

Supplementary Information for

Trigger mechanism and propagation dynamics of pyroclastic density currents at basaltic volcanoes

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Supplementary Figures

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Example of input file to run the simulation

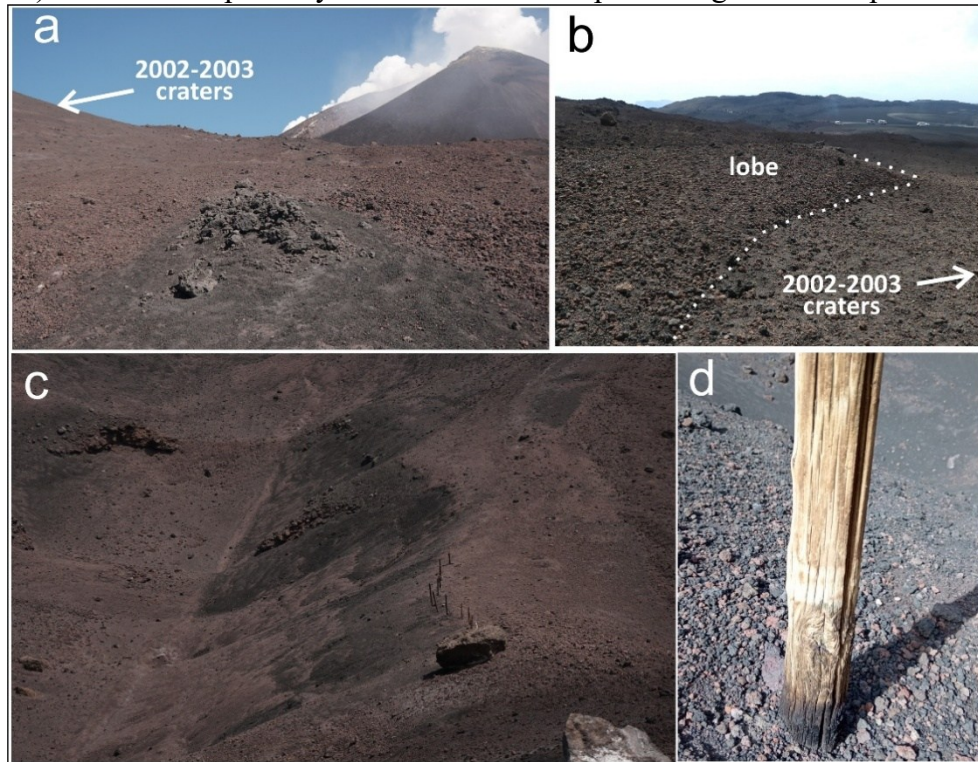
Other Supplementary Material for this manuscript includes the following:

Supplementary Movies 1 to 4

Supplementary Figures

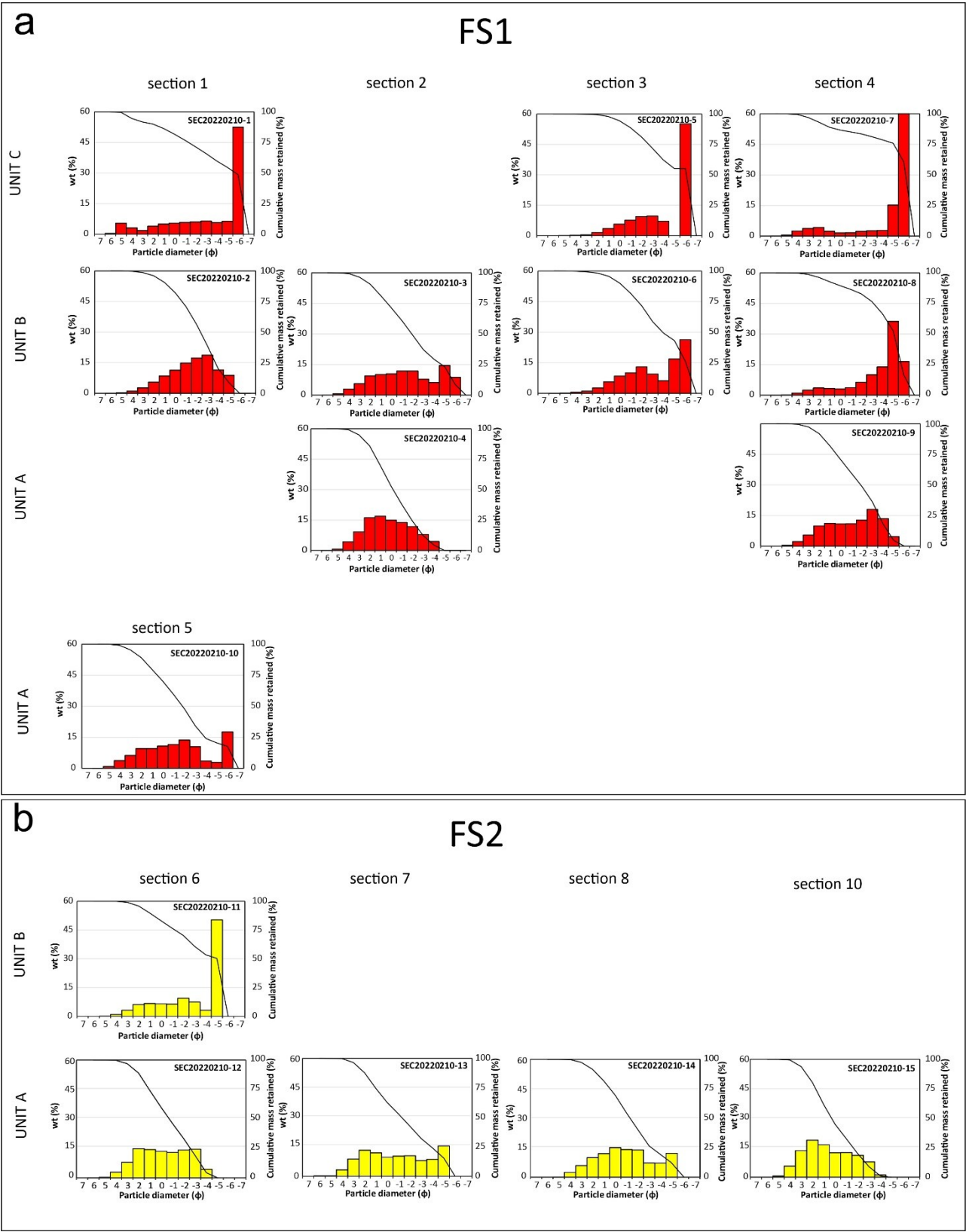
Supplementary Fig. 1

a) and b) photos showing the PDC deposit south-southeast of the SEC, with decimeter-sized blocks on the surface and the presence of a lobe in the eastern portion of the deposit near to the 2002-2003 craters (not visible in the photo), from where Unit C begins to be observed and Unit B shows greater thicknesses; c) photo of the PDC deposit as it appeared inside the uppermost scoria cone of 2002-2003 craters d) details of the partially carbonized wooden pole along the tourist path inside the crater.



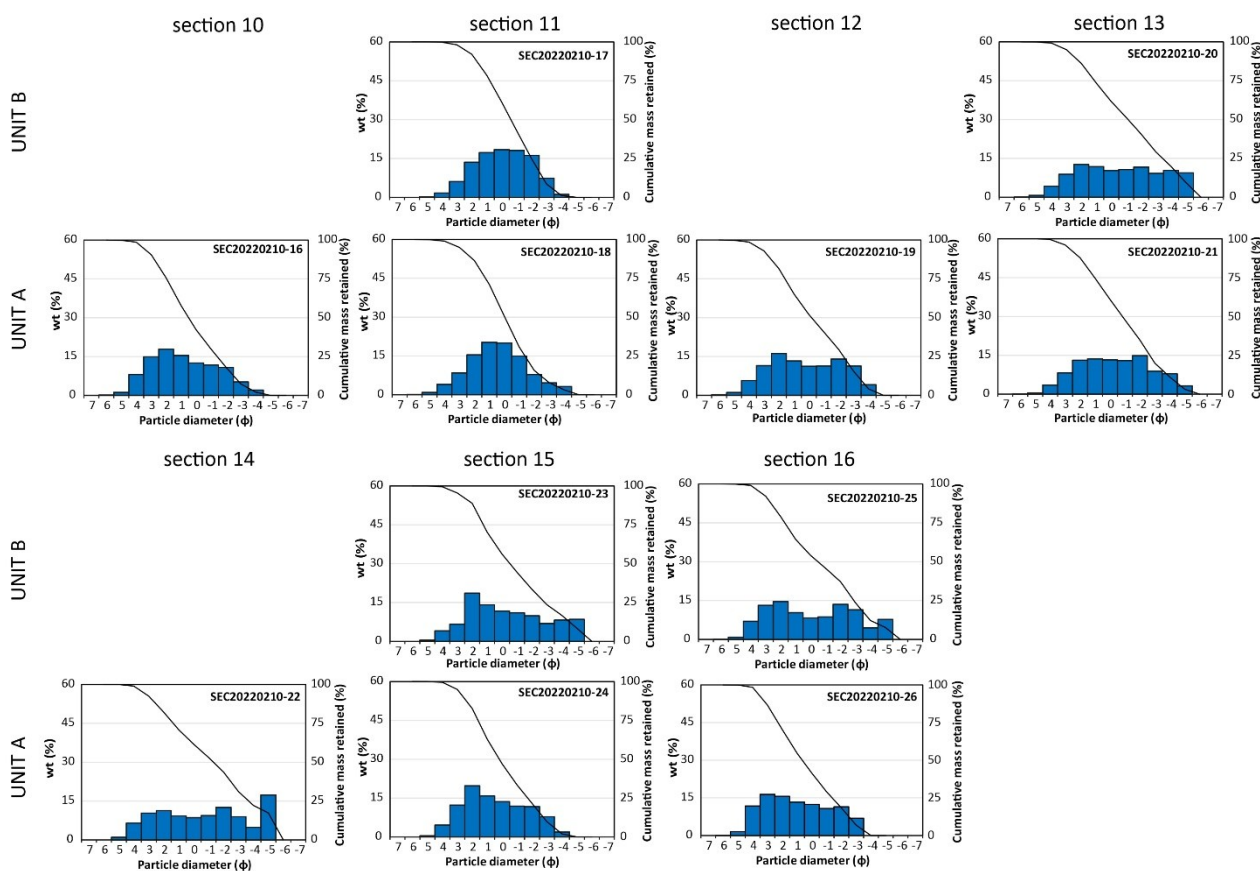
Supplementary Fig. 2

Grain Size Distributions of all analyzed samples from: a) the proximal sector FS1; b) the intermediate sector FS2; c) the distal sector FS3



C

FS3



Supplementary Tables

Supplementary Table 1.

Table listing the analyzed samples along with their associated Flow Sector (FS), stratigraphic section with total thickness, and Unit with corresponding thickness.

FS	Section	Section Thickness (cm)	Unit	Sample	Unit Thickness (cm)
1	1	> 100	C	SEC20220210-1	60
			B	SEC20220210-2	>40
	2	70	B	SEC20220210-3	40
			A	SEC20220210-4	30
	3	>90	C	SEC20220210-5	50
			B	SEC20220210-6	>40
	4	> 100	C	SEC20220210-7	20
			B	SEC20220210-8	40
			A	SEC20220210-9	>30
	5	80	A	SEC20220210-10	80
2	6	65	B	SEC20220210-11	40
			A	SEC20220210-12	25
	7	20	A	SEC20220210-13	20
	8	25	A	SEC20220210-14	25
	9	40	A	SEC20220210-15	40
3	10	25	A	SEC20220210-16	25
	11	40	B	SEC20220210-17	15
			A	SEC20220210-18	25
	12	30	A	SEC20220210-19	30
	13	40	B	SEC20220210-20	20
			A	SEC20220210-21	20
	14	5	A	SEC20220210-22	5
	15	20	B	SEC20220210-23	10
			A	SEC20220210-24	10
	16	20	B	SEC20220210-25	15
			A	SEC20220210-26	5

Supplementary Table 2.

Table listing the GSD analyses performed on all collected sample, reporting the % of class weight retained.

Sample name	ϕ μm	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
		63000	31500	16000	8000	4000	2000	1000	500	250	125	63	32	15
SEC20220210-1		48.68	5.91	5.29	6.01	5.59	5.38	5.01	4.56	3.64	1.71	2.90	5.00	0.33
SEC20220210-2			8.74	11.41	18.68	17.27	14.81	11.29	8.43	5.45	2.59	1.09	0.22	0.01
SEC20220210-3		8.67	14.50	6.15	7.83	11.79	11.81	10.44	10.12	9.45	5.64	2.96	0.59	0.06
SEC20220210-4				4.44	7.87	11.81	13.78	14.94	16.87	16.15	9.14	4.27	0.68	0.04
SEC20220210-5		55.13		7.07	9.65	9.37	7.57	5.64	3.47	1.49	0.42	0.16	0.03	
SEC20220210-6		26.27	16.82	6.13	9.45	12.95	10.00	8.44	5.57	2.59	1.05	0.56	0.17	0.01
SEC20220210-7		60.69	15.17	2.80	2.58	2.28	1.63	1.56	2.31	4.19	3.75	2.49	0.48	0.05
SEC20220210-8		16.51	36.18	13.85	9.99	6.32	3.70	3.05	3.22	3.52	2.44	1.02	0.17	0.03
SEC20220210-9			4.65	13.49	18.02	12.77	10.97	10.96	11.18	9.93	5.45	2.21	0.38	
SEC20220210-10		17.61	2.85	3.53	10.41	13.59	11.48	10.69	9.54	9.51	6.20	3.68	0.84	0.07
SEC20220210-11				4.36	14.62	14.19	12.96	13.52	14.39	14.85	7.91	2.89	0.27	0.02
SEC20220210-12			50.28	3.15	7.39	9.41	6.34	6.54	6.63	6.12	3.14	0.93	0.07	
SEC20220210-13			12.12	7.19	7.24	13.85	14.06	15.05	12.01	9.94	5.92	2.46	0.15	
SEC20220210-14				1.18	7.78	11.11	12.51	12.40	16.52	18.83	13.47	5.63	0.55	
SEC20220210-15			15.42	8.62	7.99	10.46	10.25	9.73	11.93	13.26	8.80	3.28	0.14	0.12
SEC20220210-16				2.10	5.24	10.78	11.71	12.52	15.45	17.84	14.92	8.08	1.18	0.18
SEC20220210-17				1.15	7.37	16.22	18.12	18.43	17.26	13.52	6.09	1.70	0.14	0.00
SEC20220210-18				3.22	4.66	7.84	15.01	20.00	20.27	15.45	8.44	4.04	0.92	0.14
SEC20220210-19				4.11	11.32	14.05	11.32	11.26	13.30	16.16	11.45	5.71	1.08	0.24
SEC20220210-20			9.44	10.34	9.21	11.63	10.69	10.31	11.80	12.66	8.88	4.24	0.71	0.08
SEC20220210-21			3.23	7.87	8.89	14.86	12.98	13.24	13.63	13.12	8.23	3.53	0.52	0.09
SEC20220210-22			17.34	4.80	8.98	12.55	9.37	8.58	9.25	11.31	10.33	6.49	0.99	0.00
SEC20220210-23			8.48	8.20	6.87	9.88	11.02	11.71	14.09	18.60	6.65	4.02	0.45	0.03
SEC20220210-24				1.95	7.84	11.73	11.88	13.65	15.86	19.73	12.31	4.59	0.43	0.03
SEC20220210-25			7.69	4.45	11.43	13.54	8.67	8.26	10.31	14.61	13.16	6.99	0.81	0.08
SEC20220210-26					6.86	11.43	10.74	12.41	13.28	15.61	16.34	11.74	1.53	0.07

Example of input file (best fit parameters) to run IMEX_Sflow2D

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RUN_NAME="exampleEtna",
RESTART=T,
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DT_OUTPUT= 10.000000000000E-00,
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OUTPUT_ESRI_FLAG=T,
OUTPUT_PHYS_FLAG=F,
OUTPUT_RUNOUT_FLAG=T,
VERBOSE_LEVEL= 0,
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X0= 497250.0 ,
Y0= 4174000.0 ,
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COMP_CELLS_Y= 600,
CELL_SIZE = 10.D0 ,
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ENERGY_FLAG = F,
TOPO_CHANGE_FLAG = F,
GAS_FLAG = T,
LIQUID_FLAG = F,
RADIAL_SOURCE_FLAG = F,
BOTTOM_RADIAL_SOURCE_FLAG = F,
COLLAPSING_VOLUME_FLAG = F ,
ALPHA_FLAG = T ,
SUBTRACT_INIT_FLAG = F ,
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T_BCW%FLAG= 1,
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THETA= 1.3000000000000000 ,
RECONSTR_COEFF= 1.0000000000000000 ,
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&EXPL_TERMS_PARAMETERS
GRAV= 9.81 ,

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SETTLING_FLAG = F ,
EROSION_COEFF = 0.D0 ,
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T_AMBIENT = 300.D0 ,
ENTRAINMENT_FLAG = F ,
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EPS_STOP = 5.D-4 ,
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DYN_PRES_LEVELS0 = 0.0 , 1000.0 , 10000.0 , 50000.0 , 100000.0

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