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Supplement of

Comparison of regolith physical and chemical characteristics with geophysical data along a climate and ecological gradient, Chilean Coastal Cordillera (26 to 38° S)

Mirjam Schaller et al.

Correspondence to: Mirjam Schaller (mirjam.schaller@uni-tuebingen.de)

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Fig. S1: Compilation of physical and chemical investigations with depth at the pedon location in the top-slope position of the S-facing hillslope in Pan de Azúcar. Properties shown are: 1) GPR transect and the envelope profile of the 500 MHz measurement; 2) GPR transect and the envelope profile of the 1000 MHz measurement; 3) Bulk density; 4) Grain size distribution of sand, silt, and clay; 5) Loss on ignition LOI; 6) Chemical index of alteration CIA 7) Chemical index of the mass transfer coefficient Tau τ; and 8) volumetric strain ε_{strain}. The black line indicates the boundary between the mobile pedolith and the immobile saprolith (after Oeser et al., 2018) and the gray area with green lines reflects the transition zone from B to C horizon (after Bernhard et al., 2018).

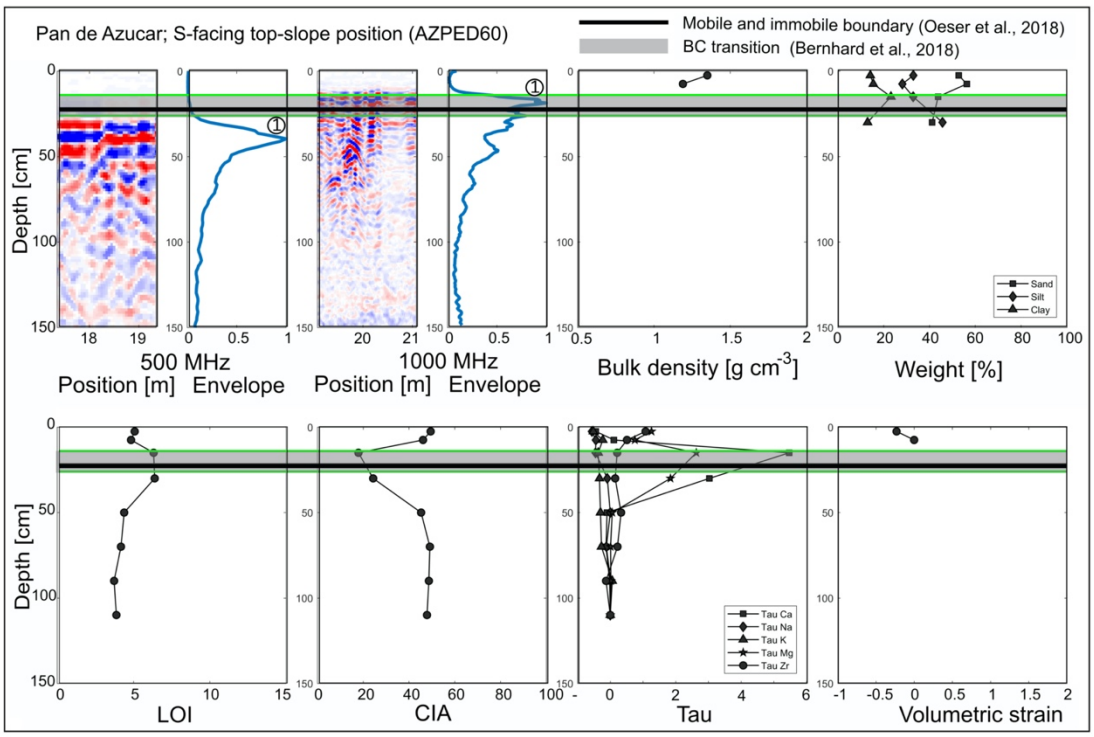

Fig. S2: Compilation of physical and chemical investigations at the pedon location in the toe-slope position of the S-facing hillslope in Pan de Azúcar.

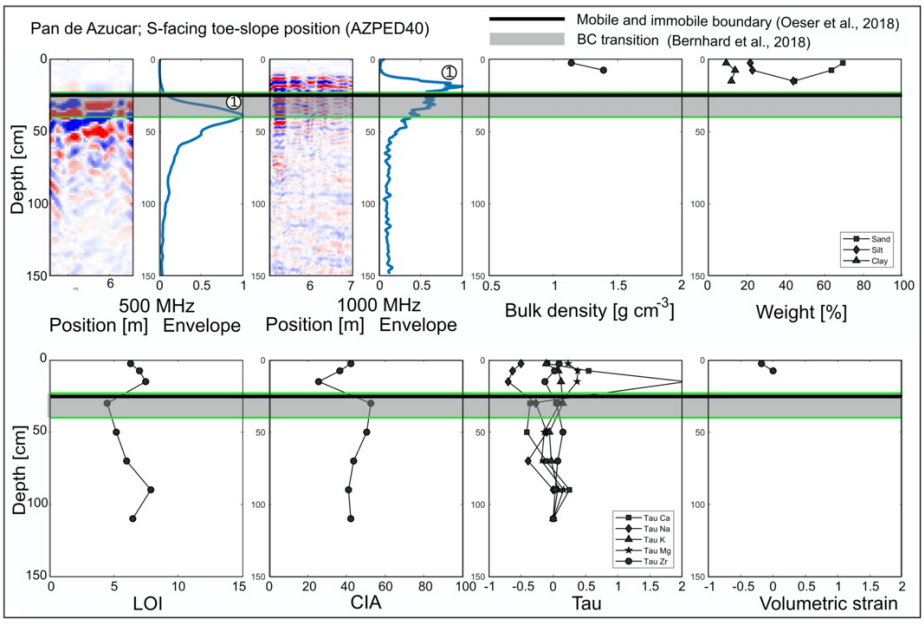

Fig. S3: Compilation of physical and chemical investigations at the pedon location in the mid-slope position of the N-facing hillslope in Pan de Azúcar.

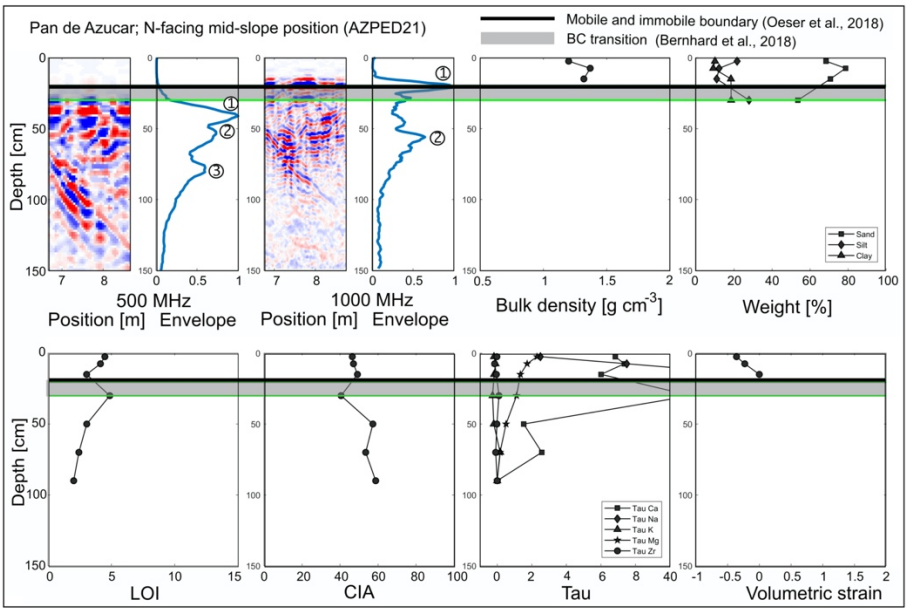

Fig. S4: Compilation of physical and chemical investigations at the pedon location in the top-slope position of the S-facing hillslope in Santa Gracia.

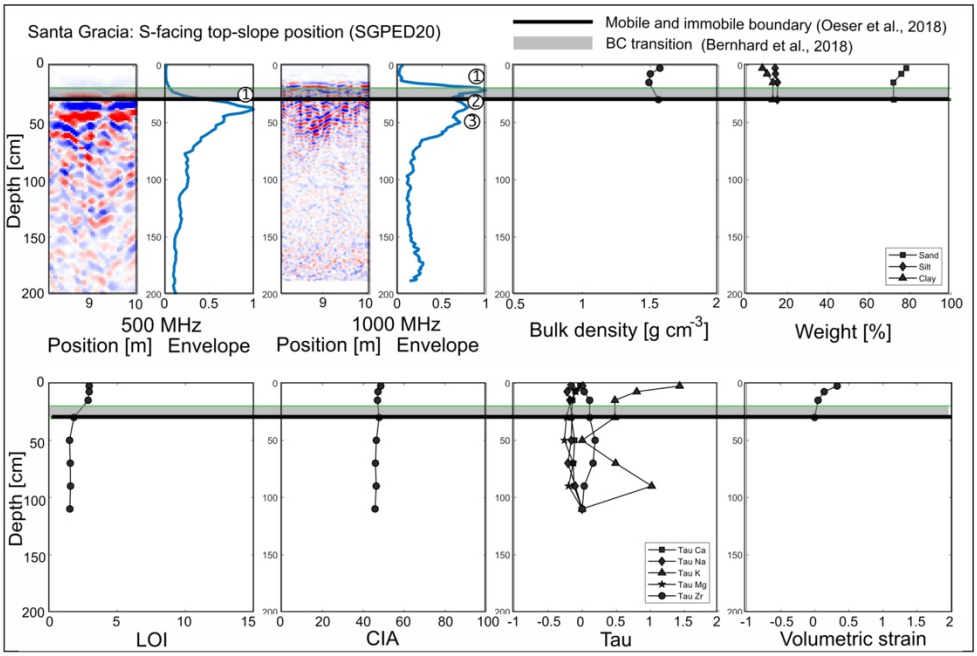

Fig. S5: Compilation of physical and chemical investigations at the pedon location in the toe-slope position of the S-facing hillslope in Santa Gracia.

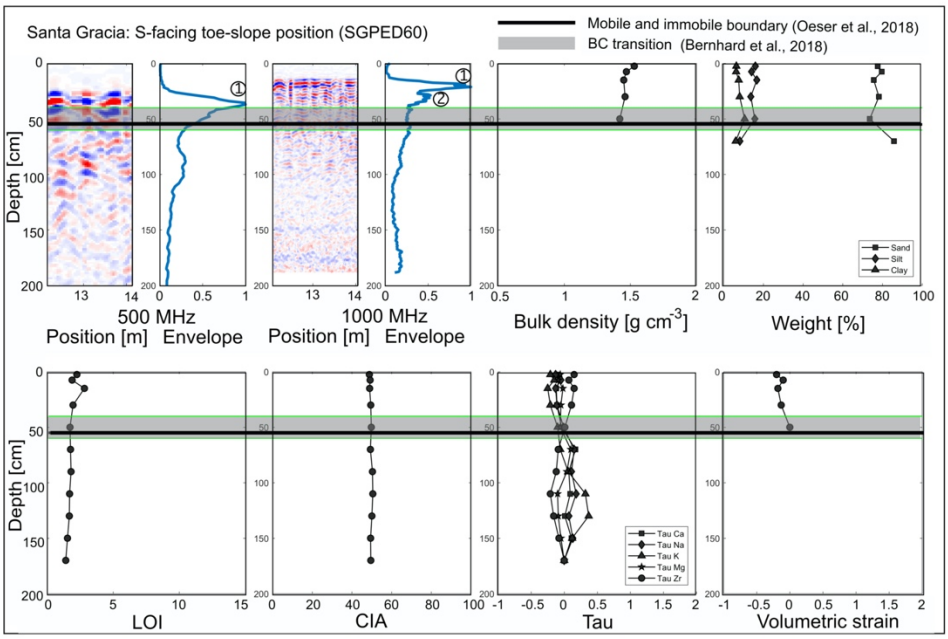

Fig. S6: Compilation of physical and chemical investigations at the pedon location in the mid-slope position of the N-facing hillslope in Santa Gracia.

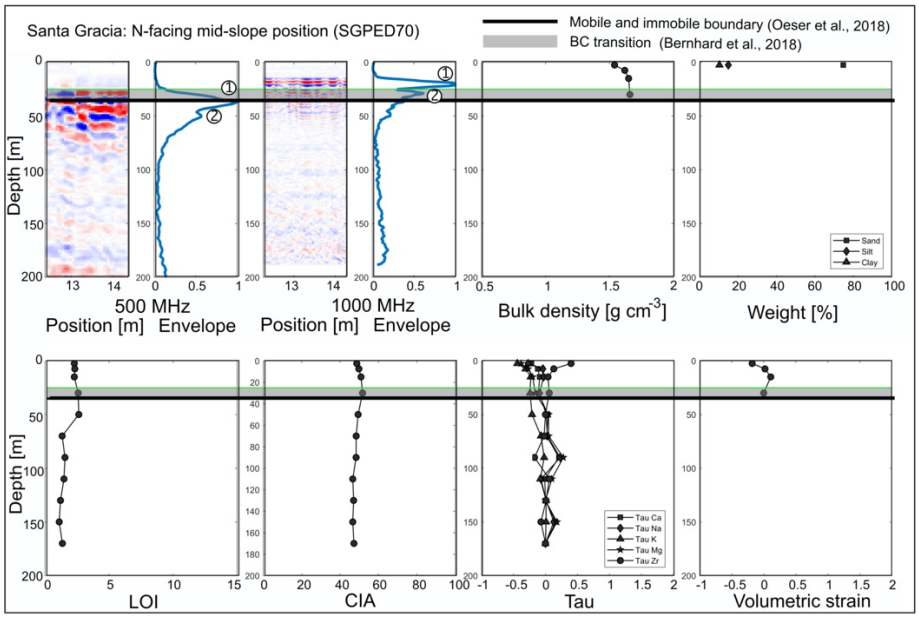

Fig. S7: Compilation of physical and chemical investigations at the pedon location in the top-slope position of the S-facing hillslope in La Campana.

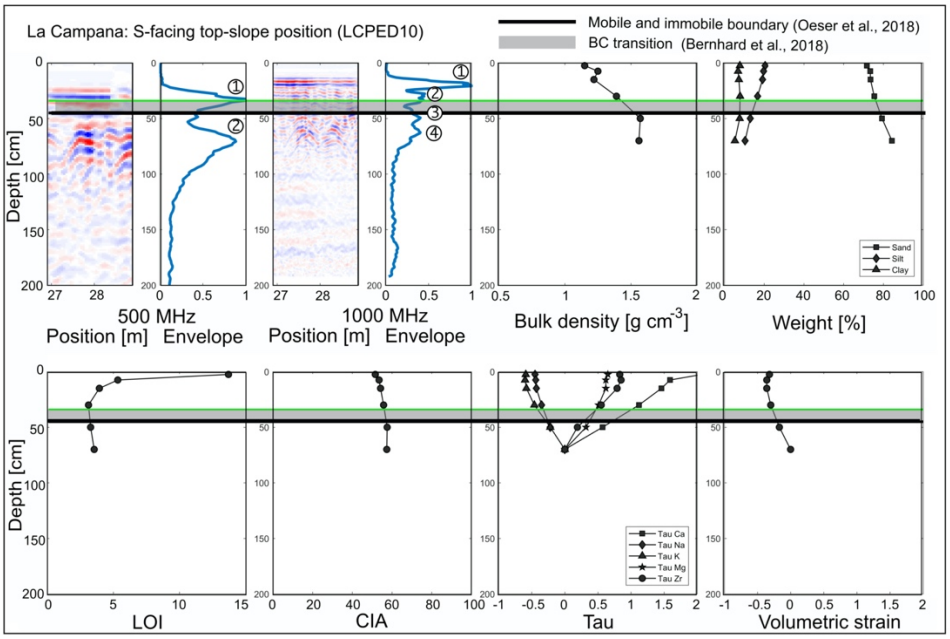

Fig. S8: Compilation of physical and chemical investigations at the pedon location in the toe-slope position of the S-facing hillslope in La Campana.

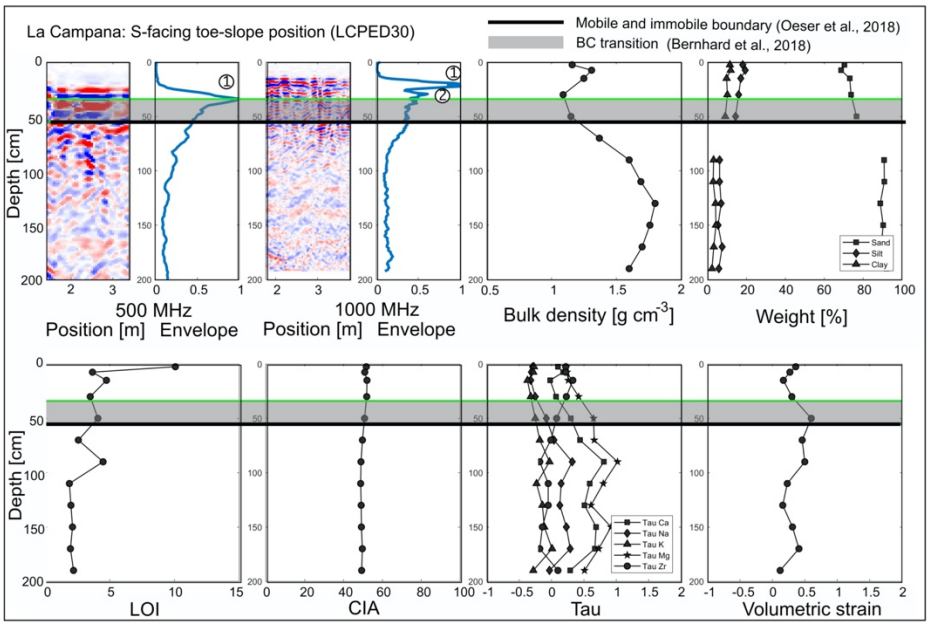

Fig. S9: Compilation of physical and chemical investigations at the pedon location in the mid-slope position of the N-facing hillslope in La Campana.

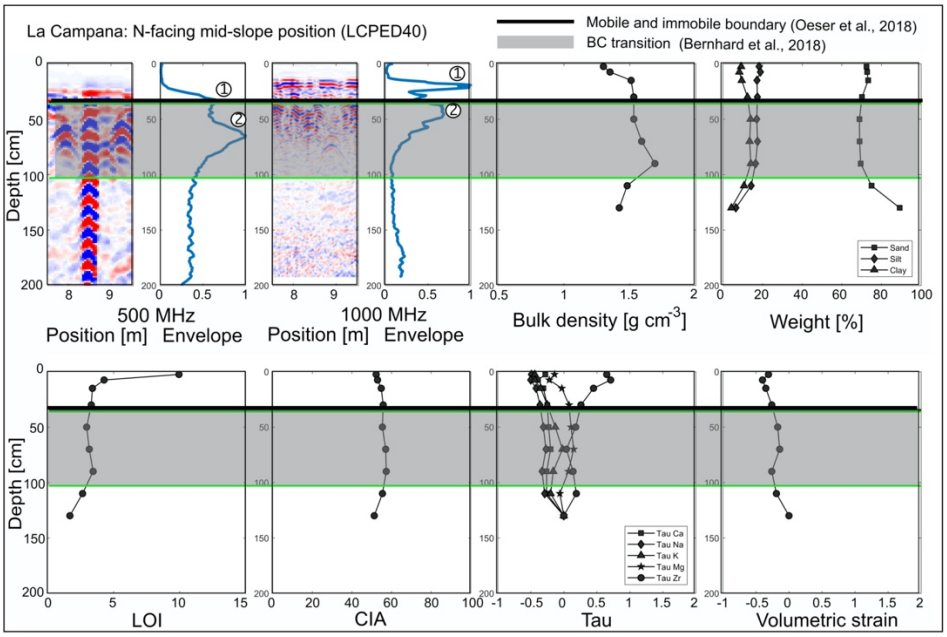

Fig. S10: Compilation of physical and chemical investigations at the pedon location in the top-slope position of the S-facing hillslope in Nahuelbuta.

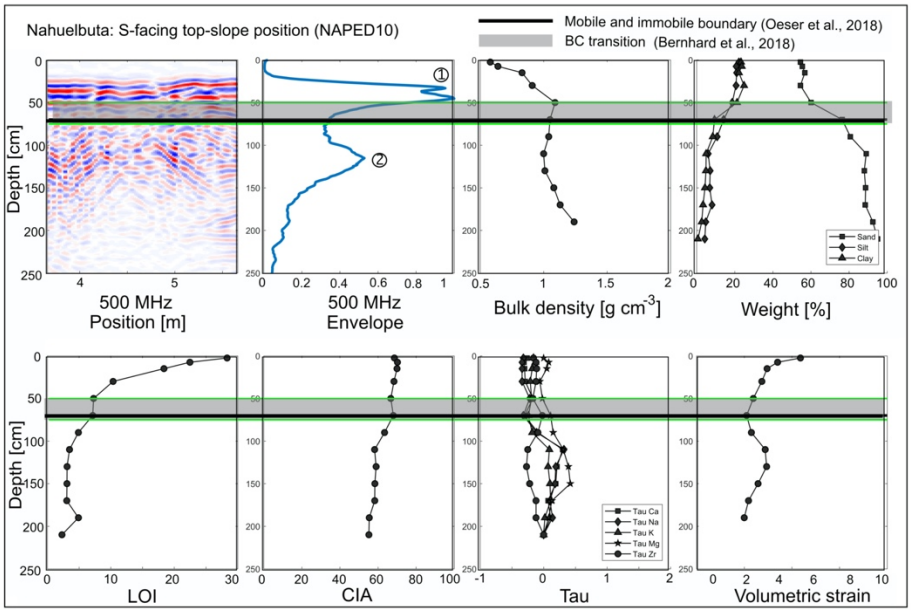

Fig. S11: Compilation of physical and chemical investigations at the pedon location in the toe-slope position of the S-facing hillslope in Nahuelbuta .

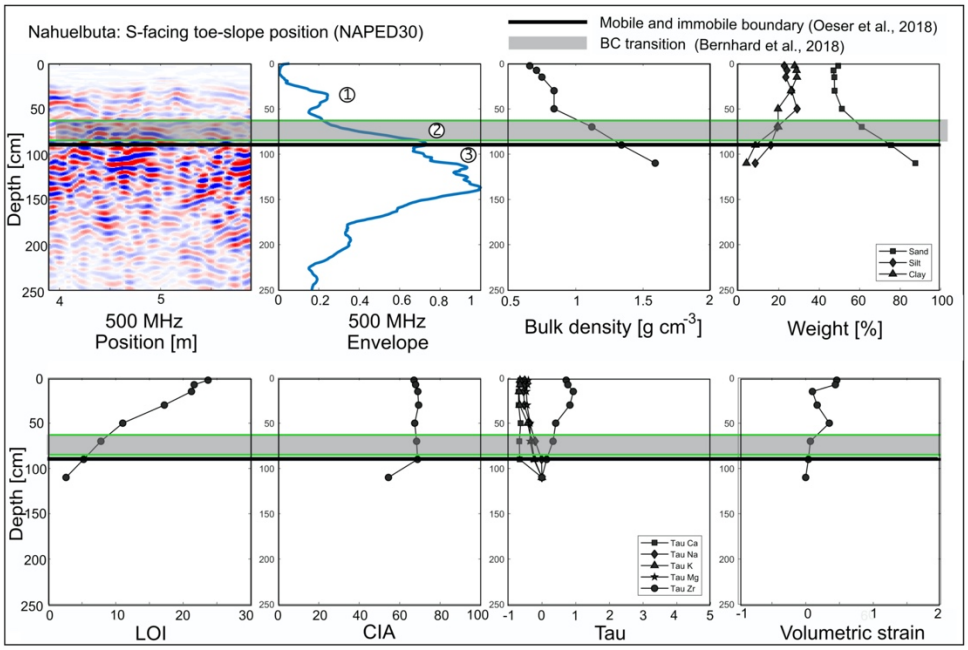

Fig. S12: Compilation of physical and chemical investigations at the pedon location in the mid-slope position of the N-facing hillslope in Nahuelbuta.

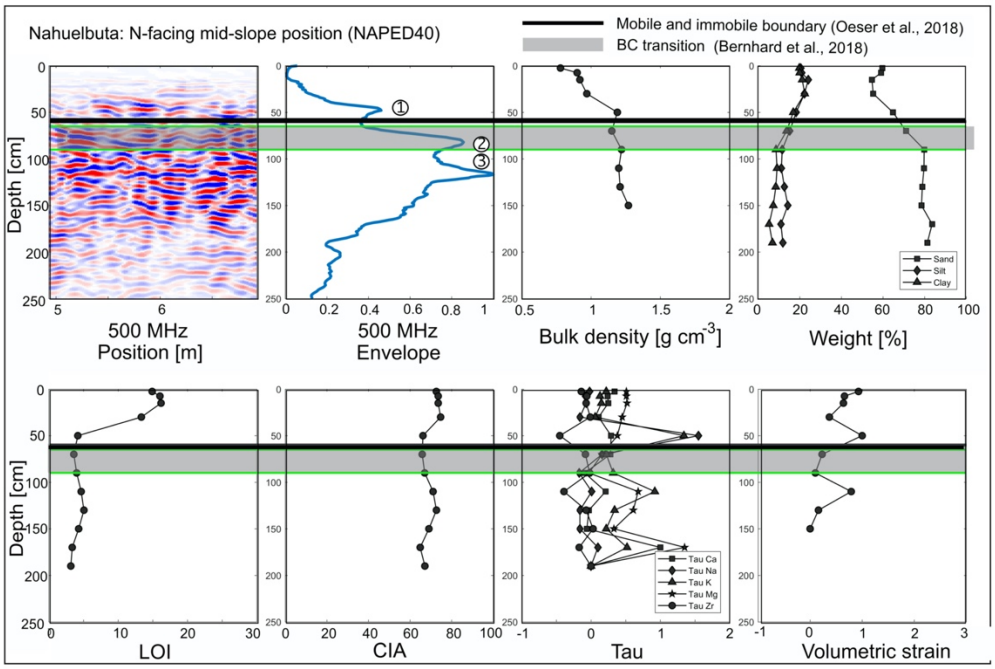

Fig. S13: Primary component analysis PCA of parameters for all pedons in all four Earth Shape areas. A) Scree plot showing the percentage of explained variances and B) Variables - PCA.

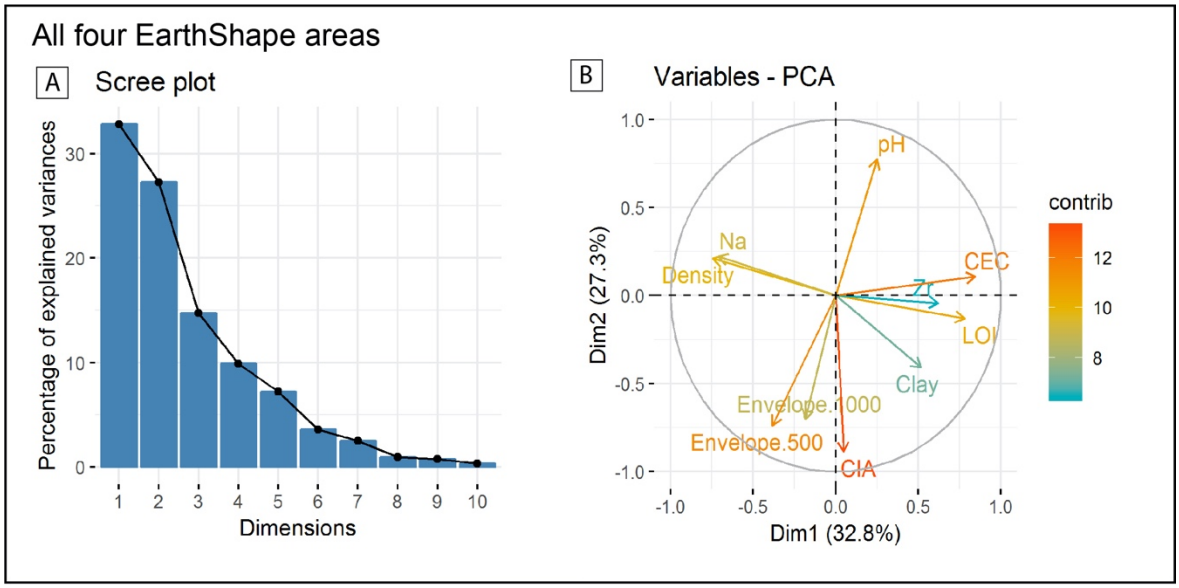

Fig. S14: 1000 MHz GPR transect and envelope profile for the mid-slope position of the N-facing hillslope in Pan de Azúcar (AZPED21). The hillslope transect spans over ~13 m. Interpretation of the radar signal are indicated where possible (stippled and black lines in A and B). The potential pedolith thickness is indicated based on the envelopes (stars). Uphill is from left to right.

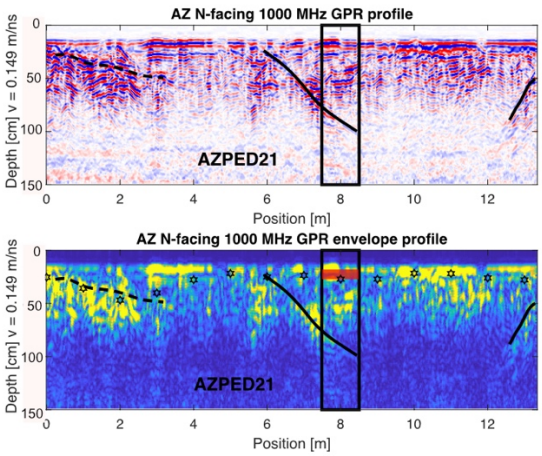

Fig. S15: 1000 MHz GPR transect and envelope profile for the top-slope position of the S-facing hillslope in Santa Gracia (SGPED20). The hillslope transect spans over ~13 m. The potential pedolith thickness is indicated based on the envelopes (stars). Uphill is from left to right.

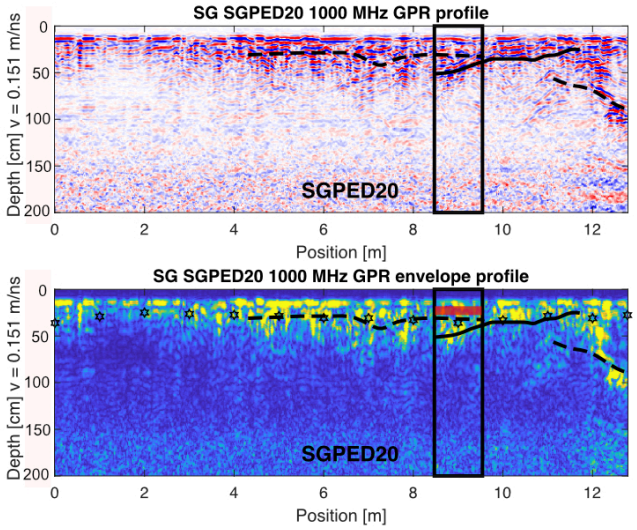

Fig. 16: 1000 MHz GPR transect and envelope profile for the toe-slope position of the S-facing hillslope in Santa Gracia (SGPED60). The hillslope transect spans over ~20 m. The potential pedolith thickness is indicated based on the envelopes (stars). Uphill is from left to right.

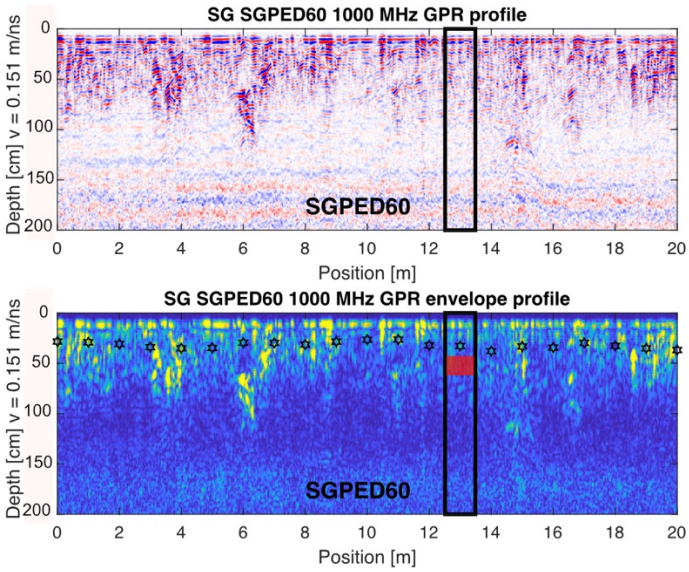

Fig. S17: 1000 MHz GPR transect and envelope profile for the top-slope position of the N-facing hillslope in Santa Gracia (SGPED70). The hillslope transect spans over ~16 m. The potential pedolith thickness is indicated based on the envelopes (stars). Uphill is from left to right.

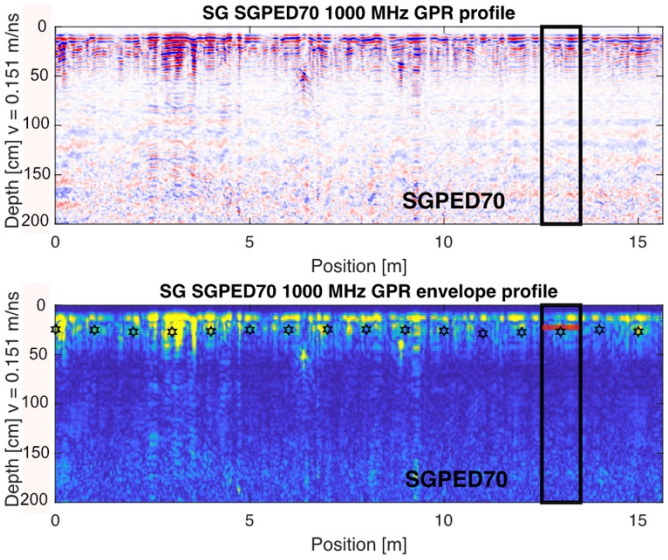

Fig. S18: 500 MHz GPR transect and envelope profile for the top-slope position of the S-facing hillslope in La Campana (LCPED10). The hillslope transect spans over ~20 m. The potential pedolith thickness is indicated based on the envelopes (stars). Uphill is from left to right.

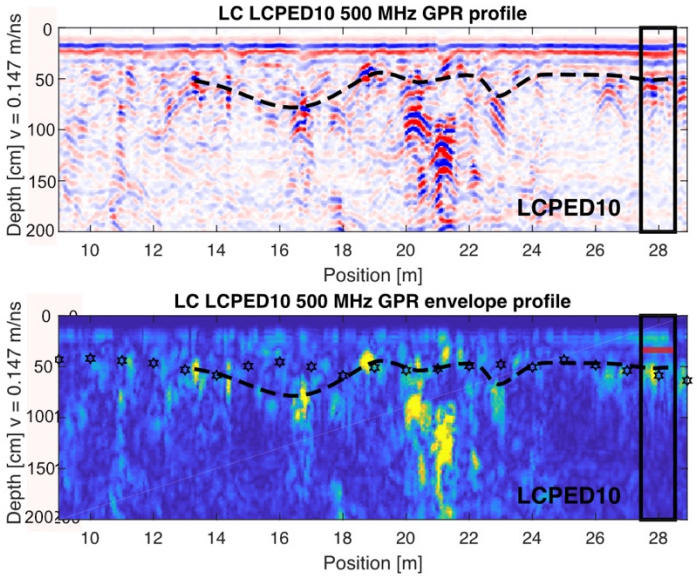

Fig. S19: 500 MHz GPR transect and envelope profile for the toe-slope position of the S-facing hillslope in La Campana (LCPED30). The hillslope transect spans over ~8 m. The potential pedolith thickness is indicated based on the envelopes (stars). Uphill is from left to right.

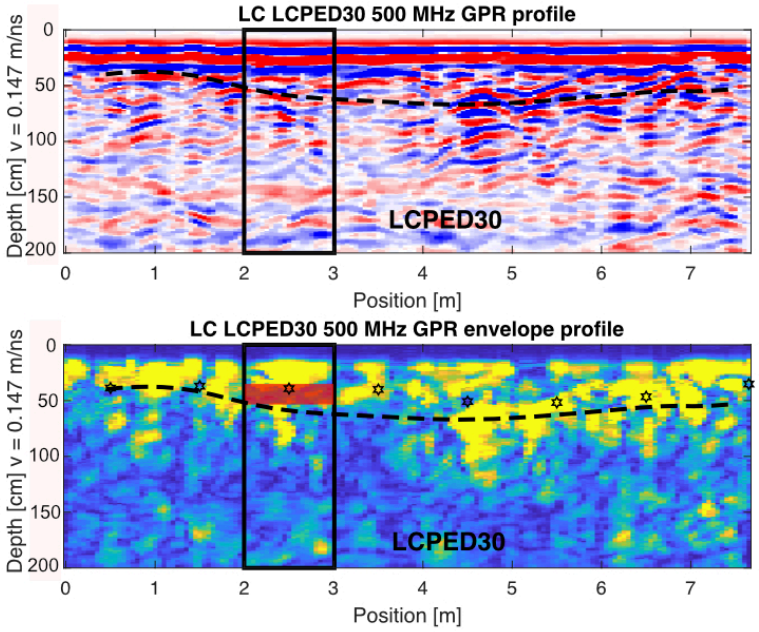

Fig. S20: 500 MHz GPR transect and envelope profile for the mid-slope position of the N-facing hillslope in La Campana (LCPED40). The hillslope transect spans over ~20 m. The potential pedolith thickness is indicated based on the envelopes (stars). Uphill is from left to right.

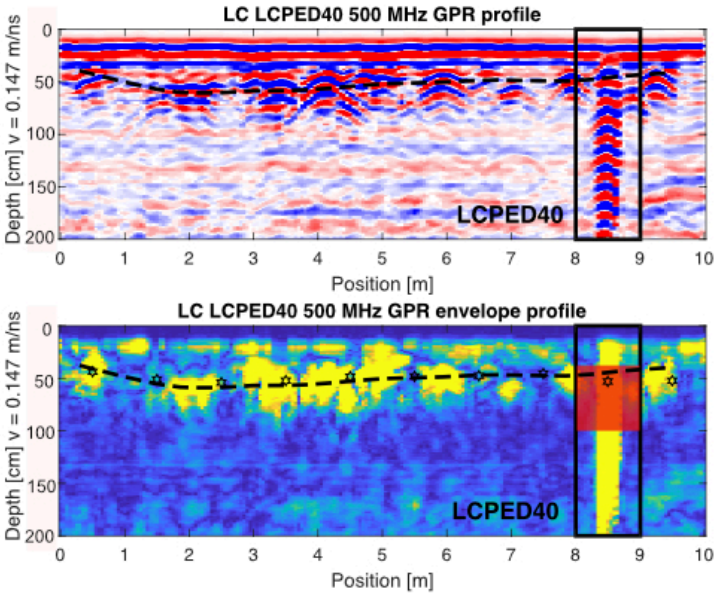

Fig. S21: 500 MHz GPR transect and envelope profile for the top-slope position of the S-facing hillslope in Nahuelbuta (NAPED10). The hillslope transect spans over ~6 m. The potential pedolith thickness is indicated based on the envelopes (stars). Uphill is from left to right.

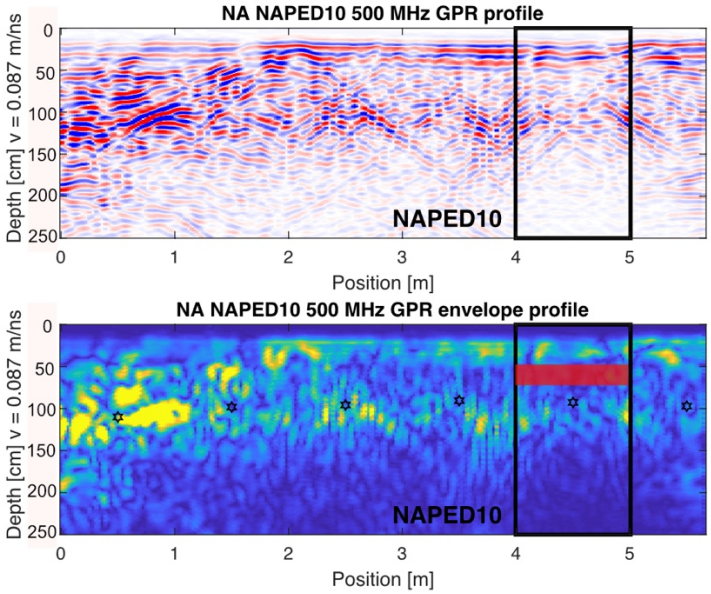

Fig. 22: 500 MHz GPR transect and envelope profile for the toe-slope position of the S-facing hillslope in Nahuelbuta (NAPED30). The hillslope transect spans over ~7 m. The potential pedolith thickness is indicated based on the envelopes (stars). Uphill is from left to right.

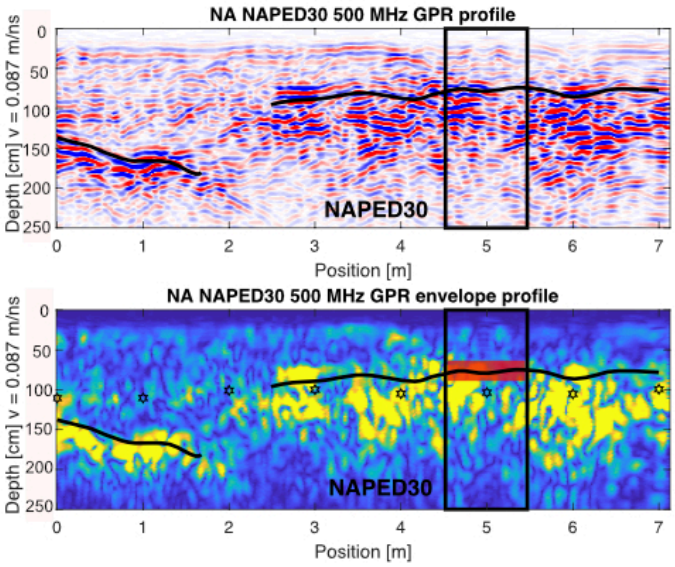

Fig. 23: 500 MHz GPR transect and envelope profile for the mid-slope position of the N-facing hillslope in Nahuelbuta (NAPED40). The hillslope transect spans over ~6 m. The potential pedolith thickness is indicated based on the envelopes (stars). Uphill is from left to right.

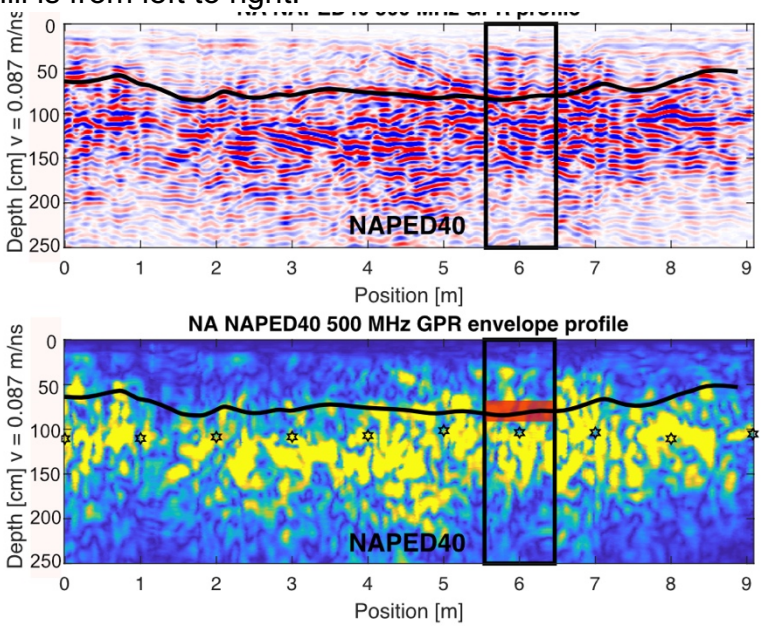

Table S:
TableS1A to D

Table S1A: Data compilation for regolith profiles

Pedon	Location °S	Location °W	Altitude m	Sample	IGSN	Depth cm	GPR 500[1] MHz	GPR 1000[1] MHz	Bulk density[2]	Grain size[3] sand %	silt %	clay %	pH[4]	CEC[5] µmolc/g	LOI[6]	CIA[7]	Ca	Na	Tau[8] K	Mg	Zr	Vol. strain[9]
Pan de Azucar																						
AZPED60	26.11012	70.54922	343	AZPED60-01-RO	GFRO100TP	2.5	3.93E+11	1.83E+12	1.35	52.8	33.0	14.2	8.08		5.08	49.48	-0.44	-0.56	-0.52	1.26	1.08	-0.23
				AZPED60-02-RO	GFRO100TQ	7.5	2.75E+11	1.51E+12	1.19	56.3	28.2	15.5	8.19		4.84	46.15	0.11	-0.44	-0.23	0.75	0.51	0.00
				AZPED60-03-RO	GFRO100TR	15	6.02E+11	2.69E+13		43.8	32.9	23.2	8.17		6.32	17.93	5.47	-0.45	-0.37	2.63	0.21	
				AZPED60-04-RO	GFRO100TS	30	1.52E+13	3.01E+13		41.2	45.7	13.0	8.04		6.39	24.36	3.03	-0.09	-0.33	1.84	0.15	
				AZPED60-05-RO	GFRO100TT	50	2.21E+13	1.93E+13							4.39	45.31	-0.10	0.00	-0.30	0.06	0.33	
				AZPED60-06-RO	GFRO100TU	70	1.06E+13	1.10E+13							4.18	49.14	-0.13	-0.12	-0.27	0.01	0.22	
				AZPED60-07-RO	GFRO100TW	90	6.22E+12	6.95E+12							3.73	48.70	-0.02	0.01	0.06	0.02	-0.13	
				AZPED60-08-RO	GFRO100TV	110	4.82E+12	4.11E+12							3.88	47.88	0.00	0.00	0.00	0.00	0.00	
AZPED50	26.11027	70.54922	333	AZPED50-01-RO	GFRO100TX	2.5	3.37E+11	1.96E+12	1.19				8.01		4.77	52.51	-0.40	-0.08	-0.07	0.74	0.24	0.10
				AZPED50-02-RO	GFRO100TY	7.5	2.16E+11	1.91E+12	1.59	81.3	11.2	7.5	8.10		4.49	36.98	1.24	0.21	0.18	0.13	-0.13	0.00
				AZPED50-03-RO	GFRO100TZ	15	7.01E+11	3.65E+13							3.22	52.45	-0.44	0.21	0.32	-0.14	-0.07	
				AZPED50-04-RO	GFRO100U0	30	1.60E+13	3.06E+13							3.22	50.77	-0.38	0.19	0.13	-0.23	0.02	
				AZPED50-05-RO	GFRO100U1	50	2.32E+13	1.36E+13							3.96	49.82	-0.16	0.17	0.10	-0.06	-0.08	
				AZPED50-06-RO	GFRO100U2	70	1.47E+13	7.76E+12							3.78	51.78	-0.35	-0.01	-0.03	-0.16	0.03	
				AZPED50-07-RO	GFRO100U3	90	1.38E+13	6.06E+12							4.88	42.91	0.56	-0.09	0.08	0.25	-0.09	
				AZPED50-08-RO	GFRO100U4	110	7.58E+12	5.85E+12							4.03	50.20	-0.19	0.08	0.14	-0.07	-0.01	
				AZPED50-09-RO	GFRO100U5	130	5.32E+12	7.41E+12							4.76	48.55	0.00	0.00	0.00	0.00	0.00	
AZPED40	26.11024	70.54921	326	AZPED40-01-RO	GFRO100BJ	2.5	2.92E+11	1.69E+12	1.14	69.4	21.5	9.1	8.11		6.31	42.31	-0.09	-0.16	-0.11	0.23	0.09	-0.18
				AZPED40-02-RO	GFRO100U6	7.5	2.12E+11	1.63E+12	1.39	63.5	22.7	13.7	8.11		7.00	36.63	0.55	-0.34	0.08	0.38	0.02	0.00
				AZPED40-03-RO	GFRO100U7	15	7.47E+11	3.00E+13		44.4	43.8	11.8	8.24		7.48	25.64	2.06	-0.63	0.12	0.37	-0.13	
				AZPED40-04-RO	GFRO100U8	30	1.81E+13	3.25E+13							4.49	52.63	-0.36	-0.70	0.15	0.10	0.05	
				AZPED40-05-RO	GFRO100U9	50	2.33E+13	1.30E+13							5.20	50.52	-0.41	-0.27	-0.06	-0.14	0.15	
				AZPED40-06-RO	GFRO100UA	70	7.12E+12	6.31E+12							6.00	43.77	-0.11	-0.10	-0.03	-0.18	0.07	
				AZPED40-07-RO	GFRO100UB	90	4.37E+12	5.91E+12							7.88	41.11	0.25	-0.39	0.07	0.16	0.03	
				AZPED40-08-RO	GFRO100UC	110	2.45E+12	5.75E+12							6.48	42.28	0.00	0.00	0.00	0.00	0.00	
AZPED21	26.10936	70.54907	342	AZPED21-01-LMM	GFRO100UD	2.5	2.73E+11	8.47E+11	1.20	68.4	21.6	10.0	8.10		4.49	46.47	6.83	2.50	-0.19	2.30	-0.02	-0.36
				AZPED21-02-LMM	GFRO100UE	7.5	1.73E+11	6.77E+11	1.37	78.7	12.2	9.1	8.12		4.14	47.11	7.36	7.50	-0.10	1.73	-0.15	-0.23
				AZPED21-03-LMM	GFRO100UF	15	4.60E+11	1.80E+13	1.32	70.7	10.9	18.4	8.09		3.05	49.19	6.01	15.00	-0.18	1.34	-0.05	0.00
				AZPED21-04-LMM	GFRO100UG	30	1.01E+13	2.16E+13		53.6	27.9	18.5	7.96		4.88	40.57	11.24	30.00	-0.27	1.12	0.10	
				AZPED21-05-LMM	GFRO100UH	50	1.67E+13	2.18E+13							3.06	57.30	1.53	50.00	-0.20	0.51	-0.02	
				AZPED21-06-LMM	GFRO100UJ	70	9.33E+12	1.85E+13							2.44	53.53	2.58	70.00	0.17	0.16	-0.09	
				AZPED21-07-LMM	GFRO100UK	90	9.64E+12	7.90E+12							2.03	58.79	0.00	90.00	0.00	0.00	0.00	

(1) Average of envelope signal over regolith depth from this study
(2) Bulk density from Bernhard et al., 2018
(3) Grain size distribution from Bernhard et al., 2018
(4) pH from Bernhard et al., 2018
(5) Cation exchange capacity from Bernhard et al., 2018
(6) Loss on Ignition LOI from Oeser et al., 2018
(7) Chemical Index of Alteration CIA calculated based on data from Oeser et al., 2018
(8) Mass transfer coefficient Tau calculated based on data from Oeser et al., 2018
(9) Volumetric strain calculated based on data from Oeser et al., 2018

Table S1B: Data compilation for regolith profiles

Pedon	Location °S	Location °W	Altitude m	Sample	IGSN	Depth cm	GPR 500[1] MHz	GPR 1000[1] MHz	Bulk density[2]	Grain size[3] sand %	silt %	clay %	pH[4]	CEC[5] µmolc/g	LOI[6]	CIA[7]	Ca	Na	Tau[8] K	Mg	Zr	Vol. strain[9]
Santa Gracia																						
SGPED10	29.75633	71.16626	727																			
SGPED20	29.75636	71.16721	718	SGPED20-01-LMM	GFRO100UL	2.5	2.40E+11	8.29E+11	1.57	78.1	14.0	7.8	7.01	89.26	2.94	48.50	-0.03	0.01	1.43	-0.17	-0.16	0.33
				SGPED20-02-LMM	GFRO100UM	7.5	1.47E+11	5.66E+11	1.50	75.7	14.2	10.1	6.43	73.12	2.94	47.18	-0.10	-0.22	0.80	-0.09	0.03	0.14
				SGPED20-03-LMM	GFRO100UN	15	5.09E+11	7.15E+12	1.49	71.8	15.2	13.0	6.38	116.94	2.86	46.90	-0.14	-0.18	0.48	-0.17	0.11	0.05
				SGPED20-04-LMM	GFRO100UP	30	1.15E+13	1.93E+13	1.56	72.0	15.1	12.9	6.61	119.59	1.82	47.70	-0.16	-0.15	0.48	-0.23	0.11	0.00
				SGPED20-05-LMM	GFRO100UQ	50	1.48E+13	1.56E+13							1.50	46.34	-0.11	-0.16	0.00	-0.26	0.19	
				SGPED20-06-LMM	GFRO100UR	70	7.81E+12	6.78E+12							1.55	45.91	-0.13	-0.21	0.49	-0.13	0.16	
				SGPED20-07-LMM	GFRO100US	90	5.73E+12	3.88E+12							1.57	46.31	-0.12	-0.10	1.02	-0.20	0.03	
				SGPED20-08-LMM	GFRO100UT	110	4.69E+12	3.07E+12							1.52	45.71	0.00	0.00	0.00	0.00	0.00	
SGPED40	29.75738	71.16635	682	SGPED40-01-RO	GFRO100UU	2.5	2.55E+11	7.84E+11	1.48	76.8	17.5	5.6	6.28	44.75	1.89	47.70	-0.42	-0.48	-0.19	-0.40	0.69	-0.41
				SGPED40-02-RO	GFRO100UV	7.5	2.26E+11	7.94E+11	1.55	78.9	15.3	5.8	6.29	51.05	1.96	48.40	-0.49	-0.54	-0.26	-0.43	0.84	-0.46
				SGPED40-03-RO	GFRO100V3	15	7.59E+11	1.45E+13	1.55	78.6	13.9	7.5	6.18	52.49	1.93	48.84	-0.47	-0.50	-0.20	-0.42	0.72	-0.41
				SGPED40-04-RO	GFRO100UW	30	1.87E+13	2.08E+13	1.44	78.1	13.7	8.2	6.11	59.95	1.85	49.21	-0.44	-0.46	-0.23	-0.40	0.63	-0.37
				SGPED40-05-RO	GFRO100UX	50	2.33E+13	1.76E+13	1.43	76.9	13.7	9.5	5.97	70.38	1.97	49.17	-0.07	-0.13	-0.07	0.06	0.05	0.00
				SGPED40-06-RO	GFRO100UY	70	1.31E+13	1.71E+13		77.6	14.2	8.2	5.48	108.79	2.09	49.61	-0.14	-0.06	-0.17	0.06	0.05	
				SGPED40-07-RO	GFRO100UZ	90	1.65E+13	9.04E+12							2.20	51.30	-0.35	-0.17	-0.28	-0.04	0.17	
				SGPED40-08-RO	GFRO100V0	110	8.37E+12	4.29E+12							1.81	48.23	-0.43	-0.38	-0.52	-0.20	0.62	
				SGPED40-09-RO	GFRO100V1	130	4.60E+12	3.31E+12							1.28	47.06	-0.10	-0.07	-0.27	0.01	0.10	
				SGPED40-10-RO	GFRO100V2	150	4.29E+12	4.09E+12							1.19	47.05	0.01	-0.06	0.07	0.09	0.00	
				SGPED40-11-RO	GFRO100CR	170	3.77E+12	5.76E+12							1.08	46.84	0.00	0.00	0.00	0.00	0.00	
SGPED60	29.75826	71.16615	638	SGPED60-01-RO	GFRO100V4	2.5	2.42E+11	1.05E+12	1.53	77.6	16.0	6.4	6.57	71.15	2.26	48.79	-0.10	-0.13	-0.21	-0.06	0.15	-0.20
				SGPED60-02-RO	GFRO100V5	7.5	2.05E+11	7.30E+11	1.47	79.6	14.1	6.3	6.58	68.05	1.90	49.18	-0.07	-0.05	-0.15	-0.09	0.07	-0.10
				SGPED60-03-RO	GFRO100V6	15	5.95E+11	1.31E+13	1.45	75.6	16.7	7.6	6.64	68.31	2.83	48.93	-0.12	-0.13	-0.25	-0.02	0.15	-0.18
				SGPED60-04-RO	GFRO100V7	30	1.36E+13	1.93E+13	1.46	78.2	13.7	8.1	6.03	68.11	1.97	49.50	-0.11	-0.11	-0.21	-0.05	0.11	-0.13
				SGPED60-05-RO	GFRO100V8	50	1.32E+13	1.05E+13	1.42	73.6	15.7	10.6	5.94	96.93	1.74	49.78	-0.04	-0.01	-0.10	-0.06	0.01	0.00
				SGPED60-06-RO	GFRO100V9	70	6.25E+12	8.79E+12	n.d.	85.8	8.2	6.1	5.99	109.51	1.78	49.32	0.17	0.15	-0.06	0.10	-0.09	
				SGPED60-07-RO	GFRO100VA	90	7.41E+12	6.55E+12	n.d.						1.82	50.36	0.07	0.11	0.06	0.04	-0.12	
				SGPED60-08-RO	GFRO100VB	110	5.42E+12	3.90E+12	n.d.						1.71	50.54	0.09	0.18	0.32	-0.10	-0.21	
				SGPED60-09-RO	GFRO100VC	130	3.67E+12	3.52E+12	n.d.						1.69	50.07	0.01	0.07	0.37	-0.09	-0.16	
				SGPED60-10-RO	GFRO100VD	150	3.02E+12	4.76E+12	n.d.						1.55	49.42	0.11	0.13	0.12	-0.05	-0.08	
				SGPED60-11-RO	GFRO100VE	170	2.71E+12	6.26E+12	n.d.						1.42	49.53	0.00	0.00	0.00	0.00	0.00	
SGPED70	29.76120	71.16559	690	SGPED70-01-RO	GFRO100VF	2.5	3.94E+11	5.72E+11	1.54	74.8	14.9	10.3	6.21	74.97	2.29	48.73	-0.22	-0.27	-0.44	-0.38	0.40	-0.18
				SGPED70-02-RO	GFRO100VG	7.5	2.28E+11	6.01E+11	1.62					84.42	2.33	49.81	-0.12	-0.04	-0.31	-0.27	0.13	0.02
				SGPED70-03-RO	GFRO100VH	15	4.89E+11	1.49E+13	1.65				5.77		2.29	50.93	-0.09	-0.03	-0.23	-0.20	0.04	0.11
				SGPED70-04-RO	GFRO100VJ	30	1.12E+13	2.22E+13	1.66						2.59	51.73	-0.11	-0.09	-0.24	-0.16	0.06	0.00
				SGPED70-05-RO	GFRO100VK	50	1.21E+13	7.21E+12							2.64	49.43	0.04	0.01	-0.21	0.05	0.00	
				SGPED70-06-RO	GFRO100VL	70	4.54E+12	2.11E+12							1.34	48.41	0.02	0.03	-0.07	0.05	-0.02	
				SGPED70-07-RO	GFRO100VM	90	1.71E+12	2.70E+12							1.56	48.38	0.21	0.23	-0.02	0.28	-0.17	
				SGPED70-08-RO	GFRO100VN	110	1.09E+12	3.20E+12							1.48	46.65	-0.01	-0.07	-0.08	0.10	0.06	
				SGPED70-09-RO	GFRO100VP	130	1.15E+12	3.93E+12							1.21	47.08	0.00	0.01	0.01	0.00	0.01	
				SGPED70-10-RO	GFRO100VQ	150	1.28E+12	4.90E+12							1.11	46.64	0.16	0.13	0.01	0.18	-0.07	
				SGPED70-11-RO	GFRO100VR	170	1.69E+12	6.41E+12							1.36	47.24	0.00	0.00	0.00	0.00	0.00	

(1) Average of envelope signal over regolith depth from this study
(2) Bulk density from Bernhard et al., 2018
(3) Grain size distribution from Bernhard et al., 2018
(4) pH from Bernhard et al., 2018
(5) Cation exchange capacity from Bernhard et al., 2018
(6) Loss on Ignition LOI from Oeser et al., 2018
(7) Chemical Index of Alteration CIA calculated based on data from Oeser et al., 2018
(8) Mass transfer coefficient Tau calculated based on data from Oeser et al., 2018
(9) Volumetric strain calculated based on data from Oeser et al., 2018

Table S1C: Data compilation for regolith profiles

Pedon	Location		Altitude	Sample	IGSN	Depth	GPR 500[1]	GPR 1000[1]	Bulk density[2]	Grain size[3] sand	silt	clay	pH[4]	CEC[5]	LOI[6]	CIA[7]	Ca	Na	Tau[8] K	Mg	Zr	Vol. strain[9]
	°S	°W	m			cm	MHz	MHz		%	%	%		µmolc/g								
La Campana																						
LCPED10	32.95581	71.06332	734	LCPED10-01-RO	GFRO10021	2.5	3.57E+11	8.02E+11	1.15	71.7	20.5	7.8	5.92	256.37	13.70	51.59	2.07	-0.45	-0.59	0.65	0.83	-0.32
				LCPED10-02-RO	GFRO10022	7.5	3.61E+11	1.14E+12	1.25	73.4	19.7	6.9	5.78	104.37	5.34	53.50	1.59	-0.44	-0.60	0.62	0.85	-0.36
				LCPED10-03-RO	GFRO10023	15	1.17E+12	3.39E+13	1.22	73.5	19.2	7.3	5.50	63.07	3.95	54.24	1.46	-0.43	-0.58	0.62	0.79	-0.36
				LCPED10-04-RO	GFRO10024	30	2.37E+13	3.28E+13	1.39	75.4	16.7	7.9	5.12	51.54	3.13	55.78	1.12	-0.35	-0.46	0.51	0.55	-0.30
				LCPED10-05-RO	GFRO100VS	50	1.74E+13	2.53E+13	1.57	79.3	13.0	7.7	4.69	41.90	3.29	57.57	0.57	-0.22	-0.22	0.32	0.19	-0.17
				LCPED10-06-RO	GFRO100VT	70	3.03E+13	2.09E+13	1.56	84.3	10.4	5.3	4.53	39.24	3.56	57.38	0.00	0.00	0.00	0.00	0.00	0.00
LCPED20	32.95588	71.06355	718	LCPED20-01-RO	GFRO10029	2.5	4.13E+11	1.41E+12	0.64	73.2	17.1	9.7	5.55		13.80	51.12	0.35	-0.15	-0.13	0.19	0.03	0.85
				LCPED20-02-RO	GFRO1002A	7.5	2.85E+11	8.73E+11	1.04	74.7	16.5	8.9	5.34	233.68	6.19	53.62	-0.01	-0.16	-0.19	0.12	0.10	0.38
				LCPED20-03-RO	GFRO1002B	15	5.77E+11	1.51E+13	1.23	75.4	15.1	9.5	5.31	110.00	4.75	54.82	-0.02	-0.12	-0.14	0.22	0.06	0.12
				LCPED20-04-RO	GFRO1002C	30	1.41E+13	2.82E+13	1.25	75.5	14.1	10.5	5.06	78.61	4.71	54.78	0.04	-0.08	-0.11	0.39	0.01	0.20
				LCPED20-05-RO	GFRO1002D	50	1.95E+13	4.66E+13	1.40	76.6	14.5	8.9	4.88	69.35	5.11	54.40	-0.07	-0.22	-0.23	0.29	0.18	-0.13
				LCPED20-06-RO	GFRO100VU	70	2.49E+13	1.92E+13	1.49	83.4	11.4	5.3	4.84	53.77	3.53	53.34	0.67	0.19	0.03	1.52	-0.17	0.17
				LCPED20-07-RO	GFRO100VV	90	1.57E+13	7.44E+12	1.54	84.5	8.9	6.6	4.64	46.80	2.71	53.78	0.49	0.13	0.03	1.14	-0.16	0.12
				LCPED20-08-RO	GFRO100VW	110	5.60E+12	6.63E+12	1.47	86.2	9.6	4.2	4.63	47.25	3.46	53.34	0.21	-0.01	-0.12	0.66	-0.02	-0.01
				LCPED20-09-RO	GFRO100VY	130	4.58E+12	6.57E+12	1.53	88.5	6.6	4.9	4.50	29.50	2.10	53.37	-0.02	-0.08	-0.17	0.12	0.08	-0.13
				LCPED20-10-RO	GFRO100VX	150	3.43E+12	7.02E+12	1.44	86.1	8.8	5.2	4.81	25.97	1.76	52.46	0.00	0.00	0.00	0.00	0.00	0.00
														31.70								
LCPED30	32.95615	71.06380	708	LCPED30-01-RO	GFRO1002Q	2.5	3.55E+11	1.02E+12	1.16	70.4	18.1	11.5	6.08	265.09	10.07	51.72	0.10	-0.29	-0.27	0.23	0.22	0.36
				LCPED30-02-RO	GFRO1002R	7.5	2.61E+11	7.40E+11	1.31	68.7	19.4	11.9	5.90	214.96	3.67	50.93	0.18	-0.31	-0.28	0.24	0.22	0.27
				LCPED30-03-RO	GFRO1002S	15	7.64E+11	1.57E+13	1.25	73.1	17.1	9.8	5.94	107.99	4.75	52.07	-0.02	-0.32	-0.37	0.26	0.33	0.17
				LCPED30-04-RO	GFRO1002T	30	1.60E+13	2.63E+13	1.09	73.8	16.0	10.2	5.92	90.85	3.50	51.94	0.07	-0.25	-0.32	0.42	0.23	0.30
				LCPED30-05-RO	GFRO1002U	50	1.43E+13	1.75E+13	1.15	76.6	14.4	9.1	5.83	84.92	4.09	50.82	0.30	-0.08	-0.25	0.65	0.08	0.60
				LCPED30-06-RO	GFRO100VZ	70	9.84E+12	1.19E+13	1.37					66.37	2.58	49.74	0.44	0.04	-0.18	0.66	-0.01	0.46
				LCPED30-07-RO	GFRO100W0	90	6.52E+12	6.35E+12	1.60	90.8	6.2	3.1	5.97	42.66	4.49	48.98	0.81	0.32	-0.03	1.02	-0.18	0.50
				LCPED30-08-RO	GFRO100W1	110	4.40E+12	5.29E+12	1.69	90.9	6.2	2.9	5.92	53.27	1.89	48.82	0.59	0.15	-0.23	0.80	-0.05	0.23
				LCPED30-09-RO	GFRO100W2	130	3.87E+12	5.93E+12	1.80	88.8	7.0	4.1	5.72	66.23	2.01	49.08	0.51	0.13	-0.14	0.61	-0.05	0.16
				LCPED30-10-RO	GFRO100W3	150	2.75E+12	5.87E+12	1.76	90.3	5.4	4.3	5.80	60.10	2.13	49.20	0.69	0.23	-0.11	0.92	-0.14	0.31
				LCPED30-11-RO	GFRO100W4	170	3.12E+12	7.14E+12	1.70	89.3	7.5	3.2	5.62	58.46	1.97	49.68	0.67	0.29	0.01	0.73	-0.18	0.41
				LCPED30-12-RO	GFRO100W5	190	3.76E+12	7.18E+12	1.60	92.0	5.8	2.3	5.68	52.91	2.21	49.33	0.29	-0.03	-0.28	0.51	0.10	0.12
				LCPED30-13-RO	GFRO100W6	210	3.55E+12	4.97E+12	1.64	93.1	5.5	1.4	5.76	59.30	1.93	48.91	0.10	-0.19	-0.37	0.28	0.32	-0.09
				LCPED30-14-RO	GFRO100W7	230	1.96E+12	4.97E+12	1.64	93.5	5.0	1.6	5.74	52.38	1.73	48.90	0.53	0.18	-0.20	0.74	-0.05	0.27
				LCPED30-15-RO	GFRO100WA	250	1.59E+12		1.62	91.5	6.6	1.9	5.61	48.02	1.88	49.12	0.50	0.14	-0.22	0.71	-0.03	0.26
				LCPED30-16-RO	GFRO100WB	270			1.55	91.8	5.6	2.6	5.55	59.82	2.07	49.73	0.65	0.28	-0.06	0.92	-0.15	0.51
				LCPED30-17-RO	GFRO100W9	290			1.64	90.0	8.3	1.6	5.30	59.85	1.75	49.39	0.26	-0.04	-0.22	0.53	0.10	0.10
				LCPED30-18-RO	GFRO100WB	310			1.60	89.8	8.0	2.2	5.42	57.53	1.91	49.37	0.64	0.37	-0.25	0.82	-0.14	0.43
				LCPED30-19-RO	GFRO100WC	330			1.66	91.6	6.1	2.3	5.45	61.57	1.93	49.43	0.09	-0.11	-0.30	0.32	0.19	0.00
				LCPED30-20-RO	GFRO100WD	350			1.72	91.1	6.0	2.8	5.34	47.63	1.74	50.25	0.00	0.00	0.00	0.00	0.00	
LCPED40	32.95720	71.06425	724	LCPED40-01-LMM	GFRO1002V	2.5	4.72E+11	1.46E+12	1.30	72.5	18.3	9.2	5.74	191.97	9.95	52.24	-0.28	-0.49	-0.44	-0.14	0.65	-0.31
				LCPED40-02-LMM	GFRO1002W	7.5	3.14E+11	8.28E+11	1.35	72.8	18.9	8.3	5.37	92.10	4.28	52.94	-0.39	-0.50	-0.44	-0.22	0.71	-0.40
				LCPED40-03-LMM	GFRO1002X	15	8.01E+11	1.40E+13	1.51	73.3	17.2	9.5	5.06	74.86	3.40	54.81	-0.31	-0.42	-0.35	-0.03	0.45	-0.35
				LCPED40-04-LMM	GFRO1002Y	30	1.15E+13	2.03E+13	1.53	70.2	17.4	12.4	4.93	78.34	3.31	55.80	-0.25	-0.36	-0.25	0.08	0.26	-0.26
				LCPED40-05-LMM	GFRO1002Z	50	1.74E+13	2.16E+13	1.53	68.9	17.1	14.0	5.05	80.66	2.96	55.39	-0.23	-0.31	-0.13	0.11	0.18	-0.17
				LCPED40-06-LMM	GFRO10030	70	2.23E+13	8.83E+12	1.59	69.0	17.5	13.5	4.96	82.85	3.16	57.07	-0.20	-0.27	-0.02	0.15	0.04	-0.14
				LCPED40-07-LMM	GFRO100WG	90	1.34E+13	3.33E+12	1.69	69.5	16.5	14.1	5.02	84.75	3.45	57.35	-0.26	-0.33	-0.16	0.07	0.14	-0.26
				LCPED40-08-LMM	GFRO100WF	110	1.00E+13	3.20E+12	1.48	75.0	14.3	10.7	5.02	55.79	2.65	55.41	-0.26	-0.29	-0.20	-0.06	0.19	-0.19
				LCPED40-09-LMM	GFRO100WE	130	9.04E+12	3.49E+12	1.42	89.2	6.5	4.3	5.31	36.59	1.69	51.29	0.00	0.00	0.00	0.00	0.00	0.00

(1) Average of envelope signal over regolith depth from this study
(2) Bulk density from Bernhard et al., 2018
(3) Grain size distribution from Bernhard et al., 2018
(4) pH from Bernhard et al., 2018
(5) Cation exchange capacity from Bernhard et al., 2018
(6) Loss on Ignition LOI from Oeser et al., 2018
(7) Chemical Index of Alteration CIA calculated based on data from Oeser et al., 2018
(8) Mass transfer coefficient Tau calculated based on data from Oeser et al., 2018
(9) Volumetric strain calculated based on data from Oeser et al., 2018

Table S1D: Data compilation for regolith profiles

Pedon	Location		Altitude	Sample	IGSN	Depth	GPR 500[1]	GPR 1000[1]	Bulk density[2]	Grain size[3]			pH[4]	CEC[5]	LOI[6]	CIA[7]	Ca	Na	Tau[8]			Vol. strain[9]
	°S	°W	m			cm	MHz	MHz		sand %	silt %	clay %		µmolc/g					K	Mg	Zr	
Nahuelbuta																						
NAPED10	37.80735	73.01285	1248	NAPED10-01-RO	GFRO1000H	2.5	1.31E+12		0.58	54.5	22.2	23.3	3.67	118.39	28.33	68.62	-0.26	-0.32	-0.16	0.00	-0.16	1.18
				NAPED10-02-RO	GFRO1000J	7.5	6.32E+11		0.64	55.5	20.8	23.7	3.94	80.35	22.47	70.23	-0.31	-0.34	-0.13	0.08	-0.12	0.70
				NAPED10-03-RO	GFRO1000K	15	3.38E+12		0.83	56.8	21.0	22.2	4.10	68.45	18.38	70.00	-0.30	-0.34	-0.18	0.05	-0.11	0.48
				NAPED10-04-RO	GFRO1000L	30	8.74E+13		0.91	54.5	20.7	24.9	4.40	42.18	10.37	68.40	-0.29	-0.34	-0.21	-0.06	-0.12	0.37
				NAPED10-05-RO	GFRO1000M	50	1.04E+14		1.09	60.1	18.7	21.2	4.58	33.75	7.29	66.73	-0.17	-0.22	-0.19	-0.02	-0.17	0.19
				NAPED10-06-RO	GFRO1000N	70	4.99E+13		1.05	76.4	14.2	9.4	4.46	25.53	7.16	68.05	-0.30	-0.32	-0.24	0.11	-0.02	0.05
				NAPED10-07-RO	GFRO1000P	90	4.81E+13		1.04	80.7	10.8	8.5	4.52	22.34	4.90	63.46	-0.09	-0.11	-0.18	0.15	-0.09	0.15
				NAPED10-08-RO	GFRO1000Q	110	6.75E+13		1.00	89.0	6.1	5.0	4.86	13.66	3.50	58.23	0.30	0.32	0.09	0.31	-0.25	0.44
				NAPED10-09-RO	GFRO1000R	130	5.97E+13		1.01	88.0	7.1	4.9	4.85	12.38	3.12	59.01	0.21	0.19	0.07	0.39	-0.27	0.47
				NAPED10-10-RO	GFRO1000S	150	3.43E+13		1.08	88.7	6.9	4.4	4.85	10.91	3.10	58.37	0.19	0.18	0.10	0.42	-0.22	0.29
				NAPED10-11-RO	GFRO1000T	170	2.05E+13		1.13	88.5	8.1	3.4	4.88	10.12	3.07	58.30	0.07	0.10	0.11	0.13	-0.12	0.09
				NAPED10-12-RO	GFRO1000U	190	1.72E+13		1.24	92.5	4.8	2.7	5.05	5.19	4.91	55.42	0.11	0.14	0.02	0.08	-0.12	0.00
				NAPED10-13-RO	GFRO1000V	210	1.24E+13			95.0	4.3	0.7	4.21	4.53	2.31	55.22	0.00	0.00	0.00	0.00	0.00	
NAPED20	37.80770	73.01357	1239	NAPED20-01-LMM	GFRO10019	2.5	6.77E+11		0.66	56.0	19.5	24.5	4.01	97.05	26.07	72.23	-0.64	-0.61	-0.71	-0.87	1.35	-0.60
				NAPED20-02-LMM	GFRO10018	7.5	4.40E+11		0.72	53.7	19.5	26.8	4.07	75.30	24.51	73.68	-0.67	-0.62	-0.76	-0.87	1.71	-0.68
				NAPED20-03-LMM	GFRO1001A	15	6.98E+12		0.74	51.3	21.1	27.6	4.15	69.19	22.00	74.06	-0.67	-0.62	-0.75	-0.87	1.66	-0.69
				NAPED20-04-LMM	GFRO1001B	30	5.48E+13		0.77	51.2	21.4	27.4	4.33	45.43	15.02	73.88	-0.67	-0.62	-0.76	-0.87	1.70	-0.69
				NAPED20-05-LMM	GFRO1001C	50	4.09E+13		0.86	52.1	21.2	26.8	4.41	29.01	6.85	69.41	-0.64	-0.49	-0.55	-0.88	1.18	-0.66
				NAPED20-06-LMM	GFRO1001D	70	2.43E+13		1.18	64.0	18.6	17.4	4.19	38.59	8.93	75.44	-0.64	-0.69	-0.51	-0.69	1.20	-0.75
				NAPED20-07-LMM	GFRO100WP	90	2.13E+13		1.07	78.3	12.7	9.0	4.21	41.86	7.74	67.18	3.42	0.64	1.62	2.36	-0.59	0.47
				NAPED20-08-LMM	GFRO100WN	110	3.50E+13		0.89	80.0	11.8	8.2	4.27	27.73	6.67	61.56	2.12	0.14	0.12	0.79	-0.20	-0.10
				NAPED20-09-LMM	GFRO100WM	130	2.76E+13		0.90	81.1	11.9	7.1	4.46	15.60	6.88	59.57	0.73	-0.25	-0.45	-0.20	0.57	-0.55
				NAPED20-10-LMM	GFRO100WL	150	3.09E+13		1.05	77.9	13.6	8.5	4.48	15.47	6.91	65.57	0.79	-0.19	-0.22	-0.01	0.15	-0.47
				NAPED20-11-LMM	GFRO100WK	170	4.49E+13		0.81	77.8	14.6	7.6	4.18	37.86	8.18	79.01	-0.32	-0.50	0.32	0.11	-0.13	-0.10
				NAPED20-12-LMM	GFRO100WQ	190	3.30E+13		0.93	81.2	12.3	6.5	4.25	28.72	7.03	73.65	0.32	-0.01	0.39	0.47	-0.31	0.00
				NAPED20-13-LMM	GFRO100WR	210	1.17E+13			80.3	11.5	8.2	4.42	19.37	6.85	73.55	0.08	-0.13	-0.04	0.13	-0.08	
				NAPED20-14-LMM	GFRO100WJ	230	8.04E+12			82.4	11.7	5.9	4.52	16.05	7.11	71.99	0.36	0.20	0.09	0.29	-0.15	
				NAPED20-15-LMM	GFRO100WH	250	5.27E+12			83.6	10.8	5.6	4.58	15.50	6.91	72.42	0.00	0.00	0.00	0.00	0.00	
NAPED30	37.80838	73.01345	1228	NAPED30-01-RO	GFRO1001F	2.5	3.42E+12		0.66	49.4	22.8	27.9	4.38	82.65	23.70	67.12	-0.64	-0.51	-0.65	-0.40	0.72	0.46
				NAPED30-02-RO	GFRO1001G	7.5	1.27E+12		0.71	47.1	24.1	28.8	4.18	61.78	21.64	67.92	-0.66	-0.51	-0.65	-0.42	0.77	0.44
				NAPED30-03-RO	GFRO1001H	15	3.51E+12		0.75	47.5	23.5	29.0	4.23	60.28	21.24	69.00	-0.69	-0.54	-0.68	-0.46	0.93	0.10
				NAPED30-04-RO	GFRO1001J	30	2.54E+13		0.84	47.6	26.4	26.1	4.36	37.22	17.22	69.39	-0.69	-0.52	-0.66	-0.44	0.83	0.17
				NAPED30-05-RO	GFRO1001K	50	2.94E+13		0.84	51.2	29.1	19.7	4.48	27.41	11.05	67.47	-0.63	-0.36	-0.42	-0.35	0.41	0.35
				NAPED30-06-RO	GFRO100WU	70	5.19E+13		1.12	61.0	19.3	19.8	4.49	27.34	7.81	68.41	-0.67	-0.20	-0.31	-0.35	0.33	0.07
				NAPED30-07-RO	GFRO100WT	90	1.06E+14		1.34	75.4	16.1	8.5	4.39	19.85	5.25	68.88	-0.66	-0.01	-0.22	-0.24	0.14	0.04
				NAPED30-08-RO	GFRO100WS	110	1.30E+14		1.59	87.5	8.4	4.1	4.53	8.21	2.64	54.48	0.00	0.00	0.00	0.00	0.00	0.00
NAPED40	37.80904	73.01380	1200	NAPED40-01-RO	GFRO1001R	2.5	3.23E+12		0.78	59.7	20.5	19.8	4.57	47.67	14.91	72.64	0.34	-0.02	0.22	0.51	-0.14	0.93
				NAPED40-02-RO	GFRO1001S	7.5	1.26E+12		0.90	59.1	20.9	20.0	4.52	42.58	16.03	73.55	0.24	-0.08	0.13	0.51	-0.06	0.66
				NAPED40-03-RO	GFRO1001T	15	4.33E+12		0.92	54.7	24.1	21.2	4.51	42.61	16.19	73.55	0.25	-0.07	0.15	0.52	-0.07	0.64
				NAPED40-04-RO	GFRO1001U	30	1.79E+13		0.97	55.3	22.3	22.4	4.57	32.00	13.35	74.70	0.11	-0.16	0.06	0.45	-0.01	0.37
				NAPED40-05-RO	GFRO1001V	50	5.15E+13		1.19	64.8	18.3	16.9	4.80	11.87	4.19	66.21	0.29	1.55	1.34	0.38	-0.45	1.00
				NAPED40-06-RO	GFRO100X0	70	7.35E+13		1.15	71.1	15.2	13.7	4.83	7.95	3.61	65.85	0.28	0.16	0.22	0.16	-0.08	0.23
				NAPED40-07-RO	GFRO10050	90	1.03E+14		1.22	79.8	11.6	8.6	4.90	7.49	4.02	67.05	-0.09	-0.17	0.32	-0.03	-0.02	0.10
				NAPED40-08-RO	GFRO100WZ	110	1.14E+14		1.20	79.7	11.2	9.1	4.76	10.35	4.67	71.07	0.21	0.01	0.92	0.68	-0.39	0.79
				NAPED40-09-RO	GFRO100WY	130	9.47E+13		1.21	78.9	12.6	8.5	4.73	13.71	5.07	72.70	-0.03	-0.16	0.34	0.61	-0.07	0.16
				NAPED40-10-RO	GFRO100WX	150	8.09E+13		1.27	78.5	14.3	7.3	4.73	14.94	4.31	69.07	-0.06	-0.16	0.22	0.33	0.03	0.00
				NAPED40-11-RO	GFRO100WV	170	5.79E+13		n.d.	83.6	11.0	5.3	4.87	9.87	3.38	64.89	1.00	0.10	0.52	1.35	-0.17	
				NAPED40-12-RO	GFRO100WW	190	3.39E+13		n.d.	81.3	11.9	6.9	4.91	11.32	3.18	67.14	0.00	0.00	0.00	0.00	0.00	

[1] Average of envelope signal over regolith depth from this study
[2] Bulk density from Bernhard et al., 2018
[3] Grain size distribution from Bernhard et al., 2018
[4] pH from Bernhard et al., 2018
[5] Cation exchange capacity from Bernhard et al., 2018
[6] Loss on Ignition LOI from Oeser et al., 2018
[7] Chemical Index of Alteration CIA calculated based on data from Oeser et al., 2018
[8] Mass transfer coefficient Tau calculated based on data from Oeser et al., 2018
[9] Volumetric strain calculated based on data from Oeser et al., 2018

TableS2A to D

Table S2A: Data compilation for regolith profiles

Pedon	Location °S	°W	Altitude m	Sample	IGSN	Depth cm	GPR 500[1] MHz	GPR 1000[1] MHz	Bulk density[2]	Grain size[3] sand %	silt %	clay %	pH[4]	CEC[5] µmolc/g	LOI[6]	CIA[7]	Ca	Na	Tau[8] K	Mg	Zr	Vol. strain[9]
Pan de Azucar																						
AZPED60	26.11012	70.54922	343	AZPED60-01-RO	GFRO100TP	5.00	3.93E+11	1.83E+12	-0.031	0.691	-0.951	0.260	0.022	0.000	-0.048	-0.665	0.109	0.024	0.056	-0.101	-0.114	0.046
				AZPED60-02-RO	GFRO100TQ	11.25	2.81E+11	2.01E+12		-1.663	0.629	1.033	-0.003	0.000	0.197	-3.763	0.715	-0.001	-0.018	0.250	-0.040	
				AZPED60-03-RO	GFRO100TR	22.50	7.50E+11	3.09E+13		-0.173	0.852	-0.679	-0.009	0.000	0.005	0.429	-0.163	0.024	0.002	-0.052	-0.004	
				AZPED60-04-RO	GFRO100TS	40.00	1.63E+13	2.95E+13							-0.100	1.047	-0.156	0.004	0.002	-0.089	0.009	
				AZPED60-05-RO	GFRO100TT	60.00	2.21E+13	1.93E+13							-0.011	0.192	-0.002	-0.006	0.002	-0.002	-0.006	
				AZPED60-06-RO	GFRO100TU	80.00	1.06E+13	1.10E+13							-0.023	-0.022	0.006	0.007	0.016	0.000	-0.017	
				AZPED60-07-RO	GFRO100TW	100.00	6.22E+12	6.95E+12							0.008	-0.041	0.001	-0.001	-0.003	-0.001	0.006	
				AZPED60-08-RO	GFRO100TV																	
AZPED50	26.11027	70.54922	333	AZPED50-01-RO	GFRO100TX	5.00	3.37E+11	1.96E+12	0.080				0.018	0.000	-0.056	-3.105	0.328	0.058	0.051	-0.122	-0.075	-0.021
				AZPED50-02-RO	GFRO100TY	11.25	2.26E+11	2.64E+12							-0.169	2.063	-0.224	0.000	0.019	-0.037	0.009	
				AZPED50-03-RO	GFRO100TZ	22.50	8.86E+11	4.07E+13							0.000	-0.112	0.004	-0.001	-0.013	-0.006	0.006	
				AZPED50-04-RO	GFRO100U0	40.00	1.72E+13	2.90E+13							0.037	-0.048	0.011	-0.001	-0.002	0.009	-0.005	
				AZPED50-05-RO	GFRO100U1	60.00	2.32E+13	1.36E+13							-0.009	0.098	-0.009	-0.009	-0.007	-0.005	0.005	
				AZPED50-06-RO	GFRO100U2	80.00	1.47E+13	7.76E+12							0.055	-0.443	0.046	-0.004	0.005	0.020	-0.006	
				AZPED50-07-RO	GFRO100U3	100.00	1.38E+13	6.06E+12							-0.043	0.364	-0.038	0.008	0.003	-0.016	0.004	
				AZPED50-08-RO	GFRO100U4	120.00	7.58E+12	5.85E+12							0.037	-0.082	0.010	-0.004	-0.007	0.004	0.001	
				AZPED50-09-RO	GFRO100U5																	
AZPED40	26.11024	70.54921	326	AZPED40-01-RO	GFRO100BJ	5.00	2.92E+11	1.69E+12	0.049	-1.173	0.239	0.935	0.000	0.000	0.138	-1.134	0.129	-0.037	0.037	0.030	-0.014	0.035
				AZPED40-02-RO	GFRO100U6	11.25	2.31E+11	2.39E+12		-2.546	2.808	-0.262	0.017	0.000	0.064	-1.467	0.201	-0.038	0.007	-0.001	-0.020	
				AZPED40-03-RO	GFRO100U7	22.50	9.48E+11	3.53E+13							-0.199	1.800	-0.162	-0.005	0.001	-0.019	0.012	
				AZPED40-04-RO	GFRO100U8	40.00	1.95E+13	3.10E+13							0.036	-0.106	-0.002	0.022	-0.010	-0.012	0.005	
				AZPED40-05-RO	GFRO100U9	60.00	2.33E+13	1.30E+13							0.040	-0.338	0.015	0.008	0.001	-0.002	-0.004	
				AZPED40-06-RO	GFRO100UA	80.00	7.12E+12	6.31E+12							0.094	-0.133	0.018	-0.014	0.005	0.017	-0.002	
				AZPED40-07-RO	GFRO100UB	100.00	4.37E+12	5.91E+12							-0.070	0.059	-0.013	0.019	-0.003	-0.008	-0.001	
				AZPED40-08-RO	GFRO100UC																	
AZPED21	26.10936	70.54907	342	AZPED21-01-LMM	GFRO100UD	5.00	2.73E+11	8.47E+11	0.035	2.053	-1.868	-0.185	0.004	0.000	-0.070	0.129	0.107	0.026	0.018	-0.114	-0.028	0.028
				AZPED21-02-LMM	GFRO100UE	11.25	1.71E+11	9.89E+11	-0.006	-1.070	-0.176	1.247	-0.004	0.000	-0.145	0.278	-0.180	-0.029	-0.010	-0.053	0.013	0.030
				AZPED21-03-LMM	GFRO100UF	22.50	5.59E+11	2.51E+13		-1.138	1.133	0.004	-0.009	0.000	0.122	-0.575	0.349	0.004	-0.006	-0.014	0.010	
				AZPED21-04-LMM	GFRO100UG	40.00	1.08E+13	1.84E+13							-0.091	0.836	-0.485	-0.001	0.003	-0.031	-0.006	
				AZPED21-05-LMM	GFRO100UH	60.00	1.67E+13	2.18E+13							-0.031	-0.188	0.052	0.013	0.018	-0.018	-0.004	
				AZPED21-06-LMM	GFRO100UJ	80.00	9.33E+12	1.85E+13							-0.021	0.263	-0.129	-0.005	-0.008	-0.008	0.005	
				AZPED21-07-LMM	GFRO100UK																	

(1) Average of envelope signal over regolith depth from this study
(2) Bulk density from Bernhard et al., 2018
(3) Grain size distribution from Bernhard et al., 2018
(4) pH from Bernhard et al., 2018
(5) Cation exchange capacity from Bernhard et al., 2018
(6) Loss on Ignition LOI from Oeser et al., 2018
(7) Chemical Index of Alteration CIA calculated based on data from Oeser et al., 2018
(8) Mass transfer coefficient Tau calculated based on data from Oeser et al., 2018
(9) Volumetric strain calculated based on data from Oeser et al., 2018

Table S2B: Data compilation for regolith profiles

Pedon	Location °S	°W	Altitude m	Sample	IGSN	Depth cm	GPR 500[1] MHz	GPR 1000[1] MHz	Bulk density[2]	Grain size[3] sand %	silt %	clay %	pH[4]	CEC[5] µmolc/g	LOI[6]	CIA[7]	Ca	Na	Tau[8] K	Mg	Zr	Vol. strain[9]
Santa Gracia																						
SGPED10	29.75633	71.16626	727																			
SGPED20	29.75636	71.16721	718	SGPED20-01-LMM	GFRO100UL	5.00	2.395E+11	8.287E+11	-0.014	-0.485	0.041	0.443	-0.116	-3.227	0.000	-0.264	-0.014	-0.046	-0.125	0.017	0.037	-0.038
				SGPED20-02-LMM	GFRO100UM	11.25	1.568E+11	6.910E+11	-0.001	-0.521	0.125	0.396	-0.007	5.842	-0.011	-0.038	-0.006	0.006	-0.043	-0.011	0.011	-0.013
				SGPED20-03-LMM	GFRO100UN	22.50	8.200E+11	1.219E+13	0.005	0.014	-0.005	-0.009	0.015	0.177	-0.069	0.054	-0.001	0.001	0.000	-0.004	-0.001	-0.003
				SGPED20-04-LMM	GFRO100UP	40.00	1.319E+13	1.846E+13							-0.016	-0.068	0.003	0.000	-0.024	-0.001	0.004	
				SGPED20-05-LMM	GFRO100UQ	60.00	1.481E+13	1.558E+13							0.003	-0.021	-0.001	-0.002	0.024	0.007	-0.001	
				SGPED20-06-LMM	GFRO100UR	80.00	7.812E+12	6.776E+12							0.001	0.020	0.001	0.005	0.026	-0.004	-0.007	
				SGPED20-07-LMM	GFRO100US	100.00	5.727E+12	3.880E+12							-0.003	-0.030	0.006	0.005	-0.051	0.010	-0.002	
				SGPED20-08-LMM	GFRO100UT																	
SGPED40	29.75738	71.16635	682	SGPED40-01-RO	GFRO100UU	5.00	2.547E+11	7.841E+11	0.015	0.411	-0.446	0.035	0.002	1.260	0.014	0.141	-0.013	-0.011	-0.014	-0.006	0.029	-0.011
				SGPED40-02-RO	GFRO100UV	11.25	2.583E+11	9.233E+11	0.000	-0.042	-0.183	0.225	-0.015	0.192	-0.004	0.059	0.003	0.005	0.008	0.001	-0.016	0.006
				SGPED40-03-RO	GFRO100V3	22.50	1.137E+12	2.024E+13	-0.008	-0.032	-0.014	0.046	-0.005	0.498	-0.005	0.024	0.002	0.003	-0.002	0.002	-0.006	0.003
				SGPED40-04-RO	GFRO100UW	40.00	2.158E+13	1.880E+13	0.000	-0.062	-0.001	0.063	-0.007	0.521	0.006	-0.002	0.019	0.017	0.008	0.023	-0.029	0.018
				SGPED40-05-RO	GFRO100UX	60.00	2.332E+13	1.758E+13		0.036	0.027	-0.063	-0.025	1.921	0.006	0.022	-0.004	0.003	-0.005	0.000	0.000	
				SGPED40-06-RO	GFRO100UY	80.00	1.314E+13	1.708E+13							0.006	0.085	-0.010	-0.005	-0.006	-0.005	0.006	
				SGPED40-07-RO	GFRO100UZ	100.00	1.645E+13	9.035E+12							-0.020	-0.154	-0.004	-0.011	-0.012	-0.008	0.022	
				SGPED40-08-RO	GFRO100V0	120.00	8.368E+12	4.286E+12							-0.027	-0.059	0.016	0.015	0.013	0.011	-0.026	
				SGPED40-09-RO	GFRO100V1	140.00	4.605E+12	3.310E+12							-0.005	-0.001	0.005	0.001	0.017	0.004	-0.005	
				SGPED40-10-RO	GFRO100V2	160.00	4.292E+12	4.092E+12							-0.005	-0.010	0.000	0.003	-0.003	-0.005	0.000	
				SGPED40-11-RO	GFRO100CR																	
SGPED60	29.75826	71.16615	638	SGPED60-01-RO	GFRO100V4	5.00	2.417E+11	1.053E+12	-0.012	0.397	-0.392	-0.005	0.002	-0.621	-0.072	0.078	0.006	0.015	0.012	-0.006	-0.016	0.020
				SGPED60-02-RO	GFRO100V5	11.25	2.048E+11	9.327E+11	-0.002	-0.532	0.358	0.173	0.008	0.035	0.124	-0.033	-0.006	-0.011	-0.013	0.010	0.011	-0.011
				SGPED60-03-RO	GFRO100V6	22.50	9.275E+11	1.961E+13	0.001	0.174	-0.204	0.030	-0.041	-0.013	-0.057	0.038	0.000	0.001	0.003	-0.002	-0.003	0.003
				SGPED60-04-RO	GFRO100V7	40.00	1.561E+13	1.674E+13	-0.002	-0.230	0.104	0.126	-0.004	1.441	-0.012	0.014	0.003	0.005	0.006	-0.001	-0.005	0.007
				SGPED60-05-RO	GFRO100V8	60.00	1.324E+13	1.052E+13		0.606	-0.378	-0.228	0.002	0.629	0.002	-0.023	0.011	0.008	0.002	0.008	-0.005	
				SGPED60-06-RO	GFRO100V9	80.00	6.252E+12	8.791E+12							0.002	0.052	-0.005	-0.002	0.006	-0.003	-0.001	
				SGPED60-07-RO	GFRO100VA	100.00	7.410E+12	6.552E+12							-0.006	0.009	0.001	0.004	0.013	-0.007	-0.005	
				SGPED60-08-RO	GFRO100VB	120.00	5.418E+12	3.899E+12							-0.001	-0.024	-0.004	-0.006	0.002	0.001	0.003	
				SGPED60-09-RO	GFRO100VC	140.00	3.666E+12	3.521E+12							-0.007	-0.032	0.005	0.003	-0.013	0.002	0.004	
				SGPED60-10-RO	GFRO100VD	160.00	3.018E+12	4.761E+12							-0.007	0.005	-0.005	-0.007	-0.008	0.002	0.004	
				SGPED60-11-RO	GFRO100VE																	
SGPED70	29.76120	71.16559	690	SGPED70-01-RO	GFRO100VF	5.00	3.942E+11	5.722E+11	0.016				-1.242	1.890	0.008	0.216	0.019	0.047	0.026	0.022	-0.055	0.040
				SGPED70-02-RO	GFRO100VG	11.25	2.459E+11	8.420E+11	0.004				0.769	-11.256	-0.005	0.150	0.004	0.002	0.010	0.010	-0.011	0.013
				SGPED70-03-RO	GFRO100VH	22.50	6.988E+11	2.272E+13	0.000				-0.385	0.000	0.020	0.053	-0.001	-0.004	-0.001	0.003	0.001	-0.007
				SGPED70-04-RO	GFRO100VJ	40.00	1.285E+13	1.877E+13							0.003	-0.115	0.008	0.005	0.002	0.010	-0.003	
				SGPED70-05-RO	GFRO100VK	60.00	1.206E+13	7.211E+12							-0.065	-0.051	-0.001	0.001	0.007	0.000	-0.001	
				SGPED70-06-RO	GFRO100VL	80.00	4.538E+12	2.108E+12							0.011	-0.002	0.009	0.010	0.003	0.012	-0.008	
				SGPED70-07-RO	GFRO100VM	100.00	1.711E+12	2.703E+12							-0.004	-0.086	-0.011	-0.015	-0.003	-0.009	0.011	
				SGPED70-08-RO	GFRO100VN	120.00	1.087E+12	3.197E+12							-0.014	0.021	0.001	0.004	0.005	-0.005	-0.002	
				SGPED70-09-RO	GFRO100VP	140.00	1.148E+12	3.930E+12							-0.005	-0.022	0.008	0.006	0.000	0.009	-0.004	
				SGPED70-10-RO	GFRO100VQ	160.00	1.278E+12	4.897E+12							0.013	0.030	-0.008	-0.006	-0.001	-0.009	0.004	
				SGPED70-11-RO	GFRO100VR																	

(1) Average of envelope signal over regolith depth from this study
(2) Bulk density from Bernhard et al., 2018
(3) Grain size distribution from Bernhard et al., 2018
(4) pH from Bernhard et al., 2018
(5) Cation exchange capacity from Bernhard et al., 2018
(6) Loss on Ignition LOI from Oeser et al., 2018
(7) Chemical Index of Alteration CIA calculated based on data from Oeser et al., 2018
(8) Mass transfer coefficient Tau calculated based on data from Oeser et al., 2018
(9) Volumetric strain calculated based on data from Oeser et al., 2018

Table S2C: Data compilation for regolith profiles

Pedon	Location °S	Location °W	Altitude m	Sample	IGSN	Depth cm	GPR 500[1] MHz	GPR 1000[1] MHz	Bulk density[2]	Grain size[3] sand %	silt %	clay %	pH[4]	CEC[5] µmolc/g	LOI[6]	CIA[7]	Ca	Na	Tau[8] K	Mg	Zr	Vol. strain[9]
La Campana																						
LCPED10	32.95581	71.06332	734	LCPED10-01-RO	GFRO10021	5.00	3.57E+11	8.02E+11	0.019	0.342	-0.160	-0.182	-0.028	-30.399	-1.672	0.383	-0.096	0.003	-0.002	-0.007	0.006	-0.007
				LCPED10-02-RO	GFRO10022	11.25	3.71E+11	1.48E+12	-0.004	0.009	-0.067	0.058	-0.037	-5.507	-0.185	0.098	-0.017	0.002	0.003	0.000	-0.008	-0.001
				LCPED10-03-RO	GFRO10023	22.50	1.70E+12	4.37E+13	0.011	0.132	-0.167	0.035	-0.025	-0.769	-0.055	0.103	-0.023	0.005	0.008	-0.007	-0.016	0.004
				LCPED10-04-RO	GFRO10024	40.00	2.53E+13	2.80E+13	0.009	0.193	-0.186	-0.007	-0.022	-0.482	0.008	0.089	-0.028	0.006	0.012	-0.010	-0.018	0.007
				LCPED10-05-RO	GFRO100VS	60.00	1.74E+13	2.53E+13	-0.001	0.251	-0.130	-0.122	-0.008	-0.133	0.014	-0.009	-0.028	0.011	0.011	-0.016	-0.009	0.008
				LCPED10-06-RO	GFRO100VT																	
LCPED20	32.95588	71.06355	718	LCPED20-01-RO	GFRO10029	5.00	4.13E+11	1.41E+12	0.079	0.297	-0.127	-0.170	-0.042	46.737	-1.522	0.500	-0.072	-0.001	-0.012	-0.016	0.014	-0.094
				LCPED20-02-RO	GFRO1002A	11.25	2.81E+11	9.99E+11	0.025	0.098	-0.184	0.085	-0.004	-16.491	-0.192	0.160	-0.002	0.006	0.006	0.014	-0.005	-0.034
				LCPED20-03-RO	GFRO1002B	22.50	7.48E+11	2.20E+13	0.002	0.006	-0.071	0.065	-0.017	-2.093	-0.003	-0.003	0.004	0.003	0.002	0.011	-0.003	0.005
				LCPED20-04-RO	GFRO1002C	40.00	1.52E+13	2.67E+13	0.007	0.053	0.024	-0.077	-0.009	-0.463	0.020	-0.019	-0.005	-0.007	-0.006	-0.005	0.009	-0.016
				LCPED20-05-RO	GFRO1002D	60.00	1.95E+13	4.66E+13	0.004	0.340	-0.158	-0.182	-0.002	-0.779	-0.079	-0.053	0.037	0.020	0.013	0.062	-0.018	0.015
				LCPED20-06-RO	GFRO100VU	80.00	2.49E+13	1.92E+13	0.002	0.056	-0.124	0.068	-0.010	-0.348	-0.041	0.022	-0.009	-0.003	0.000	-0.019	0.001	-0.003
				LCPED20-07-RO	GFRO100VV	100.00	1.57E+13	7.44E+12	-0.003	0.088	0.036	-0.124	0.000	0.022	0.038	-0.022	-0.014	-0.007	-0.007	-0.024	0.007	-0.006
				LCPED20-08-RO	GFRO100VW	120.00	5.60E+12	6.63E+12	0.003	0.116	-0.153	0.037	-0.006	-0.888	-0.068	0.001	-0.011	-0.004	-0.002	-0.027	0.005	-0.006
				LCPED20-09-RO	GFRO100VY	140.00	4.58E+12	6.64E+12	-0.005	-0.123	0.110	0.013	0.016	-0.176	-0.017	-0.045	0.001	0.004	0.008	-0.006	-0.004	0.006
				LCPED20-10-RO	GFRO100VX																	
LCPED30	32.95615	71.06380	708	LCPED30-01-RO	GFRO1002Q	5.00	3.55E+11	1.02E+12	0.030	-0.349	0.260	0.089	-0.036	-10.027	-1.280	-0.158	0.016	-0.003	-0.002	0.001	0.001	-0.019
				LCPED30-02-RO	GFRO1002R	11.25	3.09E+11	9.43E+11	-0.009	0.588	-0.307	-0.282	0.005	-14.262	0.144	0.151	-0.028	-0.002	-0.012	0.003	0.015	-0.013
				LCPED30-03-RO	GFRO1002S	22.50	1.11E+12	2.34E+13	-0.010	0.050	-0.073	0.023	-0.001	-1.143	-0.083	-0.008	0.007	0.005	0.003	0.011	-0.007	0.009
				LCPED30-04-RO	GFRO1002T	40.00	1.72E+13	2.40E+13	0.003	0.137	-0.081	-0.056	-0.004	-0.296	0.030	-0.056	0.011	0.009	0.004	0.012	-0.007	0.015
				LCPED30-05-RO	GFRO1002U	60.00	1.43E+13	1.75E+13	0.011	-3.828	-0.719	-0.453	-0.292	-0.928	-0.076	-0.054	0.007	0.006	0.003	0.000	-0.004	-0.007
				LCPED30-06-RO	GFRO100VZ	80.00	9.84E+12	1.19E+13	0.012	4.538	0.309	0.153	0.299	-1.185	0.096	-0.038	0.018	0.014	0.007	0.018	-0.008	0.002
				LCPED30-07-RO	GFRO100W0	100.00	6.52E+12	6.35E+12	0.005	0.007	0.002	-0.008	-0.002	0.531	-0.130	-0.008	-0.011	-0.008	-0.010	-0.011	0.006	-0.014
				LCPED30-08-RO	GFRO100W1	120.00	4.40E+12	5.29E+12	0.005	-0.103	0.041	0.062	-0.010	0.648	0.006	0.013	-0.004	-0.001	0.004	-0.009	0.000	-0.003
				LCPED30-09-RO	GFRO100W2	140.00	3.87E+12	6.08E+12	-0.002	0.075	-0.081	0.007	0.004	-0.307	0.006	0.006	0.009	0.005	0.002	0.015	-0.004	0.008
				LCPED30-10-RO	GFRO100W3	160.00	2.75E+12	5.87E+12	-0.003	-0.050	0.104	-0.053	-0.009	-0.082	-0.008	0.024	-0.001	0.003	0.006	-0.010	-0.002	0.005
				LCPED30-11-RO	GFRO100W4	180.00	3.12E+12	7.14E+12	-0.005	0.132	-0.085	-0.047	0.003	-0.278	0.012	-0.018	-0.019	-0.016	-0.015	-0.011	0.014	-0.015
				LCPED30-12-RO	GFRO100W5	200.00	3.76E+12	7.18E+12	0.002	0.056	-0.013	-0.043	0.004	0.320	-0.014	-0.021	-0.009	-0.008	-0.005	-0.012	0.011	-0.011
				LCPED30-13-RO	GFRO100W6	220.00	3.55E+12	4.97E+12	0.000	0.018	-0.027	0.008	-0.001	-0.346	-0.010	0.000	0.021	0.018	0.009	0.023	-0.018	0.018
				LCPED30-14-RO	GFRO100W7	240.00	1.96E+12	4.97E+12	-0.001	-0.097	0.082	0.015	-0.006	-0.218	0.008	0.011	-0.001	-0.002	-0.001	-0.001	0.001	0.000
				LCPED30-15-RO	GFRO100WA	260.00			-0.004	0.013	-0.050	0.037	-0.003	0.590	0.010	0.030	0.007	0.007	0.008	0.011	-0.006	0.012
				LCPED30-16-RO	GFRO100W8	280.00			0.004	-0.087	0.136	-0.049	-0.013	0.002	-0.016	-0.017	-0.019	-0.016	-0.008	-0.020	0.013	-0.020
				LCPED30-17-RO	GFRO100W9	300.00			-0.002	-0.013	-0.018	0.030	0.006	-0.116	0.008	-0.001	0.019	0.020	-0.001	0.015	-0.012	0.017
				LCPED30-18-RO	GFRO100WB	320.00			0.003	0.091	-0.097	0.006	0.002	0.202	0.001	0.003	-0.027	-0.024	-0.002	-0.025	0.016	-0.021
				LCPED30-19-RO	GFRO100WC	340.00			0.003	-0.023	0.000	0.024	-0.006	-0.697	-0.010	0.041	-0.005	0.005	0.015	-0.016	-0.010	0.000
				LCPED30-20-RO	GFRO100WD																	
LCPED40	32.95720	71.06425	724	LCPED40-01-LMM	GFRO1002V	5.00	4.72E+11	1.46E+12	0.009	0.067	0.110	-0.177	-0.074	-19.974	-1.134	0.139	-0.021	-0.002	0.000	-0.014	0.011	-0.018
				LCPED40-02-LMM	GFRO1002W	11.25	3.20E+11	9.52E+11	0.022	0.070	-0.228	0.158	-0.041	-2.298	-0.117	0.250	0.010	0.011	0.012	0.025	-0.035	0.006
				LCPED40-03-LMM	GFRO1002X	22.50	1.06E+12	1.98E+13	0.002	-0.208	0.018	0.190	-0.009	0.232	-0.006	0.066	0.004	0.004	0.006	0.007	-0.013	0.006
				LCPED40-04-LMM	GFRO1002Y	40.00	1.22E+13	1.85E+13	0.000	-0.064	-0.015	0.080	0.006	0.116	-0.018	-0.021	0.001	0.002	0.006	0.002	-0.004	0.004
				LCPED40-05-LMM	GFRO1002Z	60.00	1.74E+13	2.16E+13	0.003	0.003	0.021	-0.024	-0.004	0.110	0.010	0.084	0.001	0.002	0.006	0.002	-0.007	0.002
				LCPED40-06-LMM	GFRO10030	80.00	2.23E+13	8.83E+12	0.005	0.024	-0.054	0.030	0.003	0.095	0.015	0.014	-0.003	-0.003	-0.007	-0.004	0.005	-0.006
				LCPED40-07-LMM	GFRO100WG	100.00	1.34E+13	3.33E+12	-0.010	0.278	-0.109	-0.169	0.000	-1.448	-0.040	-0.097	0.000	0.002	-0.002	-0.007	0.002	0.003
				LCPED40-08-LMM	GFRO100WF	120.00	1.00E+13	3.20E+12	-0.003	0.710	-0.391	-0.319	0.015	-0.960	-0.048	-0.206	0.013	0.014	0.010	0.003	-0.010	0.010
				LCPED40-09-LMM	GFRO100WE																	

[1] Average of envelope signal over regolith depth from this study
[2] Bulk density from Bernhard et al., 2018
[3] Grain size distribution from Bernhard et al., 2018
[4] pH from Bernhard et al., 2018
[5] Cation exchange capacity from Bernhard et al., 2018
[6] Loss on Ignition LOI from Oeser et al., 2018
[7] Chemical Index of Alteration CIA calculated based on data from Oeser et al., 2018
[8] Mass transfer coefficient Tau calculated based on data from Oeser et al., 2018
[9] Volumetric strain calculated based on data from Oeser et al., 2018

Table S2D: Data compilation for regolith profiles

Pedon	Location		Altitude	Sample	IGSN	Depth	GPR 500[1]	GPR 1000[1]	Bulk density[2]	Grain size[3] sand	silt	clay	pH[4]	CEC[5]	LOI[6]	CIA[7]	Ca	Na	Tau[8] K	Mg	Zr	Vol. strain[9]
	°S	°W	m			cm	MHz	MHz		%	%	%		µmolc/g								
Nahuelbuta															µmolc/g							
NAPED10	37.80735	73.01285	1248	NAPED10-01-RO	GFRO1000H	5.00	1.3147E+12		0.01139	0.20268	-0.28829	0.08562	0.05400	-7.60889	-1.17200	0.32210	-0.00846	-0.00497	0.00515	0.01535	0.00780	-0.09542
				NAPED10-02-RO	GFRO1000J	11.25	6.3965E+11		0.02506	0.17227	0.03605	-0.20832	0.02133	-1.58585	-0.54533	-0.03075	0.00123	0.00025	-0.00606	-0.00466	0.00145	-0.02946
				NAPED10-03-RO	GFRO1000K	22.50	7.4276E+12		0.00544	-0.15652	-0.02317	0.17969	0.02000	-1.75184	-0.53400	-0.10609	0.00034	0.00015	-0.00198	-0.00704	-0.00089	-0.00727
				NAPED10-04-RO	GFRO1000L	40.00	9.7634E+13		0.00894	0.28332	-0.10076	-0.18256	0.00900	-0.42133	-0.15400	-0.08361	0.00598	0.00558	0.00090	0.00202	-0.00240	-0.00887
				NAPED10-05-RO	GFRO1000M	60.00	1.0401E+14		-0.00180	0.81343	-0.22343	-0.59000	-0.00600	-0.41108	-0.00650	0.06565	-0.00628	-0.00476	-0.00232	0.00630	0.00737	-0.00726
				NAPED10-06-RO	GFRO1000N	80.00	4.9944E+13		-0.00069	0.21401	-0.17004	-0.04398	0.00300	-0.15923	-0.11300	-0.22912	0.01024	0.01047	0.00294	0.00216	-0.00362	0.00494
				NAPED10-07-RO	GFRO1000P	100.00	4.8141E+13		-0.00194	0.41563	-0.23708	-0.17855	0.01700	-0.43404	-0.07000	-0.26150	0.01984	0.02153	0.01330	0.00790	-0.00779	0.01459
				NAPED10-08-RO	GFRO1000Q	120.00	6.7543E+13		0.00053	-0.04850	0.05081	-0.00231	-0.00050	-0.06388	-0.01900	0.03898	-0.00471	-0.00648	-0.00088	0.00399	-0.00120	0.00160
				NAPED10-09-RO	GFRO1000R	140.00	5.9674E+13		0.00346	0.03533	-0.00757	-0.02776	0.00000	-0.07393	-0.00100	-0.03217	-0.00100	-0.00035	0.00172	0.00174	0.00256	-0.00924
				NAPED10-10-RO	GFRO1000S	160.00	3.4257E+13		0.00227	-0.01295	0.06140	-0.04845	0.00150	-0.03926	-0.00150	-0.00344	-0.00614	-0.00415	0.00042	-0.01457	0.00499	-0.00960
				NAPED10-11-RO	GFRO1000T	180.00	2.0481E+13		0.00549	0.20323	-0.16891	-0.03432	0.00850	-0.24670	0.09200	-0.14387	0.00193	0.00177	-0.00478	-0.00233	-0.00011	-0.00474
				NAPED10-12-RO	GFRO1000U	200.00	1.7216E+13			0.12406	-0.02341	-0.10065	-0.04200	-0.03276	-0.13000	-0.01021	-0.00527	-0.00680	-0.00089	-0.00422	0.00620	
				NAPED10-13-RO	GFRO1000V																	
NAPED20	37.80770	73.01357	1239	NAPED20-01-LMM	GFRO10019	5.00	6.77E+11		0.011	-0.462	0.001	0.461	0.012	-4.351	-0.312	0.291	-0.007	-0.003	-0.009	-0.001	0.072	-0.016
				NAPED20-02-LMM	GFRO10018	11.25	5.93E+11		0.002	-0.318	0.219	0.099	0.011	-0.815	-0.335	0.050	0.000	0.000	0.001	0.000	-0.006	-0.001
				NAPED20-03-LMM	GFRO1001A	22.50	1.25E+13		0.002	-0.008	0.019	-0.010	0.012	-1.584	-0.465	-0.012	0.000	0.000	-0.001	0.000	0.002	0.000
				NAPED20-04-LMM	GFRO1001B	40.00	5.93E+13		0.005	0.046	-0.012	-0.034	0.004	-0.821	-0.409	-0.223	0.002	0.007	0.010	0.000	-0.026	0.001
				NAPED20-05-LMM	GFRO1001C	60.00	4.09E+13		0.016	0.594	-0.127	-0.467	-0.011	0.479	0.104	0.301	0.000	-0.010	0.002	0.009	0.001	-0.005
				NAPED20-06-LMM	GFRO1001D	80.00	2.43E+13		-0.006	0.717	-0.295	-0.422	0.001	0.164	-0.060	-0.413	0.203	0.067	0.106	0.153	-0.090	0.061
				NAPED20-07-LMM	GFRO100WP	100.00	2.13E+13		-0.009	0.084	-0.046	-0.038	0.003	-0.707	-0.054	-0.281	-0.065	-0.025	-0.075	-0.079	0.019	-0.028
				NAPED20-08-LMM	GFRO100WN	120.00	3.50E+13		0.001	0.055	0.003	-0.058	0.010	-0.606	0.011	-0.099	-0.070	-0.020	-0.028	-0.050	0.039	-0.023
				NAPED20-09-LMM	GFRO100WM	140.00	2.76E+13		0.008	-0.158	0.086	0.072	0.001	-0.006	0.002	0.300	0.003	0.003	0.011	0.010	-0.021	0.004
				NAPED20-10-LMM	GFRO100WL	160.00	3.09E+13		-0.012	-0.007	0.050	-0.043	-0.015	1.119	0.064	0.672	-0.055	-0.016	0.027	0.006	-0.014	0.019
				NAPED20-11-LMM	GFRO100WK	180.00	4.49E+13		0.006	0.170	-0.114	-0.056	0.004	-0.457	-0.058	-0.268	0.032	0.025	0.003	0.018	-0.009	0.005
				NAPED20-12-LMM	GFRO100WQ	200.00	3.30E+13			-0.045	-0.038	0.082	0.009	-0.467	-0.009	-0.005	-0.012	-0.006	-0.021	-0.017	0.011	
				NAPED20-13-LMM	GFRO100WR	220.00	1.17E+13			0.107	0.008	-0.115	0.005	-0.166	0.013	-0.078	0.014	0.016	0.007	0.008	-0.004	
				NAPED20-14-LMM	GFRO100WJ	240.00	8.04E+12			0.056	-0.046	-0.011	0.003	-0.028	-0.010	0.021	-0.018	-0.010	-0.005	-0.015	0.008	
				NAPED20-15-LMM	GFRO100WH																	
NAPED30	37.80838	73.01345	1228	NAPED30-01-RO	GFRO1001F	5.00	3.42E+12		0.010	-0.457	0.278	0.179	-0.040	-4.175	-0.412	0.161	-0.004	0.001	0.000	-0.003	0.011	-0.004
				NAPED30-02-RO	GFRO1001G	11.25	1.21E+12		0.005	0.055	-0.083	0.028	0.007	-0.199	-0.053	0.144	-0.005	-0.005	-0.004	-0.006	0.021	-0.045
				NAPED30-03-RO	GFRO1001H	22.50	4.64E+12		0.006	0.004	0.191	-0.195	0.009	-1.538	-0.268	0.026	0.001	0.002	0.001	0.002	-0.007	0.004
				NAPED30-04-RO	GFRO1001J	40.00	2.80E+13		0.000	0.183	0.135	-0.318	0.006	-0.491	-0.309	-0.096	0.003	0.008	0.012	0.005	-0.021	0.009
				NAPED30-05-RO	GFRO1001K	60.00	2.94E+13		0.014	0.489	-0.492	0.003	0.000	-0.003	-0.162	0.047	-0.002	0.008	0.005	0.000	-0.004	-0.014
				NAPED30-06-RO	GFRO100WU	80.00	5.19E+13		0.011	0.722	-0.157	-0.565	-0.005	-0.375	-0.128	0.024	0.000	0.009	0.005	0.006	-0.009	-0.002
				NAPED30-07-RO	GFRO100WT	100.00	1.06E+14		0.013	0.603	-0.386	-0.218	0.007	-0.582	-0.131	-0.720	0.033	0.001	0.011	0.012	-0.007	-0.002
				NAPED30-08-RO	GFRO100WS																	
NAPED40	37.80904	73.01380	1200	NAPED40-01-RO	GFRO1001R	5.00	3.23E+12		0.025	-0.108	0.071	0.232	-0.010	-1.018	0.224	0.181	-0.019	-0.011	-0.018	-0.002	0.015	-0.053
				NAPED40-02-RO	GFRO1001S	11.25	1.20E+12		0.002	-0.589	0.434	0.162	-0.001	0.004	0.021	0.000	0.001	0.001	0.002	0.002	-0.001	-0.003
				NAPED40-03-RO	GFRO1001T	22.50	5.93E+12		0.003	0.040	-0.121	-0.363	0.004	-0.708	-0.189	0.076	-0.009	-0.006	-0.006	-0.005	0.004	-0.018
				NAPED40-04-RO	GFRO1001U	40.00	1.90E+13		0.011	0.471	-0.199	-0.163	0.012	-1.006	-0.458	-0.424	0.009	0.086	0.064	-0.003	-0.022	0.032
				NAPED40-05-RO	GFRO1001V	60.00	5.15E+13		-0.002	0.319	-0.156	-0.252	0.002	-0.196	-0.029	-0.018	0.000	-0.070	-0.056	-0.011	0.019	-0.038
				NAPED40-06-RO	GFRO100X0	80.00	7.35E+13		0.004	0.434	-0.181	0.024	0.004	-0.023	0.021	0.060	-0.019	-0.017	0.005	-0.010	0.003	-0.007
				NAPED40-07-RO	GFRO10050	100.00	1.03E+14		-0.001	-0.007	-0.017	-0.032	-0.007	0.143	0.033	0.201	0.015	0.009	0.030	0.036	-0.018	0.034
				NAPED40-08-RO	GFRO100WZ	120.00	1.14E+14		0.001	-0.035	0.067	-0.060	-0.001	0.168	0.020	0.082	-0.012	-0.008	-0.029	-0.004	0.016	-0.031
				NAPED40-09-RO	GFRO100WY	140.00	9.47E+13		0.003	-0.024	0.085	-0.096	0.000	0.061	-0.038	-0.181	-0.002	0.000	-0.006	-0.014	0.005	-0.008
				NAPED40-10-RO	GFRO100WX	160.00	8.09E+13			0.259	-0.163	0.077	0.007	-0.253	-0.047	-0.209	0.053	0.013	0.015	0.051	-0.010	
				NAPED40-11-RO	GFRO100WV	180.00	5.79E+13			-0.118	0.042	-0.343	0.002	0.072	-0.010	0.112	-0.050	-0.005	-0.026	-0.067	0.008	
				NAPED40-12-RO	GFRO100WW																	

[1] Average of envelope signal over regolith depth from this study
[2] Bulk density from Bernhard et al., 2018
[3] Grain size distribution from Bernhard et al., 2018
[4] pH from Bernhard et al., 2018
[5] Cation exchange capacity from Bernhard et al., 2018
[6] Loss on Ignition LOI from Oeser et al., 2018
[7] Chemical Index of Alteration CIA calculated based on data from Oeser et al., 2018
[8] Mass transfer coefficient Tau calculated based on data from Oeser et al., 2018
[9] Volumetric strain calculated based on data from Oeser et al., 2018

TableS3 A to C

Table S3A: Regolith moisture content determined in soil augers from Santa Gracia

				Regolith depth		Regolith water content		Closest pedon location			
Core ID	Location		Altitude	1	2	1	2	Pedon	Position	Location	
	°S	°W	m	m	m	%	%			°S	°W
SG Soil 01	29.75838	71.16614	665	0.34		1.8		SGPED60	toe, S-facing	29.75826	71.16615
SG Soil 02	29.75833	71.16625	669	0.20	0.40	15.3*	2.2				
SG Soil 03	29.75808	71.16611	676	0.20	0.39	12.3*	1.7				
SG Soil 04	29.75804	71.16613	678	0.20	0.36	1.2	2.0				
SG Soil 05	29.75748	71.16645	706	0.24	0.44	7.6	1.5	SGPED40	mid, S-facing	29.75738	71.16635
SG Soil 06	29.75688	71.16642	732	0.29		1.7					
SG Soil 07	29.75818	71.16644	676	0.30	0.41	1.4	4.0				
SG Soil 08	29.75775	71.16630	690	0.30	0.53	1.1	2.2				
SG Soil 09	29.75636	71.16741	740	0.29		2.4		SGPED20	top, S-facing	29.75636	71.16721
SG Soil 10	29.76115	71.16557	711	0.23	0.42	7.0	6.7	SGPED70	mid, N-facing	29.76120	71.16559

* potential problems during sample analysis

Table S3B: Regolith moisture content determined in soil augers from La Campana

				Regolith depth			Regolith water content			Closest pedon location			
Core ID	Location		Altitude	1	2	3	1	2	3	Pedon	Position	Location	
	°S	°W	m	m	m	m	%	%	%			°S	°W
LC Soil 01	32.95621	71.06351	741	0.17	0.27		1.7	2.0					
LC Soil 02	32.95604	71.06358	744	0.30	0.46		2.7	3.7					
LC Soil 03	32.95612	71.06368	735	0.30	0.60	0.90	2.0	1.8	1.5	LCPED30	toe, S-facing	32.95615	71.06380
LC Soil 04	32.95585	71.06336	751	0.18	0.32		3.3	3.3					
LC Soil 05	32.95577	71.06329	757	0.20	0.40		1.6	1.6		LCPED10	top, S-facing	32.95581	71.06332
LC Soil 06	32.95596	71.06333	752	0.20			2.2						
LC Soil 07	32.95710	71.06398	750	0.22	0.40		3.4	2.3					
LC Soil 08	32.95706	71.06422	746	0.28	0.47		2.7	3.4					
LC Soil 09	32.95712	71.06429	746	0.30	0.44	0.56	2.2	2.8	3.2	LCPED40	mid, N-facing	32.95720	71.06425
LC Soil 10	32.95595	71.06354	745	0.30	0.51		3.4	3.3					
LC Soil 11	32.95587	71.06352	747	0.25	0.40	0.58	3.1	3.1	2.5	LCPED20	mid, S-facing	32.95588	71.06355
LC Soil 12	32.95596	71.06359	748	0.20	0.40		3.2	2.4					
LC Soil 13	32.95598	71.06344	748	0.25	0.47	0.56	2.6	1.9	1.1				

Table S3C: Regolith moisture content determined in soil augers from Nahuelbuta

					Regolith depth					Regolith water content				Closest pedon location			
Core ID	Location		Altitude	1	2	3	4	5	1	2	3	4	5	Pedon	Position	Location	
	°S	°W	m	m	m	m	m	m	%	%	%	%	%			°S	°W
NA Soil 01	37.80722	73.01283	1259	0.30	0.60	0.75	0.97		23.3	9.3*	19.9	15.1		NAPED10	top, S-facing	37.80735	73.01285
NA Soil 02	37.80714	73.01290	1260	0.30	0.47	0.60	0.76	0.96	28.9	31.1	28.5	4.0*	15.9				
NA Soil 03	37.80722	73.01316	1259	0.30	0.60	0.73	0.99		21.2	19.6	18.1	14.3					
NA Soil 04	37.80724	73.01330	1255	0.30	0.60	0.73	0.99		30.4	28.9	22.3	15.5					
NA Soil 05	37.80725	73.01339	1253	0.30	0.63	0.76	0.94		25.9	26.2	23.4	23.8					
NA Soil 06	37.80735	73.01348	1253	0.30	0.45	0.63	0.77	0.95	25.6	26.4	19.1	20.7	18.9				
NA Soil 07	37.80745	73.01349	1254	0.30	0.51	0.72	0.98		36.0	30.2	25.6	16.2					
NA Soil 08	37.80758	73.01353	1244	0.30	0.49	0.67	0.97		46.8*	32.0	28.8	16.7					
NA Soil 09	37.80763	73.01345	1248	0.30	0.49	0.67	0.98		28.2	28.8	29.1	20.6					
NA Soil 10	37.80769	73.01342	1251	0.30	0.60	0.77	0.91		33.7	29.4	25.3	19.0		NAPED20	mid, S-facing	37.80770	73.01357
NA Soil 11	37.80775	73.01345	1248	0.30	0.60	0.78	0.96		27.5	27.3	24.5	9.4*		NAPED20	mid, S-facing	37.80770	73.01357
NA Soil 12	37.80782	73.01362	1240	0.30	0.50	0.70	0.97		31.2	16.3	21.0	22.3		NAPED20	mid, S-facing	37.80770	73.01357
NA Soil 13	37.80810	73.01343	1231	0.30	0.62	0.82	0.97		31.5	30.8	20.3	21.7					
NA Soil 14	37.80815	73.01344	1232	0.30	0.54	0.81	0.99		33.5	27.9	10.6*	22.8					
NA Soil 15	37.80831	73.01339	1225	0.30	0.44	0.63	0.80		32.5	33.1	27.3	59.4*					
NA Soil 16	37.80835	73.01346	1219	0.30	0.50	0.64	0.82	0.92	39.0	41.3	40.1	46.1*	27.4	NAPED30	toe, S-facing	37.80838	73.01345
NA Soil 17	37.80902	73.01381	1224	0.10	0.33	0.55	0.78	0.98	24.5	19.7	19.5	21.7	23.0	NAPED40	mid, N-facing	37.80904	73.01380
NA Soil 18	37.80901	73.01377	1222	0.30	0.53	0.70	0.85	0.97	24.3	25.1	24.0	18.9	13.5	NAPED40	mid, N-facing	37.80904	73.01380

* potential problems during sample analysis

TableS4 A to E

Table S4A: Principal compnent analysis for physical and chemical properties in Pan de Azucar

Parameter	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8
	%	%	%	%	%	%	%	%
Bulk density	5	7	34	39	1	12	2	0
Clay	20	0	14	4	30	4	0	27
LOI	4	30	9	12	5	28	2	10
CIA	17	1	29	6	2	41	0	4
Tau Na	13	21	3	0	7	2	8	45
Tau Zr	9	18	0	30	5	9	28	1
Envelope 500 MHz	22	2	2	0	48	0	25	2
Envelope 1000 MHz	10	21	8	9	2	4	35	10

Table S4B: Principal compnent analysis for physical and chemical properties in Santa Gracia

Parameter	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8
	%	%	%	%	%	%	%	%
Bulk density	17	0	3	67	7	2	3	0
Clay	1	15	38	1	8	34	3	0
LOI	11	16	0	17	41	1	12	1
CIA	16	2	27	7	7	31	8	2
Tau Na	2	31	10	5	1	0	5	45
Tau Zr	1	36	4	1	0	8	1	49
Envelope 500 MHz	29	0	4	0	0	24	40	2
Envelope 1000 MHz	22	0	14	0	35	0	28	0

Table S4C: Principal compnent analysis for physical and chemical properties in La Campana

Parameter	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11
	%	%	%	%	%	%	%	%	%	%	%
Bulk density	14	0	13	4	15	19	17	1	1	10	6
Clay	9	7	8	7	35	5	2	0	16	4	7
LOI	17	1	6	0	15	19	9	10	15	7	0
CIA	0	25	2	7	1	1	0	37	26	0	3
Tau Na	17	7	4	0	2	2	2	9	0	51	6
Tau Zr	15	2	17	8	1	1	5	1	2	2	46
pH	1	14	28	0	1	4	1	0	10	19	21
CEC	4	16	1	14	27	2	3	23	0	0	11
Volumetric strain	19	3	2	3	2	13	4	17	29	7	1
Envelope 500 MHz	4	12	12	2	2	34	31	1	1	0	0
Envelope 1000 MHz	1	11	5	55	0	0	26	1	1	0	0

Table S4D: Principal compnent analysis for physical and chemical properties in Nahuelbuta

Parameter	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10
	%	%	%	%	%	%	%	%	%	%
Bulk density	13	4	4	1	0	10	62	5	0	0
Clay	13	0	2	3	33	5	2	32	11	0
LOI	15	3	0	1	3	0	12	13	0	53
CIA	6	0	54	26	11	0	0	2	0	0
Tau Na	9	14	1	7	1	59	5	3	0	1
Tau Zr	8	23	3	3	8	10	0	5	33	8
pH	1	47	5	0	11	3	2	0	26	5
CEC	12	0	2	27	21	10	2	16	11	1
Volumetric strain	14	4	0	10	0	2	3	16	19	31
Envelope 500 MHz	8	5	29	21	13	1	13	9	0	1