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Interactive comment on "Integrating field, textural and geochemical monitoring to track eruption triggers and dynamics: a case-study from Piton de la Fournaise" *by* Lucia Gurioli et al.

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Dear Madison,

Thanks a lot for your comments and corrections. Please find here our detailed list of responses and the manuscript attached with all the corrections and the new figures; A few explanations are reported on Amanda responses.

"The connections between sample locations, type of products collected, and ultimate textural results could be presented in a clearer fashion, which would only serve to strengthen the results and importance of the study. "

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We made it clearer moving the sample strategy in the methodology and adding the corresponding samples to the sample sites and improving the figures.

“L 35-37: This comment also concerns the end of the discussion. Although second boiling is a plausible triggering mechanism, I have two issues with this statement. First, the idea of second boiling, i.e. water exsolution, is directly the result of cooling and chemical evolution of a separate body, and cannot be decoupled. And second, there is some evidence for a mafic recharge event months before the June 20th eruption. Although I agree that there is no evidence for heat or chemical recharge in the erupted products from this minor eruption, ultimately I feel as if a potential recharge event two months before ending 5 years of dormancy is an important observation and should be at least comment on.”

In the discussion we clarified that deep magma transfer (mantle level depth) has been identified by Boudoire et al., 2017 (GRL) months before the June 2014 eruption. We speculate that deep magma transfer can have modified the stress field at crustal level and promoted/facilitated volatile exsolution in the shallow reservoir. Vertical magma transfer at crustal level has been identified only in 2015 by Peltier et al., 2016 and resulted in progressive change of magma composition (Coppola et al., 2017).

“L108: What are the typical heights for Strombolian activity?”

Average height of PdF fountains is 20 meters (we added in the text); larger fountains (tens-hundreds of meters only occur during large and intense eruptions, like 2007. Strombolian are usually less than 10 meters high

“L133: This deeper seismicity and increase in soil CO2 seems to suggestion that some sort of magma movement/recharge is associated with the beginning of activity. Although decoupled in terms of months from the eruption on June 20th, a comment on how this fits into the plumbing system and inner working for PdF would make a nice addition for the reader.”

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Please see previous remarks/answers on this point

“L152-156: The inflation and deformation trends mentioned would be great to see as a figure (supplemental?), for integration of the information provided here, with the larger story of the PdF system.”

We added this information in Figures 1 and 12

“Section 2.2: The detail of the samples collected is excellent, however it was challenging as a reader to understand how many samples were collected at each location, and then how many of these samples were then focused on in the methodology. Perhaps a general sentence on this could help to transition the reader.”

We moved the sampling strategy and specify the samples

“L214: Two bulk samples from the Main Vent. Does that mean the base and the top?”

Yes, we explained it better (see also new Figure 3)

“L245: How many sample sites were there? From the Figures it seems as only three samples are being presented: the top and bottom of the Main Vent, and then a sample from the Western Fracture.”

Yes, we explain that the sample sites for the texture were three: Western Fracture, Upper Fracture and Main Vent and we specify the number of samples and clasts for each site (from line 208)

“L370: How many deposits from the Fractures were studied? It seems that the figures only have the Western Fracture; does that include multiple samples?”

We studied one deposit from the Western Fracture (for a total of 25 scoriae) and only one big bomb at Upper Fracture that broke in five fragments (see 208). Actually, we stressed in the text the description of this bomb, because we could measure the core and the quenched rind and find interesting results, see new Figure 6 + caption + (from line 435)

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"L411-415: The first line states that the fluidal and golden clasts have a larger amount of isolate vesicles, but then on 413 it states that these two types with high vesicularity are characterized by fewer amounts of isolate vesicles? Fewer, but still the largest amount compared to the other clast types? Some clarification required."

We rewrote it (from line 471).

"L422: How much of the lower Ni and Cr concentrations whole rock geochemistry could just be due to crystal content?"

Careful sample selection has permitted to obtain a set of virtually olivine-cpx free crystals. Any addition of mafic crystals translates into an enrichment in Ni-Cr; those samples that contain a few % of crystals, (consistent with textural and petrological observation) are slightly enriched in compatible elements. We added this explanation in caption of Figure 7

"L524/L549: Some of the data (MIs and Plagioclase, specifically) point to having a bimodal population. However, this point doesn't seem to come back up in the discussion."

Bimodal MI composition has been used as i) further evidence (beside geochemical modeling) to link the November 2009 and June 2014 magmas. Discussion to constrain the duration of cooling 2009-2014 vs the timing of foaming (11 days before the eruption as constrained by inflation) and ii) to support processes of crystal recycling. Recall here that i) bimodal composition of plagioclase is common at PdF and ii) it tracks two environments: calcic plagioclase formed in depth during cooling (before degassing) and sodic plagioclase formed during magma ascent and degassing in the dyke before magma fragmentation and extrusion (see new Figure 10a).

"L553: How detailed (in terms of spacing) were these transects compared to the DiMuro et al. dataset? Were BSE images taken? Seems hard to believe that both the 2008 and 2014 have bimodal plag populations, and that the 2014 eruption is a

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more evolved upper portion of the system, but doesn't contain complex zonation in the plag? I am not trying to discredit the observation if it is valid, but rather more information could help to support this statement."

The 2008 eruptive products contained plagioclase with complex zoning and unusual composition. Their intermediate composition, in fact, filled the gap typically observed between calcic and sodic composition usually observed in many PdF eruption. The composition of 2014 plagioclase is bimodal and does not show the occurrence of intermediate compositions (Fig. 10a). Plagioclase analyses were performed on spots representative of core, mantle and rim portions of the crystals.

"L559: This is really shallow. How were the H2O/CO2 concentrations measured in Di Muro et al. 2016, and in what phase (plagioclase or olivine?)? Di Muro et al., 2016 performed a review of all analyses on melt inclusions performed at PdF. Most analyses of volatiles were obtained on melt inclusions host in olivines and pyroxene. The shallow pressure has been confirmed by the study of several PdF eruptions and is attributed to shallow magma emplacement (consistently with geophysical data; see Di Muro et al., 2014 for a review). A few melt inclusions have been also identified recording late stage water and CO2 leakage and diffusion. This last process, however, does not modify significantly the average shallow saturation pressure recorded by most melt inclusions at PdF."

Besides that, it is important to recall that the vast majority of volcano-tectonic earthquakes recorded at PdF are located in the uppermost 2 km of the volcano edifice, at shallow depth below the summit caldera.

"L575-581: Are these temperatures +/- associated with the error in the thermometer, or the standard deviation of the plagioclase dataset? Although it does appear to show a decrease in temperature, I wouldn't refer to this range (50 C) as large variability in temperature, especially considering I believe this thermometer has an error bar that will help to overlap the dataset."

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Error bars reported in Figure 10b correspond to the standard deviation of the plagioclase dataset, whose range is larger than error of the method. We stress that reported temperatures are obtained using Helz dry model; further uncertainty arises from the dependence of the method on dissolved water content as shown recently by Putirka; in order to minimize the number of assumptions and perform a comparison between distinct eruptions, we preferred to adopt the dry model. We added this explanation in caption of figure 10b

"L600: What would you expect to see as a geochemical signature of hot gases streaming past ejecta? Do people see evidence for this as a geochemical signature in other systems?"

Vlastélic et al. have documented the mobility of alkalis and other elements on PdF clasts having experiences long exposures to acid gases. This is a well-known process potentially affecting samples with a high glass contents (e.g. Pele's hairs, golden pumices etc). Our aim was to show that our samples, collected rapidly after eruption, do not show any evidence of post-emplacement modification by acid attack.see explanation added at line 671.

"L611-612: Very neat observation!"

Thanks. I stressed this point especially for past basaltic deposits, where we need to be careful when we interpret them.

"Section 5.2: A strength to this section is starting with background information on the textural information observed in other systems."

Amanda asked to reorganize this section and in part we did it, but we agree with Madison to leave the background first

"L648-650: I think this is a key point for the community to come out of your paper that should be highlighted more in the conclusions."

Thanks Madison, we agree with you and we will stress this point, but we also have to

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convince review 3 that we are right; according to him/her everything happen after the explosion

“L691-696: The information presented here may be more useful earlier in this section so the reader has it for guidance when reading through the results of this study. Just a suggestion.”

Yes, we moved it up

“L711-712: This manuscript has a rich amount of information. One of the weaknesses at the end, however, is the challenge of visualizing how the textural information fits into the eruption/sampling information. Perhaps a schematic depicting the statement that eruption style and thus eruptive products, vary along the length of the fracture system would help guide the reader and bring everything together.”

We added a new Figure (Fig. 12) to show the eruptive style variation in time and link it with the reservoir-dyke system and deep system

“L764: In this presentation, the cooler, crystallizing magma is below the shallow chamber that is being replenished with volatiles? Is this a stable configuration?”

We explained the configuration earlier with a zoned shallow reservoir and we added Figure 12

“L772: This reference to Menand and Phillips seems random. Observed experimentally how?”

We just cited them and we deleted the experimental side, that doesn’t concern the paper

“L772-773: The golden and fluidal fragments vs. spiny fragment lines are a repeat of Lines 762-765.”

Removed

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“L790-792: I don’t understand how to call on cooling, crystallization and water release as a pressurization mechanism, and then state that magma cooling and evolution is not helping to pressurize the source. I think from the MI sentence before I understand that the idea is there is no evidence for evolution controlling what types of products are erupted out, but I don’t see how that can translate into the lack of evidence for cooling and evolution driving pressurization.”

See new interpretation and Figure 12

“Figure 1: In many ways this figure is the most important, as it frames where the samples used in this study were taken. However, it is challenging to read and not fully explained. Including: (A). I can’t tell the difference between red in orange at this scale. “

We enlarged the figure

“What are the dates? “ The dates when the fractures were active. We added in the caption of Figure 1.

“Eruptions or samples collected? “ Eruptions

“Also the units for lat/long should be described”. Added

“(C). Adding the sample locations to the blow up of C would be useful.” We enlarged the Figure

“Also C needs to be lighter as it is hard to read. “ Done

“Where were the gases collected that are listed as sampled in C? And, were they commented on in this study?” We just mention them in the sample strategy (see line 221) but we also state that we do not discuss these data in the paper

“Figure 2: Photo collection is not just from ‘the website’, but rather several sources. Corrected

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“Although I appreciate that the sources are provided, it would be nice to explain what the photo depicts, and why that is important for the study. “ We added more explanations in the captions, in the photos and also we added more useful photos.

“How do these pictures fit into sample locations/clasts described? “ We added all the geographical symbols to locate the area

“Figure 3: It appears the thermal scale bars for the two images in a) are different. Are they still comparable? The setting range used for the acquisition of the data was the same; the occurrence of slightly different maxima in the two fields of view results in distinct scale bars; however, the two figures can still be combined to qualitatively illustrate the sampling field soon after the eruption. The temperature of the deposit were instead measured using a thermocouple.” We removed the thermal photo and we added a photo of the deposit

“Why is the diameter scale different for the Western Fracture, shown in d), compared to a) and e)?” Fig 3b is in half phi, while in c and d the diameter is in full phi, we added in the caption.

“Main vent should be capitalized to Main Vent.” Done

“Figure 4: I really like this figure. I found myself wondering the distribution of these 4 types. It might be nice to direct the reader to Figure 5 for that information.” We added it in the caption and we added the lava as well and the crystals properly

“Figure 5: Main Cone should be Main Vent for consistency.” Corrected

“One thing I found confusing in this paper was keeping track of the different sampling locations and what was being compared. “ We added explanation in the methodology

“Does this figure show data for the base and top (not through stratigraphy) from one sample location? If so, it might be nice to clearly state this.” We added explanation in the figure caption

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“Figure 6: Shouldn’t a) and c) be the same if they are both for the Main Vent, where c) is broken down by clast type? “ Yes, thanks a lot, we re-did the graphs, with the right normalization

“What do the stars in c) represent? “ They represent the picked samples for the texture measurements. We added in the caption and we adjusted the histograms

“The diagonal lines in d) look the same, although the caption just refers to a single line. Perhaps explain what the % refer to (I assume the % vesicularity accommodated by isolated vesicles?) “ yes, we added the explanation

“Figure 10: Need to specify if the glasses are melt inclusions or matrix.” The data have been obtained by studying the glass-plagioclase equilibrium or on the basis of matrix glass analyses; we added this information in the caption

Technical Corrections

“L119: The last previous sounds awkward. Perhaps just ‘The last’?” Done

“L327: ‘smooth fluidal (Figs. 3d) bombs and lapilli’. Refers to multiple figures, and also reads oddly. Are the bombs and lapilli fludial? “ yes

“L225, L445, L451: Lines where paragraph indents are needed” Added indents

“L690: Need another parentheses at the end”. Added correction

Please also note the supplement to this comment:
https://www.solid-earth-discuss.net/se-2017-99/se-2017-99-AC1-supplement.pdf

Interactive comment on Solid Earth Discuss., https://doi.org/10.5194/se-2017-99, 2017.

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Particle name	Type	a (axe) (mm)	b(axe) (mm)	c(axe) (mm)	Weight (gr)	Density (gr/cm³)	Por (%)	V(Pyc) (cm³)	SD (cm³)	Conn (cm³)
REU140624-12-1	Lava					2,15	25,44			
RUE140624-3-1	spiny opaque scoria	57,87	43,03	14,1	14	1,41	51,05	4,87	0,01	99,91
REU140624-3-2	spiny opaque scoria	48,38	26,84	24,7	12,95	1,26	56,39	4,50	0,00	99,94
REU140624-3-3	fluidal scoria	35,71	30,09	29,52	9,68	0,74	74,22	3,58	0,01	97,73
REU140624-3-4	spiny glassy scoria	50,82	27,73	27,43	8,79	0,84	70,88	3,26	0,02	97,19
REU140624-3-5	spiny opaque scoria	40,69	38,19	24,64	17,58	1,52	47,20	6,05	0,01	101,00
REU140624-3-6	spiny glassy scoria	39,66	31,42	19,51	7,05	0,79	72,56	2,81	0,02	94,38
REU140624-3-7	spiny glassy scoria	36,69	29,07	20,87	7,34	0,89	69,11	2,68	0,02	97,77
REU140624-3-8	fluidal scoria	37,78	25,67	20,7	3,98	0,57	80,31	1,81	0,01	92,32
REU140624-3-9	spiny glassy scoria	44,79	24,2	17,33	5,88	0,83	71,28	2,24	0,02	96,13
REU140624-3-10	spiny opaque scoria	37	31,41	25,8	16,81	1,41	51,20	5,77	0,02	101,06
REU140624-3-11	spiny glassy scoria	44,24	28,03	22,14	6,63	0,72	75,17	2,58	0,03	95,97
REU140624-3-12	spiny glassy scoria	39,83	26,95	23,15	5,84	0,78	72,78	2,20	0,03	96,90
REU140624-3-13	spiny glassy scoria	37,87	20,44	30,29	8,99	0,95	67,04	3,26	0,00	97,85
REU140624-3-14	fluidal scoria	34,61	20,68	23,52	3,87	0,56	80,72	1,59	0,00	95,65
REU140624-3-15	spiny glassy scoria	32,52	32,09	14,66	3,61	0,72	74,93	1,34	0,00	97,72
REU140624-3-16	spini glassy scoria	33,1	28,19	15,86	4,99	1,03	64,28	1,75	0,00	99,48
REU140624-3-17	fluidal scoria	32,74	22,4	16,4	3,36	0,71	75,18	1,47	0,00	91,42
REU140624-3-18	fluidal scoria	25,78	22,15	14,12	2,42	0,57	80,23	1,18	0,00	90,12
REU140624-3-19	fluidal scoria	28,4	21,87	21,79	2,46	0,52	81,98	1,06	0,00	94,61
REU140624-3-20	spiny glassy scoria	26,39	23,2	18,76	4,66	1,23	57,31	1,79	0,00	92,18
REU140624-3-21	spiny glassy scoria	30,17	20,97	16,94	3,53	0,77	73,18	1,29	0,00	98,14
REU140624-3-22	spiny glassy scoria	28,19	22,24	15,42	4,43	1,11	61,35	1,61	0,00	97,10
REU140624-3-23	fluidal scoria	29,48	24,56	19,09	2,14	0,60	79,24	0,91	0,00	94,16
REU140624-3-24	fluidal scoria	33,27	21,24	16,2	3,01	0,77	73,41	1,12	0,00	97,46
REU140624-3-25	fluidal scoria	30,31	25,08	13,92	2,57	0,65	77,35	1,10	0,00	93,33
REU140624-3-26	spiny glassy scoria	25,44	20,22	13,3	2,88	0,99	65,75	1,07	0,00	96,41
REU140624-3-27	spiny opaque scoria	23,49	22,66	18,4	4,84	1,20	58,20	1,67	0,00	100,48
REU140624-3-28	spiny opaque scoria	28,72	22,3	19,35	5,37	1,26	56,33	2,15	0,00	87,94
REU140624-3-29	fluidal scoria	24,05	20,4	14,7	1,95	0,66	77,20	0,84	0,00	93,03
REU140624-3-30	fluidal scoria	26,7	16,17	15,73	1,82	0,54	81,19	0,78	0,00	94,65
REU140624-3-31	fluidal scoria	25,37	20,13	14,09	1,9	0,69	76,18	0,83	0,00	91,71
REU140624-3-32	spiny opaque scoria	28,83	20,22	12,2	3,45	1,32	54,28	1,22	0,00	98,74
REU140624-3-33	spiny glassy scoria	26,34	21,56	14,7	3,5	1,21	58,09	1,25	0,00	97,74
REU140624-3-34	spiny glassy scoria	29,68	21,11	14,44	3,14	0,97	66,25	1,14	0,00	97,68
REU140624-3-35	spiny glassy scoria	26,79	20,03	18,58	4,03	1,37	52,40	1,41	0,00	99,15
REU140624-3-36	spiny glassy scoria	25,53	23,41	15,95	3,22	1,01	64,95	1,15	0,01	98,41
REU140624-3-37	spiny glassy scoria	24,63	22,64	14,91	4,26	1,46	49,34	1,51	0,00	98,05
REU140624-3-38	fluidal scoria	19,39	22,34	11,4	1,4	0,65	77,60	0,67	0,00	89,33
REU140624-3-39	spiny glassy scoria	26,22	20,78	14,27	2,96	0,87	69,68	1,15	0,00	94,69
REU140624-3-40	fluidal scoria	24,96	19,04	11,52	1,22	0,69	76,20	0,67	0,01	81,53
REU140624-3-41	fluidal scoria	27,95	21,31	14,86	2,89	1,20	58,36	1,03	0,00	98,21
REU140624-3-42	fluidal scoria	22,53	18,72	17,38	2,26	0,75	73,84	1,18	0,00	82,06
REU140624-3-43	fluidal scoria	23,55	16,16	15,04	1,98	0,90	68,61	0,74	0,00	96,59
REU140624-3-44	spiny opaque scoria	26,79	19,11	15,74	2,8	1,18	58,98	1,24	0,01	81,13
REU140624-3-45	fluidal scoria	24,81	19,08	12,96	1,51	0,62	78,60	0,59	0,00	96,85
REU140624-3-46	fluidal scoria	16,64	21,76	16,21	1,24	0,60	79,30	0,57	0,01	91,44
REU140624-3-47	fluidal scoria	21,67	20,25	14,93	1,41	0,65	77,44	0,57	0,01	95,51
REU140624-3-48	spiny opaque scoria	26,28	18,63	11,99	2,22	1,12	61,26	0,81	0,00	96,91
REU140624-3-49	fluidal scoria	27,21	16,81	13,3	1,54	0,64	77,72	0,74	0,00	89,04
REU140624-3-50	fluidal scoria	25,73	17,46	15,34	2,46	1,04	63,96	1,09	0,00	84,58
REU140624-3-51	fluidal scoria	20,77	17,48	15,51	1,09	0,68	76,49	0,60	0,00	82,00
REU140624-3-52	fluidal scoria	19,5	14,36	12,87	0,96	0,62	78,35	0,44	0,00	90,85
REU140624-3-53	fluidal scoria	27,51	20,34	15,16	1,13	0,41	85,68			
REU140624-3-54	fluidal scoria	26,2	18,29	13,08	2,23	0,84	71,00	0,82	0,00	97,78
REU140624-3-55	fluidal scoria	23,14	16,08	14,03	1,12	0,46	84,13	0,51	0,00	93,96
REU140624-3-56	spiny opaque scoria	22,77	18,14	12,83	2,42	1,16	59,60	0,84	0,00	99,84
REU140624-3-57	spiny glassy scoria	26,23	14,73	12,39	1,23	0,54	81,35	0,61	0,00	90,06
REU140624-3-58	fluidal scoria	22,13	15,59	16,31	1,66	0,78	72,94	0,60	0,00	98,70
REU140624-3-59	spiny opaque scoria	26,92	12,65	12,24	2,74	1,37	52,43	0,93	0,00	101,97
REU140624-3-60	fluidal scoria	22,04	13,83	13,13	0,89	0,49	83,02	0,56	0,00	83,61
REU140624-3-61	spiny opaque scoria	23,7	20,92	13,23	3,33	1,51	47,44			
REU140624-3-62	spiny glassy scoria	26,23	17,87	10,39	1,52	0,97	66,38	0,57	0,00	95,51
REU140624-3-63	spiny glassy scoria	22,58	16,39	12,38	1,37	0,78	72,97	0,64	0,00	87,35
REU140624-3-64	spiny glassy scoria	20,53	16,8	10,05	1,01	0,75	74,02	0,40	0,00	94,96
REU140624-3-65	spiny glassy scoria	22,18	15,92	15,64	1,12	0,90	68,64	0,53	0,00	83,95
REU140624-3-66	spiny glassy scoria	18,35	12,5	11,48	0,72	0,57	80,31	0,36	0,00	89,53
REU140624-3-67	fluidal scoria	17,71	15,91	13,65	1,02	0,73	74,52	0,59	0,00	77,02
REU140624-3-68	fluidal scoria	19,12	15,53	12,9	0,74	0,64	77,66	0,41	0,00	82,96
REU140624-3-69	spiny glassy scoria	17,72	15,08	11,57	1,23	0,90	68,83	0,52	0,00	90,43
REU140624-3-70	spiny opaque scoria	20,02	19,03	12,05	1,94	1,44	50,10	0,69	0,00	98,11
REU140624-3-71	spiny glassy scoria	16,82	16,1	11,77	1,06	0,92	68,00	0,44	0,00	90,59
REU140624-3-72	spiny glassy scoria	20,71	16,3	10,17	1,26	1,38	51,92	0,47	0,00	92,74
REU140624-3-73	fluidal scoria	18,82	15,96	9,42	0,78	0,68	76,24	0,50	0,00	73,94
REU140624-3-74	spiny glassy scoria	21,16	14,86	12,25	1,99	1,26	56,27	0,71	0,00	97,77
REU140624-3-75	spiny glassy scoria	17,02	16,68	12,12	1,16	0,82	71,64	0,43	0,00	97,18
REU140624-3-76	spiny opaque scoria	23,34	13,44	8,85	1,47	1,19	58,84	0,53	0,00	97,17
REU140624-3-77	fluidal scoria	16,81	15,69	11,37	1,41	0,88	69,59	0,47	0,00	101,61
REU140624-3-78	spiny glassy scoria	17,18	15,21	12,34	1,03	0,73	74,64	0,42	0,00	93,76
REU140624-3-79	fluidal scoria	20,49	15,56	11,16	0,76	0,60	79,06	0,38	0,00	88,44
REU140624-3-80	fluidal scoria	20,98	13,91	13,11	1,22	0,65	77,47	0,49	0,00	95,45
REU140624-3-81	fluidal scoria	24,22	17	13,59	1,63	1,12	61,23	0,60	0,00	96,74
REU140624-3-82	fluidal scoria	22,68	18,14	10,77	0,96	0,62	78,35	0,54	0,00	82,86
REU140624-3-83	fluidal scoria	18,64	13,54	11,25	1,1	0,82	71,50	0,41	0,00	97,04
REU140624-3-84	spiny glassy scoria	26,37	14,59	12,89	1,53	1,09	62,32	0,54	0,00	99,03
REU140624-3-85	fluidal scoria	18,86	12,65	11,94	0,58	0,48	83,49	0,34	0,00	86,18
REU140624-3-86	spiny glassy scoria	20,46	12,17	11	0,63	0,56	80,47	0,35	0,00	85,57
REU140624-3-87	fluidal scoria	16,91	16,24	10,97	0,71	0,58	79,96	0,44	0,00	80,75
REU140624-3-88	fluidal scoria	15,83	14,68	13,17	0,9	0,61	78,89	0,41	0,00	92,03
REU140624-3-89	fluidal scoria	19,37	14,94	12,67	0,55	0,51	82,15	0,31	0,00	86,39
REU140624-3-90	fluidal scoria	17,54	13,68	9,28	0,59	0,56	80,67	0,29	0,00	89,92
REU140624-3-91	spiny glassy scoria	18,01	14,93	11,54	1,23	1,17	59,33	0,46	0,00	94,78
REU140624-3-92	spiny glassy scoria	19,43	16,21	12,73	2,33	1,60	44,59	0,85	0,00	93,21
REU140624-3-93	fluidal scoria	18,48	13,1	8,36	0,78	0,75	73,96			
REU140624-3-94	spiny glassy scoria	19,11	14,72	13,72	0,75	0,50	82,52			
REU140624-3-95	spiny glassy scoria	19,68	15,02	10,86	0,88	0,73	74,54			
REU140624-3-96	spiny glassy scoria	20,77	15,03	6,62	0,69	0,93	67,62			
REU140624-3-97	fluidal scoria	15,59	13,5	11,45	0,59	0,55	80,85			

Fig. 1.

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