

1 Coordinates of the sampling sites

Table S1. Coordinates of the sampling sites

ID	Coordinates
MRS	64°52'20"N 16°54'14"W
SRS	64°53'52"N 16°50'57"W
DYS (Main site)	64°54'55"N 16°46'35"W
HRS	64°57'17"N 16°40'31"W
VFS	65°01'41"N 16°26'10"W

2 SEM classification scheme

Particle class	Criteria
Quartz-like	Si/(Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & (Na+Mg+K+Ca+Al)/Si=0 .. 0.2 & F/(F+Si)=0 .. 0.499
Forsterite-like	(Ca+Na+K) / (Al+Si+Ca+Na+K+Mg+Fe)=0 .. 0.05 & (Fe+Mg) / (Al+Si+Ca+Na+K+Mg+Fe)=0.6 .. 0.75 & Fe/Si=0.2 .. 0.40 & Mg/Si=1.60 .. 1.80
Al-rich clay mineral	(Al+Si) / (Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & Al/Si=0.5 .. 1.5 & Fe/(Al+Si)=0 .. 0.2 & Mg/(Al+Si)=0 .. 0.2 & Ca/(Al+Si)=0 .. 0.1 & Na/(Al+Si)=0 .. 0.1 & K/(Si)=0 .. 0.1 & (Na+Cl+2*S)/(Al+Si)=0 .. 0.25
Illite/Muscovite-like	(K+Al+Si) / (Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & Al/(Al+Si)=0.3 .. 0.65 & Mg/(Mg+Al+Si)=0 .. 0.1667 & Fe/(Fe+Al+Si)=0 .. 0.1667 & (Na+Ca)/(Na+Ca+Al+Si)=0 .. 0.1667 & K/(K+Al+Si)=0.11 .. 0.3 & (Na+Cl+2*S) / (Al+Si)=0 .. 0.25
Smectite-like	(Mg+Al+Si) / (Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & Al/(Al+Si)= 0.33 .. 0.6 & Fe/(Fe+Al+Si)=0 .. 0.15 & Mg/(Mg+Al+Si)=0.1667 .. 0.5 & Ca/(Ca+Al+Si)=0 .. 0.1667 & Na/(Na+Al+Si)=0 .. 0.1667 & K/(K+Si)=0 .. 0.1 & (Na+Cl+2*S) / (Al+Si)=0 .. 0.25
Chlorite-like	(Mg+Fe+Al+Si) / (Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & Al/(Al+Si)=0.33 .. 0.6 & Fe/(Fe+Al+Si)=0.15 .. 0.5 & Mg/(Mg+Al+Si)=0.25 .. 0.5 & Ca/(Ca+Al+Si)=0 .. 0.15 & (Na+Cl+2*S) / (Al+Si)=0 .. 0.25
Microcline-like	(K+Al+Si) / (Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & Al/(Al+Si) = 0.2 .. 0.3 & (Na+K)/(Na+K+Al+Si) = 0.15 .. 0.25 & Ca/(Ca+Al+Si)=0 .. 0.1 & Na/(Na+K)=0.0 .. 0.3 & Fe/(Fe+Al+Si)=0 .. 0.15 & (Cl+2*S)/Na = 0 .. 0.3 & (Cl+2*S) / (Al+Si)=0 .. 0.125
Anorthoclase-like	(Na+K+Al+Si) / (Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & Al/(Al+Si) = 0.2 .. 0.3 & (Na+K)/(Na+K+Al+Si) = 0.15 .. 0.25 & Ca/(Ca+Al+Si)=0 .. 0.1 & Na/(Na+K)=0.3 .. 0.7 & Fe/(Fe+Al+Si)=0 .. 0.15 & (Cl+2*S)/Na = 0 .. 0.3 & (Cl+2*S) / (Al+Si)=0 .. 0.125
Albite-like	(Na+Al+Si) / (Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & Al/(Al+Si) = 0.2 .. 0.3 & (Na+K+Ca)/(Na+K+Ca+Al+Si)=0.15 .. 0.25 & Na/(Na+Ca)=0.7 .. 1.01 & Na/(Na+K)=0.7 .. 1.01 & Fe/(Fe+Al+Si)=0 .. 0.15 & (Cl+2*S)/Na = 0 .. 0.3 & (Cl+2*S) / (Al+Si)=0 .. 0.125

Complex silicate (moderat Al-low alkali)	(Al+Si+Na+Mg+K+Ca+Fe) / (Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 &
	Al/Si=0.25 .. 0.5 & (Na+K+Ca)/Si=0 .. 0.125 & Fe/Si=0 .. 0.5 & Ca/Si=0 .. 0.5 & K/Si=0 .. 0.5 & Mg/Si=0 .. 0.5 & Na/Si=0 .. 0.5 & (Na+Cl+2*S) / (Al+Si)=0 .. 0.25 & IsNotInOtherGroup=yes
Biotite-like	(Ca+Na+K+Fe+Mg+Al+Si) / (Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 &
	Na/(Na+Al+Si)=0 .. 0.1 & Mg/(Mg+Al+Si)=0.27 .. 0.5 & Al/(Al+Si)=0.19 .. 0.33 &
	K/(K+Al+Si)=0.15 .. 0.26 & Fe/(Fe+Al+Si)=0.08 .. 0.21 & (Cl+2*S)/Na = 0 .. 0.3 & (Cl+2*S) /
	(Al+Si)=0 .. 0.125
Calcite-like	Ca/(Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & (Al+Si)/Ca=0 .. 0.3 & Mg/Ca=0 .. 0.3 & S/Ca=0 .. 0.3 & Cl/Ca=0 .. 0.3 & P/(Ca+P)=0 .. 0.19 & S/(Ca+S)=0 .. 0.19
Dolomite-like	(Mg+Ca) / (Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & Mg/Ca=0.3 .. 0.3 & S/Ca=0 .. 0.3 & Cl/Ca=0 .. 0.3 & (Al+Si)/Ca=0 .. 0.3
Apatite-like	(Ca+P) / (Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & Mg/Ca=0 .. 0.3 & P/(Ca+P)=0.2 .. 0.8 & Cl/Ca=0 .. 0.3 & (Al+Si)/(P+Ca)=0 .. 0.25
Gypsum-like	(Ca+S) / (Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & Ca/(Ca+S)=0.2 .. 0.8 & Mg/Ca=0 .. 0.3 & Cl/Ca=0 .. 0.3
Fluorite-like	(Ca+F) / (F+Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & Ca/(Ca+S)=0 .. 0.1999 & Ca/(Ca+F)=0.1667 .. 0.5 & Mg/Ca=0 .. 0.3 & Cl/Ca=0 .. 0.3
Fe-oxide/Fe-hydroxide-like	Fe/(Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.5 .. 0.98999 & Cr/(Cr+Fe)=0 .. 0.1 &
	Cl/(Cl+Fe)=0 .. 0.1 & (F+Si)/(F+Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0 .. 0.499 & Ti/(Ti+Fe)=0 .. 0.1
Magnetite-like	AdditionalTitle=Density & Additional=3.3 & Mg/(Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01
Rutile-like	AdditionalTitle=Density & Additional=4.1 & Ti/(Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & Ca/(Ca+Ti)=0 .. 0.3 & Ti/(Ti+Fe)=0.75 .. 1.01
Perovskite-like	AdditionalTitle=Density & Additional=4.1 & (Ti+Ca)/(Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & Ca/(Ca+Ti)=0.3 .. 0.7
Ilmenite-like	(Fe+Ti)/(Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & Ti/(Ti+Fe)=0.25 .. 0.75
Titanomagnetite-like	(Fe+Ti)/(Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.7 .. 1.01 & Ti/(Ti+Fe)=0.1 .. 0.25

Alumite-like	$(\text{Al}+\text{K}+\text{S}) / (\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0.7 \dots 1.01$ & $\text{Ca}/(\text{Ca}+\text{Al}+\text{K}+\text{S})=0 \dots 0.05$ & $\text{Si}/(\text{Si}+\text{Al}+\text{K}+\text{S})=0 \dots 0.1$ & $\text{K}/(\text{Al}+\text{K}+\text{S})=0.05 \dots 0.3$ & $\text{S}/(\text{Al}+\text{K}+\text{S})=0.15 \dots 0.5$ & $\text{Al}/(\text{Al}+\text{K}+\text{S})=0.3 \dots 0.8$
Sea-salt	$(\text{Na}+\text{Mg}+\text{Cl}) / (\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0.7 \dots 1.01$ & $\text{Cl}/(\text{Na}+0.5*\text{Mg})=0.5 \dots 2$ & $\text{Cl} / (\text{Cl}+\text{S})=0.7 \dots 1.01$ & $\text{S}/(\text{Na}+0.5*\text{Mg})=0 \dots 0.2$ & $\text{K}/\text{Na}=0 \dots 0.5$ & $\text{Ca}/\text{Na}=0 \dots 0.5$ & $\text{Mg}/\text{Na}=0 \dots 0.5$ & $(\text{Al}+\text{Si}) / (\text{Na}+\text{Cl}+\text{S})=0 \dots 0.25$
Aged sea-salt	$(\text{Na}+\text{Mg}+\text{Cl}+\text{S}+\text{Ca}) / (\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0.7 \dots 1.01$ & $(\text{Cl}+2*\text{S}) / (\text{Na}+0.5*\text{Mg}+0.5*\text{Ca})=0.3 \dots 3.333$ & $\text{Cl} / (\text{Cl}+\text{S})=0.3 \dots 0.7$ & $\text{K} / (\text{K}+\text{Na})=0 \dots 0.3$ & $\text{Ca} / (\text{Ca}+\text{Na})=0 \dots 0.2$ & $\text{Mg} / (\text{Mg}+\text{Na})=0 \dots 0.3$ & $(\text{Al}+\text{Si}) / (\text{Al}+\text{Si}+\text{Na}+\text{Cl}+\text{S})=0 \dots 0.25$
Sodium sulfate	$(\text{Na}+\text{Mg}+\text{S}+\text{Cl}) / (\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0.7 \dots 1.01$ & $\text{S}/(\text{Na}+0.5*\text{Mg})=0.8 \dots 2$ & $\text{Cl}/(\text{Na}+0.5*\text{Mg})=0 \dots 0.2$ & $\text{Cl} / (\text{Cl}+\text{S})=0 \dots 0.3$ & $\text{K}/\text{Na}=0 \dots 0.5$ & $\text{Ca}/\text{Na}=0 \dots 0.5$ & $\text{Mg}/\text{Na}=0 \dots 0.5$ & $(\text{Al}+\text{Si})/(\text{Na}+\text{Cl}+\text{S})=0 \dots 0.25$
Ammonium-sulfate-like	$\text{S}/(\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0.7 \dots 1.01$ & $\text{Cl} / (\text{Cl}+\text{S})=0 \dots 0.3$ & $\text{Na}/\text{S}=0 \dots 1.01$ & $\text{Cl}/\text{S}=0 \dots 0.2$ & $\text{Si}/\text{S}=0 \dots 0.5$ & $(\text{Al}+\text{Si})/\text{S}=0 \dots 0.25$
Complex sulfate	$(\text{Na}+\text{Mg}+\text{K}+\text{Ca}+\text{S}+\text{Cl}) / (\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0.7 \dots 1.01$ & $(\text{Al}+\text{Si})/\text{S}=0 \dots 0.25$ & $\text{Cl} / (\text{Cl}+\text{S})=0 \dots 0.3$ & $\text{IsNotInOtherGroup}=\text{yes}$
Complex soluble salt	$(\text{Na}+\text{Mg}+\text{K}+\text{Ca}+\text{S}+\text{Cl}) / (\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0.7 \dots 1.01$ & $(\text{Al}+\text{Si})/\text{S}=0 \dots 0.25$ & $\text{IsNotInOtherGroup}=\text{yes}$
Sea-salt/silicate mixture	$(\text{Al}+\text{Si}+\text{Mg}+\text{Fe}+\text{Na}+\text{Cl}+\text{S}) / (\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0.7 \dots 1.01$ & $\text{Fe} / (\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0 \dots 0.3$ & $(\text{Na}+\text{Cl}+2*\text{S}) / (\text{Al}+\text{Si})=0.25 \dots 4$ & $\text{S}/\text{Cl}=0 \dots 0.5$ & $\text{F}/(\text{F}+\text{Si})=0 \dots 0.499$ & $\text{IsNotInOtherGroup}=\text{yes}$
Sodium sulfate/silicate mixture	$(\text{Al}+\text{Si}+\text{Mg}+\text{Fe}+\text{Na}+\text{Cl}+\text{S}) / (\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0.7 \dots 1.01$ & $\text{Fe} / (\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0 \dots 0.3$ & $(\text{Na}+\text{Cl}+2*\text{S}) / (\text{Al}+\text{Si})=0.25 \dots 4$ & $(\text{K}+\text{Ca}+\text{Fe}) / (\text{Si}+\text{Al})=0 \dots 0.7$ & $\text{Cl}/\text{S}=0 \dots 1$ & $\text{S}/\text{Na}=0 \dots 0.5$ & $\text{IsNotInOtherGroup}=\text{yes}$
Aged sea-salt/silicate mixture	$(\text{Al}+\text{Si}+\text{Mg}+\text{Fe}+\text{Na}+\text{Cl}+\text{S}) / (\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0.7 \dots 1.01$ & $(\text{Na}+\text{Cl}+2*\text{S}) / (\text{Al}+\text{Si})=0.25 \dots 4$ & $\text{Fe} / (\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0 \dots 0.3$ & $\text{S}/\text{Cl}=0.5 \dots 1$ & $\text{IsNotInOtherGroup}=\text{yes}$

Sulfate/silicate mixture	$(\text{Al}+\text{Si}+\text{Mg}+\text{Fe}+\text{Na}+\text{S}) / (\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0.7 \dots 1.01$ & Fe /		
	$(\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0 \dots 0.3$ & Si / $(\text{Al}+\text{Si}+\text{Mg}+\text{Fe}) = 0.2 \dots 1.01$ &		
	$\text{S}/(\text{Al}+\text{Si})=0.25 \dots 4$ & Cl/S=0 .. 1 & Na/S=0 .. 1 & IsNotInOtherGroup=yes		
Other silicate	$(\text{Al}+\text{Si}+\text{Na}+\text{Mg}+\text{K}+\text{Ca}+\text{Fe}+\text{Ti}) / (\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0.7 \dots 1.01$ &		
	$(\text{Na}+\text{Cl}+\text{S}) / (\text{Al}+\text{Si}+\text{Fe})=0 \dots 0.25$ & IsNotInOtherGroup=yes		
	$(\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Fe}) / (\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0.7$		
Complex mixture	.. 1.01	& (Na+Cl)	/ (Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.1 .. 0.9
	& S/(Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.1	.. 0.9	& (Ca+K+Mg+Fe)
	/ (Na+Mg+Al+Si+P+S+Cl+K+Ca+Ti+Cr+Mn+Fe)=0.1	.. 0.9	& (Al+Si) /
	$(\text{Na}+\text{Mg}+\text{Al}+\text{Si}+\text{P}+\text{S}+\text{Cl}+\text{K}+\text{Ca}+\text{Ti}+\text{Cr}+\text{Mn}+\text{Fe})=0.1 \dots 0.9$ & IsNotInOtherGroup=yes		

Table S3. Sampling times for flat-plate samplers at HRS

ID	Start date & time	End date & time	Exposure time (min)
1	08.08.2021 19:00	10.08.2021 19:40	2920
2	10.08.2021 19:40	13.08.2021 18:30	4250
3	13.08.2021 18:30	15.08.2021 15:30	2700
4	15.08.2021 15:35	17.08.2021 11:50	2655
5	17.08.2021 11:55	19.08.2021 12:15	2900
6	19.08.2021 12:20	21.08.2021 13:15	2935
7	21.08.2021 13:20	23.08.2021 13:10	2870

ID	Start date & time	End date & time	Exposure time (min)
8	23.08.2021 13:10	25.08.2021 12:15	2825
9	25.08.2021 12:15	27.08.2021 14:00	2985
10	27.08.2021 14:00	29.08.2021 15:30	2970
11	29.08.2021 15:30	31.08.2021 19:20	3110
12	31.08.2021 19:20	02.09.2021 13:55	2555
13	02.09.2021 13:55	04.09.2021 09:30	2615
14	04.09.2021 09:35	06.09.2021 09:30	2875

Table S4. Sampling times for flat-plate samplers at MRS

ID	Start date & time	End date & time	Exposure time (min)
1	09.08.2021 09:05	11.08.2021 12:00	3055
2	11.08.2021 12:00	13.08.2021 12:12	2892
3	13.08.2021 12:15	15.08.2021 11:30	2835
4	15.08.2021 11:30	17.08.2021 09:30	2760

ID	Start date & time	End date & time	Exposure time (min)
5	17.08.2021 09:40	19.08.2021 09:00	2840
6	19.08.2021 09:00	21.08.2021 09:00	2880
7	21.08.2021 09:00	23.08.2021 10:00	2940

Table S5. Sampling times for flat-plate samplers at SRS

ID	Start date & time	End date & time	Exposure time (min)
1	11.08.2021 12:45	13.08.2021 12:55	2890
2	13.08.2021 12:58	15.08.2021 12:15	2837
3	15.08.2021 12:20	17.08.2021 09:15	2695
4	17.08.2021 09:20	19.08.2021 09:20	2880
5	19.08.2021 09:23	21.08.2021 09:25	2882
6	21.08.2021 09:28	23.08.2021 11:00	2972

ID	Start date & time	End date & time	Exposure time (min)
7	23.08.2021 11:00	26.08.2021 10:00	4260
8	26.08.2021 10:00	28.08.2021 10:00	2880
9	28.08.2021 10:00	30.08.2021 10:20	2900
10	30.08.2021 10:20	01.09.2021 11:00	2920
11	01.09.2021 11:00	03.09.2021 11:00	2880
12	03.09.2021 11:00	06.09.2021 11:35	4355

Table S6. Sampling times for flat-plate samplers at VFS

ID	Start date & time	End date & time	Exposure time (min)
1	12.08.2021 22:15	14.08.2021 18:10	2635
2	14.08.2021 18:15	16.08.2021 17:30	2835
3	16.08.2021 17:35	18.08.2021 18:00	2905
4	18.08.2021 18:05	20.08.2021 09:50	2385
5	20.08.2021 09:55	22.08.2021 17:40	3345
6	22.08.2021 17:40	24.08.2021 11:10	2490

ID	Start date & time	End date & time	Exposure time (min)
7	24.08.2021 11:15	27.08.2021 09:00	4185
8	27.08.2021 09:05	29.08.2021 09:30	2905
9	29.08.2021 09:30	31.08.2021 10:25	2935
10	31.08.2021 10:25	02.09.2021 10:15	2870
11	02.09.2021 10:15	04.09.2021 10:30	2895

3 Relative Abundances of Various Types of Particles

Table S7. Size resolved volume fraction (%) of particles in each particle class (number fraction in parentheses).

Particle type	Size class in μm						
	0.1-1	1-2	2-4	4-8	8-16	16-32	32-64
Fe-oxide/Fe-hydroxide-like	3.42 (3.47)	1.23 (1.76)	0.46 (0.48)	0.19 (0.21)	0.13 (0.15)	0.06 (0.11)	
Titanomagnetite-like	1.74 (1.76)	0.79 (0.87)	0.42 (0.47)	0.11 (0.15)	0.03 (0.05)		
Quartz-like	2.01 (1.85)	0.92 (1.25)	0.32 (0.35)	0.13 (0.15)	0.11 (0.12)	0.06 (0.09)	
Complex quartz-like	1.48 (1.45)	1.82 (1.79)	2.06 (2.06)	1.85 (1.87)	1.57 (1.55)	0.99 (0.99)	0.75 (1.01)
Pyroxene/amphibole-like	4.95 (4.88)	5.79 (5.91)	4.81 (5.05)	3.64 (3.81)	2.42 (2.72)	0.84 (0.92)	0.08 (0.17)
Albite-like	0.14 (0.15)	0.22 (0.22)	0.16 (0.17)	0.15 (0.15)	0.09 (0.12)	0.03 (0.05)	0.20 (0.17)
Interm.-Plag.-like	5.83 (5.55)	7.81 (8.09)	6.88 (7.19)	4.93 (5.29)	3.57 (3.84)	1.82 (2.00)	0.95 (1.35)
Anorthite-like	1.85 (1.76)	2.84 (2.80)	2.13 (2.26)	1.92 (1.97)	1.49 (1.57)	0.98 (1.03)	1.34 (1.01)
Complex silicate (moderat Al-low alkali)	6.79 (7.12)	2.88 (3.66)	1.87 (2.00)	0.86 (1.03)	0.46 (0.49)	0.70 (0.54)	0.52 (0.51)
Complex silicate (high Al)	1.23 (1.28)	0.84 (0.98)	0.30 (0.35)	0.24 (0.25)	0.11 (0.12)	0.14 (0.13)	
Al-rich clay mineral	1.01 (0.65)	1.01 (0.42)	1.41 (0.18)	1.08 (0.06)	1.03 (0.03)	0.90 (0.04)	
Other silicate	13.19 (13.62)	7.20 (8.34)	3.34 (3.71)	2.06 (2.18)	1.61 (1.65)	1.42 (1.48)	1.39 (1.69)
Ca-rich silicate/Ca-Si-mixture	1.45 (1.53)	1.59 (1.45)	1.26 (1.24)	1.40 (1.39)	1.05 (1.14)	0.61 (0.65)	0.98 (0.68)
Medium Al mixed silicates	35.50 (34.15)	56.72 (52.74)	68.80 (67.42)	79.26 (77.36)	86.87 (85.78)	91.99 (91.72)	93.68 (93.24)
Olivine-like	0.37 (0.34)	0.24 (0.23)	0.09 (0.11)	0.07 (0.08)	0.03 (0.05)		
Calcite-like	1.41 (1.60)	0.59 (0.76)	0.22 (0.26)	0.06 (0.07)	0.02 (0.02)		
Gypsum-like	1.80 (1.85)	0.78 (0.87)	0.10 (0.13)	0.04 (0.05)	0.02 (0.02)	0.01 (0.02)	
Ammonium-sulfate-like	5.36 (4.96)	3.80 (3.43)	5.45 (5.30)	2.19 (2.87)	0.20 (0.33)	0.02 (0.04)	
Complex sulfate	1.64 (1.74)	0.42 (0.59)	0.15 (0.14)	0.20 (0.24)	0.01 (0.03)		
Sulfate/silicate mixture	0.80 (0.88)	0.37 (0.41)	0.11 (0.13)	0.10 (0.11)	0.01 (0.03)	0.01 (0.02)	
Other	8.48 (9.41)	2.79 (3.43)	0.88 (0.99)	0.58 (0.72)	0.19 (0.21)	0.28 (0.18)	0.11 (0.17)

4 Temporal evolution

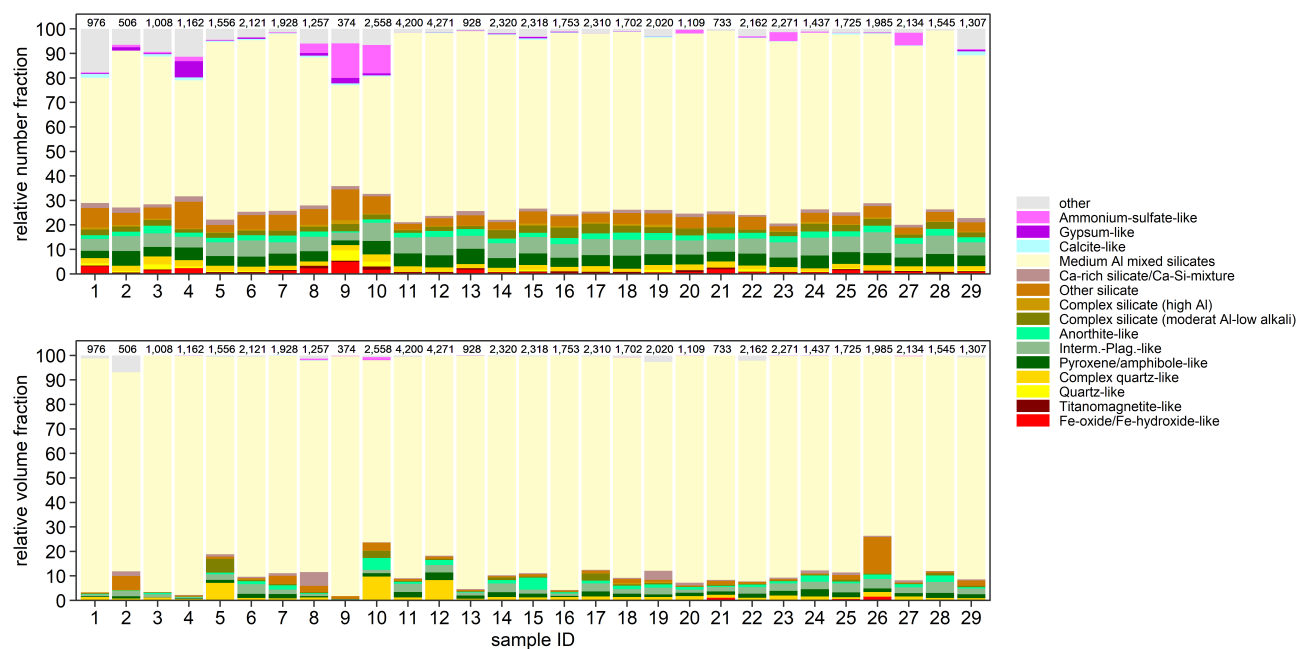


Figure S1. Chemical composition (relative number and volume abundance) of different particle groups of aerosol collected in August and September 2021 at Dyngjusandur by deposition plate sampler. The numbers on top represent total particle analysed.

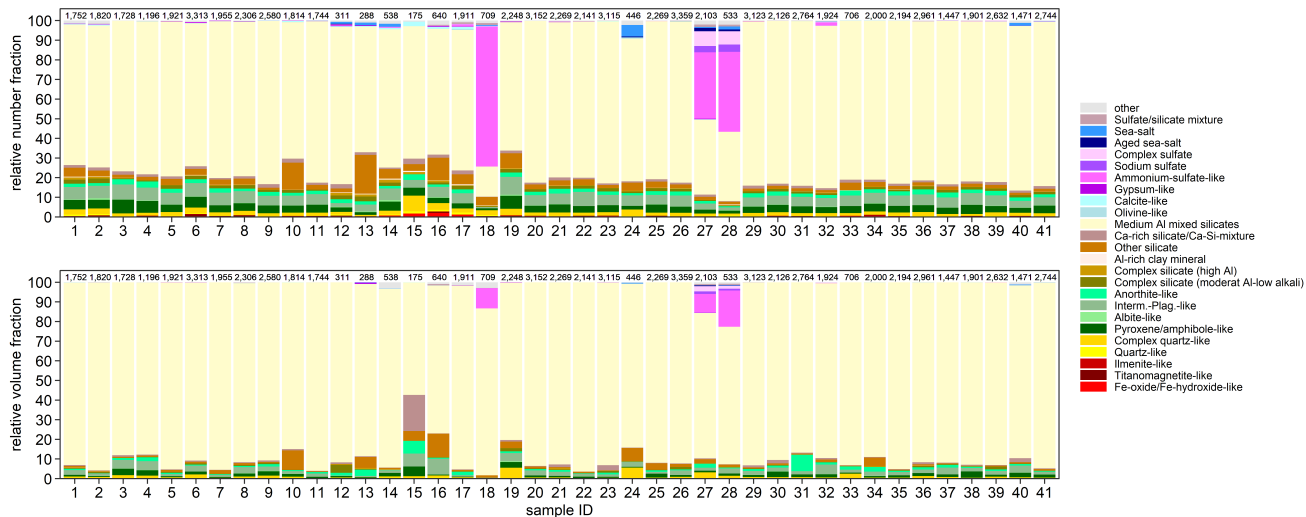


Figure S2. Chemical composition (relative number and volume abundance) of different particle groups of aerosol collected in August and September 2021 at Dyngjúsandur by free-wing impactor. The numbers on top represent total particle analysed.

5 Aspect ratio frequency distribution for select particle class

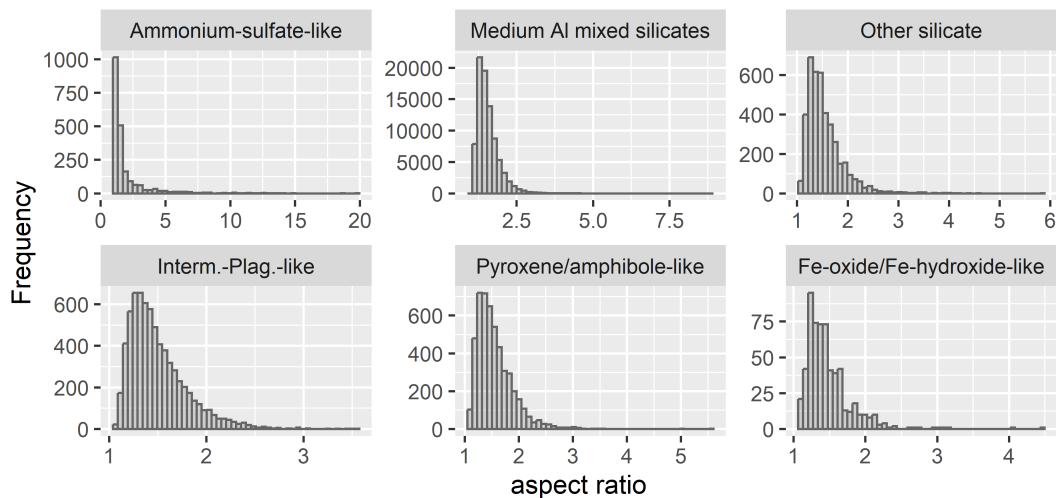


Figure S3. A selected particle group aspect ratios of the Icelandic dust at Dyngjúsandur. Full range was 1.03 to 19.65 (1.0 being spherical). The majority of particles had an aspect ratio < 3.

6 SEM image of sulfate particle

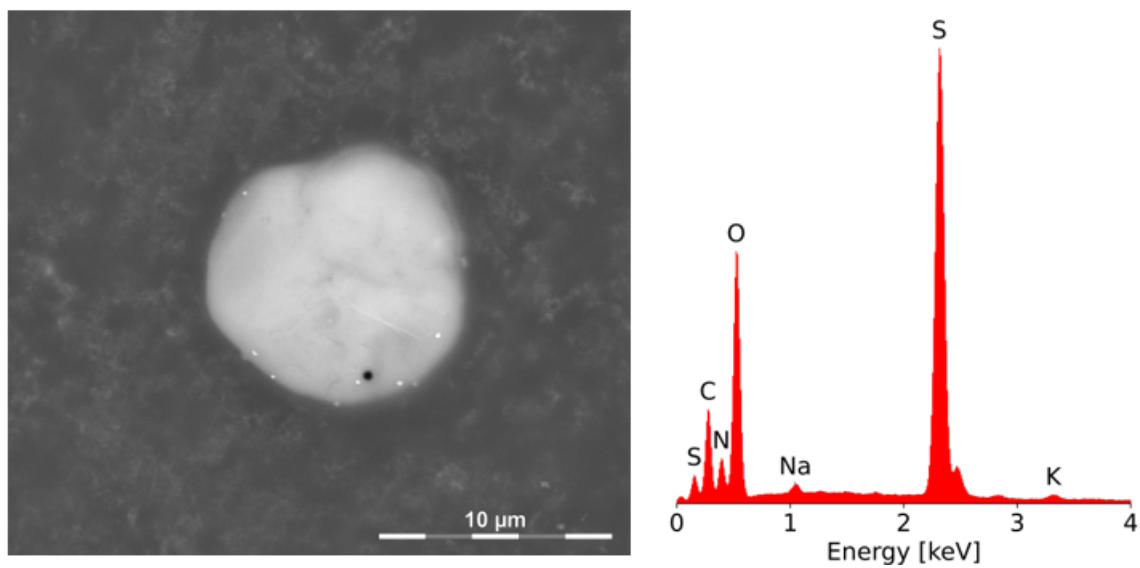


Figure S4. SEM image and its corresponding EDX signal of sulfate particles.

7 Backward trajectories

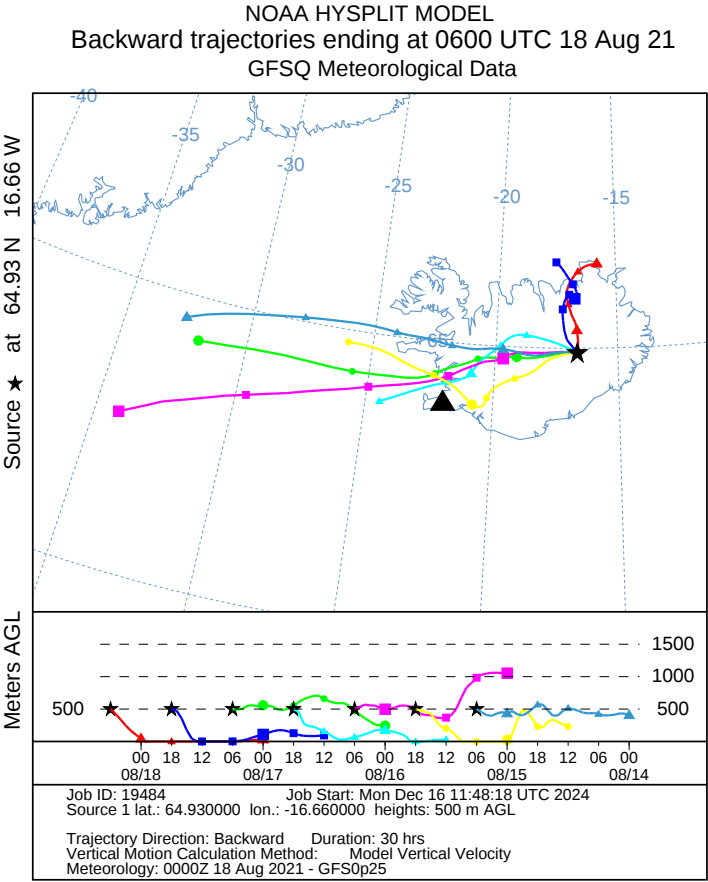


Figure S5.

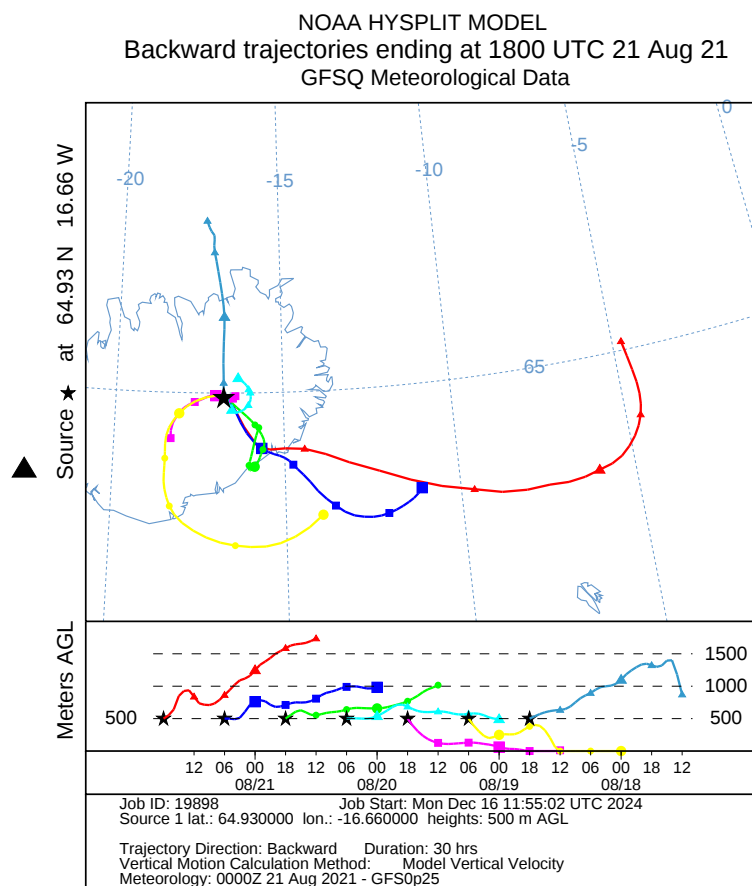


Figure S6.

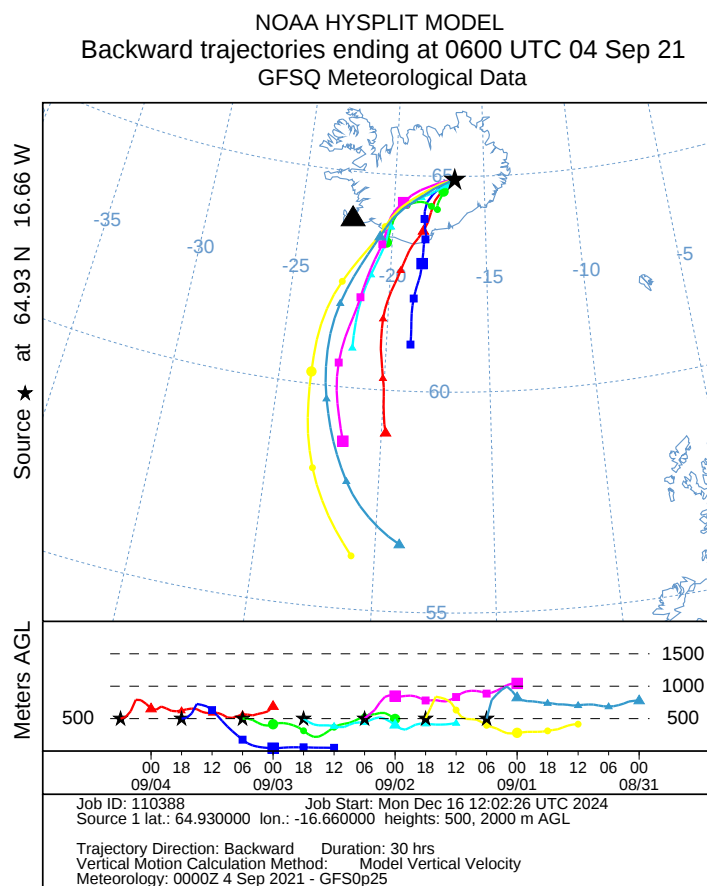


Figure S7.

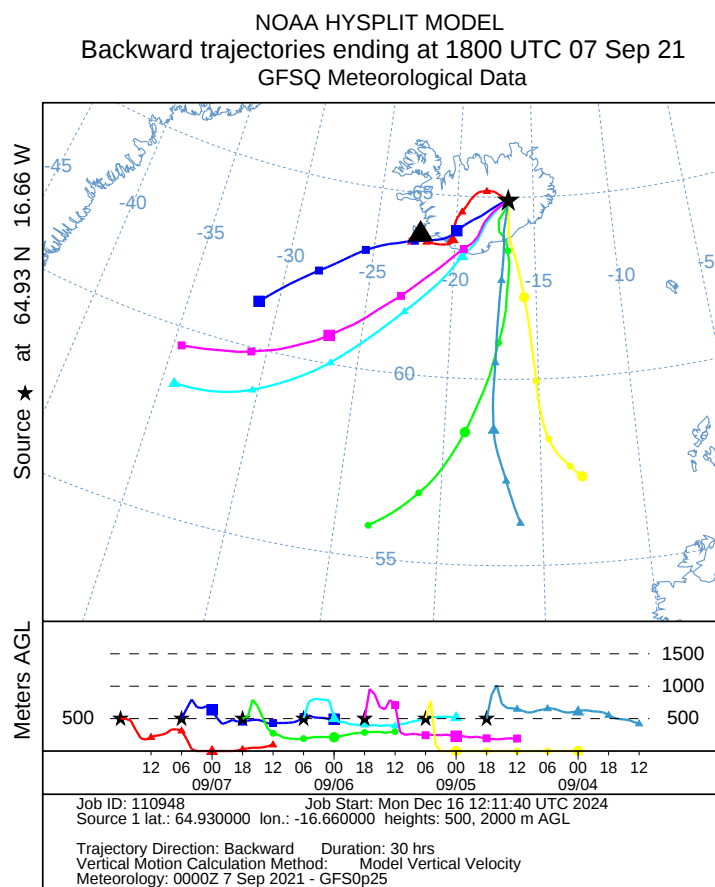


Figure S8.

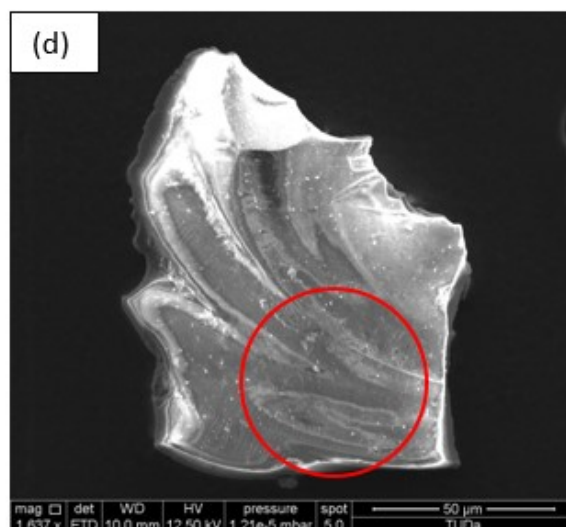
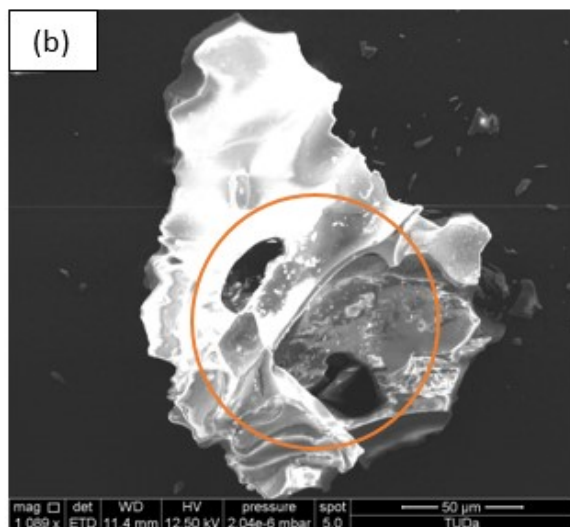
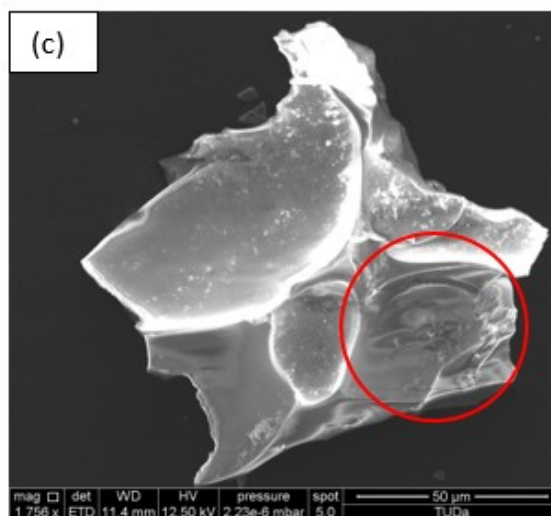
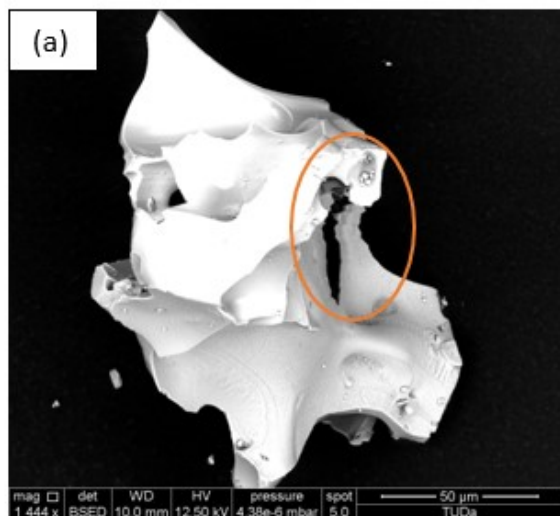


Figure S9. Morphological features of some typical coarse and super-coarse Icelandic dust collected at Dyngjúsandur. (a) and (b) highlights the presence of voids as well as fine particles and (c) and (d) shows typical river line fractures.

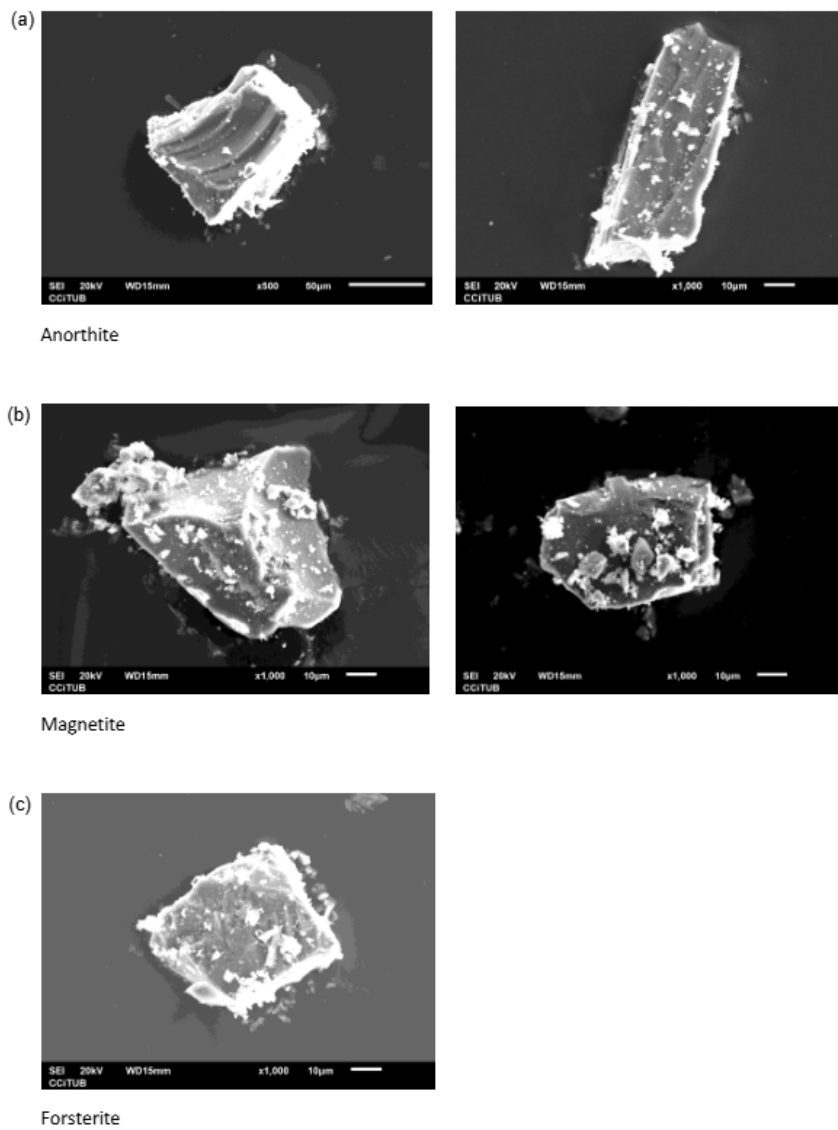


Figure S10. Scanning electron microscope (SEM) images of individual particles showcasing distinct mineral phases: (a) Anorthite (b) Magnetite and (c) Forsterit