Supplementary Material

Supplementary material 1: Table giving page numbers for historical sources used in recreating the timeline for the eruption. Can be found within the accompanying excel spreadsheet.

Citation	Found	Page number	Date/Time of activity	Notes
Tennison-Woods (1884)	Simkin and Fiske (1983)	58	20th May	Original page numbers not known
Mackenzie (1883)	Simkin and Fiske (1983)	197	20th May	Printed in Java Bode on 30th May, reprinted in Verbeek (1885). Report by Commander of the Dutch Steamer Zeeland.
Tagliche Rundchau (1883)	Verbeek (1885)	85	20th-22nd May	Report by Captain Hollmann from German warship Elisabeth
	Simkin and Fiske (1983)	59		
Grainger (1883)	Simkin and Fiske (1983)	196	20th -23rd May	Printed in Algemeen Dagblad 23rd May, reprinted by Verbeek (1885)
Symons et al., (1888)	Symons et al., (1888)	11	20th-23rd May	
Walker (1883)	Simkin and Fiske (1983)	60	20th-23rd May	Report by Captain Walker of the ship Actaea (6 degrees 50 'S, 104 degrees 2'E)
Furneaux (1964)	Furneaux (1964)	13	21st-22nd May	Account by Mrs. Beyernick, wife of Dutch controller at Ketimbang. "they ran to the beach… the earth burst open at their feet" told by inhabitants of Sebesi visiting the island and the next day Controller of Kalimbang and The Resident of Lampong district report that "the fishermans story was true".
	Simkin and Fiske (1983)	61		
Sulzer (1883)	Simkin and Fiske (1983)	197	22nd May	Report by medical doctor aboard Dutch Steamer Soenda (name mistakenly printed as Lubzer) Printed in Java Bode 30th May and Locomotief 1st June, reprinted by Verbeek (1885).
London Times, 03/06/1883	Simkin and Fiske (1983)	61	23rd May	
Symons et al., (1888)	Symons et al., (1888)	11	24th-26th May	"the eruption… became of a more moderate character… so much so that the residents in Batavia… ceased to pay much attention to the subject".

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Symons et al., (1888)	Symons et al., (1888)	12	May 27th	Report from excursion party to island, Perboewatan in activity.
Symons et al., (1888)	Symons et al., (1888)	13	May 28th - June 19th	"although there was no intermission in the eruption, there appeared to be a decline in the volcanic activity, as far as can be judged from reports obtained from the lighthouses of the Strait, and from the captains of passing vessels."
Javasche Courant, 20/07/1883	Simkin and Fiske (1983)	199	June	Controller of Ketimbang's monthly report, "Krakatau continuously expelled smoke" and reports the loudest explosions on 28th and 30th, reprinted in Verbeek (1885)
Algemeen Dagblad, 20/06/1883	Simkin and Fiske (1983)	199	June 19th	Report from Anjer: "Krakatau smoked heavily"
Algemeen Dagblad, 26/06/1883	Simkin and Fiske (1983)	199	June 24th	Dense cloud over island dissipates, "two thick columns of smoke… rising majestically"
Symons et al., (1888)	Symons et al., (1888)	13	June 24th	"At Ketimbang… it was noticed that the appearance of the summit of Perboewatan had entirely changed; the conspicuous summit had disappeared";
Verbeek (1885)	Simkin and Fiske (1983)	199	June 24th	"The appearance of Perboewatan had completely changed": Printed in Javasche Courant 21st August.
Tennison-Woods (1884)	Simkin and Fiske (1983)	66	June 24th	"16th June… another outburst was heard at Anjer": attributed to June 19th by Algemeen Dagblad 20/06/1883. "Two dense columns of smoke" on 24th June.
Verbeek (1885)	Simkin and Fiske (1983)	199	July 3rd	Verbeek's own observations from Dutch vessel Prinses Marie which passed Krakatau from the east side: "through a dense haze, only a red glimmer was seen; no ash was noticed"
Ashdown (1883)	Simkin and Fiske (1983)	201	August 1st	Ship Siam sails through floating pumice
Verbeek (1885)	Verbeek (1885)	26	August 11th-12th	Letter and map sent from Ferzenaar to Verbeek,

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				detailing his excursion to the island
	Simkin and Fiske (1983)	67		
	Symons et al., (1888)	13		
Symons et al., (1888)	Symons et al., (1888)	14	August 11th - 25th	"The vessels that passed close to Krakatau between the 11th of August and the time of the great catastrophe reported a heavy rain of pumice and dust and constant loud explosions"
Macleod (1884)	Macleod (1884)	185	August 13th	"the opening of the new crater was… a small hole, maybe 100 ft in diameter, only a few meters above sea level"; this account conflicts with Ferzenaars, and is not mentioned by Verbeek (1885) or by Symons et al., (1888).
	Simkin and Fiske (1983)	68		
Bataviaasch Handelsblad, 16/08/1883	Simkin and Fiske (1983)	200	August 14th	Report from Dutch Steamship Madura
Algemeen Dagblad, 17/08/1883	Simkin and Fiske (1983)	200	August 16th	Report from ship The Loudon
Verbeek (1885)	Verbeek (1885), addenda	479	August 18th	Report from steamship Europa
	Simkin and Fiske (1983)	31		
Joly (1885)	Joly (1885)	298	August 22nd	Report from the Ship Medea
	Simkin and Fiske (1983)	96		
Van Heerdt (1884?)	Simkin and Fiske (1983)	68	August 23rd	Quoted from Captain Visman's log from Princes Wihelmenia; can be found in the Royal Society archives
Symons et al., (1888)	Symons et al., (1888)	14	August 25th	
Van Heerdt (1884?)	Simkin and Fiske (1983)	68	August 25th	Quoted from Captain Visman's log from Princes Wihelmenia; can be found in the Royal Society archives
Van Heerdt (1884?)	Simkin and Fiske (1983)	112	August 26th, 10am	Quoted from Captain Visman's log from Princes Wihelmenia; can be found in the Royal Society archives
Symons et al., (1888)	Symons et al., (1888)	19	August 26th, 2pm	"a black mass rising up… no less than 17 miles"; Captain Thompson of Ship Medea
	Simkin and Fiske (1983)	96		
	Joly (1885)	298		

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Sturdy (1884)	Simkin and Fiske (1983)	102	August 26th, 2pm	Report by Captain Watson, of the Ship Charles Bal.
Metzger (1884)	Simkin and Fiske (1983)	33	August 26th, 2pm	Berbice ship reports sky dark
Symons et al., (1888)	Symons et al., (1888)	19	August 26th, 5pm	
Sturdy (1884)	Simkin and Fiske (1983)	103	August 26th, 5pm	Report by Captain Watson, of the Ship Charles Bal.
Algemeen Dagblad, 11/09/1883	Simkin and Fiske (1983)	211	August 26th, 5pm	Report of first flooding by controller Le Sueur
Furneaux (1964)	Furneaux (1964)	60	August 26th, 7pm	Mr. Schint, a resident of Anjer, tells Rev. Tennison-Woods who sends the report to the Sydney Morning Herald; "smashing the boats and strewing the beach with wreckage".
Furneaux (1964)	Furneaux (1964)	67	August 26th, 7pm	"native proas… were dashed to pieces": account of Mr. Beyernick told my Mrs. Beyernick
	Simkin and Fiske (1983)	83		
Algemeen Dagblad, 05/09/1883	Simkin and Fiske (1983)	206	August 26th, 7pm	A report from Tjaringin from the Supervisor of the Department of Water Control, Mr. Gaston, printed in Verbeek (1885): "several houses were already destroyed"
Bataviaasch Handelsblad, 09/09/1883	Simkin and Fiske (1983)	72	August 26th, 9pm	New telegraph master at Anjer, Mr. Schruit's, report translated for the Ceylon Observer
Symons et al., (1888)	Symons et al., (1888)	84	August 26th, 10pm	Sounds heard in Australia; report by Mr. Kemp
	Simkin and Fiske (1983)	146		
Latter (1981)	Simkin and Fiske (1983)	388	August 26th - 27th	Origin time of waves
Tennison-Woods (1884)	Simkin and Fiske (1983)	102	August 27th, 12am	Report by Captain Logan, of the Ship Berbice; Original page numbers not known
Tennison-Woods (1884)	Simkin and Fiske (1983)	79	August 27th, 1am	Detonations heard in Singapore
Algemeen Dagblad, 27/08/1883	Simkin and Fiske (1983)	202	August 27th, 1am	Printed in Verbeek (1885); broken windows in Batavia
Symons et al., (1888)	Symons et al., (1888)	90	August 27th, 1am	Sirik on Java is partially submerged.
Sturdy (1884)	Simkin and Fiske (1983)	103	August 27th, 4am	Report by Captain Watson, of the Ship Charles Bal.

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Symons et al., (1888)	Symons et al., (1888)	22	August 27th, 5.30 am	First major explosion; according to Verbeek
Verbeek (1885)	Simkin and Fiske (1983)	207	August 27th, 6am	"it did not become light"; observations from journal of lighthouse keeper M. van Mens
Verbeek (1885)	Simkin and Fiske (1983)	202	August 27th, 6am	
Metzger (1884)	Simkin and Fiske (1983)	88	August 27th, 6am	Several vessels were thrown on the beach; reports from the Loudon
Symons et al., (1888)	Symons et al., (1888)	22	August 27th, 6.44 am	Second major explosion; according to Verbeek
Sturdy (1884)	Simkin and Fiske (1983)	103	August 27th, 8 am	Report by Captain Watson, of the Ship Charles Bal.
Verbeek (1885)	Simkin and Fiske (1983)	202	August 27th, 8 am	Heaviest explosion in Batavia according to Dr. van der Stok of the Meteorological Observatory.
Symons et al., (1888)	Symons et al., (1888)	22, 69	August 27th, 10am	Largest major explosion
Symons et al., (1888)	Symons et al., (1888)	26	August 27th, 10am	Pumice the size of a pumpkin
Ceylon Observer 06/09/1883	Simkin and Fiske (1983)	146	August 27th, 10am	Explosions heard in Singapore
Algemeen Dagblad, 03/09/1883	Simkin and Fiske (1983)	205	August 27th, 10am	Printed in Verbeek (1885); lighthouse destroyed
Symons et al., (1888)	Symons et al., (1888)	93	August 27th, 10am	Immense wave inundates the coasts of Java and Sumatra; ship Berouw carried 1.8 miles inland
	Simkin and Fiske (1983)	39		
Symons et al., (1888)	Symons et al., (1888)	22	August 27th, 10.45am	Last major explosion
Times of London, 08/10/1883	Simkin and Fiske (1983)	133	August 27th, 12pm	150 human corpses observed by Bay of Naples Ship
Symons et al., (1888)	Symons et al., (1888)	26	August 27th, 11am - 3pm	"The dust fell in small rounded accretions" in Batavia
Symons et al., (1888)	Symons et al., (1888)	27	August 27th, 11pm	explosions declined on violence

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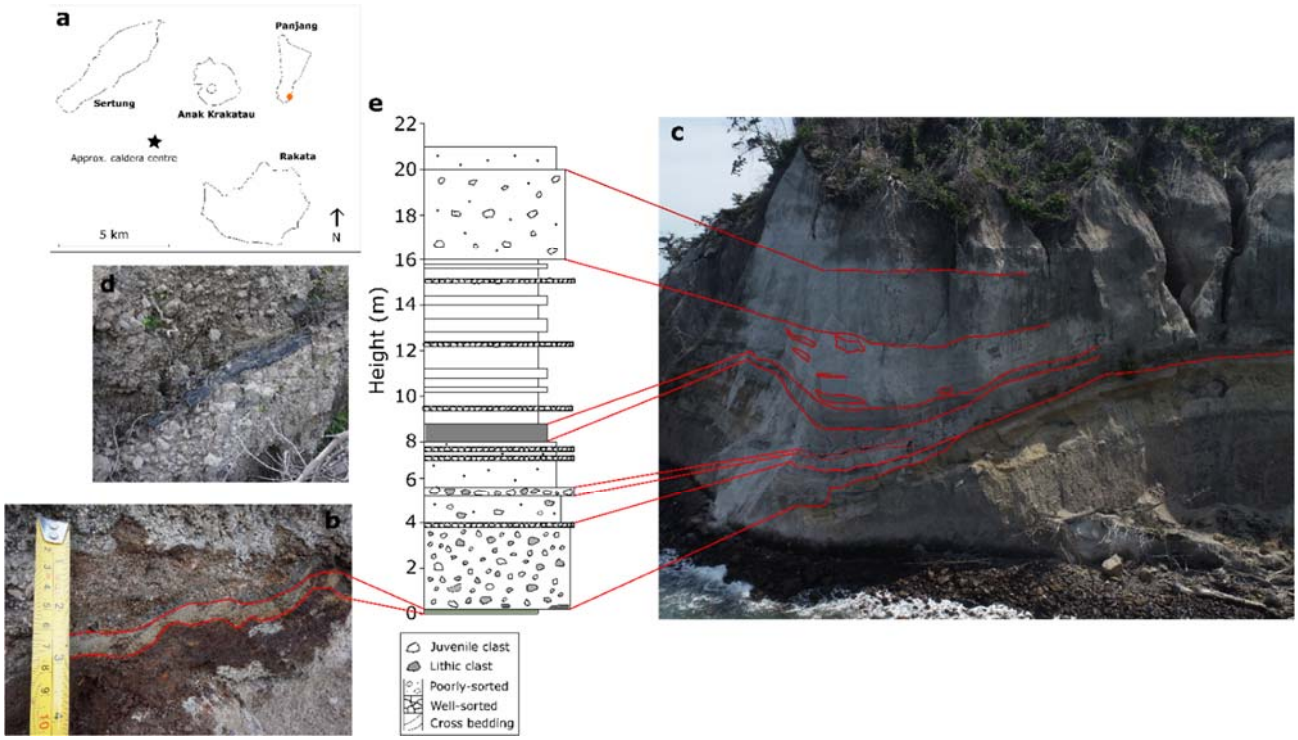
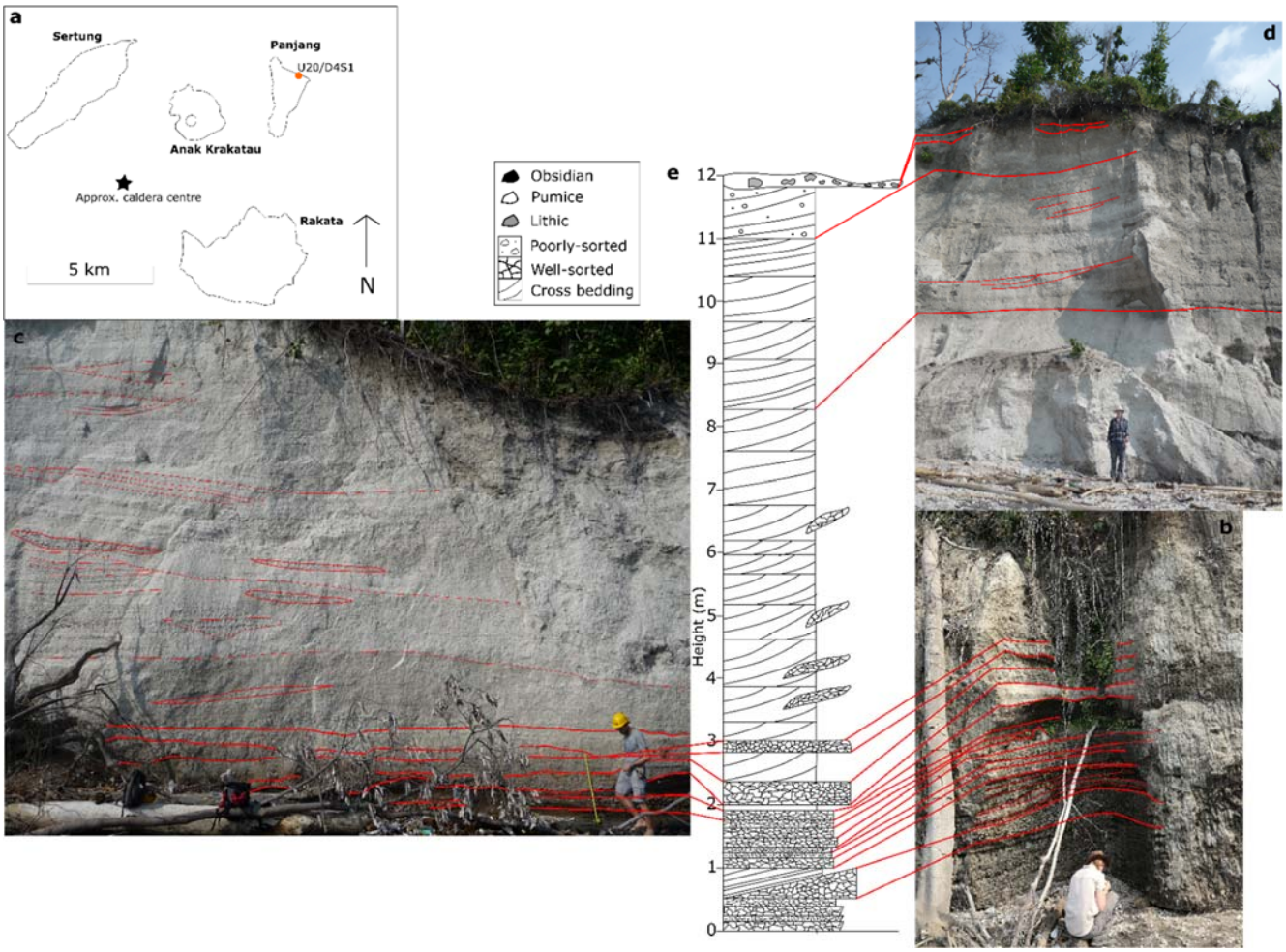
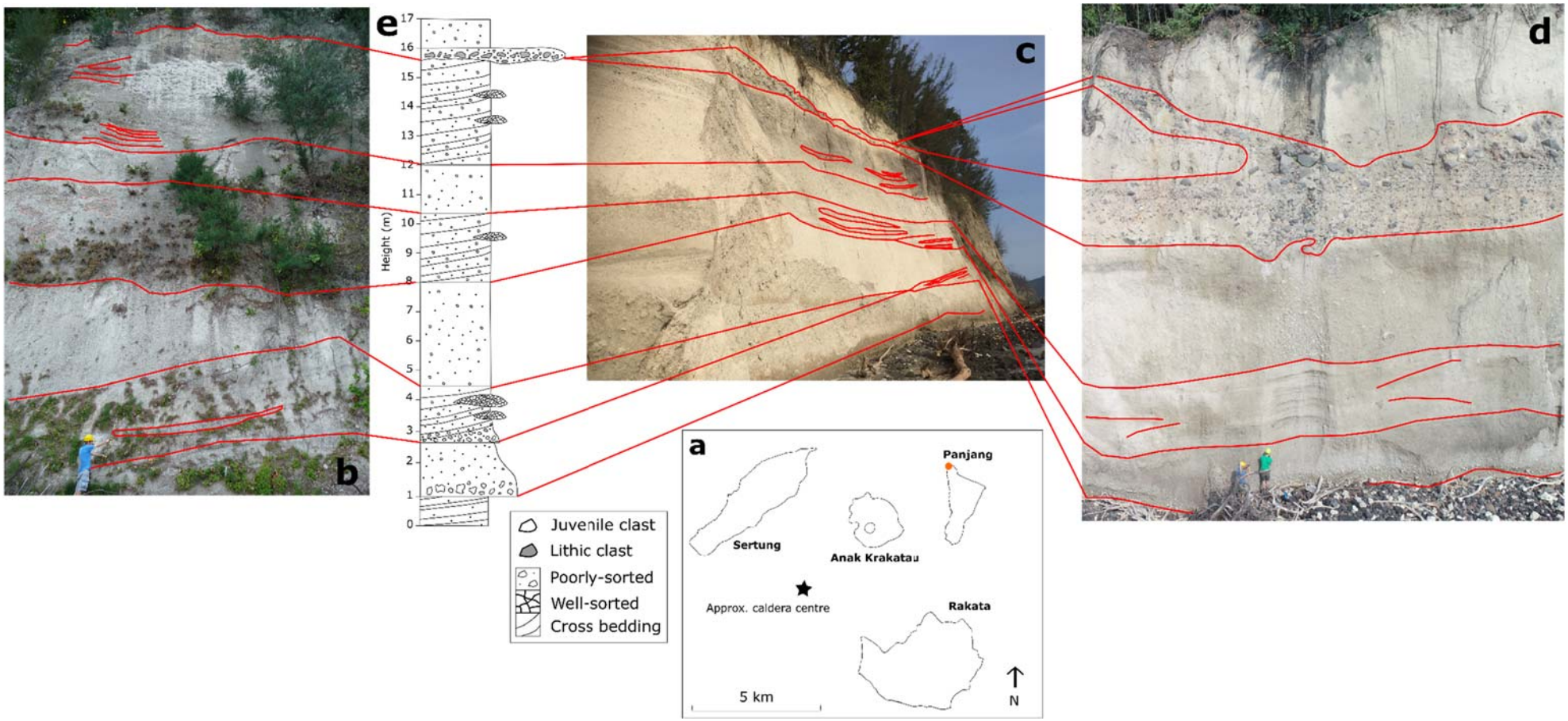


Supplementary material 2: Locality MS-Swim1 on southern Panjang is shown on the map in inset (a), and was visited for the first time during the 2019 field campaign. The photograph in inset (b) shows ~ 2 cm of olive-green, very fine ash aggregates, overlying ~ 4cm of a red, oxidised palaeosol defining an erosive boundary with volcanic rock below. The sequence overlying the green ash is shown in the photograph in insert (c), with the stratigraphic column showing the entire sequence in inset (d), with correlations in red. Directly above the olive-green ash unit is ~ 3m of massive, light-grey matrix-supported deposit. Clasts consist of ~80 % pumice, with ~ 20 % lithics up to 50 cm in size. Inset (e) is a photograph showing the charcoal present towards the base of this layer. At the top of this unit there is < 10 cm of a pumice supported layer. Above this there is ~ 60 cm of massive ignimbrite with a lower maximum clast size than below, and a lower proportion of lithics followed by another clast supported layer ~ 10 cm thick. Overlying this it is possible to observe ~ 2 m of a matrix-rich unit, interbedded with clast supported layers which become more common towards the top. Overlying this unit there is a distinct, darker-grey, matrix-rich unit, which extends for ~1 m. Above this there is ~ 7 m of a light-grey, matrix-rich, stratified unit, interbedded with thin pumice-supported layers. Large lithics are completely absent from this section. Towards the top of this outcrop there is ~ 5 m of matrix-supported unit containing very coarse pumices, with the top metre having a lower maximum pumice size.

Supplementary Material

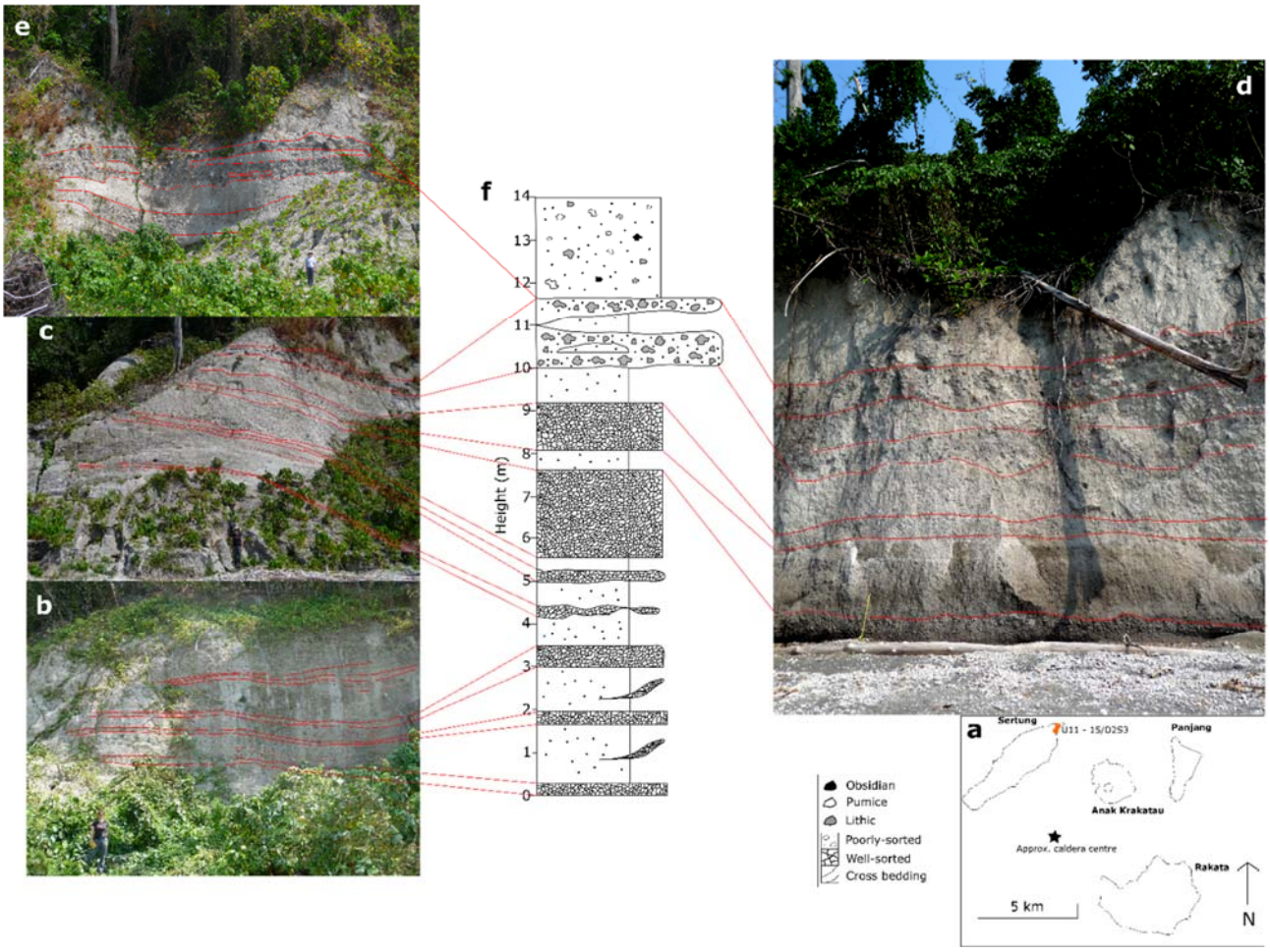


Supplementary material 3: Inset (a) shows a map with the locality U20/D4S1 on northern Panjang, which was visited in both field campaigns, and presented here for the first time. Inset (b) shows the base of this locality, which is a ~3 m sequence predominantly comprising bedded, pumice-supported units. The pumice in these units is light-grey and sub angular. The coarsest layers are found towards the base, the first 3 of which are internally reverse graded. Charcoal was observed in the coarsest pumice-supported layer that is truncated by the unit overlying it; this layer is not graded. The unit overlying the charcoal is matrix-supported, and contains lapilli ~ 2 cm in size. This unit is also cross-stratified with darker, fine laminations. Sorting improves throughout the pumice beds overlying the cross-stratified layer. These are interbedded with matrix supported layers predominantly composed of coarse ash, with some mm-scale lapilli. Moving west along the outcrop, and up in the stratigraphy, it is possible to observe m-scale units of matrix-supported deposits containing abundant low-angle cross-stratification, which are shown in the photograph in inset (c). These units sometimes contain pumice-supported lenses. At the very top of this outcrop it is possible to observe a ~50 cm thick layer containing lithic blocks of up to 20 cm in size, which is shown in the photograph in inset (d). The boundary between this unit and the cross-stratified unit below appears to be gradational. A stratigraphic log is shown in inset (e), with stratigraphic correlations in red.



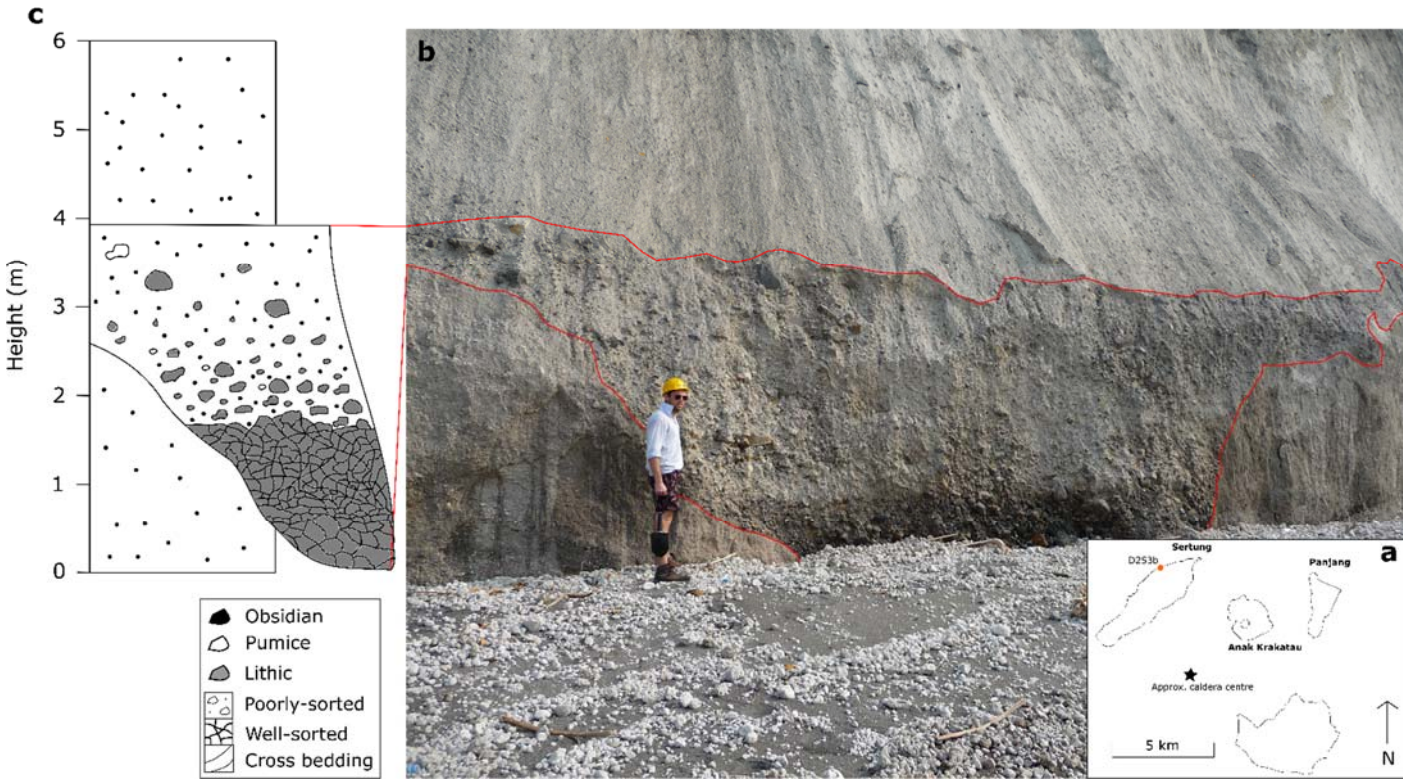
Supplementary material 4: Locality NP3/D3S1, northern Panjang is shown on the map in inset (a), and was visited in both field campaigns. The photographs in inset (b), (c) and (d) show a sequence of structureless, matrix-supported, poorly-sorted units containing ~90 % white pumice, interbedded with similar units containing abundant low-angle cross-stratification. These packets can be anywhere up to ~3.5 m in thickness, with pumices up to ~20 cm in size, with the average being ~ 5 cm. Two units towards the base are normally graded. The units containing cross-stratification also contain pumice-supported lenses. Towards the top of this sequence, its is possible to observe ~ 50 cm of a matrix-supported unit containing lithic blocks up to 50 cm in size. Above this is another structureless, matrix-supported, poorly-sorted unit. Insert (e) shows the stratigraphic log, with correlations in red.

Supplementary Material



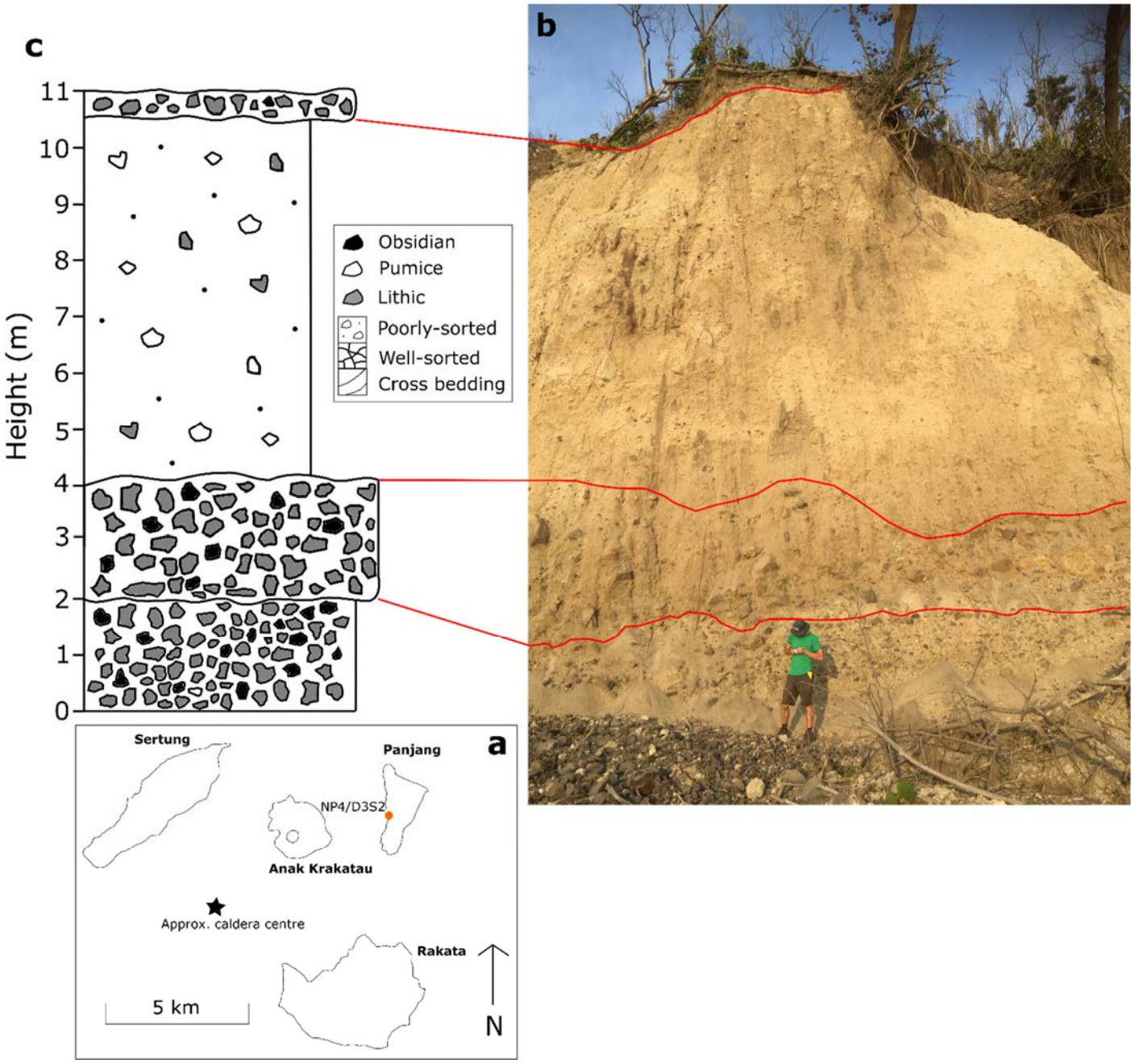
Supplementary material 5: Localities U11 to U15/D2S3a are located on northern Sertung, and are shown on the map in inset (a); they were visited in both field campaigns. In 2019 this outcrop was much more laterally extensive, and thus has been split into four separate localities. The photographs in inset (b) and (c) show that this outcrop is comprised of clast-supported units containing predominantly pumice lapilli up to ~ 20 cm in size, interbedded with poorly-sorted, matrix supported units. The poorly sorted layers contain less-continuous pumice lenses, in which the pumices are often rounded. In the continuous pumice layers, pumices are often angular to sub-angular, and some of these units show reverse grading. Pumices found in the matrix supported units are rounded and ~ 1cm in size. Inset (d) and (e) show the top of the sequence, where there is ~ 1 m of matrix-supported unit containing angular lithic blocks ~ 20 cm in size, with maximum lithic size of ~60 cm. The boundary with the units below and above is gradational, and occasionally this breccia bifurcates, with layers of ash filling the gaps in between. Above this is a massive, matrix-supported, poorly-sorted unit, which in places contains up to ~ 50% lithic clasts. Both the lithic rich layer, and the unit above contain obsidian. Insert (f) shows the stratigraphic log, with correlations marked in red.

Supplementary Material



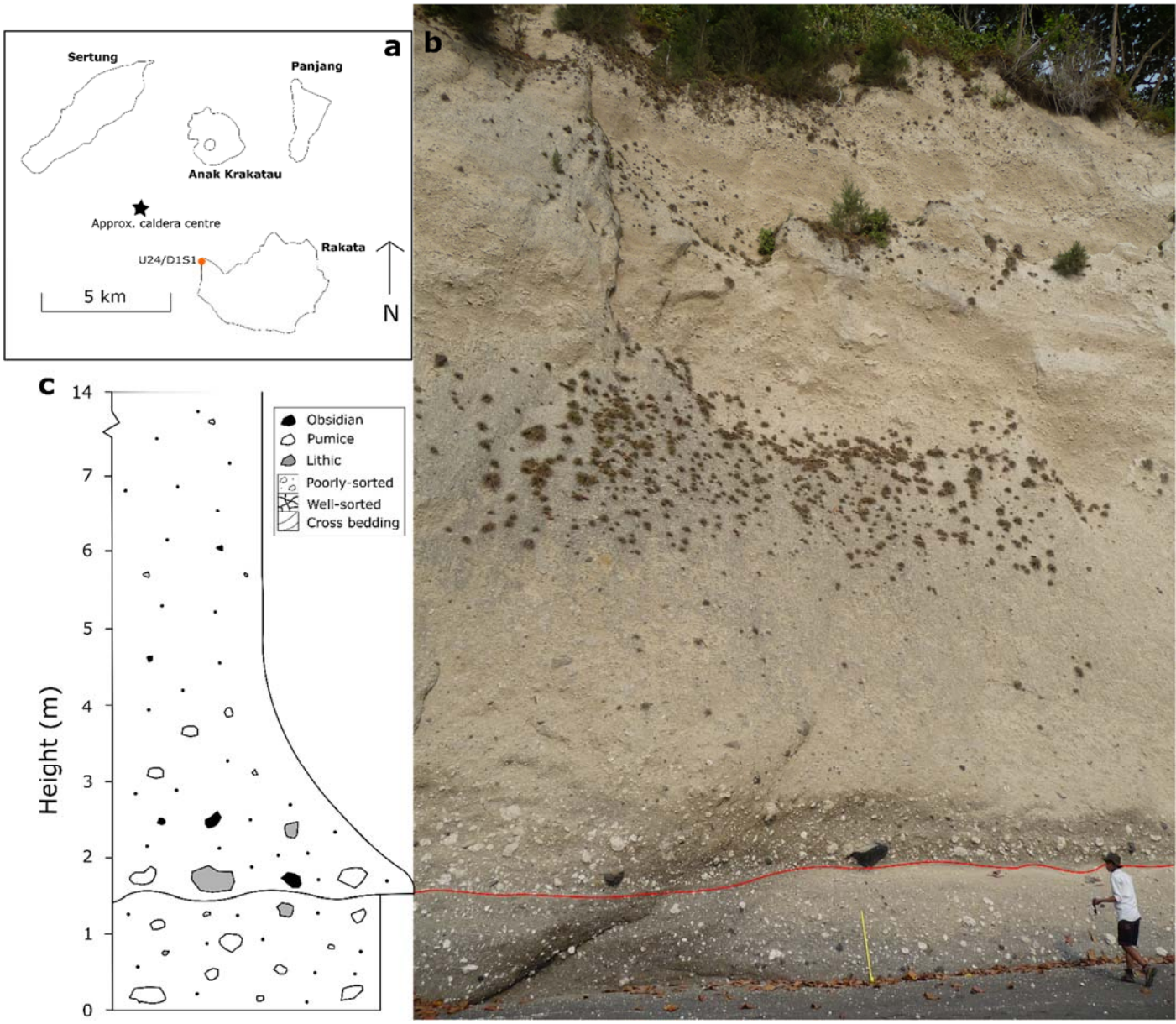
Supplementary material 6: Inset (a) is a map showing locality D2S3b, on western Sertung which was only visited in 2017 due to the tide. Inset (b) is a field photograph, which shows a clast-supported unit predominantly containing angular lithic blocks ~ 20 cm in size. This gradually becomes matrix supported moving upwards in stratigraphic height. The maximum height of this lithic rich unit is 4 m, however it shows a lot o lateral variation, and within a 1 m tails off to 50 cm in height. Overlying this is a massive, matrix-supported unit containing pumice clasts. Stratigraphic log is shown in insert (c), with correlations in red.

Supplementary Material



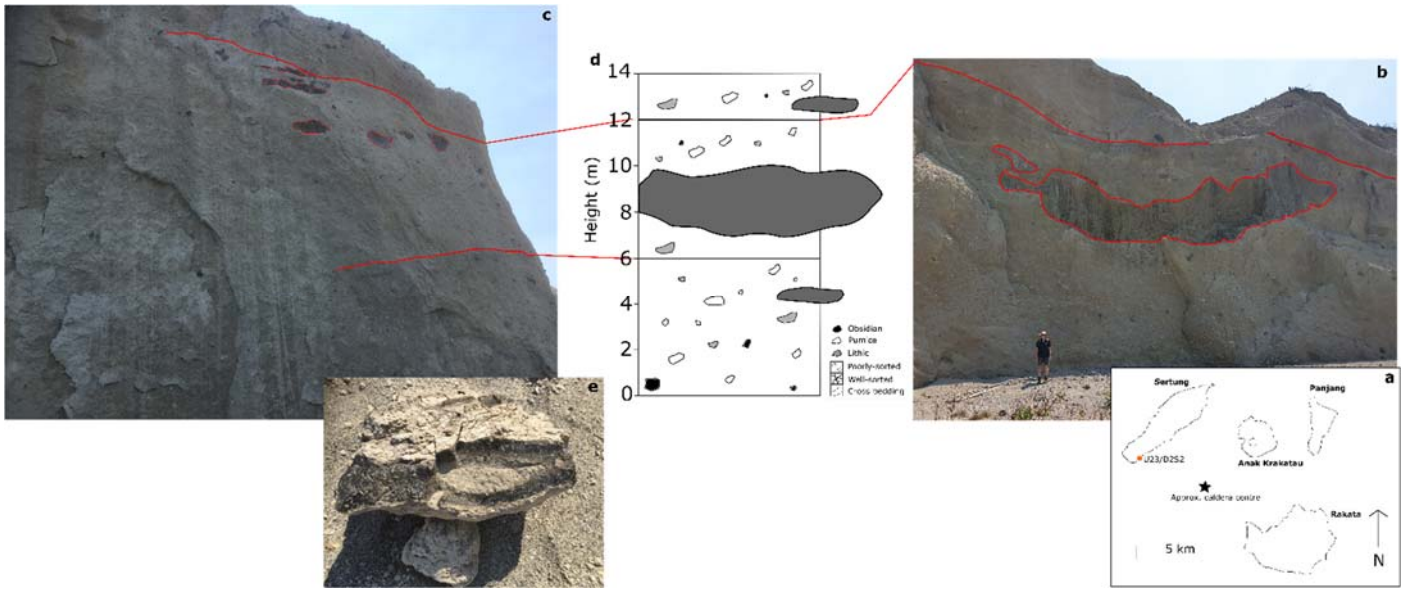
Supplementary material 7: Locality NP4/D3S2 on eastern Panjang, shown on the map in inset (a), was visited on both campaigns, however had considerably more exposure in 2019. Inset (b) is a field photo which shows that the base of the outcrop is a matrix-supported unit containing both abundant lithic and obsidian blocks at the base, which is ~ 2 m in thickness. Maximum clast size is ~ 30 cm. Lithics are dense lavas. There is a gradational boundary with the unit above (~ 2 m), which is another matrix supported, lithic-rich unit, however the maximum clast size is ~ 60 cm. Overlying this is a massive, structureless matrix supported unit ~ 6.5 m thick. 80 % of clasts in this unit are pumice, with the remainder being lithics. At the top of this sequence it is possible to see another matrix-supported unit rich in lithic blocks, ~ 0.5 m thick. Stratigraphic log is shown in insert (c), with correlations in red.

Supplementary Material

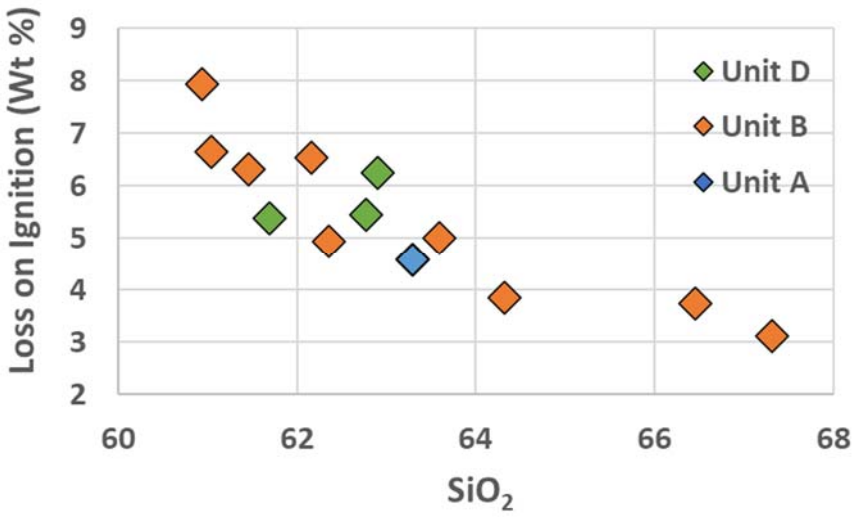


Supplementary material 8: Inset (a) is a map showing locality U24/D1S1, located on western Rakata, which was visited on both field campaigns. Inset (b) shows a field photograph showing that the outcrop is composed of ~ 14 m of massive, matrix-supported deposit. 80% of clasts are pumice, with 15 % dense, lava lithics. Both frothy, as well as glassy obsidian is also present (~5 %) (e.g. Shields et al. 2016). The vast majority of the pumice is white, however mixed pumice was also found at this locality, along with some scoria. After the first 1.5 m of unit, the maximum clast size increases, and is normally graded as you move up the sequence thereafter. Stratigraphic log is shown in insert (c), with correlations shown in red.

Supplementary Material



Supplementary material 9: Inset (a) is a map showing locality U23/D2S2, located on southern Sertung, which was visited in both field campaigns. However, the exposure in 2019 was far superior to 2017, which allowed us to observe structures that had not been seen before. Inset (b) and (c) are field photographs, showing ~ 14 m of massive, poorly-sorted, matrix-supported deposit, with two boundaries only denoted by crude colour changes at ~ 6 m and 12 m. Of the clasts present in this massive unit, approximately 80 % are pumice clasts, with 15 % dense lithics and 5% obsidian. The dense lithic ranged from lapilli size, up to 8 m across their long axes. The largest lithic blocks appeared to be tear-drop shaped, and aligned in the direction of flow. Some of these appeared jointed. It should be noted that there were no sag structures associated with these large blocks. Mudstone clasts were also present. These also appeared deformed, similar to the lithic blocks. Stratigraphic log is shown in insert (d), with correlations shown in red. Inset (e) is a photograph of frothy obsidian, although glassy clasts are also present (e.g. Shields et al. 2016).



Supplementary Material 10: Graph showing XRF SiO_2 against Loss on Ignition (LOI). The correlation (R^2 = 0.76) implies that the higher alkali values may be as a result of alteration. Key in stratigraphic order.

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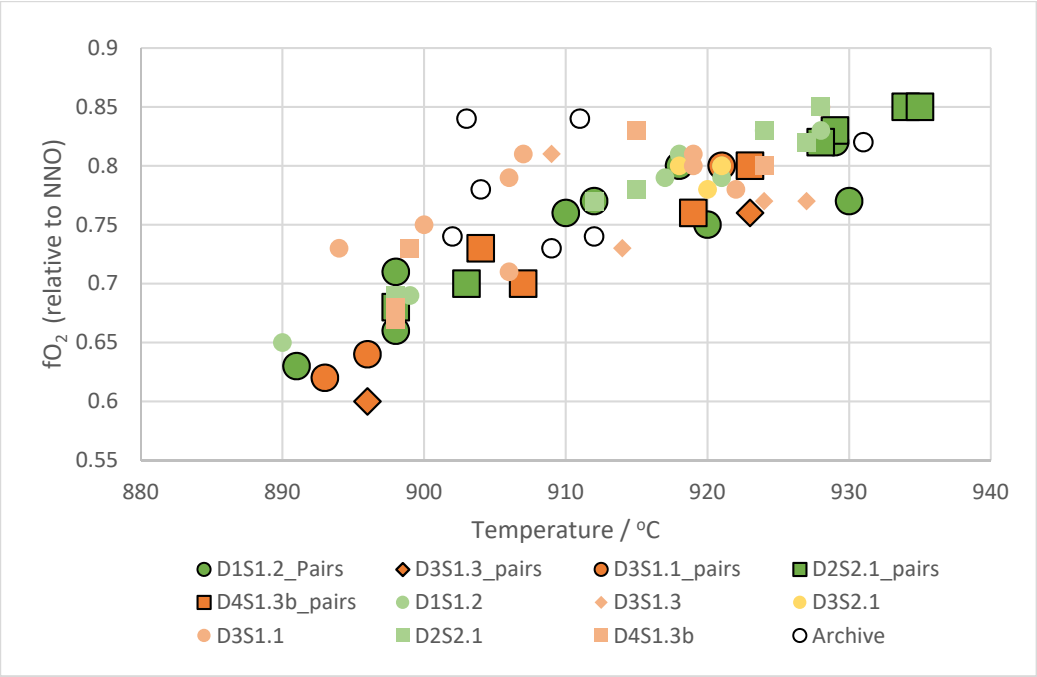
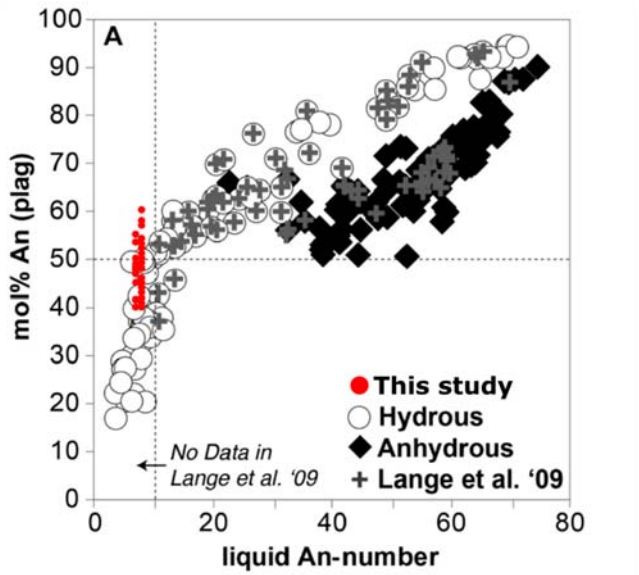


Supplementary Material 11: Plot showing results for Fe/Ti oxide thermometry using Ghiorso and Evans (2008), with temperature plotted against fO_2. Unit B is orange, Unit C is yellow and Unit D is green. Large shapes with black outlines represent data derived from touching pairs, pastel colours represent data from Fe/Ti oxides included within the same pyroxene, and colourless circles represent data generated from unrelated Fe/Ti oxides found in archive samples.



Supplementary Material 12: Plot taken from Waters and Lange (2015), showing mol% anorthite in plagioclase phenocrysts against melt anorthite content for the data they used to calibrate their plagioclase hygrometer. This is compared with data for plagioclase analyses from this study plotted in red; only those that well within the data from Waters and Lange (2015) was used to generate estimates of water content.