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8. Appendix

The appendix contains all the data, reports and images used in this work. All the samples measured points are seen in EDS images made by the microprobe, the rejected and accepted data, mineral and IGPET data. The appendix consists of chapters A-I.

Appendix A: Fieldwork report

Introduction

The fieldwork was to Chiapas and Tabasco province, Mexico for two weeks from 18 march to 1 April 2015, in which the major part consists of driving to the locations. In early April the temperature in Mexico is already 25-35 degrees during the day which made the fieldwork a real exercise, in summer it gets even higher to an average of 35 degrees.

In total we visited three rivers from which eight sections were investigated. The Magdalena, south and north Platanar River were reached by first driving 50 km south from Huimanguillo, where the hotel was located, to the site and the last part by foot. The roads in Mexico are of average conditions, but you have to take the speed bumps into account, which increase your travelling time by at least 1-2 hours. It is feasible using a normal car, but SUV or four-wheel drive cars are recommended. The terrain in the river valleys around the volcano consist mainly of terraces covered with trees, bushes and grasses. The terraces are often pastures for cattle and surrounded with barbed wire, but the local inhabitants are very willing to let you on their fields provided that you ask permission in advance. The best preserved sections are located closest to the river, further away from the river and at higher (and older) terrace levels the sections are more weathered and overgrown by vegetation.

This fieldwork report is divided into two parts based on the two rivers from which river terraces have been sampled. The Magdalena and the north Platanar have been sampled. The south Platanar is not included in this research because this is an old branch of the Platanar River and no pumice rocks were found near the river. It transported the sediment originating from the Catedral volcano to the delta (fig 3.1 from Book Scolamacchia and Macias, 2015, Macias et al. 2010). The pumice rocks most likely all have been weathered into matrix and since we are only interested in young volcanic deposits (<10,000 BP) no further attention will be given to this part of the river.

In the Magdalena River 3 terraces have been sampled and 5 terraces in the north Platanar River. They are named after their geographic altitude and GPS number, which can be number 1-999 randomly given by the GPS. All the coordinates are listed in appendix B with their GPS number.

The maps used here are Lidar images from GIS data. Lidar stands for Light Detection and Ranging and is a remote sensing method which examines the surface of the earth by sending light beams to the earth and measuring the reflected light beams time delay between the detection and transmission of a pulse of a reflected spectrum (Summering, chapter 3 Esri paper 2010). From this an altitude map of the area is created in which the altitude is represented relative to a reference point, often the lowest point in the image. The images used in here are for the global image of the area relative to the sea level and in the zooms relative to the river. The zoom-in images have been corrected for the river gradient so that the terraces are better visible.

The sampling of the sections is done by taking from every unit two samples. Two pumice clasts and one or two matrix samples are taken from every unit. Only fresh and large pumice rocks were taken, for they include the composition of the glass shards and thin section made from these have a well

preserved surface. When the surface of a section is weathered or covered vegetation, a clean surface is cut by a spade and from this surface samples are taken.

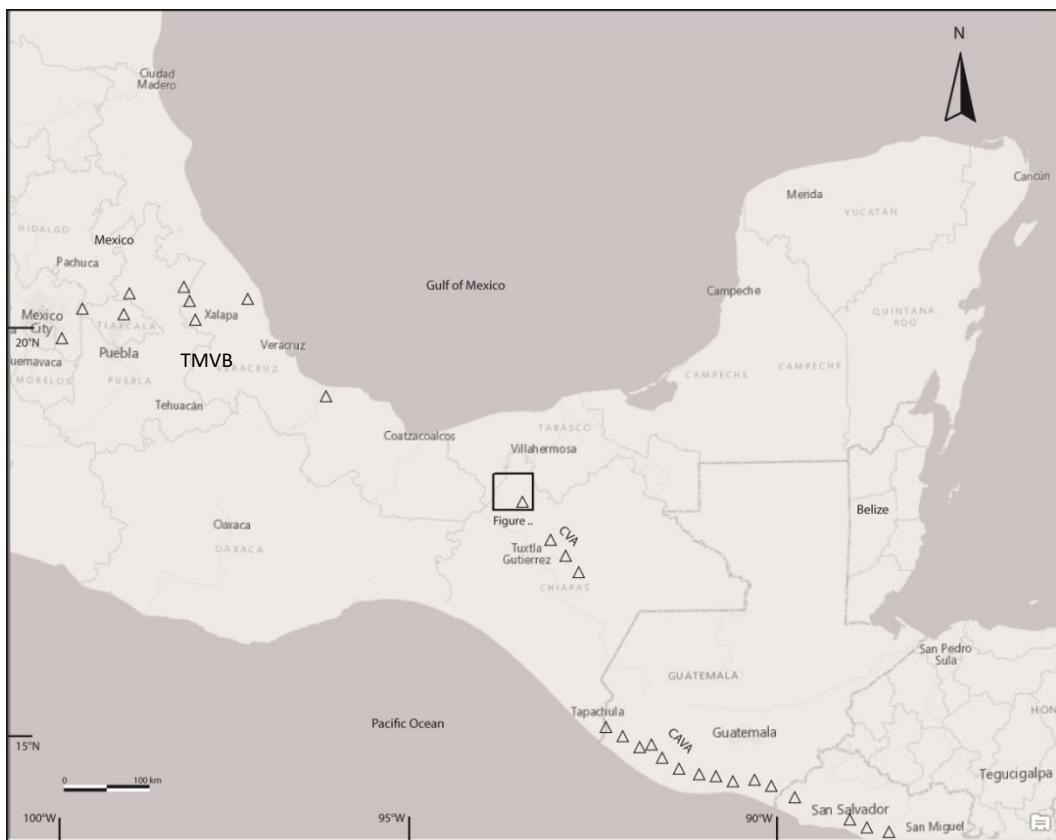


Figure A-1. Map of the volcanoes in the southeast part of Mexico as open triangles. El Chichón is located in open square. CVA: Chiapanecan volcanic arc, CAVA: Central American volcanic arc, TMVB: Trans Mexican Volcanic Belt, volcanic arc near Mexico City.

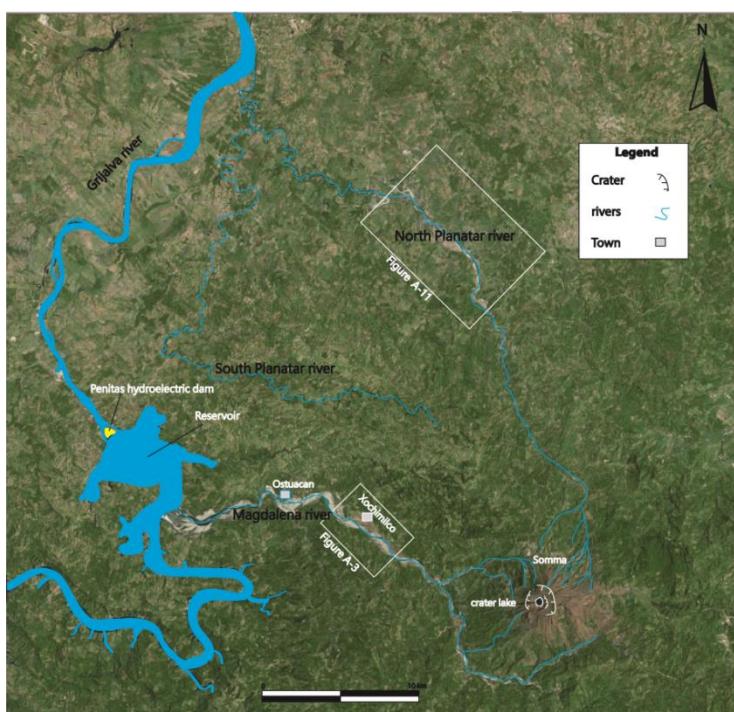


Figure A-2. ArcGIS image of the area around El Chichón. White open squares show zoom images of the Platanar and Magdalena River, in blue the rivers. Green colour shows the vegetation.

Magdalena River

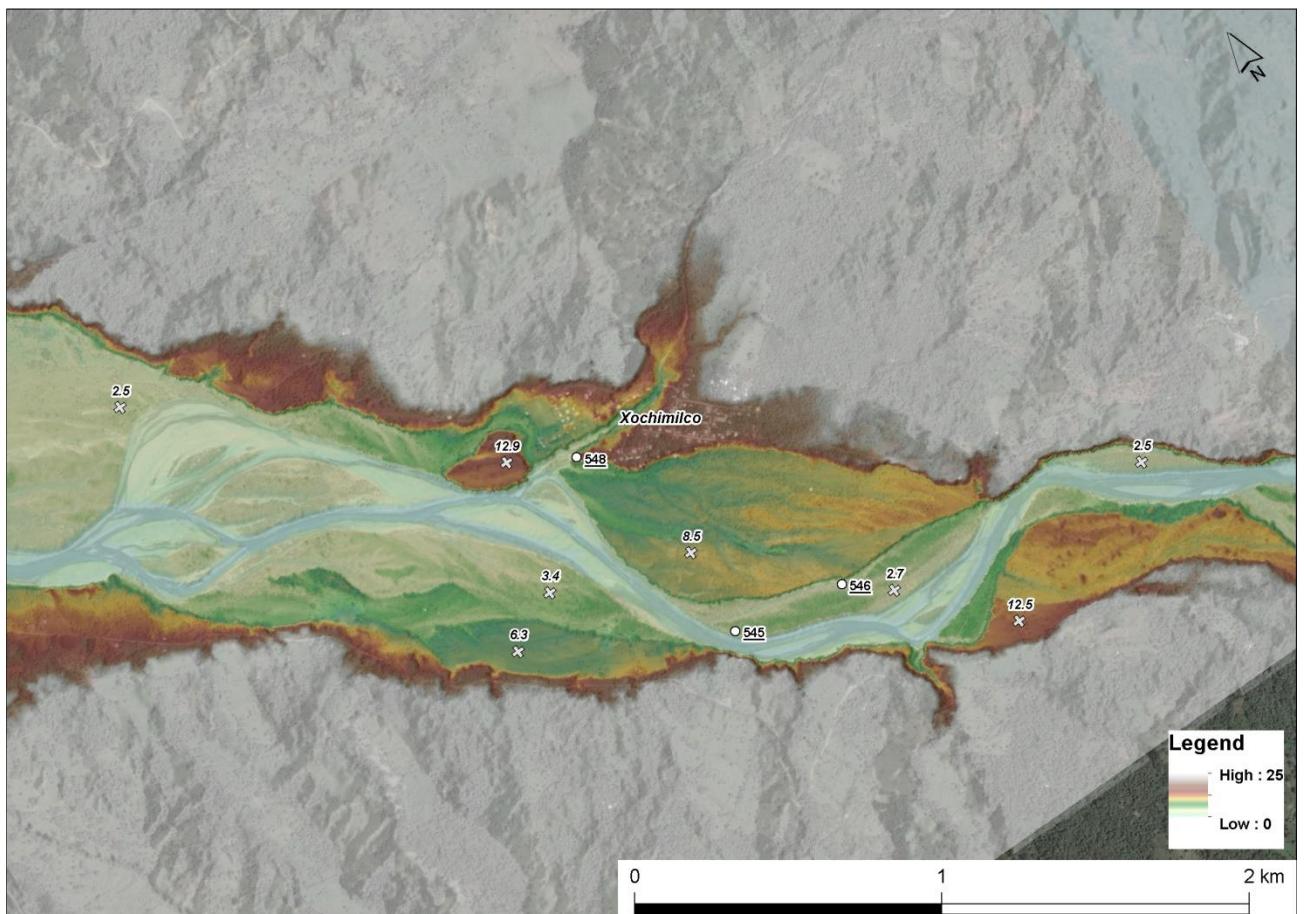


Figure A-3. Lidar image of the Magdalena River with the visited sites. X-es with numbers give height measured relative to the lowest point (river). White dots with number above gives site number from GPS (see Appendix B). Colours give height relative to the river, everything higher than 25 m is displayed in white/grey. The image is corrected for the gradient of the river.

The Magdalena River is located west of El Chichón and is one of the main sediment transporters of the volcano. During the fieldwork three river terrace levels have been recognised and sampled. These are the 5m, 8.5m and 12.9m terraces (m = meter, site number 545-548, Appendix B). The locations are close to a little village Xochimilco. The deposits consist mainly of volcanic sediments, pumice rocks ranging from 2-20 cm diameter and dacite rocks. Typically a colour of the sediments is grey, dark grey to black and sometimes yellow pumice layers. The underlying bedrock is mainly limestone and some occasionally sandstones.

5 m terrace

Site number 545 (-93.3074°/17.3837°)

The 5m terrace is described in Macias et al. (2004, number 156) and I have divided this terrace into four units; A-D. The division is based on the texture, colour and characteristics observed in different parts of the section. The section shows a lot of lateral thickness variation in the individual units, especially unit B and C. The pumices found are well rounded of medium sphericity and the dacites are more angular shaped.

Unit A is half a meter thick and consists of light grey, fine grained volcanoclastic matrix with lenses of gravel (<5 cm diameter). Debris flow type deposits with little fluvial influence are seen. The top 20 cm is altered by soil formation. The average grain size of the matrix is fine to medium grained.

Unit B is much darker in comparison with unit A and is generally 1-2 meter thick. It has a dark grey/black colour and lenses of light grey volcanic sediments. The matrix consists of fine sand with a lot of fine black magnetite microlayers distributed in the unit. In the layers there are lenses which consist mainly of grey pumice clasts (<10 cm diameter). The average grain size of the matrix is fine to medium grained.

Unit C is a totally different facies. The 1.5 – 2.5m thick unit is poorly sorted, unconsolidated conglomerate with a lot of large clasts (1-100 cm diameter). The largest clasts (dacite) found is 120 cm in diameter and the pumices are much bigger than unit A and B. The unit has two types of pumice rocks in it. The typically light grey type is located throughout the entire section and pumice with yellow erosion surfaces are localized in lenses. The yellow colour is an indicator of a different composition as the light grey ones. The unit also contains small layers of fluvial influenced sands. However there is a sorting of layers consisting of large clasts and finer clasts, but it is difficult to say if it is fining or coarsening upward. It is a chaotic poorly consolidated conglomerate facies.

Unit D is at the bottom of the section and 1-2 meter thick but is poorly exposed (see figure A-5). Recent flooding and erosion of the terrace covered the lower part of the section. The contact between unit C and D is hidden under the rubble. Therefore unit D is defined at the height where unit C cannot be seen anymore. The layer varies laterally in thickness and is a conglomerate type of deposit, poorly consolidated and poorly sorted, the grain size varies between 1-10 cm grains with a medium to coarse sand matrix. The clasts are very angular in this part of the section and smaller than the ones of unit C.



Figure A-4. Same stratigraphic section as the figure below showing large clasts in the lower unit. In this section four units are described as distinguished by the red lines. Unit A, B and C and unit D is covered by recent deposits. Shovel is 90 cm long.

Legend

Unit A: fine to medium sand matrix with light grey pumice clasts in it and occasionally dacite rocks (<5 cm diameter). Light grey colour top 10-20 cm consists of soil.

Unit B: fine volcanic sand matrix with large light grey pumice clasts of uniform grain size. Small layers of light grey matrix in the dark grey/black magnetite rich matrix. Pumice clasts mainly concentrated in lenses of the unit. 1-2 meter thick unit.

Unit C: poorly sorted conglomerate with large dacite blocks up to 120 cm and large pumice clasts of 5-10 cm in diameter and 1.5 – 2.5m thick. Lenses of finer grained sand with cross bedding. Alternating layers of finer and coarser grained deposits. Yellow and light grey pumices; yellow pumice is situated in small distinct layers while the light grey pumice is distributed all over the unit.

Unit D: poorly exposed conglomerate deposit with generally smaller grain size clasts (1-15 cm). Poorly consolidated, 1-2 m thick and brown to light grey colour tints.

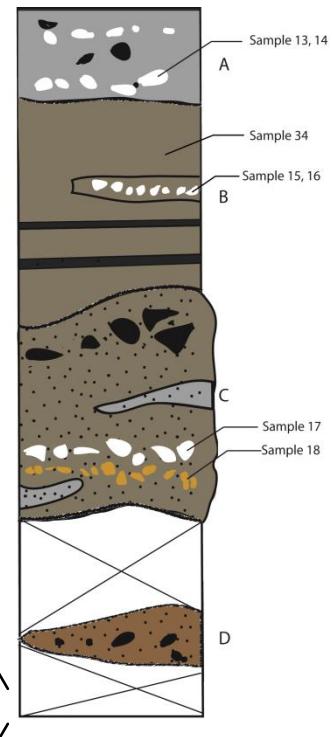


Figure A-5. Overview picture of stratigraphic section 156 (Macias et al. 2003) visited 22/3/15 showing four units with huge lateral variation. Top part consists mainly of very fine grained deposits with pumice. Lower part is a conglomerate-like structure with large clasts (2-100 cm), including pumice and dacite rocks.



A. Unit D



B. Unit C



C. Unit B



D. Unit A

Figure A-6. Close up pictures of the different units of stratigraphic section 156 (Macias et al. 2003). PhD Nooren and pen (14 cm) for scale. **A.** Part of Unit D, very poorly consolidated, exposed rocks with a large variation in grain size. **B.** Unit C in the top part and under it unit D which is covered by recent flood and erosion sediments. **C.** Close-up of unit B, very fine grained sediments with large pumices. **D.** Unit A on top visible as light grey deposits with pumice of 2-4 cm diameter and very fine sediments and under it unit B, dark grey/ brown very fine ash with pumice rocks generally larger than pumice of unit A (5-10 cm).

8.5 m terrace

Site number 546 (-93.3039° / 17.38304°)

The 8.5m terrace is found further north at one level higher than the 5m terrace and 3.5 m is exposed. The bottom part of the terrace is overgrown with flora. The terrace is an unsorted mixture of very coarse gravel matrix (<7.5 cm) surrounding large pumice and dacite rocks. The erosion visible on the surface gives the indication that the terrace is older than the 5m terrace along with the fact that it's further away from the river. It has a strong resemblance with Unit C of the previous described terrace. Most rocks are well rounded and ranging between 5-25 cm diameter and the pumices are yellow weathered.

Legend

Strong eroded section with dacite and pumice rocks, 5-25 cm in diameter and well rounded. Lower part of terrace covered with vegetation. Strong resemblance with unit C, 5m terrace, gravel to sandy matrix.

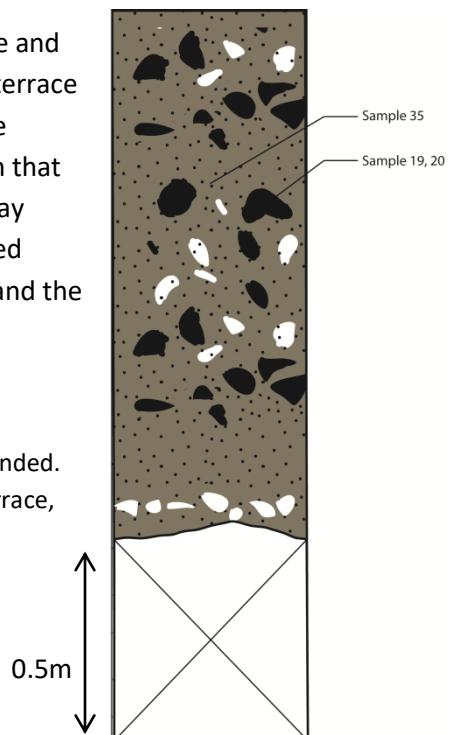


Figure A-7. Overview picture of stratigraphic section 8.5 m terrace, very poorly exposed and weathered.



Figure A-8. Zoom on the stratigraphic section, professor Middelkoop for scale. Very large grain size variation, section include dacite and pumice blocks. Majority of the clasts are heavily eroded.

12.9 m terrace

Site number 548 (-93.3083°/17.39056°)

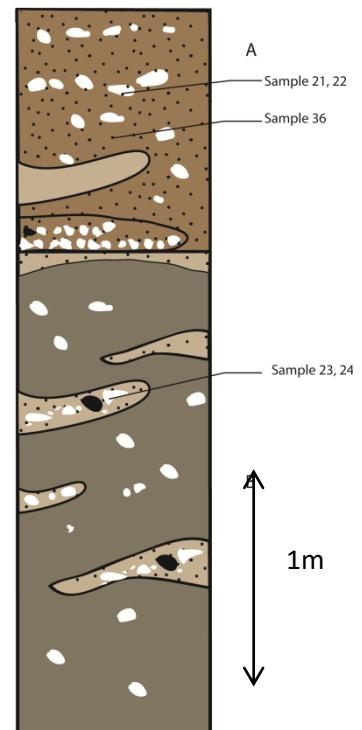
The 12.9m terrace consists of unit A and B. It is located northwest of 8.5m terrace and south of Xochimilco. It is recently cut by the local people and has a really unaltered surface, the pumices in the section are big and of good condition although they all have a weathered surface. Most pumice clasts are well rounded and the dacites are more angular shaped, but most clasts are very spherical. The two units in the terrace very different from each other. The top unit A is 1.5m thick and has a very light grey and brown colour. The colour is really distinct from the rest of the units of the terraces of the Magdalena River. Also the grain size of the clasts is different in unit A, pumices are much larger than unit B. There are lot more rocks in the matrix compared to unit B. The top layer is magnetite rich, followed by a medium to coarse grained matrix with clasts <10 cm diameter. Towards the bottom of the unit there is a layer of large dacite clasts with a diameter up to 25 cm and has an unconsolidated conglomerate appearance.

Unit B is much more uniform. It has one lens of coarser rocks up to 50 cm in diameter consisting of dacite and pumice rocks, but the rest of the layer is fine to medium grained with pumice rocks. It has a dark grey/black colour with alternating light grey parts and little layers of cm size clasts.

Legend

Unit A: brown to light grey volcanoclastic layer with a conglomerate lens in the bottom part. Medium to coarse grained matrix with <10 cm diameter pumice and dacite clasts.

Unit B: dark grey to black matrix with alternating light grey parts. Pumice mainly concentrated in the light grey layers and up to 0.5 m dacite rocks are present in these lenses. Fine to medium grained matrix with magnetite rich layers.



A.



B.

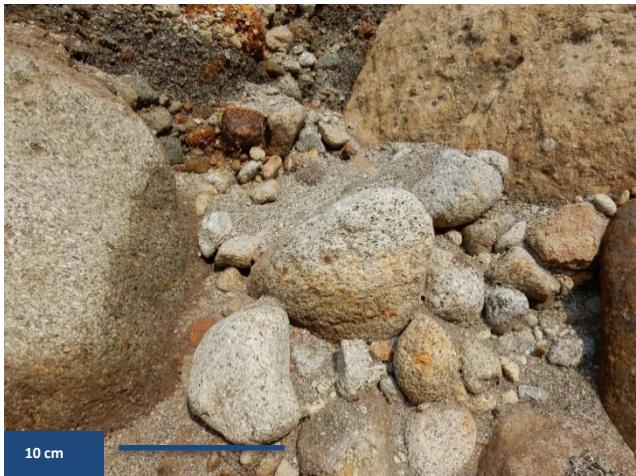
Figure A-9. A. Close up picture of unit A and B showing the lenses of pumice and dacite rocks, fine grained volcanoclastic sediments. **B.** Terrace 12.9 m showing two units A and B. Unit A top part brown colour, lower part consists of pumice and dacite clasts. Unit B consists of two types of volcanoclastic sediments separated by their colour, the dark grey/black and the light grey type, with a lens of coarser grain conglomerate. Shove is 90 cm.



A.



B.



C.

Figure A-10. **A.** Close up of the lower part of the section (unit B) showing tiny lenses of high magnetite layers in the grey sediments. **B.** Close up of the magnetite lenses t of unit B. **C.** close up of the pumice rocks found in the lens of unit B.

North Platanar River

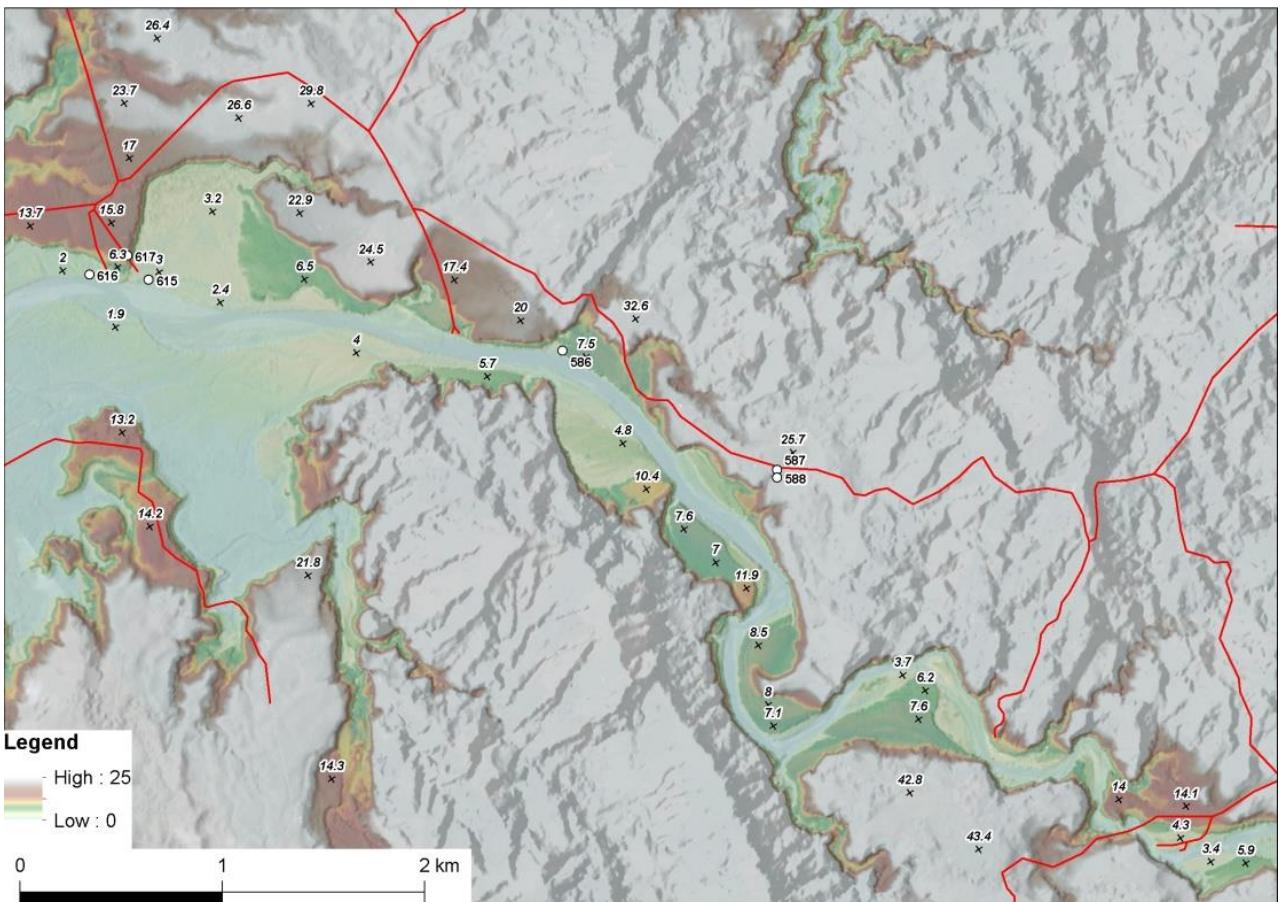


Figure A-11. Lidar image of the main branch of the Platanar River (north-Platanar) with visited sites. X-es with numbers give height relative to lowest point (river). White dots with number above gives site number from GPS (see Appendix B). Colours give height relative to the river, everything higher than 25 m is displayed in white. The image is corrected for the gradient of the river.

The Platanar River is the other main transporter of the volcanic sediments from El Chichón. It has two branches; the south Platanar River and the north Platanar River. The south Platanar is an older branch that is nowadays a little stream and of minor importance, the largest part of the drainage goes through the north Platanar branch. The river originates at El Chichón and joins the Grijalva River forty kilometres north. From this river five terrace levels were investigated and in one of them charcoal was found. These are the 7.5m, 25.7m, 2m, 3m and 15.8m terraces (site number 586-617). Overall the texture, composition and colour are identical with the river terraces of the Magdalena River, light grey layers with pumice and yellow eroded pumice layers. Fine matrix with alternating layers of coarse grained volcanoclastic conglomerates, black magnetite rich layers, large pumice clasts localized in lenses and more eroded terraces at higher elevations. In the higher terraces the pumices are entirely eroded and crumble when they are sampled.

7.5 m terrace (charcoal found)

Site number 586 (-93.2634°/17.53583°)

The first encountered terrace in the Platanar River is located at site number 586 and beautiful exposed. It is located in the outer bend of the river, so river erosion cuts this section creating the fresh surface. The section has huge lateral variation in the individual layers and the visibility of the section also varies. In general the section consist of fine grain layers of debris flow deposits with light grey pumices, yellow pumice rocks layers, fluvial fine grained volcanoclastic deposits and coarse light grey pumice layers, but some distinction can be made. The chaotic appearance of the terrace is interpreted as a high energy deposition environment of debris flow deposits. Finer grained layers showing crossbedding (fig. A-12) and conglomerate facies. This terrace is build up from several events with large amount of new material. The section is subdivided into four units. From the top unit A is 1 m thick and consists of layers of fine grained matrix with an occasional layer of light grey pumice clasts. In the top of the unit 20-30 cm soil has formed. Unit B is 0-1.5 meter thick and is a very coarse grained facies with yellow and light grey pumice clasts of 1-20 cm size. The unit varies greatly laterally and sometimes is not present. Unit C is 1 meter thick and has alternating layers of fluvial deposits consisting of very fined grained layers with light grey pumice rocks and fine grained debris flow deposits. There are horizontal fine grained deposits on top of layers which show crossbedding (fig. A-12). At the bottom of the section is unit D (2.5 - 4 meter thick), which consists of layers of



yellow and light grey pumice rocks (fig. E-1). The pumice is concentrated in lenses in a fine grained light grey matrix and clasts are 5-15 cm with some really large (20-40 cm) dacite clasts. A major part of the bottom part is covered with rubble although you can see the entire section at some spots. The pumices are well rounded and have a low sphericity; the dacites are much more angular. The units show lateral variation.

Figure A-12. Close up picture of the crossbedding in unit C. GPS for scale is 15 cm.

Legend

Unit A: 1-1.5 meter thick generally horizontal layered fine grained unit and contains light grey pumice and dark dacite rocks.

Unit B: 0-1.5 meter thick chaotic conglomerate layered unit consisting of mostly yellow and light grey pumices, dacite rocks. The clasts are horizontally layered or at an angle relative to a horizontal line.

Unit C: 1 meter thick unit that is alternating between coarse grained pumice rich layers, fine grained debris flow layers and fluvial deposit layers with cross bedding.

Unit D: 2.5 – 4 meter layered unit consisting of two parts; an upper yellow pumice rich part and a bottom light grey pumice rich part. The pumices are concentrated into lenses and between the lenses are fine grained layers.

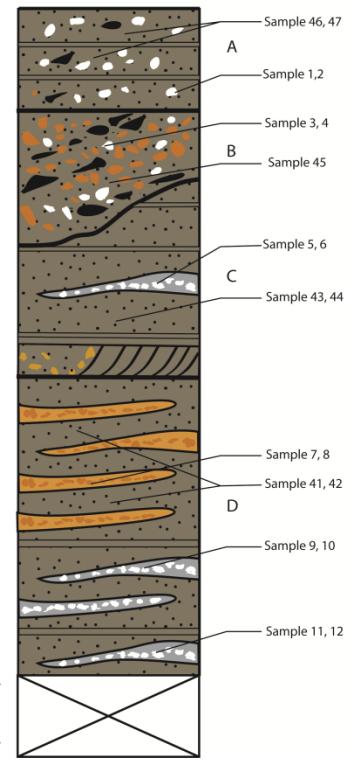


Figure A-13. Overview picture of the section showing the lateral variation of the units along with the alluvial deposits covering the lower part of the section. BSc Post for scale.



A.

B.

Figure A-14. Detailed picture showing units A-D from two viewpoints. **A.** Looking to the south on the section seeing mainly the top part of the section. **B.** Looking north on the section showing all four units. GPS and wooden pole for scale (15 and 100 cm).



Figure A-15. Close up picture showing the lower part of unit D with two distinct parts consisting of yellow pumice on top of a light grey pumice rich part. GPS size is 15 cm.

25.7 m terrace

Site number 587-588 (-93.2583°/17.52599°, 93.2585°/17.52569°)

This terrace is covered almost completely by vegetation and soil. The fresh surface under the soil was entirely weathered and the pumice rocks were crumbled into matrix. The samples extracted from this terrace cannot be used for analysis, but the terrace shows the same characteristics as the other terrace of the Platanar and Magdalena River. The erosion and vegetation gives the surface a brown colour, but the fresh surface is light grey with dark brown/copper like oxidation layers.

Legend

Only a part of the section is exposed, but severely weathered. The pumice clasts are weathered into matrix and whole section is covered with a weathered surface or vegetation. Fresh cut surface is light grey.

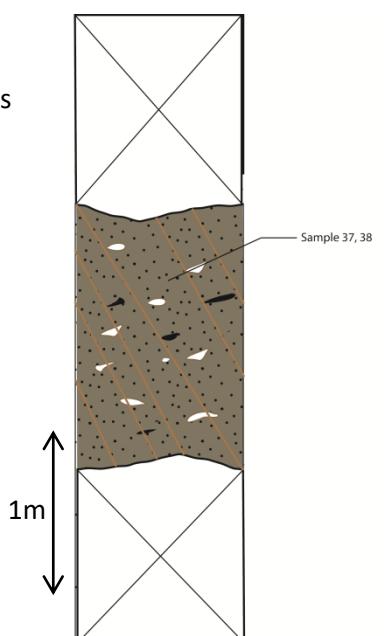




Figure A-16. 25.7m terrace completely overgrown with vegetation, under light grey eroded fine grain matrix, no pumices found. Only small dacite clasts. Terrace ~3.5 m high.



Figure A-17. Picture taken of the 25.7m terrace at another location. Clear soil formation on the surface, pumice clasts completely weathered, 1-5 cm dacite clasts visible. Professor Middelkoop as scale.

2 m terrace

Site number 616 (93.2794°/17.55073°)

This is the lowest and closest terrace to the river and the 3m terrace is next to this terrace. It is the volcanic material of the 1982 eruption and is sampled to find the fingerprint of the 1982 eruption. It consists of light grey matrix filled with mainly light grey pumices of 1-10 cm diameter along with dacite clasts and lenses of yellow weathered pumice rocks. It has a very fresh surface, but major parts are covered with vegetation (fig. A-18). The pumice clasts are mainly localized in lenses in between fine grained layers.

Legend

Section covered from the top by vegetation. Yellow and light grey pumice localized in lenses in the top part of the section.

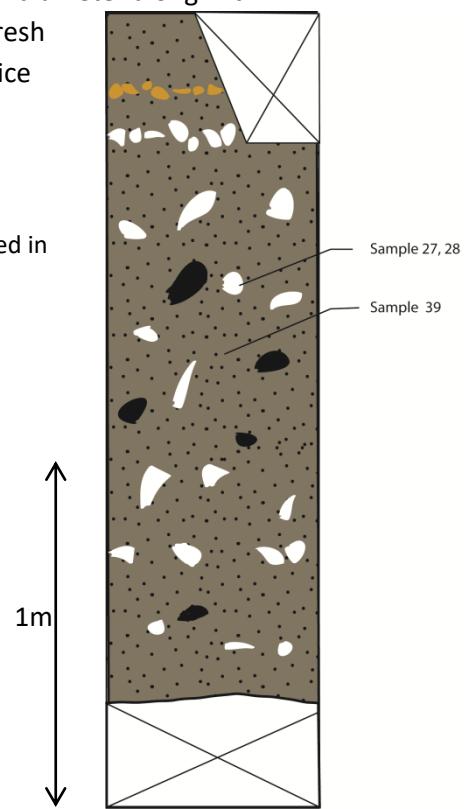




Figure A-18. 2m terrace close to the river overgrown with vegetation, but little weathering. Circle shows fresh surface from which samples were taken.

3 m terrace

Site number 615 (93.2773°/17.54904°)

This section is next to the 2m terrace and it has a large tree on top of it. Due to weathering the surface of the section is not well visible, but the pumice sampled are of good quality. They are mainly light grey pumice rocks of 1-10 cm diameter with a brown oxidized surface layer. There is a lot of soil formation on the outer surface of the section. The pumice rocks are less rounded than the other sections but still are spherical shaped.

Legend

Top part of the section is unclosed. On top of this terrace is a large tree and the bottom part of the section is covered with vegetation. The pumice clasts are weathered on the surface and have a brown to light grey colour. This is also seen in the matrix.

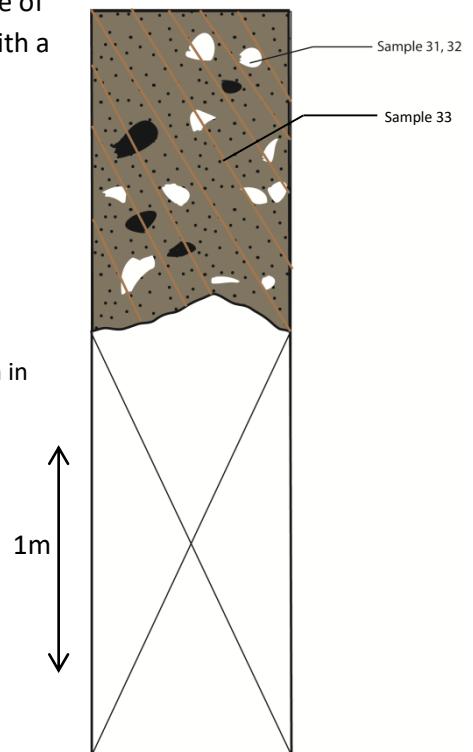
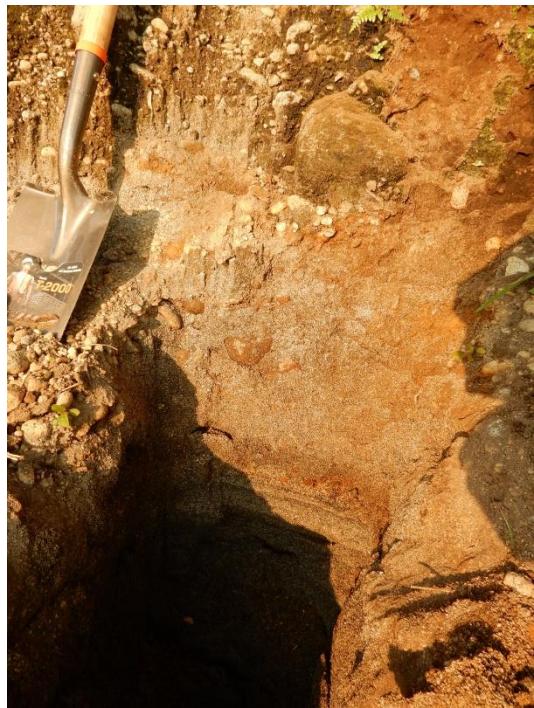


Figure A-19. Overview picture of the 3m terrace with a large Tree on top of it.



A



B

Figure A-20. Close up of the 3m terrace. **A.** Soil formation on the section. **B.** Fresh cut surface with pumice rock in brown due to weathering. Spade is 90 cm.

15.8 m terrace

Site number 617 (93.2775°/17.55045°)

In between the 7.5m terrace and the 25.7m there were two more terrace, one at ~11 m and one at 15.8m. The terrace at 11m however was very small and the sediments were very severely weathered. It was only present at that site and couldn't be traced laterally. It is therefore not sampled. The 15.8m terrace was also an old terrace which resembles the 25.7m discussed earlier. From this terrace matrix and some little light grey pumice rocks were sampled. However they were very small and had a crumbly texture. The entire section is covered with vegetation and is really weathered. All the pumice clasts that were present are weathered and crumbled into matrix, although the size of the pumice rocks could be seen by a preserved erosion rim around the original pumice. The trees on top are rooted deep into this terrace.

Legend

2m tick 15.8m terrace that has been completely eroded the pumice clasts. The section is tangled with roots and severely oxidized. There are magnetite rich layers in the section.

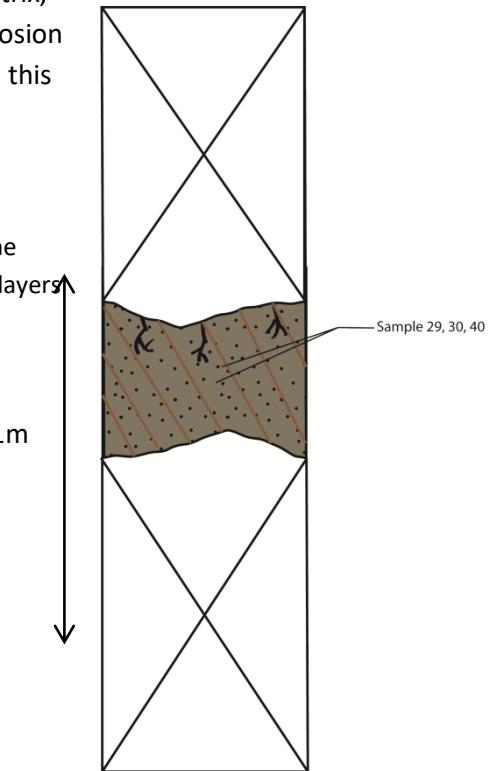


Figure A-21. Fresh cut surface of the terrace, black magnetite rich layer clearly visible and light grey fine grained matrix. Shove size is 90 cm.



Figure A-22. Horizon of the 15.8m terrace overgrown with vegetation and trees.

Appendix B: Coordinates of fieldwork locations

The coordinates used in this research are given by a number between 400 and 700. Global positioning system (GPS) is used to measure the locations and they are described by latitude and longitude degrees.

Table B-1. Waypoint number with their coordinates.

waypoint	X (longitude °)	Y (latitude °)
545	-93.3074	17.3837
546	-93.3039	17.38304
548	-93.3083	17.39056
586	-93.2634	17.53583
587	-93.2583	17.52599
588	-93.2585	17.52569
615	-93.2773	17.54904
616	-93.2794	17.55073
617	-93.2775	17.55045

Appendix C: Sample preparation

The tephra obtained from pumice clasts and matrix is prepared in thin sections and stubs respectively. To be clear on the term stub; a stub is an epoxy filled one-inch diameter cylinder, 1-3 cm thick, which has 4,5 mm holes filled with tephra (fig. ...).



Figure C-1. Araldite DBF epoxy cylinder block (stub) of one inch diameter with eight drilled holes (4.5 mm diameter) in which sample is put.

Tephra has to be prepared with great caution. Small glass shards are very prone to be altered by both acidic and basic treatment (Dugmore et al., 1992 and Blockley et al., 2005). It can namely alter the geochemical composition of tephra and therefore it is recommended to use heavy fluid separation to isolate the glass shards.

The stubs and thin sections are prepared in the Geolab of the University Utrecht with the courtesy of Otto Stiekema (O.H.Stiekema@uu.nl) using the method from Dr P.A.R. Shane, University of Auckland, described in Lowe (2011).

Thin section preparation

The first way of analysing glass shards used in this thesis is to prepare thin sections from pumice clasts. Glass shards are easier to recognize in thin section under the EMP. The other way is by stubs filled with matrix of the river terraces which will be explained later.

Thin sections are made from rocks, clast and pumices. There are many types of thin sections with their own purposes. Here the general process of making thin sections used for EMP analysis. First the sample is cut so that the largest surface is visible. From this surface a 25 by 40 mm, 15 mm thick piece is cut and this is glued to a glass plate. The sample is washed and trimmed until a thickness of 30 µm is reached. Then the surface is polished. Lastly the surface needs to be carbon coated in order to enhance the electron conductivity if the sample is analysed by the EMP.

Figure C-2. 5 steps that explain the preparation of a thin section. 1-3. Glue a piece of cut sample on the glass. 4. Cut of the majority of the sample until 1.5 cm remains glued to the glass. 5. Polish of sample until the thickness of the sample is 30 µm.



Heavy liquid separation

In order to analyse the matrix extracted from the river terraces the glass shards from the tephra first have to be isolated. The most effective way of doing this without affecting the geochemical composition is heavy liquid separation. This does not alter their geochemical composition and isolates the glass shards from other matrix grains (Dugmore et al., 1992 and Blockley et al., 2005).

The separation goes as follows. The matrix is put into tubes filled with a heavy liquid with various densities. Tephra glass shards namely usually has a low density ($2350-2450 \text{ kg/m}^3$, Shipley and Sarna-Wojcicki, 1982) and thus can be separated from heavier minerals, such as clays, plagioclases and quartz which have a density larger than 2500 kg/m^3 . What will happen is that the tephra and light contaminants will float and the residue of the matrix will sink. The tephra is poured into another tube and the residue is removed. Now another heavy fluid with a lower density than the tephra separates the lighter minerals, roots and contaminants from the tephra glass shards. The tephra sinks kept in the tube while the rest is poured away.

The tube filling with heavy liquid and tephra separation is done two times for each heavy liquid and after the separation method the tubes are filled with demineralized water and centrifuged to remove any leftovers of heavy liquid. Lastly the sample is dried in a stove at 105°C . The sample can now be put into the stub.

Steps of preparation:

1. Dry samples in stove at 105°C .
2. Sieve samples with $>2 \text{ mm}$ sieve to remove any large grains.
3. Put a teaspoon of matrix sample an 8 ml tube and weigh sample.
4. Fill tube with 2500 km/m^3 heavy liquid, stir and centrifuge.
5. Pour the fluid with the tephra into a 15 ml tube and don't let any residue in the 15 ml tube.
6. Repeat step 4 and 5. Now all tephra is in the 15 ml tube.



Figure C-3. a. 15 ml tube filled with isolated tephra. **b.** residue of the matrix sample.

7. Fill the 15 ml tube with 2000 kg/m³ heavy fluid and repeat step 4 and 5 with this heavy liquid to remove any roots, carbon contaminants. The tephra will sink and any contaminants will float and be removed.
8. Fill the tube with demineralized water, stir and centrifuge and pour the heavy fluid in the filter barrel to wash the tephra clean and remove last bits of heavy fluid.
9. Repeat step 8 three times.
10. Now sieve the samples with a 50 µm sieve to filter out the smaller glass shards. This makes on a good 5x5 µm spot analysis more likely.

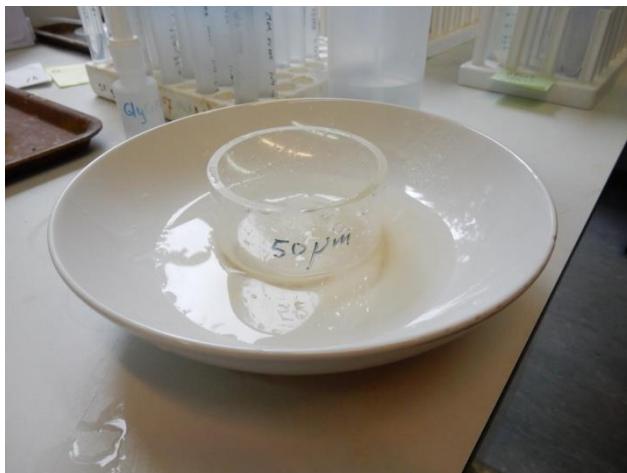


Figure C-4. 50 um sieve in a bowl filled with demineralized water used to separate small glass shards.

11. The last step is drying the samples and then they are ready to go into the stubs.



Figure C-5. Resulting sample after using heavy liquid separation.

Stubs Preparation

The following material is needed to create a stub:

- Sample (dry)
- Glass plates
- Two side sticky tape (preferably water resistant) and normal tape
- Araldite DBF and Araldite 20-20 epoxy
- Funnel (<4,5 mm tube end)

- Pipet
- Small needle

The stubs are made by doing the following steps:

First you have to make one inch cylindrical block Araldite DBF in which you drill 5-8 holes depending on how much samples you have. This can be made in practically any Geolab.

Second once the holes are drilled you put a piece of two side sticky tape on the glass plate and put the empty stub on top of the tape (fig . C-7). Make sure that the stub is firm attached to the tape so that no epoxy can leak.

Third you seal all but one hole with tape so that the other holes cannot be contaminated with other samples and you use the funnel to pour in the sample (fig C-7). Then you remove the tape and be careful remove the tape. Do this careful, because some of the sample can stick to the tape and contaminate the other holes. The funnel has to be cleaned after each step and the tape has to be replaced.

Fourth the Araldite 20-20 is dropped into every hole until they are completely filled. This is an epoxy with a lower viscosity which will flow more easily through the matrix grains. This is important when you have large amounts of sample. Usually in tephrochronology your amount is limited to a few tephra shards. In this case you can use the normal Araldite DBF epoxy.



Figure C-6. Stub with holes filled with matrix sample and Araldite 20-20.

Fifth use a needle to mix the epoxy between the grains. If you only have a few glass shards this step is not required, but make sure your fluid doesn't contain any bubbles.

Sixth once the epoxy becomes solid (leave it for 24 hours) you carefully remove the glass plate and two side sticky tape and polish the glass shard side of the sample. Be careful when polishing, glass shards of tephra are very delicate and easy to polish off entirely (fig. C-7: 3-5).

Negative effect by using this method of stub preparation is that the 50-50 epoxy leaks if you don't firmly put the stub on the sticky tape. When it leaks and dries, the polishing and removing the glass plate and sticky tape is really hard. Often bubbles are included into the epoxy, but this is with every method.

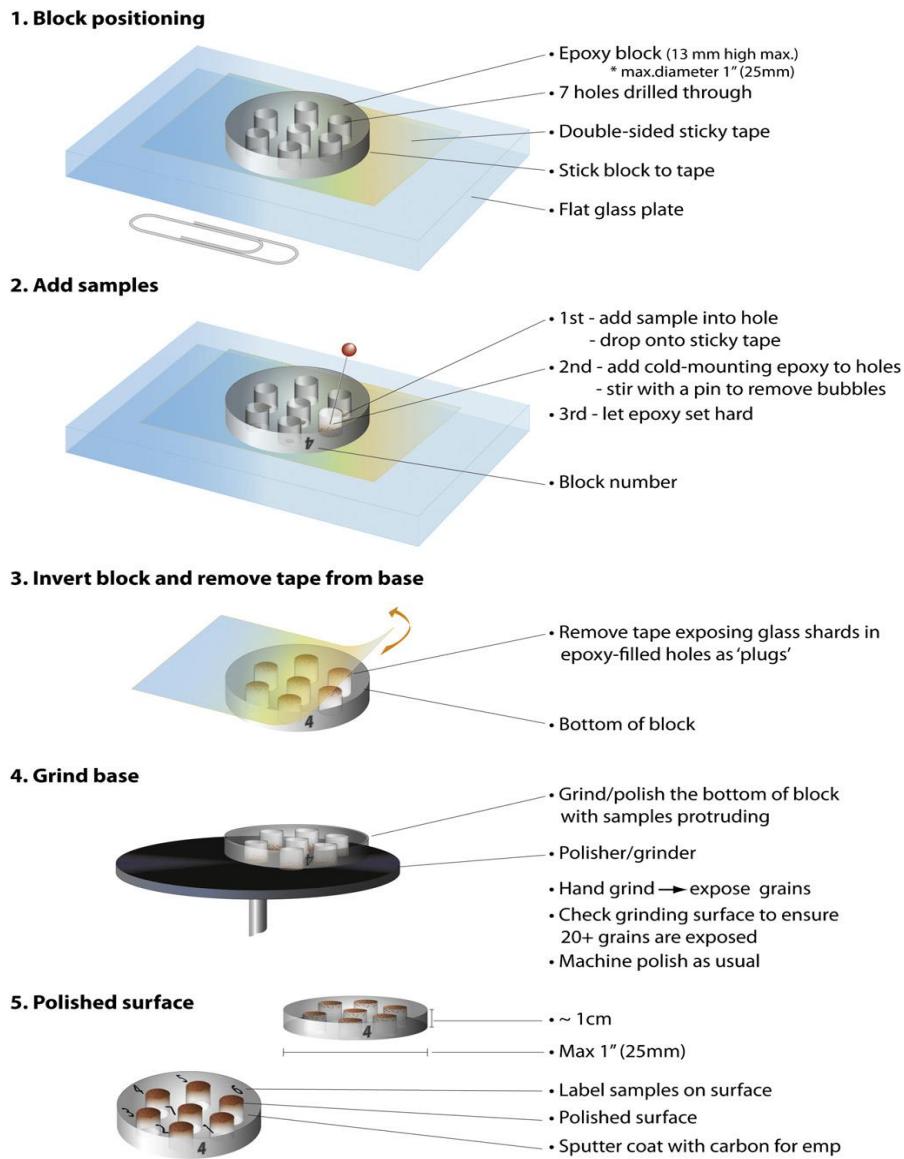


Figure C-7.

Preparation stubs explained in five pictures (from Lowe, 2011). 1. In the first step the sample is put into the holes and bottom is sealed. 2. Second step the epoxy is put on top the sample and fills space between grains. 3. + 4. When the epoxy is crystallized and the seal is removed the bottom is polished. 5. In the last step the surface is carbon coated and then is ready to measure by the EMP.

Appendix D: Flooding images

Images of several locations flooded by the 1982 eruption rocks. First image taken at Ostuacán ($17^{\circ}24'N$, $93^{\circ}20'W$) second at Francisco Leon ($17^{\circ}17'N$, $93^{\circ}14'W$).

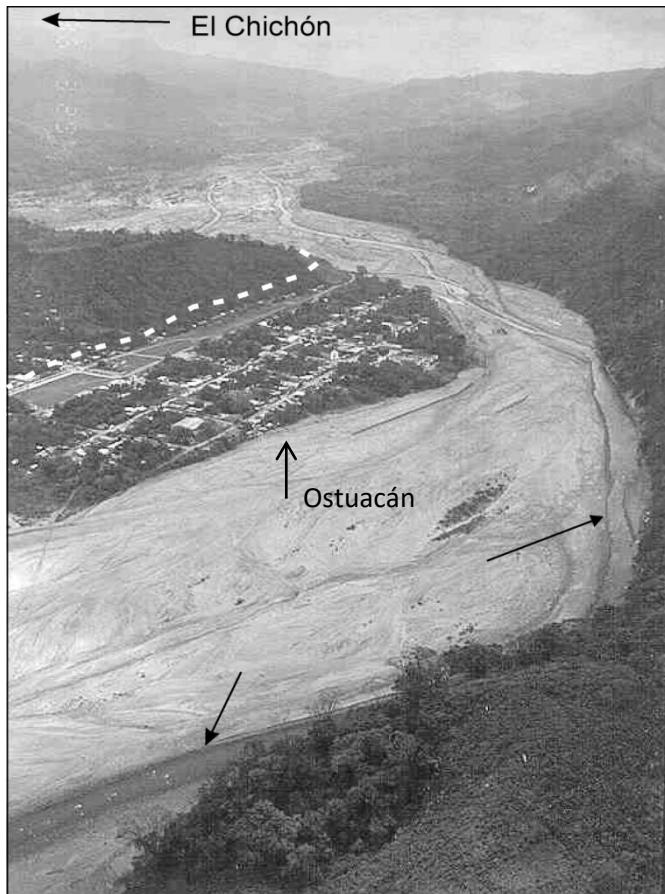


Figure D-1. Picture of the Magdalena River flooded by the 1982 eruption volcanoclastics. Arrows indicate channel of the river, dashed white line is the limit of the flooding. From Macias et al. (2004).

Northern part of Francisco Leon



Village with church marked in yellow circle.



Same church after the 1982 eruption

Figure D-2. Two images showing before and after the flooding of Francisco Leon during the 1982 eruption. Only the church roof top remains. From Tilling (2009).

Appendix E: Thin section images

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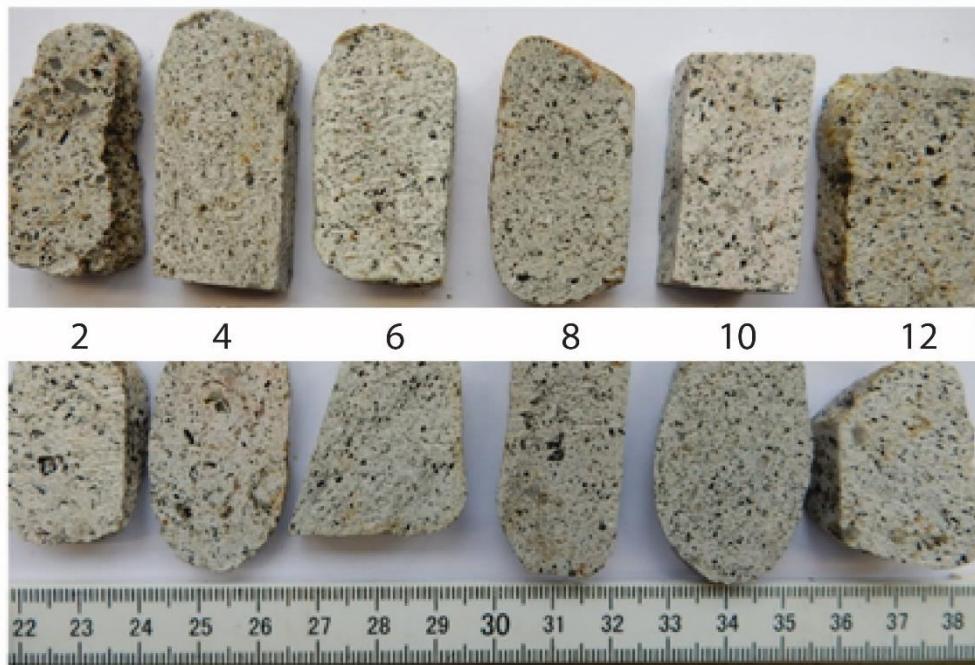
4

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Boca
Sample



Figure E-1. Cross cut images of pumice samples SP1-SP32. Two types of pumice, yellow and grey colour.

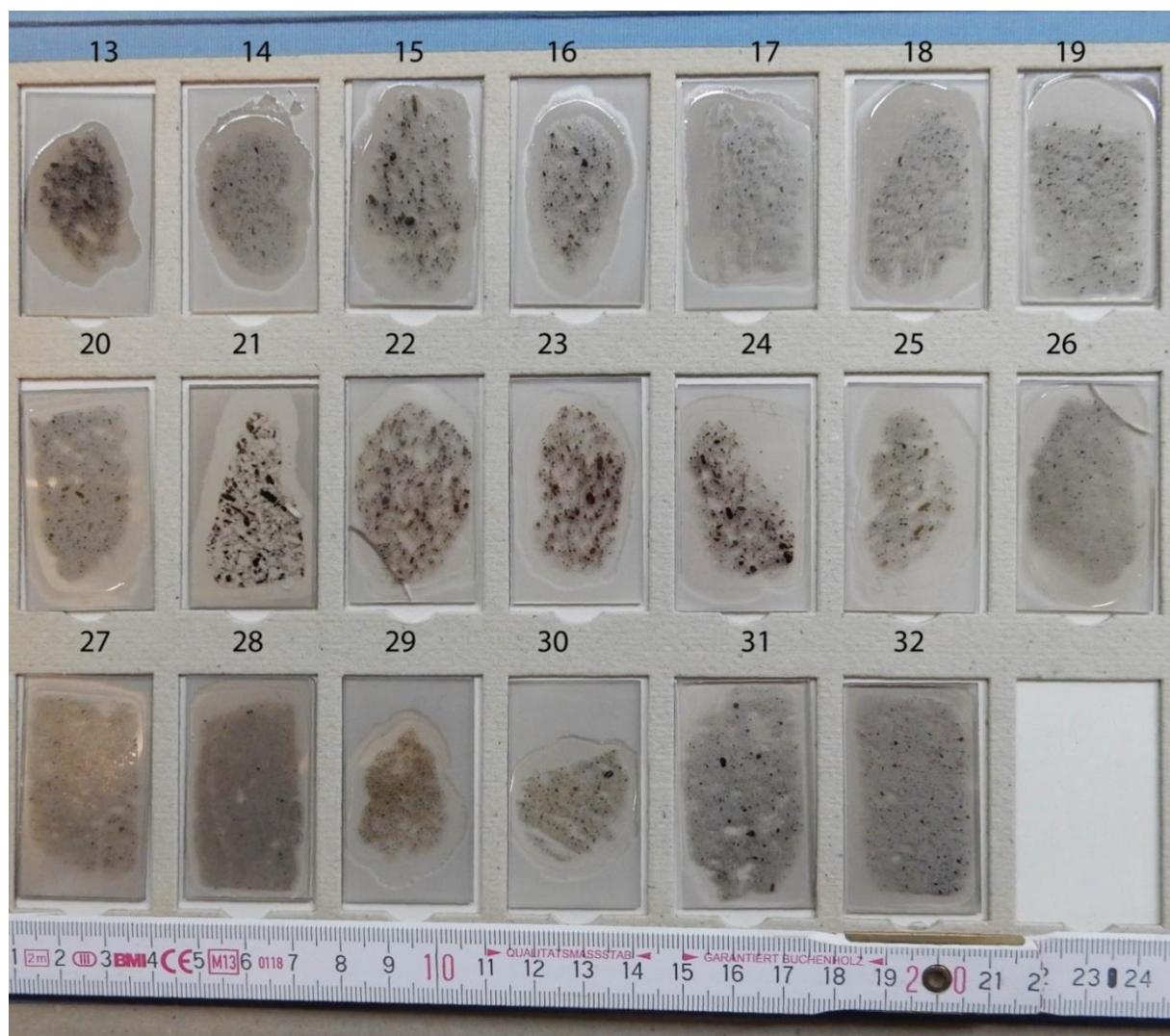
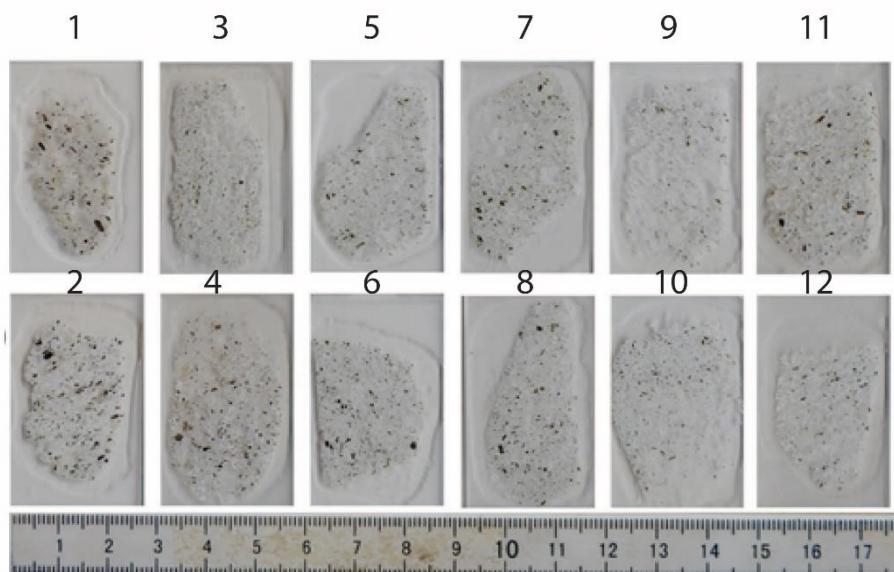


Figure E-2. Thin sections of pumice samples Sp₁-Sp₃₂.

Appendix F: EDS images

This appendix is composed of five parts, which are the session days on which tephra is measured. In each part the EDS images of the measured samples are shown with one overview image and one zoom. The numbers in the table are references to Appendix F.

F1 Session 28-4-2015

Samples measured: S_{P2}, S_{P3}, S_{P5} S_{P6}.

Sample: S_{P2}

Number of samples: 17

11	Sample 2-1
12	Sample 2-2
13	Sample 2-3
14	Sample 2-4
15	Sample 2-5
16	Sample 2-6
17	Sample 2-7

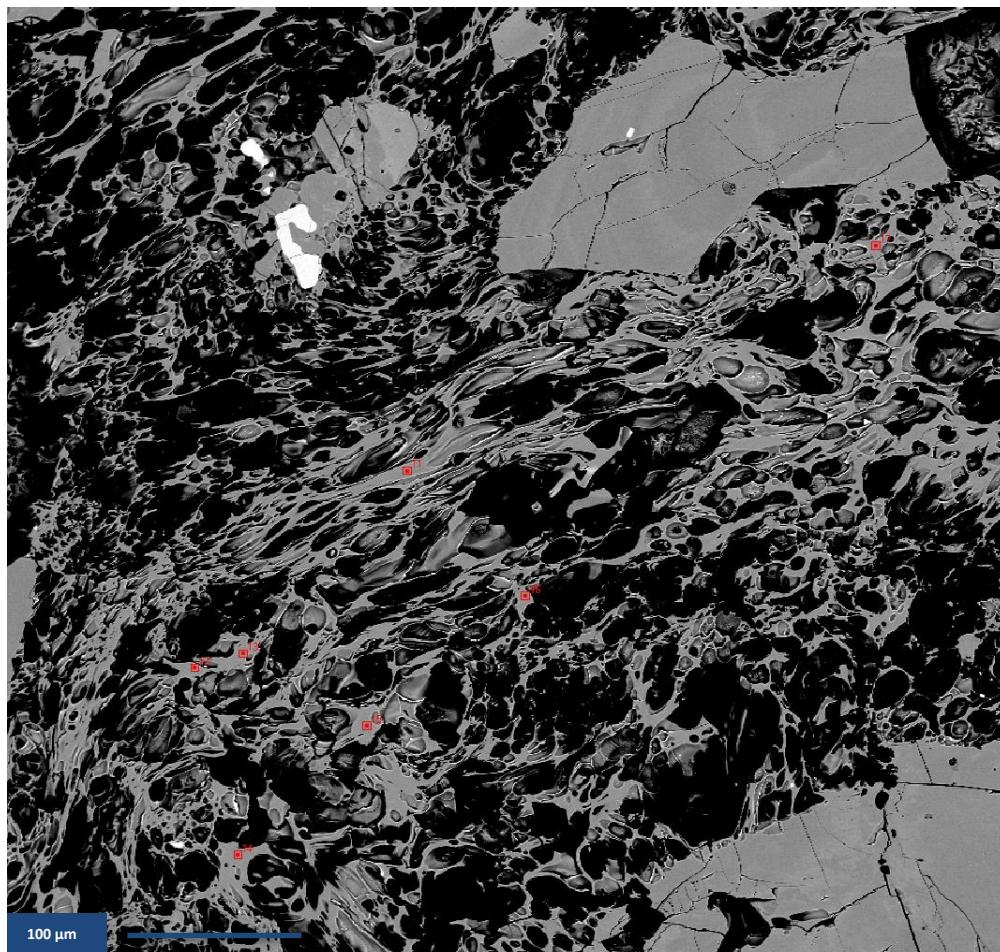
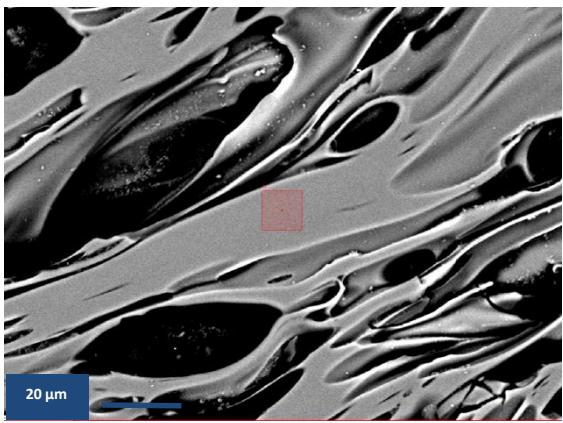
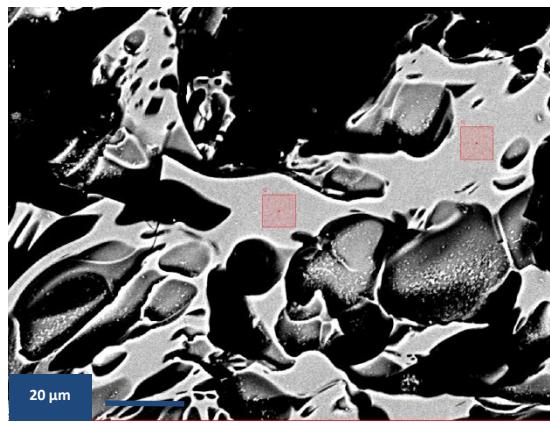


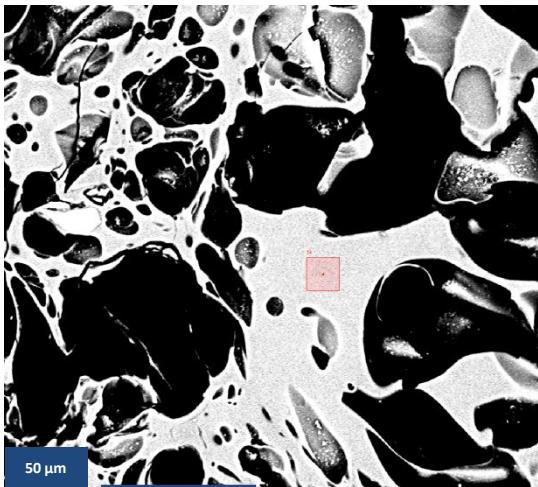
Figure F2-1. Overview picture of the S_{P2} glass shard data points 11-17, the focus beam for the WDS is 5 by 5 μm and 5nA, numbers represent the sampled spots.



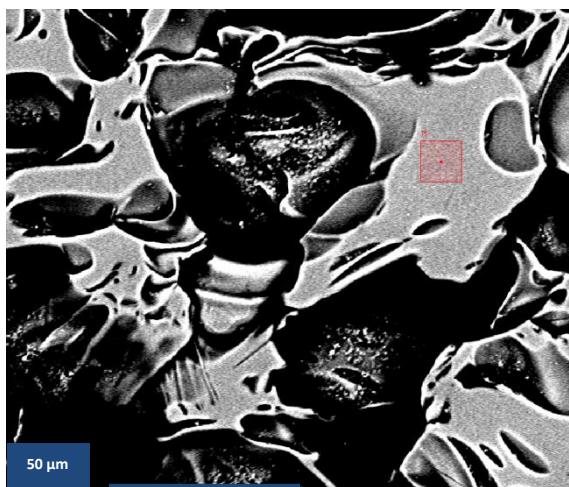
11



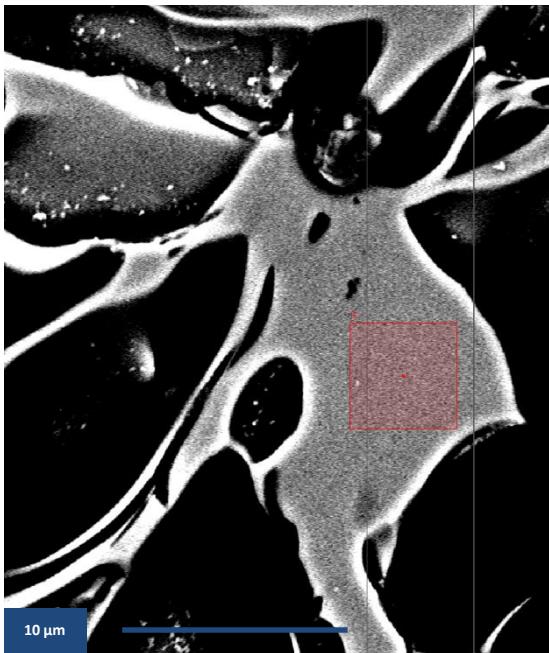
12 and 13



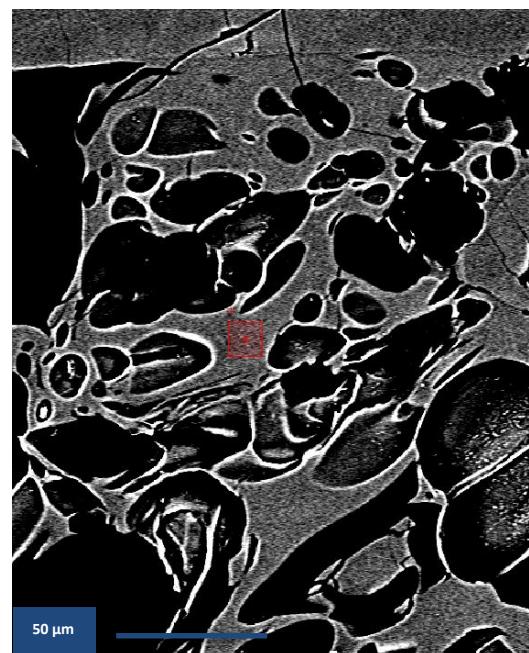
14



15



16



17

Figure F2-2. Zoomed view of the different glass shards with the sampled points. Points represent the sampled sites and enclose an area of 5 by 5 µm.

Sample: S_{P3}

Number of samples: 10

1	Sample 3-1	6	Sample 3-6
2	Sample 3-2	7	Sample 3-7
3	Sample 3-3	8	Sample 3-8
4	Sample 3-4 (NCU)	9	Sample 3-9
5	Sample 3-5	10	Sample 3-10

*NCU: no close up

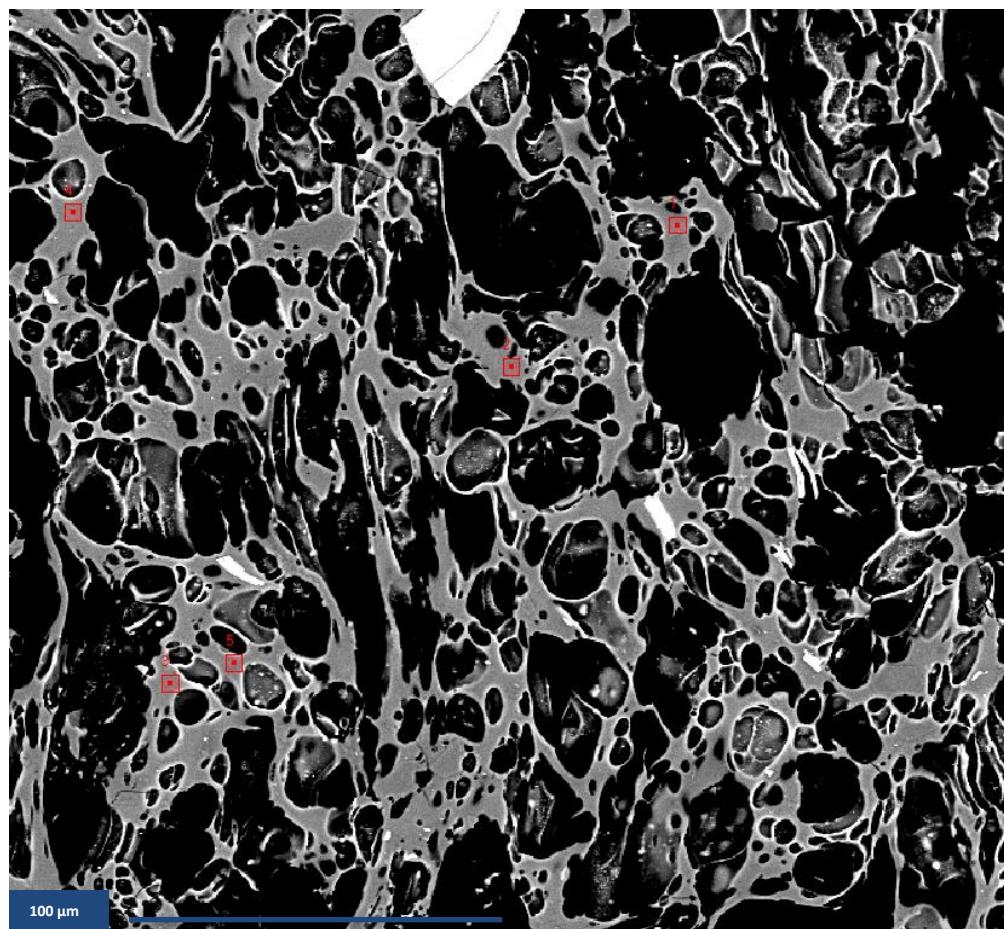
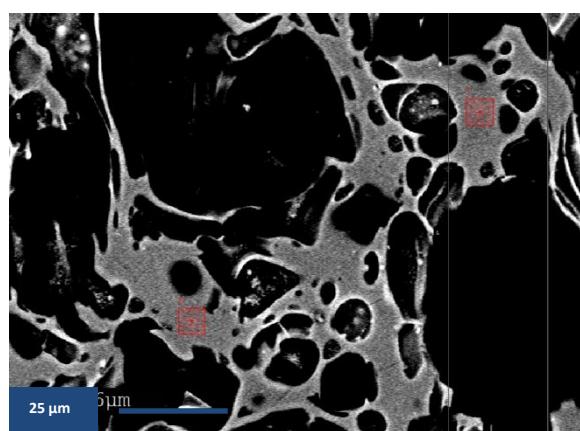
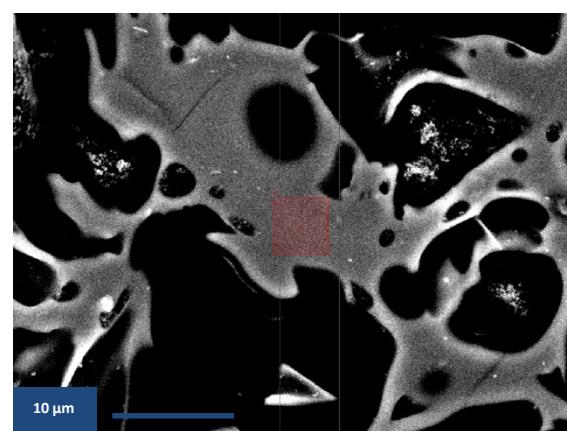


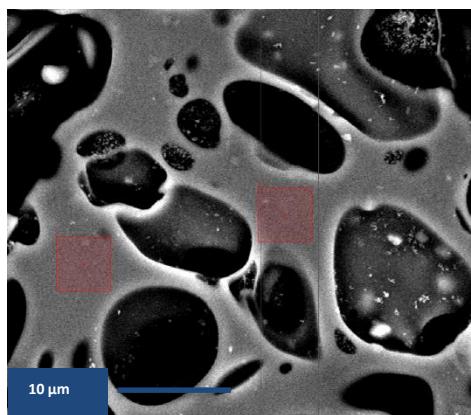
Figure F2-3. Overview picture of the S_{P3} glass shard data points 1-5, the focus beam for the WDS is 5 by 5 µm and 5nA, numbers represent the sampled spots.



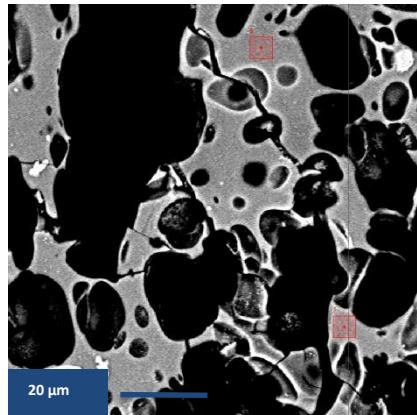
1 and 2



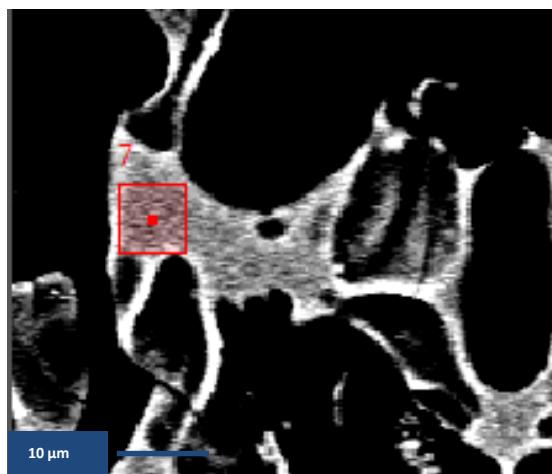
2



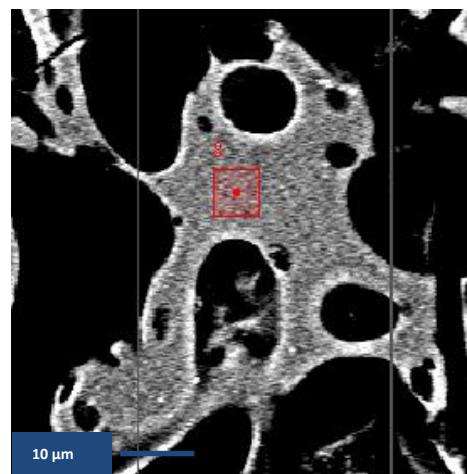
3 and 5



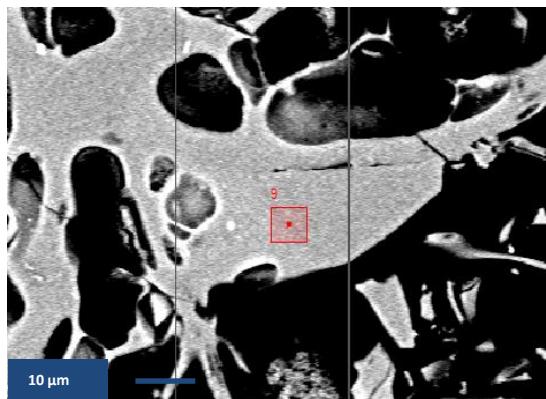
6 and 7



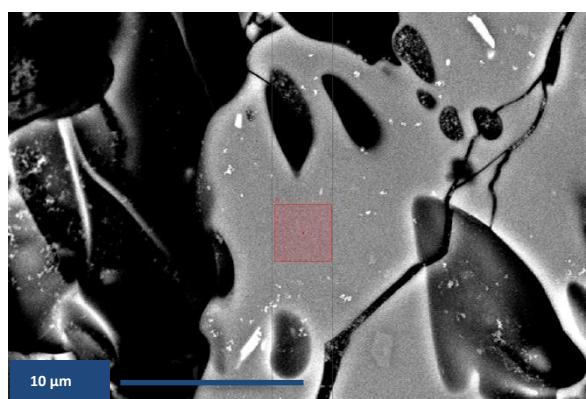
7



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Figure F2-4. Zoomed view of the different glass shards with the sampled points 1-10 without 4. Points represent the sampled sites and enclose an area of 5 by 5 μm .

Sample: S_{P5}

Number of samples: 10

11	Sample 5-1	16	Sample 5-6
12	Sample 5-2	17	Sample 5-7
13	Sample 5-3	18	Sample 5-8
14	Sample 5-4	19	Sample 5-9
15	Sample 5-5	20	Sample 5-10

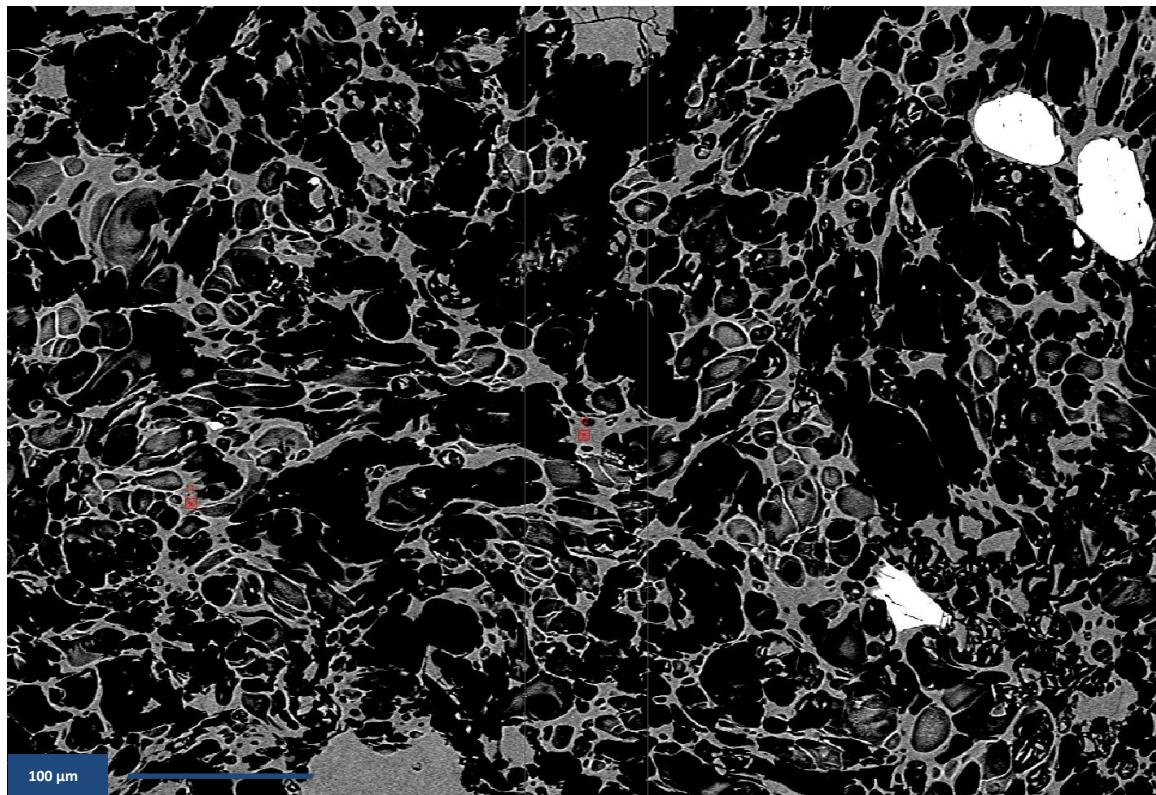
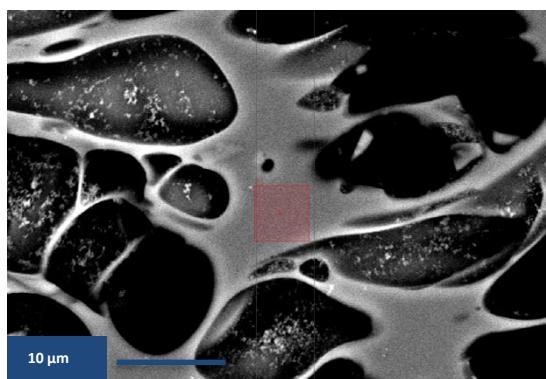
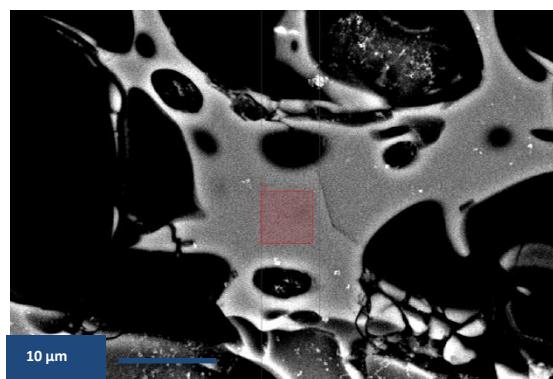


Figure F2-5. Overview picture of the sample 3 glass shard data points 11-12, the focus beam for the WDS is 5 by 5 μm and 5nA, numbers represent the sampled spots.



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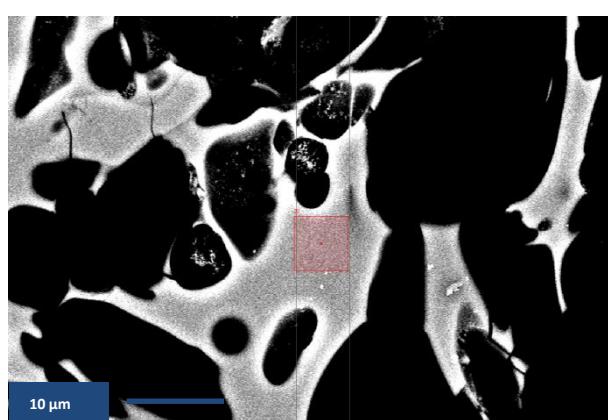
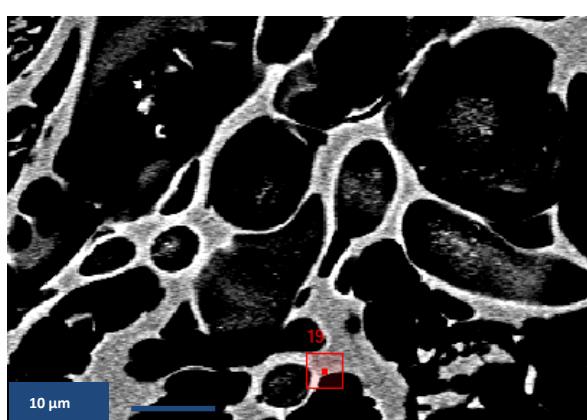
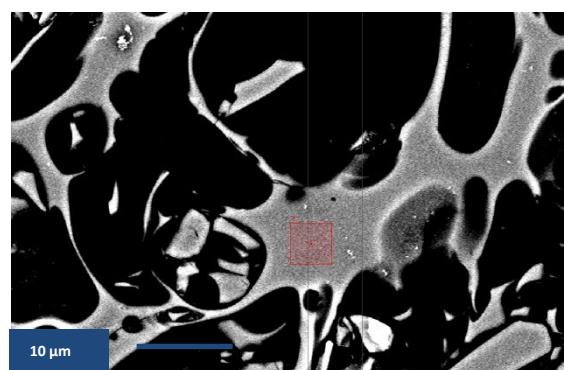
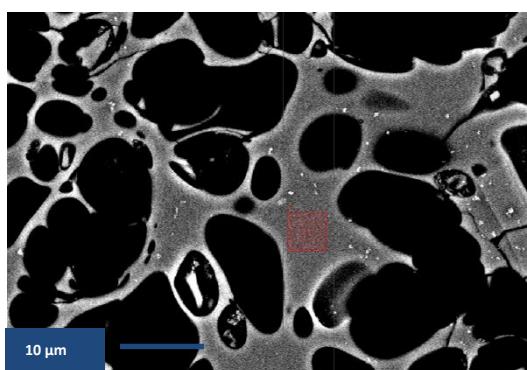
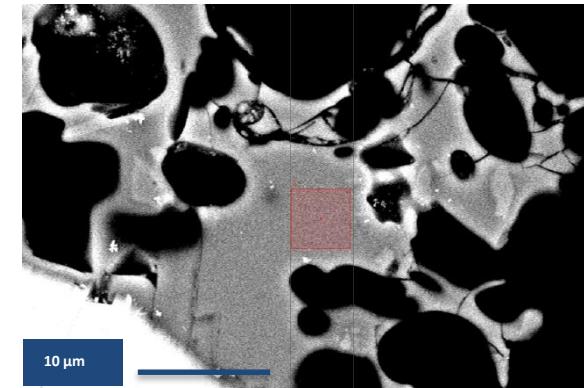
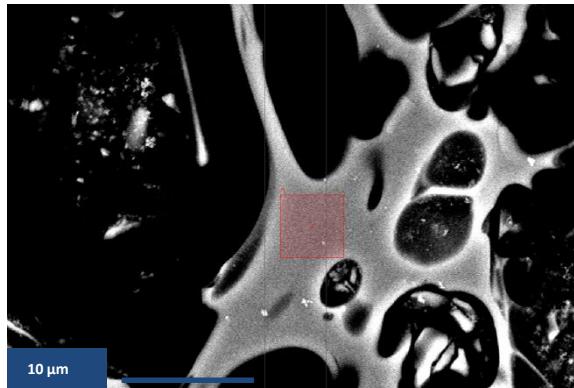
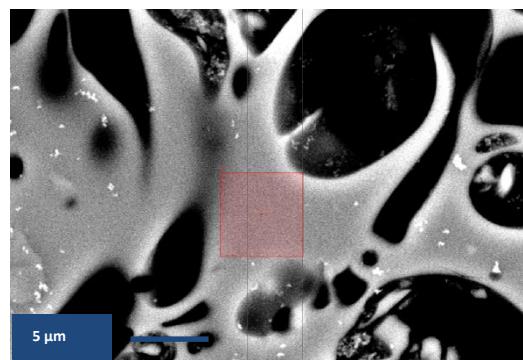
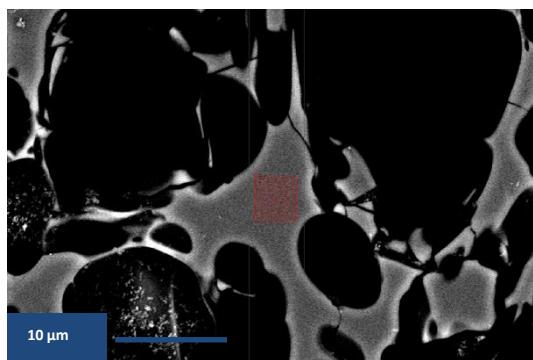


Figure F2-6. Zoomed view of the different glass shards with the sampled points 11-20. Points represent the sampled sites and enclose an area of 5 by 5 μm .

Sample: S_{P6}

Number of samples: 10

21	Sample 6-1	26	Sample 6-6
22	Sample 6-2	27	Sample 6-7
23	Sample 6-3	28	Sample 6-8
24	Sample 6-4	29	Sample 6-9
25	Sample 6-5	30	Sample 6-10

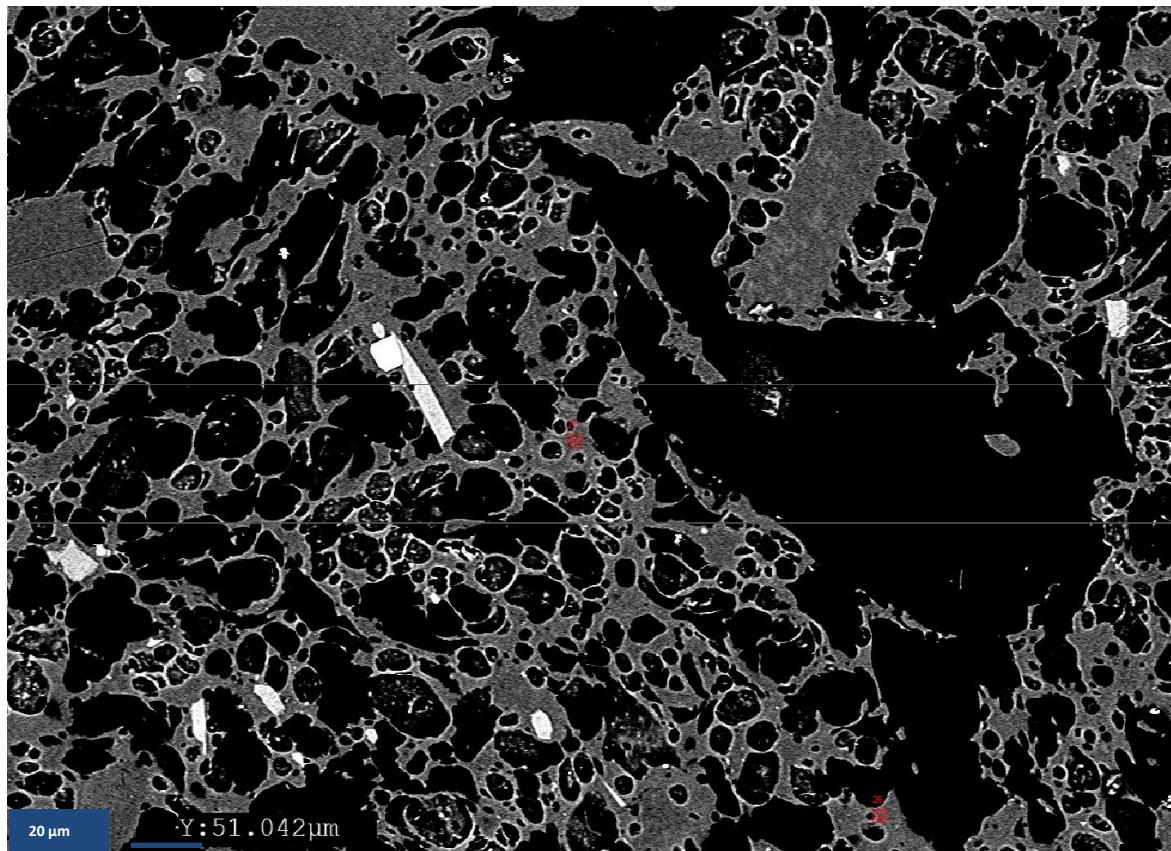
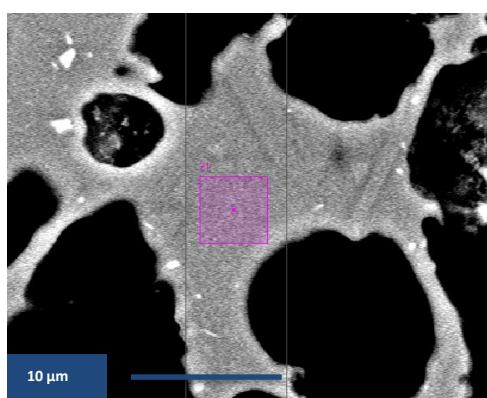
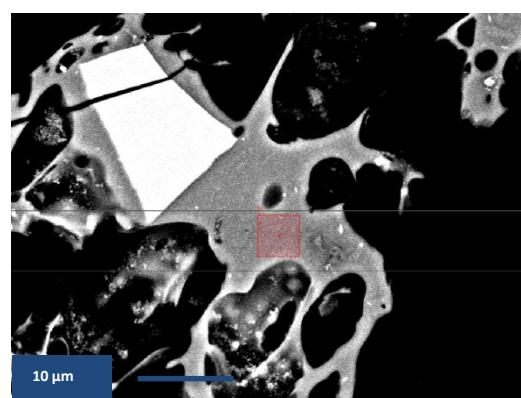


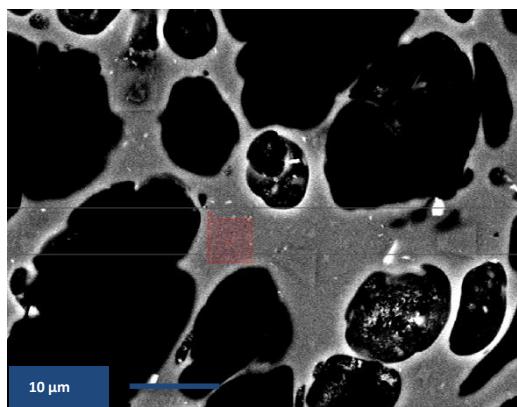
Figure F2-7. Overview picture of the sample 6 glass shard data points 26-27, the focus beam for the WDS is 5 by 5 μm and 5nA, numbers represent the sampled spots.



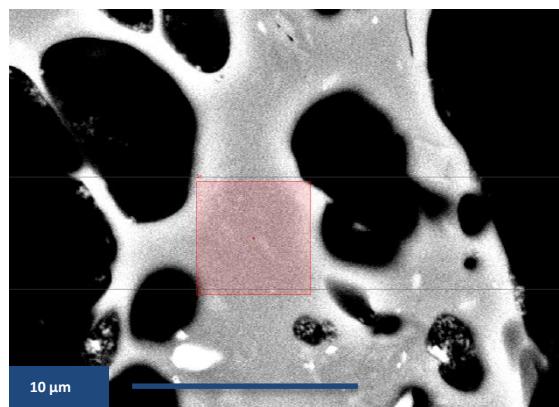
21



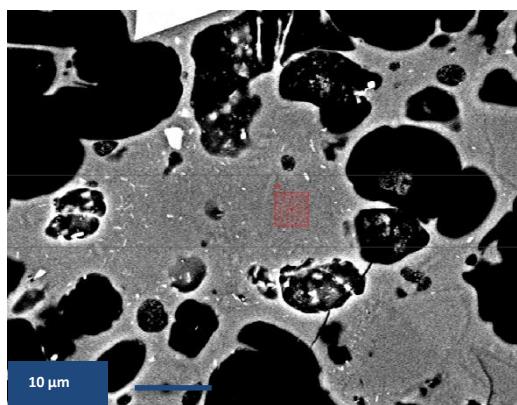
22



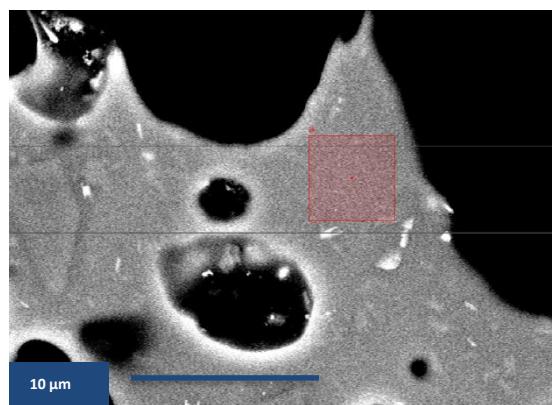
23



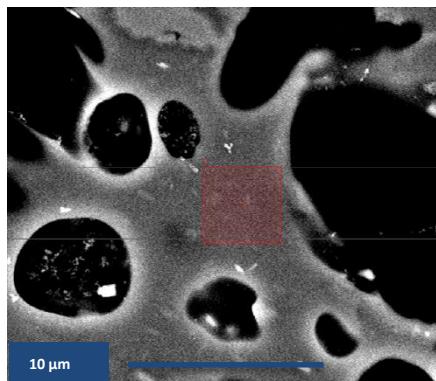
24



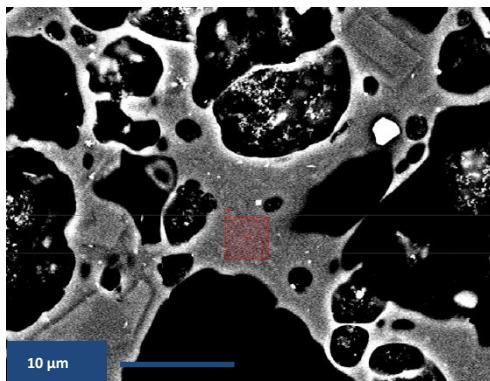
25



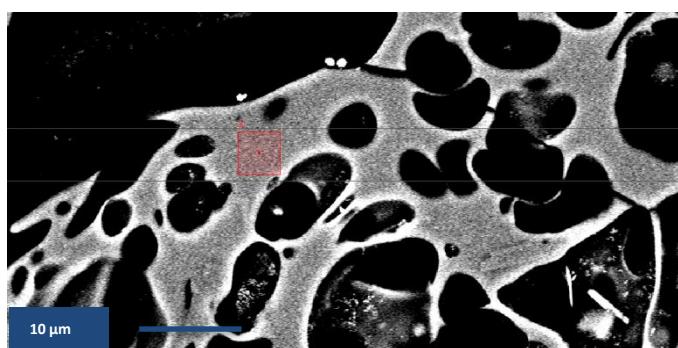
26



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Figure F2-8. Zoomed view of the different glass shards with the sampled points 21-30, without 28. Points represent the sampled and enclose an area of 5 by 5 µm.

F2 session 30-4-2015

Samples measured: S_{P4}, S_{P7}-S_{P12}.

Sample: S_{P7}

Number of samples: 6

1	Sample 7-1, NCU
2	Sample 7-2
3	Sample 7-3
4	Sample 7-4
5	Sample 7-5
6	Sample 7-6

*NCU: no close up.

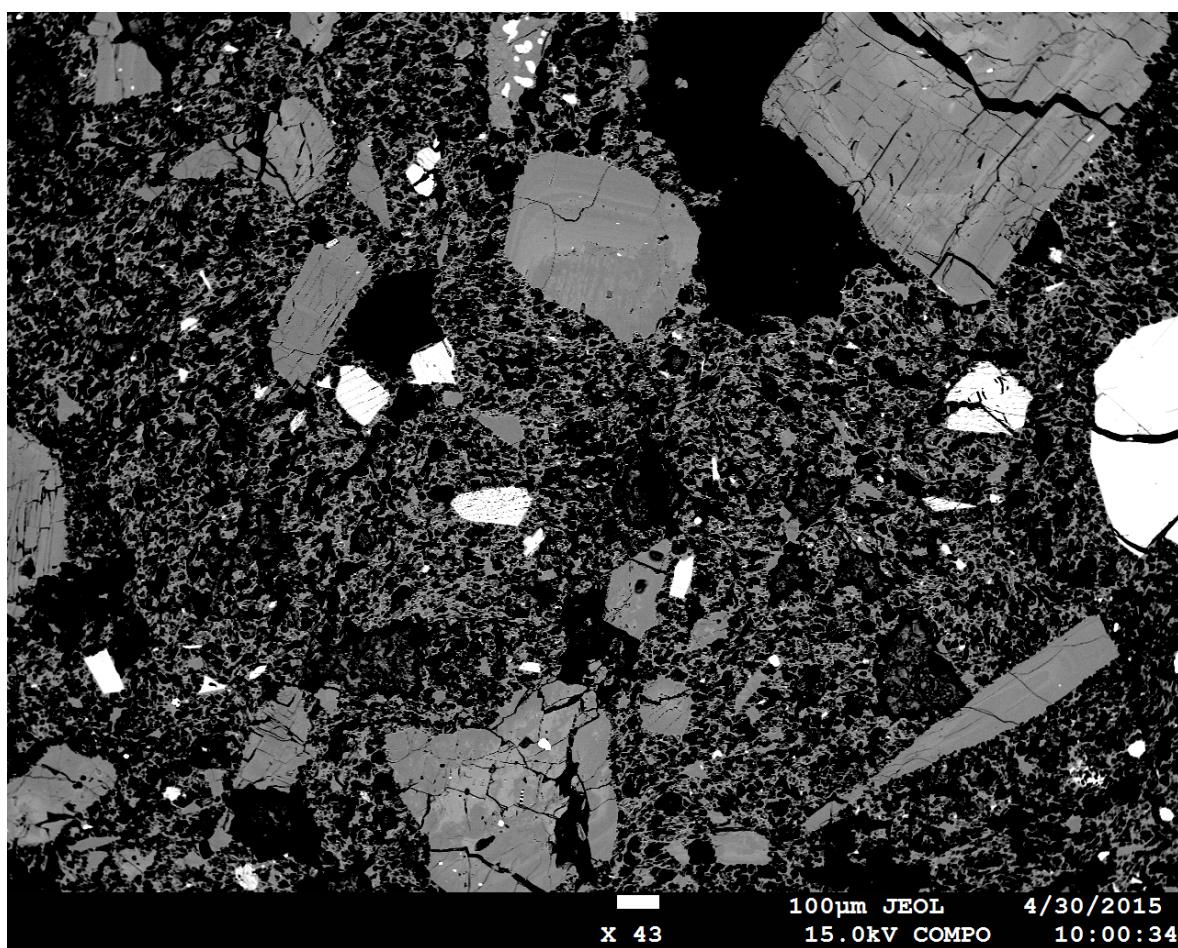


Figure F3-1. Overview picture of the S_{P7} glass shard, the focus beam for the WDS is 5 by 5 μm and 5nA.

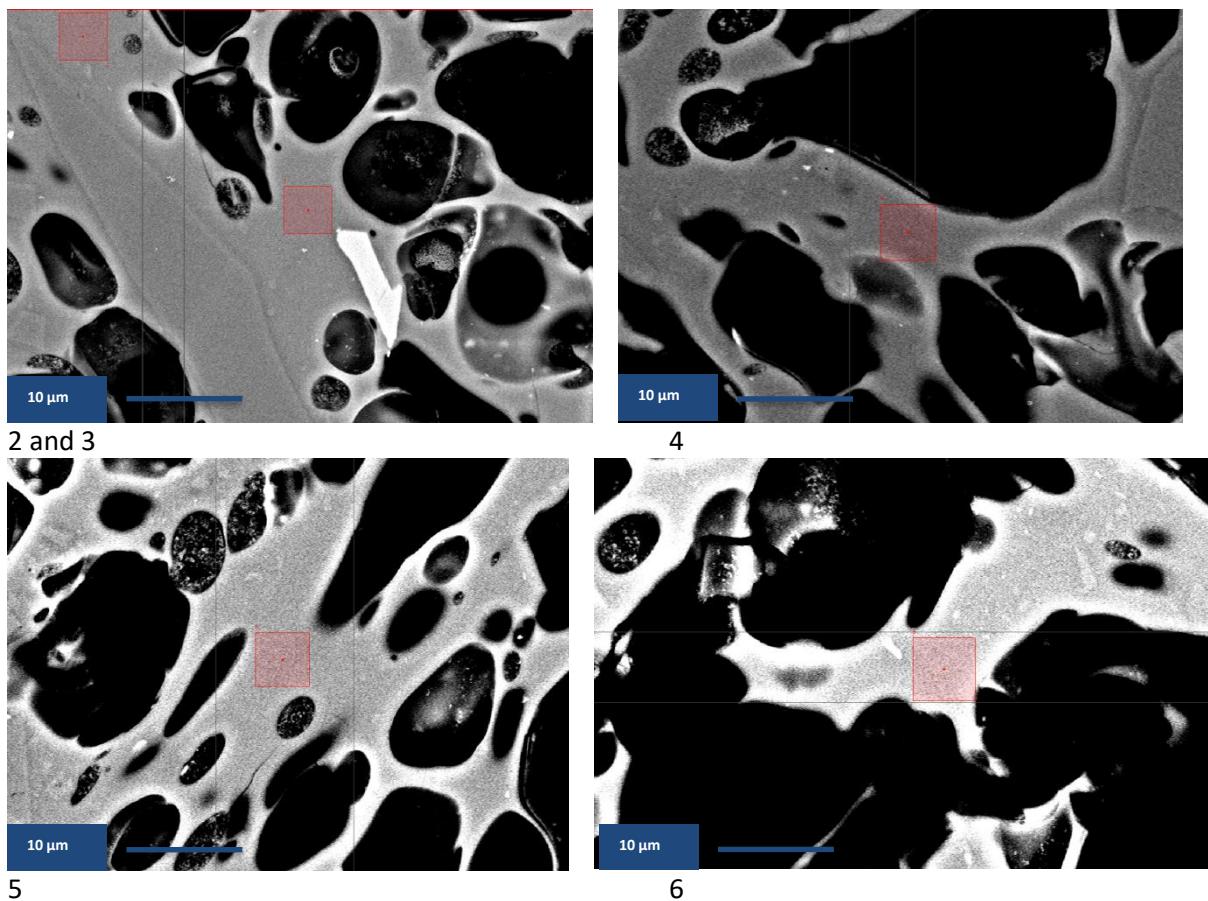


Figure F3-2. Zoomed view of the different glass shards with the sampled points. Points represent the sampled sites and enclose an area of 5 by 5 μm .

Sample: S_{P8}

Number of samples: 7

7	Sample 8-1
8	Sample 8-2
9	Sample 8-3
10	Sample 8-4
11	Sample 8-5
12	Sample 8-6
13	Sample 8-7

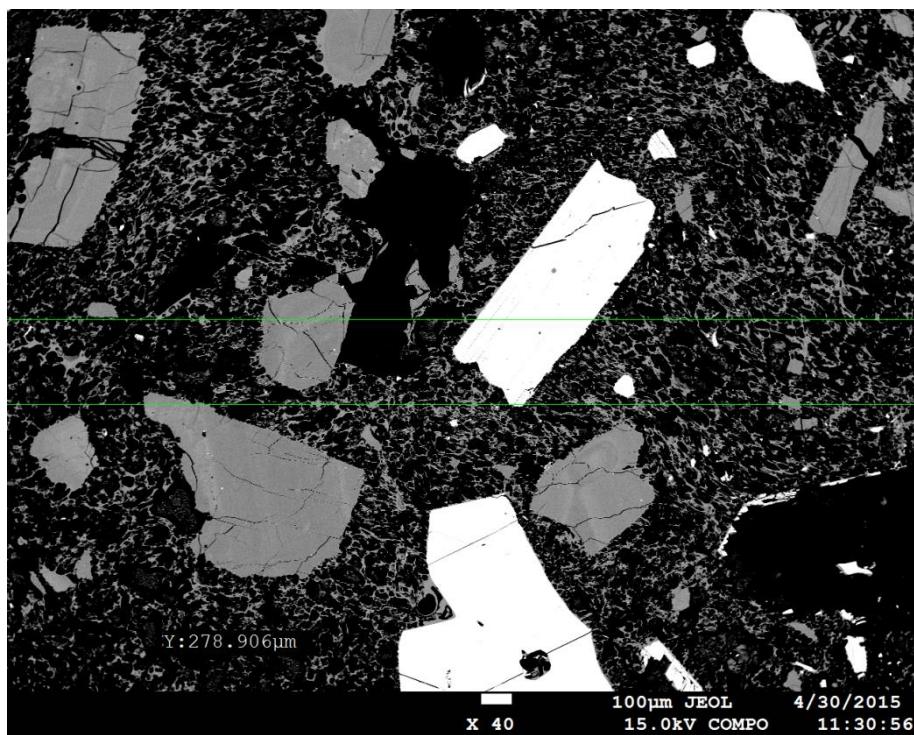
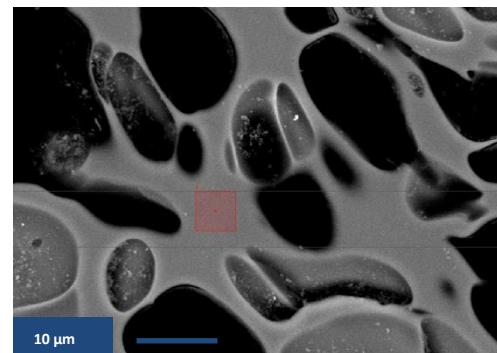
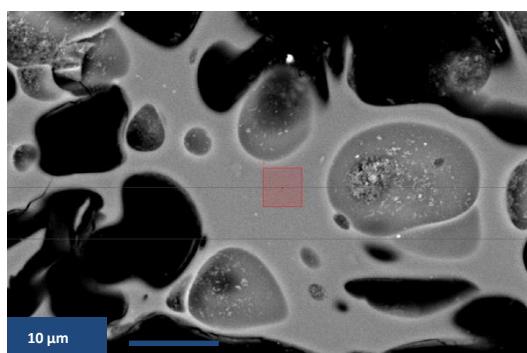
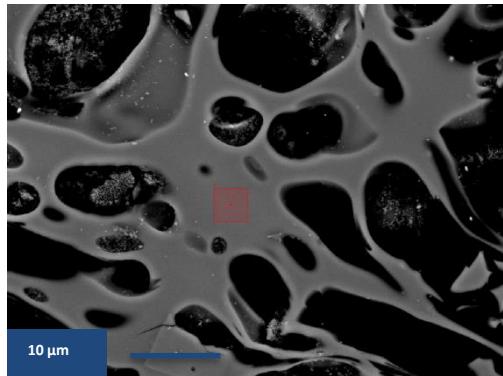


Figure F3-3. Overview picture of the S_{P8} glass shard, the focus beam for the WDS is 5 by 5 μm and 5nA.

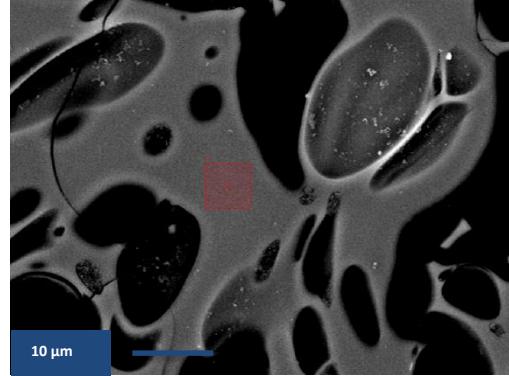


7

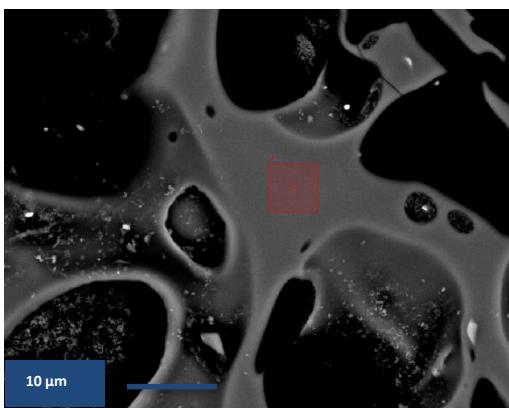
8



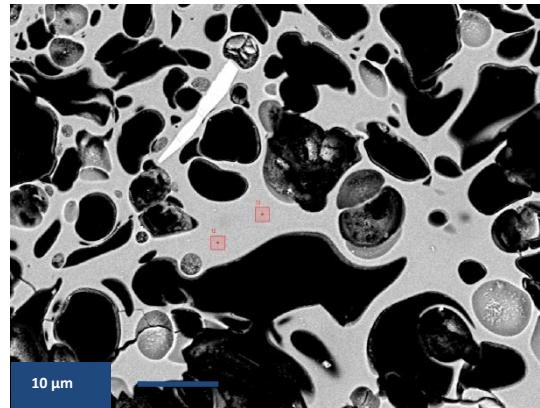
9



10



11



12 and 13

Figure F3-4. Zoomed view of the different glass shards with the sampled points. Points represent the sampled sites and enclose an area of 5 by 5 µm.

Sample: S_{P9}

Number of samples: 7

14	Sample 9-1
15	Sample 9-2
16	Sample 9-3
17	Sample 9-4
18	Sample 9-5
19	Sample 9-6
20	Sample 9-7

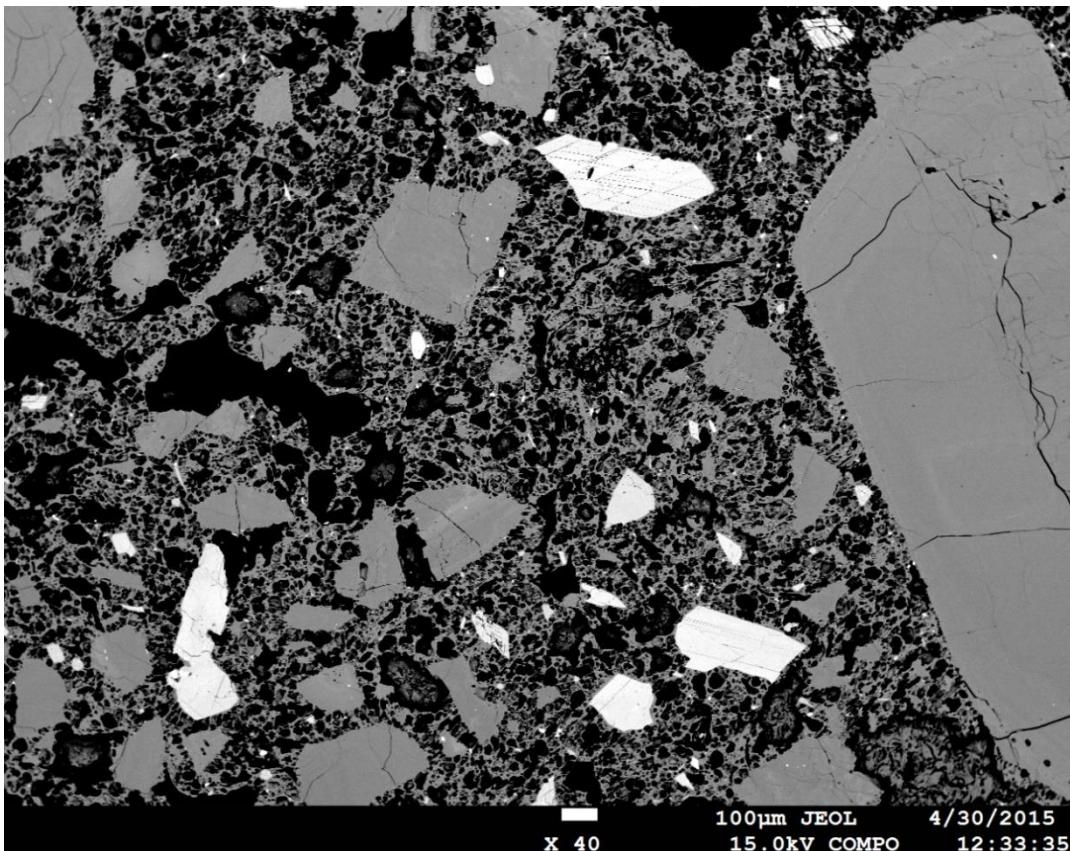


Figure F3-5. Overview picture of the S_{P9} glass shard, the focus beam for the WDS is 5 by 5 µm and 5nA.

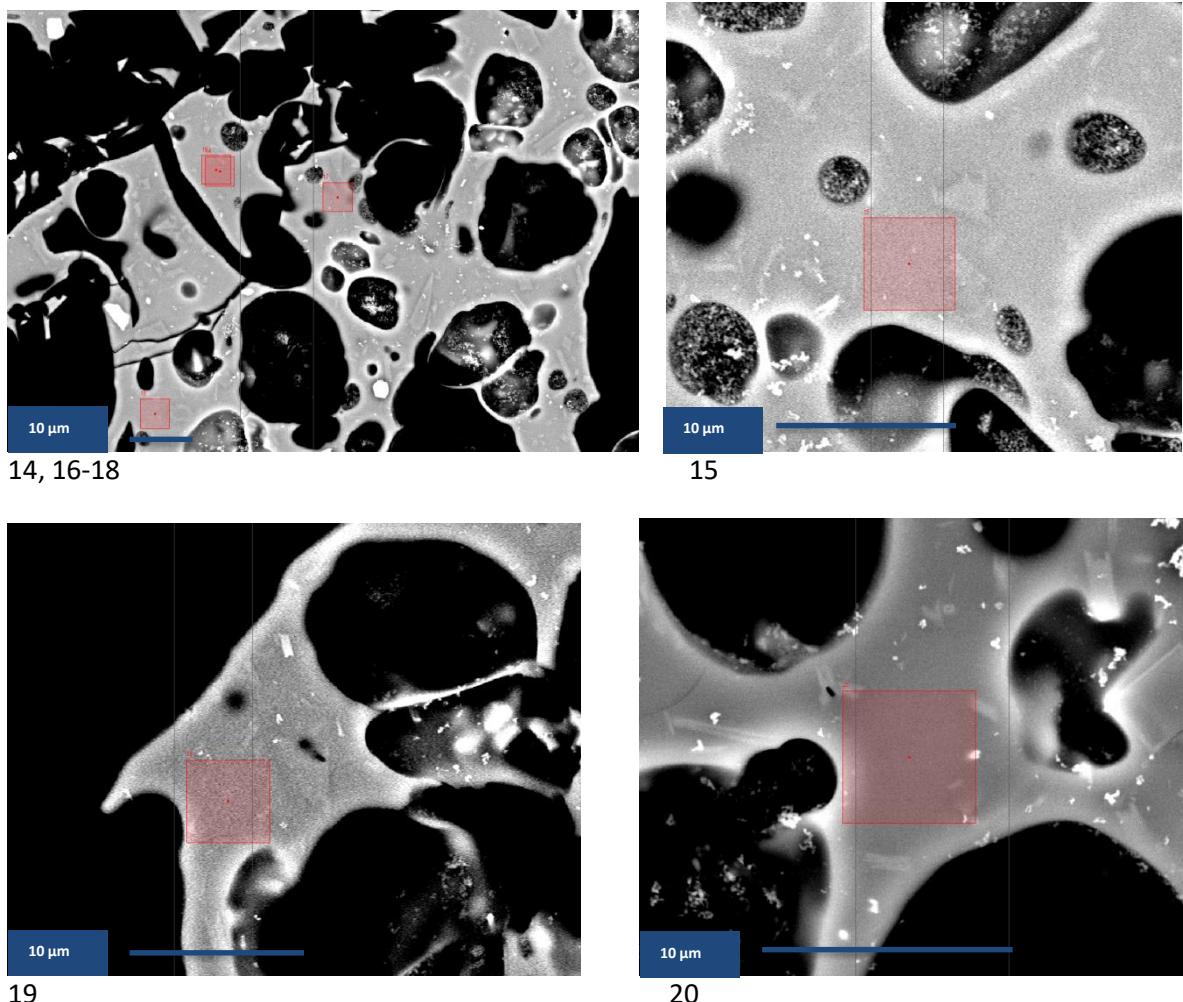


Figure F3-6. Zoomed view of the different glass shards with the sampled points 14-20. Points represent the sampled sites and enclose an area of 5 by 5 μm .

Sample: S_{P4}

Number of samples: 7

21	Sample 4-1
22	Sample 4-2
23	Sample 4-3
24	Sample 4-4
25	Sample 4-5
26	Sample 4-6
27	Sample 4-7

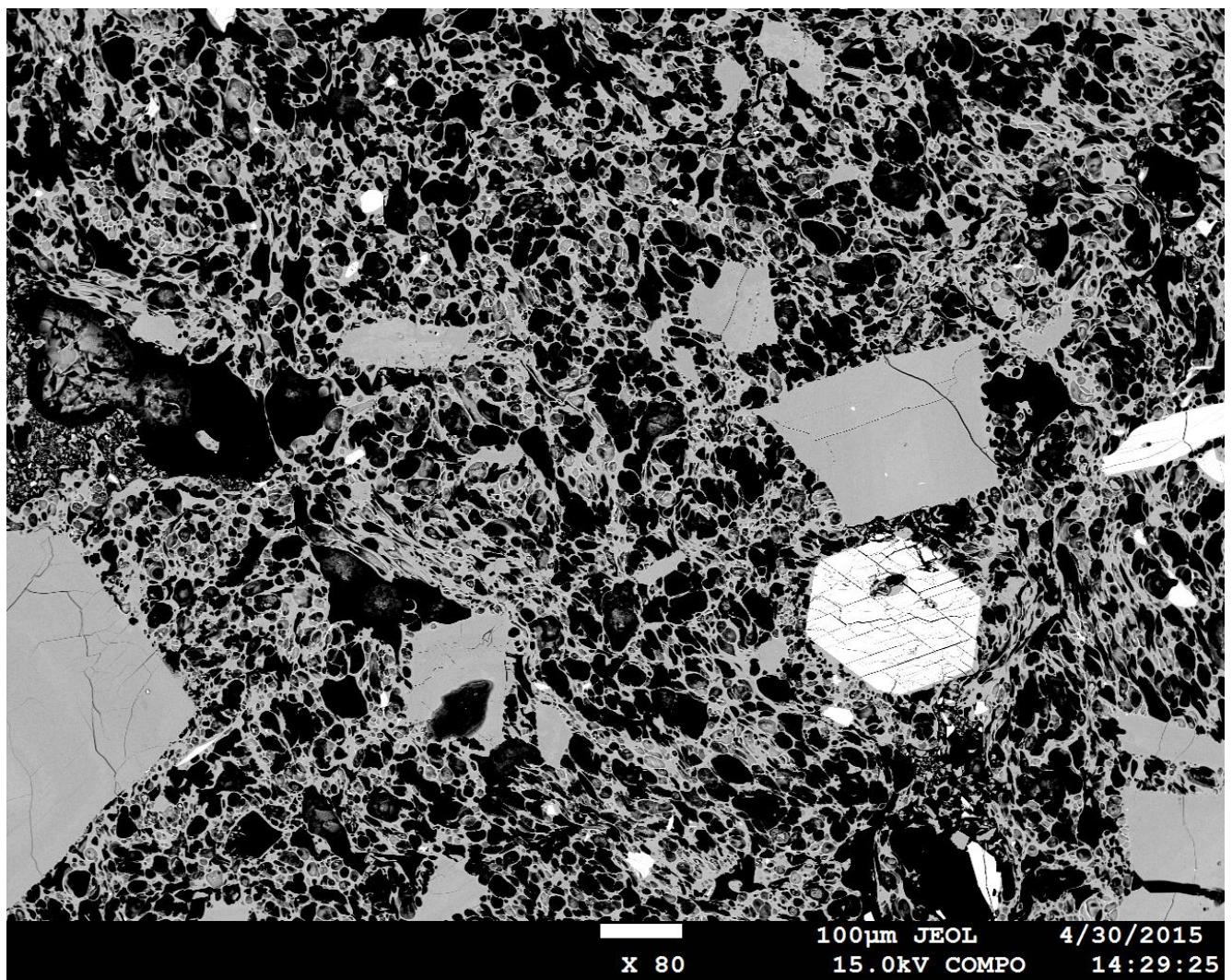
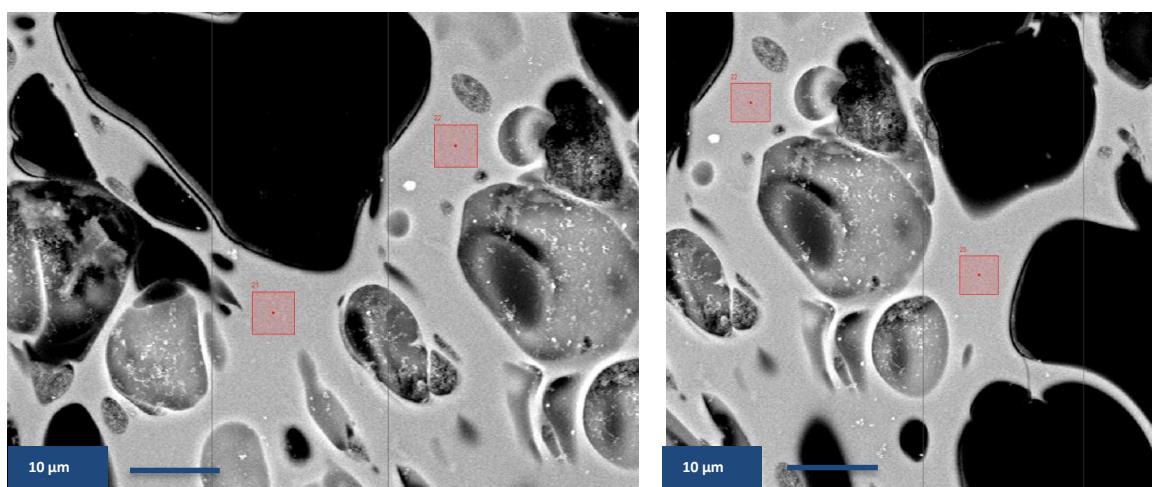
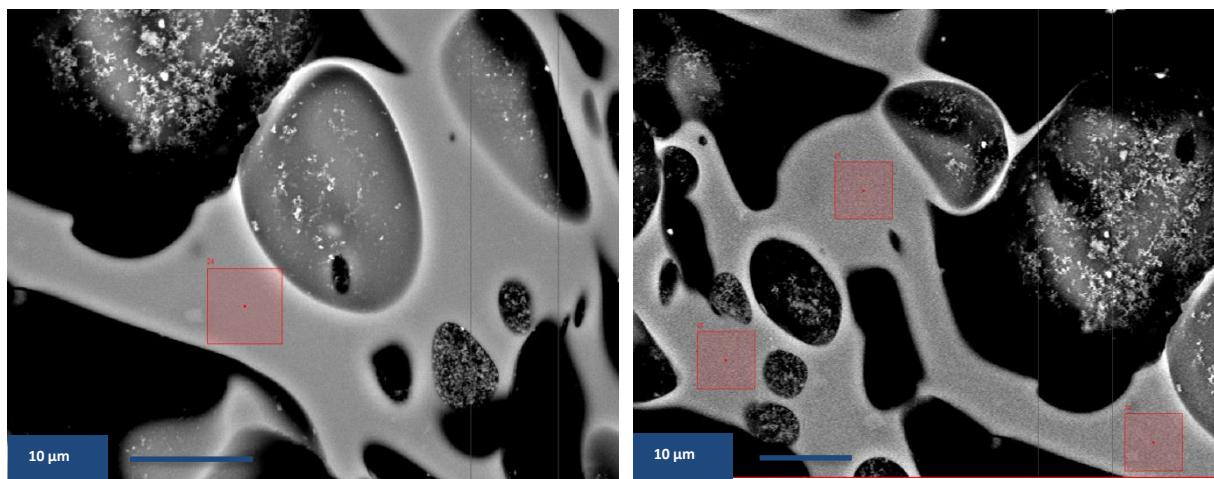


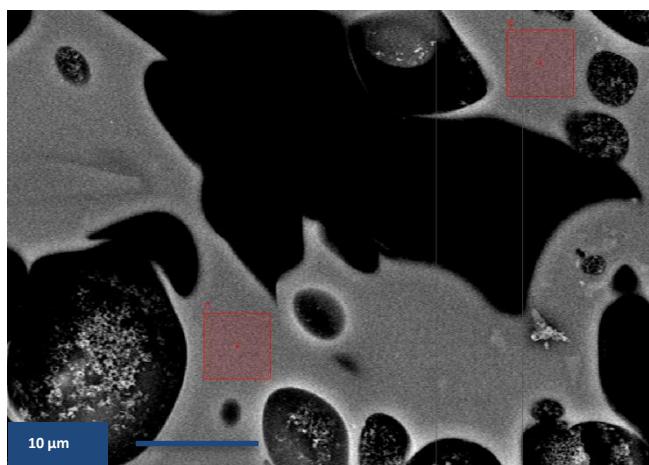
Figure F3-7. Overview picture of the Sp₄ glass shard, the focus beam for the WDS is 5 by 5 µm and 5nA.





24

24-26



26 and 27

Figure F3-8. Zoomed view of the different glass shards with the sampled points 21-27. Points represent the sampled sites and enclose an area of 5 by 5 μm .

Sample: S_{P11}

Number of samples: 7

28	Sample 11-1
29	Sample 11-2
30	Sample 11-3
31	Sample 11-4
32	Sample 11-5
33	Sample 11-6
34	Sample 11-7

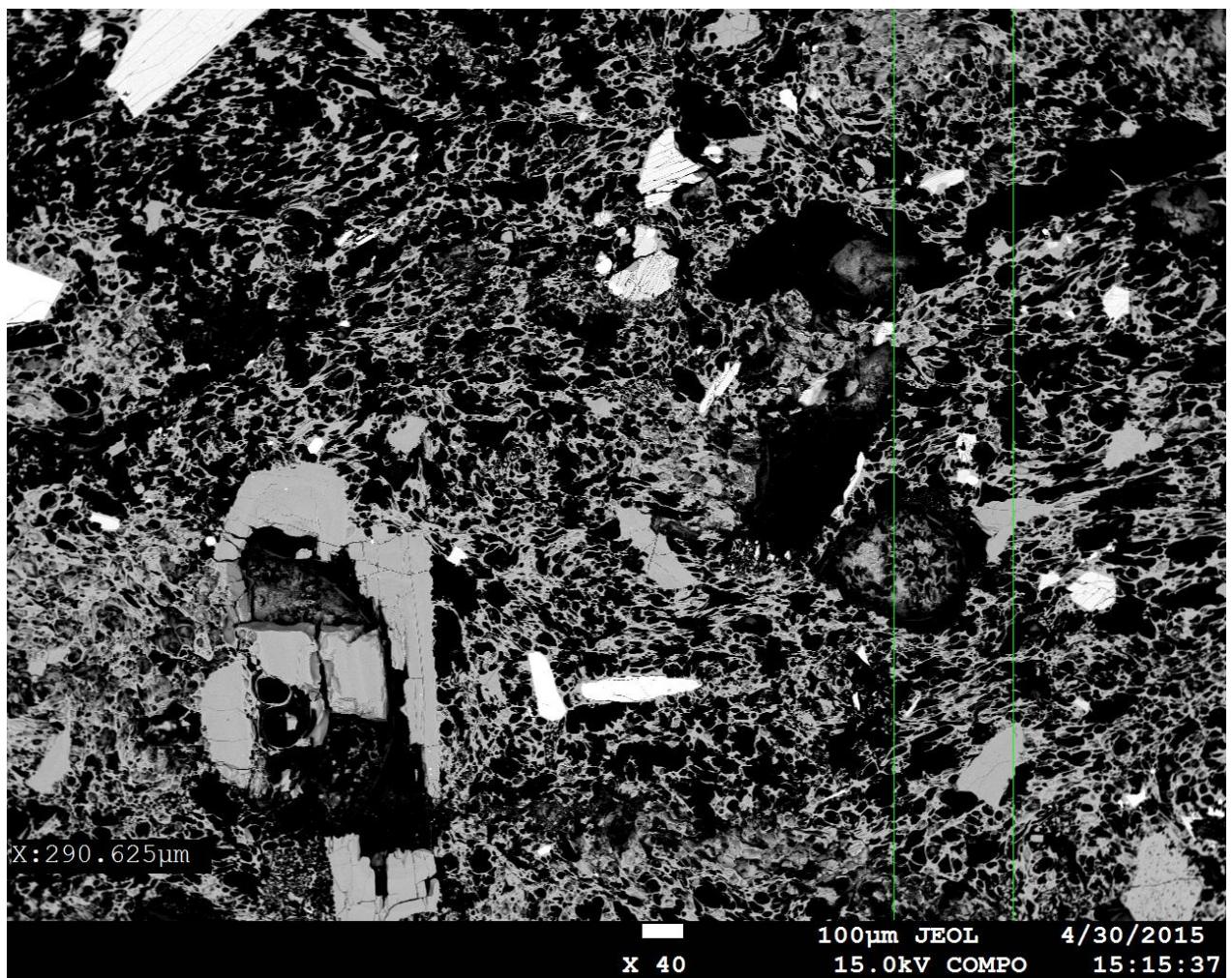
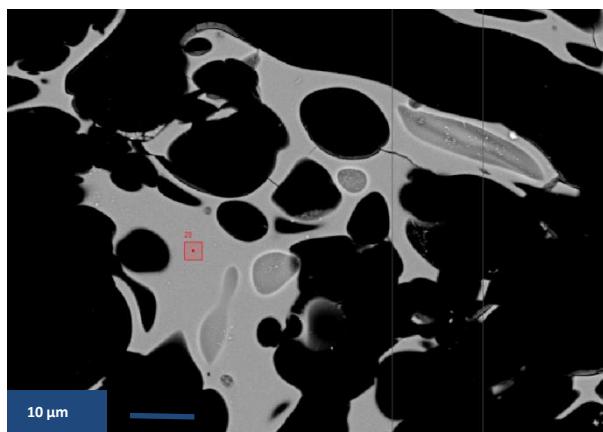
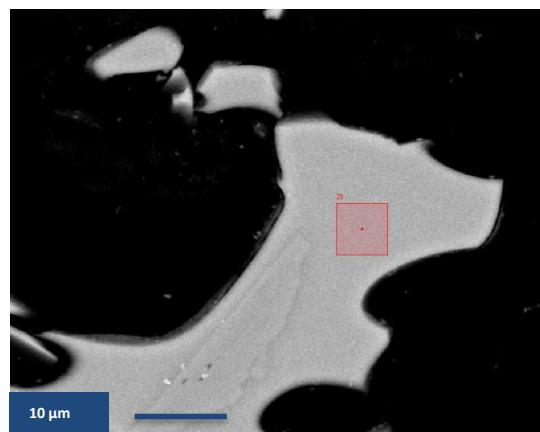


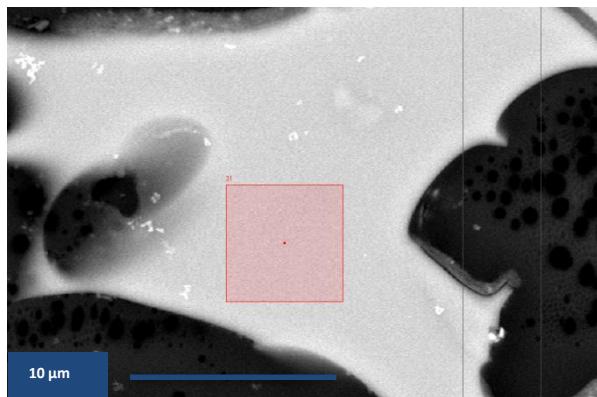
Figure F3-9. Overview picture of the S_{P11} glass shard, the focus beam for the WDS is 5 by 5 μm and 5nA.



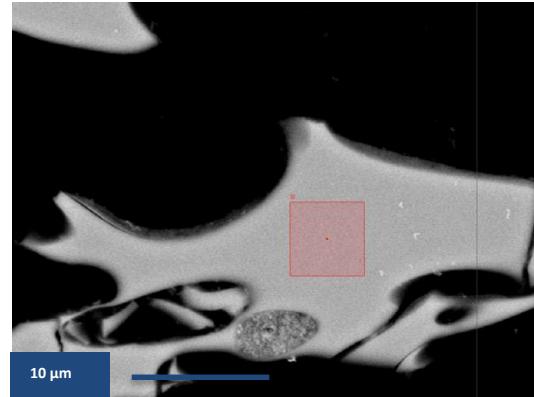
28



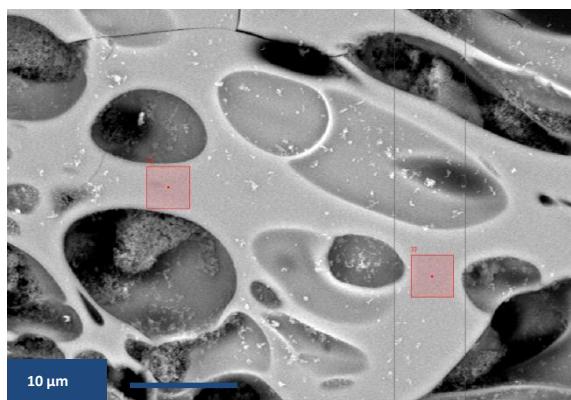
29



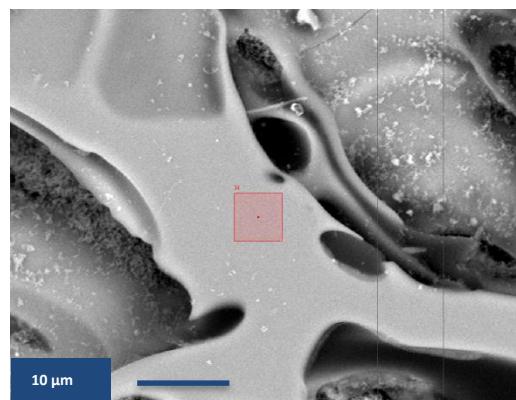
30



31



32, 33



34

Figure F3-10. Zoomed view of the different glass shards with the sampled points 28-34. Points represent the sampled sites and enclose an area of 5 by 5 μm.

Sample: S_{P10}

Number of samples: 6

35	Sample 10-1
36	Sample 10-2
37	Sample 10-3
38	Sample 10-4
39	Sample 10-5
40	Sample 10-6

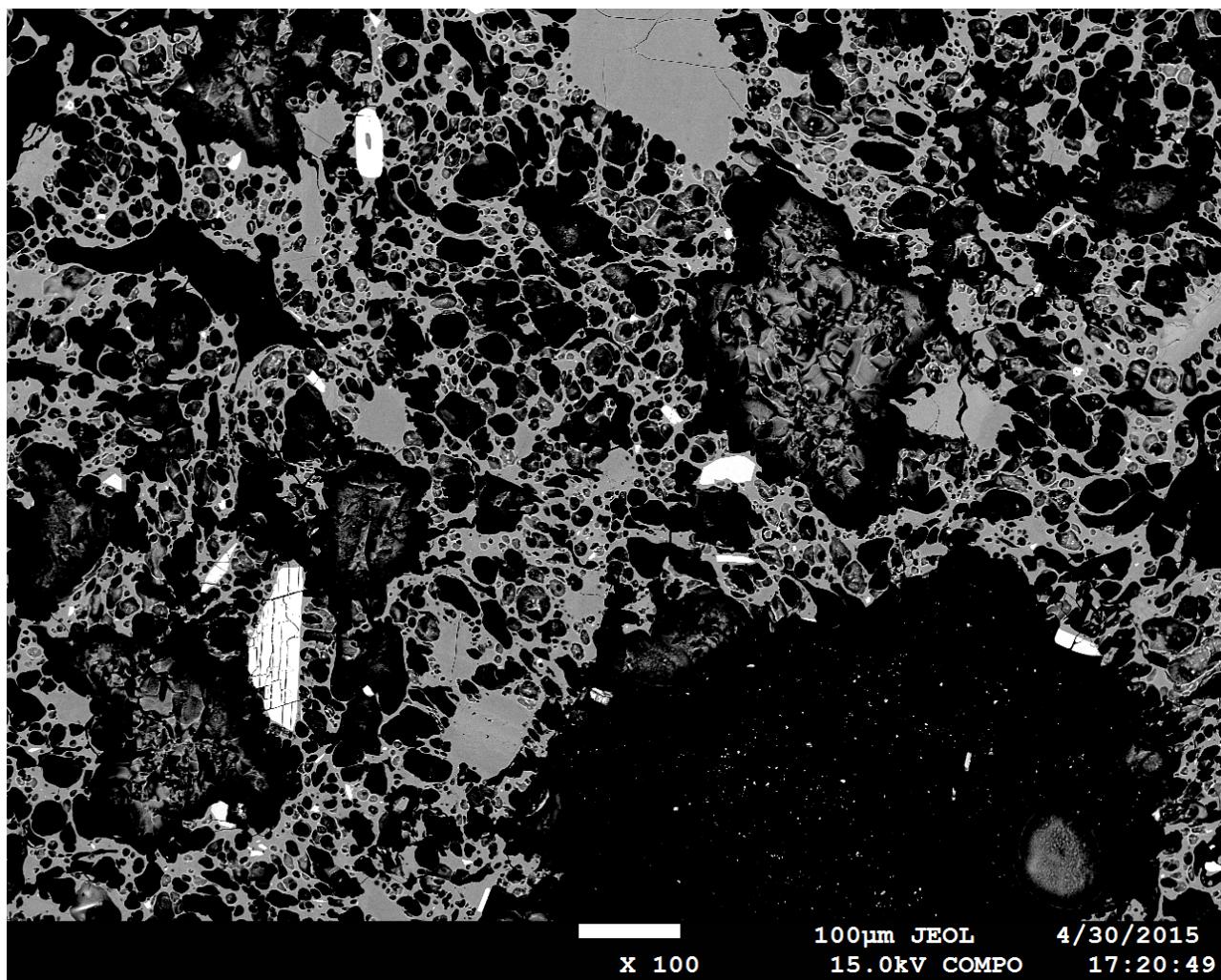
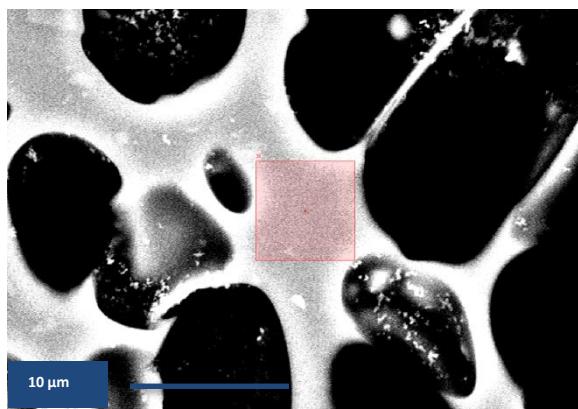
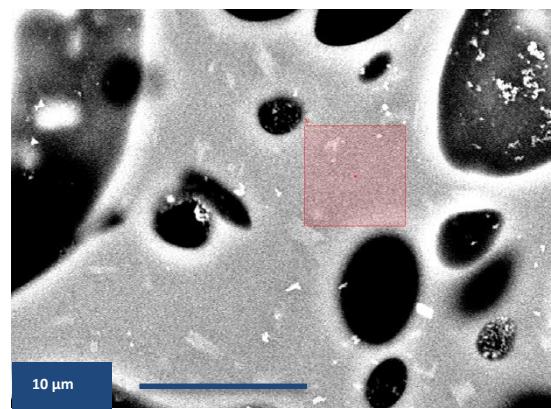


Figure F3-11. Overview picture of the S_{P10} glass shard, the focus beam for the WDS is 5 by 5 μm and 5nA.

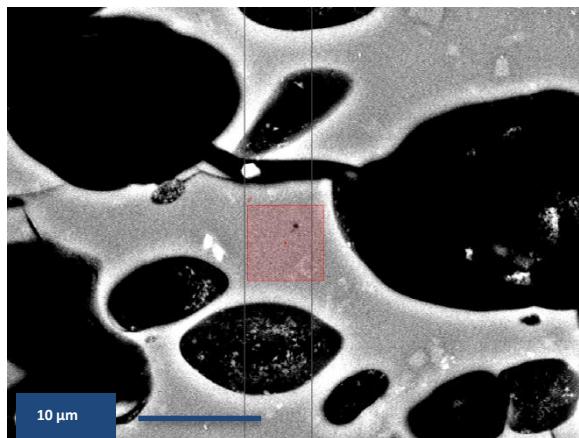


35

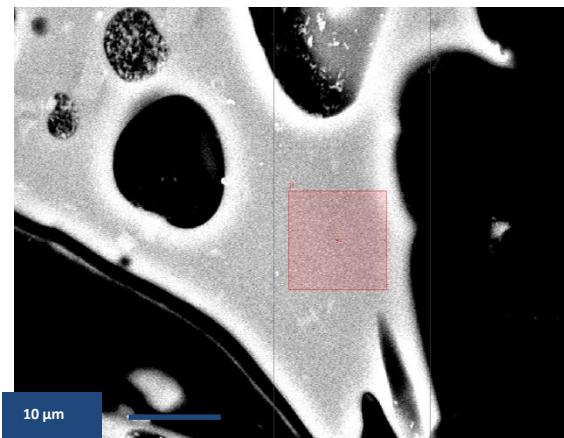


36

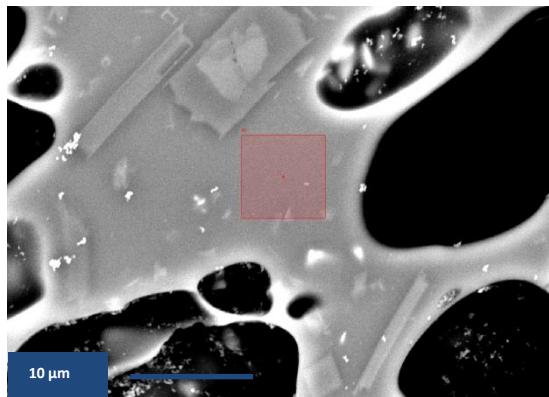
140



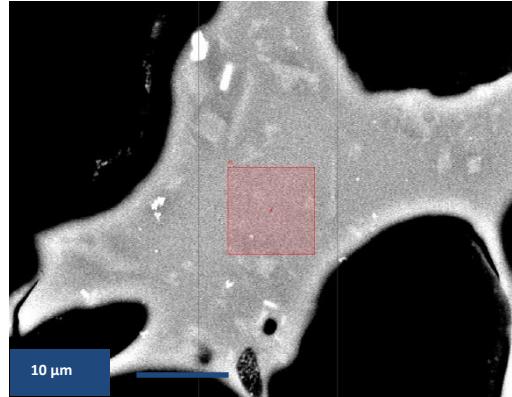
37



38



39



40

Figure F3-12. Zoomed view of the different glass shards with the sampled points 35-40. Points represent the sampled sites and enclose an area of 5 by 5 µm.

Sample: S_{P12}

Number of samples: 12

41	Sample 12-1
42	Sample 12-2
43	Sample 12-3
44	Sample 12-4
45	Sample 12-5
46	Sample 12-6
47	Sample 12-7
48	Sample 12-8
49	Sample 12-9
50	Sample 12-10
51	Sample 12-11
52	Sample 12-12

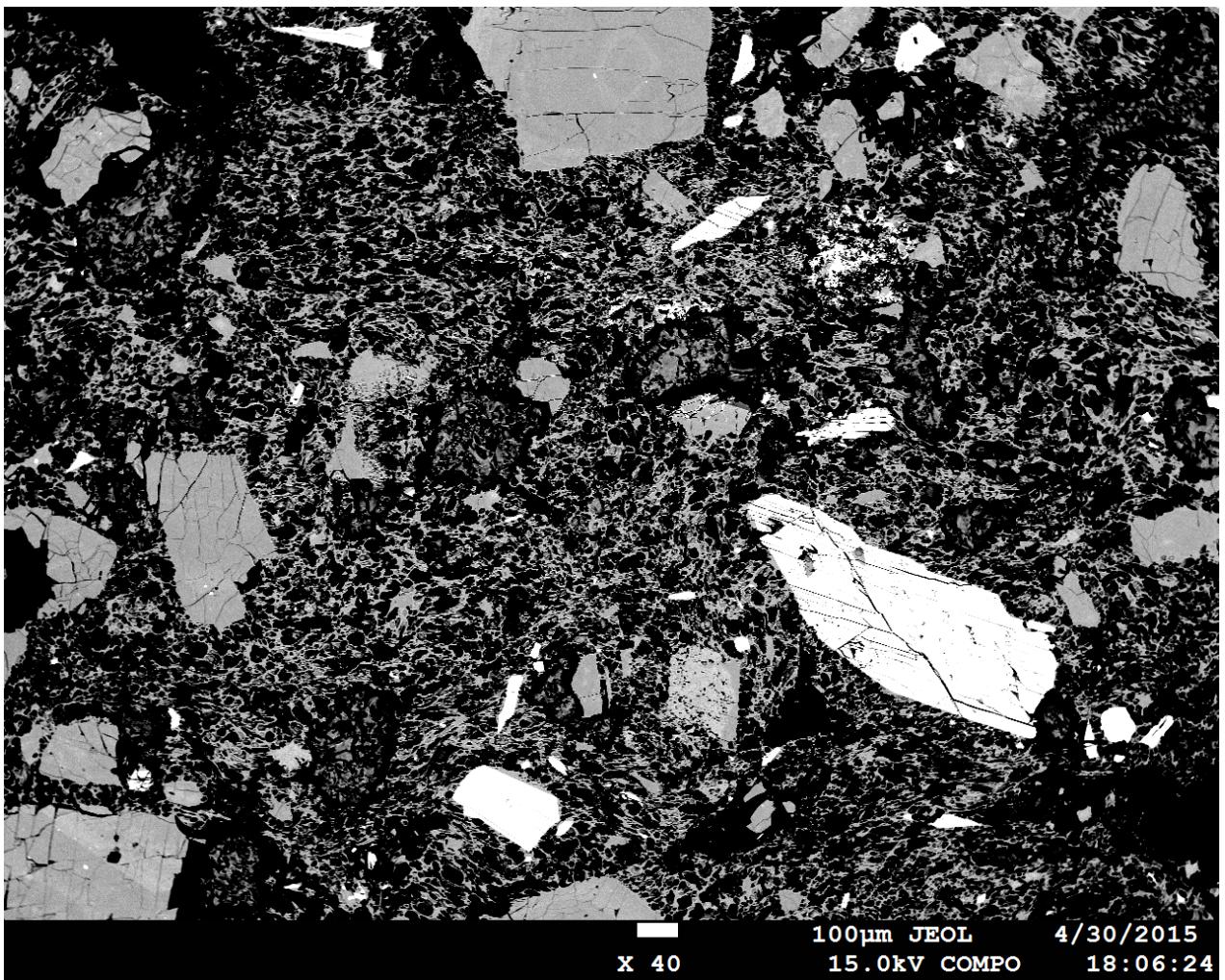
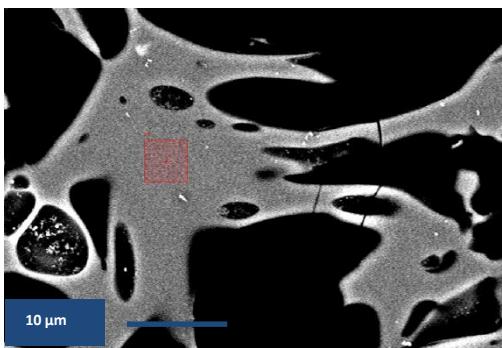
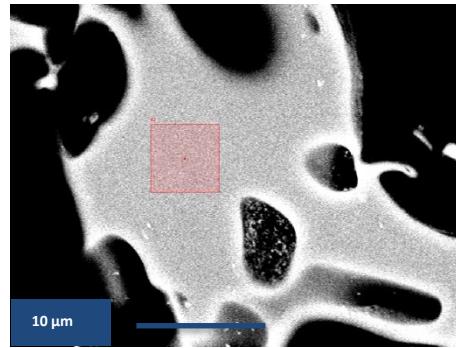


Figure F3-13. Overview picture of the S_{P12} glass shard, the focus beam for the WDS is 5 by 5 μm and 5nA.

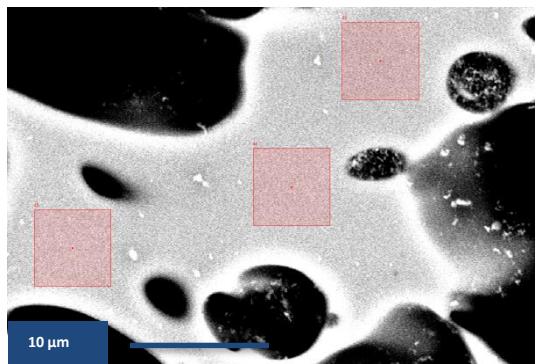


41

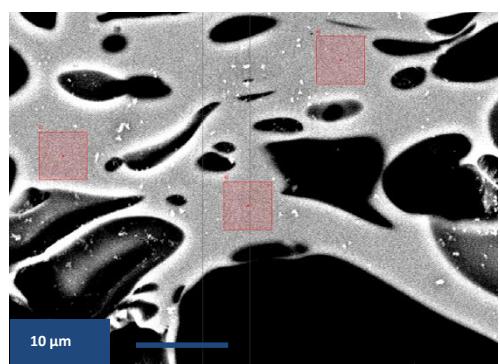


42

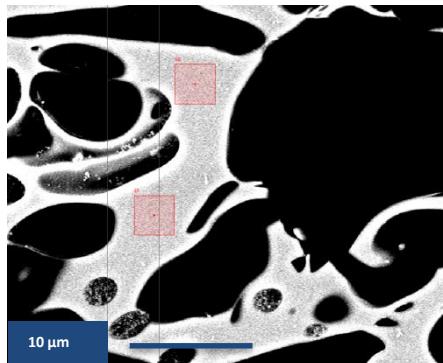
142



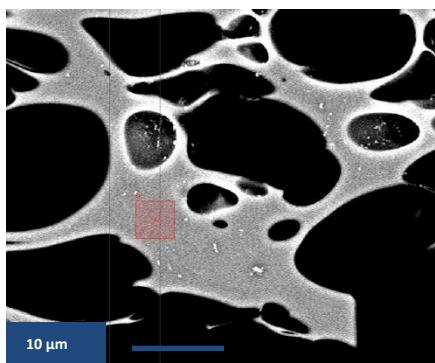
43-45



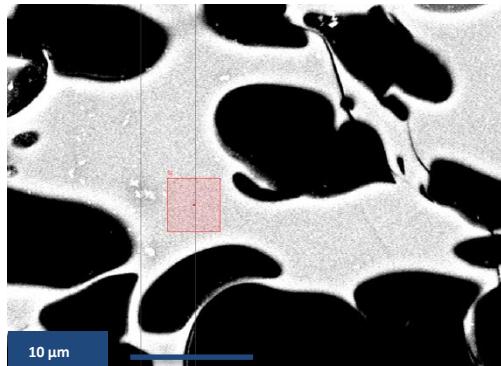
46-48



49,50



51



52

Figure F3-14. Zoomed view of the different glass shards with the sampled points 41-52. Points represent the sampled sites and enclose an area of 5 by 5 μm .

F3 sessions 1-6-2015 and 2-6-2015

Samples measured: S_{M14}, S_{M17}-S_{M20}, S_{P26}-S_{P32}.

Sample: S_{M13}

Number of samples: none.

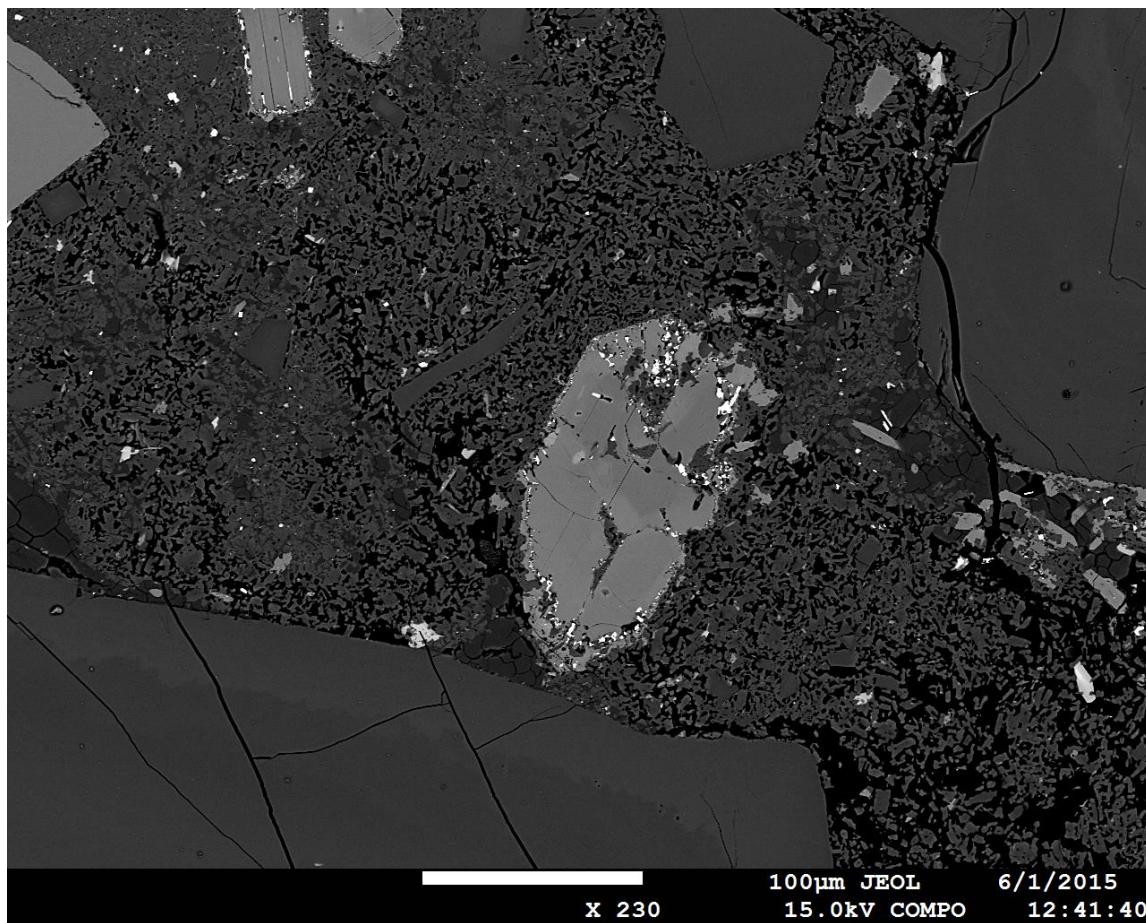


Figure F4-1. Overview picture of the S_{M13}, the focus beam for the WDS is 5 by 5 μm and 5nA.

Sample: S_{M14}

Number of samples: 11.

1	S14-1
2	S14-2
3	S14-3
4	S14-4
5	S14-5
6	S14-6 (NCU)
7	S14-7 (NCU)
8	S14-8 (NCU)
9	S14-9 (NCU)
10	S14-10 (NCU)
11	S14-11 (NCU)
12	S14-12 (NCU)

NCU: no close up.

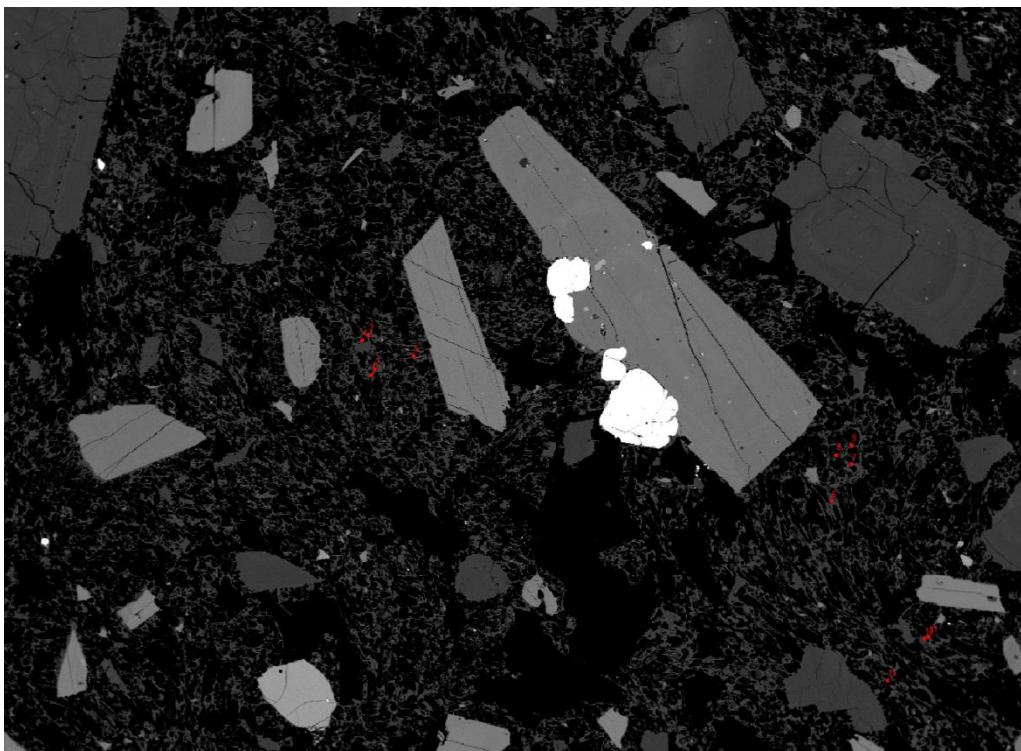


Figure F4-2. Overview picture of the S_{M14} glass shard data points 1-13 and minerals, the focus beam for the WDS is 5 by 5 μm and 5nA, numbers represent the sampled spots.

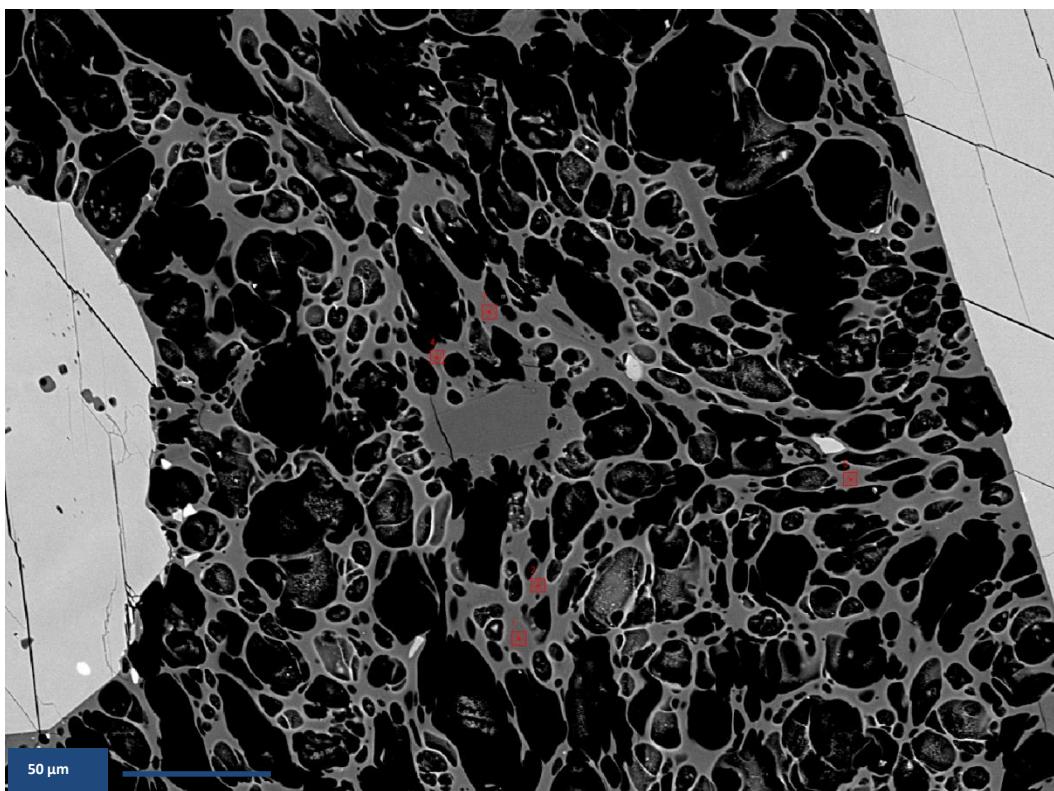


Figure F4-3. Zoom in on figure F4-2 with glass shard data points 1-5, the focus beam for the WDS is 5 by 5 μm and 5nA, numbers represent the sampled spots.

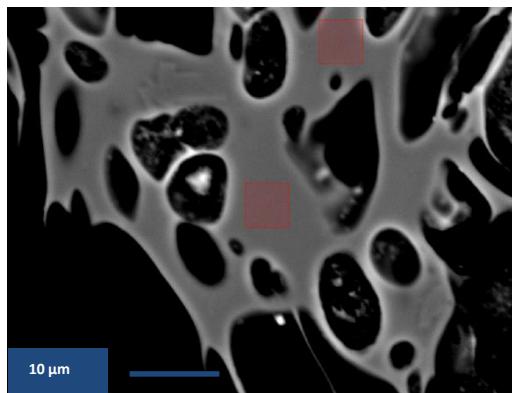


Figure F4-4. Close up picture of analysed tephra, points 1 and 2 are measured showed here.

Sample: S_{M15}

Number of samples: none.

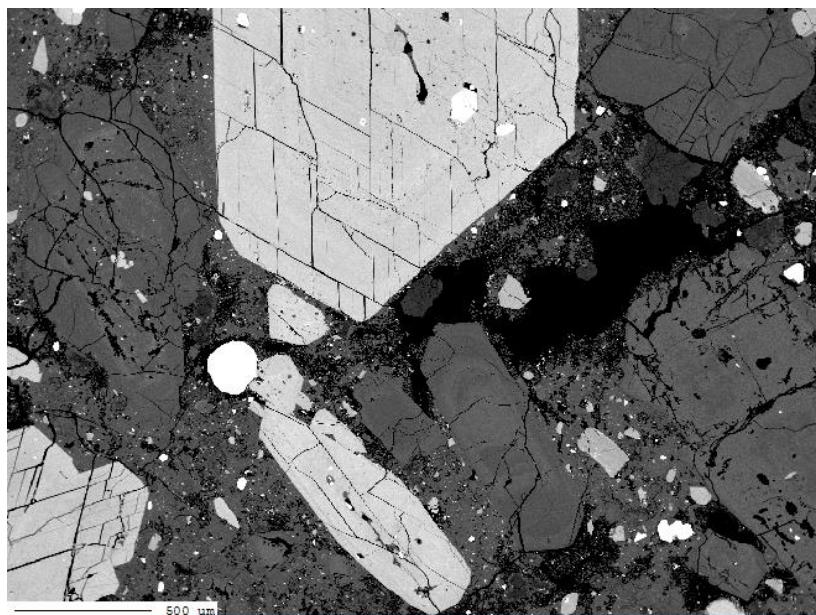


Figure F4-5. Overview picture of S_{M15}, in which the small glass matrix can be seen, too small to analyse. Minerals in picture are CPX (light grey) and plagioclase (darker grey ones).

Sample: S_{M16}

Number of samples: none.

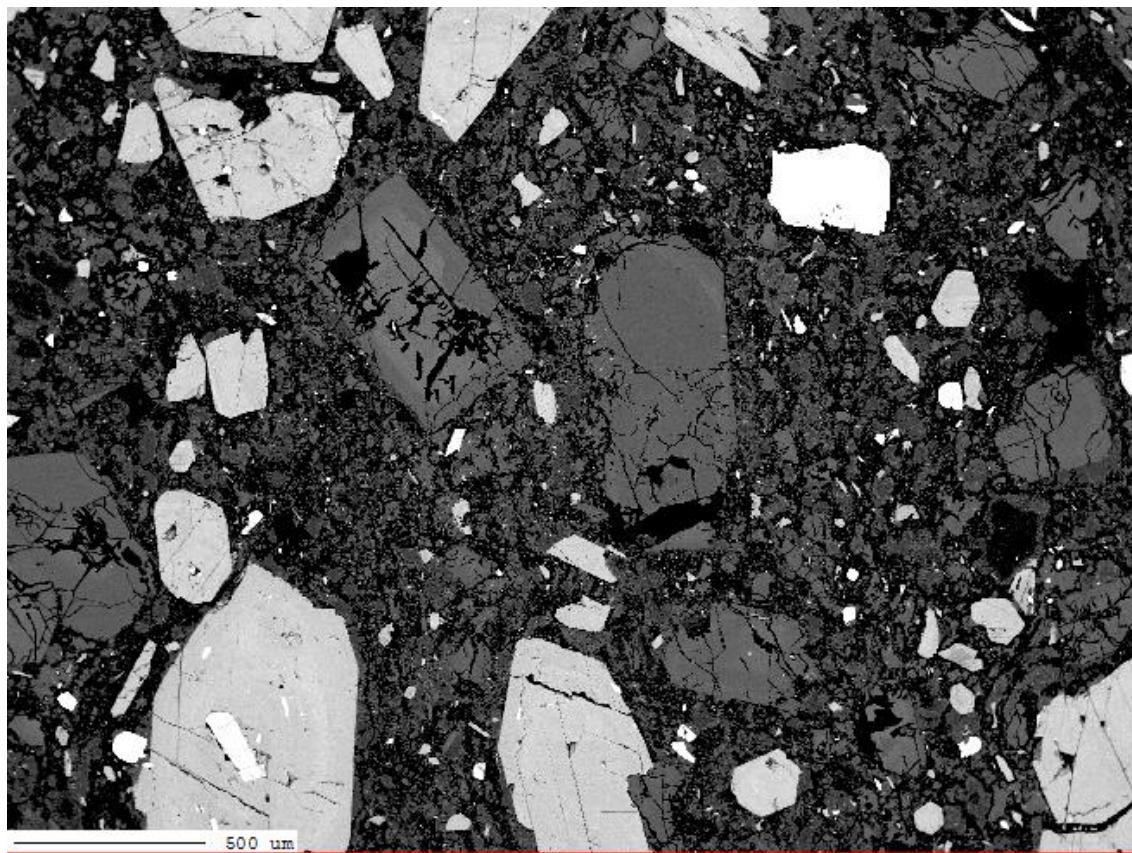


Figure F4-6. Overview picture of S_{M16}, in which the small glass matrix can be seen, too small to analyse. Minerals seen in picture are CPX (light grey), magnetite (white) and plagioclase (darker grey).

Sample: S_{M17}

Number of samples: 13.

1	S17-1
2	S17-2 (NCU)
3	S17-3 (NCU)
4	S17-4
5	S17-5
6	S17-6
7	S17-7
8	S17-8
9	S17-9
10	S17-10
11	S17-11
12	S17-12 (NCU)
13	S17-13

NCU: no close up.

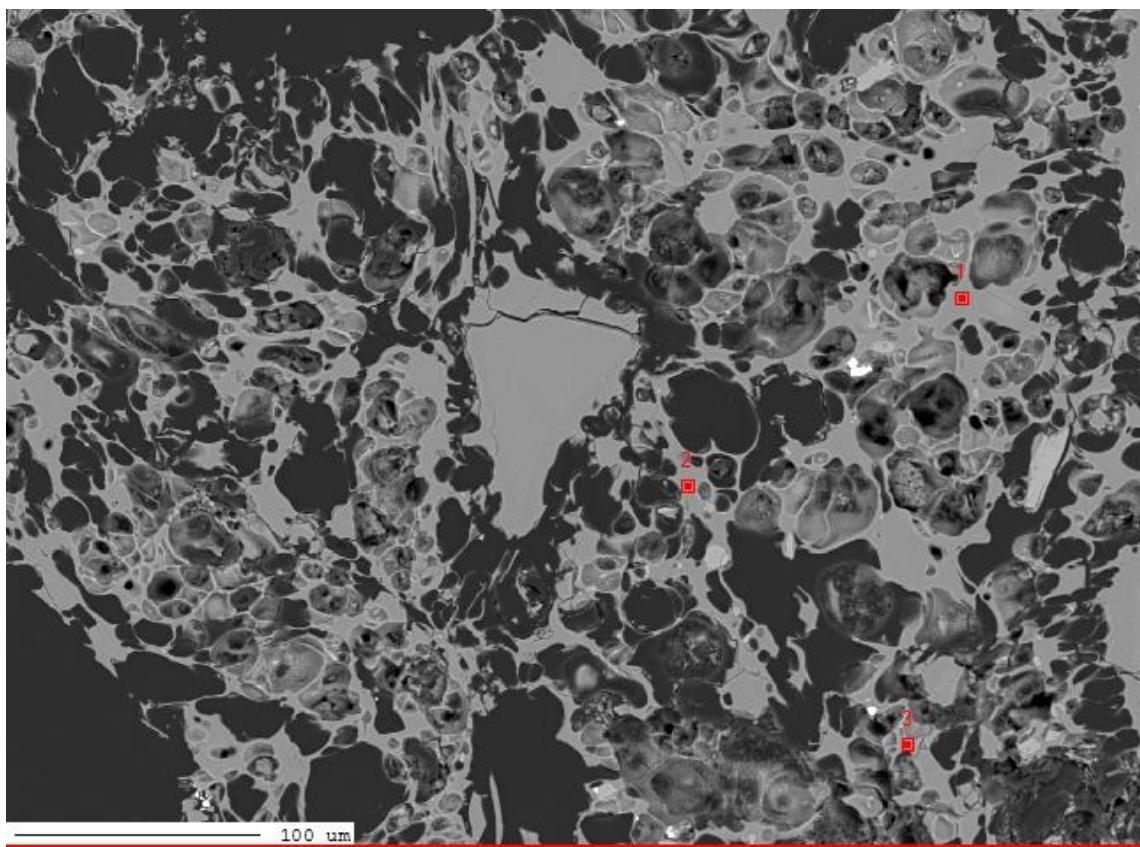
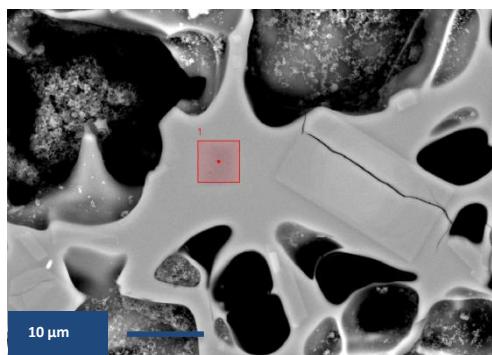
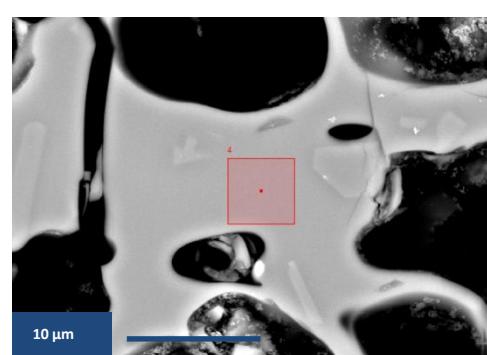


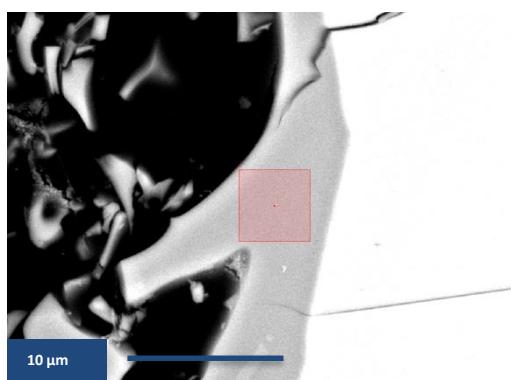
Figure F4-7. Overview picture of S_M17, showing glass shard data points 1-3, the focus beam for the WDS is 5 by 5 μm and 5nA, numbers represent the sampled spots.



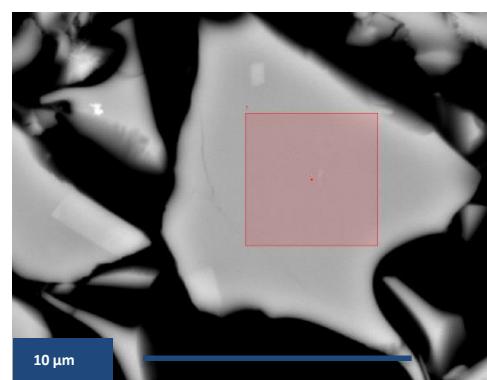
1



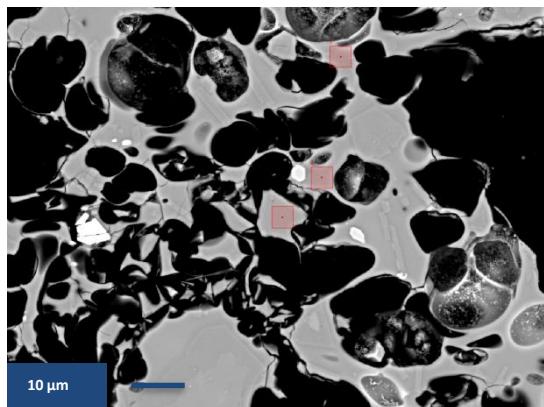
4



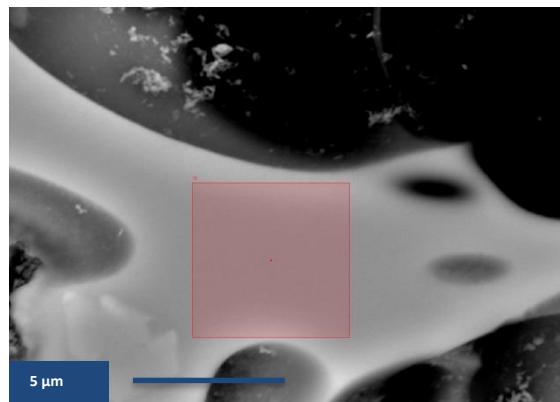
5



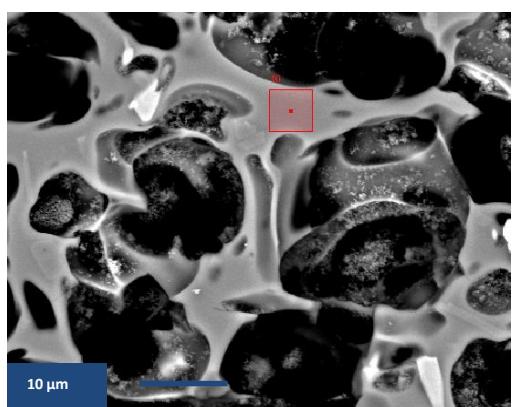
7



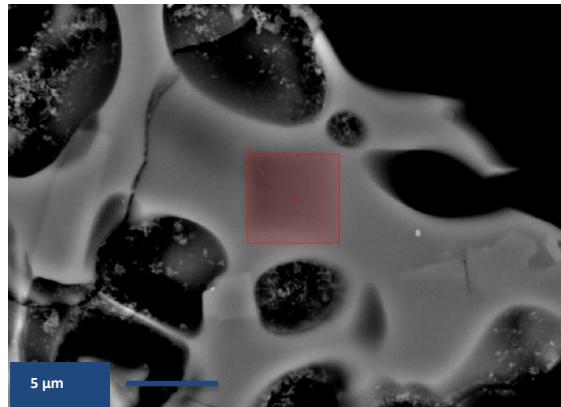
7, 8, 9



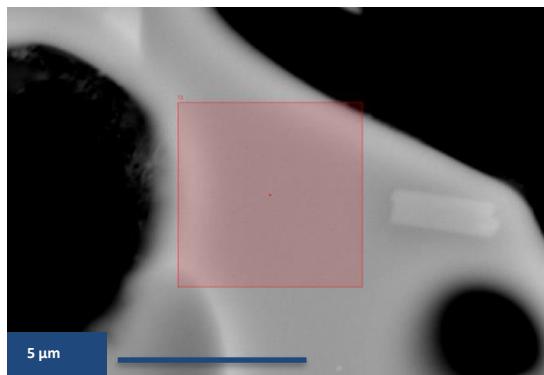
10



10



11



13

Figure F4-8. Zoomed view of glass shards S_{M17} points 1, 4, 5, 7-11 and 13 with the sampled sites. Points represent the sampled sites and enclose an area of 5 by 5 μm .

Sample: S_{M18}

Number of samples: 10.

1	S18-1
2	S18-2
3	S18-3
4	S18-4
5	S18-5
6	S18-6
7	S18-7
8	S18-8
9	S18-9
10	S18-10

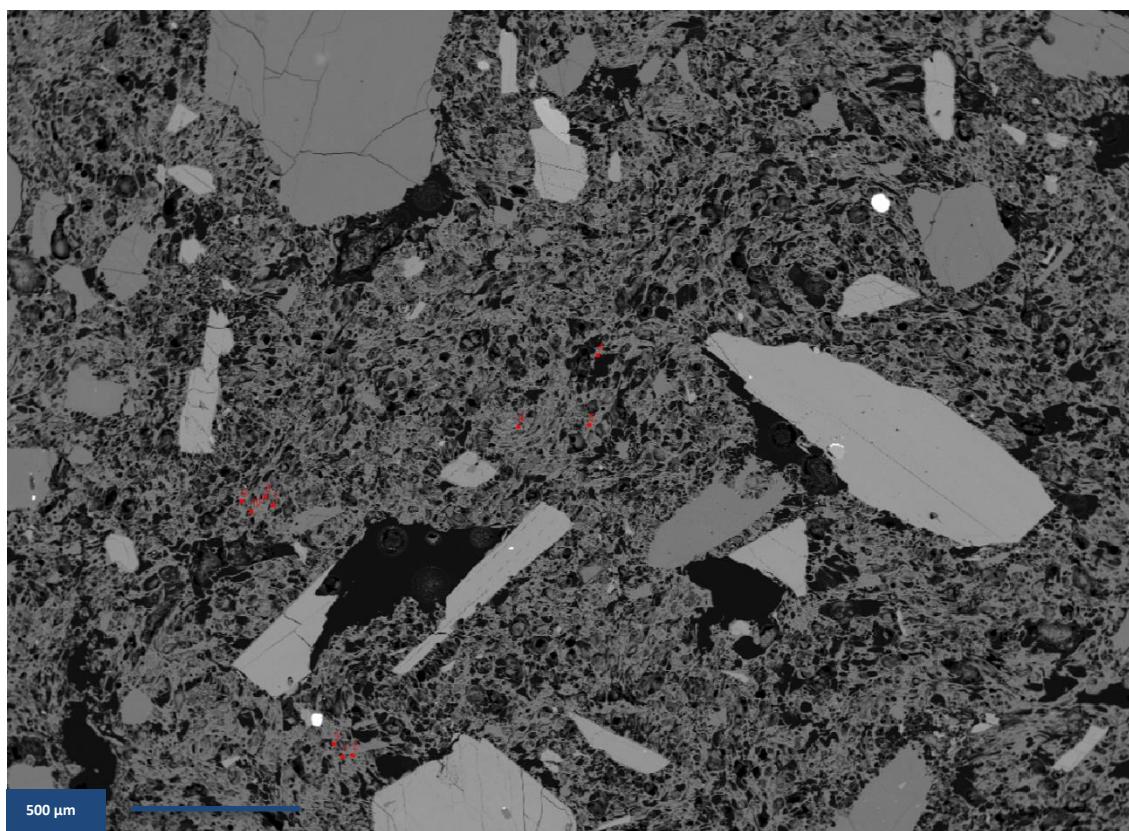
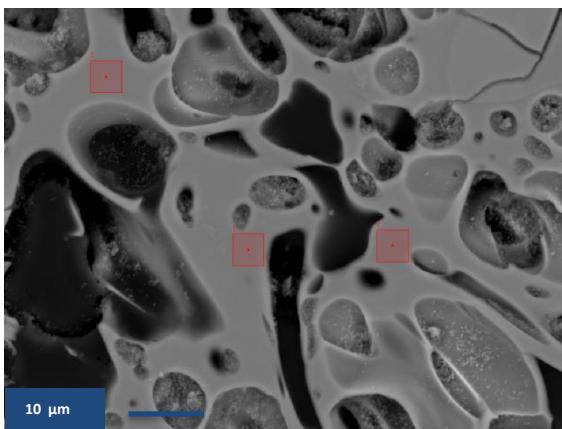
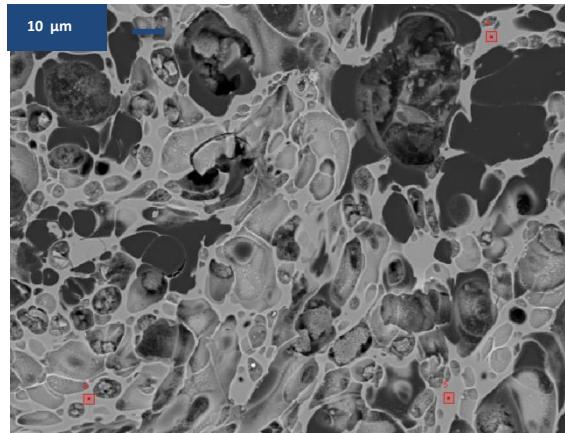


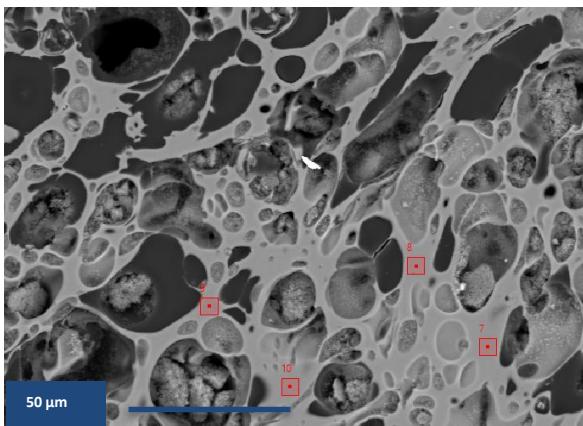
Figure F4- 9. overview picture of S_{M18} showing glass shard points 1-10, the focus beam for the WDS is 5 by 5 μm and 5nA, numbers represent the sampled spots.



1-3



4-6



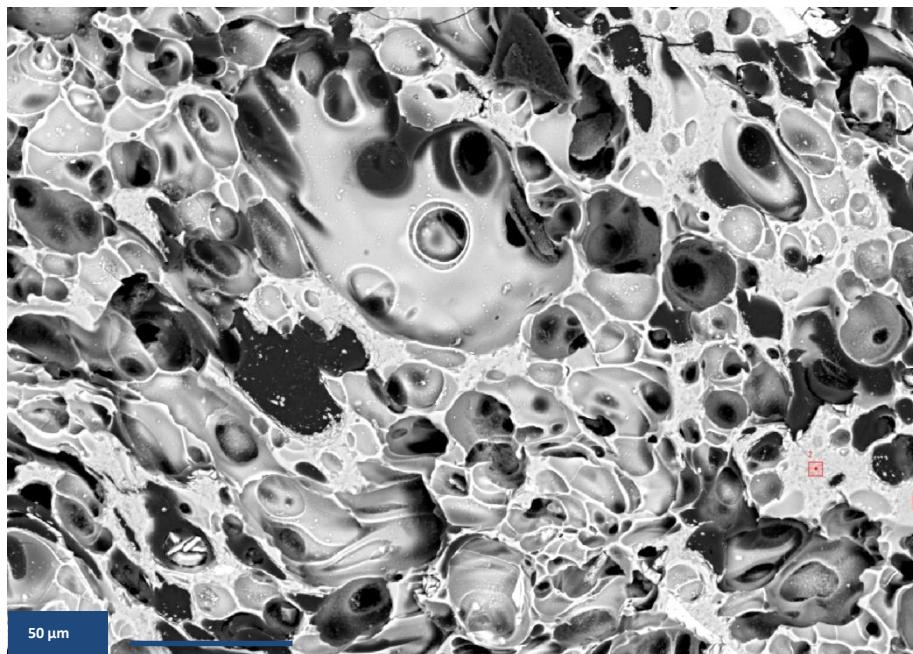
7-10

Figure F4-10. Zoomed view of the different glass shards points 1-10 with the sampled points. Points represent the sampled sites and enclose an area of 5 by 5 μm .

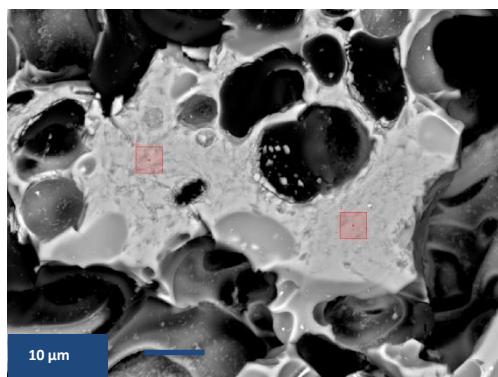
Sample: 19 Unpolished

Number of samples: none.

1	S19-1
2	S19-2
3	S19-3



A



B

Figure F4-11. A. overview picture of unpolished S_{M19}, numbers represent sampled points 1-3 by WDS 5 by 5 μm area. B. Zoom in on S_{M19} points 1 and 2 taken on tephra in matrix.

Sample: S_{M19} Polished

Number of samples: 12.

1	S19-1 (NCU)
2	S19-2 (NCU)
3	S19-3 (NCU)
4	S19-4
5	S19-5
6	S19-6
7	S19-7
8	S19-8
9	S19-9
10	S19-10
11	S19-11

NCU: no close up.

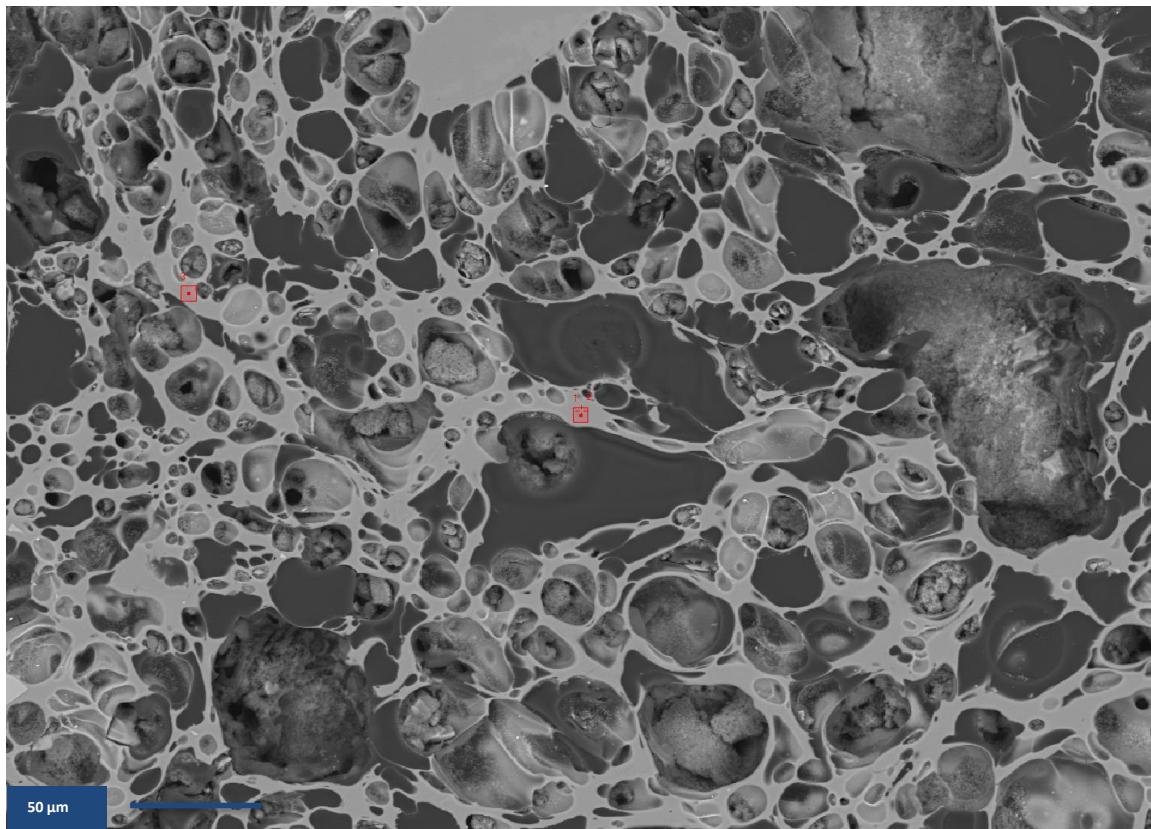
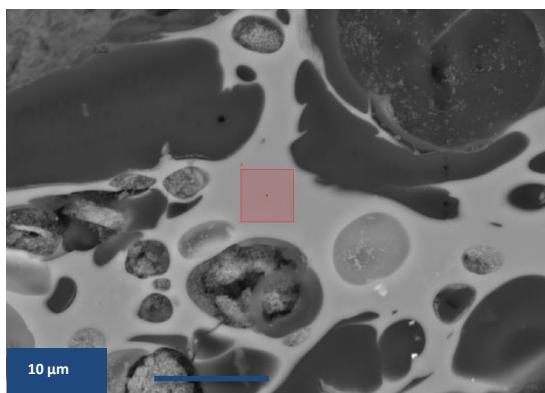
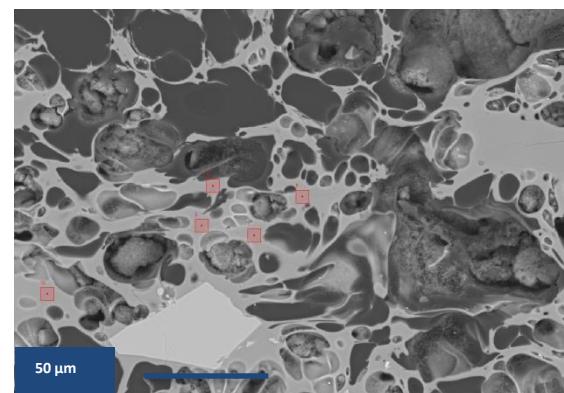


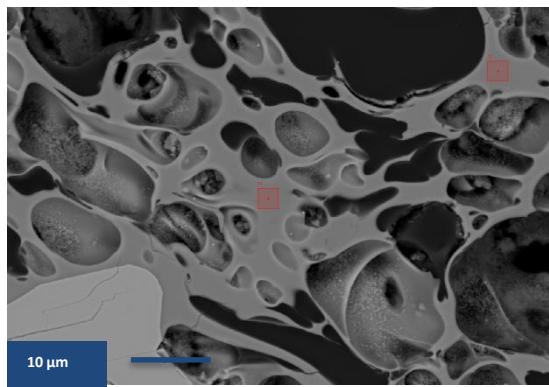
Figure F4-12. Overview picture showing the glass structure of S_{M19} with data points 1-3, the focus beam for the WDS is 5 by 5 μm and 5nA current.



4

4,5,6,7,10





11, 12

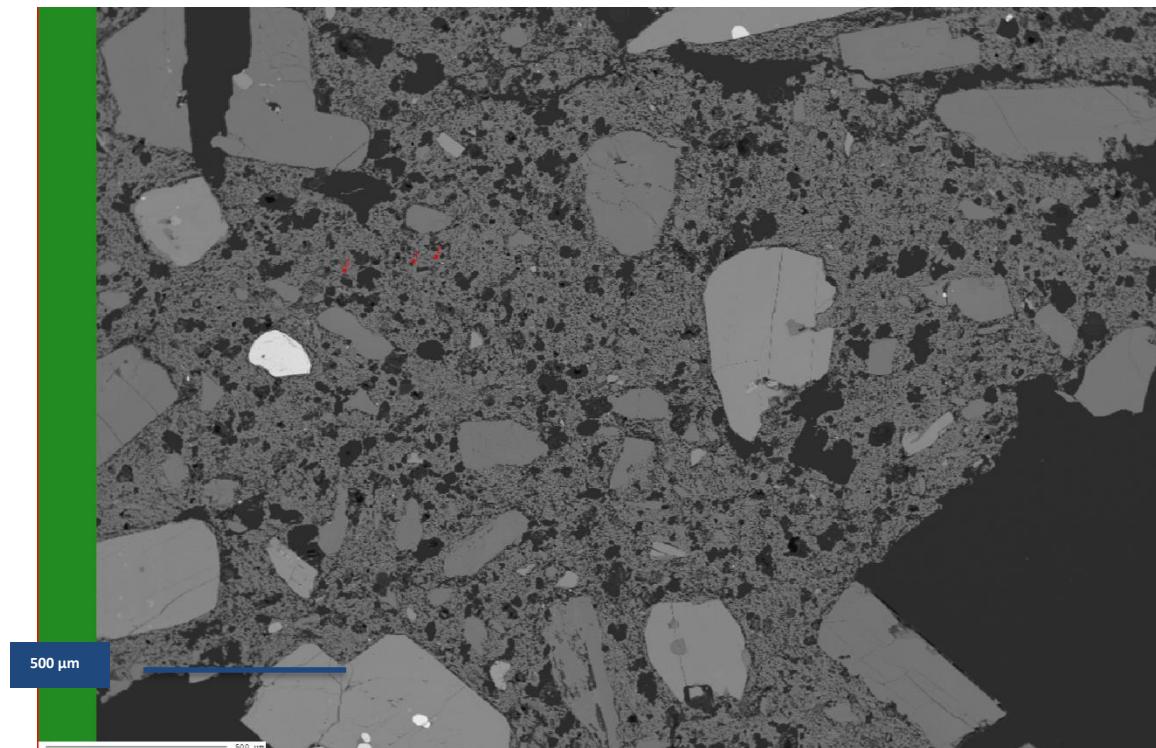
Figure F4-13. Zoom in on the individual sample spots 4-12, red square is a 5 by 5 μm WDS analysed area.

Sample: S_{M20}

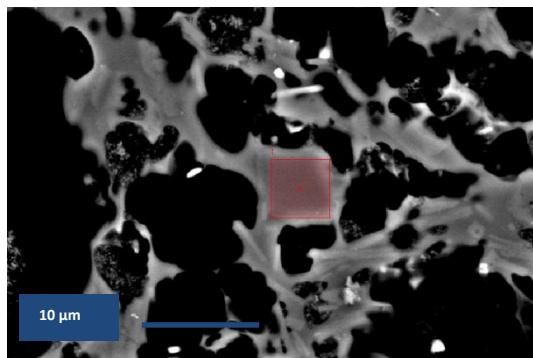
Number of samples: 5.

1	S20-1
2	S20-2 (NCU)
3	S20-3
4	S20-4
5	S20-5

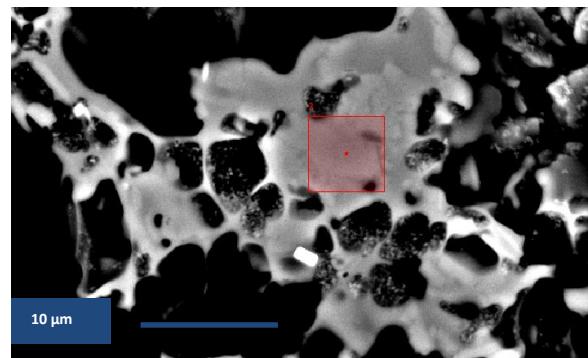
NCU: no close up.



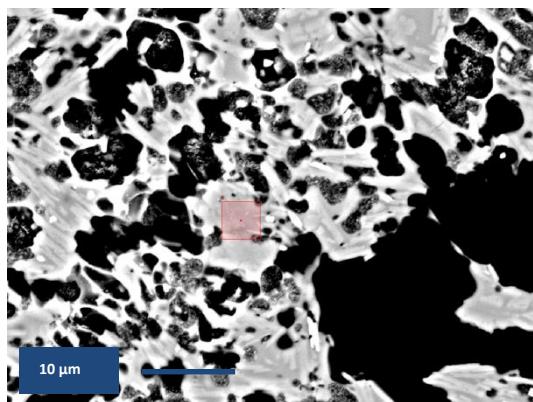
1-3



1



3



4

Figure F4-14. Big picture is overview picture showing glass shard data points 1-3 and other pictures show a zoom in of data points 1, 3 and 4.

Sample: S_{P26}

Number of samples: 12.

1	S26-1
2	S26-2
3	S26-3
4	S26-4
5	S26-5
6	S26-6
7	S26-7 (NCU)
8	S26-8
9	S26-9
10	S26-10
11	S26-11
12	S26-12

NCU: no close up.

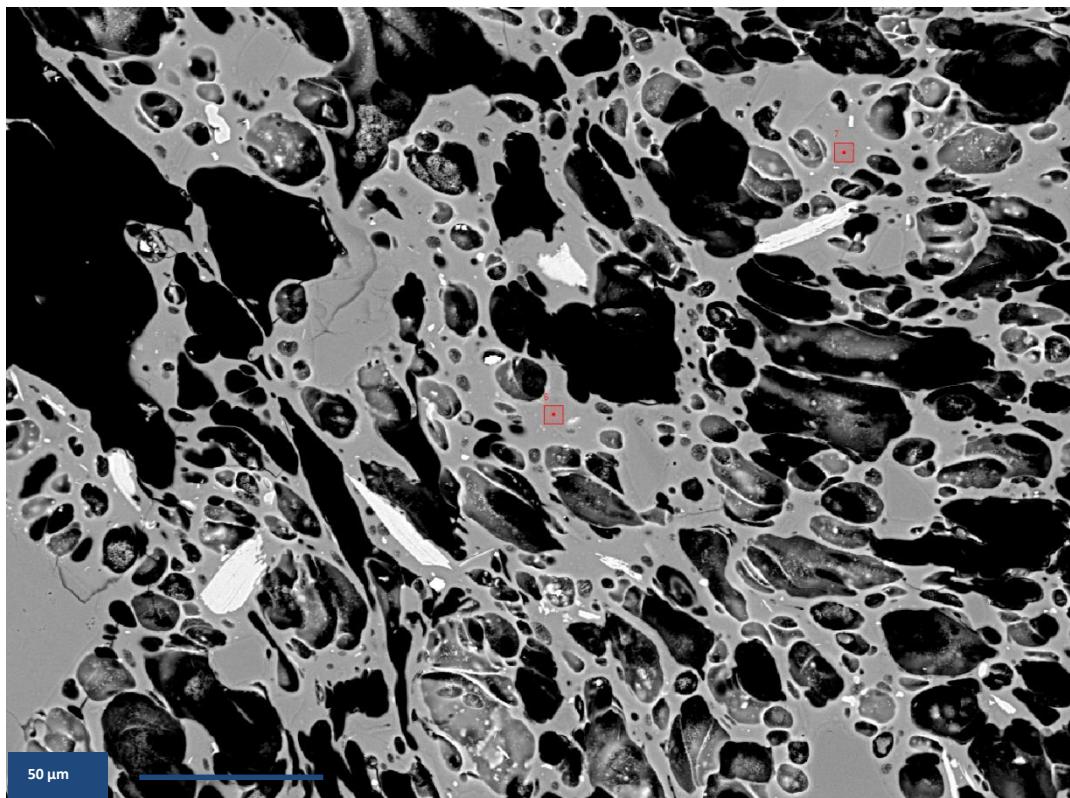
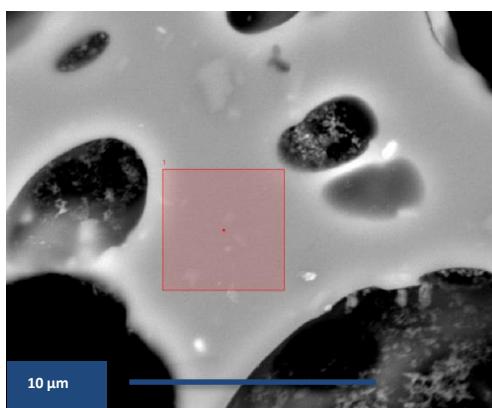
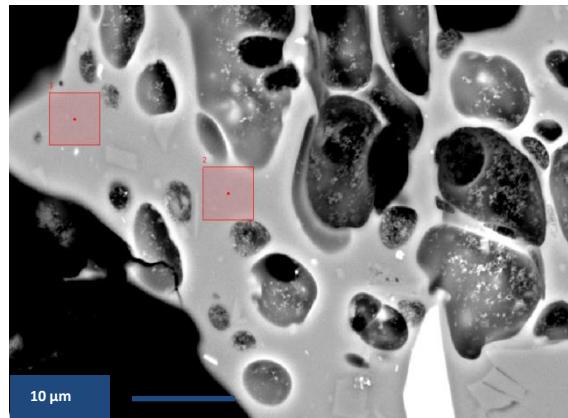


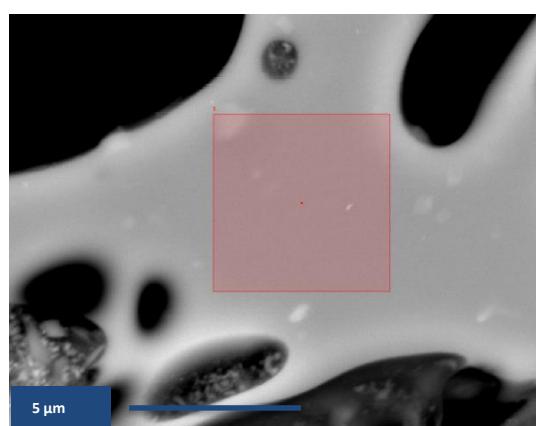
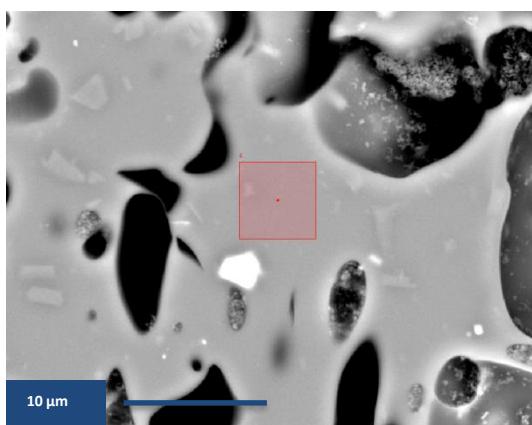
Figure F4-15. Overview picture of Sp26 showing data points 6 and 7, which cover a 5 by 5 µm area which is analysed by WDS. There is a lot of plagioclase contamination in the tephra.



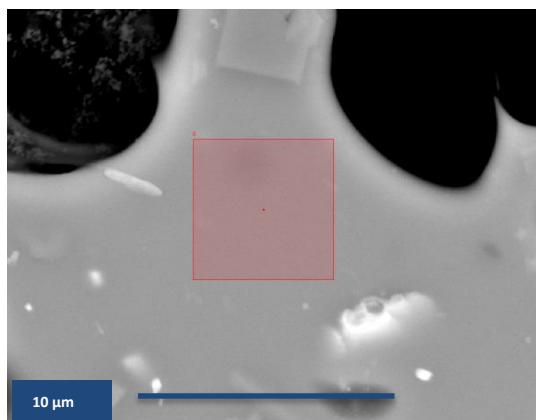
1



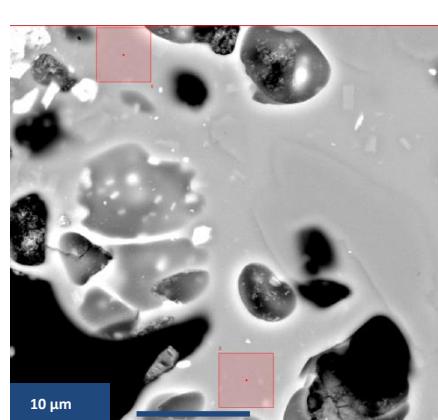
2,3



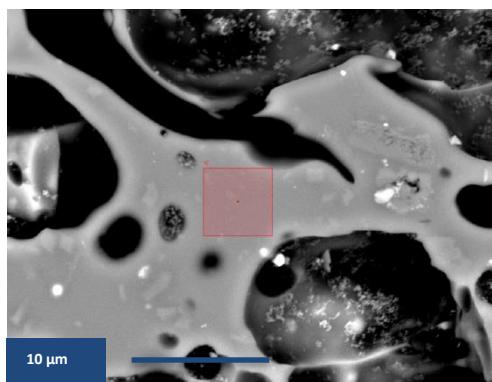
4



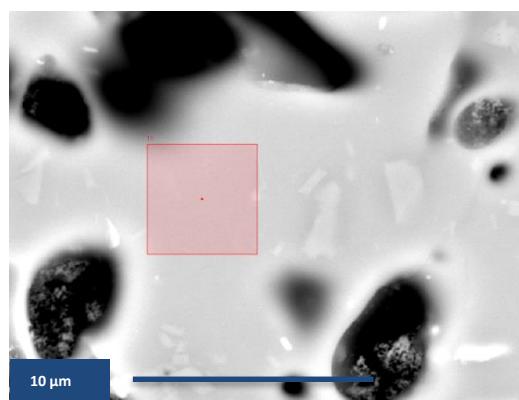
5



6



8,9



10

11

Figure F4-16. Zoom in on the individual data points given by a number, red square is a 5 by 5 μm WDS analysed area.

Sample: S_{P27}

Number of samples: 11.

1	S27-1
2	S27-2
3	S27-3
4	S27-4
5	S27-5
6	S27-6
7	S27-7
8	S27-8
9	S27-9
10	S27-10
11	S27-11

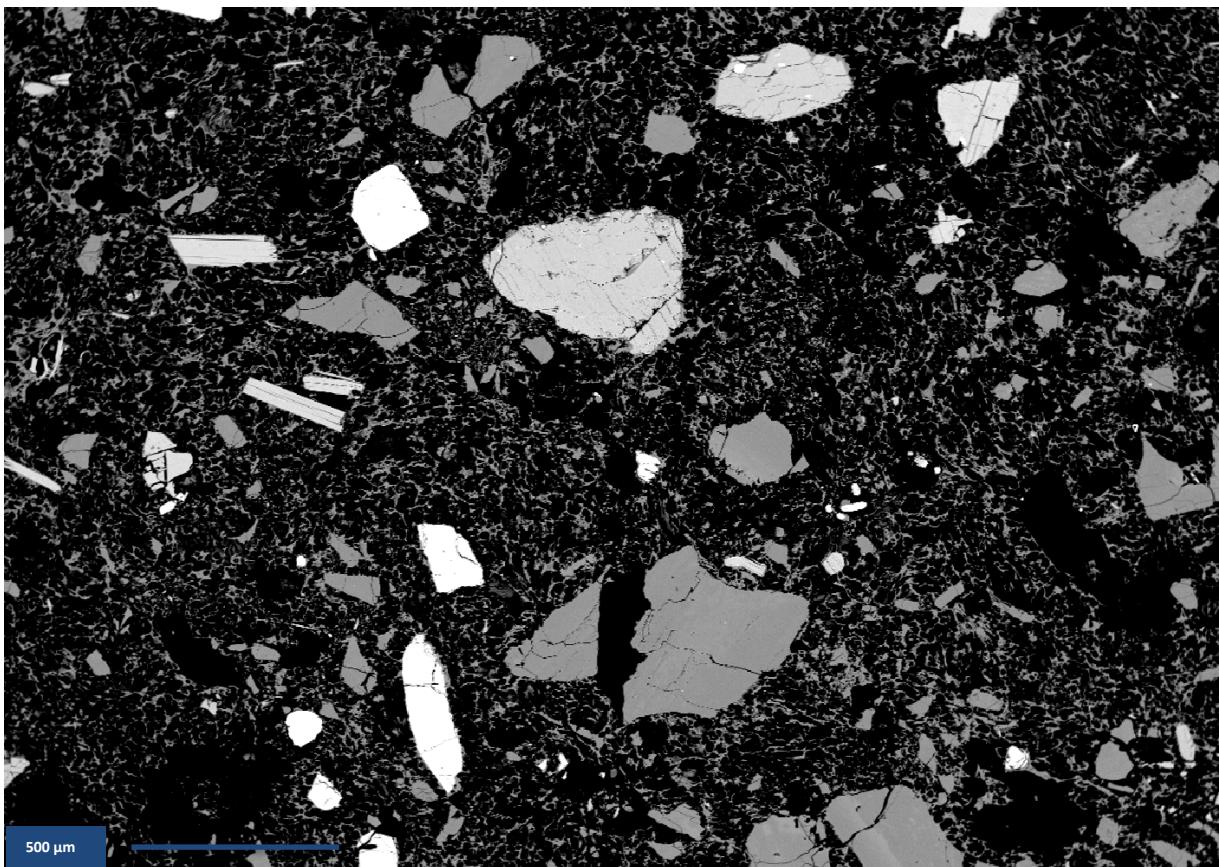
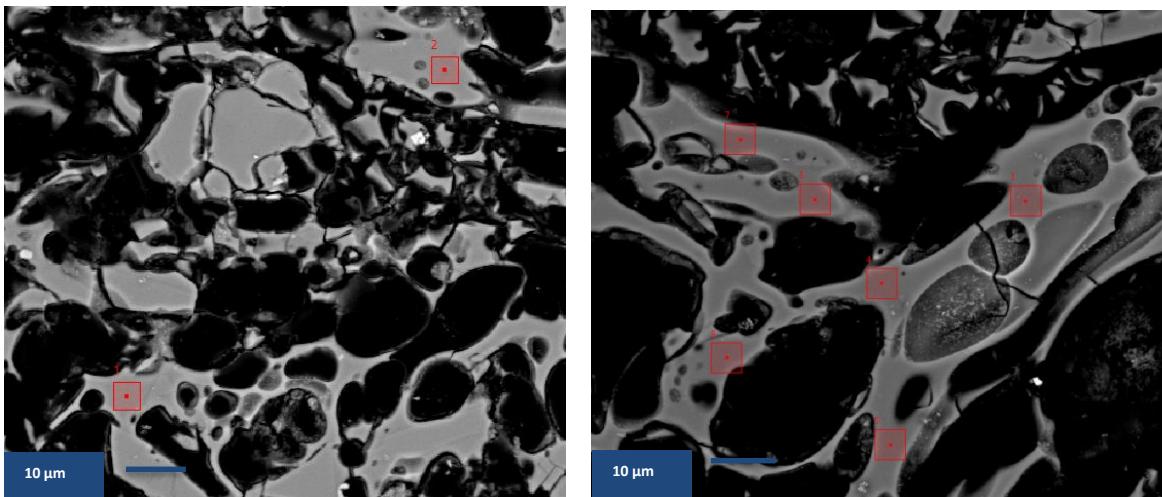
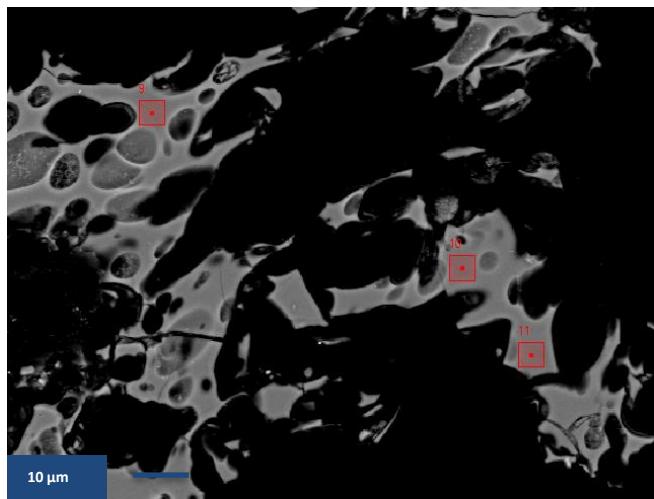


Figure F4-17. Overview picture of S_P27 showing minerals and glass matrix, there is CPX, plagioclase and magnetite seen here.



1,2

3-8



9-11

Figure F4-18. Zoom in on the individual data points given by a number, red square is a 5 by 5 μm WDS analysed area.

Sample: S_{P28}

Number of samples: 11.

1	S28-1
2	S28-2
3	S28-3
4	S28-3
5	S28-3
6	S28-4
7	S28-6
8	S28-4
9	S28-5
10	S28-6

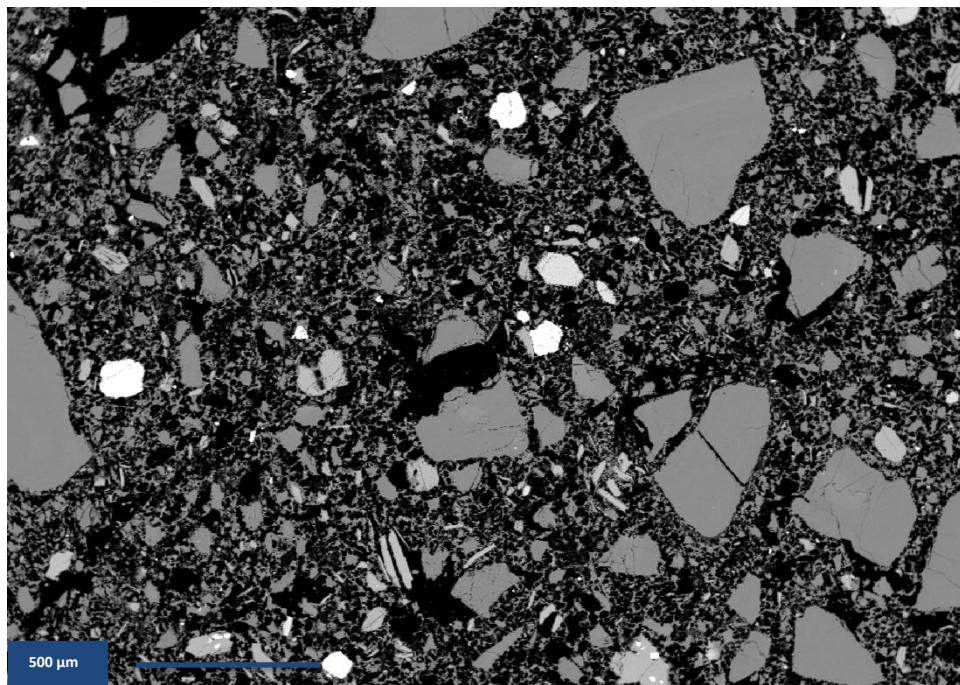


Figure F4-19. Overview picture of S_P28 showing minerals and glass matrix, there is mainly plagioclase and magnetite seen here.

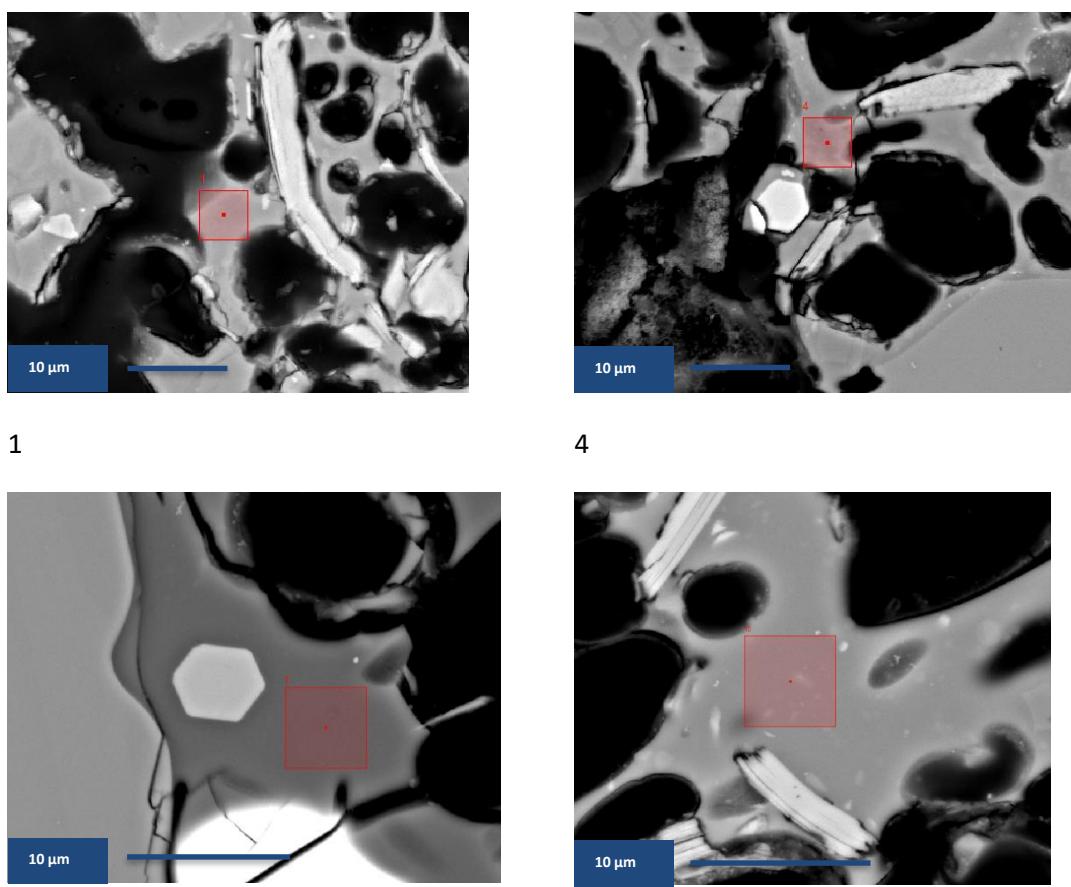


Figure F4-20. Zoom in on the individual data points given by a number, red square is a 5 by 5 μm WDS analysed area.

Sample: S_{P29}

Number of samples: 4, but no tephra.

1	S29-1
2	S29-2
3	S29-3
4	S29-4

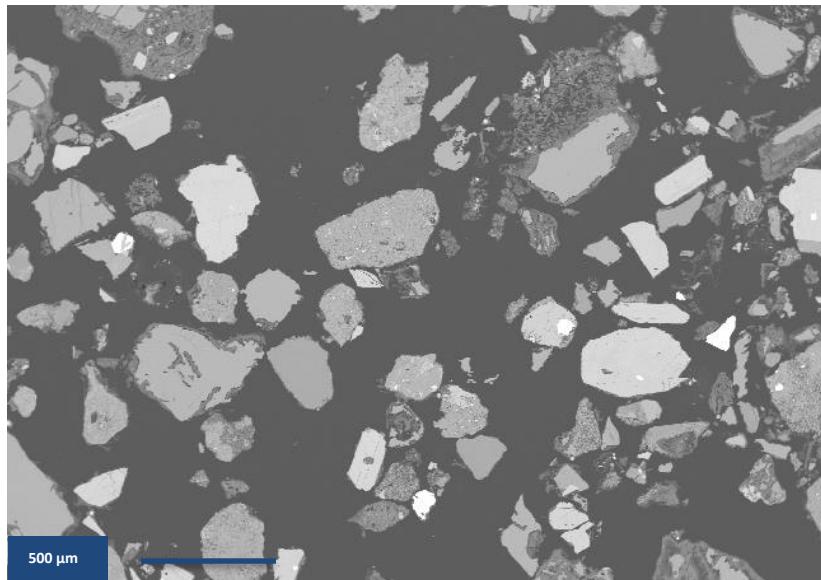


Figure F4-21. Overview picture of S_{P29} showing the minerals in the thin section.

Sample: S_{P30}

Number of samples: 2, but no tephra.

1	S30-1
2	S30-2

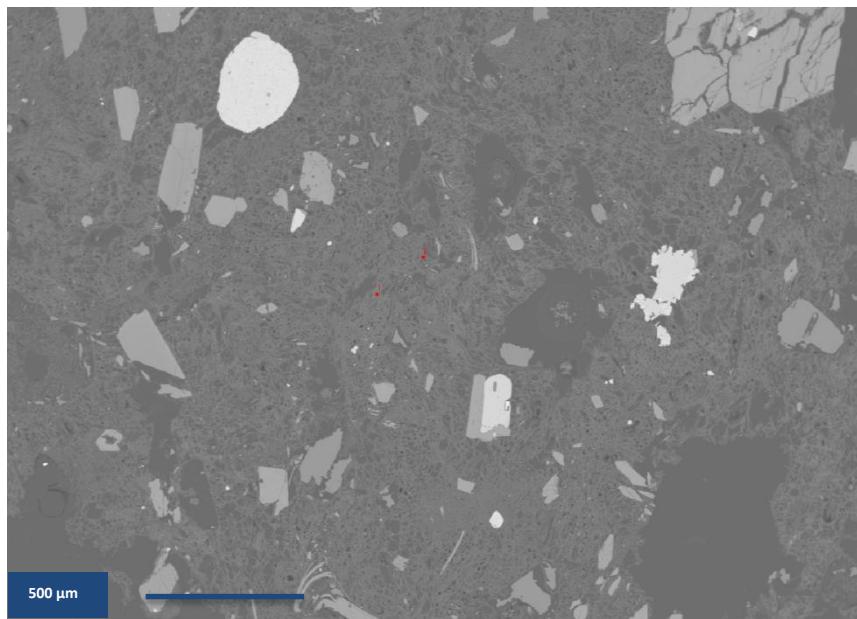


Figure F4-22. Overview picture of S_{P30} showing the minerals in the thin section.

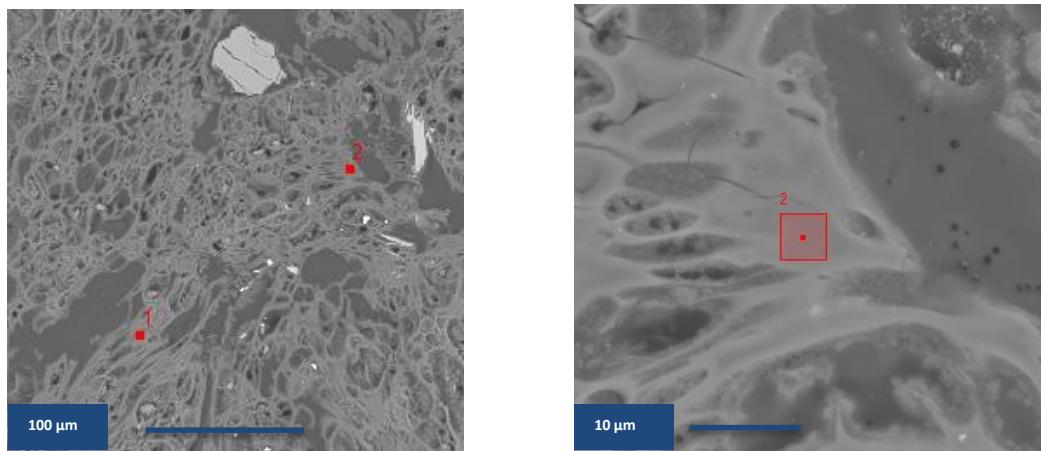


Figure F4-23. Zoom in on data points of S_{P30} , numbers refer to sample name and red square is a 5 by 5 μm area which is analysed by WDS.

Sample: S_{P31}

Number of samples: 7.

1	S_{31-1}
2	S_{31-2}
3	S_{31-3}
4	S_{31-4}
5	S_{31-5}
6	S_{31-6}
7	S_{31-7} (NCU)

NCU: no close up.

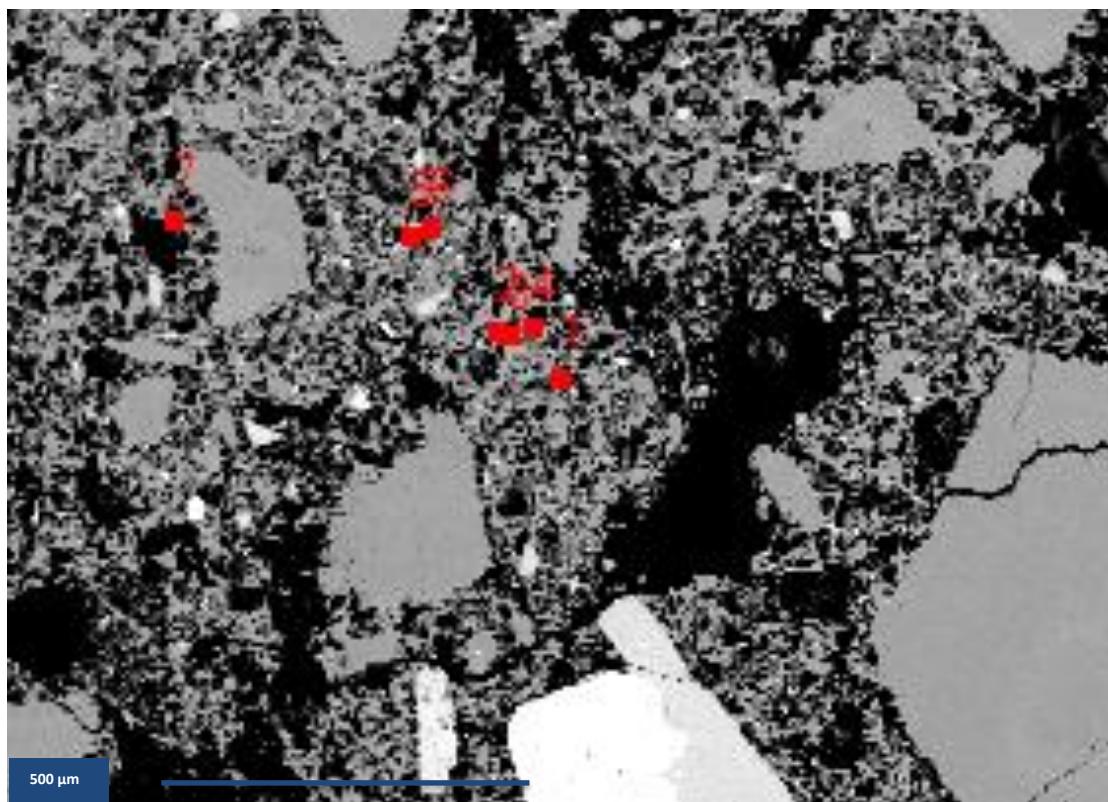
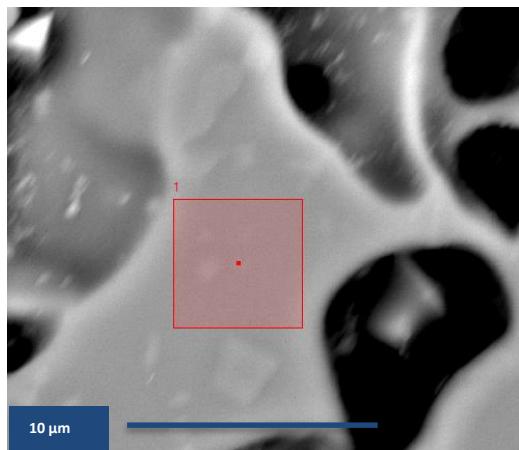
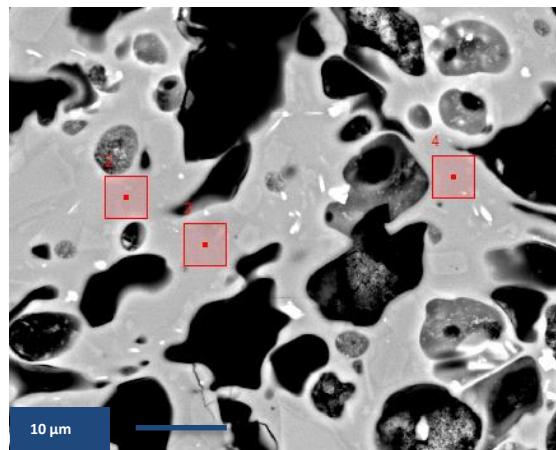


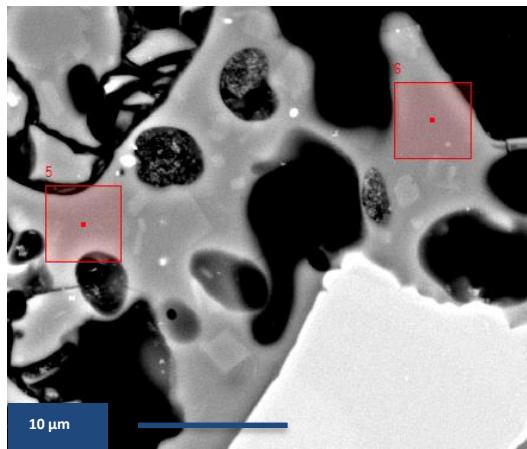
Figure F4-24. Overview picture of S_{P31} showing data points 1-7.



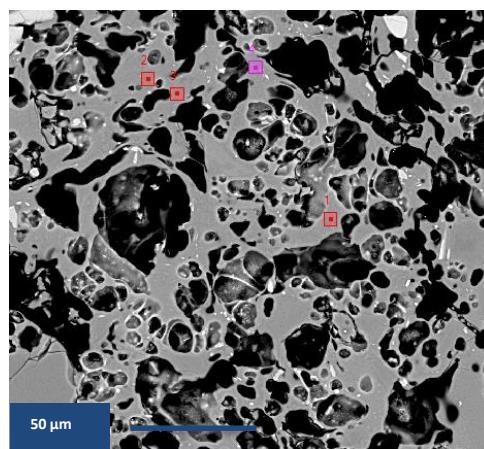
1



2-4



5-6



1-4

Figure F4-25. Zoom in on data points of S_{P31}, numbers refer to sample name and red square is a 5 by 5 μm area which is analysed by WDS. Note the plagioclase contamination in the glass matrix.

Sample: S_{P32}

Number of samples: 27.

1	S32-1	15	S32-15
2	S32-2	16	S32-16
3	S32-3	17	S32-17
4	S32-4	18	S32-18
5	S32-5	19	S32-19
6	S32-6	20	S32-20
7	S32-7	21	S32-21
8	S32-8	22	S32-22 (NCU)
9	S32-9	23	S32-23 (NCU)
10	S32-10	24	S32-24
11	S32-11	25	S32-25
12	S32-12	26	S32-26
13	S32-13	27	S32-27
14	S32-14		

NCU: no close up.

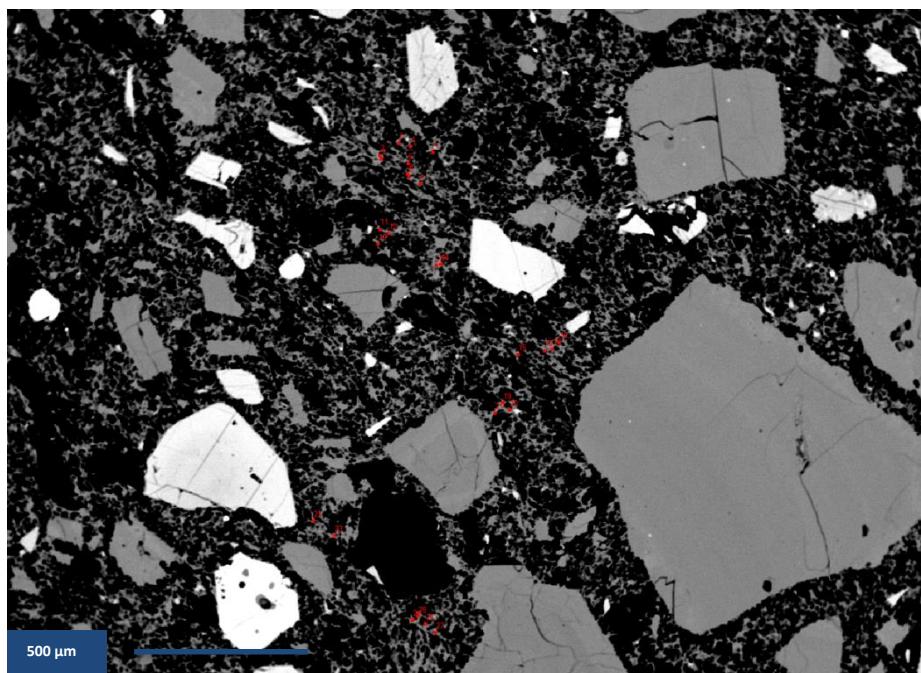
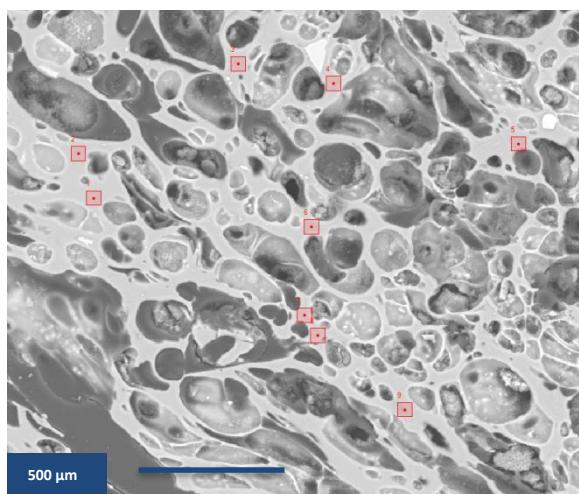
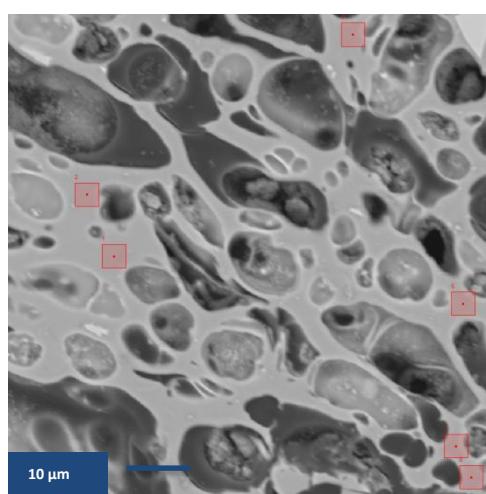


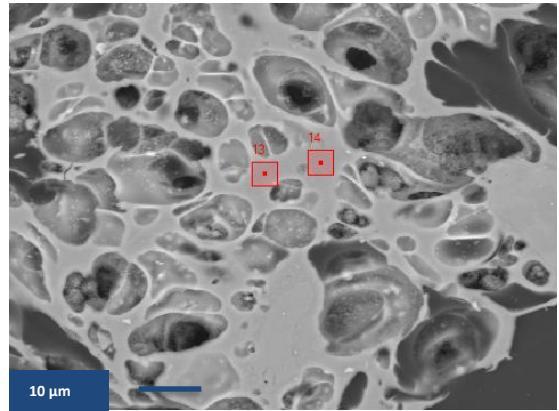
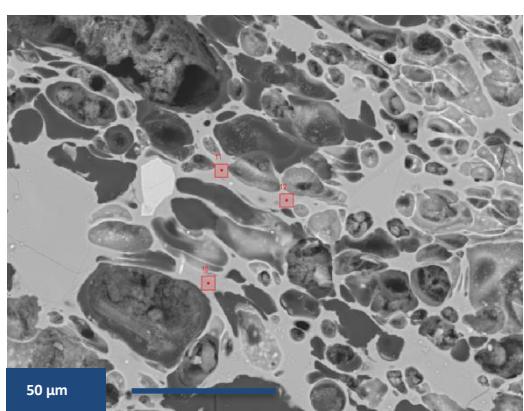
Figure F4-26. Overview picture showing all 27 glass shard data point and their surrounding minerals.



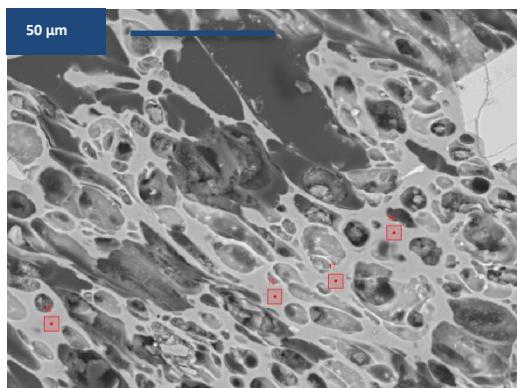
1-9



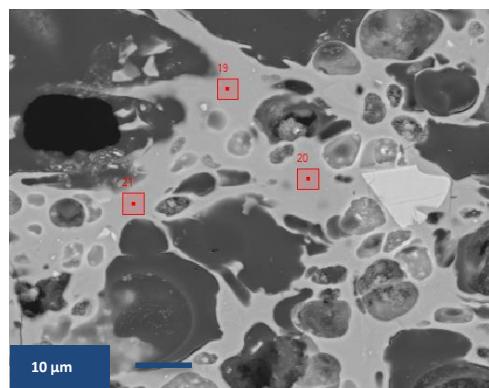
1-6



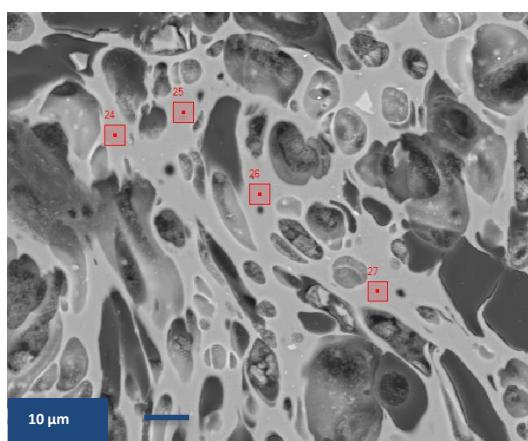
10-12



13, 14



15-18



19-21

24-27

Figure F4-27. Zoom in on data points of S_{P32}, numbers refer to sample name and red square is a 5 by 5 μm area which is analysed by WDS.

F4 session 14-7-2015

Samples measured: S193, S_{Pm33}-S_{Pm47}, S48-S55.

Sample: S193 (Tephra for comparison instruments, from Huizinga, unpub. MSc thesis, 2013)

Number of samples: 10

15	S193-1
16	S193-2
17	S193-3
18	S193-4
19	S193-5
20	S193-6
21	S193-7
22	S193-8
23	S193-9
24	S193-10

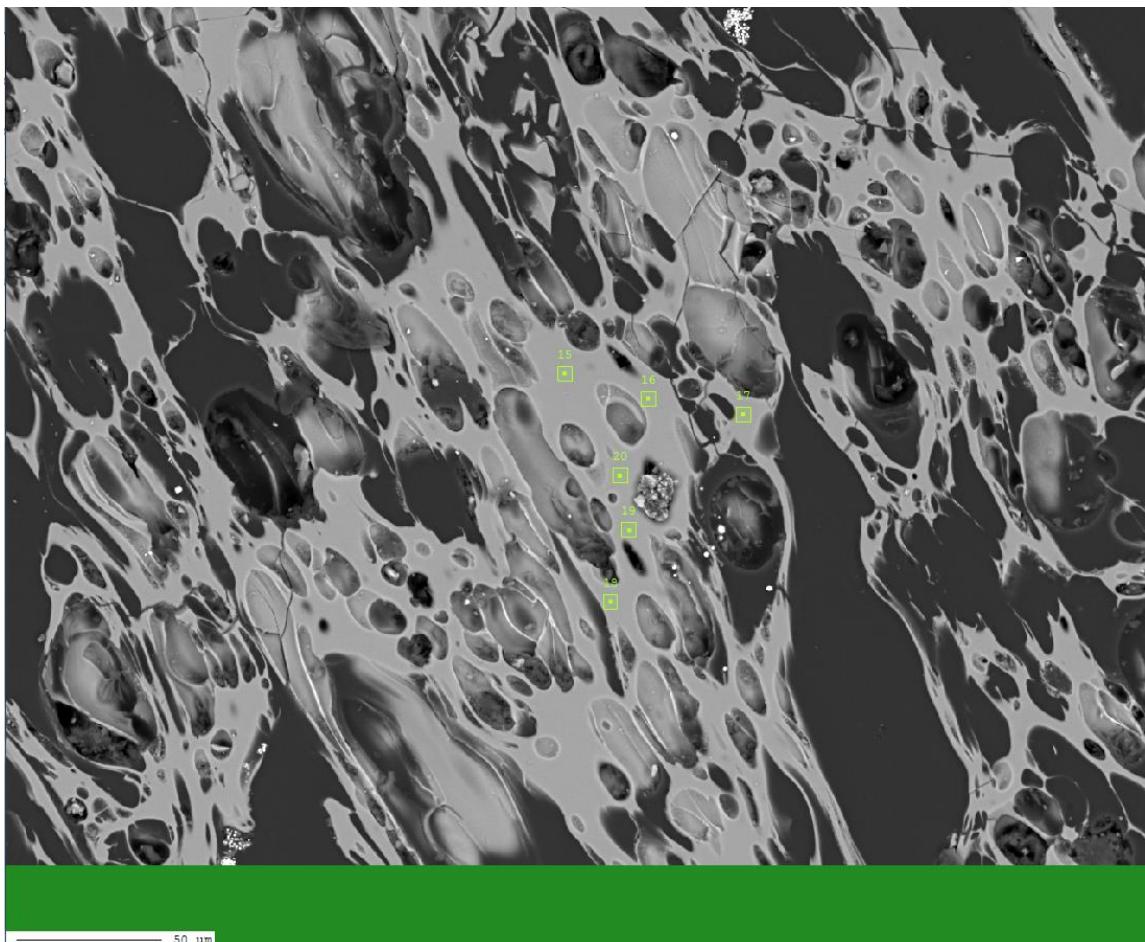


Figure F5-1. Picture of point 15-20 of S193, good well preserved tephra.

Sample: S_{Pm33}

Number of grains: 2

Number of samples: 5

1	S33 grain 1
1	S33 grain 2
2	S33 grain 2
3	S33 grain 2
4	S33 grain 2

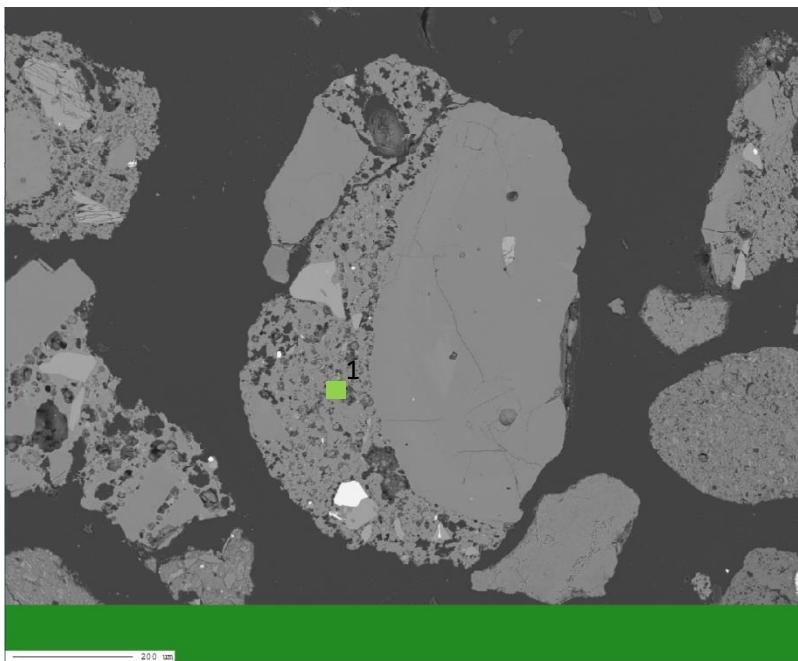


Figure F5-2. Grain 1 in S_{Pm33}.

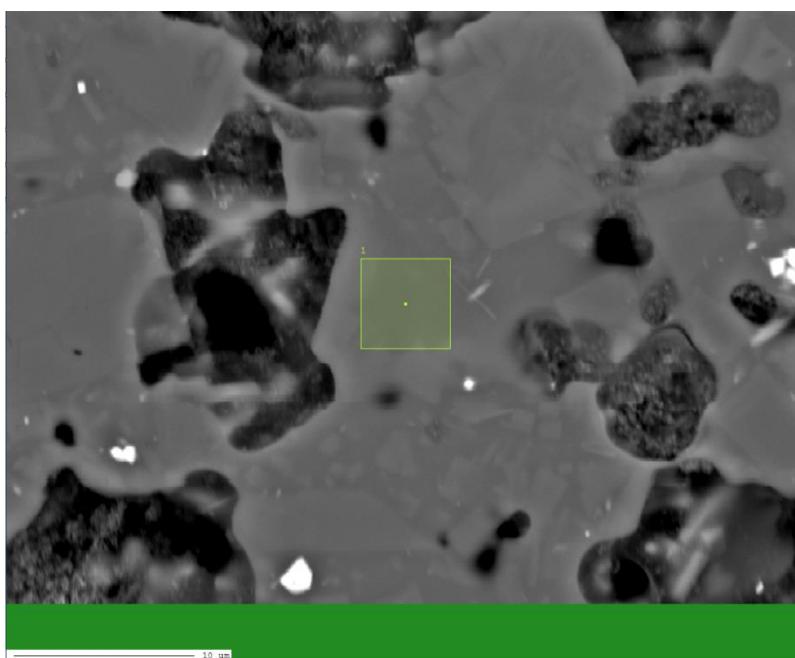


Figure F5-3. Zoom in of F5-2 with the point of S_{Pm33}.

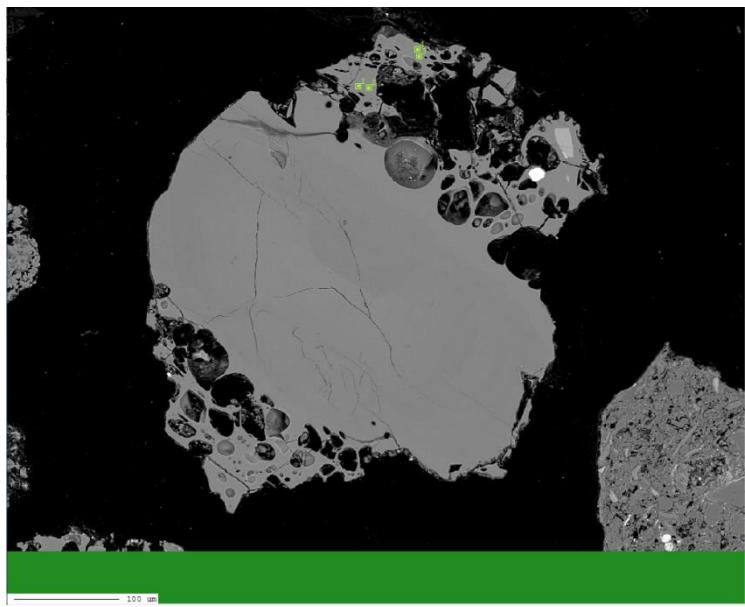


Figure F5-4. Grain 2 in S_{Pm33} , points 1-4.

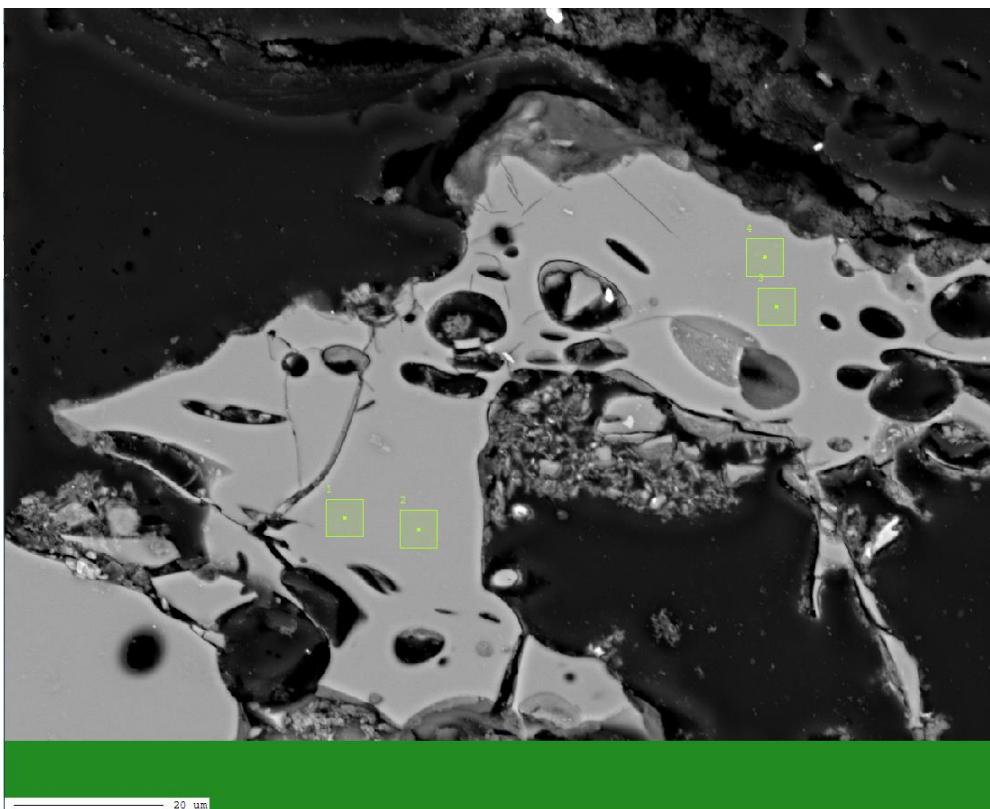


Figure F5-5. Zoom on grain 2 of S_{Pm33} , points 1-4.

Sample: S_{Mm36}

Number of grains: 3

Number of samples: 10

4	S36 grain 1 (NCU)
5	S36 grain 1 (NCU)
6	S36 grain 1 (NCU)
7	S36 grain 2 (NCU)
8	S36 grain 3 (NCU)
9	S36 grain 3 (NCU)
10	S36 grain 3 (NCU)
11	S36 grain 3 (NCU)
12	S36 grain 3 (NCU)
13	S36 grain 3 (NCU)

*NCU: no close up

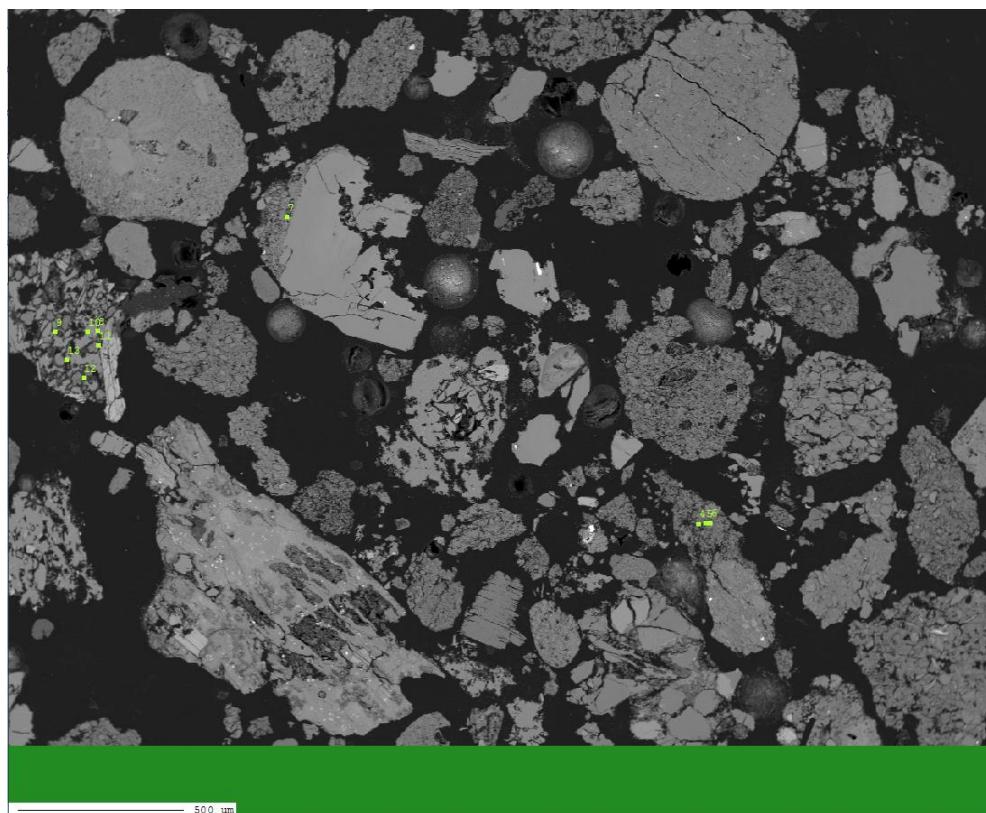


Figure F5-6. S_{Mm36} showing three grains with points 4-12.

Sample: S_{Pm37}

Number of grains: 1

Number of samples: 3

1	S37 grain - (no picture)
2	S37 grain 1
3	S37 grain 1

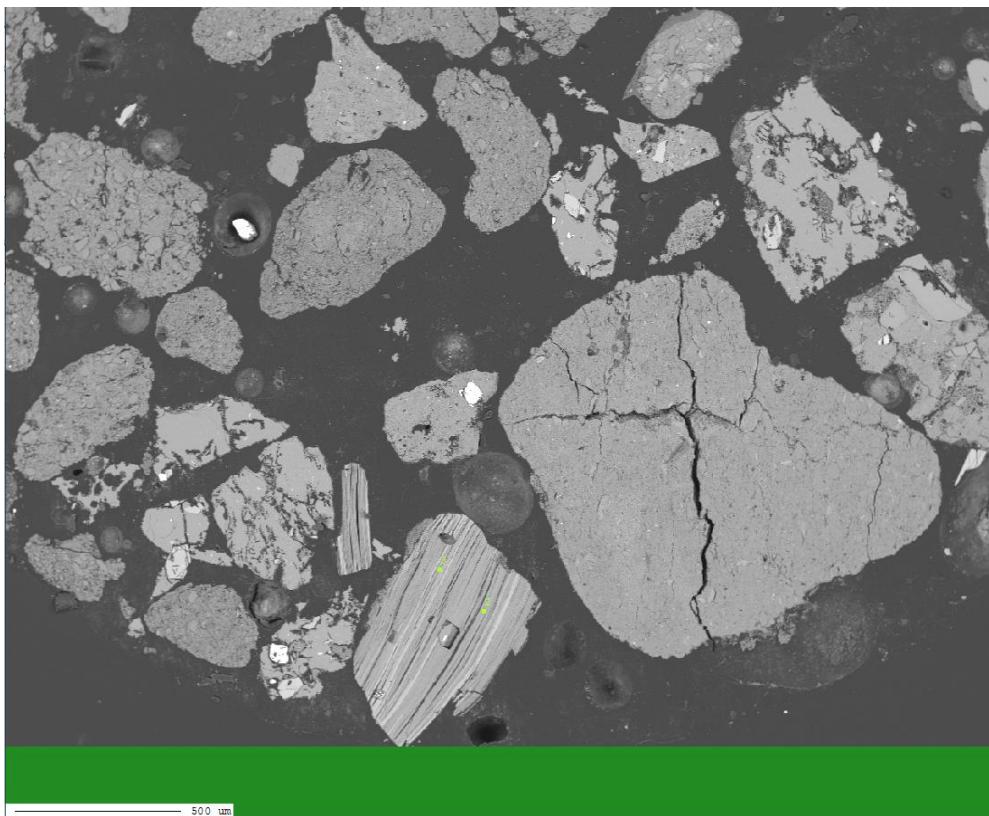


Figure F5-7. S_{Pm37} showing grain 1 points 2 and 3.

Sample: S_{Pm38}

Number of grains: 2

Number of samples: 12

1	S_{38} grain 1 (NCU)
2	S_{38} grain 1 (NCU)
3	S_{38} grain 1 (NCU)
4	S_{38} grain 1 (NCU)
5	S_{38} grain 1 (NCU)
6	S_{38} grain 1 (NCU)
7	S_{38} grain 1 (NCU)
8	S_{38} grain 1 (NCU)
9	S_{38} grain 2 (no picture)
10	S_{38} grain 2 (no picture)
11	S_{38} grain 2 (no picture)
12	S_{38} grain 2 (no picture)

*NCU: no close up

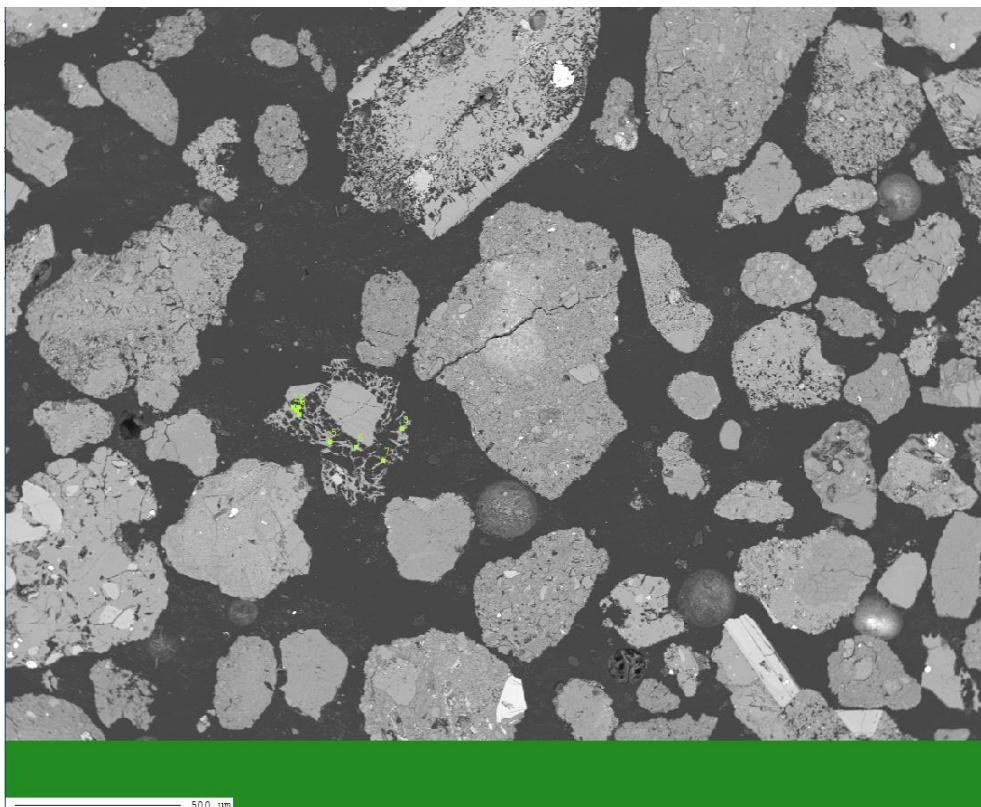


Figure F5-8. Overview picture showing measured grain in S_{Pm38} with measured points 1-8.

Sample: S_{Pm39}

Number of grains: 2

Number of samples: 11

1	S39 grain 1 (NCU)
2	S39 grain 1 (NCU)
3	S39 grain 1 (NCU)
4	S39 grain 1 (NCU)
5	S39 grain 1 (NCU)
6	S39 grain 2 (NCU)
7	S39 grain 2 (NCU)
8	S39 grain 2 (NCU)
9	S39 grain 2 (NCU)
10	S39 grain 2 (NCU)
11	S39 grain 2 (NCU)

*NCU: no close up

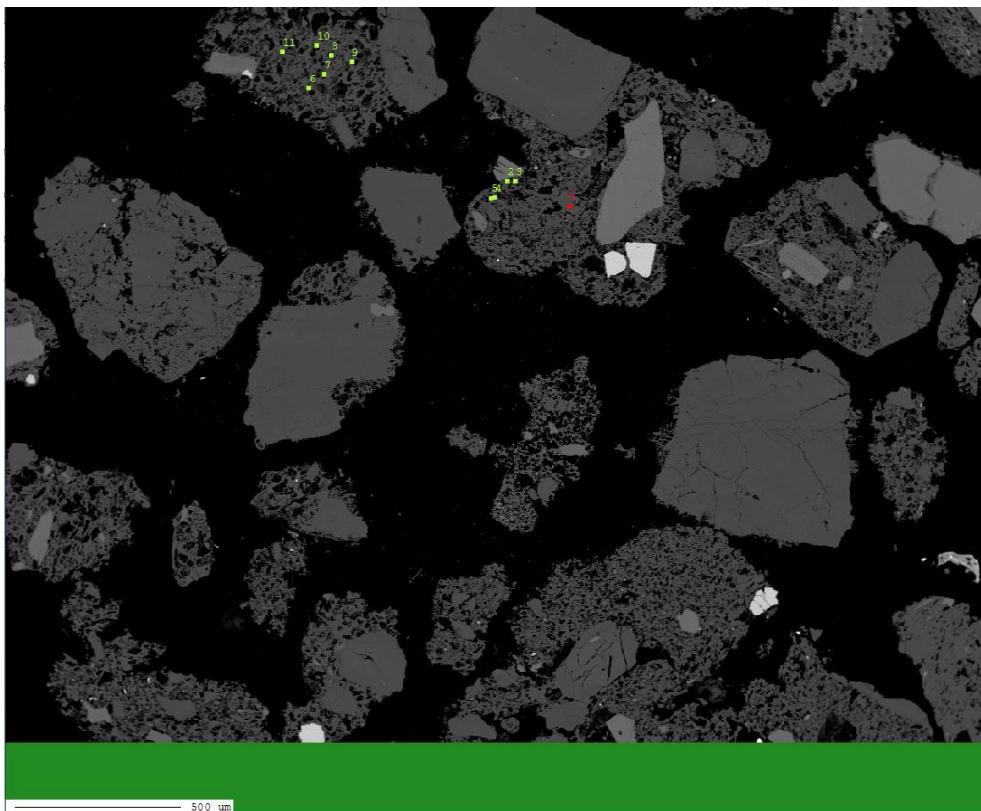


Figure F5-9. Overview picture of S_{Pm39} showing measured points 1-11 in two grains.

Sample: S_{Pm40A} (first stub).

Number of grains: 3

Number of samples: 18

1	S40a grain 1 (NCU)
2	S40a grain 1 (NCU)
3	S40a grain 1 (NCU)
4	S40a grain 1 (NCU)
5	S40a grain 1 (NCU)
6	S40a grain 1 (NCU)
7	S40a grain 1 (NCU)
8	S40a grain 2 (NCU)
9	S40a grain 2 (NCU)
10	S40a grain 2 (NCU)
11	S40a grain 2 (NCU)
12	S40a grain 2 (NCU)
13	S40a grain 2 (NCU)
14	S40a grain 3 (NCU)
15	S40a grain 3 (NCU)
16	S40a grain 3 (NCU)
17	S40a grain 3 (NCU)
18	S40a grain 3 (NCU)

*NCU: no close up

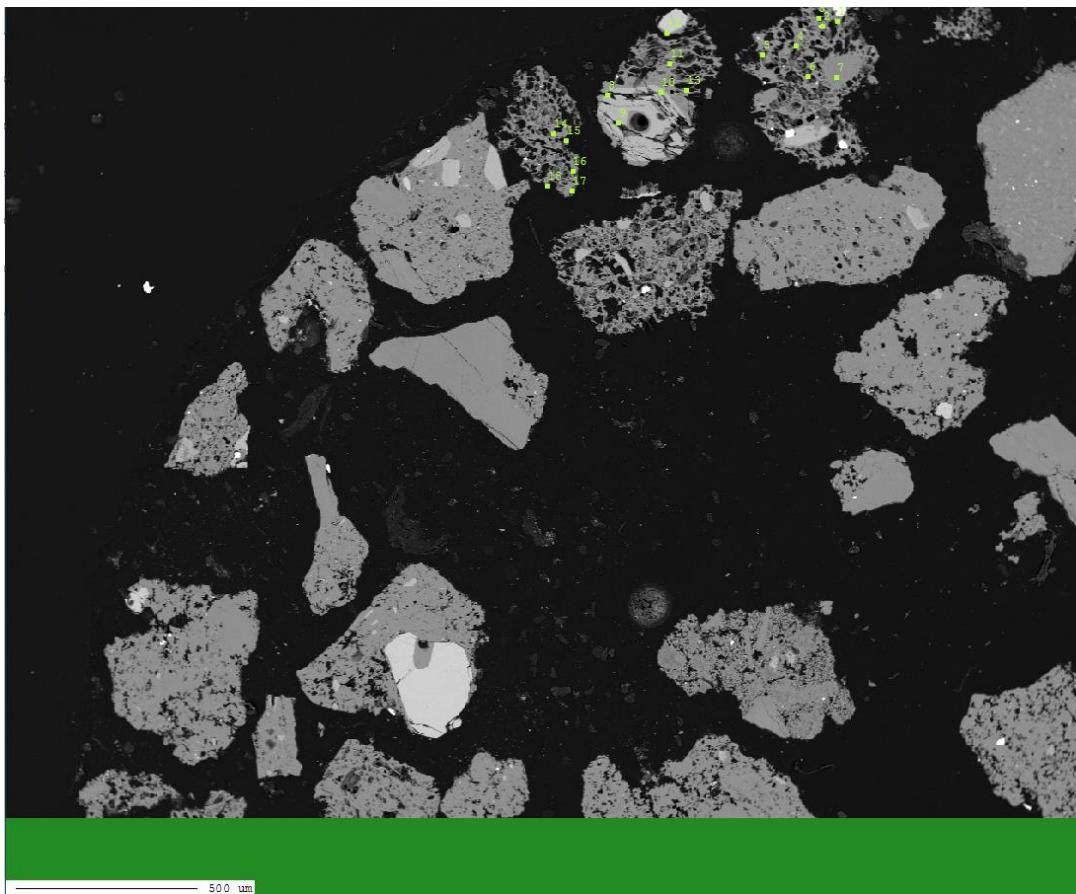


Figure F5-10. Overview picture of S_{Pm}40 with 18 measured points in 3 grains.

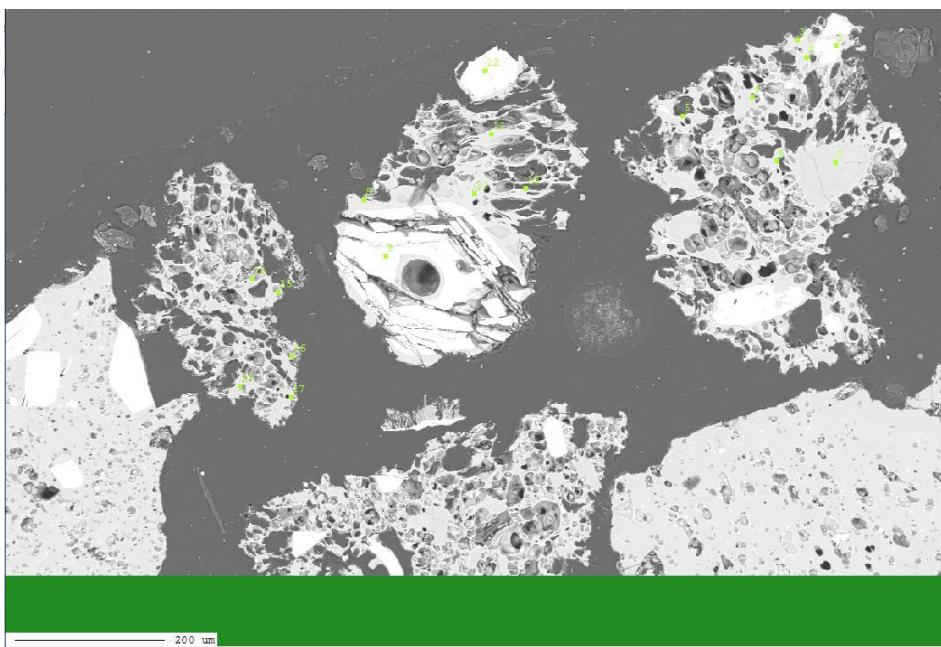


Figure F5-11. Zoom of the three grains of S_{Pm}40.

Sample: S_{Pm40B} (second stub)

Number of grains: 2

Number of samples: 2

1	S40b grain 1
1	S40b grain 2

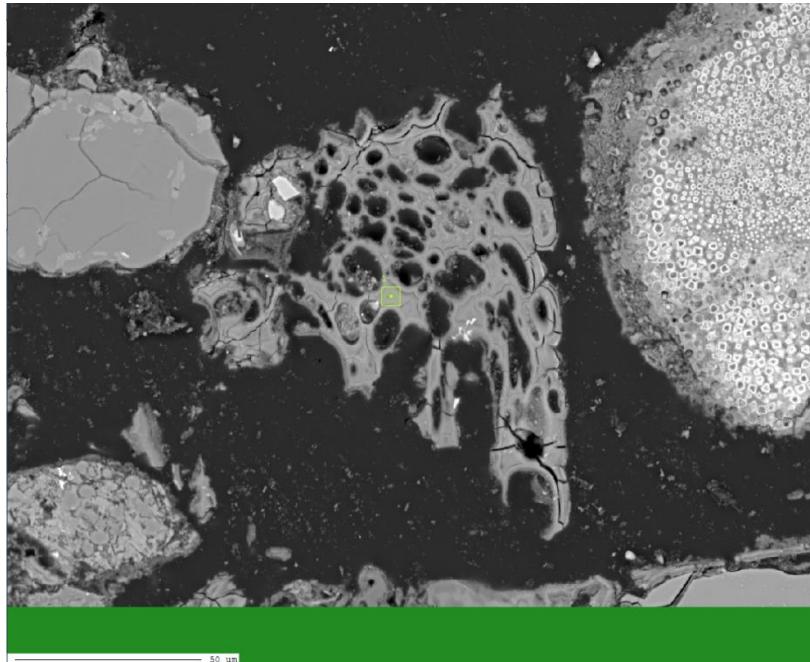


Figure F5-12. Grain 1 of S_{Pm40B} showing weathered tephra with point 1.

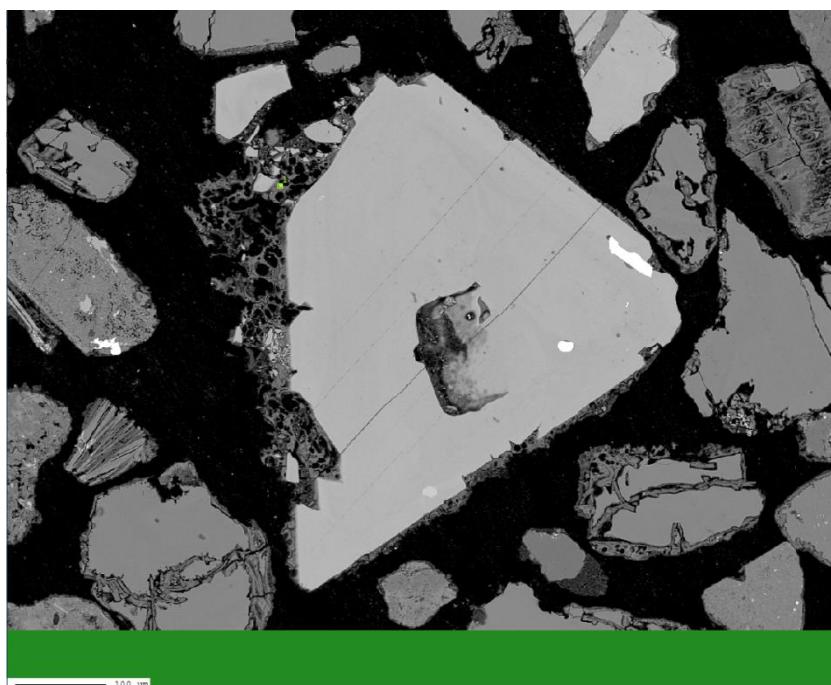


Figure F5-13. Grain 2 of S_{Pm40B} with one measured point, tephra one edges.

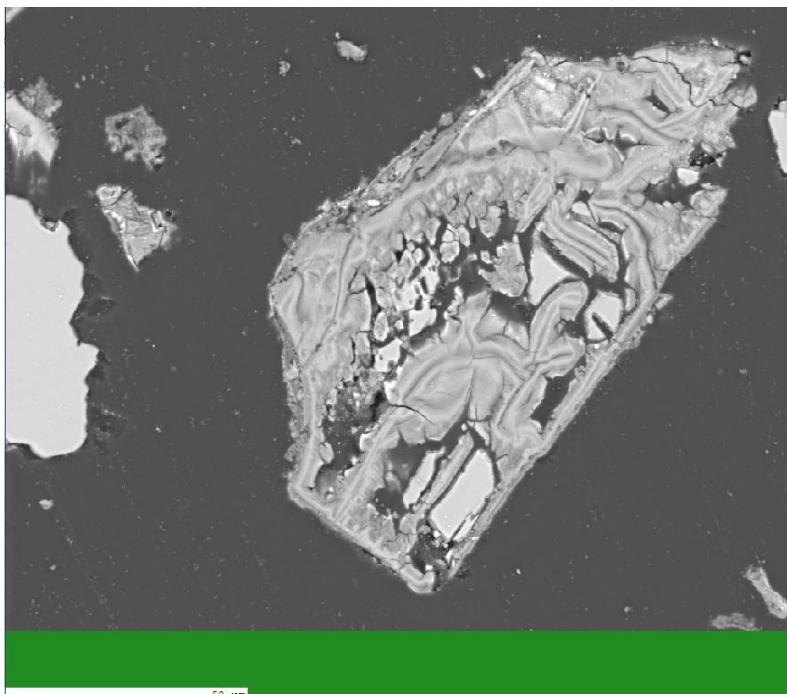


Figure F5-14. Grain 3 of S_{Pm40B} showing real weather sample.

Sample: S_{Pm41}

Number of grains: 2

Number of samples: 5

1	S41 grain 1 (NCU)
2	S41 grain 1 (NCU)
1	S41 grain 2
2	S41 grain 2
3	S41 grain 2

*NCU: no close up

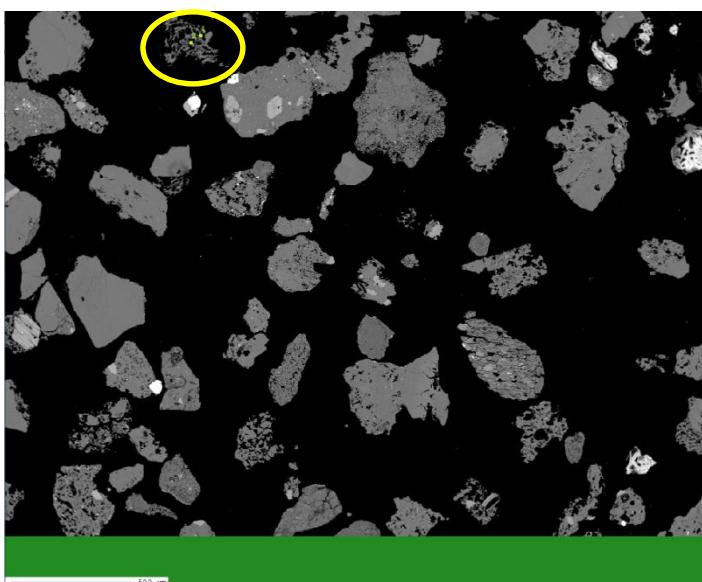


Figure S5-15. Overview of S_{Pm41} with grain 1 containing two measured points.

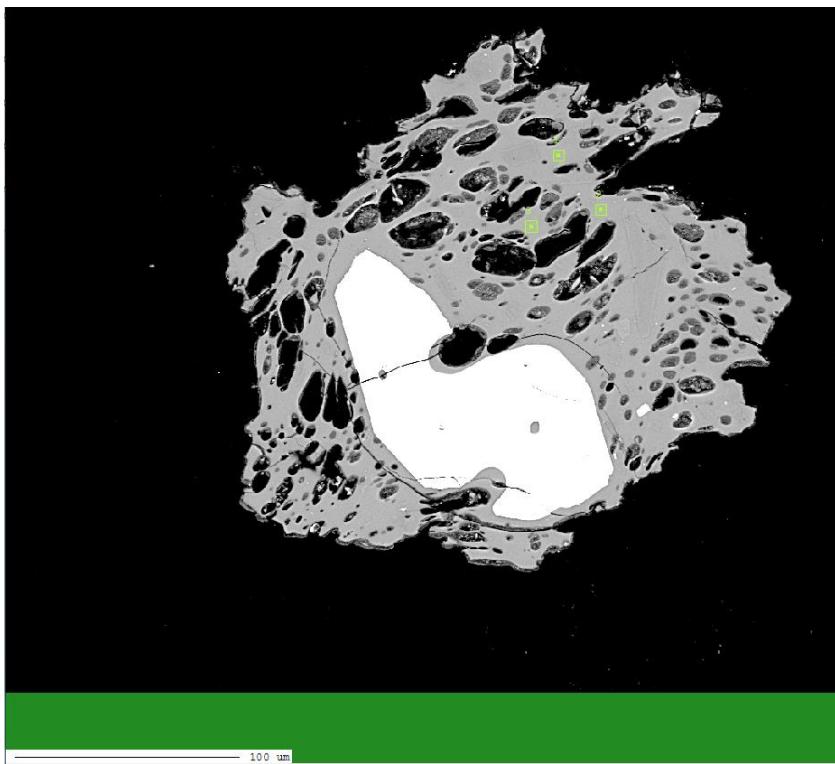


Figure F5-16. Zoom in grain 2 of S_{Pm41} showing tephra surrounding mineral with points 1-3.

Sample: S_{Pm42}

Number of grains: 2

Number of samples: 6

1	S42 grain 1
2	S42 grain 1
3	S42 grain 1
4	S42 grain 2
5	S42 grain 2
6	S42 grain 2

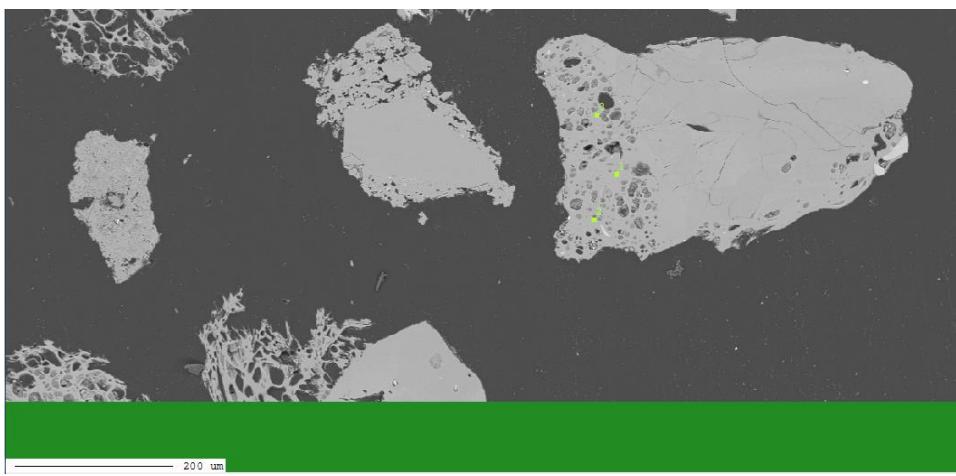


Figure F5-17. Picture of S_{Pm42} with grain 1 containing measuring points 1-3.

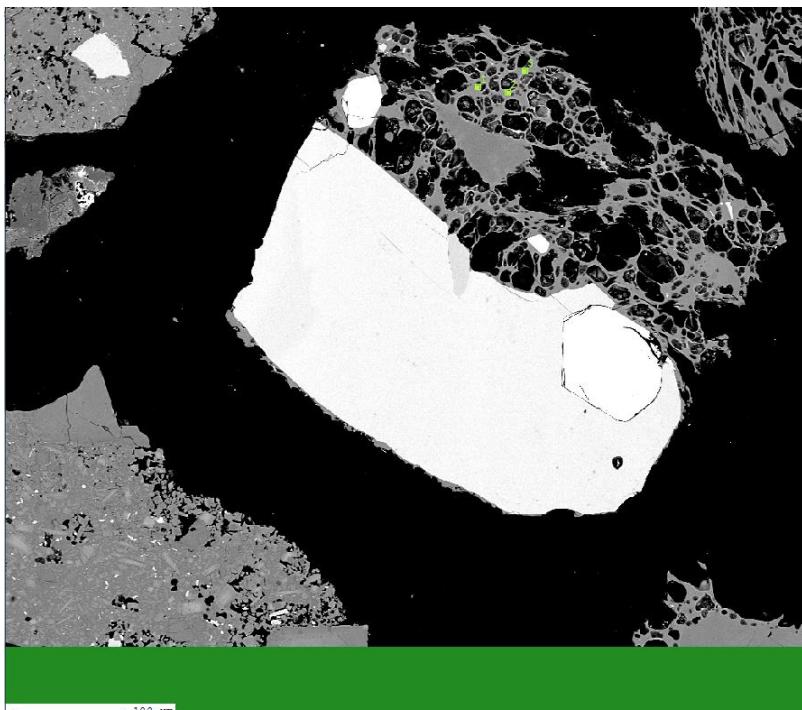


Figure F5-18. Grain 2 of S_{Pm42} mineral with tephra on edges, measured point 1-3 (plagioclase mineral).

Sample: S_{Pm43} .

Number of grains: 1

Number of samples: 4

1	S43 grain 1 (NCU)
2	S43 grain 1 (NCU)
3	S43 grain 1 (NCU)
4	S43 grain 1 (NCU)

*NCU: no close up

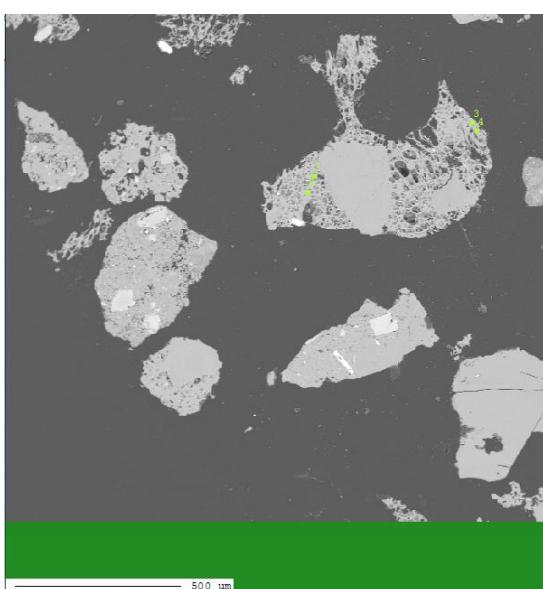


Figure F5-19. Overview image with grain 1 containing measured points 1-4 in S_{Pm43} .

Sample: S_{Pm44}.

Number of grains: 1

Number of samples: 4

1	S44 grain 1
2	S44 grain 1
3	S44 grain 1

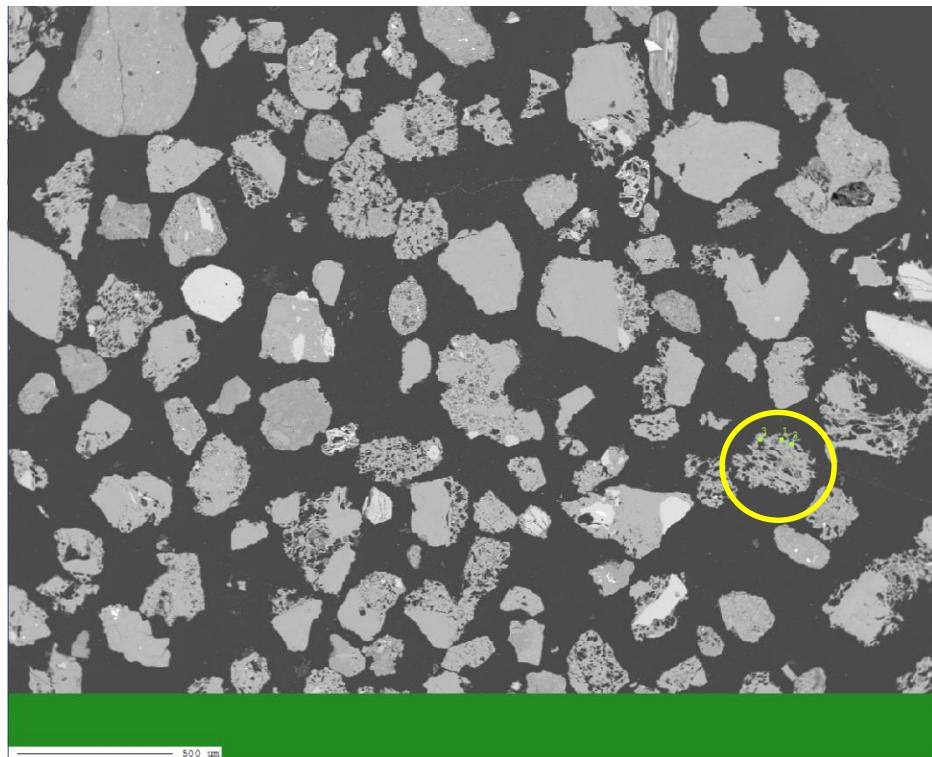


Figure F5-20. Overview of S_{Pm44} with grain 1 containing measured points 1-3.

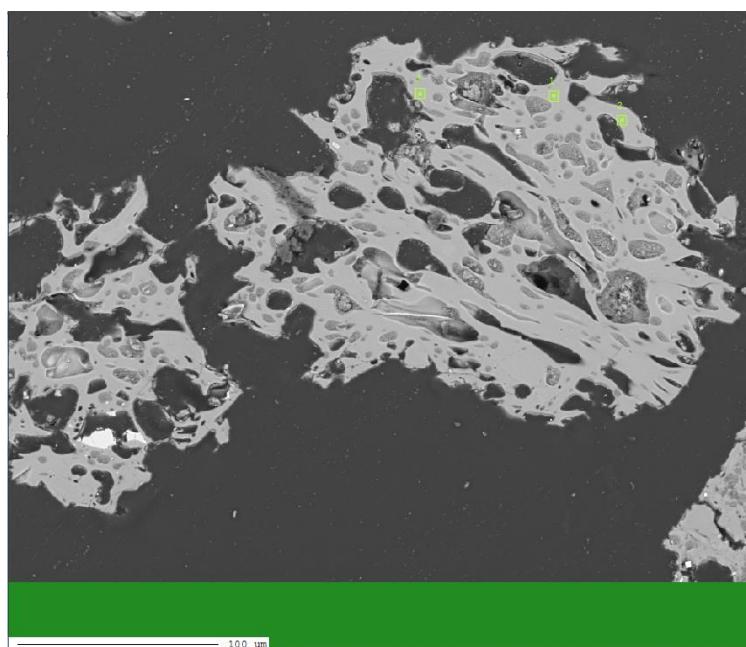


Figure F5-21. Zoom in grain 1 of S_{Pm44} showing well preserved tephra with points 1-3.

Sample: S_{Pm45}

Number of grains: 1

Number of samples: 4

1	S45 grain 1
2	S45 grain 1
3	S45 grain 2
4	S45 grain 1 (NCU)

*NCU: no close up

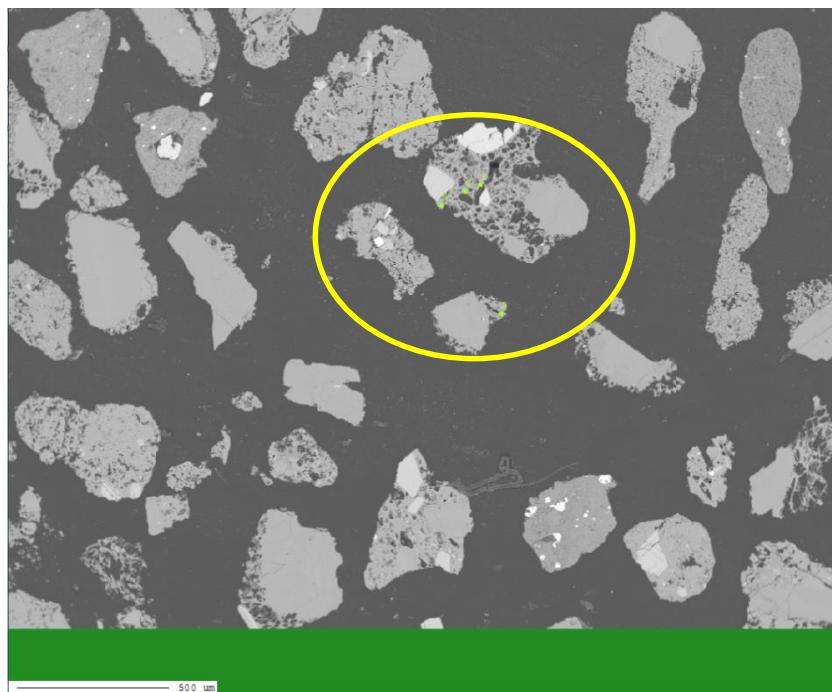


Figure F5-22. Overview of S_{Pm45} with grain 1 and 2.

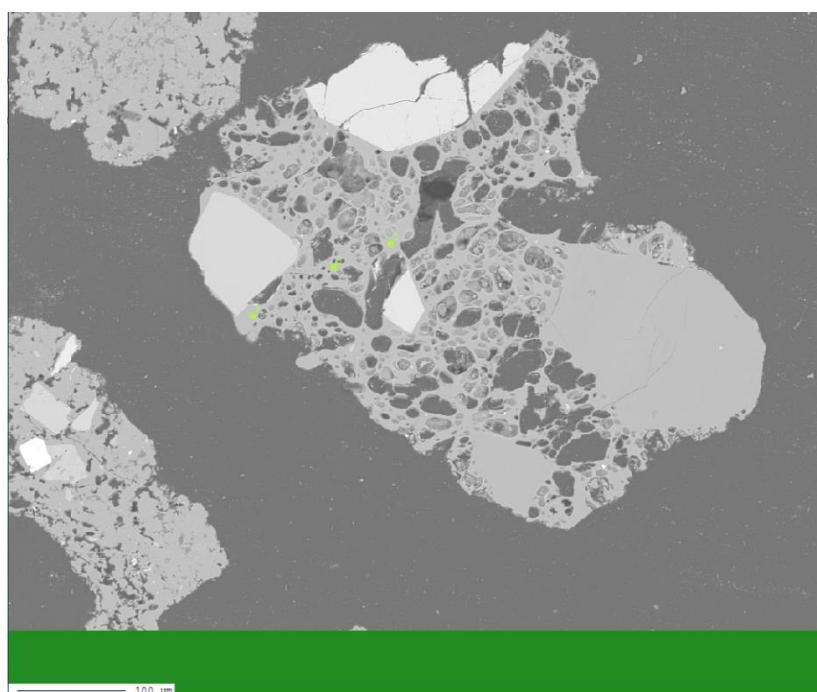


Figure F5-23. Grain 1 of S_{Pm45} showing measured points 1-3.

Sample: S_{Pm46}.

Number of grains: 3

Number of samples: 6

1	S46 grain 1
2	S46 grain 1
1	S46 grain 2
2	S46 grain 2
3	S46 grain 3
4	S46 grain 3

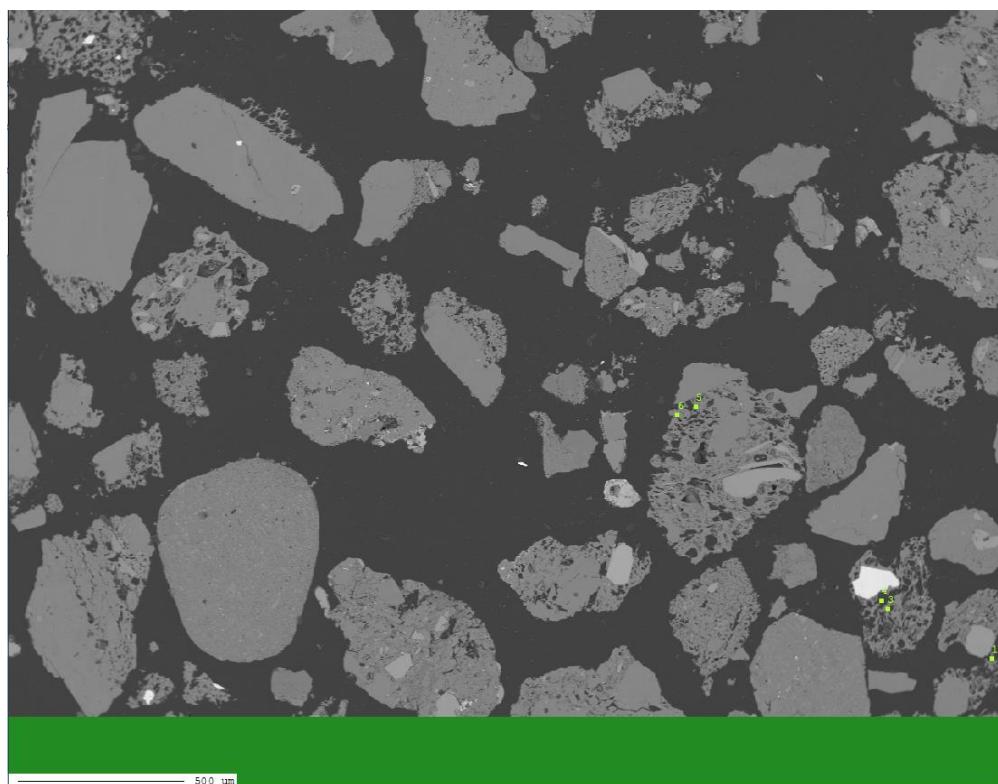


Figure F5-24. Overview of S_{Pm46} showing measured points 1-6 in three grains.

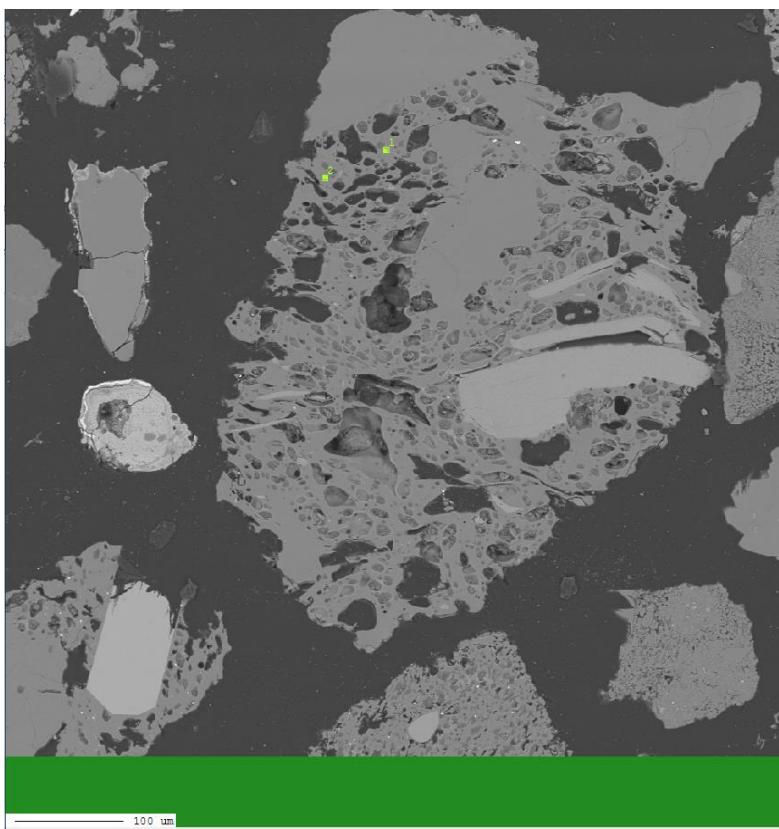


Figure F5-25. Grain 3 of S_{Pm46} with measured points 5 and 6 displayed as 1 and 2, tephra grain well preserved along with minerals.

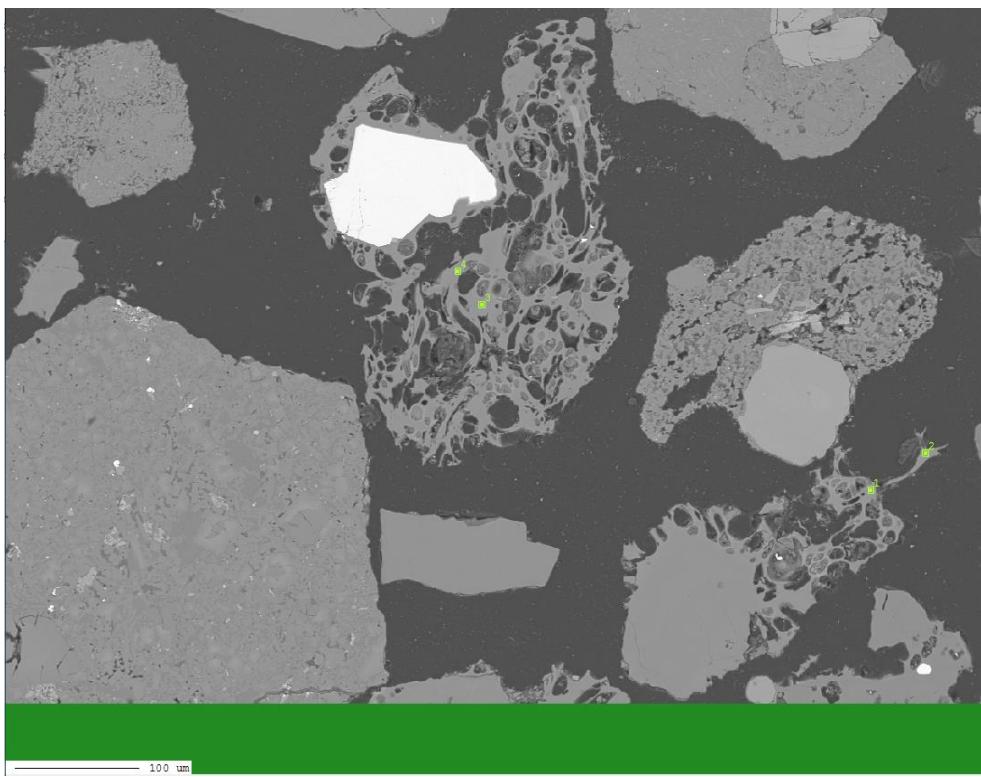


Figure F5-26. Grain 1 and 2 of S_{Pm46} with measured points 1-4.

Sample: S_{Pm47}.

Number of grains: 2

Number of samples: 4

1	S47 grain 1
2	S47 grain 1
3	S47 grain 1
4	S47 grain 1

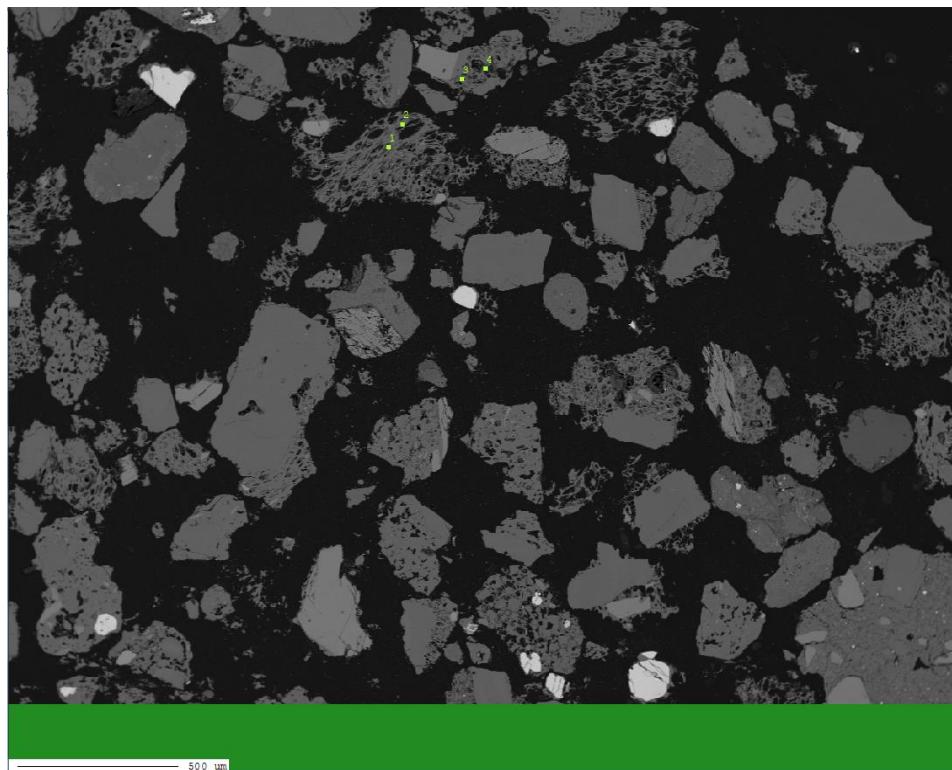


Figure F5-27. Overview image of S_{Pm47} with grain 1 and 2.

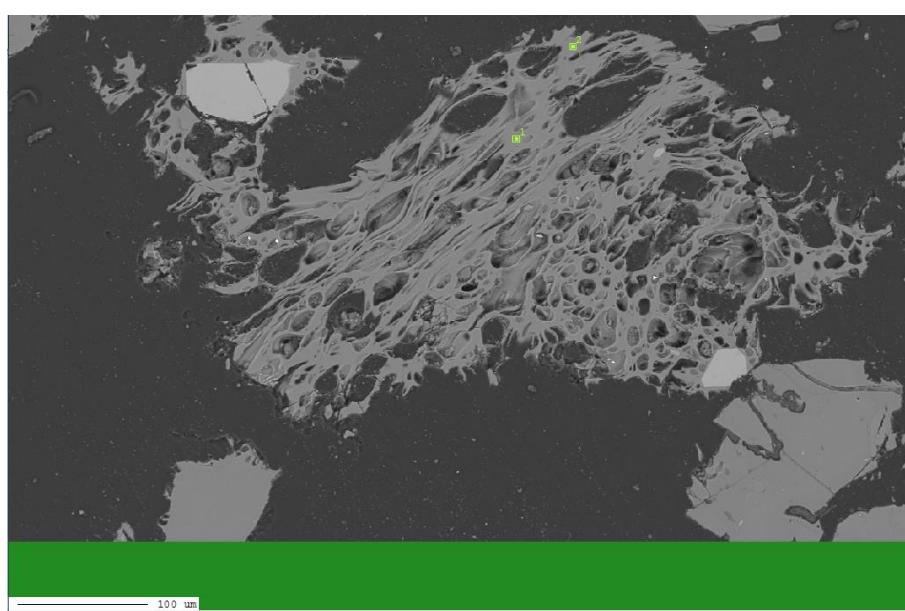


Figure F5-28. Zoom of grain 1 of S_{Pm47} with measured points, well preserved tephra.

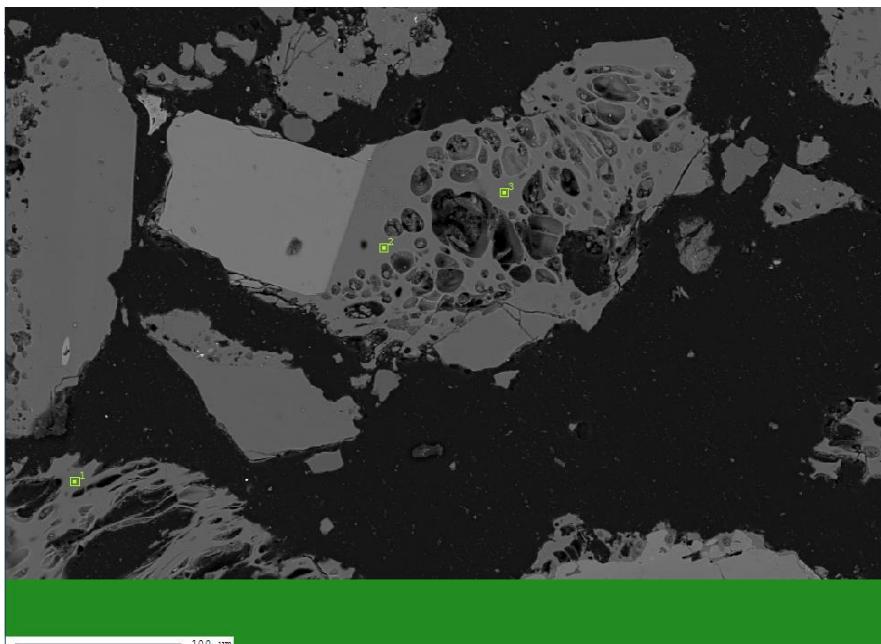


Figure F5-29. Zoom of grain 2 of S_{Pm47} with measured point 3 and 4.

Sample: S48.

Number of grains: 2

Number of samples: 3

1	S48 grain 1
2	S48 grain 1
3	S48 grain 2

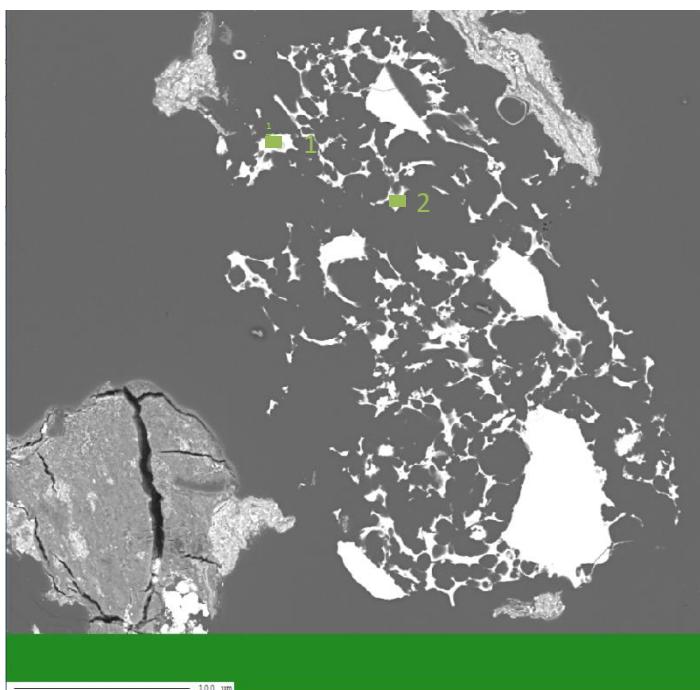


Figure F5-30. Tephra grain 1 of S48, points 1-2.

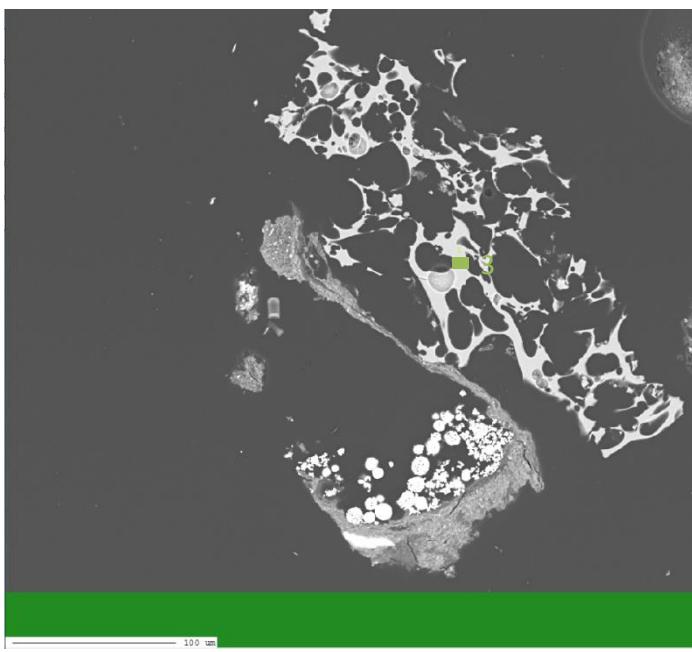


Figure F5-31. Grain 2 of S48, same character of the other grain in previous image.

Sample: S50.

Number of grains: 2

Number of samples: 4

1	S50 grain 1
2	S50 grain 1
3	S50 grain 2
4	S50 grain 2

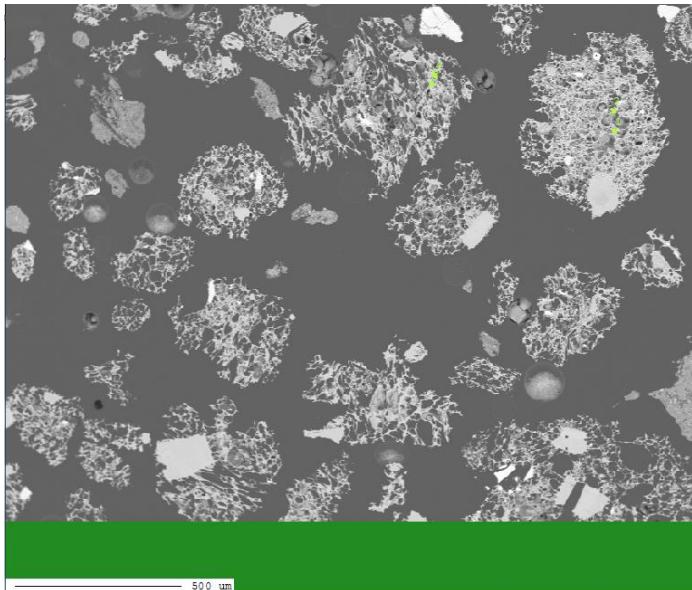


Figure F5-32. Overview image of S50 showing the two measured grains with 4 measured points in light green.

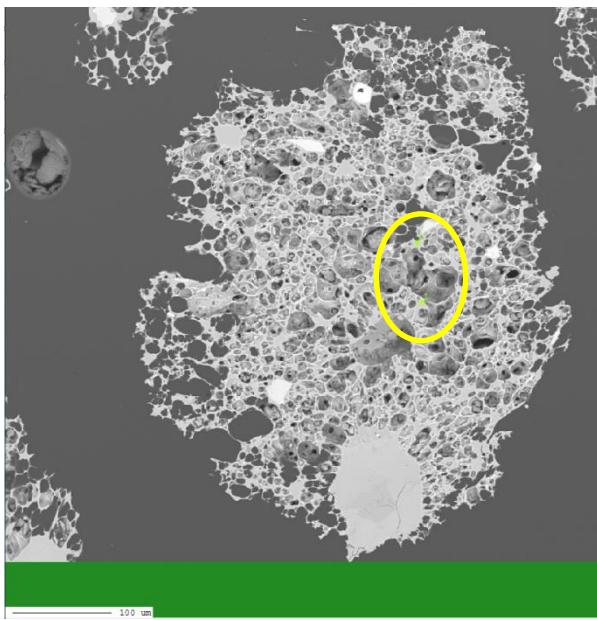


Figure F5-33. Zoom on grain 1 in S50 with measured points 1-2 in light green, well preserved tephra.

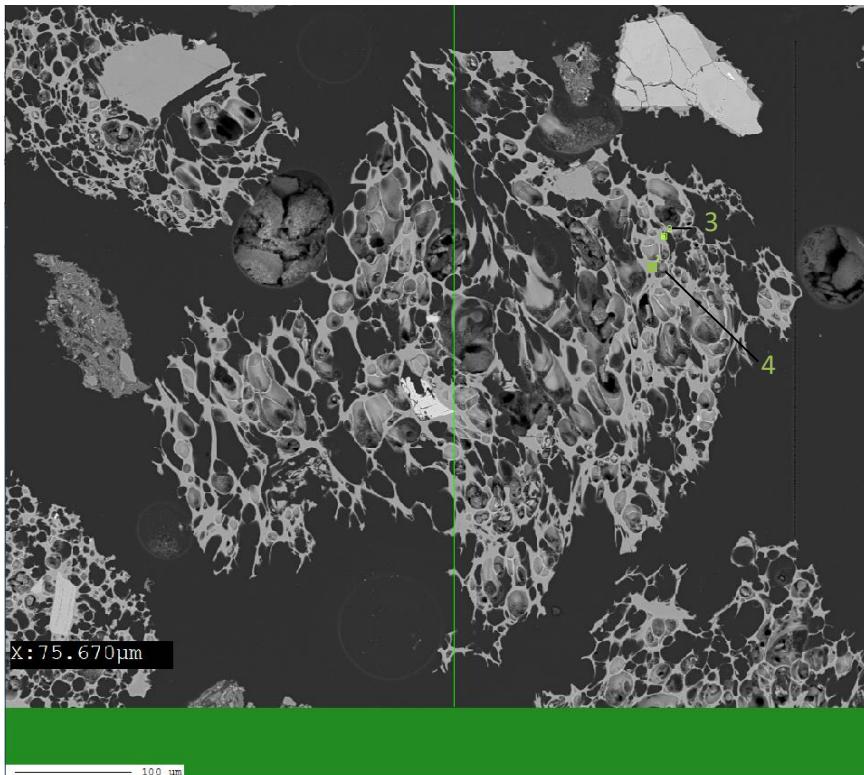


Figure F5-34. Zoom on grain 2 of S50 with measured points 3-4 in light green, well preserved tephra.

Sample: S52.

Number of grains: 2

Number of samples: 4

1	S52 grain 1
2	S52 grain 1
3	S52 grain 2
4	S52 grain 2



Figure F5-35. Grain 1-2 of S52 with four measured data points, small tephra with different characteristics than S50.

Sample: S53.

Number of grains: 4

Number of samples: 8

1	S53 grain 1
2	S53 grain 1
3	S53 grain 1
1	S53 grain 2
2	S53 grain 3
3	S53 grain 3
1	S53 grain 4
2	S53 grain 5

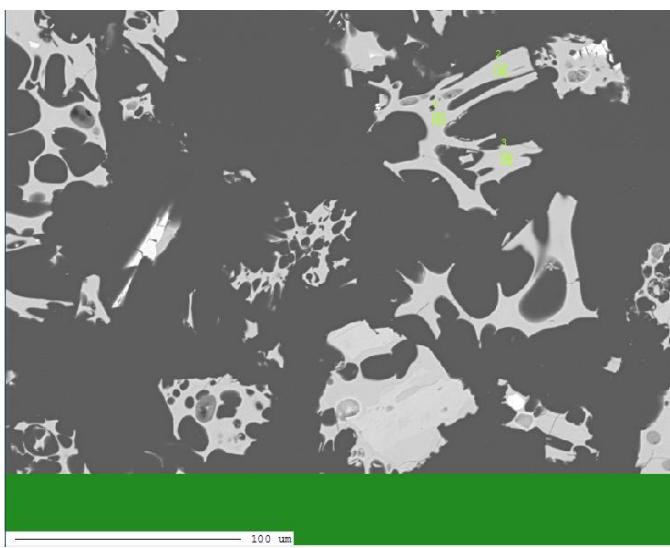


Figure F5-36. Grain 1 of S53 with measured points 1-3 in light green.

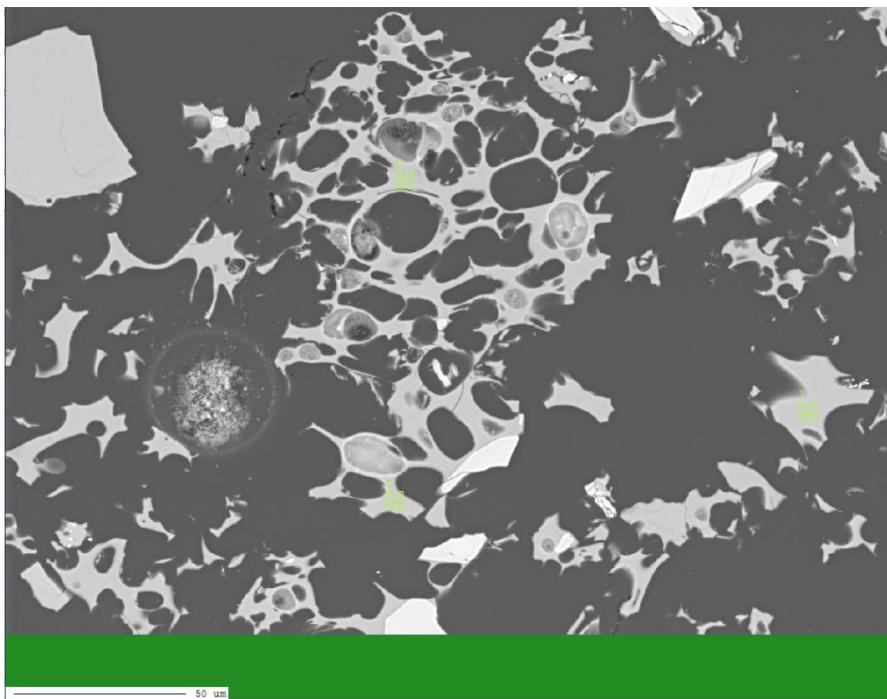


Figure F5-37. Grain 2 and 3 in S53 with three measured data points in light green, well preserved tephra.

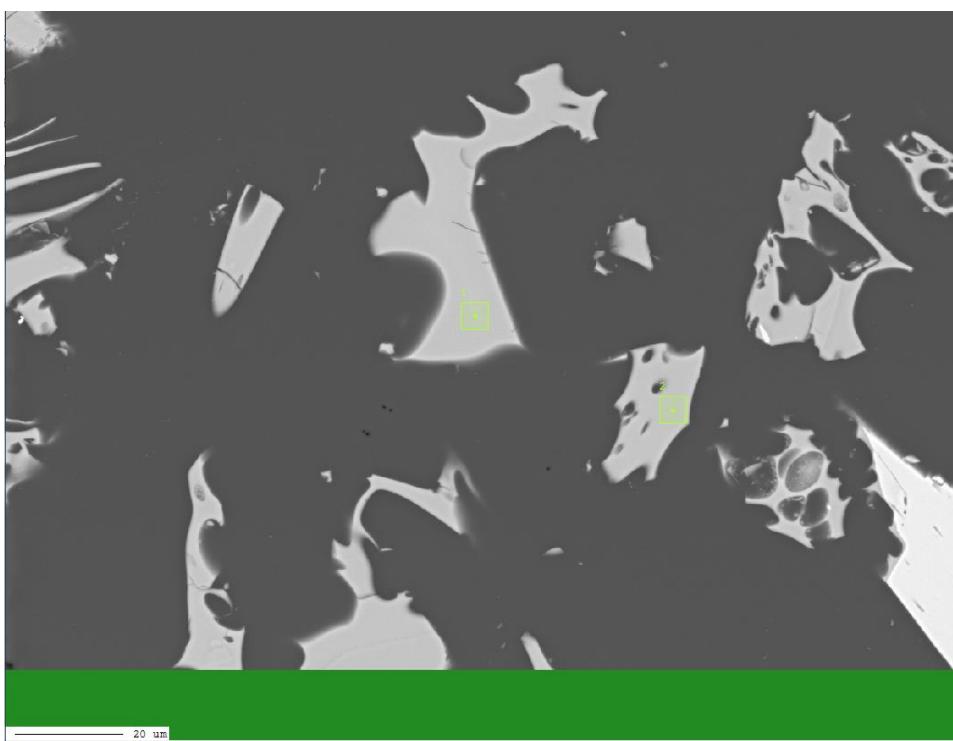


Figure F5-38. Grain 4 and 5 in S53 with two measured data points in light green.

Sample: S54.

Number of grains: 2

Number of samples: 6

1	S54 grain 1
2	S54 grain 1
3	S54 grain 1
1	S54 grain 2

2	S54 grain 2
3	S54 grain 2

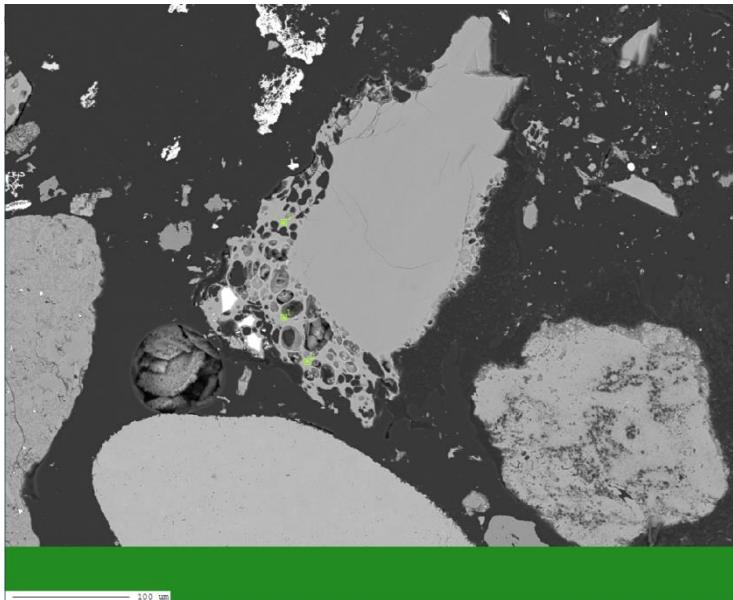


Figure F5-39. Grain 1 of S54 with measured points 1-3 in light green, tephra is surrounding the mineral.

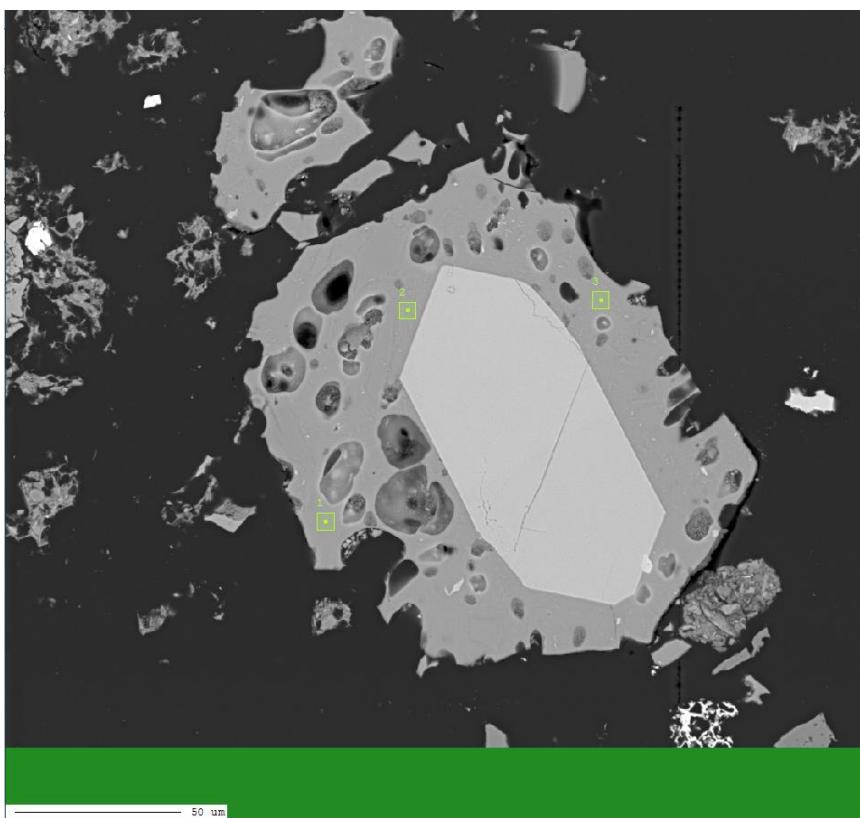


Figure F5-40. Grain 2 in S54, different texture of tephra surrounding the mineral, very large surfaces of tephra.

Sample: S55.

Number of grains: 1

Number of samples: 2

1	S55 grain 1 (NCU)
2	S55 (mineral, NCU)

*NCU: no close up

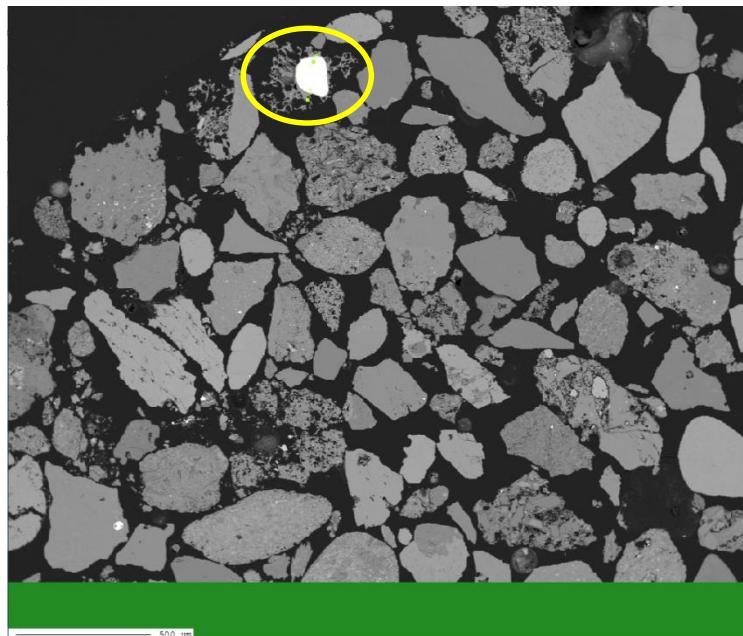


Figure F5-41. Overview picture of S55 containing two measured points.

Appendix G: standards

Two tables of with the standards from six days of measuring. The first table is the average of all the days together and second table for each day separately. Standards VG-568, Nist0SRM-620, VGA-99, VG-2 and Diopside were used as external standards. The accuracy and precision are reported in percentage deviation from the reported value.

Table G-1. Average of standards of the individual days of VG-568, NIST0SRM-620, VGA-99, VG-2 and Diopside.

	Sum VG-568 (rhyolitic glass)				Sum NIST0SRM 620			
	Reported (wt %)	Average (n = 31)	Accuracy (relative %)	Precision (%)	Reported (wt %)	Average (n = 24)	Accuracy (relative %)	Precision (%)
SiO₂	76.71	76.31	-0.53	0.67	72.08	72.59	0.70	1.35
Na₂O	3.75	3.58	-4.59	8.84	14.39	14.11	-1.96	5.17
P₂O₅	0.09	-	-	-	-	-	-	-
Cl	0.13	0.099	-23.94	29.33	-	-	-	-
TiO₂	0.12	0.076	-36.57	37.57	0.018	0.016	-8.84	158.76
K₂O	4.89	5.25	7.32	1.59	0.41	0.41	-0.39	13.01
CaO	0.5	0.45	-10.74	12.15	7.11	7.39	3.98	2.16
SO₃	-	-	-	-	0.28	-	-	-
Al₂O₃	12.02	11.93	-0.73	0.94	1.8	1.79	-0.64	5.57
MgO	0.09	-	-	-	3.69	3.87	4.83	3.08
FeO	1.23	1.18	-3.87	8.09	-	-	-	-
MnO	0.03	0.027	-8.58	159.78	-	-	-	-
Totals before normalisation	99.68	98.96	-0.72	0.53	99.78	100.52	0.75	0.80

	Sum Glass Vg-2				Sum Diopside			
	Reported (wt %)	Average (n = 7)	Accuracy (relative %)	Precision (%)	Reported (wt %)	Average (n = 6)	Accuracy (relative %)	Precision (%)
SiO₂	50.81	48.26	-5.028	0.86	54.55	54.81	0.48	1.10
Na₂O	2.62	2.65	1.27	2.62	-	0.010	-	-
P₂O₅	0.2	0.31	55.55	7.35	-	0.19	-	-
Cl	-	0.027	-	33.33	-	0.0025	-	-
TiO₂	1.85	1.88	1.69	3.32	-	0.011	-	-
K₂O	0.19	0.18	-5.45	6.72	-	0.00072	-	-
CaO	11.12	11.56	3.94	3.52	25.61	26.38	3.02	2.79
SO₃	-	0.31	-	-	-	0.018	-	-
Al₂O₃	14.06	13.85	-1.51	0.47	-	0.0055	-	-
MgO	6.71	6.77	0.90	5.64	16.5	16.74	1.48	1.60
FeO	11.84	11.81	-0.28	0.85	2.51	2.42	-3.54	47.59
MnO	0.22	0.22	-1.83	20.27	0.65	0.53	-18.96	1679.52
Totals before normalisation	99.62	97.82	-1.80	0.61	99.82	101.13	1.301	0.70

Table G-2. Error in standards of EMP measured on six different days. VG-568. NIST0SRM-620. VGA-99. VG-2 and Diopside used as standards.

A. VG-568 (rhyolitic glass)

		12-2-2015			28-4-2015		
	Reported (wt %)	Average (n = 4)	Accuracy (relative %)	Precision (%)	Average (n = 4)	Accuracy (relative %)	Precision (%)
SiO₂	76.71	73.44	-4.27	0.70	76.80	0.11	0.21
Na₂O	3.75	3.41	-9.07	12.60	3.80	1.2	2.20
P₂O₅	0.09	0.014	-84.94	77.98	-	-	-
Cl	0.13	0.105	-19.60	8.19	0.091	-30.35	4.79
TiO₂	0.12	0.070	-41.29	28.81	0.082	-31.77	16.71
K₂O	4.89	5.26	7.62	0.29	5.34	9.20	0.85
CaO	0.5	0.46	-9.02	4.39	0.45	-9.83	1.24
SO₃	-	0.0092	-	-	-	-	-
Al₂O₃	12.02	12.13	0.89	0.55	11.77	-2.12	0.95
MgO	0.09	0.034	-61.75	42.65	-	-	-
FeO	1.23	1.17	-4.59	2.57	1.18	-3.86	1.98
MnO	0.03	0.0051	-82.92	143.52	0.041	35.17	31.08
Totals before normalisation	99.68	96.23	-3.46		99.60	-0.083	0.27
	30-4-2015			1-6-2015			
	Average (n = 3)	Accuracy (relative %)	Precision (%)	Average (n = 7)	Accuracy (relative %)	Precision (%)	
SiO₂	76.72	0.017	0.28	76.81	0.13	0.75	
Na₂O	3.79	1.16	1.69	3.49	-6.90	3.94	
P₂O₅	-	-	-	0.0060	-93.32	-	
Cl	0.11	-13.21	3.96	0.099	-23.91	3.95	
TiO₂	0.060	-50.31	5.11	0.080	-33.61	27.09	
K₂O	5.09	4.16	0.23	5.31	8.68	0.95	
CaO	0.45	-10.57	3.49	0.44	-11.76	2.15	
SO₃	-	-	-	0.0098	-	-	
Al₂O₃	11.96	-0.47	0.29	11.71	-2.58	1.13	
MgO	-	-	-	0.026	-71.49	-	
FeO	1.18	-3.73	3.41	1.21	-1.51	7.49	
MnO	0.037	24.11	27.76	0.020	-34.05	57.37	
Totals before normalisation	99.44	-0.24	0.21	99.22	-0.46	0.58	

	2-6-2015			14-7-2015		
	Average (n = 10)	Accuracy (relative %)	Precision (%)	Average (n = 3)	Accuracy (relative %)	Precision (%)
SiO₂	76.88	0.22	0.68	77.19	0.63	0.89
Na₂O	3.247	-13.41	17.39	3.73	-0.53	2.29
P₂O₅	0.006	-93.33	-	0.0013	-98.52	-
Cl	0.091	-30.32	16.97	0.096	-26.23	16.05
TiO₂	0.068	-43.55	32.68	0.097	-18.92	17.87
K₂O	5.21	6.61	2.99	5.26	7.63	0.58
CaO	0.44	-11.56	6.28	0.44	-11.69	6.16
SO₃	0.009	-	-	0.0041	-	-
Al₂O₃	11.79	-1.94	0.58	12.24	1.86	0.26
MgO	0.028	-68.72	-	0.022	-75.70	-
FeO	1.16	-5.34	4.75	1.18	-4.17	3.50
MnO	0.019	-35.13	83.34	0.042	41.33	56.79
Totals before normalisation	98.95	-0.73	0.43	100.31	0.63	0.77

B. NISTOSRM 620

		12-2-2015			28-4-2015		
	Reported (wt%)	Average (n = 4)	Accuracy (relative %)	Precision (%)	Average (n = 3)	Accuracy (relative %)	Precision (%)
SiO₂	72.08	72.53	0.62	1.18	73.45	1.90	2.69
Na₂O	14.39	13.93	-3.20	1.24	13.83	-3.91	11.76
P₂O₅	-	0.074	-	13.29	-	-	-
Cl	-	0.020	-	43.14	-	-	-
TiO₂	0.018	0.015	-17.36	86.21	0.013	-28.70	84.96
K₂O	0.41	0.42	3.23	1.98	0.40	-1.54	3.24
CaO	7.11	7.68	7.95	0.76	7.56	6.38	1.00
SO₃	0.28	0.26	-8.40	-	-	-	-
Al₂O₃	1.8	1.93	7.31	2.21	1.73	-4.07	1.81
MgO	3.69	4.29	16.12	0.40	3.68	-0.27	3.39
FeO	-	0.034	-	45.18	-	-	-
MnO	-	0.0037	-	200.00	-	-	-
Totals before normalisation	99.78	101.19	1.41	0.81	100.99	1.21	0.72

	30-4-2015			1-6-2015		
	Average (n = 3)	Accuracy (relative %)	Precision (%)	Average (n = 6)	Accuracy (relative %)	Precision (%)
SiO₂	72.02	-0.079	0.51	72.23	0.21	0.91
Na₂O	14.52	0.88	2.24	13.65	-5.13	2.52
P₂O₅	-	-	-	0.033	-	46.58
Cl	0.020	-	26.53	0.017	-	36.49
TiO₂	0.023	27.96	15.35	0.023	28.89	62.81
K₂O	0.39	-3.67	4.07	0.42	1.76	2.57
CaO	7.1	-0.14	0.61	7.45	4.83	0.72
SO₃	0.20	-27.86	-	0.24	-15.20	-
Al₂O₃	1.72	-4.19	2.99	1.75	-3.00	3.33
MgO	3.69	-0.09	1.64	3.80	2.85	1.09
FeO	0.026	-	116.96	0.028	-	115.58
MnO	0.013	-	56.78	0.022	-	154.92
Totals before normalisation	99.78	0.0057	0.64	99.66	-0.12	0.87

	2-6-2015			14-7-2015		
	Average (n = 5)	Accuracy (relative %)	Precision (%)	Average (n = 3)	Accuracy (relative %)	Precision (%)
SiO₂	72.30	0.30	0.72	72.99	1.26	0.34
Na₂O	14.04	-2.42	1.73	14.68	2.015	0.77
P₂O₅	0.056	-	41.94	0.037	-	88.62
Cl	0.022	-	13.77	0.029	-	26.49
TiO₂	0.024	33.56	26.54	0.00047	-97.41	173.21
K₂O	0.41	-0.015	4.97	0.40	-2.11	2.40
CaO	7.28	2.45	4.24	7.28	2.44	0.62
SO₃	0.23	-19.21	-	0.26	-6.86	-
Al₂O₃	1.76	-2.44	1.69	1.85	2.54	1.54
MgO	3.84	4.07	2.13	3.92	6.32	0.74
FeO	0.055	-	41.93	0.050	-	41.50
MnO	0	-	-	0.0113	-	66.50
Totals before normalisation	100.01	0.24	1.04	101.51	1.74	0.44

C. Glass A-99

		12-2-2015		
	Reported (wt%)	Average (n = 4)	Accuracy (relative %)	Precision (%)
SiO ₂	50.94	46.91	-7.91	2.09
Na ₂ O	2.66	2.59	-2.73	6.90
P ₂ O ₅	0.38	0.53	39.99	3.82
Cl	-	0.024	-	24.07
TiO ₂	4.06	4.03	-0.68	0.82
K ₂ O	0.82	0.87	6.42	1.43
CaO	9.3	9.44	1.48	0.50
SO ₃	-	0.03	-	-
Al ₂ O ₃	12.49	12.28	-1.66	0.67
MgO	5.08	5.08	0	0.72
FeO	13.3	13.47	1.26	1.75
MnO	0.15	0.19	23.42	15.27
Totals before normalisation	99.2	95.48	-3.75	1.10

D. Glass Vg-2

		12-2-2015			14-7-2015		
	Reported (wt%)	Average (n = 4)	Accuracy (relative %)	Precision (%)	Average (n = 3)	Accuracy (relative %)	Precision (%)
SiO ₂	50.81	46.36	-8.76	1.25	50.15	-1.29	0.14
Na ₂ O	2.62	2.68	2.29	2.42	2.63	0.25	2.81
P ₂ O ₅	0.2	0.34	68.23	6.36	0.29	42.87	8.47
Cl	-	0.03	-	32.46	0.027	-	34.18
TiO ₂	1.85	1.87	1.22	2.44	1.89	2.16	3.99
K ₂ O	0.19	0.175	-7.96	9.41	0.18	-2.95	2.45
CaO	11.12	11.76	5.78	4.16	11.35	2.10	2.65
SO ₃	-	0.33	-	-	0.30	-	-
Al ₂ O ₃	14.06	13.79	-1.90	0.60	13.90	-1.11	0.29
MgO	6.71	6.56	-2.27	6.93	6.98	4.07	4.19
FeO	11.84	11.76	-0.70	1.16	11.86	0.14	0.30
MnO	0.22	0.23	4.63	4.25	0.20	-8.29	30.30
Totals before normalisation	99.62	95.88	-3.75	0.87	99.76	0.14	0.04

E. Diopside

		1-6-2015			2-6-2015		
	reported (wt%)	Average (n = 1)	Accuracy (relative %)	Precision (%)	Average (n = 3)	Accuracy (relative %)	Precision (%)
SiO₂	54.55	55.1	1.01	-	54.47	-0.15	0.49
Na₂O	0	0	-	-	0.012	-	105.17
P₂O₅	0	0.21	-	-	0.21	-	24.68
Cl	0	0	-	-	0.0074	-	95.06
TiO₂	0	0	-	-	0.006	-	173.21
K₂O	0	0	-	-	0	-	-
CaO	25.61	25.6	-0.04	-	27.12	5.91	4.70
SO₃	0	0.026	-	-	0.014	-	-
Al₂O₃		0	-	-	0.016	-	88.37
MgO	16.5	16.43	-0.4	-	16.44	-0.34	0.28
FeO	2.51	2.46	-1.99	-	2.40	-4.25	4.79
MnO	0.65	0.55	-15.3	-	0.50	-22.78	8.49
Totals before normalisation	99.82	100.38	0.56	-	101.20	1.39	1.07

	14-7-2015		
	Average (n = 2)	Accuracy (relative %)	Precision (%)
SiO₂	54.87	0.59	0.03
Na₂O	0.017	-	13.93
P₂O₅	0.15	-	37.91
Cl	0	-	-
TiO₂	0.026	-	119.58
K₂O	0.0022	-	141.42
CaO	26.43	3.18	0.19
SO₃	0.015	-	-
Al₂O₃	0.0006	-	141.42
MgO	17.36	5.21	1.06
FeO	2.4	-4.38	1.77
MnO	0.528	-18.78	21.55
Totals before normalisation	101.79	1.98	0.13

Appendix H: EMP data

H1: Accepted data

The same abbreviations shown in H1 are used in this appendix. Here all the data points used in this thesis are shown. They later are averaged to show the samples with standard deviation based on the measurements shown here.

Table H1-1

sample	3 m. stub 1	3 m. stub 2	3 m. stub 2	3 m. stub 2					
grain (glass shards get -)	3	3	3	4	4	4	-	-	-
reference number to appendix H	A3a	A3b	A3c	A4a	A4b	A4c	*	*	*
SiO₂	72.83	73.74	73.81	69.03	68.87	68.77	71.46	69.36	69.44
Na₂O	4.38	4.11	4.04	4.42	4.53	4.49	3.97	4.02	3.81
P₂O₅	0.02	0.01	0.03	0.09	0.05	0.09	0.00	0.09	0.14
Cl	0.24	0.24	0.21	0.23	0.23	0.24	0.21	0.23	0.23
TiO₂	0.22	0.18	0.21	0.22	0.28	0.26	0.15	0.26	0.26
K₂O	6.00	5.83	5.84	5.86	5.72	5.75	4.90	5.86	5.84
CaO	0.79	0.73	0.69	2.01	2.04	2.09	2.04	2.04	2.07
SO₃	0.01	0.01	0.00	0.04	0.05	0.04	0.03	0.00	0.02
F	0.03	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.03
Al₂O₃	14.26	13.98	14.06	16.35	16.49	16.44	16.17	16.40	16.33
MgO	0.12	0.08	0.10	0.21	0.22	0.26	0.07	0.22	0.24
FeO^t	1.03	1.00	0.92	1.46	1.43	1.43	0.93	1.43	1.51
MnO	0.06	0.04	0.06	0.07	0.09	0.15	0.08	0.09	0.08
Total	94.44	93.37	93.29	95.64	95.68	95.10	93.51	93.72	93.64
Date	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015
comment	Minin	Minin	Minin	apatite MI	apatite MI	apatite MI	-	-	-
morphology	GS	GS	GS	Mined	Mined	Mined	Mined	Mined	Mined
Picture	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No

sample	3 m. stub 2									
grain (glass shards get -)	1	1	1	2	2	2	3	3	3	5
reference number to appendix H	B1a	B1b	B1c	B2a	B2b	B2c	B3a	B3b	B3c	B5
SiO ₂	73.57	72.83	72.61	73.32	73.62	73.38	72.39	73.23	73.32	73.68
Na ₂ O	2.76	2.58	2.51	2.34	2.41	2.11	2.48	2.46	2.46	2.21
P ₂ O ₅	0.04	0.05	0.05	0.06	0.04	0.07	0.07	0.00	0.04	0.00
Cl	0.22	0.22	0.21	0.20	0.21	0.21	0.19	0.19	0.22	0.21
TiO ₂	0.28	0.26	0.29	0.27	0.26	0.21	0.25	0.24	0.30	0.26
K ₂ O	4.65	4.68	4.60	4.05	4.22	3.93	4.44	4.52	4.54	4.52
CaO	1.74	1.71	1.70	1.59	1.52	1.63	1.62	1.60	1.54	1.62
SO ₃	0.03	0.01	0.00	0.00	0.00	0.02	0.01	0.01	0.00	0.00
F	0.00	0.05	0.02	0.00	0.03	0.02	0.09	0.05	0.00	0.00
Al ₂ O ₃	14.90	15.84	16.25	16.39	16.06	16.75	16.62	16.16	15.75	15.79
MgO	0.18	0.22	0.19	0.20	0.16	0.17	0.22	0.17	0.18	0.17
FeO ^t	1.56	1.49	1.48	1.49	1.39	1.38	1.51	1.31	1.54	1.49
MnO	0.07	0.09	0.10	0.09	0.08	0.12	0.12	0.07	0.09	0.06
Total	91.87	90.81	92.37	96.51	93.83	95.20	95.54	92.66	90.65	92.80
Date	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015
comment	Minin. NaL	Amp MI. NaL								
morphology	GS	Minin								
Picture	Yes									

sample	10 m	10 m	10 m	10 m	10 m	10 m	2	2	2	2
grain (glass shards get -)	6	6	8	9	10	11	-	-	-	-
reference number to appendix H	C6a	C6b	C8	C9	C10	C11a	11	12	13	14
SiO₂	69.13	68.99	68.98	68.57	68.65	69.01	69.18	69.33	69.04	69.16
Na₂O	4.76	4.64	4.59	4.83	4.71	4.91	4.61	4.81	4.73	4.84
P₂O₅	0.05	0.10	0.07	0.04	0.05	0.08	0.01	0.00	0.01	0.00
Cl	0.25	0.20	0.22	0.22	0.22	0.20	0.22	0.24	0.22	0.23
TiO₂	0.24	0.24	0.25	0.30	0.24	0.22	0.27	0.23	0.25	0.29
K₂O	5.84	5.85	5.88	5.88	5.84	5.62	5.94	5.95	5.99	6.01
CaO	1.95	1.97	1.90	1.91	1.90	1.87	1.91	1.91	1.95	1.88
SO₃	0.01	0.05	0.02	0.04	0.05	0.03	0.01	0.05	0.05	0.01
F	0.00	0.11	0.00	0.00	0.06	0.02	n.m	n.m	n.m	n.m
Al₂O₃	15.79	15.94	16.18	16.39	16.52	16.25	16.02	15.69	15.94	15.72
MgO	0.22	0.24	0.22	0.21	0.23	0.24	0.21	0.21	0.18	0.22
FeO^t	1.66	1.60	1.59	1.48	1.44	1.47	1.55	1.48	1.53	1.58
MnO	0.10	0.08	0.10	0.13	0.09	0.07	0.08	0.11	0.10	0.08
Total	92.78	90.90	92.64	92.72	91.21	94.13	96.83	97.56	97.98	98.03
Date	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	28-4-2015	28-4-2015	28-4-2015	28-4-2015
comment	Minin	Minin	Minin	Minin	Minin	Minin	Minin	Minin	Minin	Minin
morphology	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Picture	no close-up	no close-up	Yes	No	No	Yes	Yes	Yes	Yes	Yes

sample	2	2	3	3	3	3	3	3	5	5	5
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grain (glass shards get -)	-	-	-	-	-	-	-	-	-	-	-	-
reference number to appendix H	15	16	2	3	4	5	6	8	11	12	13	
SiO₂	69.51	69.07	70.41	70.39	70.42	70.37	70.55	70.48	70.86	70.81	70.82	
Na₂O	4.69	4.80	4.13	4.49	4.27	4.39	4.16	4.20	4.36	4.03	4.11	
P₂O₅	0.00	0.00	0.02	0.01	0.04	0.02	0.03	0.00	0.00	0.03	0.01	
Cl	0.22	0.25	0.25	0.24	0.26	0.23	0.25	0.27	0.20	0.19	0.19	
TiO₂	0.26	0.28	0.19	0.22	0.24	0.22	0.27	0.25	0.19	0.17	0.23	
K₂O	5.84	5.97	6.42	6.37	6.45	6.30	6.42	6.41	6.16	6.19	6.13	
CaO	1.90	1.89	1.47	1.62	1.57	1.68	1.45	1.45	1.67	1.71	1.66	
SO₃	0.01	0.03	0.03	0.00	0.01	0.00	0.00	0.02	0.00	0.01	0.00	
F	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	
Al₂O₃	15.74	15.93	15.45	15.23	15.33	15.23	15.35	15.37	15.15	15.27	15.31	
MgO	0.22	0.18	0.17	0.14	0.10	0.20	0.14	0.11	0.13	0.17	0.13	
FeO^t	1.51	1.52	1.35	1.27	1.23	1.33	1.32	1.38	1.25	1.34	1.31	
MnO	0.10	0.08	0.12	0.03	0.08	0.03	0.06	0.08	0.03	0.08	0.10	
Total	98.21	98.26	102.33	103.84	103.30	103.68	104.03	101.00	100.57	97.42	99.22	
Date	28-4-2015	28-4-2015	28-4-2015	28-4-2015	28-4-2015	28-4-2015	28-4-2015	28-4-2015	28-4-2015	28-4-2015	28-4-2015	
comment	Minin	Minin	HT	HT	HT	HT	HT	HT	-	-	-	
morphology	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS	
Picture	Yes	Yes	Yes	Yes	No close up	Yes	Yes	Yes	Yes	Yes	Yes	

sample	5	5	5	6	7	7	7	7	8	8
grain (glass shards get -)	-	-	-	-	-	-	-	-	-	-
reference number to appendix H	16	17	18	30	1	2	4	6	7	8
SiO₂	70.95	70.98	70.85	69.51	69.60	69.35	69.39	70.26	69.24	69.56
Na₂O	4.16	4.32	4.13	4.10	4.60	4.68	4.68	5.00	4.09	4.03
P₂O₅	0.00	0.02	0.04	0.01	0.04	0.04	0.01	0.00	0.00	0.02
Cl	0.23	0.18	0.23	0.26	0.25	0.22	0.23	0.23	0.20	0.22
TiO₂	0.20	0.15	0.17	0.24	0.25	0.21	0.25	0.19	0.27	0.23
K₂O	6.08	6.00	6.01	6.27	6.08	6.00	5.85	5.94	6.03	6.11
CaO	1.59	1.71	1.70	1.86	1.63	1.70	1.61	1.52	1.87	1.83
SO₃	0.05	0.00	0.00	0.02	0.02	0.05	0.06	0.00	0.02	0.03
F	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m
Al₂O₃	15.22	15.15	15.35	15.84	15.82	16.05	16.35	15.29	16.54	16.25
MgO	0.15	0.12	0.16	0.17	0.20	0.18	0.17	0.18	0.19	0.18
FeO^t	1.28	1.28	1.27	1.64	1.40	1.45	1.34	1.33	1.44	1.42
MnO	0.10	0.09	0.10	0.08	0.11	0.07	0.08	0.06	0.11	0.11
Total	98.12	102.14	97.15	100.00	98.24	98.44	96.89	98.98	97.14	96.89
Date	28-4-2015	28-4-2015	28-4-2015	28-4-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015
comment	-	HT	-	-	Plco	Plco	Plco	Plco	Plco	Plco
morphology	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Picture	Yes	Yes	Yes	Yes	No close up	Yes	Yes	Yes	Yes	Yes

sample	8	8	8	8	8	9	9	9	9	4	4
grain (glass shards get -)	-	-	-	-	-	-	-	-	-	-	-
reference number to appendix H	9	10	11	12	13	14	15	19	20	21	22
SiO₂	69.03	69.30	69.62	69.54	69.69	69.92	69.73	69.78	69.73	69.77	69.23
Na₂O	4.31	4.26	4.21	4.48	4.36	4.16	4.33	4.54	4.35	4.12	4.23
P₂O₅	0.00	0.01	0.00	0.02	0.03	0.00	0.03	0.04	0.00	0.08	0.05
Cl	0.22	0.21	0.24	0.24	0.23	0.24	0.24	0.21	0.22	0.22	0.21
TiO₂	0.25	0.24	0.28	0.25	0.19	0.25	0.22	0.28	0.29	0.30	0.26
K₂O	6.21	6.15	6.11	6.03	5.82	5.93	6.15	5.80	5.80	6.13	6.17
CaO	1.85	1.87	1.83	1.85	1.83	1.66	1.65	1.67	1.80	1.77	1.77
SO₃	0.00	0.01	0.06	0.04	0.01	0.00	0.01	0.02	0.00	0.00	0.02
F	n.m										
Al₂O₃	16.34	16.21	15.88	15.85	16.07	16.01	15.87	15.87	16.11	15.93	16.26
MgO	0.18	0.20	0.18	0.21	0.21	0.24	0.23	0.21	0.20	0.21	0.21
FeO^t	1.55	1.47	1.51	1.42	1.50	1.51	1.47	1.51	1.43	1.43	1.52
MnO	0.05	0.08	0.10	0.08	0.06	0.08	0.07	0.08	0.07	0.04	0.07
Total	97.17	96.75	97.92	98.54	98.16	96.54	96.80	98.08	97.99	96.93	98.49
Date	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015
comment	-	-	-	-	-	-	-	-	-	-	-
morphology	GS										
Picture	Yes										

sample	4	4	4	4	11	11	11	11	11	11
grain (glass shards get -)	-	-	-	-	-	-	-	-	-	-
reference number to appendix H	24	25	26	27	28	29	30	32	33	34
SiO₂	69.60	69.93	69.58	70.62	68.95	69.05	69.25	68.86	68.66	68.88
Na₂O	4.23	3.94	4.15	3.87	4.86	4.57	4.70	4.86	4.96	4.80
P₂O₅	0.06	0.03	0.00	0.03	0.01	0.05	0.04	0.00	0.05	0.03
Cl	0.22	0.22	0.24	0.24	0.25	0.22	0.24	0.23	0.24	0.25
TiO₂	0.25	0.23	0.23	0.22	0.25	0.24	0.24	0.33	0.26	0.31
K₂O	5.90	6.06	5.92	5.65	5.58	5.68	5.50	5.62	5.54	5.61
CaO	1.76	1.85	1.73	1.68	1.93	1.95	1.86	1.85	1.84	1.90
SO₃	0.03	0.05	0.00	0.08	0.06	0.01	0.02	0.01	0.00	0.09
F	n.m									
Al₂O₃	16.23	16.05	16.45	15.92	16.17	16.50	16.22	16.41	16.66	16.30
MgO	0.20	0.19	0.18	0.18	0.20	0.21	0.20	0.24	0.22	0.25
FeO^t	1.46	1.40	1.41	1.43	1.59	1.47	1.59	1.50	1.45	1.49
MnO	0.07	0.06	0.10	0.09	0.16	0.05	0.12	0.09	0.12	0.08
Total	97.49	95.90	97.08	96.42	98.96	97.47	99.11	99.41	99.01	100.01
Date	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015
comment	-	-	-	-	-	-	-	-	-	-
morphology	GS									
Picture	Yes									

sample	10	10	10	10	10	10	12	12	12	12	12
grain (glass shards get -)	-	-	-	-	-	-	-	-	-	-	-
reference number to appendix H	35	36	37	38	39	40	41	42	44	45	46
SiO₂	70.01	69.51	70.24	69.68	69.57	70.05	69.39	69.43	69.47	69.34	69.19
Na₂O	4.69	4.35	4.10	4.14	4.38	4.34	4.43	4.55	4.47	4.76	4.75
P₂O₅	0.00	0.00	0.06	0.00	0.02	0.00	0.04	0.01	0.00	0.00	0.05
Cl	0.21	0.21	0.23	0.20	0.24	0.24	0.22	0.22	0.24	0.21	0.20
TiO₂	0.25	0.23	0.23	0.26	0.27	0.24	0.30	0.27	0.26	0.21	0.22
K₂O	6.11	6.03	6.02	6.04	6.19	6.09	5.69	5.81	5.67	5.70	5.72
CaO	1.55	1.69	1.58	1.58	1.60	1.60	1.88	1.83	1.83	1.80	1.85
SO₃	0.04	0.00	0.04	0.02	0.06	0.01	0.02	0.00	0.00	0.04	0.05
F	n.m										
Al₂O₃	15.41	16.18	15.84	16.36	15.89	15.62	16.29	16.12	16.32	16.15	16.22
MgO	0.21	0.19	0.17	0.17	0.18	0.22	0.16	0.22	0.17	0.23	0.19
FeO^t	1.45	1.44	1.42	1.50	1.46	1.44	1.47	1.45	1.53	1.52	1.48
MnO	0.08	0.18	0.09	0.05	0.14	0.17	0.09	0.09	0.03	0.07	0.05
Total	98.79	95.45	96.09	96.70	97.65	96.75	97.33	96.59	95.69	96.92	95.75
Date	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015
comment	-	-	-	-	-	-	-	-	-	-	-
morphology	GS										
Picture	Yes										

sample	12	12	12	12	12	12	14	14	14	14	14
grain (glass shards get -)	-	-	-	-	-	-	-	-	-	-	-
reference number to appendix H	47	48	49	50	51	52	1	3	7	9	10
SiO₂	68.89	69.33	69.59	69.27	69.22	69.74	69.53	69.19	69.33	69.22	68.98
Na₂O	4.72	4.88	4.62	4.65	4.72	4.70	4.50	4.56	4.69	4.57	4.79
P₂O₅	0.00	0.05	0.00	0.00	0.00	0.02	0.02	0.00	0.07	0.06	0.02
Cl	0.22	0.21	0.21	0.22	0.21	0.21	0.21	0.21	0.20	0.21	0.19
TiO₂	0.26	0.32	0.28	0.30	0.25	0.22	0.25	0.24	0.28	0.24	0.28
K₂O	5.73	5.67	5.69	5.73	5.65	5.54	5.99	5.95	5.87	5.89	6.00
CaO	1.83	1.78	1.84	1.86	1.79	1.75	1.92	1.96	1.84	1.96	1.90
SO₃	0.02	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.06	0.03	0.01
F	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m
Al₂O₃	16.39	15.94	15.99	16.11	16.33	16.04	15.76	16.00	15.92	16.08	16.04
MgO	0.24	0.21	0.22	0.23	0.22	0.18	0.20	0.21	0.21	0.22	0.20
FeO^t	1.61	1.49	1.47	1.52	1.51	1.50	1.51	1.54	1.47	1.45	1.53
MnO	0.08	0.11	0.08	0.09	0.10	0.11	0.12	0.14	0.05	0.07	0.07
Total	96.32	96.38	96.42	97.59	97.12	96.45	96.71	97.18	97.07	98.31	97.01
Date	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	1-6-2015	1-6-2015	1-6-2015	1-6-2015	1-6-2015
comment	-	-	-	-	-	-	-	-	-	-	-
morphology	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Picture	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

sample	14	14	17	17	17	17	17	17	17	17	18
grain (glass shards get -)	-	-	-	-	-	-	-	-	-	-	-
reference number to appendix H	11	12	2	3	4	6	7	9	10	12	1
SiO ₂	68.95	69.08	71.00	70.16	70.96	70.85	71.06	70.63	71.04	70.79	68.89
Na ₂ O	4.51	4.72	4.20	4.18	4.23	4.05	3.93	4.20	3.86	3.94	4.51
P ₂ O ₅	0.02	0.07	0.00	0.01	0.02	0.00	0.00	0.00	0.05	0.00	0.01
Cl	0.22	0.22	0.29	0.25	0.27	0.27	0.26	0.26	0.25	0.26	0.21
TiO ₂	0.27	0.22	0.32	0.28	0.28	0.31	0.30	0.28	0.33	0.26	0.29
K ₂ O	5.93	5.92	6.68	6.87	6.63	6.88	6.82	6.72	6.78	6.76	5.66
CaO	1.98	1.94	1.15	1.21	1.06	1.01	1.11	1.08	1.06	1.07	2.04
SO ₃	0.00	0.02	0.03	0.06	0.02	0.01	0.04	0.02	0.03	0.04	0.03
F	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m
Al ₂ O ₃	16.23	16.09	14.89	15.28	14.93	15.00	15.00	15.35	15.05	15.34	16.65
MgO	0.25	0.19	0.15	0.25	0.14	0.17	0.14	0.16	0.16	0.17	0.20
FeO ^t	1.56	1.44	1.26	1.34	1.34	1.38	1.26	1.26	1.26	1.32	1.44
MnO	0.08	0.08	0.04	0.11	0.11	0.07	0.07	0.05	0.14	0.06	0.07
Total	98.08	98.24	96.52	93.55	97.29	94.80	95.01	94.15	95.78	94.74	95.12
Date	1-6-2015	1-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015
comment	-	-	LT	LT	LT	LT	LT	LT	LT	LT	LT
morphology	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Picture	Yes	Yes	No close up	No close up	Yes	Yes	Yes	Yes	Yes	No close up	Yes

sample	18	18	18	18	18	19	19	19	19	19	19
grain (glass shards get -)	-	-	-	-	-	-	-	-	-	-	-
reference number to appendix H	2	3	4	5	8	1	4	6	9	10	11
SiO₂	69.99	69.45	69.69	69.90	69.75	69.22	69.29	69.28	69.24	68.96	69.22
Na₂O	4.35	4.58	4.52	4.32	4.38	4.81	4.93	4.64	4.65	4.70	4.60
P₂O₅	0.02	0.01	0.01	0.01	0.02	0.01	0.05	0.05	0.00	0.00	0.00
Cl	0.20	0.20	0.22	0.22	0.23	0.25	0.23	0.21	0.21	0.22	0.22
TiO₂	0.21	0.28	0.25	0.25	0.29	0.28	0.26	0.28	0.30	0.28	0.27
K₂O	5.57	5.67	5.73	5.52	5.61	5.90	5.94	5.90	5.84	5.94	5.88
CaO	1.92	1.97	2.01	2.03	1.91	1.81	1.83	1.96	1.92	1.91	1.99
SO₃	0.00	0.05	0.00	0.03	0.04	0.00	0.02	0.02	0.05	0.02	0.03
F	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m
Al₂O₃	15.91	16.03	15.82	15.86	16.01	16.00	15.68	15.86	15.90	16.12	15.90
MgO	0.24	0.21	0.17	0.29	0.21	0.22	0.18	0.21	0.24	0.22	0.18
FeO^t	1.50	1.45	1.45	1.44	1.48	1.46	1.52	1.53	1.56	1.53	1.60
MnO	0.08	0.08	0.14	0.12	0.06	0.04	0.08	0.06	0.09	0.09	0.11
Total	94.71	96.29	96.02	95.85	96.11	98.41	99.18	98.89	99.16	99.09	99.11
Date	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015
comment	LT	LT	LT	LT	LT	-	-	-	-	-	-
morphology	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Picture	Yes	Yes	Yes	Yes	Yes	No close up	Yes	Yes	Yes	Yes	Yes

sample	19	20	26	26	26	26	26	26	26	26	27
grain (glass shards get -)	-	-	-	-	-	-	-	-	-	-	-
reference number to appendix H	12	5	1	3	4	5	6	8	10	12	1
SiO₂	69.23	68.75	70.80	71.03	70.45	70.94	70.68	70.97	70.86	70.86	71.52
Na₂O	4.67	5.22	4.41	4.20	4.60	4.37	4.19	4.45	4.31	4.41	4.13
P₂O₅	0.00	0.04	0.03	0.00	0.04	0.00	0.00	0.00	0.06	0.00	0.04
Cl	0.22	0.19	0.21	0.23	0.19	0.21	0.20	0.21	0.22	0.23	0.18
TiO₂	0.30	0.16	0.25	0.23	0.26	0.20	0.23	0.21	0.20	0.26	0.23
K₂O	5.83	5.11	6.18	6.10	6.11	6.11	6.28	6.09	6.09	6.24	6.02
CaO	1.87	2.09	1.40	1.44	1.37	1.44	1.40	1.39	1.35	1.33	1.51
SO₃	0.03	0.29	0.00	0.02	0.04	0.00	0.00	0.02	0.02	0.00	0.03
F	n.m										
Al₂O₃	15.99	16.95	15.25	15.23	15.24	15.28	15.28	15.13	15.32	15.22	14.97
MgO	0.22	0.05	0.18	0.17	0.20	0.13	0.22	0.19	0.15	0.14	0.14
FeO^t	1.61	1.15	1.21	1.32	1.41	1.26	1.41	1.27	1.28	1.24	1.15
MnO	0.04	0.00	0.09	0.03	0.11	0.07	0.12	0.07	0.13	0.07	0.09
Total	98.41	97.63	99.35	99.43	98.94	98.24	97.94	98.28	98.95	99.27	96.22
Date	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015
comment	-	Plco	-	-	-	-	-	-	-	-	LT. Plco
morphology	GS										
Picture	Yes										

sample	27	27	27	27	27	28	28	28	28	28	28
grain (glass shards get -)	-	-	-	-	-	-	-	-	-	-	-
reference number to appendix											
H	7	8	9	10	11	2	3	5	6	9	10
SiO ₂	71.09	71.70	71.66	71.65	71.82	70.53	70.78	71.28	71.72	70.57	71.34
Na ₂ O	4.09	3.94	4.25	4.16	3.86	3.45	4.04	3.98	4.06	4.27	3.82
P ₂ O ₅	0.06	0.05	0.01	0.06	0.00	0.10	0.06	0.00	0.01	0.00	0.00
Cl	0.17	0.15	0.16	0.21	0.19	0.18	0.17	0.16	0.16	0.15	0.16
TiO ₂	0.18	0.19	0.17	0.14	0.19	0.44	0.31	0.19	0.21	0.34	0.22
K ₂ O	5.77	6.08	5.93	5.75	5.89	6.32	6.02	6.59	6.13	5.56	5.85
CaO	1.60	1.55	1.48	1.54	1.57	1.30	1.59	1.03	1.66	1.76	1.87
SO ₃	0.01	0.00	0.05	0.00	0.04	0.15	0.02	0.00	0.04	0.00	0.00
F	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m
Al ₂ O ₃	15.49	14.92	14.85	15.03	15.07	14.55	14.97	14.48	14.18	15.46	14.73
MgO	0.16	0.17	0.16	0.15	0.16	0.91	0.51	0.15	0.44	0.49	0.48
FeO ^t	1.32	1.18	1.19	1.19	1.15	2.04	1.42	2.05	1.32	1.36	1.41
MnO	0.08	0.06	0.09	0.10	0.06	0.02	0.11	0.08	0.08	0.03	0.11
Total	95.19	92.86	95.38	96.13	94.56	93.25	94.99	96.90	96.45	97.00	95.17
Date	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015
comment	LT. Plco	LT	LT	LT	LT	LT	LT				
morphology	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Picture	Yes	Yes	Yes	Yes	Yes	No close up	No close up	Yes	No close up	No close up	Yes

sample	31	31	31	31	31	31	32	32	32	32
grain (glass shards get -)	-	-	-	-	-	-	-	-	-	-
reference number to appendix H	1	2	3	4	5	7	2	3	12	13
SiO₂	69.75	69.42	70.19	69.23	69.44	70.49	69.33	69.71	69.02	69.24
Na₂O	4.20	4.35	4.36	4.47	4.30	4.31	4.63	4.45	4.40	4.83
P₂O₅	0.07	0.01	0.06	0.00	0.03	0.05	0.05	0.02	0.01	0.02
Cl	0.23	0.24	0.22	0.20	0.20	0.24	0.19	0.22	0.23	0.21
TiO₂	0.27	0.30	0.33	0.40	0.26	0.37	0.25	0.24	0.30	0.25
K₂O	6.67	6.44	6.58	6.07	6.27	6.57	6.12	6.06	6.09	5.78
CaO	1.26	1.46	1.32	1.64	1.41	1.23	1.82	1.76	1.84	2.03
SO₃	0.03	0.04	0.01	0.01	0.00	0.04	0.00	0.00	0.04	0.02
F	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m
Al₂O₃	15.74	16.06	15.21	15.24	16.26	14.93	15.81	15.73	16.30	15.85
MgO	0.22	0.19	0.17	0.37	0.23	0.23	0.19	0.18	0.23	0.17
FeO^t	1.52	1.43	1.46	2.23	1.56	1.48	1.54	1.54	1.48	1.47
MnO	0.05	0.06	0.09	0.14	0.04	0.07	0.07	0.09	0.06	0.11
Total	98.08	97.77	95.65	97.89	97.22	97.51	97.05	95.09	90.66	97.86
Date	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015
comment	Plco	Plco	Plco	Plco	Plco	Plco	LT	LT	LT	LT
morphology	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Picture	Yes	Yes	Yes	Yes	Yes	No close up	Yes	Yes	Yes	Yes

sample	32	32	32	32	32	32	32	3	15	16	17
grain (glass shards get -)	-	-	-	-	-	-	-				
reference number to appendix H	16	18	19	21	23	25	26	193grain1-2	S193-1	S193-2	S193-3
SiO₂	68.90	68.08	69.48	69.48	69.34	69.41	69.39	68.02	77.03	77.06	77.31
Na₂O	4.60	4.64	4.57	4.62	4.40	4.63	4.44	4.45	3.86	3.76	3.98
P₂O₅	0.03	0.00	0.09	0.02	0.06	0.01	0.00	0.01	0.00	0.01	0.00
Cl	0.22	0.22	0.25	0.24	0.22	0.16	0.22	0.21	0.10	0.09	0.10
TiO₂	0.23	0.25	0.27	0.25	0.26	0.26	0.20	0.27	0.10	0.12	0.09
K₂O	6.04	6.16	5.85	6.07	6.01	5.76	6.04	5.71	4.60	4.62	4.41
CaO	1.86	1.80	1.89	1.85	1.95	1.98	1.78	1.61	0.70	0.68	0.64
SO₃	0.07	0.00	0.02	0.02	0.01	0.00	0.02	0.00	0.00	0.00	0.02
F	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m
Al₂O₃	16.22	16.85	15.85	15.56	16.04	16.03	16.08	18.10	12.91	12.95	12.83
MgO	0.21	0.24	0.21	0.17	0.16	0.19	0.22	0.20	0.10	0.11	0.08
FeO^t	1.51	1.66	1.45	1.52	1.48	1.46	1.53	1.38	0.55	0.54	0.48
MnO	0.11	0.09	0.08	0.19	0.08	0.12	0.07	0.05	0.07	0.06	0.07
Total	96.95	93.38	94.69	95.86	96.14	95.39	96.64	98.15	97.71	95.79	96.78
Date	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015
comment	LT	LT	LT	LT	LT	LT	LT	unknown	-	-	-
morphology	GS	GS	GS	GS	GS	GS	GS	Mined	Mined	Mined	Mined
Picture	Yes	Yes	Yes	Yes	No close up	Yes	Yes	Yes	Yes	Yes	Yes

sample	19	20	21	22	24	33	33	33	33	36
grain (glass shards get -)						1	2	2	2	2
reference number to appendix H	S193-5	S193-6	S193-7	S193-8	S193-10	1	1	2	3	7
SiO₂	76.99	76.63	76.95	76.90	77.08	65.12	68.87	68.68	68.41	84.59
Na₂O	4.04	3.96	3.79	3.87	4.10	6.33	4.73	4.74	5.00	2.06
P₂O₅	0.03	0.00	0.00	0.01	0.03	0.00	0.01	0.04	0.00	0.03
Cl	0.09	0.10	0.13	0.08	0.10	0.11	0.23	0.25	0.22	0.01
TiO₂	0.12	0.11	0.11	0.10	0.09	0.11	0.24	0.28	0.22	0.08
K₂O	4.50	4.49	4.54	4.55	4.59	4.89	5.70	5.71	5.81	3.64
CaO	0.71	0.73	0.70	0.66	0.59	2.82	1.87	1.90	1.96	0.79
SO₃	0.00	0.04	0.02	0.00	0.00	0.00	0.07	0.05	0.00	0.01
F	n.m									
Al₂O₃	12.69	13.18	13.03	13.07	12.76	19.84	16.38	16.45	16.54	8.68
MgO	0.06	0.10	0.09	0.11	0.09	0.08	0.23	0.22	0.22	0.00
FeO^t	0.66	0.58	0.59	0.64	0.54	0.66	1.56	1.56	1.53	0.11
MnO	0.09	0.10	0.06	0.03	0.04	0.04	0.11	0.11	0.08	0.00
Total	95.75	95.80	97.33	95.68	96.25	100.00	98.27	98.52	97.73	97.23
Date	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015
comment	-	-	-	-	-	Plco	-	-	-	Plco
morphology	Mined	Mined	Mined	Mined	Mined	GS	GS	GS	GS	GS
Picture	Yes									

sample	36	37	38	38	38	38	38	38	39	39	40a
grain (glass shards get -)	3	1	1	1	1	1	1	1	2	2	1
reference number to appendix H	8	1	1	3	4	5	6	8	6	11	5
SiO ₂	75.46	55.72	71.57	71.32	71.27	71.52	71.57	71.50	69.57	68.85	70.06
Na ₂ O	3.54	5.85	4.10	4.43	4.15	4.15	4.07	4.23	4.67	4.00	4.46
P ₂ O ₅	0.03	0.07	0.00	0.04	0.00	0.00	0.02	0.00	0.02	0.02	0.00
Cl	0.08	0.01	0.17	0.18	0.17	0.17	0.18	0.19	0.23	0.22	0.27
TiO ₂	0.15	0.01	0.22	0.22	0.21	0.20	0.17	0.21	0.25	0.32	0.27
K ₂ O	4.76	0.47	5.70	5.63	5.41	5.59	5.69	5.54	6.00	6.40	6.56
CaO	1.62	10.00	1.55	1.48	1.45	1.52	1.45	1.51	1.55	1.42	1.14
SO ₃	0.01	0.00	0.06	0.00	0.01	0.00	0.04	0.03	0.05	0.03	0.04
F	n.m										
Al ₂ O ₃	13.61	27.44	15.20	15.19	15.92	15.37	15.41	15.38	15.94	16.76	15.62
MgO	0.07	0.02	0.12	0.16	0.14	0.18	0.15	0.17	0.18	0.22	0.19
FeO ^t	0.61	0.42	1.24	1.26	1.19	1.22	1.22	1.17	1.45	1.58	1.29
MnO	0.06	0.00	0.08	0.09	0.07	0.09	0.02	0.06	0.09	0.19	0.09
Total	99.87	98.94	95.65	98.20	98.08	97.35	97.99	98.00	101.43	96.87	100.42
Date	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015
comment	Plco	Plco	-	-	-	-	-	-	-	-	-
morphology	GS										
Picture	Yes										

sample	40a	41	41	41	41						
grain (glass shards get -)	1	2	2	2	3	3	3	1	1	2	2
reference number to appendix H	6	8	10	11	15	16	18	1	2	3	4
SiO ₂	68.92	68.93	68.93	68.89	70.97	69.88	70.59	69.42	69.26	69.25	69.17
Na ₂ O	4.65	4.78	4.42	4.55	4.04	4.40	4.08	4.53	4.58	4.27	4.38
P ₂ O ₅	0.06	0.01	0.00	0.00	0.00	0.01	0.15	0.00	0.00	0.08	0.00
Cl	0.23	0.23	0.21	0.22	0.25	0.19	0.25	0.21	0.22	0.20	0.22
TiO ₂	0.26	0.28	0.26	0.24	0.25	0.28	0.27	0.23	0.25	0.31	0.26
K ₂ O	6.01	5.70	5.84	5.89	6.59	6.41	6.68	5.87	5.84	6.00	6.00
CaO	1.81	1.85	1.88	1.88	1.00	1.33	1.27	1.78	1.80	1.85	1.72
SO ₃	0.02	0.05	0.00	0.02	0.03	0.02	0.06	0.01	0.00	0.00	0.00
F	n.m										
Al ₂ O ₃	16.42	16.16	16.45	16.45	15.35	16.04	14.95	16.10	16.15	16.30	16.30
MgO	0.20	0.19	0.26	0.21	0.13	0.12	0.20	0.15	0.18	0.21	0.26
FeO ^t	1.32	1.66	1.64	1.56	1.30	1.22	1.42	1.58	1.60	1.42	1.55
MnO	0.08	0.16	0.11	0.09	0.10	0.12	0.07	0.12	0.11	0.11	0.14
Total	101.27	100.67	100.52	100.69	97.57	96.00	95.15	98.94	97.35	99.52	100.05
Date	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015
comment	-	-	-	-	-	-	-	-	-	-	-
morphology	GS										
Picture	Yes										

sample	41	42	42	42	42	43	43	43	43	44	44
grain (glass shards get -)	2	1	1	1	2	1	1	1	1	1	1
reference number to appendix H	5	1	2	3	4	1	2	3	4	1	2
SiO ₂	68.98	69.67	69.39	69.52	68.58	69.10	68.93	69.11	69.44	68.55	68.60
Na ₂ O	4.45	4.47	4.48	4.60	4.84	4.39	4.43	4.25	4.39	4.68	4.72
P ₂ O ₅	0.02	0.00	0.03	0.00	0.04	0.02	0.02	0.04	0.00	0.00	0.03
Cl	0.18	0.24	0.22	0.22	0.18	0.23	0.19	0.24	0.21	0.23	0.22
TiO ₂	0.29	0.26	0.26	0.28	0.33	0.27	0.21	0.29	0.31	0.26	0.24
K ₂ O	5.95	6.02	5.91	6.08	5.71	6.24	6.22	6.27	6.10	6.20	5.91
CaO	1.86	1.64	1.66	1.69	1.98	1.76	1.79	1.65	1.71	1.84	1.89
SO ₃	0.02	0.01	0.03	0.02	0.05	0.05	0.03	0.05	0.03	0.01	0.03
F	n.m										
Al ₂ O ₃	16.47	15.86	16.21	15.85	16.47	16.19	16.42	16.32	16.10	16.29	16.46
MgO	0.21	0.20	0.23	0.18	0.22	0.21	0.21	0.21	0.24	0.25	0.22
FeO ^t	1.49	1.53	1.50	1.47	1.54	1.48	1.51	1.45	1.38	1.59	1.54
MnO	0.08	0.11	0.09	0.09	0.06	0.07	0.04	0.13	0.10	0.08	0.14
total	100.06	101.46	100.78	101.15	99.99	101.84	100.84	99.99	100.81	99.24	99.07
Date	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015
comment	-	HT	HT	HT	-	-	-	-	-	-	-
morphology	GS										
Picture	Yes										

sample	44	45	45	45	46	46	47	47	47	47
grain (glass shards get -)	1	1	1	2	1	1	1	1	2	2
reference number to appendix H	3	1	2	3	1	2	1	2	3	4
SiO₂	68.91	69.58	69.01	69.02	68.96	69.29	69.12	68.84	68.74	69.11
Na₂O	4.71	4.49	4.59	4.48	4.61	4.65	4.52	4.77	4.78	4.81
P₂O₅	0.05	0.01	0.10	0.04	0.01	0.05	0.03	0.06	0.01	0.01
Cl	0.20	0.20	0.22	0.21	0.20	0.19	0.19	0.24	0.20	0.18
TiO₂	0.26	0.25	0.26	0.28	0.26	0.25	0.26	0.31	0.23	0.24
K₂O	5.81	5.95	5.85	5.92	6.07	5.97	5.88	5.79	5.85	5.79
CaO	1.81	1.70	1.75	1.79	1.81	1.75	1.78	1.84	1.84	1.79
SO₃	0.03	0.01	0.05	0.03	0.06	0.02	0.00	0.04	0.03	0.02
F	n.m									
Al₂O₃	16.37	16.06	16.21	16.42	16.10	15.97	16.34	16.30	16.45	16.12
MgO	0.21	0.16	0.20	0.22	0.21	0.20	0.20	0.21	0.19	0.28
FeO^t	1.50	1.52	1.72	1.47	1.61	1.53	1.59	1.50	1.54	1.55
MnO	0.15	0.06	0.05	0.13	0.11	0.13	0.09	0.10	0.14	0.11
Total	99.52	100.48	99.08	98.90	100.92	99.85	100.09	99.37	101.36	101.26
Date	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015
comment	-	-	-	-	-	-	-	-	HT	HT
morphology	GS									
Picture	Yes									

sample	50	50	50	52	52	52	53	53	53	53
grain (glass shards get -)	1	2	2	1	1	2	1	1	1	2
reference number to appendix H	1	3	4	1	2	4	1	2	3	1
SiO ₂	67.72	68.69	69.27	69.24	68.97	69.66	69.46	69.49	69.20	69.22
Na ₂ O	4.66	4.43	4.60	4.71	4.47	4.77	4.41	4.35	4.55	4.55
P ₂ O ₅	0.06	0.02	0.02	0.00	0.00	0.04	0.09	0.02	0.07	0.03
Cl	0.20	0.23	0.24	0.18	0.19	0.20	0.20	0.20	0.20	0.18
TiO ₂	0.29	0.32	0.26	0.20	0.29	0.25	0.23	0.24	0.26	0.23
K ₂ O	5.64	5.79	5.65	5.65	5.69	5.54	5.86	5.85	5.79	5.74
CaO	2.25	1.89	1.83	1.92	1.93	1.83	1.89	1.89	1.84	1.85
SO ₃	0.03	0.29	0.02	0.08	0.06	0.04	0.07	0.02	0.00	0.03
F	n.m									
Al ₂ O ₃	16.94	16.46	16.39	16.13	16.49	16.07	16.08	16.12	16.38	16.31
MgO	0.31	0.25	0.22	0.20	0.24	0.17	0.20	0.23	0.17	0.20
FeO ^t	1.80	1.57	1.44	1.59	1.57	1.36	1.36	1.47	1.45	1.52
MnO	0.10	0.04	0.07	0.09	0.11	0.08	0.15	0.11	0.10	0.14
Total	100.21	99.92	100.37	99.71	98.12	100.24	97.56	96.58	98.98	96.77
Date	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015
comment	-	-	-	-	-	-	-	-	-	-
morphology	GS									
Picture	Yes									

sample	53	53	54	54	54	54	55	55
grain (glass shards get -)	3	4	1	1	2	2	1	1
reference number to appendix H	3	1	2	3	2	3	1	2
SiO₂	69.29	69.60	68.70	68.85	69.20	70.03	68.97	68.15
Na₂O	4.69	4.57	4.91	4.78	5.14	4.74	4.84	4.93
P₂O₅	0.04	0.00	0.00	0.00	0.05	0.02	0.06	0.00
Cl	0.20	0.19	0.20	0.22	0.18	0.20	0.23	0.23
TiO₂	0.25	0.24	0.26	0.27	0.21	0.21	0.26	0.32
K₂O	5.58	5.74	5.34	5.89	5.32	5.74	5.80	5.79
CaO	2.02	1.87	1.95	1.68	2.19	1.63	1.90	1.95
SO₃	0.02	0.00	0.00	0.01	0.00	0.00	0.01	0.01
F	n.m							
Al₂O₃	16.16	15.98	16.90	16.44	16.05	15.66	15.91	16.51
MgO	0.18	0.20	0.22	0.19	0.17	0.20	0.24	0.20
FeO^t	1.50	1.46	1.46	1.61	1.36	1.46	1.69	1.80
MnO	0.07	0.13	0.08	0.06	0.13	0.10	0.08	0.10
Total	95.50	98.30	100.08	98.86	101.99	100.11	100.54	100.31
Date	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015
comment	-	-	-	-	-	-	-	-
morphology	GS							
Picture	Yes							

H2: Rejected data

This appendix is composed of two part I1 and I2. I1 shows the data that is used and I2 shows the rejected data. The first three columns show the sample name. the grain and third the reference number which it is called in appendix H. The samples are mentioned only by their number for convenient reasons. So instead of Sp2: sample 2.

Abbreviations	Meaning
Plco	Plagioclase contamination
GS	Glass shard
Mined	Mineral with glass on edges
LT	Low totals
HT	High totals
Amp	Amphibole or Amphibole microlith (ml)
Pyr	Pyroxene
Minin	Mineral inclusion
HT	High totals
HNa	High Sodium content
NaL	Na loss
NTM	Next to mineral
UPS	Unpolished section
NT	No tephra
Mag	Magnetite
Zo	Zonation in mineral present

Table H2-1.

Sample	3 m. stub 1	3 m. stub 2	3 m. stub 2	3 m. stub 2				
grain (glass shard get -)	1	1	2	2	3	-	-	-
reference number to appendix H	A1a	A1b	A2a	A2b	A3d	*	*	*
SiO₂	65.94	58.97	65.25	75.93	72.70	65.42	59.76	63.16
Na₂O	5.88	6.86	3.83	1.61	3.91	6.16	6.78	2.73
P₂O₅	0.02	0.07	0.09	0.10	0.09	0.02	0.05	0.14
Cl	0.01	0.01	0.15	0.28	0.23	0.01	0.01	0.14
TiO₂	0.03	0.05	0.29	0.03	0.24	0.03	0.15	0.33
K₂O	8.43	0.93	4.66	4.97	5.80	8.41	1.60	3.93
CaO	0.48	7.50	6.08	1.67	0.71	0.48	6.72	8.96
SO₃	0.00	0.00	0.04	0.04	0.04	0.00	0.00	0.03
F	0.00	0.01	0.04	0.00	0.11	0.00	0.00	0.04
Al₂O₃	18.82	25.12	14.12	14.65	14.39	19.13	23.57	12.62
MgO	0.00	0.02	2.24	0.05	0.49	0.00	0.56	3.81
FeO^t	0.36	0.45	3.05	0.64	1.21	0.33	0.75	3.87
MnO	0.02	0.00	0.17	0.02	0.08	0.01	0.05	0.24
total	97.04	96.15	95.11	53.17	86.66	95.26	94.41	93.75
Date	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015
comment	Pico	Pico	Pyr	pyr	Minin	Pico	Pico. LT	Pico. LT
Morphology (type of sample)	GL	GL	Mined	Mined	Mined	Mined	Mined	Mined
Picture	Yes	Yes	Yes	Yes	Yes	No	No	No

Sample	3 m. stub 2								
grain (glass shard get -)	-	-	-	-	-	4	7	7	8
reference number to appendix H	*	*	*	*	*	B4	B7a	B7b	B8
SiO₂	77.46	74.82	75.13	74.11	63.87	74.06	42.14	73.97	42.85
Na₂O	1.24	3.25	2.76	3.52	3.47	2.48	2.07	2.19	2.10
P₂O₅	0.09	0.01	0.02	0.09	3.42	0.02	0.12	0.03	0.13
Cl	0.31	0.24	0.25	0.25	0.27	0.21	0.09	0.20	0.10
TiO₂	0.07	0.17	0.21	0.18	0.26	0.27	2.53	0.25	1.93
K₂O	4.57	5.71	5.59	5.87	5.43	4.72	1.68	4.15	1.70
CaO	1.65	0.70	0.78	0.72	6.19	1.30	11.94	1.55	11.87
SO₃	0.04	0.00	0.03	0.00	0.07	0.03	0.05	0.02	0.04
F	0.05	0.04	0.00	0.07	0.00	0.02	0.18	0.08	0.10
Al₂O₃	13.80	13.91	14.09	14.09	15.36	15.24	11.79	15.65	11.13
MgO	0.06	0.10	0.10	0.13	0.23	0.12	10.33	0.17	10.07
FeO^t	0.65	1.00	1.02	0.93	1.34	1.42	16.57	1.62	17.39
MnO	0.02	0.05	0.03	0.06	0.08	0.11	0.53	0.12	0.59
total	47.68	91.04	78.31	93.28	94.46	92.32	93.41	91.13	93.35
Date	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015
comment	Plco. LT	Amp	Amp	Amp	Amp				
Morphology (type of sample)	Mined								
Picture	No	No	No	No	No	Yes	Yes	Yes	No close up

Sample	3 m. stub 2								
grain (glass shard get -)	9	10	11	11	12	12	14	15	17
reference number to appendix H	B9	B10	B11a	B11b	B12	B12	B14	B15	B17
SiO₂	42.89	42.85	42.40	63.53	51.62	51.62	43.75	50.31	51.33
Na₂O	1.96	2.08	2.27	1.21	0.49	0.49	2.10	0.59	0.53
P₂O₅	0.15	0.12	0.13	0.40	0.20	0.20	0.15	0.20	0.16
Cl	0.14	0.10	0.06	0.30	0.00	0.00	0.08	0.01	0.00
TiO₂	2.07	2.14	1.95	0.44	0.33	0.33	1.69	0.45	0.41
K₂O	1.56	1.55	1.62	4.02	0.00	0.00	1.33	0.00	0.00
CaO	11.85	11.76	12.21	2.21	23.01	23.01	11.82	23.20	23.22
SO₃	0.03	0.04	0.03	2.26	0.00	0.00	0.01	0.00	0.00
F	0.17	0.10	0.15	0.16	0.00	0.00	0.09	0.01	0.00
Al₂O₃	11.02	11.59	12.98	19.18	1.89	1.89	10.82	2.86	2.10
MgO	10.39	10.24	12.39	0.85	12.54	12.54	10.41	11.66	12.85
FeO^t	17.10	16.82	13.44	5.21	9.09	9.09	17.09	10.07	8.68
MnO	0.67	0.61	0.36	0.24	0.83	0.83	0.65	0.64	0.71
total	94.05	90.23	93.66	62.15	96.40	96.40	93.72	96.62	96.17
Date	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015
comment	Amp	Amp	Amp	Amp	Mined	Mined	Mined	Pyr	Pyr
Morphology (type of sample)	Mined	Mined	Mined	Glass	Pyr	Pyr	Pyr	Pyr	Mined
Picture	No close up	No close up	Yes	Yes	Yes	Yes	No close up	Yes	Yes

Sample	3 m. stub 2	3 m. stub 2	10 m	10 m	10 m	10 m	2	3	3
grain (glass shard get -)	18	19	4	5	7	11	-	-	-
reference number to appendix H	B18	B19	C4	C5	C7	C11b	17	1	7
SiO₂	50.15	51.69	66.45	68.53	55.54	69.08	68.06	70.48	69.78
Na₂O	0.66	0.57	4.09	4.53	5.62	4.76	4.23	3.99	4.54
P₂O₅	0.24	0.19	1.44	0.08	0.12	0.04	0.00	0.00	0.02
Cl	0.00	0.00	0.22	0.22	0.02	0.19	0.16	0.26	0.23
TiO₂	0.43	0.22	0.29	0.35	0.02	0.26	0.30	0.21	0.21
K₂O	0.00	0.00	5.25	5.77	0.48	5.64	5.63	6.14	6.07
CaO	23.09	23.27	3.46	2.24	10.40	1.84	1.93	1.45	1.65
SO₃	0.00	0.02	0.14	0.04	0.01	0.07	0.03	0.02	0.04
F	0.00	0.00	0.00	0.04	0.02	0.05	n.m	n.m	n.m
Al₂O₃	2.73	1.49	16.13	16.08	27.37	16.23	17.43	15.93	15.93
MgO	12.06	12.87	0.55	0.27	0.00	0.22	0.20	0.15	0.14
FeO^t	9.98	8.88	1.89	1.77	0.39	1.46	1.91	1.29	1.30
MnO	0.66	0.80	0.08	0.10	0.01	0.15	0.10	0.10	0.10
total	94.78	95.43	70.23	87.03	91.38	86.90	72.27	82.93	104.23
Date	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	12-2-2015	28-4-2015	28-4-2015	28-4-2015
comment	Pyr	Pyr	Minin	Minin	Pl	LT	LT	LT	HT. Plco
Morphology (type of sample)	Mined	Mined	GS	GS	GS	GS	GS	GS	GS
Picture	Yes	Yes	Yes	Yes	no close-up	Yes	Yes	Yes	Yes

Sample	3	3	5	5	5	5	6	6	6
grain (glass shard get -)	-	-	-	-	-	-	-	-	-
reference number to appendix H	9	10	14	15	19	20	21	22	23
SiO₂	69.26	71.21	68.04	69.85	71.93	68.13	67.56	68.02	68.88
Na₂O	4.52	4.68	3.67	4.26	3.96	4.16	4.53	4.50	4.08
P₂O₅	0.06	0.00	0.05	0.00	0.04	0.04	0.06	0.25	0.01
Cl	0.23	0.25	0.20	0.21	0.21	0.20	0.20	0.26	0.25
TiO₂	0.20	0.23	0.18	0.20	0.20	0.22	0.27	0.22	0.23
K₂O	5.70	6.07	5.52	5.41	5.88	6.10	5.96	5.90	6.18
CaO	2.27	1.37	1.61	1.73	1.63	1.66	2.37	2.68	2.06
SO₃	0.02	0.02	0.05	0.10	0.00	0.00	0.00	0.01	0.00
F	n.m	n.m	n.m						
Al₂O₃	16.15	14.67	19.13	16.86	14.72	17.90	17.05	16.12	16.20
MgO	0.15	0.14	0.16	0.15	0.20	0.17	0.19	0.14	0.21
FeO^t	1.32	1.30	1.28	1.20	1.17	1.36	1.69	1.79	1.81
MnO	0.10	0.06	0.09	0.04	0.07	0.07	0.11	0.13	0.10
total	104.32	103.32	83.27	88.92	90.38	94.63	102.74	104.12	101.28
Date	28-4-2015	28-4-2015	28-4-2015	28-4-2015	28-4-2015	28-4-2015	28-4-2015	28-4-2015	28-4-2015
comment	HT. Plco	HT	LT	LT	LT	LT	HT. Plco. HNa	HT. HNa	Plco
Morphology (type of sample)	GS	GS	GS						
Picture	Yes	Yes	Yes						

Sample	6	6	6	6	6	6	7	7	9
grain (glass shard get -)	-	-	-	-	-	-	-	-	-
reference number to appendix H	24	25	26	27	28	29	3	5	16
SiO₂	66.24	58.21	68.89	66.89	68.24	67.82	69.17	69.69	70.73
Na₂O	4.17	5.81	4.04	3.98	4.34	4.40	4.61	4.82	2.97
P₂O₅	0.02	0.01	0.00	0.01	0.00	0.00	0.02	0.00	0.05
Cl	0.26	0.01	0.28	0.24	0.24	0.25	0.24	0.24	0.24
TiO₂	0.29	0.06	0.24	0.23	0.33	0.26	0.28	0.24	0.28
K₂O	5.77	1.10	6.27	5.97	6.10	5.94	6.11	5.92	6.09
CaO	1.96	8.82	1.99	2.08	2.18	2.07	1.67	1.61	1.67
SO₃	0.02	0.05	0.04	0.00	0.00	0.01	0.06	0.00	0.03
F	n.m								
Al₂O₃	19.26	25.22	16.11	18.55	16.45	17.15	16.07	15.76	16.24
MgO	0.16	0.01	0.21	0.24	0.24	0.18	0.19	0.19	0.21
FeO^t	1.72	0.68	1.75	1.70	1.74	1.83	1.51	1.52	1.42
MnO	0.13	0.01	0.18	0.09	0.14	0.09	0.07	0.01	0.06
total	98.33	104.69	99.85	101.22	100.98	103.43	94.87	91.96	96.28
Date	28-4-2015	28-4-2015	28-4-2015	28-4-2015	28-4-2015	28-4-2015	30-3-2015	30-3-2015	30-3-2015
comment	Plco	HT. Plco	Plco	Plco	Plco	Plco	Plco	Plco	NaL
Morphology (type of sample)	GS								
Picture	Yes								

Sample	9	9	4	11	12	14	14	14	14	14
grain (glass shard get -)	-	-	-	-	-	-	-	-	-	-
reference number to appendix H	17	18	23	31	43	2	4	5	6	8
SiO₂	69.12	68.75	70.10	69.25	68.36	68.65	69.04	68.76	69.19	69.78
Na₂O	4.43	4.52	3.53	4.74	4.54	4.47	4.45	4.56	4.53	4.65
P₂O₅	0.00	0.01	0.05	0.01	0.00	0.00	0.00	0.04	0.00	0.03
Cl	0.24	0.23	0.21	0.23	0.19	0.18	0.22	0.22	0.21	0.23
TiO₂	0.28	0.22	0.29	0.28	0.23	0.24	0.26	0.25	0.27	0.23
K₂O	6.12	5.69	6.04	5.70	5.60	5.86	5.84	5.78	5.98	5.98
CaO	1.74	1.78	1.78	1.83	1.81	1.91	1.88	1.91	1.99	1.90
SO₃	0.00	0.00	0.05	0.00	0.00	0.02	0.00	0.00	0.02	0.00
F	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m
Al₂O₃	16.30	17.11	16.08	16.25	17.46	16.96	16.52	16.57	16.08	15.42
MgO	0.19	0.19	0.25	0.22	0.24	0.17	0.23	0.20	0.20	0.23
FeO^t	1.48	1.41	1.52	1.39	1.47	1.43	1.50	1.57	1.46	1.43
MnO	0.10	0.09	0.11	0.10	0.10	0.10	0.06	0.14	0.07	0.11
total	93.69	98.00	93.71	91.30	94.51	98.23	92.87	99.17	90.47	91.90
Date	30-3-2015	30-3-2015	30-3-2015	30-3-2015	30-3-2015	1-6-2015	1-6-2015	1-6-2015	1-6-2015	1-6-2015
comment	Plco	Plco	LT	LT	Plco	Plco	LT	Plco	LT	LT
Morphology (type of sample)	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Picture	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Sample	17	17	17	17	17	18	18	18	18
grain (glass shard get -)	-	-	-	-	-	-	-	-	-
reference number to appendix H	1	5	8	11	13	6	7	9	10
SiO₂	71.87	70.47	69.51	71.63	68.44	67.57	69.02	70.13	70.00
Na₂O	2.82	4.12	3.97	4.01	3.94	4.54	4.26	4.34	4.54
P₂O₅	0.04	0.01	0.00	0.04	0.01	0.08	0.02	0.01	0.00
Cl	0.23	0.30	0.30	0.28	0.28	0.24	0.21	0.24	0.25
TiO₂	0.32	0.30	0.29	0.28	0.31	0.35	0.28	0.22	0.30
K₂O	6.67	6.63	6.51	6.73	6.47	5.51	5.69	5.50	5.57
CaO	1.06	1.21	1.03	1.04	1.04	1.84	1.94	1.90	1.86
SO₃	0.05	0.05	0.03	0.04	0.02	0.02	0.01	0.06	0.00
F	n.m								
Al₂O₃	15.29	14.95	16.83	14.38	18.03	18.06	16.65	15.78	15.62
MgO	0.20	0.25	0.24	0.19	0.13	0.23	0.22	0.22	0.24
FeO^t	1.38	1.64	1.23	1.34	1.31	1.48	1.60	1.53	1.50
MnO	0.07	0.06	0.08	0.05	0.01	0.07	0.09	0.06	0.11
total	92.95	95.60	95.27	83.82	96.21	96.33	84.90	91.49	86.47
Date	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015
comment	LT	LT. NTM	LT. Plco	LT	LT. Plco	LT. Plco	LT	LT	LT
Morphology (type of sample)	GS								
Picture	Yes								

Sample	19*	19*	19*	19	19	19	19	19	20	20
grain (glass shard get -)	-	-	-	-	-	-	-	-	-	-
reference number to appendix H	1	2	3	2	3	5	7	8	1	2
SiO₂	63.13	69.20	56.25	73.07	66.44	68.34	67.89	69.12	58.42	61.02
Na₂O	5.47	4.52	5.72	2.35	4.54	4.99	4.90	4.44	5.86	3.85
P₂O₅	0.02	0.01	0.07	0.00	0.04	0.02	0.00	0.05	0.00	0.01
Cl	0.12	0.20	0.00	0.20	0.22	0.21	0.18	0.21	0.06	0.16
TiO₂	0.09	0.29	0.00	0.24	0.27	0.28	0.28	0.20	0.09	0.23
K₂O	2.76	5.81	0.58	4.70	5.57	5.91	5.37	5.92	2.33	4.62
CaO	5.87	2.04	10.21	1.80	1.80	1.82	2.10	2.01	5.13	1.66
SO₃	0.00	0.01	0.00	0.04	0.04	0.00	0.01	0.10	0.02	0.03
F	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m
Al₂O₃	21.35	15.98	26.76	15.74	19.33	16.69	17.53	16.02	27.52	27.24
MgO	0.13	0.24	0.00	0.21	0.20	0.23	0.17	0.26	0.03	0.17
FeO^t	1.03	1.61	0.38	1.53	1.48	1.45	1.49	1.58	0.49	0.94
MnO	0.02	0.09	0.03	0.13	0.05	0.08	0.08	0.09	0.05	0.06
total	99.61	95.74	99.41	97.93	99.88	97.84	99.09	93.46	99.95	97.06
Date	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015
comment	UPS	UPS	UPS	NaL	Plco	Plco	Plco	LT	PI	PL
Morphology (type of sample)	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Picture	Yes	Yes	Yes	No close up	No close up	Yes	Yes	Yes	Yes	No close up

Sample	20	20	26	26	26	26	27	27	27	27	27
grain (glass shard get -)	-	-	-	-	-	-	-	-	-	-	-
reference number to appendix H	3	4	2	7	9	11	2	3	4	5	6
SiO₂	67.79	68.68	69.68	70.51	69.95	69.92	71.07	70.89	70.35	69.95	71.38
Na₂O	5.18	4.10	4.41	4.43	4.34	4.36	3.92	3.87	4.05	4.02	3.98
P₂O₅	0.00	0.03	0.01	0.00	0.00	0.03	0.08	0.01	0.01	0.06	0.06
Cl	0.15	0.22	0.24	0.25	0.23	0.23	0.20	0.17	0.19	0.17	0.17
TiO₂	0.19	0.24	0.21	0.23	0.23	0.18	0.16	0.18	0.16	0.18	0.20
K₂O	4.99	5.44	5.96	6.28	6.24	6.47	6.12	5.94	5.95	5.82	5.85
CaO	2.28	1.50	1.45	1.59	1.67	1.35	1.59	1.57	1.55	1.65	1.50
SO₃	0.04	0.01	0.07	0.01	0.47	0.07	0.01	0.03	0.00	0.04	0.02
F	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m
Al₂O₃	18.47	18.59	16.48	15.06	15.31	15.65	15.27	15.98	16.27	16.70	15.43
MgO	0.03	0.10	0.18	0.26	0.22	0.19	0.18	0.15	0.16	0.17	0.11
FeO^t	0.81	1.01	1.26	1.31	1.26	1.42	1.30	1.15	1.19	1.17	1.21
MnO	0.05	0.07	0.06	0.08	0.08	0.12	0.10	0.08	0.11	0.07	0.08
total	98.21	96.50	99.83	97.14	97.38	93.39	92.94	95.57	95.62	93.84	94.43
Date	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015
comment	Plco	Plco	Plco	Plco	Plco	Plco	Plco	Plco	LT. Plco	LT. Plco	LT. Plco
Morphology (type of sample)	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Picture	Yes	Yes	Yes	No close up	Yes						

Sample	28	28	28	28	29	29	29	29	30	30	31
grain (glass shard get -)	-	-	-	-	-	-	-	-	-	-	-
reference number to appendix H	1	4	7	8	1	2	3	4	1	2	6
SiO₂	70.19	62.37	61.66	71.92	87.00	86.55	87.76	81.10	45.90	45.13	69.32
Na₂O	4.32	4.01	6.33	3.69	1.08	1.15	1.35	1.71	0.00	0.00	3.97
P₂O₅	0.05	0.12	0.05	0.06	0.04	0.00	0.00	0.04	1.78	1.80	0.01
Cl	0.13	0.09	0.01	0.15	0.01	0.00	0.00	0.00	0.12	0.07	0.26
TiO₂	0.18	0.12	0.03	0.16	0.11	0.08	0.06	0.04	0.09	0.25	0.31
K₂O	4.99	2.99	1.75	6.18	4.10	4.84	2.90	5.61	0.08	0.05	6.72
CaO	2.27	6.74	6.53	1.38	0.22	0.14	0.55	0.41	0.21	0.17	1.10
SO₃	0.00	0.00	0.00	0.00	0.00	0.04	0.01	0.02	0.13	0.05	0.00
F	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m
Al₂O₃	16.56	22.49	22.99	14.96	7.37	7.07	7.21	10.90	51.21	51.56	16.36
MgO	0.18	0.15	0.04	0.21	0.02	0.00	0.03	0.01	0.01	0.01	0.28
FeO^t	1.10	0.88	0.56	1.19	0.07	0.12	0.11	0.13	0.47	0.90	1.60
MnO	0.04	0.04	0.05	0.09	0.00	0.00	0.03	0.03	0.01	0.03	0.06
total	96.38	93.05	97.79	90.75	100.06	100.94	99.21	98.01	58.78	51.48	74.52
Date	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015
comment	LT. Plco	LT. Plco	LT. Plco	LT	NT	NT	NT	NT	NT	NT	Plco
Morphology (type of sample)	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS	GS
Picture	Yes	Yes	No close up	No close up	Yes						

Sample	32	32	32	32	32	32	32	32	32	32	32	32
grain (glass shard get -)	-	-	-	-	-	-	-	-	-	-	-	-
reference number to appendix H	1	4	5	6	7	8	9	10	11	14	17	
SiO₂	68.07	64.10	66.88	67.51	63.55	67.84	68.50	69.27	68.21	67.45	68.89	
Na₂O	4.40	4.23	4.50	4.44	4.02	4.41	4.39	4.52	4.74	4.34	4.76	
P₂O₅	0.05	0.04	0.00	0.00	0.01	0.03	0.00	0.06	0.09	0.51	0.00	
Cl	0.21	0.21	0.21	0.23	0.18	0.20	0.20	0.22	0.21	0.23	0.19	
TiO₂	0.24	0.27	0.25	0.29	0.27	0.22	0.22	0.25	0.23	0.23	0.26	
K₂O	6.06	5.50	5.78	5.77	5.35	5.67	6.03	6.09	5.92	5.85	5.59	
CaO	1.86	2.11	1.82	1.80	1.64	1.84	1.91	1.80	1.83	2.46	2.10	
SO₃	0.00	0.51	0.00	0.00	0.00	0.03	0.00	0.04	0.00	0.01	0.02	
F	n.m											
Al₂O₃	17.38	21.40	18.73	18.22	23.36	18.03	16.83	15.94	17.01	17.09	16.53	
MgO	0.19	0.18	0.19	0.22	0.19	0.18	0.23	0.20	0.19	0.23	0.16	
FeO^t	1.46	1.40	1.48	1.47	1.27	1.55	1.61	1.50	1.45	1.47	1.44	
MnO	0.07	0.05	0.16	0.05	0.14	0.01	0.08	0.12	0.13	0.13	0.08	
total	96.96	92.68	95.18	97.76	95.96	94.94	83.64	88.94	96.70	95.91	97.35	
Date	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	2-6-2015	
comment	Lt. Plco											
Morphology (type of sample)	GS											
Picture	Yes											

Sample	32	32	32	32	2	18	23	33	36	36
grain (glass shard get -)	-	-	-	-				2	1	1
reference number to appendix H	20	22	24	27	193grain1-1	S193-4	S193-9	4	4	5
SiO₂	62.13	67.38	68.95	68.60	69.99	76.89	77.19	67.92	59.32	56.29
Na₂O	6.14	4.34	4.63	4.39	4.63	4.00	3.85	4.85	0.22	0.17
P₂O₅	0.03	0.06	0.00	0.05	0.05	0.02	0.00	0.00	0.33	0.17
Cl	0.06	0.20	0.22	0.22	0.20	0.18	0.09	0.22	0.21	0.06
TiO₂	0.04	0.28	0.24	0.26	0.26	0.09	0.14	0.23	0.40	0.38
K₂O	2.57	6.00	5.86	6.09	5.20	4.56	4.59	5.80	1.21	1.11
CaO	5.97	1.71	1.74	1.92	1.60	0.68	0.66	1.95	0.40	0.52
SO₃	0.00	0.04	0.00	0.00	0.04	0.03	0.01	0.04	0.15	0.07
F	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m	n.m
Al₂O₃	22.28	18.11	16.56	16.54	16.39	12.80	12.77	17.10	27.92	29.64
MgO	0.08	0.21	0.17	0.24	0.15	0.13	0.11	0.24	1.18	1.61
FeO^t	0.71	1.58	1.52	1.56	1.41	0.53	0.50	1.56	8.55	9.93
MnO	0.00	0.08	0.10	0.11	0.08	0.09	0.10	0.09	0.13	0.05
total	97.90	95.78	96.21	97.17	94.45	91.00	92.74	96.13	48.21	78.59
Date	2-6-2015	2-6-2015	2-6-2015	2-6-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015
comment	Lt. Plco	Lt. Plco	Lt. Plco	Lt. Plco	LT	LT	LT	Plco	LT	LT
Morphology (type of sample)	GS	GS	GS	GS	matrix	matrix	matrix	matrix	matrix	matrix
Picture	Yes	No close up	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Sample	36	36	36	36	36	36	36	36	37	37
grain (glass shard get -)	1	2	3	3	3	3	3	3	1	1
reference number to appendix H	6	7	8	9	10	11	12	13	2	3
SiO₂	54.48	84.59	75.46	56.46	56.63	82.21	78.65	97.33	37.73	41.97
Na₂O	0.21	2.06	3.54	6.07	3.18	2.09	2.88	0.56	0.23	0.25
P₂O₅	0.20	0.03	0.03	0.02	0.05	0.01	0.08	0.00	0.05	0.04
Cl	0.08	0.01	0.08	0.00	0.62	0.12	0.05	0.01	0.10	0.10
TiO₂	0.73	0.08	0.15	0.00	0.11	0.06	0.04	0.10	4.08	3.32
K₂O	0.87	3.64	4.76	0.44	4.91	3.81	4.54	0.33	0.40	3.35
CaO	0.47	0.79	1.62	9.21	3.22	0.84	1.36	0.10	1.56	0.70
SO₃	0.02	0.01	0.01	0.00	0.13	0.05	0.00	0.01	0.07	0.08
F	n.m									
Al₂O₃	30.97	8.68	13.61	27.52	26.84	10.42	12.04	1.48	26.75	24.42
MgO	1.56	0.00	0.07	0.01	1.25	0.03	0.02	0.00	13.29	11.09
FeO^t	10.38	0.11	0.61	0.27	2.86	0.31	0.35	0.07	15.43	14.50
MnO	0.02	0.00	0.06	0.00	0.20	0.05	0.00	0.01	0.30	0.18
total	68.19	97.23	99.87	101.12	38.07	76.65	88.14	102.30	74.42	84.28
Date	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015
comment	LT	Plco	Plco	Plco	LT	LT	Plco.	LT	LT	LT
Morphology (type of sample)	matrix									
Picture	Yes									

Sample	38	38	38	38	38	38	39	39	39	39	39
grain (glass shard get -)	1	1	2	2	2	2	1	1	1	1	1
reference number to appendix											
H	2	7	9	10	11	12	1	2	3	4	5
SiO ₂	67.18	68.58	71.09	0.09	53.36	74.42	56.95	41.13	42.77	54.47	65.89
Na ₂ O	3.55	3.81	1.40	0.00	4.85	2.29	6.45	2.13	2.19	5.12	3.60
P ₂ O ₅	0.25	0.14	0.51	0.02	0.04	0.00	0.05	0.05	0.07	0.06	0.07
Cl	0.47	0.26	0.86	0.01	0.01	0.24	0.00	0.11	0.09	0.01	0.24
TiO ₂	0.21	0.25	0.37	5.55	0.00	0.22	0.00	2.58	2.50	0.05	0.17
K ₂ O	5.28	5.37	2.86	0.00	0.31	6.17	0.67	1.79	1.88	0.64	5.80
CaO	1.42	1.47	0.93	0.01	11.76	1.20	8.84	12.07	11.75	10.78	1.63
SO ₃	0.01	0.01	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.05	0.07
F	n.m										
Al ₂ O ₃	20.11	18.60	16.62	1.80	29.12	13.59	26.63	11.83	11.55	28.26	21.03
MgO	0.24	0.17	0.16	1.09	0.04	0.33	0.02	10.63	10.72	0.02	0.21
FeO ^t	1.24	1.26	4.89	90.15	0.51	1.39	0.38	17.12	16.03	0.51	1.26
MnO	0.05	0.06	0.23	1.27	0.01	0.15	0.00	0.57	0.46	0.04	0.03
total	62.55	73.17	27.79	96.95	100.38	95.47	101.22	99.27	98.62	101.45	71.60
Date	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015
comment	LT	LT	LT	Mag	Plco						
Morphology (type of sample)	matrix										
Picture	Yes										

Sample	39	39	39	39	40a						
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grain (glass shard get -)	2	2	2	2	1	1	1	1	1	2
reference number to appendix H	7	8	9	10	1	2	3	4	7	9
SiO₂	65.62	68.11	69.64	67.36	0.12	63.26	67.97	58.17	56.58	41.25
Na₂O	4.10	4.66	4.65	4.61	0.01	5.89	5.06	6.64	6.26	2.06
P₂O₅	0.01	0.07	0.00	0.03	0.02	0.03	0.00	0.02	0.09	0.09
Cl	0.22	0.22	0.21	0.20	0.00	0.09	0.21	0.00	0.01	0.11
TiO₂	0.23	0.19	0.25	0.25	6.44	0.18	0.24	0.02	0.00	2.62
K₂O	6.13	5.65	6.15	5.50	0.00	3.27	5.47	0.97	0.57	1.77
CaO	2.05	1.83	1.53	1.79	0.06	4.94	2.24	7.76	9.13	11.95
SO₃	0.02	0.02	0.05	0.03	0.00	0.01	0.00	0.02	0.00	0.06
F	n.m									
Al₂O₃	19.90	17.65	15.85	18.70	1.62	21.25	17.21	25.89	27.04	11.78
MgO	0.23	0.17	0.15	0.15	1.51	0.11	0.16	0.04	0.01	10.65
FeO^t	1.40	1.34	1.41	1.27	88.83	0.93	1.35	0.43	0.28	17.12
MnO	0.09	0.09	0.11	0.10	1.39	0.03	0.09	0.01	0.02	0.55
total	92.40	100.42	93.67	99.20	96.55	102.40	102.03	101.61	102.40	99.60
Date	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015
comment	Plco	Plco	Plco	Mag	Plco	HT	Plco	Plco	mineral	apatite
Morphology (type of sample)	matrix									
Picture	Yes									

Sample	40a	40a	40a	40a	40b	40b	42	42	45	46
grain (glass shard get -)	2	2	3	3	4	5	2	2	1	2
reference number to appendix H	12	13	14	17	1	2	5	6	4	3
SiO₂	0.42	68.39	62.40	62.48	48.19	45.48	68.61	65.31	68.01	67.48
Na₂O	0.00	4.58	5.23	6.36	0.03	0.09	4.39	4.40	4.82	4.90
P₂O₅	42.95	0.01	0.06	0.09	1.60	2.23	0.00	0.03	0.08	0.05
Cl	0.64	0.22	0.14	0.09	0.04	0.14	0.20	0.19	0.19	0.16
TiO₂	0.01	0.19	0.16	0.11	0.00	0.08	0.24	0.43	0.26	0.25
K₂O	0.02	5.70	4.76	3.12	0.06	0.17	5.61	5.25	5.49	5.16
CaO	55.35	1.84	3.42	4.30	0.81	0.68	1.85	2.80	2.27	2.64
SO₃	0.27	0.05	0.00	0.00	0.45	0.50	0.02	0.00	0.02	0.06
F	n.m									
Al₂O₃	0.01	17.06	22.68	22.58	47.90	49.47	17.19	17.76	16.98	17.56
MgO	0.06	0.22	0.14	0.07	0.27	0.14	0.24	1.00	0.20	0.19
FeO^t	0.13	1.63	0.96	0.76	0.54	0.94	1.55	2.73	1.57	1.45
MnO	0.14	0.10	0.06	0.03	0.11	0.08	0.10	0.09	0.10	0.10
total	101.92	99.07	94.27	96.89	78.04	63.92	100.65	98.61	100.25	99.86
Date	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015
comment	apatite	Plco	Plco	NaL	NaL	Plco	Plco	Plco	Plco	Plco
Morphology (type of sample)	matrix									
Picture	Yes									

Sample	46	46	46	48	48	48	50	52	53	53
grain (glass shard get -)	2	3	3	1	1	2	1	2	3	5
reference number to appendix H	4	5	6	1	2	3	2	3	2	2
SiO₂	68.71	70.73	71.22	73.30	72.57	72.23	66.86	69.74	68.64	69.28
Na₂O	4.66	4.48	4.45	3.84	3.96	3.80	4.96	4.26	4.87	4.39
P₂O₅	0.07	0.05	0.02	0.06	0.02	0.00	0.02	0.04	0.08	0.02
Cl	0.26	0.22	0.23	0.24	0.23	0.18	0.20	0.25	0.21	0.20
TiO₂	0.30	0.24	0.21	0.14	0.14	0.18	0.30	0.21	0.26	0.29
K₂O	6.03	5.85	5.88	5.67	5.78	5.80	5.24	5.64	5.21	5.72
CaO	1.65	1.43	1.27	1.29	1.42	1.36	2.72	1.88	2.22	1.91
SO₃	0.07	0.04	0.00	0.02	0.04	0.05	0.13	0.02	0.00	0.06
F	n.m									
Al₂O₃	16.08	15.42	15.01	14.38	14.61	15.17	17.38	16.37	16.76	16.27
MgO	0.22	0.25	0.16	0.11	0.14	0.14	0.35	0.19	0.21	0.19
FeO^t	1.86	1.22	1.46	0.87	1.01	0.99	1.77	1.34	1.47	1.52
MnO	0.10	0.07	0.09	0.07	0.09	0.09	0.08	0.05	0.07	0.14
total	90.44	100.51	92.78	81.08	86.66	92.27	101.22	91.69	91.96	93.81
Date	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015	14-7-2015
comment	Plco	-	LT	LT	LT	LT	HT	LT	LT	Plco
Morphology (type of sample)	matrix									
Picture	Yes									

Sample	54	54
grain (glass shard get -)	1	2
reference number to appendix H	1	1
SiO₂	67.68	66.76
Na₂O	4.46	4.48
P₂O₅	0.03	0.00
Cl	0.21	0.19
TiO₂	0.26	0.26
K₂O	6.03	5.44
CaO	1.78	1.70
SO₃	0.01	0.00
F	n.m	n.m
Al₂O₃	17.54	19.08
MgO	0.25	0.17
FeO^t	1.64	1.84
MnO	0.11	0.09
total	97.95	100.77
Date	14-7-2015	14-7-2015
comment	Plco	Plco
Morphology (type of sample)	matrix	matrix
Picture	Yes	Yes

Appendix I: Average normalized glass shard data

Table I-1. Normalized averaged microprobe data of the samples. Pumice and matrix samples.

Samples	SiO ₂	Na ₂ O	P ₂ O ₅	Cl	TiO ₂	K ₂ O	CaO	SO ₃	Al ₂ O ₃	MgO	FeO ^t	MnO	Totals	Number of used measurements	Number of measurements
3m-1	73.46	4.18	0.02	0.23	0.20	5.89	0.74	0.01	14.10	0.10	0.98	0.05	100	3	4
3m-2	68.89	4.48	0.08	0.23	0.25	5.77	2.05	0.04	16.43	0.23	1.44	0.11	100	3	3
3m-3	70.09	3.93	0.08	0.22	0.22	5.53	2.05	0.02	16.30	0.18	1.29	0.08	100	3	11
3m-4	73.14	2.40	0.04	0.21	0.26	4.36	1.62	0.01	16.11	0.20	1.52	0.09	100	15	28
10m	69.04	4.69	0.06	0.22	0.24	5.80	1.90	0.03	16.12	0.23	1.54	0.09	100	12	16
S2	69.22	4.75	0.00	0.23	0.26	5.95	1.91	0.03	15.84	0.20	1.53	0.09	100	6	7
S3	70.44	4.27	0.02	0.25	0.23	6.39	1.54	0.01	15.33	0.14	1.31	0.07	100	6	10
S4	69.79	4.09	0.04	0.22	0.25	5.97	1.76	0.03	16.14	0.19	1.44	0.07	100	6	7
S5	70.88	4.18	0.02	0.20	0.18	6.09	1.67	0.01	15.24	0.14	1.29	0.08	100	6	10
S6	69.51	4.10	0.01	0.26	0.24	6.27	1.86	0.02	15.84	0.17	1.64	0.08	100	3	10
S7	69.65	4.74	0.02	0.23	0.22	5.97	1.61	0.03	15.88	0.18	1.38	0.08	100	4	6
S8	69.46	4.27	0.01	0.23	0.24	6.07	1.84	0.03	16.10	0.19	1.48	0.08	100	10	7
S9	69.79	4.34	0.02	0.23	0.26	5.92	1.69	0.01	15.97	0.22	1.48	0.08	100	4	7
S10	69.84	4.33	0.01	0.22	0.25	6.08	1.60	0.03	15.88	0.19	1.45	0.12	100	6	6
S11	68.94	4.79	0.03	0.24	0.27	5.59	1.89	0.03	16.38	0.22	1.52	0.11	100	6	7
S12	69.35	4.66	0.02	0.21	0.26	5.69	1.82	0.02	16.17	0.21	1.50	0.08	100	11	12
S14	69.18	4.62	0.04	0.21	0.25	5.94	1.93	0.02	16.02	0.21	1.50	0.09	100	7	12
S17	70.81	4.07	0.01	0.26	0.30	6.77	1.09	0.03	15.10	0.17	1.30	0.08	100	8	13
S18	69.76	4.43	0.01	0.21	0.26	5.62	1.97	0.02	15.93	0.22	1.46	0.10	100	5	10
S19	69.20	4.72	0.02	0.22	0.28	5.89	1.90	0.02	15.92	0.21	1.55	0.07	100	7	12

Samples	SiO ₂	Na ₂ O	P ₂ O ₅	Cl	TiO ₂	K ₂ O	CaO	SO ₃	Al ₂ O ₃	MgO	FeO ^t	MnO	Totals	Number of used measurements	Number of measurements
S20	68.75	5.22	0.04	0.19	0.16	5.11	2.09	0.29	16.95	0.05	1.15	0.00	100	1	5
S26	70.82	4.37	0.02	0.21	0.23	6.15	1.39	0.01	15.24	0.17	1.30	0.09	100	8	11
S27	71.67	4.07	0.03	0.18	0.18	5.94	1.53	0.02	14.97	0.16	1.17	0.08	100	5	10
S28	71.04	3.94	0.03	0.16	0.29	6.08	1.54	0.04	14.73	0.50	1.60	0.07	100	6	10
S31	69.75	4.33	0.04	0.22	0.32	6.43	1.39	0.02	15.57	0.23	1.61	0.07	100	6	7
S32	69.36	4.56	0.03	0.22	0.25	5.99	1.88	0.02	15.90	0.19	1.50	0.10	100	10	27
S33	68.66	4.83	0.01	0.23	0.24	5.74	1.91	0.04	16.46	0.22	1.55	0.10	100	3	4
S38	71.46	4.19	0.01	0.18	0.20	5.59	1.49	0.02	15.41	0.15	1.22	0.07	100	6	12
S39	69.21	4.33	0.02	0.22	0.29	6.20	1.49	0.04	16.35	0.20	1.51	0.14	100	2	11
S40	69.65	4.42	0.03	0.23	0.26	6.21	1.52	0.03	15.93	0.19	1.43	0.10	100	8	20
S41	69.22	4.44	0.02	0.21	0.27	5.93	1.80	0.01	16.26	0.20	1.53	0.11	100	5	5
S42	69.29	4.60	0.02	0.21	0.28	5.93	1.74	0.03	16.10	0.21	1.51	0.09	100	4	6
S43	69.14	4.37	0.02	0.22	0.27	6.21	1.72	0.04	16.26	0.22	1.45	0.09	100	4	4
S44	68.69	4.70	0.03	0.22	0.26	5.97	1.85	0.02	16.38	0.23	1.54	0.12	100	3	3
S45	69.20	4.52	0.05	0.21	0.26	5.91	1.75	0.03	16.23	0.19	1.57	0.08	100	3	4
S46	69.12	4.63	0.03	0.20	0.25	6.02	1.78	0.04	16.04	0.20	1.57	0.12	100	2	6
S47	68.95	4.72	0.03	0.20	0.26	5.83	1.81	0.02	16.30	0.22	1.54	0.11	100	4	4
S50	68.98	4.52	0.02	0.23	0.29	5.72	1.86	0.15	16.43	0.24	1.51	0.05	100	2	4
S52	69.30	4.65	0.01	0.19	0.25	5.62	1.89	0.06	16.23	0.20	1.51	0.09	100	3	4
S53	69.38	4.52	0.04	0.20	0.24	5.76	1.89	0.02	16.17	0.20	1.46	0.12	100	6	8
S54	69.19	4.89	0.02	0.20	0.24	5.57	1.86	0.00	16.26	0.19	1.47	0.09	100	4	6
S55	68.56	4.88	0.03	0.23	0.29	5.80	1.93	0.01	16.21	0.22	1.75	0.09	100	2	2

Appendix J: Comparison between EMP instruments

In this section the data for one sample measured on two different instruments is displayed.

Table J-1. Sample 193 measurements done in this work with data from Huizinga (2013, unpub. MSc thesis). All data is normalized to 100 wt%.

Sample	Name	SiO ₂	Na ₂ O	P ₂ O ₅	Cl	TiO ₂	K ₂ O	CaO	SO ₃	Al ₂ O ₃	MgO	FeO	MnO	Totals	Instrument
This work	S193-1	77.03	3.86	0.00	0.10	0.10	4.60	0.70	0.00	12.91	0.10	0.55	0.07	97.71	JEOL JXA-8530F
This work	S193-2	77.06	3.76	0.01	0.09	0.12	4.62	0.68	0.00	12.95	0.11	0.54	0.06	95.79	JEOL JXA-8530F
This work	S193-3	77.31	3.98	0.00	0.10	0.09	4.41	0.64	0.02	12.83	0.08	0.48	0.07	96.78	JEOL JXA-8530F
This work	S193-4	76.99	4.04	0.03	0.09	0.12	4.50	0.71	0.00	12.69	0.06	0.66	0.09	95.75	JEOL JXA-8530F
This work	S193-5	76.63	3.96	0.00	0.10	0.11	4.49	0.73	0.04	13.18	0.10	0.58	0.10	95.80	JEOL JXA-8530F
This work	S193-6	76.95	3.79	0.00	0.13	0.11	4.54	0.70	0.02	13.03	0.09	0.59	0.06	97.33	JEOL JXA-8530F
This work	S193-7	76.90	3.87	0.01	0.08	0.10	4.55	0.66	0.00	13.07	0.11	0.64	0.03	95.68	JEOL JXA-8530F
This work	S193-8	77.08	4.10	0.03	0.10	0.09	4.59	0.59	0.00	12.76	0.09	0.54	0.04	96.25	JEOL JXA-8530F
Huizinga (2013)	193-2	78.77	3.37	0.02	0.07	0.12	4.20	0.62	0.00	12.22	0.09	0.52	0.01	98.05	Jeol JXA 8600 microprobe
Huizinga (2013)	193-3	79.01	3.06	0.00	0.12	0.12	4.14	0.55	0.00	12.23	0.10	0.52	0.18	98.43	Jeol JXA 8600 microprobe
Huizinga (2013)	193-5	79.15	2.85	0.00	0.12	0.08	4.14	0.57	0.04	12.38	0.08	0.57	0.02	97.55	Jeol JXA 8600 microprobe
Huizinga (2013)	193-8	78.23	3.42	0.00	0.11	0.12	4.28	0.64	0.02	12.45	0.09	0.59	0.06	97.34	Jeol JXA 8600 microprobe
Huizinga (2013)	193-10	78.71	3.17	0.01	0.14	0.11	4.33	0.64	0.00	12.28	0.09	0.48	0.05	98.56	Jeol JXA 8600 microprobe
Huizinga (2013)	193-12	78.55	3.40	0.01	0.10	0.08	4.09	0.60	0.02	12.46	0.09	0.59	0.00	98.10	Jeol JXA 8600 microprobe
Huizinga (2013)	193-16	78.67	3.24	0.03	0.10	0.11	4.14	0.62	0.00	12.39	0.09	0.57	0.04	98.57	Jeol JXA 8600 microprobe

Appendix K: Mineral data

Here the EDS and WDS results of the minerals are given for plagioclase, K-feldspars, Amphiboles, pyroxenes and minor mineral phases.

Table K-1. EDS of phenocrysts and microliths of Plagioclase.

Sample	SiO ₂	Na ₂ O	K ₂ O	CaO	Al ₂ O ₃	MgO	FeO ^(t)	Totals	Comment
10m	55.54	5.62	0.48	10.40	27.37	0.00	0.39	100.0	WDS
S1	56.2	6.92	0	9.51	27.37	0	0	99.8	EDS
S1	55.52	5.39	0	11.47	27.63	0	0	100.0	EDS
S1	56.31	5.37	0	10.53	27.79	0	0	100.0	EDS
S1	66.11	6.04	3.72	3.9	20.23	0	0	100.0	EDS
S2	55.01	5.19	0	11.1	28.1	0	0.6	100.0	EDS
S2	55.66	5.84	0	9.64	28.87	0	0	100.0	EDS
S2	57.65	6.18	0	8.89	27.27	0	0	100.0	EDS
S3	56.55	6.03	0	9.63	27.79	0	0	100.0	EDS
S4	51.19	4.49	0	14.89	29.42	0	0	100.0	EDS
S4	57.64	6.25	1.06	9.32	25.73	0	0	100.0	EDS
S5	59.19	5.81	0	8.2	26.79	0	0	100.0	EDS
S5	56.31	5.86	0	9.97	27.85	0	0	100.0	EDS
S5	61.23	7.17	0	6.47	25.13	0	0	100.0	EDS
S6	54.12	4.98	0	11.83	29.07	0	0	100.0	EDS
S6	56.97	5.94	0	10.09	27	0	0	100.0	EDS
S7	52.36	4.31	0	13.26	30.07	0	0	100.0	EDS
S7	57.06	5.93	0	8.7	28.31	0	0	100.0	EDS
S7	56.88	5.73	0	9.96	27.4	0	0	100.0	EDS
S7	56.22	6.23	0	10.44	27.11	0	0	100.0	EDS
S8	57	7.36	0	9.71	25.93	0	0	100.0	EDS
S8	56.65	4.63	0	11.02	27.71	0	0	100.0	EDS
S8	58.82	6.88	0	8.65	25.65	0	0	100.0	EDS
S9	57.89	5.37	0	0.84	26.89	0	0	100.0	EDS
S9	59.05	6.23	0	8.5	26.22	0	0	100.0	EDS
S9	57.56	6.23	0	8.72	27.48	0	0	91.0	EDS
S9	59.84	6.8	0.87	6.47	26.02	0	0	100.0	EDS
S9	54.67	6.19	0	10.3	28.83	0	0	100.0	EDS
S10	57.4	7.17	0	8.83	26.6	0	0	100.0	EDS
S10	54.06	6.24	0	9.18	29.32	0	1.19	100.0	EDS
S10	56.96	5.94	0.76	9.89	26.46	0	0	100.0	EDS
S11	57.07	5.32	0.55	10.03	27.03	0	0	100.0	EDS
S11	55.62	5.43	0	9.7	29.25	0	0	100.0	EDS
S12	57.57	5.98	0	9.09	26.31	0	1.05	100.0	EDS
S12	59.61	6.34	0	8.24	25.81	0	0	100.0	EDS
S13	57.51	5.18	2.89	9.24	28.07	0	0	100.0	EDS

S13	66.48	7.44	0	1.74	21.45	0	0	100.0	EDS
S14	59.71	5.67	0	7.86	26.76	0	0	102.9	EDS
S14	54.08	5.82	0	11.94	28.17	0	0	97.1	EDS
S14	58.74	6.44	0	9.1	25.72	0	0	100.0	EDS
S14	56.22	6.46	0	10.85	26.47	0	0	100.0	EDS
S14	60.42	5.7	0	8.23	25.65	0	0	100.0	EDS
S15	57.3	5.43	0	9.18	28.09	0	0	100.0	EDS
S15	57.99	5.9	0	9.51	26.6	0	0	100.0	EDS
S15	63.31	6.98	4.5	3.77	21.45	0	0	100.0	EDS
S16	59.46	5.95	0	8.06	26.53	0	0	100.0	EDS
S16	52.06	3.33	0.75	14.2	30.41		0	100.0	EDS
S18	59.14	5.98	0.89	9.07	24.9	0	0	100.0	EDS
S18	56.83	5.51	0	8.58	29.08	0	0	100.8	EDS
S19	57.09	5.67	0	10.42	26.81	0	0	100.0	EDS
S19	53.09	4.08	0	12.3	30.52	0	0	100.0	EDS
S19	57.43	6.22	0	9.91	26.45	0	0	100.0	EDS
S20	56.21	6.53	0	9.61	27.65	0	0	100.0	EDS
S20	58.47	6.26	0	8.78	26.49	0	0	100.0	EDS
S20	57.97	6.63	0	8.94	26.45	0	0	100.0	EDS
S26	53.14	3.99	0	12.8	30.06	0	0	100.0	EDS
S26	59.99	7.7	0	7.87	24.43	0	0	100.0	EDS
S27	57.58	6.73	0	7.16	28.53	0	0	100.0	EDS
S27	58.4	7.39	0	8.92	25.29	0	0	100.0	EDS
S27	58.73	6.05	0	9.94	25.27	0	0	100.0	EDS
S27	58.95	6.83	0	8.16	26.06		0	100.0	EDS
S28	56.32	5.95	1	9.28	27.45	0	0	100.0	EDS
S28	60.43	6.2	0	8.75	24.62	0	0	100.0	EDS
S28	55.43	5.82		10.65	28.09	0	0	100.0	EDS
S29	56.35	5.28	0	9.82	28.55	0	0	100.0	EDS
S29	58.83	6.41	0	8.54	26.22	0	0	100.0	EDS
S31	58.99	5.43	0	7.58	28.01	0	0	100.0	EDS
S31	57.39	7.2	0	8.55	26.85	0	0	100.0	EDS
S32	59.22	7.25	0	6.95	26.58	0	0	100.0	EDS
S32	59.76	6.77	0	8.23	25.23	0	0	100.0	EDS
S33 grain 1	56.22	6.81	0.63	9.12	27.22	0	0	100.0	EDS
S33 grain 1	55.73	6.3	0	10.54	27.44	0	0	100.0	EDS
S33 grain 2	57.75	7.01	0	8.91	26.32	0	0	100.0	EDS
S33 grain 2	56.88	6.29	0	9.9	26.93	0	0	100.0	EDS
S33 grain 2	59.13	6.57	2.21	7.13	24.97	0	0	100.0	EDS
S33 grain 3	56.31	6.22	0	8.83	28.63	0	0	100.0	EDS
S33 grain 3	56.43	5.83	0	10.59	27.15	0	0	100.0	EDS
S33 grain 3	66.05	3.5	4.49	8.45	13.88	0	0	100.0	EDS
S42 grain 1	55.47	5.9	0	10.35	28.28	0	0	100.0	EDS
S42 grain 1	56.53	6.68	0	9.16	27.64	0	0	100.0	EDS
S42 grain 1	55.22	4.94	0	11.03	28.81	0	0	100.0	EDS

S42 grain 1	58.54	6.69	0	8.31	26.46	0	0	100.0	EDS
S43 grain 1	56.08	7.07	0	9.22	27.63	0	0	100.0	EDS
S43 grain 1	59.55	7.99	0	7.94	24.52	0	0	100.0	EDS
S48	55.97	6.85	0	8.76	28.43	0	0	100.0	EDS
S48	57.71	6.42	0	9.3	26.57	0	0	100.0	EDS
S49	58.08	7.53	0	7.81	26.57	0	0	100.0	EDS
S49	51.32	3.45	0	14.57	30.66	0	0	100.0	EDS
S50	47.9	3.04	0	17.78	31.27	0	0	100.0	EDS
S50	47.23	0	0	18.18	34.59	0	0	100.0	EDS
S50	52.82	3.54	0	4.84	22.8	0	0	100.0	EDS
S50	66.61	12.51	0	0	20.88	0	0	100.0	EDS
S51	53.05	4.3	0	13.36	29.28	0	0	100.0	EDS
S52	58.55	7.48	0	8.35	25.61	0	0	84.0	EDS
S53	56.64	5.55	0	9.99	27.83	0	0	100.0	EDS

Table K-2. K-feldspars.

Sample	SiO ₂	Na ₂ O	K ₂ O	Al ₂ O ₃	MgO	FeO ^(t)	Totals	Comment
3m	66.81	3.98	10.17	18.84	0.00	0.21	100.0	Orthoclase WDS
S1	66.6	5.32	7.35	20.74	0	0	100.0	Orthoclase EDS
S33 grain 3	71.94	5.17	4.7	18.19	0	0	100.0	K-feldspar EDS

Table K-3. Amphibole.

Sample	SiO ₂	Na ₂ O	TiO ₂	K ₂ O	CaO	Al ₂ O ₃	MgO	FeO ^(t)	Totals	Comment
3m	41.98	2.56	2.28	1.91	10.87	12.87	9.73	17.09	99.3	WDS
3m	42.14	2.07	2.53	1.68	11.94	11.79	10.33	16.57	99.2	WDS
3m	42.85	2.10	1.93	1.70	11.87	11.13	10.07	17.39	99.3	WDS
3m	42.89	1.96	2.07	1.56	11.85	11.02	10.39	17.10	99.1	WDS
3m	42.85	2.08	2.14	1.55	11.76	11.59	10.24	16.82	99.3	WDS
3m	42.40	2.27	1.95	1.62	12.21	12.98	12.39	13.44	99.5	WDS
S1	44.16	0	0	0	13.33	12.18	10.81	19.51	100.0	EDS
S1	44.94	0	0	0	13.73	11.92	13.9	15.52	100.0	EDS
S2	44.56	0	0	0	12.37	12.43	11.35	19.29	100.0	EDS
S2	46.68	0	0	0	13.34	17.95	0	22.03	100.0	Fe-Hornblende EDS
S4	42.79	2.08	2.52	1.27	12.33	13.05	10.34	15.61	100.0	EDS
S4	42.3	2.15	1.65	2.15	12.94	11.83	11.61	15.37	100.0	EDS
S5	41.97	0	0	10.8	0	14.04	14.48	18.72	100.0	Potassium rich EDS
S5	45.12	0	0	0	11.43	11.9	11.53	20.02	100.0	EDS
S5	41.53	0	0	10.88	0	16.98	13.64	16.97	100.0	Potassium rich EDS
S6	47.2	0	0	0	12.12	12.83	11.75	16.1	100.0	EDS

S6	44.4	0	0	0	13.51	11.6	11.63	18.85	100.0	EDS
S6	47.43	0	0	0	11.96	11.56	10.05	18.99	100.0	EDS
S6	41.23	0	0	0	13.71	16.08	17.66	11.31	100.0	EDS
S7	41.21	2.31	2.83	1.5	13.7	11.52	9.76	17.18	100.0	EDS
S7	41.42	2.18	3.73	1.76	11.79	12.71	9.77	16.63	100.0	EDS
S7	41.84	1.55	3.06	1.45	12.2	12.25	10.34	17.3	100.0	EDS
S7	41.39	2.02	2.13	1.71	12.79	12.34	11.59	16.03	100.0	EDS
S8	44.82	2.44	1.47	1.98	12	11.88	10.65	14.76	100.0	EDS
S8	41.14	2.11	3.28	2	11.19	12.02	9.69	18.56	100.0	EDS
S8	45.54	0	0	0	13.31	12.97	12.63	15.55	100.0	EDS
S9	45.97	0	0	0	13.28	13.12	11.22	16.42	100.0	EDS
S9	43.71	2.06	0	2.12	11	12.94	9.69	18.47	100.0	EDS
S9	44.49	1.65	2.05	1.91	12.13	11.5	10.24	16.03	100.0	EDS
S10	43	2.43	3.27	1.69	10.18	12.35	11.25	15.84	100.0	EDS
S10	42.64	1.98	2.81	0	11.1	11.3	9.71	20.46	100.0	EDS
S11	41.85	2.33	2.34	2.28	10.99	12.21	11.49	16.51	100.0	EDS
S11	41.17	2.47	4	1.42	11.89	10.99	11.21	16.86	100.0	EDS
S12	44.8	2.72	0	0	13.06	11.92	10.12	17.39	100.0	EDS
S12	39.78	1.3	3.44	1.71	11.61	17.19	10.34	14.63	100.0	EDS
S14	45.54	2.5	0	1.83	11.62	12.12	10.38	16.01	100.0	EDS
S14	47.95	0	0	0	11.34	11.87	11.55	17.3	100.0	EDS
S14	42.67	2.23	0	2.07	13.44	12.64	10.6	16.36	100.0	EDS
S15	48.25	0	0	0	12.74	12.14	11.72	15.14	100.0	EDS
S16	46.45	1.81	0	0	11.28	11.81	10.63	18.02	100.0	EDS
S16	44.84	1.94	0	0	12.56	11.14	11.06	18.46	100.0	EDS
S16	43.45	1.49	1	0	11.12	12.31	9.77	20.11	99.3	EDS
S18	44.34	2.58	0	2.16	9.86	11.6	11.41	18.05	100.0	EDS
S19	46.34	0	0	0	13.21	11.34	12.33	16.77	100.0	EDS
S19	45.76	0	0	0	12.5	12.64	12.27	16.83	100.0	EDS
S20	41.74	2.61	0	1.86	12.35	11.77	11.62	18.04	100.0	EDS
S20	42.91	2.76	0	1.55	12.06	12.49	9.67	18.56	100.0	EDS
S26	42.26	2.61	3.1	2.02	11.16	11.95	11.3	15.59	100.0	EDS
S26	37.7	0	4.66	9.61	0	15.09	15.31	17.63	100.0	Potassium rich EDS
S27	41.69	1.91	3.15	2.27	11.54	13.16	11.51	14.78	100.0	EDS
S27	45.84	1.96	1.77	1.26	11.78	11.24	10.23	15.91	100.0	EDS
S28	32.73	0.7	3.6	7.67	0	12.07	12.06	15.03	83.9	Contaminated with glue EDS
S29	44.37	1.55	3.01	1.15	11.78	10.66	11.36	16.11	100.0	EDS
S30	43.65	0	0	0	12.81	12.37	12.33	18.85	100.0	EDS
S30	43.6	2	0	0.84	13.2	13.66	16.93	9.76	100.0	EDS
S30	45.85	1.19	0.89	0.97	12.01	11.07	12.14	15.88	100.0	EDS
S30	39.39	0	3.39	8.98	0	15.09	13.42	19.74	100.0	EDS
S31	46.75	0	0	0	12.06	13.62	13.12	14.45	100.0	EDS
S32	43.99	0	0	0	11.5	11.78	12.62	20.12	100.0	EDS

S33 grain 1	42.34	1.89	2.25	1.91	11.82	12.03	11.26	16.5	100.0	EDS
S33 grain 1	40.54	1.83	2.53	1.8	12.24	11.57	10.94	18.56	100.0	EDS
S33 grain 2	41.03	2.79	1.85	1.33	13.11	10.12	11.45	18.33	100.0	EDS
S40 grain 1	44.11	0	0	0	10.9	16.07	11.11	17.82	100.0	EDS
S40 grain 1	32.42	0	0	0	0	31	0	36.58	100.0	EDS
S40 grain 2.2	41.25	2.06	2.62	1.77	11.95	11.78	10.65	17.12	99.4	EDS
S43 grain 1	41.8	0	0	0	10.25	10.34	7.81	15.82	86.0	EDS
S43 grain 1	45.76	0	0	0	11.29	13.33	11.98	17.64	100.0	EDS
S50	42.75	0	0	0	12.98	11.61	12.8	19.86	100.0	EDS
S53	44.57	0	0	0	12.88	11.55	11.24	19.76	100.0	EDS
S53	41.82	0	0	0	12.83	12.16	12.41	20.78	100.0	EDS
S54	45.6	0	0	0	12.96	12.58	11.6	17.26	100.0	EDS
S55	41.99	0	0	0	11.99	13.34	13.13	19.54	100.0	EDS

Table K-4. Pyroxene.

Sample	SiO ₂	Na ₂ O	P ₂ O ₅	TiO ₂	CaO	Al ₂ O ₃	MgO	FeO ^(t)	Totals	Comment
3m	51.62	0.49	0.20	0.33	23.01	1.89	12.54	9.09	99.17	WDS
3m	50.31	0.59	0.20	0.45	23.20	2.86	11.66	10.07	99.34	WDS
3m	51.33	0.53	0.16	0.41	23.22	2.10	12.85	8.68	99.28	WDS
3m	50.15	0.66	0.24	0.43	23.09	2.73	12.06	9.98	99.34	WDS
3m	51.69	0.57	0.19	0.22	23.27	1.49	12.87	8.88	99.18	WDS
3m	51.82	0.65	0	0	21.79	2.94	12.24	10.56	100.00	WDS
S1	48.25	0.77	0	0	21.35	6.80	9.64	12.44	99.25	EDS
S3	53.56	0	0	0	23.10	0	14.27	9.07	100.00	EDS
S3	52.38	0	0	0	23.49	1.24	14.15	8.74	100.00	EDS
S6	50.96	0	0	0	24.62	0	12.73	11.70	100.01	EDS
S6	46.01	0	0	0	21.27	0	12.05	20.67	100.00	EDS
S7	52.68	0.32	0	0	22.65	1.62	13.69	9.04	100.00	EDS
S11	54.48	0	0	0	23.0	1.54	13.54	7.45	100.01	EDS
S14	52.36	0.28	0	0	22.36	1.92	11.71	11.38	100.01	EDS
S14	53.81	0	0	0	22.86	1.16	14.09	8.07	99.99	EDS
S15	48.91	0	0	0	23.24	5.28	11.80	10.77	100.00	EDS
S19	59.21	0	0	0	27.01	0	13.78	0	100.00	pure diopside EDS
S20	53.07	0	0	0	22.29	2.16	13.07	9.41	100.00	EDS
S26	50.89	0	0	0	14.16	14.67	0.00	20.28	100.00	Hedenbergite EDS
S26	54.46	0	0	0	22.32	0.96	14.12	8.13	99.99	EDS
S27	52.74	0.79	0	0	22.15	2.30	12.08	9.93	99.99	EDS
S27	51.47	0	0	0	22.22	2.54	15.19	8.58	100.00	EDS
S28	52.00	0	0	0	24.36	0	12.34	11.30	100.00	EDS
S31	60.82	0	0	0	25.09	0	14.10	0	100.01	pure diopside EDS

S31	50.28	0	0	0	14.90	14.43	0	20.38	99.99	Hedenbergite EDS
S32	52.52	0	0	0	24.62	0	13.75	9.11	100.00	EDS
S50	48.81	0	0	0	24.58	4.40	13.06	9.15	100.00	

Minor mineral phases

Table K-5. Magnetite.

Sample	SiO ₂	P ₂ O ₅	TiO ₂	CaO	Al ₂ O ₃	MgO	FeO ^(t)	Totals	Comment
S1	0	0	7.02	0	0	0	92.99	100.0	EDS
S1	0	0	7.13	0	0	0	92.87	100.0	EDS
S2	0	0	7.91	0	0	0	92.09	100.0	EDS
S3	0	0	5.85	0	0	0	94.15	100.0	EDS
S3	0	0	6.61	0	0	0	93.39	100.0	EDS
S8	0	0	6.23	0	4.97	1.13	87.68	100.0	EDS
S9	0	0	6.51	0	0	0	93.49	100.0	EDS
S10	0	0	7.68	0	0	0	92.32	100.0	EDS
S14	0	0	8.18	0	0	0	91.82	100.0	EDS
S15	0	0	6.81	0	0	0	93.19	100.0	EDS
S16	0	0	6.33	0	0	0	93.67	100.0	EDS
S18	0	0	6.64	0	0	0	93.36	100.0	EDS
S20	0	0	5.16	0	0	0	94.84	100.0	EDS
S26	0.98	0	7.2	0	2.26	0.93	87.56	98.9	EDS
S27	0	0	6.77	0	0	0	93.23	100.0	EDS
S28	0	0	0	0	0	0	100	100.0	EDS
S28	0	0	5.85	0	0	0	94.15	100.0	EDS
S28	0	0	6.21	0	0	0	93.79	100.0	EDS
S29	0	0	9.43	0	0	0	90.57	100.0	EDS
S30	0	0	5.32	0	0	0	94.68	100.0	EDS
S30	0	0	39.26	0	0	0	60.74	100.0	EDS
S31	0	0	7.76	0	0	0	92.24	100.0	EDS
S32	0	0	7.17	0	0	0	92.83	100.0	EDS
S33 grain 1	0	0	6.6	0	2.31	1.34	89.76	100.0	EDS
S33 grain 2	0	0	6.7	0	2.09	0.62	90.59	100.0	EDS
S38 grain 1-10	0.09	0.02	5.55	0	1.80	1.09	90.15	98.7	EDS
S40 grain 1-1	0.12	0.02	6.44	0	1.62	1.51	88.83	98.5	EDS
S43 grain 1	0	0	6.59	0	0	0	93.41	100.0	EDS
S54	0	0	5.11	0	0	0	94.89	100.0	EDS
S54	0	0	7.42	0	0	0	92.58	100.0	EDS
S55	0	0	7.49	0	0	0	92.51	100.0	EDS

Table K-6. Apatite.

Sample	SiO₂	P₂O₅	TiO₂	CaO	ZrO₂	Al₂O₃	MgO	FeO^(t)	Totals	Comment
S7	0	37.51	0	52.23	10.27	0	0	0	100.0	EDS
S4	0	43.79	0	56.21	0	0	0	0	100.0	EDS
S8	0	42.03	0	57.97	0	0	0	0	100.0	EDS
S28	0	34.51	0	51.39	11.73	0	0	0	97.6	EDS
S32	0	42.97	0	57.03	0	0	0	0	100.0	EDS
S40 grain 2-5	0.42	42.95	0.01	55.35	0	0.01	0.06	0.13	98.9	EDS

Table K-7. Others.

Sample	SiO₂	P₂O₅	TiO₂	CaO	ZrO₂	Al₂O₃	MgO	FeO^(t)	Totals	Comment
S11	29.5	0	40.35	30.14	0	0	0	0	100.0	titanite (sphene) EDS
S14	0	0	6.17	0	0	33.26	0	60.57	100.0	ilmenite-corundum EDS
S8	32.43	0	39.56	26.53	0	1.48	0	0	100.0	titanite (sphene) EDS
S1	32.29	0	37.95	29.76	0	0	0	0	100.0	titanite (sphene) EDS
S29	46.48	0	0	9.04	0	53.52	0	0	109.0	Aluminium silicate weathered EDS
S29	43.96	0	0	0	0	56.04	0	0	100.0	Aluminium silicate weathered EDS

Appendix L: IGPET data

The used samples, minerals and models are shown in this appendix. The av-samples are averages from clusters or data sets.

Table L-1. Used tephra samples for modelling.

Samples	SiO[2]	TiO[2]	Al[2]O[3]	FeO{t}	MgO	CaO	Na[2]O	K[2]O
C1-av	69.35	.26	16.08	1.5	.21	1.8	4.48	5.95
C2av	70.96	.23	15.2	1.3	.18	1.45	4.18	6.17
HuizmaxC1(D)	72.29	.27	15.77	1.49	.21	1.84	2.62	5.07
HuizmaxC1(Na)	72.29	.27	15.77	1.49	.21	1.84	3.62	5.07
HuizavC1(D)	70.96	.26	15.95	1.48	.21	1.89	3.53	5.32
HuizgavC2(D)	73.59	.19	14.74	1.2	.14	1.46	3.01	5.26
Macias-av(D)	71.04	0.25	16.98	1.49	.23	1.85	3.29	4.65
Macias-1	69.45	.44	16.59	2.72	.62	2.43	3.08	4.51

Table L-2. Used minerals for modelling.

Minerals	SiO[2]	TiO[2]	Al[2]O[3]	FeO	MgO	CaO	Na[2]O	K[2]O	P[2]O5
Pl-An(0.65)	51.32	0	30.66	0	0	14.57	3.45	0	0
Pl-Al(0.7)	61.23	0	25.13	0	0	6.47	7.17	0	0
Pl-av	57.12	0	27.16	0	0	9.51	6.02	0.12	0
Hb-average	43.23	1.15	13.89	16.95	10.86	10.94	1.15	1.46	0.01
CPX-average	52.42	0.11	3.9	10.04	11.4	21.39	0.49	0.27	0.04
Mag-average-mt	2.73	10.26	1.42	82.83	.19	2.47	0.03	0	0
Kfsp-Orthoclase	66.71	0	19.79	0	0	0	4.65	8.76	0
Ti-titanite	32.29	39.56	1.48	0	0	29.76	0	0	0

Table L-3. Results of IGPET crystal fractionation of orthoclase.

A. Parental Magma: C1.
Daughter Magma: H_{C1}, H_{C2}.

H _{C1} average										
Fractions	Solid cumulate (%)					Variables				
0.014	5.6					Plagioclase (Pl-av)				
0.010	3.9					Clinopyroxene (CPX-av)				
0.004	1.4					Magnetite (Mag-av)				
0.228	89.1					Orthoclase (KFSP)				
0.744						residual liquid (Huiz _{av-C1})				
Major elements										
	SiO ₂	TiO ₂	Al ₂ O ₃	FeO	MnO	MgO	CaO	Na ₂ O	K ₂ O	P ₂ O ₅
Observed C1-av	69.52	0.26	16.12	1.50	0.09	0.21	1.80	4.49	5.96	0.03
Calculated C1-av	69.51	0.23	16.85	1.51	0.07	0.27	1.77	3.79	5.97	0.02
Difference	0.01	0.03	-0.36	-0.01	0.02	-0.06	0.03	0.71	-0.01	0.01
Sum of squares of residuals: 0.636										

H _{C2} average										
Fractions			Solid cumulate (%)				Variables			
0.062			14.7				Plagioclase (Pl-av)			
0.016			3.7				Clinopyroxene (CPX-av)			
0.008			1.9				Magnetite (Mag-av)			
0.338			79.7				Orthoclase (KFSP)			
0.576							Residual liquid (Huiz _{av-C2})			
Major elements										
	SiO ₂	TiO ₂	Al ₂ O ₃	FeO	MnO	MgO	CaO	Na ₂ O	K ₂ O	P ₂ O ₅
Observed C1-av	69.52	0.26	16.12	1.50	0.09	0.21	1.80	4.49	5.96	0.03
Calculated C1-av	69.48	0.19	16.98	1.52	0.06	0.26	1.79	3.70	6.01	0.01
Difference	0.02	0.07	-0.43	-0.01	0.03	-0.05	0.01	0.80	-0.05	0.02
Sum of squares of residuals: 0.828										

H _{C1} tephra sample										
Fractions			Solid cumulate (%)				Variables			
0.036			8.5				Plagioclase (Pl-av)			
0.017			4.2				Clinopyroxene (CPX-av)			
0.005			1.3				Magnetite (Mag-av)			
0.359			86.0				Orthoclase (KFSP)			
0.582							Residual liquid (Huiz _{max-C1})			
Major elements										
	SiO ₂	TiO ₂	Al ₂ O ₃	FeO	MnO	MgO	CaO	Na ₂ O	K ₂ O	P ₂ O ₅
Observed C1-av	69.52	0.26	16.12	1.50	0.09	0.21	1.80	4.49	5.96	0.03
Calculated C1-av	69.17	0.22	17.37	1.49	0.07	0.32	1.80	3.43	6.12	0.02
Difference	0.14	0.05	-0.63	0.01	0.02	-0.11	0	1.07	-0.16	0.01
Sum of squares of residuals: 1.585										

B. Parental Magma: C1.
Daughter Magma: 550 AD tephra (Macias et al. 2003).

550 AD tephra sample										
Fractions			Solid cumulate (%)				Variables			
0.348			99.6				Orthoclase (KFSP)			
0.001			0.4				Titanite (Ti)			
0.651							Residual liquid (Macias-1)			
Major elements										
	SiO ₂	TiO ₂	Al ₂ O ₃	FeO	MnO	MgO	CaO	Na ₂ O	K ₂ O	P ₂ O ₅
Observed C1-av	69.52	0.26	16.12	1.50	0.09	0.21	1.80	4.49	5.96	0.03
Calculated C1-av	68.53	0.34	17.70	1.77	0.08	0.40	1.62	3.63	5.99	0
Difference	0.40	-0.08	-0.79	-0.27	0.01	-0.19	0.18	0.87	-0.02	0.03
Sum of squares of residuals: 1.684										

550 AD average										
Fractions			Solid cumulate (%)				Variables			
0.022			6.2				Clinopyroxene (CPX-av)			
0.003			1.0				Magnetite (Mag-av)			
0.326			92.3				Orthoclase (KFSP)			
0.002			0.6				Titanite (Ti)			
0.647							Residual liquid (Macias-av)			
Major elements										
	SiO ₂	TiO ₂	Al ₂ O ₃	FeO	MnO	MgO	CaO	Na ₂ O	K ₂ O	P ₂ O ₅
Observed C1-av	69.52	0.26	16.12	1.50	0.09	0.21	1.80	4.49	5.96	0.03
Calculated C1-av	69.01	0.28	17.55	1.46	0.06	0.40	1.74	3.66	5.87	0
Difference	0.21	-0.2	-0.71	0.04	0.03	-0.19	0.07	0.83	0.09	0.03
Sum of squares of residuals: 1.298										

550 AD average adjusted for Na										
Fractions			Solid cumulate (%)				Variables			
0.006			1.7				Magnetite (Mag-av)			
0.321			98.3				Orthoclase (KFSP)			
0.674							Residual liquid (Macias-av, Na increase 1 wt%)			
Major elements										
	SiO ₂	TiO ₂	Al ₂ O ₃	FeO	MnO	MgO	CaO	Na ₂ O	K ₂ O	P ₂ O ₅
Observed C1-av	69.52	0.26	16.12	1.50	0.09	0.21	1.80	4.49	5.96	0.03
Calculated C1-av	68.89	0.23	17.71	1.47	0.06	0.15	1.92	3.69	5.92	0
Difference	0.25	0.04	-0.79	0.04	0.03	0.06	-0.11	0.80	0.05	0.03
Sum of squares of residuals: 1.355										

Appendix M: standards from two instruments

Table M-1. the same standard measured by two microprobes, this work and Huizinga (2013, unpub. MSc thesis).

Standard: VG-568 (rhyolitic glass)					
	This work	Huizinga (2013, unpub. MSc thesis)		This work	Huizinga (2013, unpub. MSc thesis)
	Reported (wt %)	Average (n = 31)	Average (n = 37)	Accuracy (relative %)	Accuracy (relative %)
SiO₂	76.71	76.31	77,72	-0.53	0,7
Na₂O	3.75	3.58	3,51	-4.59	-6,93
P₂O₅	0.01	-	-	-	-
Cl	0.13	0.099	0,1	-23.94	-24,99
TiO₂	0.12	0.076	0,08	-36.57	36,25
K₂O	4.89	5.25	5,04	7.32	2,42
CaO	0.5	0.45	0,43	-10.74	14,91
SO₃	-	-	-	-	-
Al₂O₃	12.06	11.93	11,90	-0.73	-1,66
MgO	0.09	-	-	-	-
FeO	1.28	1.18	1,16	-3.87	-6,58
MnO	0.03	0.027	0,03	-8.58	-12,57
Totals before normalisation	99.59	98.96	99,97	-0.72	-