

Supplementary information for

Trans-Pacific Saharan dust recorded in Mount Logan ice core

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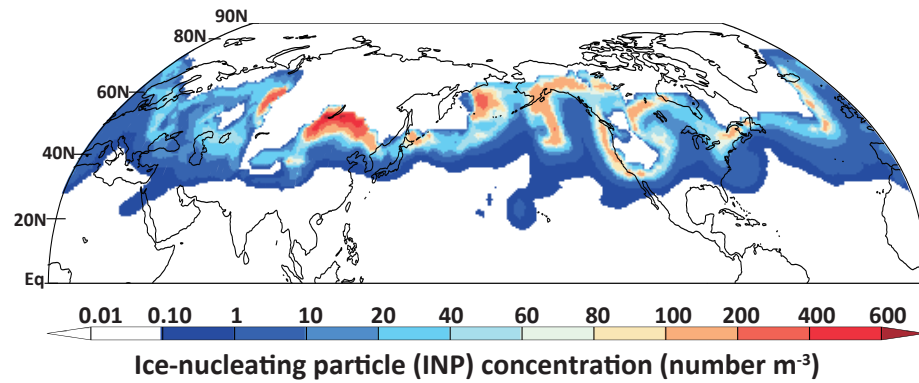
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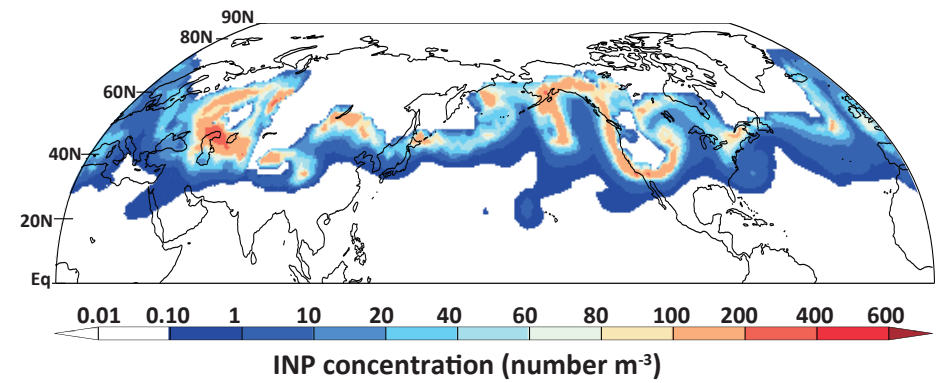
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Figures S1 and S2, and Tables S1 and S2.

(a) Asian Dust (Gobi + Taklimakan)



(b) Saharan Dust



(c) Saharan Dust

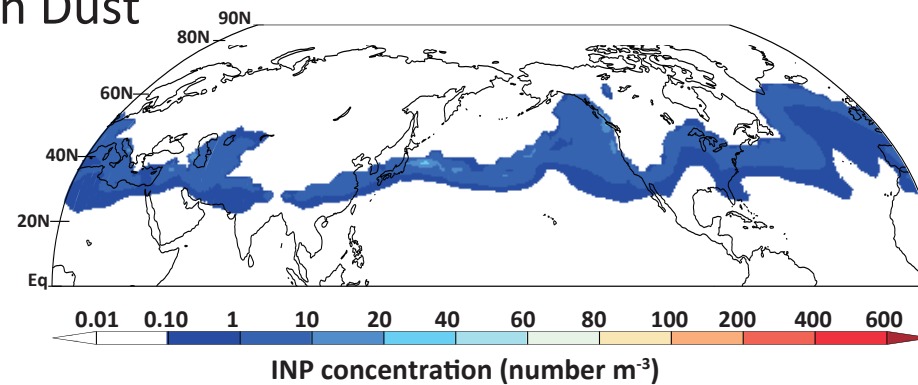
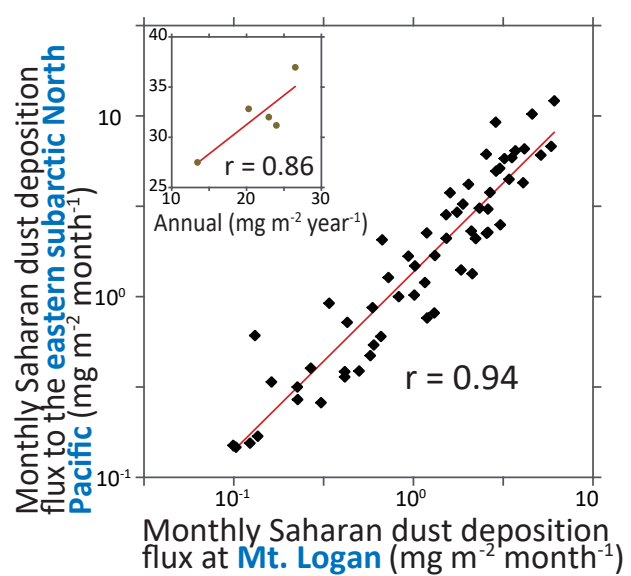
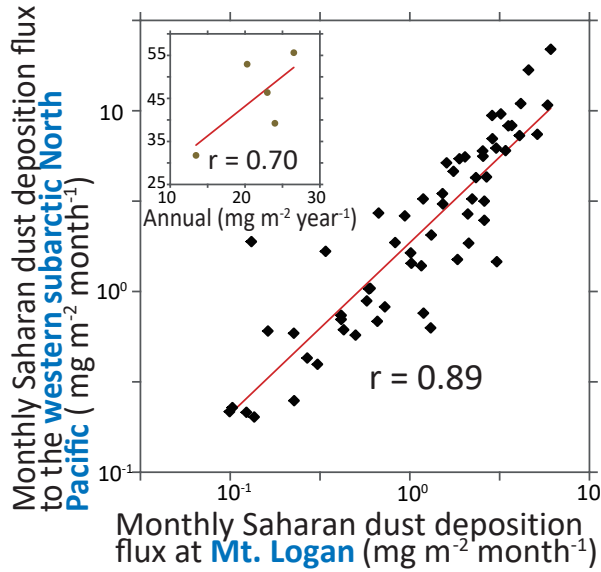


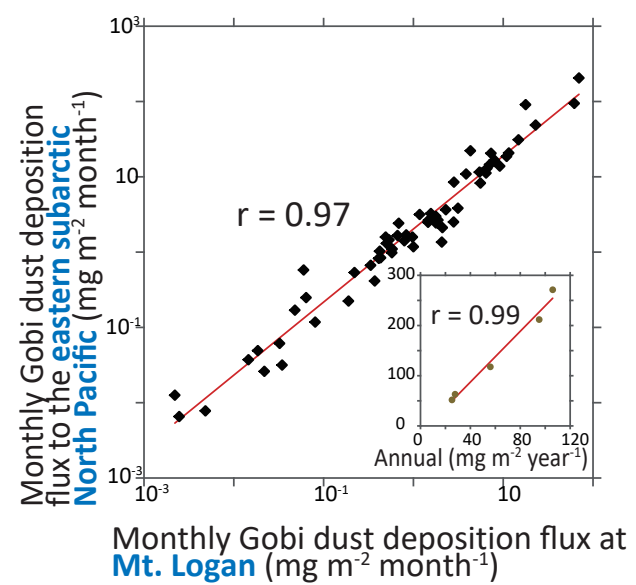
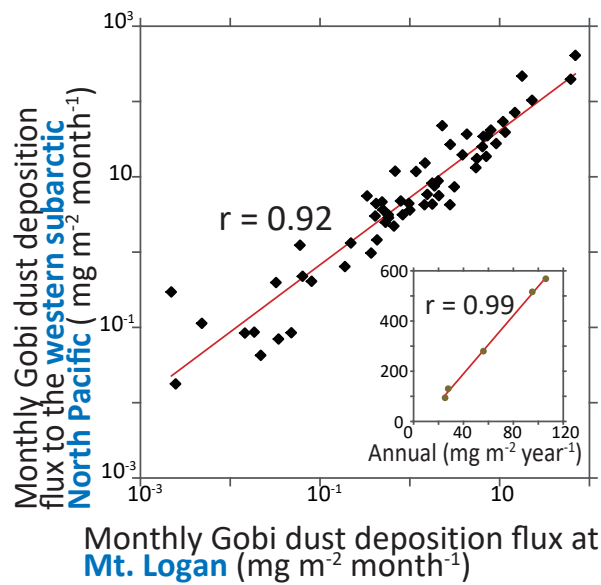
Figure S1.

Ice-nucleating particle (INP) concentrations over the North Pacific simulated using the IMPACT model at 400 hPa for (a) Asian dust and (b) Saharan dust on May 7, 1988, and (c) Saharan dust on January 5, 1987.

Saharan dust



Gobi dust



Taklimakan dust

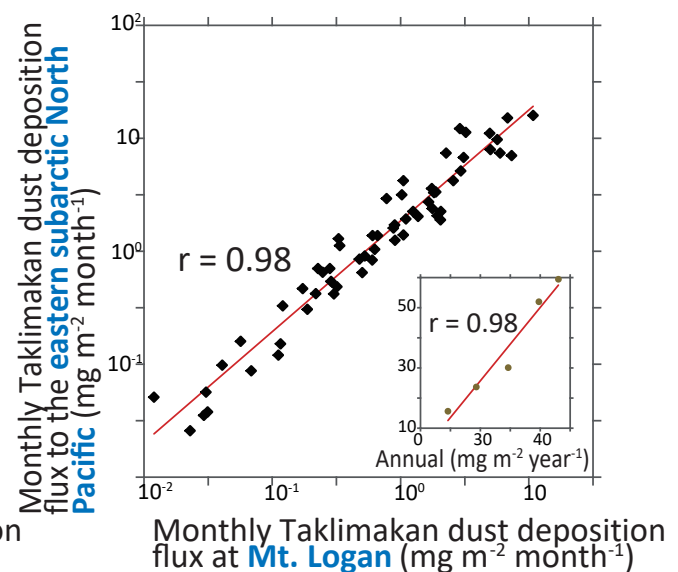
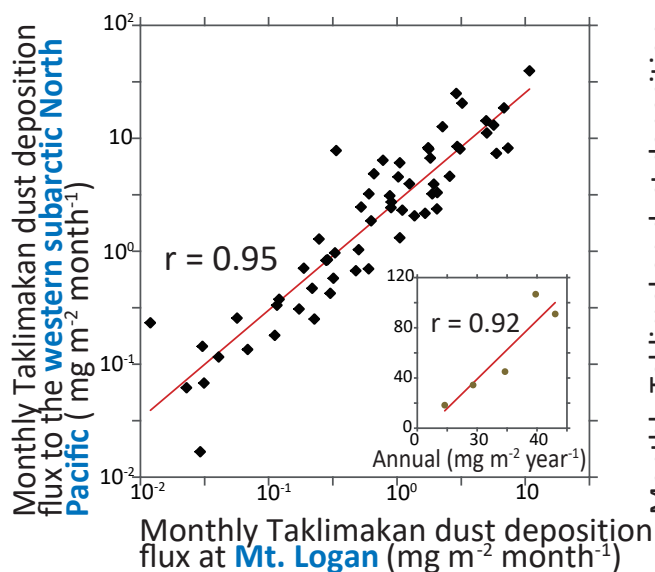


Figure S2.

Asian and Saharan dust monthly deposition fluxes at Mount Logan plotted against those over the western ($45\text{--}53^\circ\text{N}$, $159^\circ\text{E}\text{--}171^\circ\text{W}$; left) and eastern ($45\text{--}53^\circ\text{N}$, $139\text{--}171^\circ\text{W}$; right) subarctic North Pacific during 1985–1989, as simulated using the IMPACT model. The inset panels show the corresponding annual correlations.

Table S1. Calculation of dust deposition flux at Mount Logan for the year 1987

King Col core Sample ID	Water equivalent top depth (m)	Water equivalent bottom depth (m)	Water equivalent sample length (m)	Volumetric particle concentration ($\text{cm}^3 \text{ m}^{-3}$)	Volumetric particle concentration of long- range transported dust [*] ($\text{cm}^3 \text{ m}^{-3}$)	Deposition flux of all particles ($\text{mg m}^{-2} \text{ year}^{-1}$)	Deposition flux of long-range transported dust ($\text{mg m}^{-2} \text{ year}^{-1}$)	Annual deposition flux of all particles [†] ($\text{mg m}^{-2} \text{ year}^{-1}$)	Annual deposition flux of long-range transported dust [†] ($\text{mg m}^{-2} \text{ year}^{-1}$)
#25	16.7	16.8	0.10	0.047	0.043	12	11	123	89
#26	16.8	16.91	0.11	0.061	0.050	18	15		
#27	16.91	17.02	0.11	0.128	0.051	37	15		
#28	17.02	17.14	0.12	0.040	0.035	13	11		
#29	17.14	17.25	0.11	0.042	0.039	12	11		
#30	17.25	17.36	0.11	0.065	0.056	19	16		
#31	17.36	17.46	0.10	0.052	0.044	14	12		
#32	17.46	17.61	0.15	0.067	0.051	27	20		

^{*}Volumetric particle concentration fitted by a log-normal particle size distribution with diameters between 2 and 4 μm

[†]Samples #25 and #32 are mixed with layers from the years 1988 and 1986, respectively. Their corresponding fluxes were excluded from the annual deposition flux calculation

Table S2. Cluster compositions of Mount Logan samples for each particle size fraction

Station/Sample ID	Location	Particle size fraction (µm)	Measured particle number	Cluster 1 particle number (ratio)	Cluster 2 particle number (ratio)	Cluster 3 particle number (ratio)
KC ice core #1 (24.61–24.71 m)	Mt. Logan	< 8	116	77 (66%)	32 (28%)	7 (6%)
		< 4	86	63 (73%)	18 (21%)	5 (6%)
		4–8	30	14 (47%)	14 (47%)	2 (7%)
KC ice core #2 (24.71–24.81 m)	Mt. Logan	< 8	105	59 (56%)	32 (30%)	14 (13%)
		< 4	75	42 (56%)	22 (29%)	11 (15%)
		4–8	30	17 (57%)	10 (33%)	3 (10%)
KC ice core #3 (24.81–24.91 m)	Mt. Logan	< 8	96	51 (53%)	35 (36%)	10 (10%)
		< 4	56	39 (70%)	12 (21%)	5 (9%)
		4–8	40	12 (30%)	23 (58%)	5 (13%)
KC ice core #4 (24.91–25.01 m)	Mt. Logan	< 8	84	49 (58%)	34 (40%)	1 (1%)
		< 4	64	41 (64%)	23 (36%)	0 (0%)
		4–8	20	8 (40%)	11 (55%)	1 (5%)
KC ice core #5 (25.01–25.13 m)	Mt. Logan	< 8	81	30 (37%)	43 (53%)	8 (10%)
		< 4	59	25 (42%)	30 (51%)	4 (7%)
		4–8	22	5 (23%)	13 (59%)	4 (18%)
KC ice core #6 (25.13–25.29 m)	Mt. Logan	< 8	111	23 (21%)	85 (77%)	3 (3%)
		< 4	72	17 (24%)	54 (75%)	1 (1%)
		4–8	39	6 (15%)	31 (79%)	2 (5%)
KC ice core #7 (25.29–25.44 m)	Mt. Logan	< 8	81	45 (56%)	34 (42%)	2 (2%)
		< 4	57	35 (61%)	22 (39%)	0 (0%)
		4–8	24	10 (42%)	12 (50%)	2 (8%)
KC ice core #8 (25.44–25.60 m)	Mt. Logan	< 8	97	69 (71%)	22 (23%)	6 (6%)
		< 4	71	50 (70%)	18 (25%)	3 (4%)
		4–8	26	19 (73%)	4 (15%)	3 (12%)
KC ice core #9 (25.60–25.65 m)	Mt. Logan	< 8	45	37 (82%)	7 (16%)	1 (2%)
		< 4	41	34 (83%)	6 (15%)	1 (2%)
		4–8	4	3 (-)*	1 (-)	0 (-)
KC ice core #10 (25.65–25.70 m)	Mt. Logan	< 8	65	45 (69%)	18 (28%)	2 (3%)
		< 4	55	39 (71%)	14 (25%)	2 (4%)
		4–8	10	6 (-)	4 (-)	0 (-)
KC ice core #11 (25.70–25.76 m)	Mt. Logan	< 8	78	50 (64%)	23 (29%)	5 (6%)
		< 4	74	48 (65%)	23 (31%)	3 (4%)
		4–8	4	2 (-)	0 (-)	2 (-)
KC ice core #12 (25.76–25.82 m)	Mt. Logan	< 8	98	57 (58%)	31 (32%)	10 (10%)
		< 4	74	50 (68%)	19 (26%)	5 (7%)
		4–8	24	7 (29%)	12 (50%)	5 (21%)
KC ice core #13 (25.82–25.92 m)	Mt. Logan	< 8	90	51 (57%)	30 (33%)	9 (10%)
		< 4	69	43 (62%)	21 (30%)	5 (7%)
		4–8	21	8 (38%)	9 (43%)	4 (19%)
KC ice core #14 (25.92–26.02 m)	Mt. Logan	< 8	67	48 (72%)	13 (19%)	6 (9%)
		< 4	58	44 (76%)	9 (16%)	5 (9%)
		4–8	9	4 (-)	4 (-)	1 (-)
KC ice core #15 (26.02–26.13 m)	Mt. Logan	< 8	69	41 (59%)	26 (38%)	2 (3%)
		< 4	57	35 (61%)	21 (37%)	1 (2%)
		4–8	12	6 (-)	5 (-)	1 (-)
KC ice core #16 (26.63–26.23 m)	Mt. Logan	< 8	70	42 (60%)	23 (33%)	5 (7%)
		< 4	61	41 (67%)	16 (26%)	4 (7%)
		4–8	9	1 (-)	7 (-)	1 (-)
KC ice core #17 (26.23–26.33 m)	Mt. Logan	< 8	63	32 (51%)	23 (37%)	8 (13%)
		< 4	53	25 (47%)	21 (40%)	7 (13%)
		4–8	10	7 (-)	2 (-)	1 (-)
KC ice core #18 (26.33–26.43 m)	Mt. Logan	< 8	59	28 (47%)	21 (36%)	10 (17%)
		< 4	55	25 (45%)	20 (36%)	10 (18%)
		4–8	4	3 (-)	1 (-)	0 (-)
KC ice core #19 (26.43–26.60 m)	Mt. Logan	< 8	63	43 (68%)	17 (27%)	3 (5%)
		< 4	61	42 (69%)	16 (26%)	3 (5%)
		4–8	2	1 (-)	1 (-)	0 (-)
KC ice core #20 (26.60–26.77 m)	Mt. Logan	< 8	75	55 (73%)	18 (24%)	2 (3%)
		< 4	61	45 (74%)	14 (23%)	2 (3%)
		4–8	14	10 (-)	4 (-)	0 (-)
KC ice core #21 (26.77–26.92 m)	Mt. Logan	< 8	82	50 (61%)	28 (34%)	4 (5%)
		< 4	67	42 (63%)	22 (33%)	3 (4%)
		4–8	15	8 (-)	6 (-)	1 (-)
KC ice core #22 (26.92–27.07 m)	Mt. Logan	< 8	69	41 (59%)	25 (36%)	3 (4%)
		< 4	59	36 (61%)	21 (36%)	2 (3%)
		4–8	10	5 (-)	4 (-)	1 (-)
KC ice core #23 (27.07–27.13 m)	Mt. Logan	< 8	64	41 (64%)	20 (31%)	3 (5%)
		< 4	61	40 (66%)	18 (30%)	3 (5%)
		4–8	3	1 (-)	2 (-)	0 (-)
KC ice core #24 (27.13–27.30 m)	Mt. Logan	< 8	108	44 (41%)	45 (42%)	19 (18%)
		< 4	70	41 (59%)	23 (33%)	6 (9%)
		4–8	38	3 (8%)	22 (58%)	13 (34%)
KC ice core #25 (27.30–27.45 m)	Mt. Logan	< 8	62	34 (55%)	21 (34%)	7 (11%)
		< 4	53	32 (60%)	14 (26%)	7 (13%)
		4–8	9	2 (-)	7 (-)	0 (-)

KC ice core #26 (27.45–27.60 m)	Mt. Logan	< 8	95	46 (48%)	38 (40%)	11 (12%)
		< 4	50	22 (44%)	17 (34%)	11 (22%)
		4–8	45	24 (53%)	21 (47%)	0 (0%)
KC ice core #27 (27.60–27.76 m)	Mt. Logan	< 8	155	59 (38%)	72 (46%)	24 (15%)
		< 4	69	35 (51%)	29 (42%)	5 (7%)
		4–8	86	24 (28%)	43 (50%)	19 (22%)
KC ice core #28 (27.76–27.92 m)	Mt. Logan	< 8	50	32 (64%)	17 (34%)	1 (2%)
		< 4	47	31 (66%)	15 (32%)	1 (2%)
		4–8	3	1 (-)	2 (-)	0 (-)
KC ice core #29 (27.92–28.08 m)	Mt. Logan	< 8	68	45 (66%)	21 (31%)	2 (3%)
		< 4	58	40 (69%)	17 (29%)	1 (2%)
		4–8	10	5 (-)	4 (-)	1 (-)
KC ice core #30 (28.08–28.23 m)	Mt. Logan	< 8	69	35 (51%)	33 (48%)	1 (1%)
		< 4	48	27 (56%)	21 (44%)	0 (0%)
		4–8	21	8 (38%)	12 (57%)	1 (5%)
KC ice core #31 (28.23–28.38 m)	Mt. Logan	< 8	104	56 (54%)	36 (35%)	12 (12%)
		< 4	71	38 (54%)	27 (38%)	6 (8%)
		4–8	33	18 (55%)	9 (27%)	6 (18%)
KC ice core #32 (28.38–28.58 m)	Mt. Logan	< 8	99	72 (73%)	20 (20%)	7 (7%)
		< 4	85	63 (74%)	16 (19%)	6 (7%)
		4–8	14	9 (-)	4 (-)	1 (-)
KC ice core #33 (28.58–28.81 m)	Mt. Logan	< 8	62	37 (60%)	20 (32%)	5 (8%)
		< 4	46	30 (65%)	13 (28%)	3 (7%)
		4–8	16	7 (-)	7 (-)	2 (-)
KC ice core #34 (28.81–29.01 m)	Mt. Logan	< 8	74	46 (62%)	22 (30%)	6 (8%)
		< 4	61	36 (59%)	19 (31%)	6 (10%)
		4–8	13	10 (-)	3 (-)	0 (-)
KC ice core #35 (29.01–29.23 m)	Mt. Logan	< 8	63	39 (62%)	21 (33%)	3 (5%)
		< 4	49	32 (65%)	15 (31%)	2 (4%)
		4–8	14	7 (-)	6 (-)	1 (-)
KC ice core #36 (29.23–29.45 m)	Mt. Logan	< 8	106	52 (49%)	40 (38%)	14 (13%)
		< 4	62	34 (55%)	22 (35%)	6 (10%)
		4–8	44	18 (41%)	18 (41%)	8 (18%)
KC ice core #37 (29.45–29.65 m)	Mt. Logan	< 8	89	51 (57%)	28 (31%)	10 (11%)
		< 4	46	33 (72%)	10 (22%)	3 (7%)
		4–8	43	18 (42%)	18 (42%)	7 (16%)
KC ice core #38 (29.65–29.85 m)	Mt. Logan	< 8	83	48 (58%)	31 (37%)	4 (5%)
		< 4	61	37 (61%)	22 (36%)	2 (3%)
		4–8	22	11 (50%)	9 (41%)	2 (9%)
KC ice core #39 (29.85–29.95 m)	Mt. Logan	< 8	65	35 (54%)	22 (34%)	8 (12%)
		< 4	58	31 (53%)	19 (33%)	8 (14%)
		4–8	7	4 (-)	3 (-)	0 (-)
KC ice core #40 (29.95–30.06 m)	Mt. Logan	< 8	64	45 (70%)	16 (25%)	3 (5%)
		< 4	59	42 (71%)	14 (24%)	3 (5%)
		4–8	5	3 (-)	2 (-)	0 (-)
KC ice core #41 (30.06–30.16 m)	Mt. Logan	< 8	69	52 (75%)	13 (19%)	4 (6%)
		< 4	59	45 (76%)	11 (19%)	3 (5%)
		4–8	10	7 (-)	2 (-)	1 (-)
KC ice core #42 (30.16–30.26 m)	Mt. Logan	< 8	69	50 (72%)	12 (17%)	7 (10%)
		< 4	65	48 (74%)	10 (15%)	7 (11%)
		4–8	4	2 (-)	2 (-)	0 (-)
KC ice core #43 (30.26–30.36 m)	Mt. Logan	< 8	55	32 (58%)	18 (33%)	5 (9%)
		< 4	46	31 (67%)	10 (22%)	5 (11%)
		4–8	9	1 (-)	8 (-)	0 (-)
KC ice core #44 (30.36–30.46 m)	Mt. Logan	< 8	91	39 (43%)	44 (48%)	8 (9%)
		< 4	51	30 (59%)	18 (35%)	3 (6%)
		4–8	40	9 (23%)	26 (65%)	5 (13%)
KC ice core #45 (30.46–30.56 m)	Mt. Logan	< 8	75	23 (31%)	49 (65%)	3 (4%)
		< 4	46	19 (41%)	26 (57%)	1 (2%)
		4–8	29	4 (14%)	23 (79%)	2 (7%)
KC ice core #46 (30.56–30.71 m)	Mt. Logan	< 8	59	33 (56%)	23 (39%)	3 (5%)
		< 4	38	22 (58%)	14 (37%)	2 (5%)
		4–8	21	11 (52%)	9 (43%)	1 (5%)

*Non-cluster compositions due to a small number of particles less than 20