt rock

Light greenish-gray devitrified melt. Streaks with lots of small clasts and patches of secondary carbonate (possibly remnants of suevitic groundmass). Melt and many melted clasts are strongly devitrified (contain abundant microlites). The melt is altered to smectite, finest-grained silica, and carbonate. In patches, there is dark-brown oxidic material as well – likely formed from mafic mineral precursors. Biotite clasts have been completely oxidised. Many clasts are at least partially annealed. Remaining crystalline clasts are seemingly mostly granite-derived, although it cannot be excluded that a small marl component is represented. Numerous clasts are well-rounded due to marginal assimilation by melt groundmass. Sometimes such relics appear similar to silica-filled vugs. Crystalline clasts are either unshocked or weakly shocked. Relics of sphene were noted in some clasts. A 1-cm-sized lithic clast is derived from a fine-grained biotite-granite. The biotite is completely oxidised, and feldspar is strongly altered and displays strong undulatory extinction. The fracture pattern in quartz and feldspar is reminiscent of the shock extension fracturing phenomenon noted in quartz experimentally shocked to 5-8 GPa. No PDF were noted in this large clast. Very little sulfide – traces only in micropores and in some ovoid clasts. Oxide microcrystals are ubiquitous but not as abundant as elsewhere. M 85, CC 15.

99.53 m Impact melt rock

Red variety. Significantly more tiny oxide particles than in the greenish melt variety. The groundmass is strongly altered to cryptocrystalline silica, phyllosilicate and broad, reddish schlieren of oxidic material. Some schlieren also carry significant secondary carbonate. Many clasts are completely annealed. Ballen quartz occurs a number of times, and many instances of vermicular (Buchanan and Reimold, 2002) quartz are noted. Toasting of quartz is also prominent. All this indicates that this material was very hot. Locally the melt has patches of strong microlith (felsic laths) development, and it could be that this relates to melted and then crytsallized clastic material. Remaining crystalline clasts are frequently rounded – obviously the result of partial assimilation by melt. Discrete vesicles in the altered groundmass are filled with calcite. Most clasts are quartz and feldspar with alkali feldspar >> plagioclase. Crystalline clasts are mostly unshocked, sometimes have 1 set of PDF, and rarely 2. The few lithic clasts are all granitic. Only traces of sulfide noted. M 80, CC 20.