```
Plot()
 {
 Outlier_Model("General", T(5), U(0,4),"t");
 P_Sequence("",1,0.3,U(-2,2))
 {
  Boundary();
  Curve("Atmospheric","IntCal20.14c");
  C_Date("BL-509",-18568,1131)
  {
   z=509;
   Outlier(0.05);
  };
  C_Date("BL-454",-16180,785)
  {
   z=454;
   Outlier(0.05);
  };
  C_Date("BL-427",-15464,551)
  {
   z=427;
   Outlier(0.05);
  };
  C_Date("BL-419",-15106,386)
  {
   z=419;
   Outlier(0.05);
  };
  C_Date("BL-357",-13505,705)
  {
   z=357;
   Outlier(0.05);
  };
  R_Date("348.5 – 351",12690,150)
  {
   z=350;
   Outlier(0.05);
  };
  R_Date("303-304",9875,35)
  {
   z=303.5;
   Outlier(0.05);
  };
  C_Date("pfm9k1b-284",-7475,500)
  {
   Outlier(0.05);
   z=284;
  };
  Combine("246cm", 180)
  {
   C_Date("CALS10k1b-246",-6235,500)
   {
    Outlier(0.05);
   };
   C_Date("pfm9k1b-246",-6395,500)
   {
    Outlier(0.05);
   };
   z=246;
  };
  Combine("228cm", 180)
  {
   C_Date("CALS10k1b-228",-5395,500)
   {
    Outlier(0.05);
   };
   C_Date("pfm9k1b-228",-5705,500)
   {
    Outlier(0.05);
   };
   z=228;
  };
  Combine("203cm", 180)
  {
   C_Date("CALS10k1b-203",-4635,500)
   {
    Outlier(0.05);
   };
   C_Date("pfm9k1b-203",-5195,500)
   {
    Outlier(0.05);
   };
   z=203;
  };
  Combine("189cm", 180)
  {
   C_Date("CALS10k1b-189",-4215,500)
   {
    Outlier(0.05);
   };
   C_Date("pfm9k1b-189",-4355,500)
   {
    Outlier(0.05);
   };
   z=189;
  };
  Combine("177cm", 180)
  {
   C_Date("pfm9k1b-177",-3755,500)
   {
    Outlier(0.05);
   };
   C_Date("CALS10k1b-177",-3485,500)
   {
    Outlier(0.05);
   };
   z=177;
  };
  Combine("155cm", 180)
  {
   C_Date("BL-155",-2858,529)
   {
    Outlier(0.05);
   };
   C_Date("pfm9k1b-155",-2195,500)
   {
    Outlier(0.05);
   };
```

File S1
(cont.)

```
 C_Date("CALS10k1b-155",-2245,500)
 {
  Outlier(0.05);
 };
 z=155;
};
C_Date("Aniakchak CFE II",-1622,8)
{
 z=105;
 Outlier(0.05);
};
Combine("80cm", 180)
{
 C_Date("BL-80",-803,302)
 {
  Outlier(0.05);
 };
 C_Date("pfm9k1b-80",-685,500)
 {
  Outlier(0.05);
 };
 C_Date("CALS10k1b-80",-995,500)
 {
  Outlier(0.05);
 };
 z=80;
};
C_Date("Ruppert",-515,335)
{
 z=74;
 Outlier(0.05);
};
Combine("60cm", 180)
{
 C_Date("BL-60",-322,485.5)
 {
  Outlier(0.05);
 };
 C_Date("pfm9k1b-60",-5,500)
 {
  Outlier(0.05);
 };
 C_Date("CALS10k1b-60",-115,500)
 {
  Outlier(0.05);
 };
 z=60;
};
C_Date("WRAn",325,65)
{
 z=48;
 Outlier(0.05);
};
C_Date("Opala",615,40)
{
 z=37;
 Outlier(0.05);
};
R_Date("11-13",785,45)
{
 z=12;
 Outlier(0.05);
};
Combine("3.6cm", 180)
{
 R_Date("2.6- 4.6",170,30)
 {
  Outlier(0.05);
 };
 C_Date("3-3.6",1870,7)
 {
  Outlier(0.05);
 };
 z=3.6;
};
Curve("Bomb13NH1","Bomb13NH1.14c");
C_Date("2.25-3",1901,4.)
{
 z=3;
 Outlier(0.05);
};
C_Date("1.5-2.25",1930,2)
{
 z=2.25;
 Outlier(0.05);
};
C_Date("1-1.5",1946,2)
{
 z=1.5;
 Outlier(0.05);
};
C_Date("0.5-1",1965,1.5)
{
 z=1;
 Outlier(0.05);
};
C_Date("0-0.5",1990,1)
{
 z=0.5;
 Outlier(0.05);
};
C_Date("Surface",2013,0.5)
{
 z=0;
};
Boundary();
};
};
```

Fig. S1

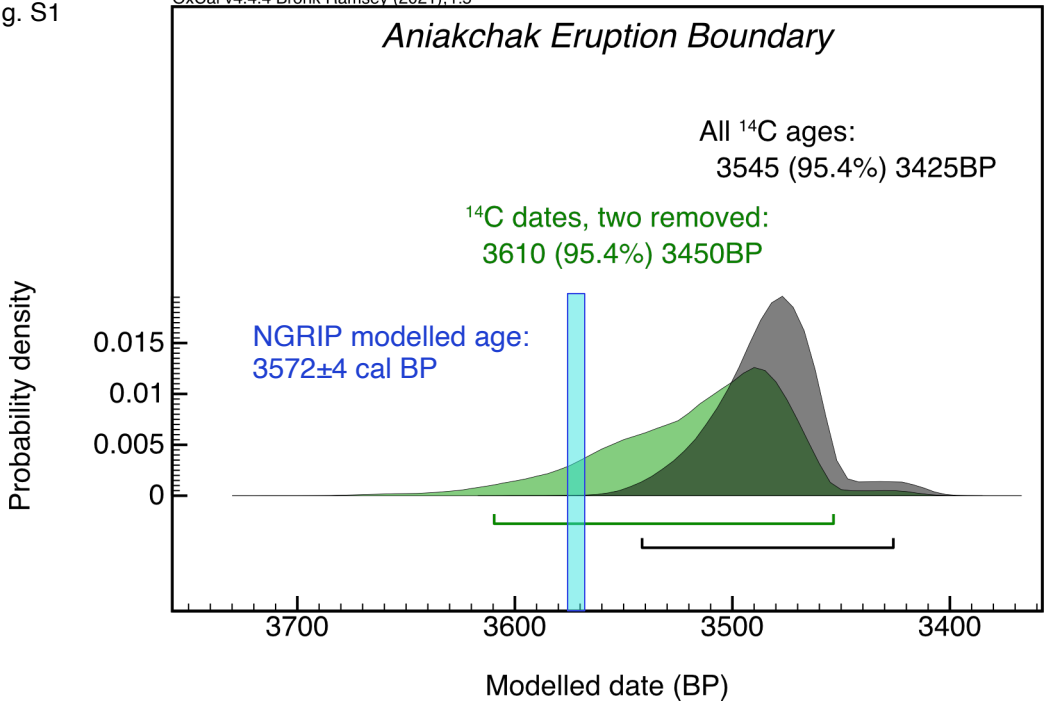

OxCal v4.4.4 Bronk Ramsey (2021); r:5
Aniakchak Eruption Boundary
All 14C ages:
3545 (95.4%) 3425BP
14C dates, two removed:
3610 (95.4%) 3450BP
NGRIP modelled age:
3572±4 cal BP
Probability density
0.015
0.01
0.005
0
3700
3600
3500
3400
Modelled date (BP)

Fig. S2

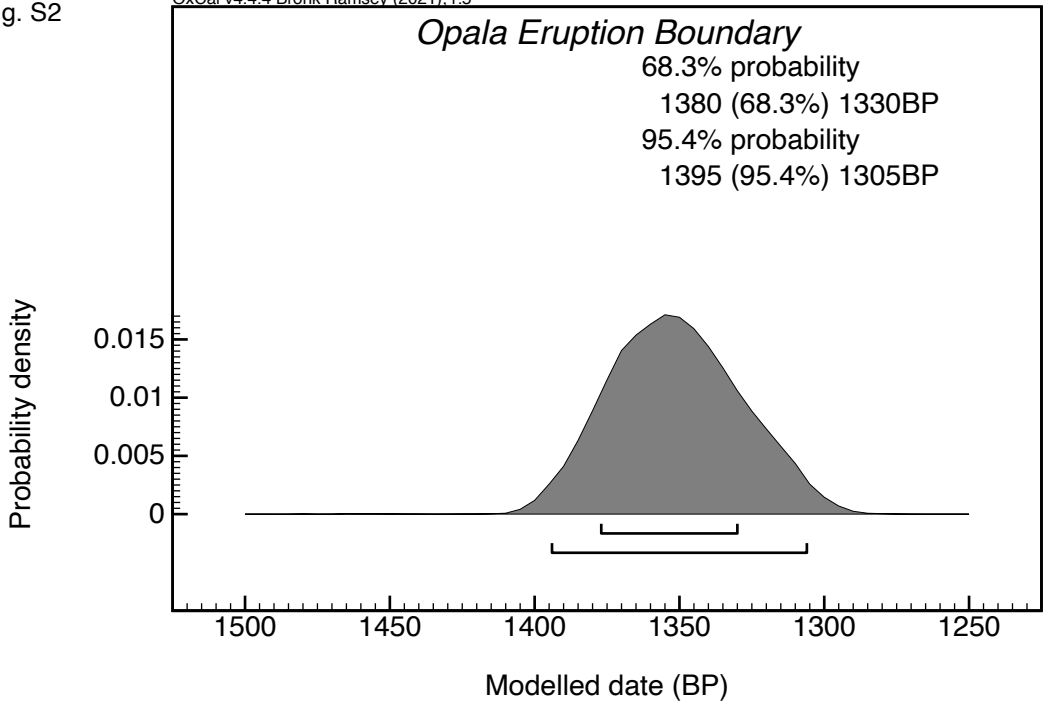

OxCal v4.4.4 Bronk Ramsey (2021); r:5
Opala Eruption Boundary
68.3% probability
1380 (68.3%) 1330BP
95.4% probability
1395 (95.4%) 1305BP
Probability density
0.015
0.01
0.005
0
1500
1450
1400
1350
1300
1250
Modelled date (BP)

Fig. S3

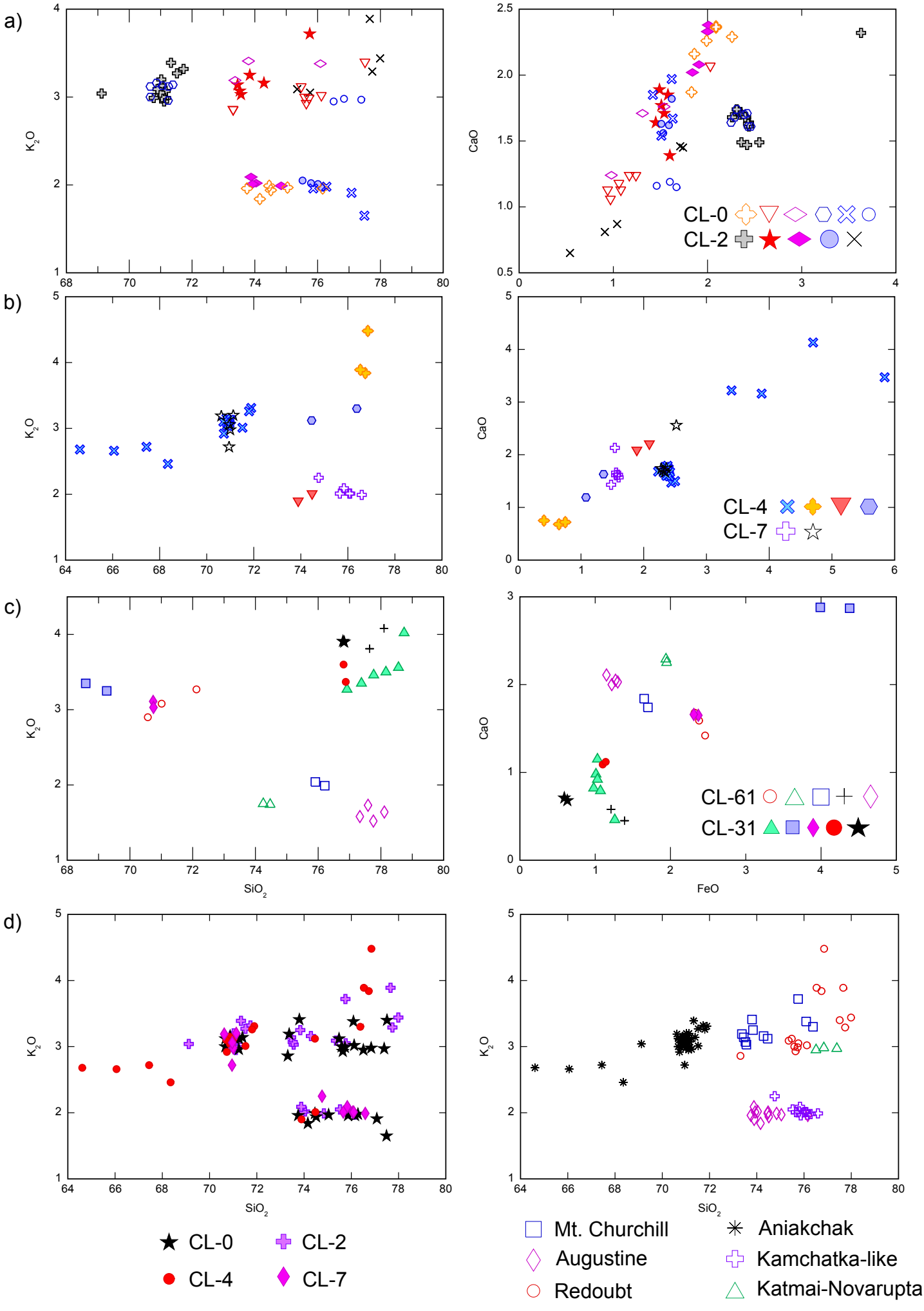
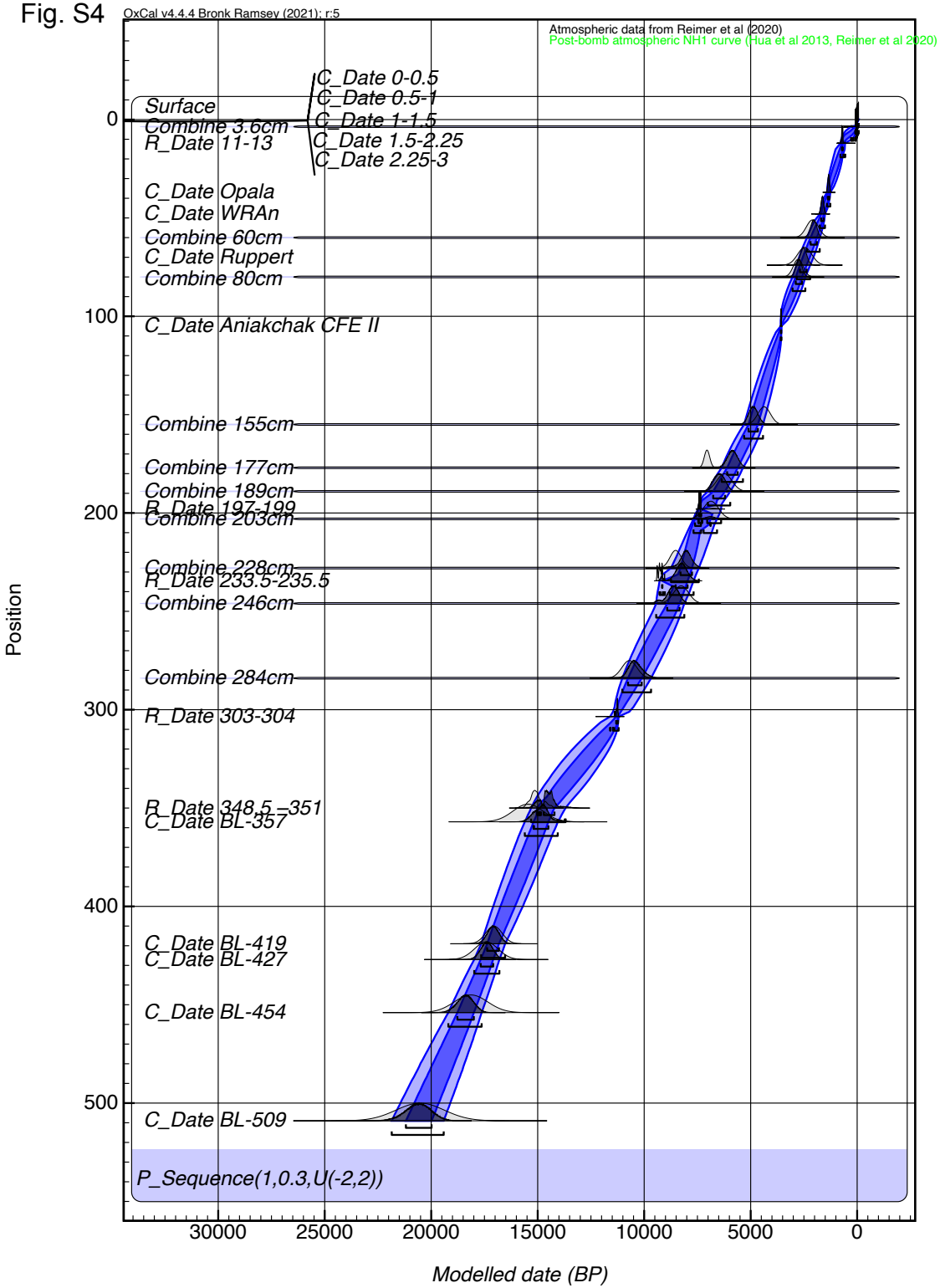

a)
b)
c)
d)
K2O
CaO
SiO2
FeO
CL-0
CL-2
CL-4
CL-7
CL-61
CL-31
Mt. Churchill
Augustine
Redoubt
Aniakchak
Kamchatka-like
Katmai-Novarupta

Fig. S4

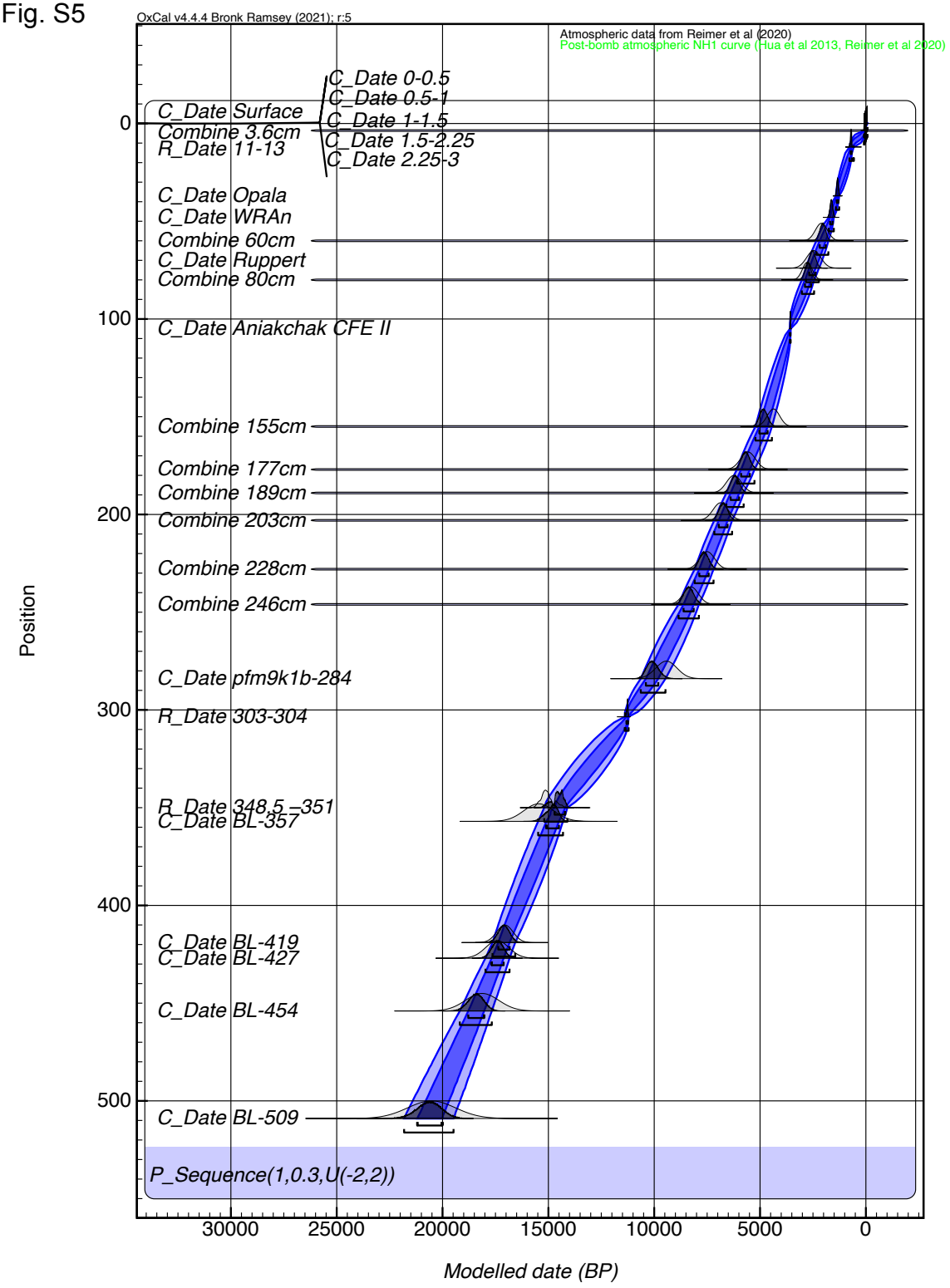


Bayesian model (v1) and outlier analysis

Posterior = likelihood of being an outlier
(original assumption is 5, or 1 in 20 chance)

Element	Ok / Outlier	Prior	Posterior	Model	Type
BL-509		5	3	General	t
BL-454		5	3	General	t
BL-427		5	2	General	t
BL-419		5	2	General	t
BL-357		5	4	General	t
348.5 – 351		5	13	General	t
303-304		5	4	General	t
BL-284		5	50	General	t
pfm9k1b-284		5	13	General	t
CALS10k1b-246		5	4	General	t
pfm9k1b-246		5	3	General	t
233.5-235.5		5	92	General	t
BL-228		5	92	General	t
CALS10k1b-228		5	6	General	t
pfm9k1b-228		5	3	General	t
CALS10k1b-203		5	5	General	t
pfm9k1b-203		5	2	General	t
197-199		5	29	General	t
CALS10k1b-189		5	3	General	t
pfm9k1b-189		5	2	General	t
BL-177		5	100	General	t
pfm9k1b-177		5	2	General	t
CALS10k1b-177		5	3	General	t
BL-155		5	2	General	t
pfm9k1b-155		5	5	General	t
CALS10k1b-155		5	5	General	t
Aniakchak CFE II		5	0	General	t
BL-80		5	1	General	t
pfm9k1b-80		5	2	General	t
CALS10k1b-80		5	2	General	t
Ruppert		5	2	General	t
BL-60		5	2	General	t
pfm9k1b-60		5	2	General	t
CALS10k1b-60		5	2	General	t
WRAn		5	1	General	t
Opala		5	1	General	t
11-13		5	4	General	t
2.6- 4.6		5	1	General	t
3-3.6		5	21	General	t
2.25-3		5	0	General	t
1.5-2.25		5	0	General	t
1-1.5		5	0	General	t
0.5-1		5	0	General	t
0-0.5		5	0	General	t

Fig. S5



Bayesian model (v2) and outlier analysis

Five outliers removed from initial model; all ages are now in good agreement.

Posterior = likelihood of being an outlier
(original assumption is 5, or 1 in 20 chance)

Element	Ok	Outlier	Prior	Posterior	Model	Type
BL-509			5	5	General	t
BL-454			5	5	General	t
BL-427			5	5	General	t
BL-419			5	4	General	t
BL-357			5	5	General	t
348.5 – 351			5	7	General	t
303-304			5	4	General	t
pfm9k1b-284			5	5	General	t
CALS10k1b-246			5	4	General	t
pfm9k1b-246			5	5	General	t
CALS10k1b-228			5	5	General	t
pfm9k1b-228			5	4	General	t
CALS10k1b-203			5	4	General	t
pfm9k1b-203			5	5	General	t
CALS10k1b-189			5	4	General	t
pfm9k1b-189			5	4	General	t
pfm9k1b-177			5	4	General	t
CALS10k1b-177			5	4	General	t
BL-155			5	4	General	t
pfm9k1b-155			5	5	General	t
CALS10k1b-155			5	5	General	t
Aniakchak CFE II			5	3	General	t
BL-80			5	4	General	t
pfm9k1b-80			5	4	General	t
CALS10k1b-80			5	4	General	t
Ruppert			5	4	General	t
BL-60			5	5	General	t
pfm9k1b-60			5	4	General	t
CALS10k1b-60			5	4	General	t
WRAn			5	4	General	t
Opala			5	4	General	t
11-13			5	6	General	t
2.6- 4.6			5	4	General	t
3-3.6			5	4	General	t
2.25-3			5	4	General	t
1.5-2.25			5	4	General	t
1-1.5			5	4	General	t
0.5-1			5	3	General	t
0-0.5			5	2	General	t

Table S1– Major element glass geochemical data.

Data are listed here by sample/depth from seven analytical days in 2018 and one in 2019. Only one sample (CL-48) was analysed on multiple days.
Analyses of reference material for given eruptions are included here below relevant/correlated CL samples. It is noted if these were analysed concurrently (not always possible given small glass populations of some samples).
Reasons for rejection of analyses are listed - these are most commonly low analytical totals (<94%), non-glass silicate and mineral inclusion or contamination (i.e. glass with some mineral input, or mostly mineral analysed).
Analyses highlighted in red text have analytical totals between 94-96%; reject analyses highlighted in red show elemental values used to identify them as anomalous.

Analytical conditions: 5 micron beam (exception: Nov 16th, 10 micron beam), 15 KeV and 6 nA current
Data normalised to 100%. St. Dev. = standard deviation.

Sample #	Run #	UA #	SiO_2	TiO_2	Al_2O_3	FeO_t	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total	H_2O_d	n	Comments
CL-0	Oct 11 2018	**Casc13-12-27**	71.05	0.45	14.84	2.25	0.16	0.49	1.64	5.84	3.13	0.20	100.00	0.71		
	Oct 11 2018	**Casc13-12-35**	71.25	0.50	15.11	2.29	0.14	0.47	1.68	5.28	3.12	0.21	100.00	1.72		
	Oct 11 2018	**Casc13-12-25**	70.67	0.52	14.90	2.31	0.20	0.53	1.74	5.82	3.12	0.24	100.00	3.47		
	Oct 11 2018	**Casc13-12-21**	71.24	0.46	15.00	2.39	0.14	0.50	1.70	5.42	2.96	0.25	100.00	0.90		
	Oct 11 2018	**Casc13-12-37**	70.67	0.46	14.96	2.42	0.14	0.52	1.71	5.97	3.00	0.20	100.00	-0.39		
	Oct 11 2018	**Casc13-12-28**	70.87	0.52	14.85	2.43	0.17	0.49	1.61	5.70	3.16	0.27	100.00	2.48		
	Oct 11 2018	**Casc13-12-26**	71.39	0.44	14.64	2.46	0.20	0.49	1.61	5.46	3.14	0.22	100.00	1.33		
		Mean	71.02	0.48	14.90	2.36	0.16	0.50	1.67	5.64	3.09	0.23	100.00	1.46	7	Aniakchak like
		St. Dev.	0.29	0.03	0.15	0.08	0.03	0.02	0.05	0.26	0.08	0.03	0.00	1.26		
	Oct 11 2018	**Casc13-12-1**	76.09	0.11	13.11	0.98	0.03	0.19	1.24	4.60	3.38	0.34	100.00	2.58		
	Oct 11 2018	**Casc13-12-22**	73.37	0.17	14.46	1.54	0.07	0.41	1.76	4.78	3.19	0.32	100.00	1.87		
	Oct 11 2018	**Casc13-12-6**	73.80	0.19	14.39	1.31	0.06	0.36	1.71	4.53	3.41	0.32	100.00	4.91		
		Mean	74.42	0.16	13.99	1.28	0.05	0.32	1.57	4.63	3.33	0.33	100.00	3.12	3	Churchill like
		St. Dev.	1.46	0.04	0.76	0.28	0.02	0.12	0.29	0.13	0.12	0.01	0.00	1.59		
	Oct 11 2018	**Casc13-12-19**	75.04	0.31	13.75	1.83	0.07	0.41	1.87	4.63	1.97	0.14	100.00	1.61		
	Oct 11 2018	**Casc13-12-10**	74.46	0.27	13.74	1.86	0.09	0.43	2.16	4.79	1.99	0.27	100.00	1.32		
	Oct 11 2018	**Casc13-12-4**	74.51	0.32	13.99	1.99	0.08	0.50	2.26	4.26	1.94	0.20	100.00	2.83		
	Oct 11 2018	**Casc13-12-17**	73.75	0.29	14.13	2.09	0.11	0.50	2.36	4.67	1.96	0.19	100.00	1.46		
	Oct 11 2018	**Casc13-12-18**	74.16	0.33	14.14	2.09	0.07	0.46	2.37	4.33	1.84	0.28	100.00	2.21		
	Oct 11 2018	**Casc13-12-31**	76.16	0.38	12.36	2.26	0.09	0.49	2.29	3.88	1.96	0.18	100.00	1.25		
		Mean	74.68	0.32	13.68	2.02	0.09	0.46	2.22	4.43	1.94	0.21	100.00	1.78	6	Augustine like
		St. Dev.	0.84	0.04	0.67	0.16	0.02	0.04	0.19	0.34	0.05	0.06	0.00	0.62		
	Oct 11 2018	**Casc13-12-36**	73.31	0.41	14.10	2.03	0.07	0.52	2.07	4.48	2.86	0.19	100.00	0.99		
	Oct 11 2018	**Casc13-12-20**	75.48	0.30	13.56	1.08	0.05	0.27	1.13	4.91	3.12	0.12	100.00	2.82		
	Oct 11 2018	**Casc13-12-33**	75.64	0.21	13.74	1.06	0.04	0.29	1.18	4.83	2.93	0.10	100.00	1.79		
	Oct 11 2018	**Casc13-12-38**	75.73	0.27	13.51	1.24	0.04	0.32	1.24	4.56	2.99	0.13	100.00	3.63		
	Oct 11 2018	**Casc13-12-12**	76.12	0.25	13.37	0.94	0.04	0.27	1.13	4.78	3.02	0.10	100.00	1.49		
	Oct 11 2018	**Casc13-12-29**	77.51	0.11	12.78	0.97	0.04	0.22	1.06	3.70	3.40	0.28	100.00	3.21		
		Mean	75.63	0.26	13.51	1.22	0.05	0.31	1.30	4.54	3.05	0.15	100.00	2.32	6	*Similar to Shiveluch, Redoubt*
		St. Dev.	1.35	0.10	0.44	0.41	0.01	0.10	0.38	0.45	0.19	0.07	0.00	1.05		
	Oct 11 2018	**Casc13-12-11**	75.86	0.18	13.16	1.63	0.04	0.28	1.67	5.08	1.96	0.17	100.00	1.71		
	Oct 11 2018	**Casc13-12-9**	76.28	0.26	13.30	1.51	0.05	0.28	1.54	4.67	1.98	0.16	100.00	1.88		
		Mean	76.07	0.22	13.23	1.57	0.04	0.28	1.60	4.87	1.97	0.17	100.00	1.79	2	
		St. Dev.	0.30	0.05	0.10	0.09	0.01	0.00	0.09	0.29	0.02	0.01	0.00	0.12		
	Oct 11 2018	**Casc13-12-23**	76.51	0.35	12.21	1.67	0.03	0.29	1.15	4.70	2.95	0.19	100.00	2.05		
	Oct 11 2018	**Casc13-12-24**	76.84	0.36	12.37	1.60	0.04	0.24	1.19	4.22	2.98	0.21	100.00	1.11		
	Oct 11 2018	**Casc13-12-5**	77.39	0.29	12.23	1.46	0.02	0.26	1.16	4.06	2.97	0.22	100.00	1.68		
		Mean	76.91	0.33	12.27	1.57	0.03	0.26	1.16	4.33	2.97	0.21	100.00	1.61	3	Katmai like
		St. Dev.	0.45	0.04	0.09	0.11	0.01	0.02	0.02	0.33	0.01	0.01	0.00	0.48		
	Oct 11 2018	**Casc13-12-30**	77.85	0.05	12.02	1.13	0.07	0.03	0.42	3.48	4.88	0.08	100.00	3.83		
	Oct 11 2018	**Casc13-12-2**	77.08	0.32	12.45	1.62	0.07	0.39	1.97	3.95	1.91	0.31	100.00	3.55		
	Oct 11 2018	**Casc13-12-39**	77.49	0.23	12.35	1.42	0.07	0.34	1.85	4.43	1.65	0.21	100.00	1.85		
	Oct 11 2018	**Casc13-12-34**	76.62	0.13	13.09	0.64	0.11	0.11	0.72	4.66	3.81	0.14	100.00	1.58		
	Oct 11 2018	**Casc13-12-7**	74.55	0.16	13.61	1.22	0.04	0.28	1.31	3.52	5.07	0.30	100.00	1.27		
	Oct 11 2018	**Casc13-12-16**	72.08	0.33	14.88	2.27	0.08	0.63	2.35	5.22	2.08	0.10	100.00	2.64		
	Oct 11 2018	**Casc13-12-3**	77.58	0.19	12.66	1.07	0.06	0.32	1.26	4.02	2.71	0.18	100.00	3.09		
	Oct 11 2018	**Casc13-12-8**	78.24	0.28	11.56	1.44	0.06	0.17	0.75	4.00	3.36	0.18	100.00	5.12		
REF	Oct 11 2018	**UA 1364-13**	75.97	0.35	12.65	1.55	0.05	0.28	1.37	4.60	3.03	0.18	100.00	-0.78		Kodiak Island, station 07JANV-2
Novarupta-Katmai	Oct 11 2018	**UA 1364-7**	76.38	0.36	12.14	1.76	0.03	0.31	1.21	4.67	2.97	0.20	100.00	4.06		Davies et al. (2016)
1912	Oct 11 2018	**UA 1364-5**	76.66	0.27	12.73	1.33	0.07	0.21	1.27	4.36	2.94	0.18	100.00	-0.18		
	Oct 11 2018	**UA 1364-14**	76.80	0.37	12.47	1.67	0.06	0.28	1.28	3.85	3.06	0.21	100.00	0.71		Analysed concurrently with unknown sample
	Oct 11 2018	**UA 1364-9**	77.01	0.36	12.35	1.67	0.04	0.26	1.20	4.00	2.99	0.18	100.00	0.21		
	Oct 11 2018	**UA 1364-1**	77.26	0.36	12.07	1.65	0.03	0.25	1.16	4.00	3.05	0.22	100.00	0.55		
	Oct 11 2018	**UA 1364-10**	77.60	0.18	11.97	1.25	0.10	0.08	0.72	4.72	3.21	0.22	100.00	3.46		
	Oct 11 2018	**UA 1364-15**	77.62	0.20	12.16	1.25	0.04	0.15	0.81	4.38	3.24	0.20	100.00	0.27		
	Oct 11 2018	**UA 1364-11**	77.62	0.33	12.47	1.29	0.04	0.22	1.17	3.59	3.10	0.21	100.00	-0.27		
	Oct 11 2018	**UA 1364-12**	77.80	0.25	12.07	1.28	0.05	0.18	1.00	4.00	3.23	0.19	100.00	0.56		
	Oct 11 2018	**UA 1364-2**	78.19	0.13	12.11	1.20	0.02	0.11	0.70	4.27	3.08	0.23	100.00	-0.45		
	Oct 11 2018	**UA 1364-6**	78.30	0.16	12.11	1.10	0.00	0.12	0.69	4.24	3.09	0.24	100.00	-0.29		
		Mean	77.27	0.28	12.28	1.42	0.04	0.20	1.05	4.22	3.08	0.20	100.00	0.65	12	
		St. Dev.	0.72	0.09	0.25	0.23	0.02	0.07	0.25	0.35	0.10	0.02	0.00	1.52		
	Oct 11 2018	**UA 1364-8**	68.82	0.69	14.92	3.71	0.10	1.10	3.65	4.47	2.41	0.16	100.00	0.06		
	Oct 11 2018	**UA 1364-4**	69.25	0.72	14.83	4.02	0.10	1.02	3.37	4.10	2.45	0.17	100.00	1.23		
	Oct 11 2018	**UA 1364-3**	69.67	0.60	14.53	3.66	0.07	1.04	3.16	4.67	2.48	0.16	100.00	0.39		
		Mean	69.25	0.67	14.76	3.80	0.09	1.06	3.39	4.42	2.45	0.16	100.00	0.56	3	
		St. Dev.	0.42	0.06	0.21	0.20	0.02	0.04	0.25	0.29	0.03	0.01	0.00	0.60		
REF	Oct 11 2018	**UA 2754-15**	76.02	0.28	13.17	1.35	0.07	0.24	1.40	3.96	3.40	0.14	100.00	0.36		Seismic station RDN, Alaska
Redoubt 1989-90	Oct 11 2018	**UA 2754-9**	76.79	0.29	12.77	1.03	0.04	0.08	1.15	4.40	3.36	0.10	100.00	0.22		Davies et al. (2016)
	Oct 11 2018	**UA 2754-13**	77.24	0.31	12.72	1.10	0.06	0.18	1.09	3.93	3.30	0.09	100.00	0.93		
	Oct 11 2018	**UA 2754-10**	77.39	0.20	12.71	0.87	0.00	0.06	1.14	4.25	3.33	0.07	100.00	1.20		Analysed concurrently with unknown sample
	Oct 11 2018	**UA 2754-11**	77.52	0.20	12.32	0.94	0.08	0.14	1.03	3.96	3.71	0.13	100.00	0.46		
	Oct 11 2018	**UA 2754-6**	77.81	0.25	12.36	1.04	0.09	0.14	1.02	3.44	3.75	0.13	100.00	1.40		
	Oct 11 2018	**UA 2754-14**	77.84	0.21	12.18	1.02	0.06	0.19	1.01	3.89	3.51	0.12	100.00	1.30		
	Oct 11 2018	**UA 2754-3**	78.06	0.30	12.06	1.10	0.06	0.14	0.86	3.75	3.57	0.12	100.00	0.84		
	Oct 11 2018	**UA 2754-8**	78.38	0.27	11.86	1.04	0.10	0.12	0.80	3.74	3.60	0.13	100.00	0.38		
		Mean	77.45	0.26	12.46	1.06	0.06	0.14	1.06	3.92	3.50	0.12	100.00	0.79	9	
		St. Dev.	0.71	0.04	0.41	0.13	0.03	0.06	0.17	0.28	0.17	0.02	0.00	0.45		
	Oct 11 2018	**UA 2754-4**	79.64	0.25	11.94	0.58	0.03	0.09	0.16	3.21	4.03	0.10	100.00	0.74		
CL-2	Oct 11 2018	**Casc13-14-8**	69.12	0.84	14.87	3.63	0.17	0.84	2.32	5.05	3.04	0.15	100.00	1.21		
	Oct 11 2018	**Casc13-14-7**	70.78	0.51	15.13	2.40	0.13	0.51	1.68	5.70	2.99	0.22	100.00	1.64		
	Oct 11 2018	**Casc13-14-31**	70.90	0.48	15.09	2.31	0.18	0.57	1.74	5.46	3.09	0.23	100.00	0.32		
	Oct 11 2018	**Casc13-14-14**	70.99	0.50	15.24	2.32	0.15	0.54	1.73	5.31	3.05	0.24	100.00	1.03		
	Oct 11 2018	**Casc13-14-19**	71.02	0.50	15.20	2.43	0.10	0.45	1.63	5.32	3.20	0.20	100.00	0.80		
	Oct 11 2018	**Casc13-14-17**	71.04	0.44	14.95	2.44	0.15	0.46	1.61	5.58	3.13	0.25	100.00	0.53		
	Oct 11 2018	**Casc13-14-39**	71.04	0.46	15.23	2.35	0.13	0.50	1.72	5.36	3.00	0.27	100.00	2.35		
	Oct 11 2018	**Casc13-14-9**	71.11	0.45	14.96	2.44	0.15	0.59	1.64	5.54	2.99	0.18	100.00	1.44		
	Oct 11 2018	**Casc13-14-22**	71.11	0.45	15.28	2.41	0.13	0.53	1.68	5.33	2.95	0.19	100.00	1.08		
	Oct 11 2018	**Casc13-14-35**	71.16	0.43	15.12	2.26	0.17	0.54	1.68	5.40	3.07	0.21	100.00	0.95		
	Oct 11 2018	**Casc13-14-37**	71.17	0.43	15.00	2.34	0.13	0.48	1.70	5.53	2.99	0.27	100.00	3.43		
	Oct 11 2018	**Casc13-14-5**	71.33	0.43	14.68	2.42	0.10	0.42	1.47	5.60	3.39	0.21	100.00	1.19		
	Oct 11 2018	**Casc13-14-16**	71.52	0.45	14.65	2.55	0.11	0.42	1.49	5.38	3.27	0.20	100.00	1.39		
	Oct 11 2018	**Casc13-14-2**	71.73	0.49	14.62	2.36	0.10	0.44	1.49	5.30	3.32	0.19	100.00	1.53		
		Mean	71.00	0.49	15.00	2.48	0.14	0.52	1.68	5.42	3.11	0.22	100.00	1.35	14	Aniakchak like
		St. Dev.	0.59	0.10	0.23	0.34	0.03	0.10	0.20	0.16	0.14	0.03	0.00	0.78		
	Oct 11 2018	**Casc13-14-18**	73.45	0.23	14.61	1.49	0.01	0.39	1.89	4.54	3.14	0.33	100.00	3.08		
	Oct 11 2018	**Casc13-14-25**	73.52	0.20	14.72	1.58	0.04	0.36	1.85	4.41	3.07	0.31	100.00	4.66		
	Oct 11 2018	**Casc13-14-23**	73.56	0.21	14.53	1.51	0.04	0.40	1.77	4.71	3.03	0.31	100.00	2.45		
	Oct 11 2018	**Casc13-14-4**	73.84	0.20	14.25	1.54	0.04	0.36	1.71	4.52	3.25	0.37	100.00	1.85		
	Oct 11 2018	**Casc13-14-26**	74.29	0.19	14.19	1.45	0.09	0.33	1.64	4.41	3.16	0.34	100.00	2.02		
		Mean	73.73	0.21	14.46	1.51	0.04	0.37	1.77	4.52	3.13	0.33	100.00	2.81	5	Churchill like
		St. Dev.	0.35	0.02	0.23	0.05	0.03	0.03	0.10	0.12	0.08	0.02	0.00	1.14		
	Oct 11 2018	**Casc13-14-3**	73.88	0.36	13.76	1.91	0.12	0.46	2.08	5.15	2.09	0.24	100.00	0.26		
	Oct 11 2018	**Casc13-14-20**	73.93	0.34	13.81	2.01	0.12	0.46	2.38	4.75	2.01	0.26	100.00	0.90		
	Oct 11 2018	**Casc13-14-21**	74.04	0.31	13.90	2.00	0.10	0.45	2.33	4.65	2.02	0.26	100.00	2.01		
	Oct 11 2018	**Casc13-14-36**	74.84	0.29	13.53	1.84	0.15	0.43	2.02	4.70	1.99	0.28	100.00	1.37		
		Mean	74.17	0.32	13.75	1.94	0.12	0.45	2.20	4.82	2.03	0.26	100.00	1.14	4	Augustine like
		St. Dev.	0.45	0.03	0.16	0.08	0.02	0.01	0.18	0.23	0.04	0.01	0.00	0.74		
	Oct 11 2018	**Casc13-14-34**	75.52	0.30	13.08	1.62	0.07	0.37	1.82	5.05	2.05	0.16	100.00	2.45		
	Oct 11 2018	**Casc13-14-10**	75.79	0.24	13.36	1.53	0.03	0.29	1.56	5.06	2.02	0.14	100.00	1.97		
	Oct 11 2018	**Casc13-14-15**	76.01	0.20	13.05	1.59	0.08	0.31	1.62	4.97	2.01	0.19	100.00	1.81		
	Oct 11 2018	**Casc13-14-12**	76.13	0.27	13.21	1.51	0.11	0.28	1.63	4.76	1.97	0.17	100.00	1.92		
		Mean	75.86	0.25	13.18	1.56	0.07	0.31	1.66	4.96	2.01	0.17	100.00	2.04	4	
		St. Dev.	0.27	0.04	0.14	0.05	0.03	0.04	0.11	0.14	0.03	0.02	0.00	0.28		
	Oct 11 2018	**Casc13-14-29**	75.35	0.41	12.91	1.74	0.08	0.35	1.45	4.48	3.09	0.19	100.00	2.84		
	Oct 11 2018	**Casc13-14-27**	75.76	0.43	13.03	1.71	0.07	0.33	1.46	4.04	3.05	0.15	100.00	4.41		
	Oct 11 2018	**Casc13-14-13**	77.66	0.09	12.57	0.54	0.07	0.08	0.65	4.37	3.89	0.11	100.00	2.14		
	Oct 11 2018	**Casc13-14-1**	77.74	0.25	12.51	0.91	0.04	0.18	0.81	4.19	3.29	0.11	100.00	2.39		
	Oct 11 2018	**Casc13-14-11**	77.99	0.11	12.15	1.04	0.06	0.14	0.87	3.92	3.44	0.37	100.00	3.59		
		Mean	76.90	0.26	12.63	1.19	0.07	0.22	1.05	4.20	3.35	0.18	100.00	3.07	5	Redoubt like
		St. Dev.	1.24	0.16	0.35	0.52	0.02	0.12	0.38	0.23	0.34	0.11	0.00	0.93		
	Oct 11 2018	**Casc13-14-32**	76.40	0.43	12.43	2.10	0.10	0.41	2.27	3.78	1.96	0.17	100.00	1.77		Augustine like
	Oct 11 2018	**Casc13-14-33**	76.37	0.46	12.25	2.20	0.14	0.47	2.18	3.83	2.00	0.13	100.00	1.53		Augustine like
	Oct 11 2018	**Casc13-14-30**	75.32	0.21	13.96	1.35	0.04	0.47	1.82	4.13	2.52	0.24	100.00	3.65		
	Oct 11 2018	**Casc13-14-24**	77.64	0.09	12.74	0.47	0.14	0.08	0.65	4.06	4.06	0.10	100.00	3.86		
	Oct 11 2018	**Casc13-14-38**	72.11	0.35	14.43	2.20	0.06	0.32	1.23	5.65	3.48	0.22	100.00	4.58		
	Oct 11 2018	**Casc13-14-6**	78.19	0.37	11.48	1.45	0.07	0.14	0.78	4.09	3.29	0.19	100.00	3.83		
CL-4	Oct 11 2018	**Casc13-16-5**	64.61	0.81	15.92	5.84	0.18	1.19	3.47	5.13	2.68	0.24	100.00	2.83		
	Oct 11 2018	**Casc13-16-10**	66.06	1.13	15.39	4.70	0.06	1.36	4.13	4.46	2.66	0.08	100.00	1.56		
	Oct 11 2018	**Casc13-16-22**	67.44	0.57	15.76	3.88	0.12	1.01	3.16	5.07	2.72	0.34	100.00	0.94		
	Oct 11 2018	**Casc13-16-15**	68.35	0.58	15.65	3.40	0.15	1.18	3.22	4.88	2.46	0.15	100.00	1.82		
		Mean	66.61	0.77	15.68	4.45	0.13	1.19	3.50	4.88	2.63	0.20	100.00	1.79	4	Half cone like (Aniakchak)
		St. Dev.	1.64	0.26	0.22	1.07	0.05	0.14	0.44	0.30	0.12	0.11	0.00	0.79		
	Oct 11 2018	**Casc13-16-24**	68.03	0.51	15.40	3.70	0.09	0.75	2.23	4.89	4.19	0.27	100.00	2.79		
	Oct 11 2018	**Casc13-16-23**	70.71	0.57	14.93	2.36	0.15	0.47	1.60	5.95	3.10	0.20	100.00	0.23		
	Oct 11 2018	**Casc13-16-9**	70.73	0.50	15.04	2.42	0.12	0.52	1.67	5.94	2.92	0.20	100.00	1.00		
	Oct 11 2018	**Casc13-16-4**	70.84	0.48	14.73	2.41	0.21	0.55	1.59	5.89	3.15	0.20	100.00	-0.01		
	Oct 11 2018	**Casc13-16-16**	70.85	0.48	15.01	2.36	0.10	0.45	1.65	5.82	3.10	0.22	100.00	-0.43		
	Oct 11 2018	**Casc13-16-28**	70.86	0.49	15.04	2.40	0.13	0.50	1.63	5.75	3.04	0.22	100.00	0.70		
	Oct 11 2018	**Casc13-16-33**	70.88	0.52	15.11	2.38	0.18	0.54	1.61	5.54	3.07	0.20	100.00	1.80		
	Oct 11 2018	**Casc13-16-6**	70.90	0.41	15.12	2.32	0.11	0.54	1.66	5.66	3.09	0.24	100.00	1.01		
	Oct 11 2018	**Casc13-16-35**	70.94	0.47	15.12	2.38	0.16	0.55	1.79	5.40	3.03	0.22	100.00	0.57		
	Oct 11 2018	**Casc13-16-25**	70.97	0.52	15.00	2.34	0.19	0.48	1.77	5.42	3.13	0.23	100.00	1.01		
	Oct 11 2018	**Casc13-16-21**	70.97	0.50	15.06	2.37	0.15	0.50	1.71	5.48	3.08	0.22	100.00	0.46		
	Oct 11 2018	**Casc13-16-7**	71.03	0.48	14.92	2.23	0.17	0.53	1.68	5.67	3.13	0.21	100.00	1.28		
	Oct 11 2018	**Casc13-16-11**	71.52	0.47	15.00	2.40	0.13	0.49	1.73	5.05	3.01	0.24	100.00	1.63		
	Oct 11 2018	**Casc13-16-34**	71.80	0.43	14.74	2.50	0.15	0.38	1.50	5.08	3.26	0.22	100.00	2.70		
	Oct 11 2018	**Casc13-16-30**	71.89	0.47	14.77	2.44	0.13	0.41	1.47	4.99	3.31	0.16	100.00	1.62		
		Mean	70.86	0.49	15.00	2.47	0.14	0.51	1.69	5.50	3.17	0.22	100.00	1.09	15	Aniakchak like
		St. Dev.	0.86	0.04	0.17	0.35	0.03	0.08	0.18	0.36	0.30	0.02	0.00	0.91		
	Oct 11 2018	**Casc13-16-1**	73.89	0.32	13.96	2.09	0.08	0.42	2.21	4.97	1.90	0.21	100.00	1.44		
	Oct 11 2018	**Casc13-16-13**	74.48	0.30	13.60	1.89	0.11	0.41	2.09	4.95	2.01	0.21	100.00	0.55		
		Mean	74.18	0.31	13.78	1.99	0.10	0.41	2.15	4.96	1.96	0.21	100.00	1.00	2	Augustine like
		St. Dev.	0.42	0.02	0.26	0.14	0.02	0.01	0.09	0.02	0.08	0.00	0.00	0.63		
	Oct 11 2018	**Casc13-16-27**	74.46	0.18	14.35	1.36	0.07	0.29	1.63	4.31	3.12	0.28	100.00	1.34		
	Oct 11 2018	**Casc13-16-14**	76.38	0.14	13.26	1.08	0.09	0.20	1.19	4.10	3.30	0.32	100.00	2.05		
		Mean	75.42	0.16	13.81	1.22	0.08	0.25	1.41	4.20	3.21	0.30	100.00	1.69	2	Churchill like
		St. Dev.	1.36	0.03	0.77	0.20	0.01	0.07	0.31	0.14	0.13	0.03	0.00	0.50		
	Oct 11 2018	**Casc13-16-31**	76.53	0.12	13.24	0.75	0.15	0.14	0.72	4.35	3.89	0.13	100.00	3.59		
	Oct 11 2018	**Casc13-16-17**	76.74	0.16	13.29	0.65	0.13	0.09	0.68	4.35	3.84	0.09	100.00	1.89		
	Oct 11 2018	**Casc13-16-19**	76.85	0.08	13.24	0.41	0.08	0.02	0.75	4.05	4.48	0.06	100.00	2.86		
		Mean	76.71	0.12	13.26	0.61	0.12	0.09	0.72	4.25	4.07	0.10	100.00	2.78	3	Redoubt like
		St. Dev.	0.16	0.04	0.02	0.17	0.03	0.06	0.03	0.18	0.36	0.04	0.00	0.86		
	Oct 11 2018	**Casc13-16-26**	77.31	0.24	12.48	1.46	0.05	0.38	2.02	4.13	1.73	0.24	100.00	2.29		
	Oct 11 2018	**Casc13-16-20**	77.32	0.20	12.71	1.37	0.09	0.21	1.35	4.45	2.18	0.16	100.00	4.88		
	Oct 11 2018	**Casc13-16-8**	69.81	0.32	16.17	2.29	0.05	0.84	3.44	4.90	1.93	0.33	100.00	2.36		Mineral contamination?
	Oct 11 2018	**Casc13-16-2**	73.70	0.45	13.74	1.75	0.13	0.18	1.11	5.26	3.52	0.19	100.00	1.29		
	Oct 11 2018	**Casc13-16-29**	78.78	0.11	11.84	0.97	0.06	0.15	0.75	3.63	3.46	0.33	100.00	2.64		
CL-7	Oct 11 2018	**Casc13-19-15**	70.62	0.46	15.01	2.28	0.12	0.56	1.74	5.87	3.19	0.20	100.00	0.82		

Rejected analyses

Run #	SAMPLE	SiO_2	TiO_2	Al_2O_3	FeO_t	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total	H_2O_d	Comments
Oct 11 2018	**Casc13-12-14**	59.97	1.28	15.47	8.52	0.21	2.69	5.56	3.61	2.44	0.32	100.00	12.58	Low analytical total
Oct 11 2018	**Casc13-12-32**	75.48	0.24	13.71	1.21	0.01	0.31	1.26	4.60	3.00	0.23	100.00	15.90	Low analytical total
Oct 11 2018	**Casc13-12-13**	68.42	0.68	12.92	5.66	0.27	2.63	4.39	2.73	1.31	1.28	100.00	43.95	Low analytical total
Oct 11 2018	**Casc13-12-15**	75.59	0.25	13.65	1.17	0.02	0.30	1.24	4.62	3.00	0.20	100.00	7.82	Low analytical total
Oct 11 2018	**UA 2754-1**	54.17	0.02	28.60	0.60	0.03	0.07	11.52	4.74	0.23	0.02	100.00	1.59	Mineral contamination
Oct 11 2018	**UA 2754-2**	47.35	1.89	8.53	13.42	0.52	14.62	11.10	2.02	0.47	0.11	100.00	2.75	Mineral contamination
Oct 11 2018	**UA 2754-5**	54.77	0.03	28.09	0.56	0.02	0.01	10.94	5.35	0.22	0.00	100.00	1.39	Mineral contamination
Oct 11 2018	**UA 2754-7**	58.14	0.06	25.94	0.63	0.00	0.04	7.77	6.77	0.65	0.00	100.00	2.95	Mineral contamination
Oct 11 2018	**UA 2754-12**	55.47	0.06	28.47	0.28	0.00	0.05	9.72	5.78	0.17	0.00	100.00	8.55	Mineral contamination
Oct 11 2018	**Casc13-14-28**	75.75	0.26	13.00	1.60	0.01	0.30	1.39	3.76	3.72	0.27	100.00	6.33	Low analytical total
Oct 11 2018	**Casc13-16-18**	72.26	0.08	15.83	1.43	0.06	0.16	0.83	3.94	5.02	0.51	100.00	22.61	Low analytical total
Oct 11 2018	**Casc13-16-3**	64.58	0.01	22.03	0.25	0.01	0.01	4.75	7.48	0.86	0.03	100.00	2.55	Mineral contamination
Oct 11 2018	**Casc13-16-12**	55.98	0.11	27.17	0.77	0.02	0.06	10.10	5.18	0.59	0.02	100.00	2.10	Mineral contamination
Oct 11 2018	**Casc13-16-32**	66.28	0.32	19.00	1.48	0.09	0.30	3.72	6.69	2.03	0.12	100.00	1.29	Mineral contamination
Oct 11 2018	**Casc13-19-1**	76.11	0.06	11.09	0.61	0.09	0.07	0.41	3.37	6.01	2.83	100.00	37.94	Low analytical total

Table S1(cont.)– Major element glass geochemical data.

Sample #	Run #	UA #	SiO_2	TiO_2	Al_2O_3	FeO_t	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total	H_2O_d	n	Comments
	Oct 11 2018	Casc13-19-4	70.95	0.49	14.93	2.52	0.06	0.83	2.56	4.82	2.72	0.16	100.00	1.07		
	Oct 11 2018	Casc13-19-7	70.96	0.51	15.04	2.31	0.17	0.55	1.70	5.55	3.06	0.20	100.00	1.14		
	Oct 11 2018	Casc13-19-3	71.00	0.49	14.95	2.34	0.16	0.52	1.67	5.72	2.98	0.24	100.00	1.19		
	Oct 11 2018	Casc13-19-22	71.13	0.46	15.23	2.36	0.16	0.50	1.75	5.06	3.20	0.20	100.00	0.99		
		Mean	70.93	0.48	15.03	2.36	0.13	0.59	1.88	5.40	3.03	0.20	100.00	1.04	5	Aniakchak like
		St. Dev.	0.19	0.02	0.12	0.09	0.04	0.13	0.38	0.45	0.20	0.03	0.00	0.15		K2O high
	Oct 11 2018	Casc13-19-10	76.59	0.27	12.90	1.48	0.11	0.25	1.43	4.88	1.99	0.14	100.00	0.66		
	Oct 11 2018	Casc13-19-12	75.66	0.31	13.33	1.60	0.07	0.32	1.57	5.01	2.01	0.18	100.00	1.51		
	Oct 11 2018	Casc13-19-9	76.10	0.25	13.24	1.56	0.03	0.29	1.66	4.75	2.01	0.14	100.00	1.66		
	Oct 11 2018	Casc13-19-20	76.06	0.21	13.11	1.59	0.07	0.31	1.62	4.91	2.01	0.14	100.00	2.07		
	Oct 11 2018	Casc13-19-21	75.83	0.19	13.22	1.56	0.09	0.33	1.61	4.97	2.09	0.14	100.00	1.40		
	Oct 11 2018	Casc13-19-17	74.76	0.15	14.05	1.54	0.07	0.47	2.13	4.39	2.25	0.24	100.00	2.47		
		Mean	75.83	0.23	13.31	1.55	0.07	0.33	1.67	4.82	2.06	0.16	100.00	1.63	6	Kamchatka?
		St. Dev.	0.61	0.05	0.39	0.04	0.03	0.08	0.24	0.23	0.10	0.04	0.00	0.62		Looks like KO
	Oct 11 2018	Casc13-19-13	77.26	0.12	12.81	1.03	0.04	0.19	1.02	3.78	3.48	0.33	100.00	4.07		
	Oct 11 2018	Casc13-19-14	76.88	0.11	13.12	0.67	0.09	0.11	0.72	4.24	3.95	0.14	100.00	4.76		
	Oct 11 2018	Casc13-19-8	72.53	0.28	14.87	1.69	0.03	0.44	2.12	4.63	3.16	0.32	100.00	0.85		
	Oct 11 2018	Casc13-19-6	68.55	0.61	15.00	3.49	0.08	0.78	2.08	4.89	4.35	0.22	100.00	0.93		Aniakchak like?
	Oct 11 2018	Casc13-19-5	65.08	1.01	15.08	6.46	0.19	1.20	3.32	5.03	2.45	0.24	100.00	1.22		Aniakchak like?
---	Oct 11 2018	Casc13-21-3	64.85	0.87	15.83	6.03	0.19	1.20	3.36	4.82	2.69	0.20	100.00	0.65		Sample processed but very little glass
	Oct 11 2018	Casc13-21-1	71.34	0.39	14.69	2.35	0.14	0.45	1.40	5.75	3.34	0.19	100.00	0.12		
	Oct 11 2018	Casc13-21-5	76.32	0.05	13.73	0.49	0.07	0.04	0.78	3.89	4.57	0.08	100.00	2.14		
	Oct 11 2018	Casc13-21-2	77.16	0.20	12.99	1.35	0.06	0.38	2.29	3.91	1.58	0.11	100.00	1.57		
---	Oct 11 2018	Casc13-24-1	69.82	0.56	14.75	3.49	0.14	0.63	1.95	5.39	3.18	0.14	100.00	0.79		Sample processed but very little glass
	Oct 11 2018	Casc13-24-2	70.88	0.42	15.02	2.31	0.18	0.47	1.64	5.87	3.01	0.26	100.00	3.11		
	Oct 11 2018	Casc13-24-7	72.76	0.95	12.53	3.17	0.06	0.48	1.55	4.30	4.15	0.06	100.00	3.10		
	Oct 11 2018	Casc13-24-3	74.55	0.25	14.04	1.59	0.03	0.40	1.52	4.03	3.34	0.32	100.00	1.84		
	Oct 11 2018	Casc13-24-5	74.56	0.30	13.59	1.99	0.11	0.43	2.22	4.60	1.98	0.28	100.00	0.82		
	Oct 11 2018	Casc13-24-8	75.71	0.31	13.46	1.66	0.05	0.34	1.74	4.69	1.93	0.17	100.00	1.74		
	Oct 11 2018	Casc13-24-6	77.97	0.33	11.57	1.42	0.09	0.11	0.69	4.32	3.36	0.18	100.00	3.60		
	Oct 11 2018	Casc13-24-4	77.98	0.16	12.47	1.10	0.07	0.12	1.06	4.43	2.42	0.24	100.00	1.48		
---	Oct 11 2018	Casc13-27-3	70.84	0.51	15.02	2.31	0.12	0.53	1.65	5.96	2.89	0.21	100.00	0.88		Sample processed but very little glass
	Oct 11 2018	Casc13-27-2	73.85	0.22	14.32	1.39	0.02	0.33	1.61	4.82	3.19	0.33	100.00	1.44		
	Oct 11 2018	Casc13-27-4	74.51	0.34	13.72	1.93	0.12	0.44	2.21	4.41	2.11	0.27	100.00	1.02		
	Oct 11 2018	Casc13-27-1	76.42	0.10	13.23	0.64	0.08	0.11	0.72	4.78	3.82	0.12	100.00	3.60		
	Oct 11 2018	Casc13-27-5	77.14	0.22	12.28	1.36	0.07	0.26	0.78	3.73	3.91	0.32	100.00	1.96		
---	Oct 11 2018	Casc13-33-1	73.69	0.35	14.39	1.44	0.05	0.40	1.53	5.40	2.67	0.11	100.00	0.35		Sample processed but very little glass
	Oct 11 2018	Casc13-33-2	73.99	0.30	14.35	1.46	0.04	0.42	1.65	4.91	2.79	0.13	100.00	3.08		
		Mean	73.84	0.32	14.37	1.45	0.05	0.41	1.59	5.15	2.73	0.12	100.00	1.72	2	
		St. Dev.	0.21	0.03	0.03	0.01	0.01	0.01	0.08	0.35	0.09	0.01	0.00	1.93		
---	Oct 11 2018	Casc13-36-6	76.53	0.07	13.10	0.48	0.06	0.05	0.81	4.08	4.74	0.12	100.00	5.21		Sample processed but very little glass
	Oct 11 2018	Casc13-36-7	76.34	0.06	13.38	0.41	0.05	0.05	0.78	4.07	4.80	0.09	100.00	2.10		
		Mean	76.44	0.07	13.24	0.44	0.05	0.05	0.79	4.07	4.77	0.10	100.00	3.66	2	
		St. Dev.	0.13	0.00	0.20	0.05	0.01	0.00	0.02	0.01	0.04	0.02	0.00	2.20		
	Oct 11 2018	Casc13-36-2	78.18	0.20	12.05	0.92	0.03	0.09	0.63	3.79	3.87	0.32	100.00	3.57		
	Oct 11 2018	Casc13-36-3	77.67	0.18	12.24	0.95	0.11	0.08	0.72	3.97	3.84	0.30	100.00	2.51		
		Mean	77.92	0.19	12.14	0.94	0.07	0.09	0.67	3.88	3.85	0.31	100.00	3.04	2	
		St. Dev.	0.36	0.01	0.13	0.02	0.06	0.00	0.06	0.13	0.02	0.01	0.00	0.75		
CL-31	Oct 11 2018	Casc13-43-6	68.59	1.21	14.22	4.38	0.05	1.09	2.87	4.19	3.35	0.06	100.00	1.51		
	Oct 11 2018	Casc13-43-5	69.26	1.13	14.03	3.99	0.03	1.14	2.88	4.21	3.25	0.10	100.00	1.39		
		Mean	68.92	1.17	14.13	4.18	0.04	1.11	2.87	4.20	3.30	0.08	100.00	1.45	2	
		St. Dev.	0.47	0.06	0.14	0.27	0.01	0.03	0.01	0.01	0.07	0.03	0.00	0.08		
	Oct 11 2018	Casc13-43-1	70.74	0.48	14.91	2.37	0.14	0.53	1.65	5.92	3.11	0.19	100.00	-0.09		
	Oct 11 2018	Casc13-43-17	70.75	0.47	14.98	2.31	0.12	0.53	1.66	5.98	3.03	0.23	100.00	-0.82		
		Mean	70.75	0.47	14.94	2.34	0.13	0.53	1.66	5.95	3.07	0.21	100.00	-0.45	2	Aniakchak like
		St. Dev.	0.00	0.01	0.05	0.04	0.02	0.00	0.00	0.05	0.06	0.03	0.00	0.52		
	Oct 11 2018	Casc13-43-2	76.79	0.10	13.13	0.59	0.13	0.12	0.71	4.40	3.91	0.14	100.00	3.47		
	Oct 11 2018	Casc13-43-3	76.83	0.12	13.22	0.63	0.05	0.11	0.68	4.38	3.90	0.11	100.00	1.85		
		Mean	76.81	0.11	13.17	0.61	0.09	0.12	0.70	4.39	3.91	0.12	100.00	2.66	2	
		St. Dev.	0.03	0.01	0.06	0.03	0.06	0.01	0.02	0.01	0.01	0.02	0.00	1.15		
	Oct 11 2018	Casc13-43-10	76.81	0.27	12.75	1.10	0.06	0.22	1.09	3.99	3.60	0.14	100.00	0.75		
	Oct 11 2018	Casc13-43-18	76.88	0.39	12.66	1.14	0.06	0.21	1.12	4.04	3.37	0.17	100.00	2.39		
		Mean	76.84	0.33	12.71	1.12	0.06	0.22	1.10	4.02	3.48	0.16	100.00	1.57	2	Redoubt like
		St. Dev.	0.05	0.09	0.07	0.03	0.00	0.01	0.02	0.04	0.17	0.01	0.00	1.16		
	Oct 11 2018	Casc13-43-7	76.92	0.11	12.88	1.03	0.03	0.18	1.15	4.21	3.27	0.29	100.00	1.01		
	Oct 11 2018	Casc13-43-9	77.38	0.11	12.65	1.01	0.07	0.14	0.98	4.08	3.35	0.30	100.00	0.14		
	Oct 11 2018	Casc13-43-14	77.77	0.14	12.42	1.03	0.10	0.12	0.92	3.79	3.46	0.32	100.00	2.54		
	Oct 11 2018	Casc13-43-8	78.16	0.14	11.95	0.98	0.04	0.12	0.82	4.07	3.50	0.29	100.00	2.74		
	Oct 11 2018	Casc13-43-15	78.56	0.11	12.08	1.07	0.03	0.12	0.79	3.44	3.56	0.32	100.00	3.16		
	Oct 11 2018	Casc13-43-11	78.74	0.17	11.36	1.26	0.07	0.22	0.46	3.45	4.02	0.32	100.00	2.25		
		Mean	77.92	0.13	12.22	1.06	0.06	0.15	0.85	3.84	3.53	0.31	100.00	1.97	6	Similar to Mt. Churchill
		St. Dev.	0.70	0.02	0.55	0.10	0.03	0.04	0.23	0.34	0.26	0.01	0.00	1.16		
	Oct 11 2018	Casc13-43-16	74.37	0.30	13.57	1.88	0.14	0.42	2.07	4.98	2.09	0.24	100.00	0.30		
	Oct 11 2018	Casc13-43-4	74.71	0.38	13.35	1.73	0.08	0.50	1.88	4.45	2.78	0.19	100.00	1.43		
CL-37	April 27 2018	Casc13-49_005	76.38	0.12	13.40	0.63	0.11	0.14	0.81	4.59	3.70	0.14	100.00	5.17		
	April 27 2018	Casc13-49_001	76.43	0.14	13.33	0.68	0.06	0.13	0.79	4.82	3.54	0.12	100.00	1.68		
	April 27 2018	Casc13-49_012	76.51	0.09	13.25	0.62	0.09	0.12	0.80	4.57	3.85	0.14	100.00	3.82		
	April 27 2018	Casc13-49_006	76.57	0.12	13.33	0.60	0.09	0.12	0.75	4.50	3.82	0.12	100.00	4.18		
	April 27 2018	Casc13-49_004	76.70	0.13	13.45	0.68	0.07	0.12	0.80	4.26	3.71	0.10	100.00	5.59		
	April 27 2018	Casc13-49_010	76.78	0.05	13.36	0.37	0.06	0.07	0.83	4.04	4.38	0.08	100.00	1.99		
	April 27 2018	Casc13-49_011	76.79	0.07	13.13	0.63	0.14	0.12	0.77	4.40	3.85	0.14	100.00	3.96		
	April 27 2018	Casc13-49_007	76.90	0.11	13.23	0.58	0.09	0.12	0.73	4.32	3.79	0.16	100.00	4.91		
	April 27 2018	Casc13-49_002	77.08	0.13	13.04	0.59	0.05	0.13	0.74	4.27	3.87	0.13	100.00	4.65		
	April 27 2018	Casc13-49_003	77.11	0.13	13.21	0.61	0.07	0.10	0.73	4.17	3.78	0.12	100.00	3.03		
		Mean	76.73	0.11	13.27	0.60	0.08	0.12	0.77	4.39	3.83	0.12	100.00	3.90	10	Opala correlative
		St. Dev.	0.26	0.03	0.12	0.09	0.03	0.02	0.04	0.23	0.22	0.02	0.00	1.31		
	April 27 2018	Casc13-49_009	77.72	0.06	12.87	0.52	0.09	0.11	0.66	3.93	3.95	0.12	100.00	5.67		
REF	Nov 16 2018	UA 3286-1	76.40	0.17	13.39	0.70	0.09	0.15	0.77	4.28	3.97	0.10	100.00	2.62		OP-22-U (Phase III), 2.5km north of Opala
Opala (1400 cal BP	Nov 16 2018	UA 3286-10	76.63	0.18	13.37	0.65	0.16	0.11	0.77	4.18	3.88	0.09	100.00	2.29		Andrews et al. (2018)
caldera formation)	Nov 16 2018	UA 3286-11	76.76	0.11	13.21	0.68	0.13	0.14	0.74	4.06	4.11	0.06	100.00	3.08		
	Nov 16 2018	UA 3286-12	76.19	0.10	13.59	0.70	0.19	0.15	0.80	4.33	3.87	0.09	100.00	3.41		Not analysed concurrently with unknown sample
	Nov 16 2018	UA 3286-13	76.64	0.12	13.34	0.70	0.11	0.12	0.75	4.24	3.90	0.10	100.00	2.85		
	Nov 16 2018	UA 3286-14	76.48	0.06	13.48	0.71	0.09	0.10	0.75	4.27	3.97	0.10	100.00	3.74		
	Nov 16 2018	UA 3286-15	76.78	0.08	13.29	0.72	0.12	0.11	0.83	4.24	3.74	0.12	100.00	3.59		
	Nov 16 2018	UA 3286-16	76.65	0.08	13.27	0.73	0.10	0.14	0.74	4.35	3.87	0.09	100.00	3.35		
	Nov 16 2018	UA 3286-17	76.86	0.12	13.35	0.68	0.13	0.12	0.78	4.21	3.67	0.10	100.00	2.86		
	Nov 16 2018	UA 3286-18	76.73	0.13	13.19	0.71	0.14	0.12	0.78	4.12	4.02	0.09	100.00	3.30		
	Nov 16 2018	UA 3286-19	76.79	0.06	13.14	0.73	0.07	0.16	0.80	4.21	3.96	0.12	100.00	2.93		
	Nov 16 2018	UA 3286-2	76.45	0.11	13.29	0.63	0.15	0.11	0.78	4.34	4.04	0.16	100.00	3.29		
	Nov 16 2018	UA 3286-20	76.54	0.14	13.24	0.66	0.10	0.12	0.76	4.34	4.01	0.12	100.00	2.05		
	Nov 16 2018	UA 3286-21	76.90	0.16	13.17	0.68	0.11	0.10	0.67	4.25	3.88	0.12	100.00	2.47		
	Nov 16 2018	UA 3286-22	76.54	0.19	13.26	0.69	0.13	0.12	0.78	4.24	3.93	0.14	100.00	1.60		
	Nov 16 2018	UA 3286-23	76.69	0.05	13.24	0.67	0.07	0.11	0.77	4.41	3.90	0.11	100.00	1.52		
	Nov 16 2018	UA 3286-24	76.48	0.09	13.27	0.75	0.11	0.14	0.77	4.41	3.88	0.12	100.00	1.98		
	Nov 16 2018	UA 3286-25	76.69	0.13	13.35	0.70	0.11	0.10	0.73	4.14	3.97	0.09	100.00	2.46		
	Nov 16 2018	UA 3286-26	76.79	0.17	13.28	0.69	0.09	0.13	0.74	3.99	4.03	0.12	100.00	3.38		
	Nov 16 2018	UA 3286-27	76.76	0.13	13.41	0.66	0.06	0.13	0.79	4.19	3.78	0.12	100.00	2.77		
	Nov 16 2018	UA 3286-28	76.59	0.12	13.36	0.65	0.12	0.10	0.78	4.34	3.82	0.13	100.00	2.66		
	Nov 16 2018	UA 3286-29	77.16	0.09	13.12	0.61	0.07	0.08	0.78	4.05	3.95	0.12	100.00	1.82		
	Nov 16 2018	UA 3286-3	76.57	0.07	13.39	0.66	0.16	0.14	0.81	4.21	3.91	0.09	100.00	1.76		
	Nov 16 2018	UA 3286-30	76.52	0.07	13.49	0.69	0.11	0.10	0.77	4.39	3.79	0.10	100.00	1.90		
	Nov 16 2018	UA 3286-4	76.83	0.15	13.27	0.67	0.12	0.10	0.75	4.13	3.90	0.10	100.00	2.58		
	Nov 16 2018	UA 3286-5	76.43	0.15	13.29	0.72	0.12	0.13	0.78	4.32	3.96	0.13	100.00	3.63		
	Nov 16 2018	UA 3286-6	77.05	0.12	13.03	0.65	0.10	0.14	0.70	4.14	4.00	0.12	100.00	1.28		
	Nov 16 2018	UA 3286-7	76.69	0.18	13.34	0.66	0.12	0.10	0.80	4.15	3.88	0.10	100.00	2.46		
	Nov 16 2018	UA 3286-8	76.56	0.15	13.34	0.71	0.08	0.12	0.77	4.26	3.91	0.11	100.00	2.17		
	Nov 16 2018	UA 3286-9	76.35	0.11	13.45	0.74	0.11	0.14	0.79	4.34	3.88	0.12	100.00	3.81		
		Mean	76.65	0.12	13.31	0.69	0.11	0.12	0.77	4.24	3.91	0.11	100.00	2.65	30	
		StDev	0.20	0.04	0.12	0.03	0.03	0.02	0.03	0.11	0.09	0.02	0.00	0.71		
---	April 27 2018	Casc13-51_001	74.10	0.18	14.46	1.46	0.01	0.35	1.74	4.39	3.10	0.29	100.00	3.05		Sample processed but very little glass
	April 27 2018	Casc13-51_002	73.75	0.19	14.29	1.41	0.07	0.32	1.78	4.90	3.08	0.28	100.00	2.07		
		Mean	73.93	0.18	14.38	1.43	0.04	0.33	1.76	4.65	3.09	0.28	100.00	2.56	2	
		St. Dev.	0.24	0.01	0.12	0.04	0.04	0.02	0.03	0.36	0.01	0.01	0.00	0.70		
	April 27 2018	Casc13-51_004	71.23	0.48	14.77	2.47	0.13	0.42	1.52	5.73	3.12	0.17	100.00	0.54		
---	April 27 2018	Casc13-55_002	76.71	0.18	12.94	1.14	0.03	0.24	1.09	3.92	3.50	0.33	100.00	1.84		Sample processed but very little glass
CL-48	May 23 2018	Casc13-60_001	73.20	0.27	14.88	1.52	0.05	0.35	1.88	4.48	3.10	0.35	100.00	2.19		
	May 23 2018	Casc13-60_013	74.24	0.19	14.31	1.49	0.07	0.32	1.61	4.08	3.46	0.31	100.00	2.90		
	May 23 2018	Casc13-60_011	74.36	0.32	14.09	1.60	0.08	0.41	1.50	3.71	3.69	0.32	100.00	2.66		
	May 23 2018	Casc13-60_010	74.46	0.25	14.11	1.60	0.06	0.38	1.52	3.70	3.67	0.32	100.00	2.35		
	Feb 5 2018	Br60-61_014	74.40	0.28	13.86	1.76	0.03	0.43	1.56	4.23	3.17	0.33	100.00	0.85		
	Feb 5 2018	Br60-61_005	74.64	0.25	13.96	1.68	0.04	0.38	1.49	4.10	3.21	0.33	100.00	-0.41		
	Feb 5 2018	Br60-61_015	74.67	0.18	14.19	1.47	0.06	0.32	1.65	4.18	2.96	0.41	100.00	2.40		
	Feb 5 2018	Br60-61_007	74.77	0.21	14.18	1.43	0.07	0.35	1.62	3.91	3.20	0.32	100.00	0.52		
	Feb 5 2018	Br60-61_010	75.08	0.14	13.80	1.14	0.04	0.21	1.45	4.42	3.49	0.31	100.00	3.92		
	Feb 5 2018	Br60-61_011	75.39	0.15	13.83	1.18	0.06	0.21	1.42	3.95	3.53	0.35	100.00	4.88		
		Mean	74.52	0.22	14.12	1.49	0.06	0.34	1.57	4.07	3.35	0.34	100.00	2.23	10	
		St. Dev.	0.58	0.06	0.32	0.20	0.01	0.08	0.13	0.27	0.25	0.03	0.00	1.58		
	May 23 2018	Casc13-60_017	76.69	0.17	13.07	1.11	0.04	0.19	1.11	3.94	3.45	0.29	100.00	4.01		
	Feb 5 2018	Br60-61_012	76.90	0.15	12.89	1.05	0.05	0.20	1.14	3.85	3.58	0.26	100.00	0.33		
	May 23 2018	Casc13-60_015	77.22	0.15	12.94	0.95	0.01	0.12	1.10	3.68	3.63	0.24	100.00	3.64		
	May 23 2018	Casc13-60_003	77.37	0.18	12.64	0.99	0.05	0.15	1.05	3.72	3.58	0.34	100.00	2.34		
	Feb 5 2018	Br60-61_001	77.49	0.18	12.55	1.09	0.03	0.21	0.96	3.74	3.53	0.28	100.00	-0.93		
	May 23 2018	Casc13-60_016	77.62	0.17	12.60	1.09	0.00	0.12	0.85	3.57	3.80	0.24	100.00	1.23		
	May 23 2018	Casc13-60_014	77.95	0.11	12.26	1.29	0.07	0.23	0.94	3.55	3.38	0.29	100.00	2.55		
	May 23 2018	Casc13-60_005	78.01	0.24	12.09	1.05	0.05	0.13	0.60	3.56	4.03	0.30	100.00	1.30		
	Feb 5 2018	Br60-61_020	78.03	0.11	12.37	0.93	0.02	0.12	0.92	3.73	3.51	0.32	100.00	1.02		
	May 23 2018	Br60-61_013	78.14	0.21	12.09	1.15	0.04	0.13	0.65	3.51	3.78	0.38	100.00	4.99		
	Feb 5 2018	Br60-61_017	78.63	0.11	11.99	1.08	0.08	0.13	0.85	3.50	3.42	0.29	100.00	1.39		
	Feb 5 2018	Br60-61_016	79.08	0.09	11.71	0.99	0.04	0.13	0.74	3.41	3.57	0.31	100.00	5.17		
		Mean	77.76	0.16	12.43	1.06	0.04	0.15	0.91	3.65	3.61	0.30	100.00	2.25	12	
		St. Dev.	0.69	0.05	0.42	0.10	0.02	0.04	0.18	0.16	0.19	0.04	0.00	1.89		
	Composite:	**Mean**	76.29	0.19	13.20	1.26	0.05	0.24	1.21	3.84	3.49	0.31	100.00	2.24	22	White River Ash (northern lobe) correlative
		St. Dev.	1.77	0.06	0.94	0.26	0.02	0.11	0.37	0.30	0.25	0.04	0.00	1.71		
	Feb 5 2018	Br60-61_006	78.06	0.15	12.49	1.12	0.09	0.16	0.90	3.23	3.51	0.38	100.00	2.99		Like above but Na off
	Feb 5 2018	Br60-61_002	77.73	0.09	12.09	1.09	0.06	0.15	0.80	4.19	3.53	0.34	100.00	1.11		Like above but Na off
	May 23 2018	Casc13-60_007	78.32	0.16	12.84	0.98	0.06	0.11	1.01	2.93	3.37	0.28	100.00	2.51		Like above but Na off
REF	May 30 2005	UA 1044-7	73.30	0.24	14.79	1.62	0.07	0.34	1.82	4.20	3.29	0.32	100.00	3.66		Duke River Fan, Yukon
White River Ash	Oct 27 2005	UA1044-17	73.44	0.29	14.58	1.69	0.06	0.38	1.81	4.11	3.33	0.32	100.00	1.59		Jensen (2007)
(northern lobe)	Oct 27 2005	UA1044-15	73.44	0.20	14.87	1.60	0.11	0.32	1.64	4.07	3.43	0.33	100.00	1.24		
	Oct 27 2005	UA1044-11	73.55	0.30	14.50	1.60	0.07	0.33	1.74	4.35	3.20	0.37	100.00	1.66		Not analysed concurrently with unknown sample
	May 30 2005	UA 1044-23	73.56	0.27	14.35	1.72	0.07	0.43	1.87	4.09	3.28	0.35	100.00	2.87		
	May 30 2005	UA 1044-25	73.64	0.16	14.45	1.58	0.07	0.38	1.85	4.12	3.37	0.38	100.00	2.54		

Rejected analyses

Run #	SAMPLE	SiO_2	TiO_2	Al_2O_3	FeO_t	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total	H_2O_d	Comments
Oct 11 2018	Casc13-19-2	70.17	0.44	14.90	2.60	0.14	0.49	1.59	6.16	3.02	0.63	100.00	16.51	Low analytical total
Oct 11 2018	Casc13-19-19	69.97	0.51	14.92	2.81	0.15	0.62	1.69	5.67	3.06	0.77	100.00	18.25	Low analytical total
Oct 11 2018	Casc13-19-18	61.98	0.04	23.73	0.26	0.00	0.03	5.52	7.89	0.54	0.01	100.00	-0.06	Mineral contamination
Oct 11 2018	Casc13-19-16	68.49	0.05	19.60	0.01	0.01	0.02	0.11	11.67	0.02	0.03	100.00	1.35	Mineral contamination
Oct 11 2018	Casc13-19-11	99.73	0.00	0.12	0.08	0.00	0.00	0.01	0.02	0.00	0.03	100.00	0.99	Biogenic silica
Oct 11 2018	Casc13-21-4	76.32	0.06	13.76	0.48	0.03	0.04	0.78	3.87	4.45	0.28	100.00	10.23	Low analytical total
Oct 11 2018	Casc13-24-9	68.67	0.00	19.28	0.03	0.00	0.00	0.08	11.88	0.06	0.00	100.00	1.09	Mineral contamination
Oct 11 2018	Casc13-33-3	54.35	2.67	15.73	7.79	0.46	0.53	8.78	0.13	0.05	12.28	100.00	97.88	Low analytical total
Oct 11 2018	Casc13-36-1	67.47	0.05	19.95	0.04	0.00	0.01	0.75	11.59	0.13	0.00	100.00	0.37	Mineral contamination
Oct 11 2018	Casc13-36-5	48.08	0.61	30.50	5.82	0.06	1.65	0.00	0.40	11.08	2.32	100.00	44.24	Low analytical total
Oct 11 2018	Casc13-36-4	78.96	0.17	12.01	1.06	0.02	0.19	0.80	3.77	2.67	0.43	100.00	17.15	Low analytical total
Oct 11 2018	Casc13-43-13	99.86	0.04	0.03	0.00	0.04	0.00	0.01	0.00	0.01	0.02	100.00	-0.54	Biogenic silica
Oct 11 2018	Casc13-43-12	66.69	0.08	19.62	0.59	0.00	0.17	4.04	7.23	1.49	0.11	100.00	2.30	Mineral contamination
April 27 2018	Casc13-49_008	77.06	0.15	12.32	1.49	0.07	0.49	0.78	3.78	3.54	0.41	100.00	8.78	Low analytical total
April 27 2018	Casc13-51_003	77.32	0.15	11.89	1.08	0.03	0.18	0.80	4.17	3.72	0.86	100.00	26.78	Low analytical total
April 27 2018	Casc13-55_003	66.65	0.03	20.53	0.02	0.00	0.00	1.22	11.45	0.09	0.01	100.00	1.02	Mineral contamination
April 27 2018	Casc13-55_001	75.96	0.21	12.99	1.20	0.05	0.20	1.13	4.19	3.53	0.69	100.00	20.05	Low analytical total
May 23 2018	Casc13-60_018	62.37	0.02	23.65	0.22	0.00	0.01	5.95	7.16	0.60	0.03	100.00	0.93	Mineral contamination
May 23 2018	Casc13-60_021	72.17	0.07	17.37	0.65	0.00	0.06	2.19	4.88	2.50	0.15	100.00	-1.44	Mineral contamination
May 23 2018	Casc13-60_012	99.88	0.01	0.05	0.03	0.00	0.00	0.00	0.01	0.02	0.00	100.00	0.40	Biogenic silica
Feb 5 2018	Br60-61_019	78.03	0.05	13.23	0.45	0.17	0.10	0.68	3.11	4.15	0.06	100.00	6.23	Low analytical total
May 23 2018	Casc13-60_008	77.10	0.14	12.84	1.12	0.07	0.20	0.96	3.86	3.40	0.39	100.00	7.00	Low analytical total
May 23 2018	Casc13-60_020	78.41	0.11	11.70	0.97	0.02	0.11	0.60	3.96	3.83	0.37	100.00	7.13	Low analytical total
May 23 2018	Casc13-60_002	78.86	0.21	11.68	0.99	0.02	0.11	0.58	3.19	4.01	0.45	100.00	11.61	Low analytical total
Feb 5 2018	Br60-61_018	77.42	0.12	12.51	1.07	0.02	0.16	1.12	3.79	3.37	0.54	100.00	12.59	Low analytical total
Feb 5 2018	Br60-61_004	79.99	0.21	10.71	1.33	0.09	0.29	0.45	2.33	4.11	0.63	100.00	13.78	Low analytical total
Feb 5 2018	Br60-61_008	73.72	0.33	14.07	1.88	0.04	0.42	1.62	4.09	3.19	0.80	100.00	15.09	Low analytical total
May 23 2018	Casc13-60_019	74.79	0.11	14.69	0.77	0.07	0.10	1.75	4.78	2.78	0.20	100.00	-0.07	Mineral inclusion
Feb 5 2018	Br60-61_009	72.63	0.46	14.52	1.93	0.00	0.46	1.58	4.96	3.31	0.22	100.00	0.41	Mineral inclusion
Feb 5 2018	Br60-61_003	76.69	0.20	12.64	1.57	0.09	0.52	0.94	3.59	3.48	0.36	100.00	2.52	Mineral inclusion
May 23 2018	Casc13-60_009	74.71	0.34	13.60	1.95	0.05	0.41	1.37	3.49	3.75	0.44	100.00	2.54	Mineral inclusion
May 23 2018	Casc13-60_006	77.61	0.09	12.58	0.87	0.05	0.13	1.02	4.22	3.26	0.22	100.00	-0.87	Mineral inclusion
May 23 2018	Casc13-60_004	76.42	0.11	13.73	0.86	0.03	0.11	1.29	3.89	3.38	0.23	100.00	0.58	Mineral inclusion

Table S1(cont.)– Major element glass geochemical data.

Sample #	Run #	UA #	SiO_2	TiO_2	Al_2O_3	FeO_t	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total	H_2O_d	n	Comments
	May 30 2005	**UA 1044-22**	73.72	0.16	14.46	1.83	0.05	0.36	1.77	4.06	3.25	0.35	100.00	2.13		
	May 30 2005	**UA 1044-6**	73.72	0.15	14.51	1.62	0.08	0.40	1.80	4.17	3.24	0.32	100.00	2.65		
	Oct 25 2008	**UA1044-12**	73.79	0.20	14.42	1.52	0.09	0.37	1.93	4.19	3.09	0.39	100.00	2.29		
	May 30 2005	**UA 1044-9**	73.82	0.26	14.51	1.68	0.06	0.46	1.63	3.80	3.42	0.36	100.00	5.83		
	Oct 25 2008	**UA1044-16**	73.83	0.19	14.44	1.63	0.08	0.32	1.76	4.30	3.13	0.31	100.00	1.64		
	May 30 2005	**UA 1044-3**	73.84	0.24	14.85	1.70	0.06	0.38	1.81	3.58	3.22	0.33	100.00	3.74		
	Oct 27 2005	**UA1044-14**	73.85	0.28	14.36	1.69	0.12	0.33	1.71	4.08	3.28	0.30	100.00	1.05		
	May 30 2005	**UA 1044-19**	73.93	0.19	14.19	1.69	0.10	0.38	1.69	4.11	3.40	0.34	100.00	3.50		
	May 30 2005	**UA 1044-20**	73.95	0.23	14.35	1.56	0.07	0.29	1.72	4.21	3.20	0.40	100.00	3.24		
	Oct 25 2008	**UA1044-29**	73.97	0.17	14.20	1.42	0.04	0.34	1.75	4.65	3.11	0.34	100.00	4.40		
	Oct 25 2008	**UA1044-27**	73.98	0.22	14.28	1.43	0.01	0.30	1.78	4.36	3.32	0.31	100.00	3.22		
	May 30 2005	**UA 1044-21**	74.02	0.23	14.29	1.64	0.09	0.37	1.77	4.06	3.18	0.33	100.00	2.89		
	May 30 2005	**UA 1044-24**	74.02	0.25	14.41	1.59	0.01	0.35	1.77	4.11	3.16	0.33	100.00	2.14		
	Oct 27 2005	**UA1044-13**	74.03	0.23	14.17	1.73	0.08	0.36	1.51	4.08	3.47	0.35	100.00	1.68		
	Oct 25 2008	**UA1044-28**	74.04	0.22	14.35	1.51	0.03	0.30	1.75	4.25	3.18	0.38	100.00	1.96		
	Oct 27 2005	**UA1044-19**	74.09	0.29	14.14	1.62	0.09	0.40	1.69	4.12	3.26	0.30	100.00	1.43		
	Oct 25 2008	**UA1044-15**	74.09	0.21	14.16	1.47	0.08	0.34	1.82	4.34	3.14	0.34	100.00	2.06		
	May 30 2005	**UA 1044-1**	74.10	0.26	14.08	1.80	0.08	0.34	1.61	4.05	3.39	0.30	100.00	3.59		
	Oct 27 2005	**UA1044-8**	74.12	0.23	14.25	1.72	0.05	0.33	1.67	4.06	3.33	0.24	100.00	1.56		
	Oct 25 2008	**UA1044-5**	74.14	0.27	14.20	1.52	0.08	0.31	1.81	4.15	3.19	0.34	100.00	1.50		
	Oct 25 2008	**UA1044-9**	74.14	0.25	14.12	1.61	0.05	0.32	1.81	4.11	3.25	0.34	100.00	2.02		
	Oct 25 2008	**UA1044-2**	74.15	0.19	14.20	1.42	0.05	0.32	1.66	4.46	3.12	0.43	100.00	1.60		
	Oct 25 2008	**UA1044-25**	74.17	0.25	14.16	1.54	0.02	0.32	1.79	4.21	3.17	0.35	100.00	2.42		
	Oct 27 2005	**UA1044-12**	74.22	0.18	14.22	1.70	0.03	0.34	1.60	4.14	3.25	0.33	100.00	1.24		
	Oct 25 2008	**UA1044-4**	74.23	0.14	14.26	1.60	0.03	0.32	1.71	4.24	3.16	0.32	100.00	0.45		
	Oct 27 2005	**UA1044-1**	74.23	0.23	14.47	1.47	0.04	0.26	1.75	4.14	3.09	0.32	100.00	2.21		
	Oct 27 2005	**UA1044-2**	74.24	0.11	14.36	1.46	0.03	0.26	1.92	4.18	3.12	0.33	100.00	2.79		
	Oct 25 2008	**UA1044-19**	74.30	0.24	14.02	1.68	0.13	0.35	1.61	4.02	3.30	0.36	100.00	0.81		
	Oct 25 2008	**UA1044-20**	74.30	0.25	14.31	1.57	0.04	0.33	1.72	4.08	3.07	0.32	100.00	-0.29		
	Oct 25 2008	**UA1044-18**	74.35	0.27	14.03	1.54	0.06	0.41	1.74	3.94	3.36	0.30	100.00	3.18		
	Oct 25 2008	**UA1044-11**	74.36	0.23	13.98	1.54	0.04	0.32	1.78	4.13	3.27	0.34	100.00	2.61		
	Oct 25 2008	**UA1044-22**	74.38	0.19	14.23	1.50	0.04	0.26	1.72	4.19	3.12	0.37	100.00	0.99		
	May 30 2005	**UA 1044-8**	74.45	0.14	14.13	1.43	0.06	0.32	1.57	4.19	3.40	0.31	100.00	4.61		
	Oct 25 2008	**UA1044-23**	74.48	0.20	14.06	1.34	0.07	0.31	1.70	4.26	3.23	0.35	100.00	1.75		
	Oct 25 2008	**UA1044-21**	74.50	0.22	14.03	1.68	0.02	0.39	1.65	3.97	3.19	0.35	100.00	1.58		
	May 30 2005	**UA 1044-12**	74.57	0.15	14.19	1.52	0.08	0.26	1.58	4.03	3.35	0.27	100.00	3.88		
	Oct 25 2008	**UA1044-24**	74.59	0.14	14.13	1.43	0.06	0.25	1.66	4.30	3.12	0.30	100.00	2.95		
	Oct 25 2008	**UA1044-1**	74.68	0.13	14.10	1.43	0.05	0.29	1.73	4.14	3.12	0.33	100.00	2.37		
	May 30 2005	**UA 1044-14**	74.99	0.22	13.63	1.62	0.04	0.36	1.35	3.88	3.59	0.33	100.00	2.97		
	May 30 2005	**UA 1044-4**	75.02	0.13	13.95	1.29	0.09	0.28	1.52	4.03	3.34	0.35	100.00	4.88		
	Oct 27 2005	**UA1044-10**	75.08	0.17	13.82	1.36	0.00	0.24	1.59	4.28	3.18	0.28	100.00	1.45		
	Oct 27 2005	**UA1044-5**	75.12	0.25	13.84	1.32	0.01	0.23	1.51	4.04	3.39	0.30	100.00	3.53		
	Oct 27 2005	**UA1044-4**	75.39	0.12	14.03	1.30	0.06	0.23	1.54	3.95	3.09	0.28	100.00	2.35		
	Oct 27 2005	**UA1044-9**	75.48	0.16	13.63	1.42	0.00	0.27	1.40	4.06	3.31	0.27	100.00	1.62		
	May 30 2005	**UA 1044-16**	75.61	0.14	13.95	1.20	0.11	0.24	1.49	3.81	3.19	0.24	100.00	2.00		
	Oct 27 2005	**UA1044-3**	75.62	0.24	13.34	1.48	0.03	0.30	1.41	3.92	3.34	0.31	100.00	2.19		
	May 30 2005	**UA 1044-17**	75.64	0.19	13.88	1.20	0.01	0.26	1.41	3.89	3.33	0.20	100.00	2.73		
	May 30 2005	**UA 1044-15**	75.70	0.09	13.85	1.19	0.04	0.24	1.46	3.87	3.27	0.29	100.00	3.71		
	Oct 27 2005	**UA1044-18**	75.71	0.33	13.02	1.64	0.00	0.33	0.99	3.87	3.79	0.31	100.00	1.47		
		Mean	74.32	0.21	14.18	1.54	0.06	0.32	1.67	4.11	3.26	0.33	100.00	2.40	55	
		St. Dev.	0.63	0.05	0.33	0.15	0.03	0.05	0.16	0.18	0.13	0.04	0.00	1.15		
REF	Aug 22 2019	**UT1480-13**	71.69	0.21	15.48	1.79	0.09	0.48	2.18	4.65	3.19	0.33	100.00	3.55		Sixtymile, Yukon, sample 16
White River Ash	Aug 22 2019	**UT1480-25**	71.76	0.25	15.33	1.80	0.07	0.48	2.23	4.68	3.09	0.41	100.00	3.78		Preece et al. (2014)
(northern lobe)	Aug 22 2019	**UT1480-32**	71.82	0.32	15.34	1.81	0.09	0.51	2.30	4.41	3.12	0.37	100.00	3.21		
	Aug 22 2019	**UT1480-20**	72.05	0.29	14.97	1.96	0.09	0.54	2.15	4.43	3.23	0.38	100.00	2.63		Not analysed concurrently with unknown sample
	Aug 22 2019	**UT1480-33**	72.06	0.31	15.23	1.79	0.07	0.46	2.15	4.57	3.07	0.36	100.00	2.99		
	Aug 22 2019	**UT1480-34**	72.08	0.30	15.35	1.71	0.11	0.48	2.22	4.29	3.19	0.37	100.00	3.04		
	Aug 22 2019	**UT1480-14**	72.23	0.23	15.29	1.66	0.08	0.47	2.15	4.62	2.99	0.37	100.00	1.66		
	Aug 22 2019	**UT1480-18**	72.24	0.25	14.99	1.63	0.09	0.46	2.03	4.93	3.13	0.34	100.00	1.51		
	Aug 22 2019	**UT1480-3**	72.27	0.32	15.18	1.71	0.06	0.44	2.22	4.40	3.13	0.36	100.00	2.49		
	Aug 22 2019	**UT1480-27**	72.28	0.28	14.95	1.83	0.05	0.50	2.21	4.39	3.22	0.38	100.00	2.87		
	Aug 22 2019	**UT1480-24**	72.32	0.29	14.98	1.90	0.05	0.47	2.23	4.22	3.24	0.38	100.00	3.14		
	Aug 22 2019	**UT1480-2**	72.49	0.25	15.09	1.85	0.07	0.46	2.20	4.26	3.06	0.34	100.00	2.58		
	Aug 22 2019	**UT1480-12**	72.53	0.25	15.19	1.70	0.03	0.42	2.05	4.41	3.15	0.34	100.00	2.93		
	Aug 22 2019	**UT1480-10**	72.57	0.24	15.13	1.63	0.02	0.42	2.13	4.43	3.15	0.38	100.00	1.69		
	Aug 22 2019	**UT1480-4**	72.68	0.27	15.15	1.75	0.06	0.47	2.14	4.18	3.04	0.35	100.00	4.89		
	Aug 22 2019	**UT1480-15**	72.70	0.18	15.17	1.45	0.04	0.40	2.20	4.86	2.83	0.23	100.00	2.25		
	Aug 22 2019	**UT1480-19**	72.71	0.18	15.06	1.67	0.04	0.42	2.10	4.54	2.97	0.40	100.00	2.57		
	Aug 22 2019	**UT1480-17**	73.23	0.20	14.92	1.54	0.05	0.37	1.90	4.36	3.15	0.35	100.00	2.31		
	Aug 22 2019	**UT1480-30**	74.08	0.26	14.20	1.57	0.06	0.38	1.65	4.05	3.46	0.38	100.00	2.64		
	Aug 22 2019	**UT1480-16**	74.75	0.13	14.23	1.16	0.04	0.27	1.61	4.39	3.20	0.29	100.00	3.37		
	Aug 22 2019	**UT1480-1**	75.96	0.17	13.33	1.32	0.03	0.24	1.14	4.11	3.50	0.26	100.00	3.78		
	Aug 22 2019	**UT1480-28**	75.96	0.16	13.30	1.23	0.04	0.26	1.27	4.16	3.40	0.29	100.00	3.03		
	Aug 22 2019	**UT1480-31**	76.06	0.14	13.17	1.26	0.03	0.25	1.17	4.28	3.44	0.26	100.00	2.53		
	Aug 22 2019	**UT1480-26**	76.23	0.11	13.82	1.00	0.00	0.13	1.55	3.84	3.10	0.30	100.00	3.61		
	Aug 22 2019	**UT1480-6**	76.29	0.12	13.20	1.19	0.00	0.20	1.16	4.25	3.33	0.33	100.00	1.91		
	Aug 22 2019	**UT1480-7**	76.44	0.15	13.16	1.03	0.06	0.20	1.15	4.03	3.54	0.30	100.00	3.63		
	Aug 22 2019	**UT1480-5**	76.52	0.12	13.31	1.08	0.03	0.17	1.14	3.91	3.45	0.36	100.00	3.66		
	Aug 22 2019	**UT1480-22**	76.79	0.12	13.16	1.06	0.07	0.17	1.16	3.80	3.45	0.27	100.00	2.51		
	Aug 22 2019	**UT1480-23**	76.84	0.14	13.12	1.12	0.07	0.15	1.22	3.85	3.26	0.30	100.00	3.06		
	Aug 22 2019	**UT1480-11**	77.36	0.16	12.40	1.07	0.08	0.17	0.80	4.13	3.58	0.32	100.00	2.19		
	Aug 22 2019	**UT1480-21**	77.46	0.16	12.64	1.13	0.05	0.12	0.98	3.62	3.60	0.32	100.00	1.33		
		Mean	73.95	0.21	14.38	1.50	0.06	0.35	1.77	4.29	3.23	0.34	100.00	2.82	31	
		St. Dev.	2.06	0.07	0.99	0.31	0.03	0.14	0.49	0.31	0.19	0.04	0.00	0.78		
REF	Aug 22 2019	**UT1482-10**	71.67	0.29	15.03	2.03	0.09	0.54	2.14	4.24	3.65	0.43	100.00	4.09		Sixtymile, Yukon, sample 17
White River Ash	Aug 22 2019	**UT1482-29**	71.82	0.31	15.26	1.81	0.07	0.47	2.29	4.66	3.02	0.37	100.00	2.40		Preece et al. (2014)
(northern lobe)	Aug 22 2019	**UT1482-9**	71.90	0.27	15.13	1.87	0.09	0.46	2.42	4.57	2.96	0.41	100.00	2.14		
	Aug 22 2019	**UT1482-20**	71.98	0.28	15.39	1.89	0.05	0.48	2.28	4.19	3.19	0.35	100.00	4.23		Not analysed concurrently with unknown sample
	Aug 22 2019	**UT1482-19**	71.99	0.31	15.21	1.87	0.06	0.49	2.30	4.31	3.17	0.37	100.00	3.32		
	Aug 22 2019	**UT1482-27**	71.99	0.25	15.32	1.77	0.04	0.48	2.23	4.40	3.21	0.41	100.00	4.83		
	Aug 22 2019	**UT1482-28**	72.04	0.31	15.32	1.84	0.07	0.50	2.33	4.23	3.05	0.39	100.00	2.00		
	Aug 22 2019	**UT1482-14**	72.07	0.24	15.25	1.76	0.06	0.40	2.23	4.43	3.28	0.36	100.00	3.28		
	Aug 22 2019	**UT1482-32**	72.37	0.25	15.08	1.68	0.07	0.42	2.13	4.62	3.10	0.34	100.00	2.08		
	Aug 22 2019	**UT1482-26**	72.44	0.26	15.22	1.71	0.04	0.43	2.12	4.48	3.05	0.33	100.00	1.58		
	Aug 22 2019	**UT1482-21**	72.45	0.30	15.12	1.84	0.02	0.49	2.18	4.10	3.20	0.38	100.00	3.54		
	Aug 22 2019	**UT1482-16**	72.52	0.27	14.96	1.67	0.07	0.47	2.09	4.60	3.01	0.42	100.00	3.36		
	Aug 22 2019	**UT1482-22**	72.54	0.31	15.29	1.68	0.07	0.41	2.17	4.22	3.03	0.38	100.00	2.74		
	Aug 22 2019	**UT1482-12**	72.57	0.26	14.47	2.02	0.03	0.50	2.06	4.46	3.32	0.38	100.00	2.72		
	Aug 22 2019	**UT1482-5**	72.61	0.29	14.82	1.91	0.10	0.50	2.04	4.08	3.32	0.42	100.00	2.58		
	Aug 22 2019	**UT1482-15**	72.63	0.26	14.88	1.67	0.04	0.40	1.95	4.80	3.11	0.34	100.00	2.95		
	Aug 22 2019	**UT1482-24**	72.64	0.23	15.26	1.76	0.05	0.44	2.12	4.20	3.04	0.35	100.00	3.07		
	Aug 22 2019	**UT1482-18**	72.73	0.26	15.01	1.76	0.04	0.43	2.11	4.20	3.17	0.38	100.00	2.85		
	Aug 22 2019	**UT1482-17**	72.86	0.26	14.94	1.58	0.04	0.41	2.14	4.33	3.20	0.32	100.00	3.96		
	Aug 22 2019	**UT1482-3**	73.01	0.23	14.93	1.65	0.05	0.41	2.07	4.14	3.21	0.39	100.00	4.03		
	Aug 22 2019	**UT1482-1**	73.79	0.29	14.34	1.59	0.07	0.39	1.68	4.23	3.34	0.35	100.00	2.74		
	Aug 22 2019	**UT1482-11**	74.18	0.20	14.57	1.34	0.06	0.31	1.58	4.43	3.12	0.27	100.00	2.72		
	Aug 22 2019	**UT1482-8**	74.47	0.20	14.37	1.42	0.05	0.27	1.61	4.25	3.15	0.27	100.00	3.81		
	Aug 22 2019	**UT1482-2**	74.53	0.19	14.08	1.55	0.08	0.34	1.51	4.13	3.34	0.33	100.00	2.89		
	Aug 22 2019	**UT1482-25**	74.56	0.18	14.40	1.45	0.06	0.33	1.58	4.08	3.11	0.33	100.00	2.84		
	Aug 22 2019	**UT1482-4**	74.77	0.22	14.30	1.47	0.07	0.38	1.54	3.73	3.29	0.30	100.00	3.00		
	Aug 22 2019	**UT1482-23**	75.28	0.14	13.93	1.04	0.07	0.21	1.40	4.49	3.22	0.28	100.00	3.44		
	Aug 22 2019	**UT1482-30**	75.71	0.13	13.27	1.27	0.07	0.26	1.26	4.30	3.50	0.30	100.00	1.90		
	Aug 22 2019	**UT1482-13**	75.83	0.17	13.32	1.38	0.07	0.32	1.15	3.93	3.60	0.31	100.00	4.06		
	Aug 22 2019	**UT1482-31**	75.96	0.15	13.32	1.23	0.02	0.24	1.28	4.14	3.41	0.31	100.00	2.39		
	Aug 22 2019	**UT1482-33**	76.03	0.20	13.51	1.23	0.03	0.23	1.27	4.02	3.23	0.31	100.00	3.21		
	Aug 22 2019	**UT1482-34**	76.77	0.04	12.84	1.07	0.06	0.20	1.08	4.27	3.44	0.27	100.00	2.09		
	Aug 22 2019	**UT1482-6**	77.59	0.18	12.48	1.01	0.05	0.11	0.90	3.78	3.70	0.25	100.00	5.34		
	Aug 22 2019	**UT1482-7**	77.88	0.12	12.48	1.05	0.04	0.11	0.85	3.65	3.63	0.24	100.00	1.77		
		Mean	73.65	0.23	14.50	1.59	0.06	0.38	1.83	4.26	3.25	0.34	100.00	3.06	34	
		St. Dev.	1.80	0.06	0.87	0.29	0.02	0.12	0.46	0.26	0.19	0.05	0.00	0.88		
---	Aug 17 2018	**Casc13-63_002**	70.70	0.50	15.22	2.39	0.10	0.54	1.76	5.49	3.14	0.21	100.00	0.85		Sample processed but very little glass
	Aug 17 2018	**Casc13-63_003**	70.82	0.49	15.26	2.30	0.13	0.51	1.65	5.66	3.03	0.20	100.00	-0.12		
		Mean	70.76	0.50	15.24	2.34	0.11	0.53	1.70	5.57	3.08	0.21	100.00	0.37	2	Aniakchak like
		St. Dev.	0.08	0.01	0.03	0.06	0.02	0.02	0.08	0.12	0.07	0.01	0.00	0.69		
CL-61	Aug 17 2018	**Casc13-73_011**	70.57	0.42	15.28	2.32	0.15	0.49	1.68	6.02	2.90	0.22	100.00	-0.28		
	Aug 17 2018	**Casc13-73_001**	71.01	0.48	15.13	2.38	0.13	0.45	1.59	5.57	3.08	0.22	100.00	-0.56		
	Aug 17 2018	**Casc13-73_009**	72.12	0.40	14.74	2.46	0.16	0.38	1.42	4.90	3.27	0.18	100.00	0.00		
		Mean	71.23	0.43	15.05	2.39	0.15	0.44	1.57	5.50	3.09	0.20	100.00	-0.28	3	Aniakchak like
		St. Dev.	0.80	0.04	0.28	0.07	0.02	0.05	0.13	0.56	0.19	0.02	0.00	0.28		
	Aug 17 2018	**Casc13-73_010**	74.25	0.31	14.19	1.94	0.08	0.48	2.29	4.53	1.75	0.24	100.00	0.81		
	Aug 17 2018	**Casc13-73_013**	74.47	0.34	14.01	1.95	0.08	0.47	2.25	4.49	1.74	0.25	100.00	0.96		
		Mean	74.36	0.32	14.10	1.94	0.08	0.48	2.27	4.51	1.74	0.25	100.00	0.89	2	
		St. Dev.	0.16	0.02	0.12	0.01	0.00	0.01	0.03	0.03	0.01	0.01	0.00	0.11		
	Aug 17 2018	**Casc13-73_002**	75.91	0.32	13.37	1.65	0.06	0.37	1.84	4.35	2.04	0.13	100.00	1.93		
	Aug 17 2018	**Casc13-73_006**	76.21	0.31	13.18	1.70	0.06	0.37	1.74	4.34	1.99	0.13	100.00	0.13		
		Mean	76.06	0.32	13.28	1.67	0.06	0.37	1.79	4.34	2.01	0.13	100.00	1.03	2	
		St. Dev.	0.21	0.00	0.14	0.03	0.00	0.00	0.07	0.00	0.04	0.01	0.00	1.27		
	Aug 17 2018	**Casc13-73_014**	77.33	0.22	12.87	1.30	0.06	0.33	2.03	4.18	1.58	0.11	100.00	0.98		
	Aug 17 2018	**Casc13-73_005**	77.59	0.24	12.81	1.22	0.02	0.36	2.00	3.96	1.73	0.09	100.00	2.01		
	Aug 17 2018	**Casc13-73_008**	77.76	0.19	12.79	1.15	0.03	0.33	2.11	4.06	1.52	0.08	100.00	-1.30		
	Aug 17 2018	**Casc13-73_007**	78.11	0.20	12.42	1.27	0.08	0.33	2.05	3.82	1.64	0.11	100.00	0.07		
		Mean	77.70	0.21	12.72	1.23	0.05	0.34	2.05	4.01	1.62	0.10	100.00	0.44	4	Augustine like
		St. Dev.	0.33	0.02	0.20	0.07	0.03	0.01	0.05	0.16	0.09	0.02	0.00	1.40		
	Aug 17 2018	**Casc13-73_004**	78.10	0.44	11.43	1.39	0.00	0.14	0.45	3.90	4.08	0.08	100.00	0.23		
	Aug 17 2018	**Casc13-73_003**	77.64	0.44	11.84	1.21	0.06	0.10	0.58	4.27	3.81	0.07	100.00	0.31		
		Mean	77.87	0.44	11.64	1.30	0.03	0.12	0.52	4.08	3.94	0.08	100.00	0.27	2	Redoubt like
		St. Dev.	0.32	0.01	0.29	0.13	0.04	0.03	0.09	0.26	0.19	0.01	0.00	0.06		
CL-74	Aug 17 2018	**Casc13-86_015**	72.47	0.38	14.55	2.46	0.11	0.59	2.52	4.78	1.99	0.20	100.00	0.02		
	Aug 17 2018	**Casc13-86_014**	72.75	0.42	14.24	2.32	0.11	0.66	2.45	5.06	1.86	0.18	100.00	-0.59		
	Aug 17 2018	**Casc13-86_010**	73.32	0.30	14.20	1.93	0.10	0.47	2.27	5.28	1.93	0.25	100.00	1.26		
	Aug 17 2018	**Casc13-86_023**	73.34	0.32	13.96	2.06	0.12	0.49	2.24	5.31	1.96	0.25	100.00	-1.19		
	Aug 17 2018	**Casc13-86_002**	73.51	0.32	14.16	1.97	0.10	0.43	2.29	5.02	1.97	0.28	100.00	2.53		
	Aug 17 2018	**Casc13-86_029**	73.54	0.32	14.12	2.09	0.10	0.52	2.29	4.93	1.91	0.24	100.00	0.18		
	Aug 17 2018	**Casc13-86_018**	73.63	0.33	14.02	2.01	0.09	0.50	2.21	5.25	1.78	0.24	100.00	0.83		
	Aug 17 2018	**Casc13-86_033**	73.76	0.27	14.19	1.93	0.12	0.50	2.25	4.90	1.93	0.19	100.00	0.24		
	Aug 17 2018	**Casc13-86_025**	73.77	0.34	14.02	1.99	0.13	0.45	2.15	5.12	1.85	0.23	100.00	0.46		
	Aug 17 2018	**Casc13-86_036**	73.84	0.28	14.00	2.13	0.12	0.51	2.39	4.69	1.86	0.24	100.00	-0.78		
	Aug 17 2018	**Casc13-86_039**	73.85	0.29	13.94	2.06	0.10	0.45	2.21	4.61	2.26	0.29	100.00	0.90		
	Aug 17 2018	**Casc13-86_034**	73.91	0.36	13.86	1.99	0.11	0.46	2.25	4.96	1.91	0.25	100.00	-0.13		
	Aug 17 2018	**Casc13-86_005**	74.09	0.27	14.00	2.01	0.16	0.46	2.30	4.72	1.76	0.29	100.00	1.99		
	Aug 17 2018	**Casc13-86_016**	74.12	0.33	13.98	1.85	0.13	0.44	2.16	4.96	1.81	0.28	100.00	1.27		
	Aug 17 2018	**Casc13-86_003**	74.18	0.29	14.00	1.95	0.11	0.44	2.23	4.68	1.90	0.29	100.00	1.78		
	Aug 17 2018	**Casc13-86_027**	74.20	0.38	13.98	2.07	0.07	0.61	2.32	4.42	1.80	0.21	100.00	0.12		
	Aug 17 2018	**Casc13-86_009**	74.22	0.36	13.99	2.06	0.08	0.47	2.34	4.34	1.96	0.24	100.00	-0.89		
	Aug 17 2018	**Casc13-86_008**	74.23	0.30	13.93	1.97	0.12	0.42	2.10	4.93	1.81	0.24	100.00	0.81		
	Aug 17 2018	**Casc13-86_021**	74.24	0.35	14.10	1.92	0.09	0.44	2.27	4.52	1.90	0.23	100.00	0.85		
	Aug 17 2018	**Casc13-86_040**	74.28	0.25	13.95	1.95	0.10	0.45	2.21	4.73	1.89	0.23	100.00	0.57		
	Aug 17 2018	**Casc13-86_024**	74.29	0.23	13.71	1.84	0.10	0.43	2.04	5.23	1.92	0.26	100.00	0.06		
	Aug 17 2018	**Casc13-86_001**	74.31	0.28	13.67	2.07	0.10	0.49	2.29	4.63	1.91	0.33	100.00	5.23		
	Aug 17 2018	**Casc13-86_035**	74.32	0.29	13.87	1.78	0.11	0.44	2.12	4.79	2.09	0.26	100.00	1.09		
	Aug 17 2018	**Casc13-86_006**	74.33	0.31	13.69	1.92	0.11	0.44	2.12	5.05	1.82	0.25	100.00	-0.48		
	Aug 17 2018	**Casc13-86_028**	74.36	0.26	14.02	1.97	0.13	0.46	2.14	4.68	1.82	0.22	100.00	-0.64		
	Aug 17 2018	**Casc13-86_026**	74.52	0.34	13.93	1.77	0.12	0.46	2.13	4.67	1.91	0.21	100.00	0.26		
	Aug 17 2018	**Casc13-86_011**	74.52	0.30	13.81	1.89	0.12	0.40	2.06	4.80	1.94	0.19	100.00	-0.08		
	Aug 17 2018	**Casc13-86_031**	74.57	0.32	13.75	1.99	0.09	0.47	2.17	4.55	1.89	0.25	100.00	-0.66		
	Aug 17 2018	**Casc13-86_013**	74.58	0.27	14.06	1.98	0.07	0.43	2.10	4.35	1.98	0.25	100.00	0.62		
	Aug 17 2018	**Casc13-86_037**	74.76	0.30	13.49	1.85	0.12	0.41	2.05	4.82	2.00	0.26	100.00	0.47		
	Aug 17 2018	**Casc13-86_020**	74.76	0.26	13.71	1.91	0.08	0.43	2.08	4.64	1.95	0.24	100.00	0.17		

Rejected analyses

Run #	SAMPLE	SiO_2	TiO_2	Al_2O_3	FeO_t	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total	H_2O_d	Comments
Aug 22 2019	**UT1480-9**	61.85	0.05	23.69	0.33	0.02	0.03	6.18	7.11	0.71	0.04	100.00	2.97	Mineral contamination
Aug 22 2019	**UT1480-8**	75.46	0.22	13.07	1.75	0.08	0.44	1.26	3.84	3.55	0.40	100.00	6.45	Low analytical total
Aug 22 2019	**UT1480-29**	73.47	0.26	14.00	1.63	0.10	0.41	1.70	4.52	3.63	0.37	100.00	11.89	Low analytical total
Aug 17 2018	**Casc13-63_001**	68.74	0.02	19.46	0.02	0.00	0.00	0.04	11.67	0.05	0.01	100.00	0.13	Mineral contamination
Aug 17 2018	**Casc13-73_012**	69.13	0.00	19.32	0.00	0.00	0.01	0.00	11.52	0.02	0.00	100.00	0.27	Mineral contamination

Table S1(cont.)– Major element glass geochemical data.

Sample #	Run #	UA #	SiO_2	TiO_2	Al_2O_3	FeO_t	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total	H_2O_d	n	Comments
	Aug 17 2018	**Casc13-86_030**	74.77	0.23	13.67	1.82	0.04	0.40	1.95	5.08	1.84	0.27	100.00	2.10		
	Aug 17 2018	**Casc13-86_012**	74.77	0.28	13.66	1.81	0.10	0.38	2.01	4.80	1.99	0.26	100.00	0.29		
	Aug 17 2018	**Casc13-86_017**	75.04	0.24	13.76	1.79	0.16	0.40	2.09	4.44	1.89	0.25	100.00	0.52		
	Aug 17 2018	**Casc13-86_007**	75.32	0.25	13.58	1.76	0.11	0.37	1.94	4.57	1.90	0.23	100.00	-0.24		
	Aug 17 2018	**Casc13-86_019**	75.44	0.23	13.34	1.73	0.06	0.33	1.87	4.85	1.93	0.28	100.00	-1.76		
		Mean	74.16	0.30	13.91	1.96	0.11	0.46	2.18	4.81	1.91	0.25	100.00	0.48	36	Ruppert tephra correlative
		St. Dev.	0.63	0.05	0.23	0.15	0.02	0.06	0.14	0.26	0.09	0.03	0.00	1.24		
	Aug 17 2018	**Casc13-86_004**	71.01	0.52	15.17	2.41	0.12	0.49	1.61	5.61	2.90	0.22	100.00	-0.35		
	Aug 17 2018	**Casc13-86_032**	78.92	0.31	13.74	1.82	0.07	0.35	2.00	0.71	1.89	0.27	100.00	4.28		
REF	Aug 17 2018	**UA 2557_001**	73.55	0.37	14.14	2.03	0.12	0.51	2.22	4.87	2.05	0.18	100.00	-0.12		Ruppert Lake, Alaska
Ruppert tephra	Aug 17 2018	**UA 2557_003**	73.57	0.35	14.18	2.09	0.14	0.49	2.28	4.84	1.88	0.21	100.00	1.14		Monteath et al. (2017)
	Aug 17 2018	**UA 2557_005**	73.74	0.37	14.20	2.09	0.07	0.48	2.24	4.75	1.85	0.25	100.00	2.19		
	Aug 17 2018	**UA 2557_004**	73.77	0.27	13.92	2.11	0.09	0.46	2.20	5.07	1.92	0.24	100.00	1.14		Analysed concurrently with unknown sample
	Aug 17 2018	**UA 2557_015**	73.78	0.31	13.98	2.03	0.07	0.50	2.32	5.03	1.79	0.25	100.00	0.77		
	Aug 17 2018	**UA 2557_008**	73.82	0.29	14.19	2.17	0.08	0.52	2.25	4.66	1.86	0.22	100.00	-0.27		
	Aug 17 2018	**UA 2557_017**	73.85	0.24	13.98	2.20	0.12	0.42	2.29	4.73	2.01	0.20	100.00	0.29		
	Aug 17 2018	**UA 2557_013**	73.92	0.29	14.09	1.98	0.11	0.50	2.22	4.71	2.00	0.22	100.00	-1.32		
	Aug 17 2018	**UA 2557_016**	73.95	0.37	13.75	2.04	0.10	0.47	2.23	5.05	1.85	0.24	100.00	0.01		
	Aug 17 2018	**UA 2557_019**	74.11	0.36	13.87	2.03	0.08	0.46	2.16	4.83	1.91	0.25	100.00	0.24		
	Aug 17 2018	**UA 2557_014**	74.17	0.35	13.99	2.00	0.09	0.48	2.17	4.80	1.84	0.16	100.00	0.35		
	Aug 17 2018	**UA 2557_018**	74.27	0.29	13.95	1.99	0.11	0.46	2.25	4.67	1.84	0.21	100.00	2.20		
	Aug 17 2018	**UA 2557_010**	74.50	0.30	13.73	1.90	0.10	0.40	2.14	4.81	1.94	0.23	100.00	0.64		
	Aug 17 2018	**UA 2557_007**	74.52	0.26	13.99	1.92	0.14	0.44	2.11	4.59	1.86	0.21	100.00	0.34		
	Aug 17 2018	**UA 2557_020**	74.54	0.27	13.90	1.78	0.10	0.43	2.05	4.83	1.93	0.21	100.00	0.63		
	Aug 17 2018	**UA 2557_009**	74.55	0.21	13.87	1.89	0.16	0.36	2.02	4.65	2.12	0.22	100.00	-0.48		
	Aug 17 2018	**UA 2557_002**	74.83	0.25	13.64	1.81	0.06	0.41	1.96	4.78	2.11	0.20	100.00	1.29		
		Mean	74.08	0.30	13.96	2.00	0.10	0.46	2.18	4.80	1.93	0.22	100.00	0.53	17	
		St. Dev.	0.39	0.05	0.16	0.12	0.03	0.04	0.10	0.14	0.10	0.02	0.00	0.90		
	Aug 17 2018	**UA 2557_006**	70.90	0.45	15.13	2.42	0.16	0.50	1.68	5.62	3.00	0.19	100.00	-1.01		
	Aug 17 2018	**UA 2557_012**	75.26	0.31	13.61	1.81	0.07	0.37	2.01	4.36	1.99	0.26	100.00	-0.89		
	Aug 17 2018	**UA 2557_006**	73.37	0.30	14.29	1.99	0.04	0.49	2.30	5.11	1.93	0.24	100.00	0.61		
---	Aug 24 2018	**Casc13-93-1**	72.81	0.41	14.54	1.92	0.06	0.45	1.59	5.13	2.97	0.18	100.00	1.63		Sample processed but very little glass
	Aug 24 2018	**Casc13-93-6**	75.99	0.27	13.38	1.56	0.06	0.29	1.64	4.73	1.98	0.14	100.00	1.54		
CL-96	Aug 24 2018	**Casc13-108-1**	71.67	0.38	14.78	2.28	0.08	0.71	2.52	4.71	2.72	0.19	100.00	0.57		
	Aug 24 2018	**Casc13-108-9**	73.22	0.37	14.33	2.07	0.07	0.61	2.28	4.19	2.66	0.24	100.00	1.36		
	Aug 24 2018	**Casc13-108-8**	73.46	0.45	13.87	1.93	0.07	0.48	2.08	4.66	2.82	0.24	100.00	0.23		
	Aug 24 2018	**Casc13-108-7**	73.59	0.44	13.93	1.87	0.08	0.53	2.11	4.48	2.80	0.24	100.00	1.14		
	Aug 24 2018	**Casc13-108-14**	73.84	0.38	13.81	1.91	0.09	0.54	2.08	4.37	2.78	0.27	100.00	2.36		
	Aug 24 2018	**Casc13-108-4**	74.39	0.43	13.42	1.90	0.05	0.45	1.98	4.42	2.80	0.22	100.00	-0.65		
	Aug 24 2018	**Casc13-108-13**	74.40	0.37	13.58	1.82	0.05	0.45	2.00	4.35	2.79	0.23	100.00	2.97		
	Aug 24 2018	**Casc13-108-3**	74.64	0.37	13.50	1.72	0.08	0.44	1.85	4.36	2.88	0.22	100.00	-0.46		
	Aug 24 2018	**Casc13-108-16**	74.65	0.36	13.42	1.80	0.08	0.42	2.03	4.10	2.94	0.25	100.00	2.38		
	Aug 24 2018	**Casc13-108-11**	74.74	0.37	13.31	1.86	0.07	0.43	1.93	4.31	2.80	0.23	100.00	0.25		
	Aug 24 2018	**Casc13-108-5**	74.74	0.43	13.41	1.83	0.09	0.43	2.02	4.04	2.81	0.24	100.00	0.01		
	Aug 24 2018	**Casc13-108-2**	75.14	0.39	13.24	1.75	0.11	0.44	1.89	3.93	2.90	0.26	100.00	0.20		
		Mean	74.04	0.40	13.72	1.89	0.08	0.49	2.06	4.33	2.81	0.24	100.00	0.86	12	Unknown tephra
		St. Dev.	0.95	0.03	0.46	0.15	0.02	0.09	0.18	0.23	0.08	0.02	0.00	1.18		
	Aug 24 2018	**Casc13-108-12**	71.82	0.39	15.00	2.41	0.10	0.42	1.47	4.97	3.27	0.20	100.00	0.31		
	Aug 24 2018	**Casc13-108-6**	71.93	0.67	13.54	3.12	0.07	0.45	1.84	4.57	3.62	0.25	100.00	1.52		
	Aug 24 2018	**Casc13-108-15**	72.36	0.44	14.15	2.10	0.06	0.52	2.01	5.24	2.93	0.25	100.00	2.81		
	Aug 24 2018	**Casc13-108-10**	78.31	0.22	11.70	0.97	0.00	0.12	0.53	4.11	3.82	0.27	100.00	1.51		
CL-105	Aug 17 2018	**Casc13-117_002**	70.59	0.51	15.34	2.42	0.13	0.53	1.60	5.74	3.00	0.20	100.00	0.23		
	Aug 17 2018	**Casc13-117_006**	70.86	0.45	15.16	2.38	0.14	0.50	1.66	5.55	3.13	0.23	100.00	0.01		
	Aug 17 2018	**Casc13-117_011**	70.90	0.45	15.18	2.41	0.10	0.55	1.57	5.86	2.79	0.22	100.00	0.10		
	Aug 17 2018	**Casc13-117_009**	71.01	0.52	15.19	2.30	0.15	0.54	1.68	5.56	2.89	0.20	100.00	-0.62		
	Aug 17 2018	**Casc13-117_001**	71.01	0.46	15.15	2.35	0.11	0.55	1.70	5.49	3.04	0.17	100.00	-0.04		
	Aug 17 2018	**Casc13-117_004**	71.10	0.44	15.07	2.40	0.12	0.49	1.61	5.77	2.84	0.20	100.00	0.87		
	Aug 17 2018	**Casc13-117_007**	71.11	0.48	14.98	2.27	0.13	0.49	1.70	5.74	2.96	0.19	100.00	0.30		
	Aug 17 2018	**Casc13-117_016**	71.23	0.52	15.51	2.22	0.12	0.50	1.62	5.29	2.88	0.16	100.00	3.00		
	Aug 17 2018	**Casc13-117_003**	71.30	0.51	15.24	2.35	0.15	0.51	1.63	5.22	2.93	0.19	100.00	0.68		
	Aug 17 2018	**Casc13-117_017**	71.39	0.48	15.20	2.39	0.16	0.57	1.67	5.27	2.74	0.18	100.00	0.65		
	Aug 17 2018	**Casc13-117_018**	71.66	0.48	15.02	2.22	0.17	0.52	1.60	5.35	2.80	0.22	100.00	0.75		
		Mean	71.10	0.48	15.19	2.34	0.13	0.52	1.64	5.53	2.91	0.20	100.00	0.54	11	Aniakchak CFE II correlative
		St. Dev.	0.29	0.03	0.15	0.07	0.02	0.03	0.04	0.23	0.12	0.02	0.00	0.93		
	Aug 17 2018	**Casc13-117_020**	72.13	0.43	14.75	2.13	0.11	0.40	1.32	4.89	3.71	0.16	100.00	0.45		
	Aug 17 2018	**Casc13-117_012**	72.34	0.48	14.75	2.23	0.08	0.35	1.38	4.60	3.66	0.18	100.00	0.20		
	Aug 17 2018	**Casc13-117_014**	71.66	0.50	14.71	2.28	0.09	0.39	1.42	5.13	3.67	0.18	100.00	0.32		
	Aug 17 2018	**Casc13-117_008**	71.10	0.64	14.77	2.63	0.13	0.47	1.61	4.79	3.74	0.15	100.00	0.51		
		Mean	71.81	0.51	14.75	2.32	0.10	0.41	1.43	4.85	3.69	0.17	100.00	0.37	4	Unsure if separate population or alkali loss from above
		St. Dev.	0.55	0.09	0.03	0.22	0.02	0.05	0.13	0.22	0.04	0.01	0.00	0.14		
	Aug 17 2018	**Casc13-117_015**	70.31	0.46	15.34	2.30	0.19	0.52	1.64	6.10	2.98	0.21	100.00	1.51		
	Aug 17 2018	**Casc13-117_010**	70.48	0.52	15.09	2.37	0.11	0.53	1.62	6.22	2.89	0.20	100.00	0.04		
	Aug 17 2018	**Casc13-117_005**	74.26	0.26	13.96	1.50	0.05	0.24	0.70	5.54	3.30	0.25	100.00	0.03		
	Aug 17 2018	**Casc13-117_021**	69.79	0.48	14.98	3.26	0.18	0.55	1.91	5.42	3.29	0.17	100.00	1.76		
REF	Aug 17 2018	**UA 1602_001**	58.60	1.40	16.18	8.15	0.21	3.18	6.09	4.60	1.51	0.12	100.00	1.73		Zagoskin Lake, St. Michael Island, Alaska
Aniakchak CFE II	Aug 17 2018	**UA 1602_005**	59.24	1.39	16.56	7.40	0.19	3.04	5.92	4.55	1.60	0.13	100.00	2.02		Ager (2003); Davies et al. (2016)
	Aug 17 2018	**UA 1602_004**	60.99	1.51	16.56	6.15	0.20	2.55	5.14	5.01	1.84	0.08	100.00	1.99		
		Mean	59.61	1.43	16.43	7.23	0.20	2.92	5.71	4.72	1.65	0.11	100.00	1.92	3	Analysed concurrently with unknown sample
		St. Dev.	1.24	0.07	0.22	1.01	0.01	0.33	0.51	0.25	0.17	0.02	0.00	0.16		
	Aug 17 2018	**UA 1602_003**	70.61	0.56	15.06	2.55	0.17	0.51	1.68	5.69	3.02	0.19	100.00	0.15		
	Aug 17 2018	**UA 1602_002**	70.82	0.49	15.22	2.54	0.13	0.52	1.70	5.38	3.04	0.19	100.00	0.24		
		Mean	70.71	0.52	15.14	2.55	0.15	0.52	1.69	5.54	3.03	0.19	100.00	0.19	2	
		St. Dev.	0.15	0.05	0.11	0.00	0.02	0.01	0.02	0.22	0.01	0.00	0.00	0.07		
	Aug 17 2018	**UA 1602_015**	57.92	1.47	16.33	8.53	0.24	3.12	6.43	4.37	1.46	0.16	100.00	3.21		
	Aug 17 2018	**UA 1602_011**	58.04	1.36	16.52	8.05	0.24	3.23	6.52	4.53	1.41	0.13	100.00	2.93		
	Aug 17 2018	**UA 1602_012**	58.10	1.35	16.43	7.96	0.22	3.10	6.58	4.70	1.45	0.15	100.00	2.36		
	Aug 17 2018	**UA 1602_006**	58.15	1.45	16.49	7.88	0.23	3.18	6.26	4.73	1.52	0.13	100.00	5.62		
	Aug 17 2018	**UA 1602_021**	58.66	1.35	16.53	7.78	0.25	3.11	6.22	4.48	1.53	0.13	100.00	2.11		
	Aug 17 2018	**UA 1602_016**	58.75	1.36	16.62	7.85	0.24	3.03	6.12	4.38	1.53	0.15	100.00	3.25		
	Aug 17 2018	**UA 1602_013**	58.84	1.41	16.48	7.65	0.21	3.14	6.44	4.22	1.54	0.08	100.00	1.80		
	Aug 17 2018	**UA 1602_024**	58.85	1.25	16.45	7.88	0.21	2.99	6.22	4.50	1.53	0.14	100.00	2.08		
	Aug 17 2018	**UA 1602_025**	59.03	1.44	16.49	7.25	0.25	3.08	6.04	4.75	1.59	0.11	100.00	1.61		
	Aug 17 2018	**UA 1602_018**	59.33	1.42	16.71	7.43	0.22	2.80	6.18	4.33	1.46	0.14	100.00	1.86		
	Aug 17 2018	**UA 1602_020**	59.57	1.49	16.37	7.35	0.23	2.90	6.05	4.37	1.60	0.11	100.00	1.88		
	Aug 17 2018	**UA 1602_023**	59.79	1.38	16.07	7.23	0.15	2.83	5.80	4.98	1.66	0.14	100.00	0.99		
	Aug 17 2018	**UA 1602_017**	60.13	1.41	16.26	6.65	0.22	2.77	5.70	5.14	1.62	0.13	100.00	2.68		
	Aug 17 2018	**UA 1602_009**	61.24	1.31	16.54	6.36	0.27	2.50	5.26	4.65	1.77	0.13	100.00	0.99		
		Mean	59.03	1.39	16.45	7.56	0.23	2.98	6.13	4.58	1.55	0.13	100.00	2.38	14	
		St. Dev.	0.93	0.07	0.16	0.57	0.03	0.20	0.36	0.26	0.10	0.02	0.00	1.17		
	Aug 17 2018	**UA 1602_022**	70.62	0.53	15.24	2.45	0.11	0.51	1.60	5.88	2.92	0.19	100.00	1.07		
	Aug 17 2018	**UA 1602_007**	70.82	0.50	15.03	2.46	0.15	0.54	1.74	5.52	3.09	0.20	100.00	0.98		
	Aug 17 2018	**UA 1602_014**	70.85	0.45	15.23	2.63	0.16	0.58	1.72	5.23	2.98	0.22	100.00	1.36		
		Mean	70.76	0.49	15.16	2.51	0.14	0.54	1.69	5.54	3.00	0.20	100.00	1.14	3	
		St. Dev.	0.13	0.04	0.12	0.10	0.02	0.04	0.07	0.33	0.09	0.02	0.00	0.20		
	Aug 17 2018	**UA 1602_010**	64.69	1.06	15.30	6.17	0.25	1.37	3.55	4.47	3.05	0.11	100.00	0.93		
	Aug 17 2018	**UA 1602_008**	69.62	0.59	15.35	3.06	0.18	0.75	2.25	5.22	2.83	0.18	100.00	-0.08		
REF	1	**UA 1602-16**	70.83	0.47	15.15	2.57	0.10	0.48	1.75	5.41	3.09	0.19	100.00	1.84		Zagoskin Lake, St. Michael Island, Alaska
Aniakchak CFE II	1	**UA 1602-18**	71.06	0.51	15.19	2.53	0.15	0.55	1.83	5.20	2.87	0.17	100.00	2.60		Ager (2003); Davies et al. (2016)
	1	**UA 1602-13**	71.13	0.45	15.12	2.42	0.17	0.47	1.69	5.24	3.16	0.19	100.00	1.91		
	1	**UA 1602-44**	71.15	0.50	15.15	2.65	0.13	0.53	1.83	5.00	2.93	0.19	100.00	2.65		Not analysed concurrently with unknown sample
	1	**UA 1602-40**	71.16	0.46	15.14	2.67	0.15	0.48	1.74	4.95	3.12	0.17	100.00	4.79		
	1	**UA 1602-31**	71.24	0.41	15.04	2.50	0.17	0.52	1.74	5.16	3.09	0.16	100.00	5.39		These additional points from Davies et al (2016) are plotted in Figure 3given the small numberof rhyodactic analyses in this run
	1	**UA 1602-41**	71.30	0.51	15.14	2.48	0.17	0.49	1.68	4.89	3.17	0.21	100.00	5.73		
	1	**UA 1602-24**	71.35	0.51	15.15	2.46	0.12	0.48	1.63	5.20	2.94	0.21	100.00	4.85		
	1	**UA 1602-8**	71.44	0.52	14.97	2.38	0.12	0.53	1.75	5.06	3.12	0.15	100.00	2.57		
	1	**UA 1602-6**	71.53	0.47	15.02	2.37	0.16	0.52	1.69	5.04	3.07	0.17	100.00	2.42		
	1	**UA 1602-36**	71.58	0.54	14.94	2.45	0.12	0.49	1.67	4.91	3.15	0.19	100.00	1.98		
	1	**UA 1602-5**	71.65	0.38	15.02	2.60	0.14	0.48	1.68	4.74	3.17	0.18	100.00	2.67		
	1	**UA 1602-42**	71.69	0.49	15.00	2.53	0.16	0.41	1.77	4.77	3.03	0.19	100.00	4.30		
	2	**UA 1602-1**	69.21	0.63	15.72	3.23	0.15	0.80	2.64	4.74	2.73	0.19	100.00	1.11		
	2	**UA 1602-21**	69.92	0.53	15.47	3.13	0.10	0.73	2.20	4.96	2.84	0.16	100.00	1.66		
	2	**UA 1602-34**	71.00	0.50	15.39	2.56	0.11	0.47	1.82	4.82	3.18	0.21	100.00	3.77		
	2	**UA 1602-25**	71.02	0.53	15.22	2.57	0.24	0.44	1.69	4.97	3.16	0.22	100.00	0.58		
	2	**UA 1602-35**	71.07	0.59	15.21	2.69	0.16	0.55	1.81	4.71	3.05	0.20	100.00	1.76		
	2	**UA 1602-30**	71.15	0.55	14.98	2.48	0.18	0.49	1.70	5.10	3.18	0.23	100.00	5.40		
	2	**UA 1602-16**	71.20	0.53	14.99	2.57	0.13	0.50	1.79	5.05	3.05	0.25	100.00	1.89		
	2	**UA 1602-23**	71.30	0.51	15.33	2.46	0.17	0.49	1.64	4.94	3.02	0.18	100.00	3.87		
	2	**UA 1602-7**	71.38	0.54	15.23	2.42	0.13	0.42	1.82	4.69	3.18	0.23	100.00	1.62		
	2	**UA 1602-24**	71.40	0.45	15.04	2.52	0.14	0.45	1.74	4.99	3.14	0.17	100.00	2.32		
	2	**UA 1602-28**	71.41	0.40	15.20	2.48	0.14	0.42	1.77	4.85	3.17	0.21	100.00	3.44		
	2	**UA 1602-33**	71.46	0.53	15.09	2.56	0.09	0.48	1.73	4.87	3.03	0.19	100.00	0.93		
	2	**UA 1602-8**	71.54	0.56	14.99	2.49	0.12	0.44	1.75	4.91	3.07	0.17	100.00	1.32		
	2	**UA 1602-20**	70.30	0.46	16.44	2.04	0.13	0.40	1.89	5.46	2.73	0.19	100.00	2.10		
		Mean	71.13	0.50	15.20	2.55	0.14	0.50	1.79	4.99	3.05	0.19	100.00	2.80	28	
		StDev	0.54	0.06	0.30	0.22	0.03	0.09	0.20	0.20	0.13	0.02	0.00	1.47		
---	Aug 24 2018	**Casc13-119-1**	76.23	0.19	13.28	1.56	0.05	0.21	1.65	4.69	1.99	0.18	100.00	2.18		Sample processed but very little glass
	Aug 24 2018	**Casc13-119-2**	75.96	0.25	13.16	1.58	0.06	0.32	1.63	4.80	2.08	0.20	100.00	2.41		
		Mean	76.10	0.22	13.22	1.57	0.05	0.26	1.64	4.75	2.04	0.19	100.00	2.29	2	
		St. Dev.	0.19	0.05	0.09	0.02	0.01	0.08	0.02	0.08	0.06	0.01	0.00	0.16		
---	Aug 17 2018	**Casc13-131_001**	75.16	0.42	13.18	1.86	0.04	0.39	1.47	4.55	2.78	0.18	100.00	2.26		Sample processed but very little glass
---	Aug 17 2018	**Casc13-135_001**	76.19	0.22	13.37	1.43	0.08	0.31	1.56	4.76	1.96	0.16	100.00	3.92		Sample processed twice - very little glass
	Aug 17 2018	**Casc13-135_004**	77.26	0.21	12.70	1.31	0.04	0.23	1.35	4.76	2.00	0.17	100.00	2.65		
---	Oct 11 2018	**Casc13-144/46-1**	76.45	0.26	13.24	1.56	0.00	0.33	1.62	4.49	1.94	0.15	100.00	3.10		Sample processed twice - very little glass
	Aug 17 2018	**Casc13-145_001**	77.74	0.28	12.61	1.36	0.09	0.35	1.93	4.02	1.49	0.17	100.00	0.93		
REF	Aug 17 2018	**UA 2614_004**	73.00	0.18	14.83	1.79	0.10	0.56	2.25	4.34	2.66	0.34	100.00	0.61		Hayes River section
Hayes set H - unit F2	Aug 17 2018	**UA 2614_001**	73.22	0.24	14.53	1.90	0.06	0.49	2.22	4.52	2.52	0.39	100.00	1.58		Wallace et al. (2014); Davies et al. (2016)
	Aug 17 2018	**UA 2614_009**	73.31	0.25	14.86	1.79	0.11	0.55	2.17	4.16	2.52	0.35	100.00	1.85		
	Aug 17 2018	**UA 2614_007**	73.78	0.25	14.23	1.74	0.10	0.49	2.15	4.31	2.65	0.40	100.00	1.50		Analysed concurrently with unknown sample
	Aug 17 2018	**UA 2614_005**	74.37	0.17	14.37	1.56	0.06	0.49	1.97	4.13	2.60	0.37	100.00	0.28		
		Mean	73.54	0.22	14.56	1.76	0.09	0.51	2.15	4.29	2.59	0.37	100.00	1.16	5	
		St. Dev.	0.54	0.04	0.28	0.13	0.02	0.04	0.11	0.16	0.07	0.02	0.00	0.68		
	Aug 17 2018	**UA 2614_012**	71.60	0.32	15.02	2.14	0.07	0.67	2.53	4.63	2.53	0.64	100.00	4.78		
	Aug 17 2018	**UA 2614_006**	72.24	0.21	14.55	1.63	0.06	0.52	2.19	5.85	2.45	0.38	100.00	-0.67		
	Aug 17 2018	**UA 2614_011**	73.10	0.27	15.06	1.75	0.07	0.51	2.55	3.86	2.57	0.33	100.00	4.70		
	Aug 17 2018	**UA 2614_003**	73.45	0.26	14.78	1.93	0.04	0.55	2.37	3.70	2.62	0.39	100.00	5.51		
	Aug 17 2018	**UA 2614_010**	75.69	0.13	13.52	1.36	0.09	0.39	1.81	3.89	2.87	0.34	100.00	1.57		

Rejected analyses

Run #	SAMPLE	SiO_2	TiO_2	Al_2O_3	FeO_t	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total	H_2O_d	Comments
Aug 17 2018	**UA 2557_011**	56.18	0.22	6.26	2.09	0.00	0.14	1.95	0.92	2.00	39.07	100.00	96.60	Low analytical total
Aug 24 2018	**Casc13-93-2**	99.91	0.00	0.00	0.02	0.03	0.00	0.00	0.00	0.02	0.01	100.00	1.02	Biogenic silica
Aug 24 2018	**Casc13-93-3**	99.67	0.01	0.27	0.02	0.00	0.00	0.01	0.00	0.01	0.00	100.00	1.54	Biogenic silica
Aug 24 2018	**Casc13-93-4**	99.61	0.00	0.00	0.03	0.03	0.01	0.06	0.15	0.00	0.14	100.00	0.78	Biogenic silica
Aug 24 2018	**Casc13-93-5**	62.38	0.51	14.42	8.78	0.36	0.23	0.89	7.98	4.14	0.39	100.00	4.70	Mineral contamination
Aug 17 2018	**Casc13-117_013**	99.87	0.04	0.04	0.02	0.00	0.01	0.00	0.00	0.00	0.02	100.00	-1.23	Biogenic silica
Aug 17 2018	**Casc13-117_019**	72.16	0.42	14.13	2.33	0.06	0.38	1.28	5.21	3.72	0.41	100.00	9.30	Low analytical total
Aug 17 2018	**UA 1602_019**	69.82	0.62	15.04	2.80	0.14	0.57	1.68	5.73	3.14	0.61	100.00	22.33	Low analytical total
Aug 17 2018	**UA 1602_019**	70.04	0.62	14.93	2.78	0.14	0.57	1.66	5.69	3.11	0.60	100.00	21.75	Low analytical total
Oct 11 2018	**Casc13-134/36-1**	67.21	0.07	19.58	0.05	0.00	0.00	0.49	12.52	0.07	0.01	100.00	-0.23	Mineral contamination
Aug 17 2018	**Casc13-135_002**	99.89	0.03	0.01	0.01	0.02	0.02	0.00	0.00	0.01	0.01	100.00	-0.78	Biogenic silica
Aug 17 2018	**Casc13-135_003**	99.84	0.12	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.02	100.00	-0.80	Biogenic silica
Aug 17 2018	**Casc13-145_002**	68.28	0.00	19.58	0.01	0.00	0.00	0.08	12.00	0.02	0.03	100.00	0.85	Mineral contamination
Aug 17 2018	**Casc13-145_003**	99.92	0.03	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.02	100.00	-0.42	Biogenic silica
Oct 11 2018	**Casc13-144/46-2**	68.75	0.00	19.36	0.02	0.03	0.00	0.01	11.78	0.04	0.01	100.00	0.78	Mineral contamination
Aug 17 2018	**UA 2614_008**	54.45	0.00	28.89	0.40	0.03	0.03	11.15	4.90	0.14	0.00	100.00	0.57	Mineral contamination
Aug 17 2018	**UA 2614_013**	73.33	0.18	14.17	1.82	0.07	0.49	2.07	4.57	2.63	0.86	100.00	20.06	Low analytical total
Aug 17 2018	**UA 2614_002**	73.59	0.17	14.54	1.75	0.11	0.49	2.14	4.16	2.66	0.51	100.00	7.84	Low analytical total

Table S2 - Secondary standard data for EPMA analyses

Data provided here are single point analyses, averages (mean) and standard deviations.
ID 3506 data are shown without any corrections or normalisation. Old Crow data are normalised to 100% and are corrected values, if any corrections were applied to the run.

ID 3506 and Old Crow tephra were analysed at the start and end of each EPMA run, as well as in-between sets of >50 unknown analyses.
Single point data listed below bracketed the relevant unknown samples that were analysed on the given day - sample IDs are listed between the sets to show the run order.
Corrections, if applied, were calculated from a systematic difference between analysed values for Lipari or Old Crow across the run and the expected known values.
Rejected analyses are shown to the right - these are outside 2SD of their assayed values. This is often caused by accidentally analsying point that was used on a previous run and shows notable alkali loss.

Analytical conditions: 5 micron beam (exception: Nov 16th - 10 micron beam), 15 KeV and 6 nA current. St. Dev. = standard deviation.

Assayed values from Kuehn et al. (2011):

	SiO_2	TiO_2	Al_2O_3	FeO_t	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total	H_2O_4
ID 3506	**74.10**	**0.07**	**13.10**	**1.55**	**0.07**	**0.04**	**0.74**	**4.06**	**5.13**	**0.34**	**99.09**	**0.91**
Assayed	0.96	0.03	0.34	0.06	0.03	0.02	0.05	0.28	0.26	0.03		
Old Crow	**75.15**	**0.31**	**13.14**	**1.70**	**0.05**	**0.29**	**1.48**	**3.84**	**3.72**	**0.28**	**100.00**	**4.12**
Assayed	1.00	0.05	0.34	0.14	0.03	0.03	0.05	0.26	0.26	0.05		

Date Analysed	SAMPLE	SiO_2	TiO_2	Al_2O_3	FeO_t	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total	H_2O_4	n	Analytical notes
Feb 5 2018	**ID 3506**	73.89	0.08	13.06	1.61	0.08	0.04	0.72	4.18	5.11	0.34	99.04	0.96	13	
Whole run averages	**St. Dev.**	0.79	0.03	0.13	0.08	0.02	0.02	0.02	0.13	0.07	0.02	0.85	0.85		
	Old Crow	75.25	0.32	13.04	1.74	0.05	0.29	1.43	3.90	3.76	0.28	100.00	3.77	13	
	St. Dev.	0.27	0.04	0.09	0.03	0.03	0.02	0.04	0.20	0.10	0.03	0.00	0.87		
Feb 5 2018	**ID3506_016**	75.63	0.06	13.15	1.60	0.06	0.03	0.71	4.19	5.16	0.30	100.83	-0.83		NaTDI file
Single point data	**ID3506_017**	75.23	0.09	13.31	1.64	0.06	0.05	0.68	4.32	5.03	0.38	100.69	-0.69		Na and K corrected down (from ID 3506)
bracketing unknowns	**ID3506_018**	74.33	0.08	12.92	1.54	0.13	0.05	0.75	4.26	5.12	0.35	99.45	0.55		
	Mean	75.06	0.08	13.12	1.59	0.08	0.04	0.72	4.26	5.10	0.34	100.32	-0.32	3	
	St. Dev.	0.67	0.01	0.20	0.05	0.04	0.01	0.03	0.06	0.06	0.04	0.76	0.76		
	OldCrow_016	75.31	0.31	12.99	1.70	0.04	0.27	1.37	4.18	3.60	0.29	100.00	3.37		
	OldCrow_017	75.55	0.26	13.13	1.69	0.06	0.28	1.45	3.66	3.66	0.32	100.00	3.69		
	OldCrow_018	75.61	0.35	12.84	1.73	0.01	0.30	1.37	3.80	3.76	0.29	100.00	2.97		
	Mean	75.49	0.31	12.99	1.71	0.04	0.28	1.40	3.88	3.68	0.30	100.00	3.34	3	
	St. Dev.	0.16	0.05	0.14	0.02	0.03	0.02	0.05	0.27	0.08	0.02	0.00	0.36		
															Unknown: Br60-61
	ID3506_019	73.72	0.09	12.89	1.57	0.07	0.05	0.73	4.00	5.12	0.33	98.48	1.52		
	ID3506_020	74.39	0.11	13.11	1.59	0.07	0.03	0.71	4.22	5.01	0.32	99.49	0.51		
	ID3506_021	73.48	0.04	13.00	1.62	0.09	0.04	0.73	4.10	5.04	0.34	98.41	1.59		
	ID3506_022	73.74	0.11	13.09	1.60	0.09	0.05	0.69	4.17	5.00	0.35	98.80	1.20		
	Mean	73.83	0.09	13.02	1.60	0.08	0.04	0.72	4.12	5.04	0.34	98.80	1.20	4	
	St. Dev.	0.39	0.03	0.10	0.02	0.01	0.01	0.02	0.09	0.05	0.01	0.49	0.49		
	OldCrow_019	74.82	0.34	13.16	1.72	0.05	0.28	1.49	4.13	3.77	0.29	100.00	3.96		
	OldCrow_020	74.75	0.30	13.11	1.78	0.01	0.30	1.48	4.25	3.78	0.29	100.00	4.40		
	OldCrow_021	75.06	0.39	13.09	1.76	0.07	0.31	1.47	4.04	3.60	0.28	100.00	4.38		
	OldCrow_022	75.11	0.39	13.10	1.79	0.10	0.30	1.48	3.83	3.69	0.26	100.00	4.22		
	Mean	74.94	0.36	13.12	1.76	0.06	0.30	1.48	4.06	3.71	0.28	100.00	4.24	4	
	St. Dev.	0.17	0.04	0.03	0.03	0.04	0.01	0.01	0.18	0.08	0.02	0.00	0.20		
April 27 2018	**ID 3506**	74.10	0.07	13.14	1.53	0.06	0.04	0.71	4.07	5.16	0.33	99.16	0.84	20	NaTDI file
Whole run averages	**St. Dev.**	0.29	0.04	0.07	0.07	0.02	0.01	0.02	0.17	0.09	0.03	0.41	0.41		Na corrected down (to Old Crow)
	Old Crow	75.34	0.31	13.09	1.68	0.06	0.29	1.43	3.83	3.76	0.28	100.00	4.21	20	
	St. Dev.	0.23	0.04	0.09	0.06	0.02	0.02	0.04	0.17	0.09	0.01	0.00	0.86		
April 27 2018	**ID 3506_024**	74.13	0.07	13.17	1.57	0.06	0.03	0.71	3.92	5.20	0.36	99.14	0.86		
Single point data	**ID 3506_025**	73.93	0.05	13.14	1.53	0.04	0.07	0.70	4.14	5.19	0.35	99.06	0.94		
bracketing unknowns	**ID 3506_026**	73.87	0.00	13.02	1.55	0.07	0.03	0.75	4.02	5.26	0.31	98.83	1.17		
	ID 3506_027	74.00	0.08	13.05	1.54	0.03	0.05	0.71	3.85	4.98	0.34	98.56	1.44		
	ID 3506_028	73.68	0.10	13.12	1.63	0.04	0.01	0.74	4.04	5.04	0.36	98.67	1.33		
	Mean	73.92	0.06	13.10	1.56	0.05	0.04	0.72	3.99	5.13	0.34	98.85	1.15	5	
	St. Dev.	0.17	0.04	0.06	0.04	0.02	0.02	0.02	0.11	0.12	0.02	0.25	0.25		
	Old Crow_024	75.39	0.35	13.07	1.67	0.04	0.29	1.47	3.66	3.83	0.31	100.00	3.84		
	Old Crow_025	75.72	0.26	13.08	1.67	0.04	0.30	1.42	3.66	3.64	0.26	100.00	4.56		
	Old Crow_026	75.45	0.34	13.10	1.66	0.11	0.31	1.42	3.57	3.85	0.26	100.00	6.01		
	Old Crow_027	75.27	0.40	12.95	1.69	0.06	0.29	1.48	3.87	3.78	0.28	100.00	3.70		
	Old Crow_028	74.99	0.31	13.11	1.73	0.05	0.29	1.42	4.09	3.79	0.28	100.00	4.21		
	Mean	75.36	0.33	13.06	1.68	0.06	0.30	1.44	3.77	3.78	0.28	100.00	4.47	5	
	St. Dev.	0.27	0.05	0.07	0.03	0.03	0.01	0.03	0.21	0.08	0.02	0.00	0.93		
															Unknowns: Casc13-49, -51, -55
	ID 3506_029	74.13	0.13	13.17	1.58	0.08	0.04	0.71	4.21	5.21	0.36	99.53	0.47		
	ID 3506_030	74.18	0.13	13.29	1.60	0.08	0.04	0.70	4.13	5.17	0.32	99.55	0.45		
	ID 3506_031	74.19	0.06	13.11	1.60	0.04	0.05	0.69	3.90	5.20	0.36	99.11	0.89		
	ID 3506_032	74.25	0.07	13.15	1.41	0.09	0.03	0.71	4.14	5.23	0.28	99.31	0.69		
	ID 3506_033	74.69	0.06	13.18	1.54	0.08	0.06	0.75	4.24	5.13	0.27	99.95	0.05		
	Mean	74.29	0.09	13.18	1.55	0.08	0.04	0.71	4.12	5.19	0.32	99.49	0.51	5	
	St. Dev.	0.23	0.04	0.07	0.08	0.02	0.01	0.02	0.14	0.04	0.04	0.31	0.31		
	Old Crow_029	75.04	0.26	13.19	1.77	0.05	0.29	1.40	3.97	3.83	0.28	100.00	3.36		
	Old Crow_030	75.28	0.34	13.12	1.76	0.06	0.29	1.43	3.88	3.64	0.27	100.00	3.71		
	Old Crow_031	75.11	0.29	13.21	1.68	0.10	0.27	1.41	4.00	3.71	0.29	100.00	5.17		
	Old Crow_032	75.23	0.24	13.22	1.75	0.07	0.27	1.38	3.70	3.91	0.28	100.00	5.60		
	Mean	75.16	0.28	13.18	1.74	0.07	0.28	1.40	3.89	3.77	0.28	100.00	4.46	4	
	St. Dev.	0.11	0.04	0.05	0.04	0.02	0.01	0.02	0.14	0.12	0.01	0.00	1.09		
May 23 2018	**ID 3506**	74.24	0.09	13.08	1.52	0.05	0.04	0.72	4.09	5.21	0.33	99.30	0.70	16	NaSiTDI file
Whole run averages	**St. Dev.**	0.42	0.03	0.16	0.06	0.02	0.01	0.02	0.18	0.06	0.01	0.49	0.49		Na corrected down (to Old Crow)
	Old Crow	75.20	0.32	13.11	1.68	0.05	0.30	1.47	3.85	3.79	0.29	100.00	4.68	14	
	St. Dev.	0.18	0.04	0.14	0.05	0.02	0.02	0.03	0.20	0.09	0.03	0.00	1.61		
May 23 2018	**ID 3506_001**	74.28	0.09	13.20	1.62	0.05	0.05	0.73	4.20	5.30	0.35	99.78	0.22		
Single point data	**ID 3506_002**	74.87	0.06	13.33	1.48	0.03	0.01	0.72	3.81	5.17	0.30	99.72	0.28		
bracketing unknowns	**ID 3506_003**	73.88	0.02	13.00	1.47	0.06	0.04	0.71	4.07	5.25	0.32	98.76	1.24		
	ID 3506_004	74.85	0.09	13.21	1.49	0.08	0.05	0.70	4.19	5.15	0.34	100.06	-0.06		
	ID 3506_005	74.73	0.11	13.06	1.46	0.07	0.04	0.76	4.35	5.28	0.34	100.12	-0.12		
	ID 3506_006	74.69	0.08	13.18	1.47	0.04	0.06	0.71	3.86	5.22	0.34	99.58	0.42		
	Mean	74.55	0.07	13.16	1.50	0.06	0.04	0.72	4.08	5.23	0.33	99.67	0.33	6	
	St. Dev.	0.39	0.03	0.12	0.06	0.02	0.02	0.02	0.21	0.06	0.02	0.49	0.49		
	Old Crow_001	75.39	0.36	13.16	1.72	0.06	0.32	1.45	3.65	3.69	0.26	100.00	3.53		
	Old Crow_002	75.36	0.34	12.84	1.74	0.05	0.31	1.50	3.78	3.86	0.28	100.00	5.03		
	Old Crow_003	75.31	0.30	13.04	1.67	0.07	0.32	1.42	3.80	3.82	0.33	100.00	3.54		
	Old Crow_004	75.28	0.34	13.09	1.61	0.05	0.30	1.48	3.75	3.87	0.30	100.00	3.92		
	Old Crow_005	74.83	0.31	13.22	1.63	0.03	0.27	1.49	4.22	3.79	0.27	100.00	2.81		
	Old Crow_006	75.27	0.26	13.14	1.72	0.05	0.30	1.47	3.62	3.91	0.31	100.00	2.69		
	Mean	75.24	0.32	13.08	1.68	0.05	0.30	1.47	3.80	3.82	0.29	100.00	3.59	6	
	St. Dev.	0.21	0.04	0.13	0.05	0.01	0.02	0.03	0.22	0.08	0.03	0.00	0.85		
															Unknown: Casc13-60
	ID 3506_007	73.52	0.06	13.23	1.49	0.03	0.06	0.69	4.19	5.16	0.33	98.68	1.32		
	ID 3506_008	74.20	0.04	13.28	1.44	0.08	0.03	0.71	4.00	5.25	0.33	99.28	0.72		
	ID 3506_009	73.85	0.11	12.95	1.58	0.06	0.05	0.72	3.93	5.30	0.32	98.79	1.21		
	ID 3506_010	74.33	0.09	12.79	1.46	0.07	0.05	0.73	3.88	5.23	0.31	98.88	1.12		
	ID 3506_011	73.55	0.10	12.94	1.55	0.02	0.05	0.72	4.27	5.29	0.30	98.72	1.28		
	ID 3506_012	74.17	0.14	12.92	1.50	0.04	0.06	0.72	3.99	5.15	0.35	98.95	1.05		
	Mean	73.94	0.09	13.02	1.50	0.05	0.05	0.72	4.04	5.23	0.32	98.88	1.12	6	
	St. Dev.	0.35	0.04	0.19	0.05	0.02	0.01	0.01	0.15	0.07	0.02	0.22	0.22		
	Old Crow_007	75.26	0.25	12.84	1.74	0.07	0.28	1.53	3.89	3.90	0.31	100.00	7.26		
	Old Crow_008	75.31	0.36	13.21	1.63	0.08	0.31	1.45	3.50	3.92	0.31	100.00	6.99		
	Old Crow_009	75.19	0.32	13.10	1.66	0.01	0.27	1.51	4.04	3.69	0.30	100.00	7.31		
	Old Crow_010	75.12	0.38	13.03	1.64	0.07	0.32	1.46	3.94	3.84	0.26	100.00	5.20		
	Old Crow_011	75.14	0.29	13.22	1.71	0.07	0.30	1.44	3.93	3.70	0.27	100.00	5.07		
	Mean	75.20	0.32	13.08	1.67	0.06	0.29	1.48	3.86	3.81	0.29	100.00	6.36	5	
	St. Dev.	0.08	0.05	0.16	0.05	0.03	0.02	0.04	0.21	0.11	0.03	0.00	1.13		
Aug 17 2018	**ID 3506**	74.89	0.07	13.19	1.54	0.07	0.04	0.71	4.09	5.17	0.33	100.01	-0.01	19	NaSiTDI file
Whole run averages	**St. Dev.**	0.56	0.03	0.09	0.05	0.02	0.02	0.03	0.17	0.08	0.02	0.71	0.71		Si corrected down (to ID 3506)
	Old Crow	75.17	0.31	13.24	1.70	0.06	0.30	1.45	3.81	3.73	0.29	100.00	5.05	18	
	St. Dev.	0.20	0.04	0.13	0.04	0.02	0.03	0.05	0.12	0.10	0.02	0.00	0.92		
Aug 17 2018	**ID 3506_001**	74.42	0.09	13.13	1.60	0.07	0.04	0.70	3.91	5.12	0.30	99.30	0.70		
Single point data	**ID 3506_002**	74.69	0.06	13.22	1.57	0.11	0.04	0.72	4.04	5.19	0.33	99.89	0.11		
bracketing unknowns	**ID 3506_003**	74.08	0.07	13.26	1.59	0.08	0.05	0.71	3.83	5.16	0.30	99.05	0.95		
	ID 3506_004	74.40	0.12	13.12	1.54	0.08	0.05	0.74	3.79	5.26	0.36	99.38	0.62		
	ID 3506_005	75.21	0.09	13.31	1.51	0.07	0.03	0.69	4.12	5.24	0.31	100.50	-0.50		
	Mean	74.56	0.08	13.21	1.56	0.08	0.04	0.71	3.94	5.19	0.32	99.63	0.37	5	
	St. Dev.	0.42	0.03	0.08	0.04	0.02	0.01	0.02	0.14	0.06	0.03	0.58	0.58		
	Old Crow_001	75.14	0.23	13.41	1.74	0.05	0.33	1.44	3.70	3.71	0.31	100.00	6.13		
	Old Crow_002	75.04	0.38	13.47	1.69	0.05	0.29	1.53	3.63	3.71	0.28	100.00	4.63		

Rejected analyses

SAMPLE	SiO_2	TiO_2	Al_2O_3	FeO_t	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total	H_2O_4
Old Crow_033	74.95	0.38	13.03	1.67	0.08	0.26	1.45	4.23	3.70	0.31	100.00	3.20
Old Crow_012	74.67	0.30	13.01	1.70	0.04	0.32	1.51	4.47	3.77	0.27	100.00	1.81

Table S2 (cont.)- Secondary standard data for EPMA analyses

Date Analysed	SAMPLE	SiO_2	TiO_2	Al_2O_3	FeO_t	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total	H_2O_d	n	Analytical notes
	Old Crow_003	75.00	0.26	13.34	1.65	0.10	0.31	1.53	3.72	3.85	0.30	100.00	5.82		
	Old Crow_004	75.20	0.39	13.37	1.71	0.05	0.31	1.41	3.79	3.57	0.28	100.00	4.75		
	Old Crow_005	75.29	0.33	13.10	1.65	0.06	0.33	1.50	3.77	3.75	0.30	100.00	5.03		
	Mean	75.13	0.32	13.34	1.69	0.06	0.31	1.48	3.72	3.72	0.29	100.00	5.27	5	
	St. Dev.	0.12	0.07	0.14	0.04	0.02	0.02	0.05	0.06	0.10	0.01	0.00	0.67		
															Unknowns: Casc13-63, -73; Ref - Ruppert, CFE II
	ID 3506_006	75.19	0.09	13.15	1.49	0.10	0.07	0.71	3.90	5.26	0.36	100.23	-0.23		
	ID 3506_007	75.25	0.07	13.23	1.46	0.03	0.02	0.68	4.32	5.13	0.31	100.43	-0.43		
	ID 3506_008	75.35	0.00	13.28	1.58	0.05	0.05	0.73	4.05	5.24	0.32	100.58	-0.58		
	ID 3506_009	75.89	0.10	13.19	1.51	0.11	0.02	0.72	4.29	5.24	0.32	101.32	-1.32		
	ID 3506_010	75.57	0.10	13.35	1.48	0.07	0.02	0.69	4.18	5.10	0.32	100.81	-0.81		
	Mean	75.45	0.07	13.24	1.50	0.07	0.04	0.71	4.15	5.19	0.33	100.67	-0.67	5	
	St. Dev.	0.28	0.04	0.08	0.05	0.03	0.02	0.02	0.17	0.07	0.02	0.42	0.42		
	Old Crow_006	74.97	0.28	13.25	1.72	0.07	0.29	1.48	3.96	3.74	0.30	100.00	2.99		
	Old Crow_007	75.01	0.34	13.25	1.69	0.05	0.31	1.43	3.81	3.86	0.30	100.00	4.59		
	Old Crow_008	74.86	0.30	13.45	1.69	0.07	0.27	1.42	4.00	3.72	0.29	100.00	3.81		
	Old Crow_009	74.83	0.36	13.25	1.64	0.07	0.36	1.50	3.80	3.96	0.29	100.00	4.21		
	Old Crow_010	75.31	0.27	13.06	1.72	0.08	0.31	1.37	3.92	3.78	0.23	100.00	4.42		
	Mean	75.00	0.31	13.25	1.69	0.07	0.31	1.44	3.90	3.81	0.28	100.00	4.00	5	
	St. Dev.	0.19	0.04	0.14	0.03	0.01	0.03	0.05	0.09	0.10	0.03	0.00	0.64		
															Unknowns: Casc13-86, -117; Ref - CFE II
	ID 3506_011	75.39	0.10	13.12	1.47	0.06	0.00	0.66	4.16	5.12	0.33	100.33	-0.33		
	ID 3506_012	75.12	0.10	13.23	1.59	0.09	0.02	0.71	4.37	5.33	0.35	100.83	-0.83		
	ID 3506_013	75.27	0.05	13.32	1.48	0.06	0.06	0.72	4.27	5.07	0.33	100.56	-0.56		
	ID 3506_014	74.35	0.07	13.23	1.56	0.05	0.04	0.66	4.21	5.12	0.38	99.60	0.40		
	ID 3506_015	75.31	0.04	13.12	1.63	0.07	0.03	0.73	4.06	5.16	0.35	100.41	-0.41		
	Mean	75.09	0.08	13.20	1.55	0.06	0.03	0.69	4.21	5.16	0.35	100.35	-0.35	5	
	St. Dev.	0.43	0.03	0.09	0.07	0.02	0.02	0.03	0.12	0.10	0.02	0.46	0.46		
	Old Crow_011	75.60	0.30	13.00	1.68	0.07	0.25	1.38	3.80	3.67	0.32	100.00	5.22		
	Old Crow_012	75.35	0.34	13.16	1.78	0.06	0.32	1.40	3.77	3.61	0.28	100.00	5.21		
	Old Crow_014	75.22	0.30	13.19	1.75	0.10	0.27	1.47	3.71	3.76	0.28	100.00	5.24		
	Old Crow_015	75.15	0.27	13.24	1.72	0.02	0.28	1.47	3.85	3.79	0.27	100.00	5.40		
	Mean	75.33	0.30	13.15	1.73	0.06	0.28	1.43	3.78	3.71	0.29	100.00	5.27	4	
	St. Dev.	0.20	0.03	0.11	0.04	0.03	0.03	0.05	0.06	0.08	0.02	0.00	0.09		
															Unknowns: Casc13-131, -135, -145; Ref: Hayes F2
	ID 3506_016	74.00	0.02	13.08	1.60	0.06	0.02	0.76	4.10	5.10	0.34	99.00	1.00		
	ID 3506_017	74.28	0.10	13.08	1.49	0.09	0.04	0.70	3.91	5.05	0.29	98.96	1.04		
	ID 3506_019	74.89	0.02	13.14	1.48	0.07	0.04	0.68	4.03	5.21	0.34	99.84	0.16		
	ID 3506_020	74.31	0.05	13.01	1.56	0.06	0.04	0.71	4.18	5.04	0.34	99.22	0.78		
	Mean	74.37	0.05	13.08	1.53	0.07	0.04	0.71	4.05	5.10	0.33	99.26	0.74	4	
	St. Dev.	0.37	0.04	0.05	0.06	0.01	0.01	0.03	0.12	0.08	0.02	0.41	0.41		
	Old Crow_016	75.35	0.31	13.13	1.74	0.09	0.30	1.50	3.67	3.67	0.30	100.00	6.73		
	Old Crow_017	75.41	0.30	13.22	1.67	0.00	0.29	1.43	3.81	3.63	0.31	100.00	6.27		
	Old Crow_018	75.24	0.26	13.16	1.63	0.07	0.27	1.44	4.07	3.63	0.29	100.00	4.65		
	Old Crow_019	75.13	0.30	13.35	1.67	0.07	0.32	1.48	3.78	3.68	0.27	100.00	5.80		
	Mean	75.28	0.29	13.22	1.68	0.06	0.30	1.46	3.84	3.65	0.29	100.00	5.86	4	
	St. Dev.	0.12	0.02	0.10	0.05	0.04	0.02	0.03	0.17	0.03	0.02	0.00	0.89		
Aug 24 2018	**ID 3506**	74.04	0.08	13.12	1.54	0.06	0.04	0.72	4.18	5.11	0.33	99.14	0.86	19	NaTDI file
Whole run averages	**St. Dev.**	0.42	0.03	0.10	0.05	0.03	0.02	0.02	0.19	0.06	0.02	0.55	0.55		Na corrected down (from ID 3506)
	Old Crow	75.30	0.30	13.17	1.66	0.06	0.29	1.46	3.81	3.74	0.28	100.00	4.47	17	
	St. Dev.	0.19	0.03	0.06	0.05	0.03	0.02	0.04	0.17	0.11	0.02	0.00	1.23		
Aug 24 2018	**ID 3506-6**	73.93	0.06	13.14	1.55	0.06	0.05	0.73	4.14	5.04	0.33	98.96	1.04		
Single point data	**ID 3506-7**	73.88	0.04	12.98	1.60	0.07	0.02	0.72	4.51	5.11	0.36	99.22	0.78		
bracketing unknowns	**ID 3506-8**	73.46	0.09	13.12	1.49	0.02	0.01	0.70	4.19	5.09	0.33	98.43	1.57		
	ID 3506-9	73.78	0.11	13.11	1.58	0.04	0.03	0.72	4.13	5.12	0.30	98.86	1.14		
	ID 3506-10	73.23	0.08	13.11	1.49	0.06	0.03	0.70	4.03	5.10	0.34	98.10	1.90		
	Mean	73.66	0.08	13.09	1.54	0.05	0.03	0.71	4.20	5.09	0.33	98.71	1.29	5	
	St. Dev.	0.30	0.02	0.07	0.05	0.02	0.01	0.01	0.18	0.03	0.02	0.44	0.44		
	Old Crow-6	75.40	0.29	13.19	1.61	0.06	0.28	1.52	3.68	3.78	0.26	100.00	5.10		
	Old Crow-7	75.26	0.28	13.23	1.69	0.02	0.33	1.48	3.83	3.66	0.28	100.00	6.10		
	Old Crow-8	75.08	0.26	13.21	1.67	0.15	0.32	1.44	3.91	3.76	0.27	100.00	5.61		
	Old Crow-10	75.56	0.31	13.12	1.67	0.03	0.25	1.46	3.65	3.74	0.27	100.00	7.89		
	Mean	75.32	0.28	13.18	1.66	0.06	0.30	1.47	3.77	3.74	0.27	100.00	6.17	4	
	St. Dev.	0.20	0.02	0.05	0.04	0.06	0.04	0.03	0.12	0.05	0.01	0.00	1.22		
															Unknowns: Casc13-93, -108, -119
	ID 3506-11	73.53	0.11	12.92	1.54	0.10	0.07	0.68	4.28	5.14	0.32	98.61	1.39		
	ID 3506-13	73.92	0.08	13.08	1.52	0.06	0.04	0.72	4.32	5.09	0.36	99.11	0.89		
	ID 3506-14	73.53	0.07	13.05	1.57	0.04	0.01	0.71	3.80	5.10	0.32	98.15	1.85		
	ID 3506-15	73.70	0.07	13.10	1.63	0.09	0.06	0.74	4.15	5.11	0.35	98.91	1.09		
	Mean	73.67	0.09	13.04	1.57	0.07	0.05	0.71	4.14	5.11	0.34	98.69	1.31	4	
	St. Dev.	0.18	0.02	0.08	0.05	0.03	0.02	0.02	0.23	0.02	0.02	0.42	0.42		
	Old Crow-11	75.41	0.32	13.09	1.68	0.05	0.32	1.51	3.72	3.72	0.24	100.00	4.01		
	Old Crow-13	75.27	0.34	13.26	1.68	0.02	0.28	1.50	3.72	3.71	0.30	100.00	3.71		
	Old Crow-14	75.23	0.33	13.10	1.59	0.02	0.30	1.48	3.99	3.74	0.28	100.00	3.05		
	Mean	75.30	0.33	13.15	1.65	0.03	0.30	1.50	3.81	3.72	0.27	100.00	3.59	3	
	St. Dev.	0.09	0.01	0.10	0.05	0.02	0.02	0.01	0.15	0.02	0.03	0.00	0.49		
Oct 11 2018	**ID 3506**	74.00	0.09	13.06	1.56	0.07	0.04	0.72	4.12	5.19	0.34	99.12	0.88	18	NaTDI file
Whole run averages	**St. Dev.**	0.30	0.02	0.08	0.04	0.03	0.01	0.02	0.15	0.08	0.02	0.41	0.41		No correction applied
	Old Crow	75.26	0.31	13.10	1.67	0.06	0.29	1.44	3.88	3.77	0.28	100.00	4.45	19	
	St. Dev.	0.21	0.02	0.09	0.06	0.03	0.02	0.04	0.16	0.10	0.03	0.00	1.06		
Oct 11th 2018	**ID 3506_001**	74.21	0.13	13.11	1.58	0.05	0.03	0.69	3.98	5.28	0.34	99.33	0.67		
Single point data	**ID 3506_002**	73.43	0.08	13.04	1.52	0.09	0.02	0.72	4.01	5.28	0.29	98.42	1.58		
bracketing unknowns	**ID 3506_003**	73.64	0.06	13.14	1.48	0.05	0.06	0.72	4.13	5.15	0.34	98.70	1.30		
	Mean	73.76	0.09	13.10	1.53	0.06	0.04	0.71	4.04	5.24	0.32	98.82	1.18	3	
	St. Dev.	0.41	0.04	0.05	0.05	0.03	0.02	0.02	0.08	0.07	0.03	0.47	0.47		
	Old Crow_001	75.22	0.30	13.36	1.61	0.06	0.32	1.43	3.68	3.77	0.32	100.00	4.38		
	Old Crow_002	75.36	0.36	13.09	1.68	0.00	0.28	1.42	3.87	3.70	0.31	100.00	6.02		
	Old Crow_003	74.95	0.31	13.05	1.61	0.03	0.28	1.47	4.15	3.92	0.29	100.00	5.42		
	Old Crow_005	75.01	0.26	13.09	1.67	0.03	0.29	1.47	4.10	3.91	0.23	100.00	4.23		
	Mean	75.14	0.31	13.15	1.65	0.03	0.29	1.45	3.95	3.82	0.29	100.00	5.01	4	
	St. Dev.	0.19	0.04	0.15	0.04	0.03	0.02	0.02	0.22	0.11	0.04	0.00	0.86		
															Unknowns: Casc13-12, -14; Ref - Novarupta Katmai 1912, Redoubt 1989-90
	ID 3506_006	73.78	0.14	13.15	1.57	0.08	0.04	0.71	4.36	5.36	0.33	99.44	0.56		
	ID 3506_007	74.01	0.09	12.99	1.58	0.09	0.02	0.74	4.14	5.14	0.32	99.05	0.95		
	ID 3506_008	73.96	0.08	13.06	1.57	0.12	0.04	0.71	3.83	5.12	0.34	98.76	1.24		
	ID 3506_009	73.90	0.09	13.14	1.54	0.07	0.03	0.69	4.14	5.19	0.32	99.04	0.96		
	ID 3506_010	73.99	0.10	13.12	1.48	0.04	0.05	0.71	4.19	5.07	0.34	99.02	0.98		
	Mean	73.93	0.10	13.09	1.55	0.08	0.04	0.71	4.13	5.18	0.33	99.06	0.94	5	
	St. Dev.	0.09	0.02	0.07	0.04	0.03	0.01	0.02	0.19	0.11	0.01	0.24	0.24		
	Old Crow_006	75.24	0.34	13.11	1.72	0.05	0.28	1.41	3.77	3.89	0.23	100.00	5.12		
	Old Crow_007	75.27	0.32	13.16	1.63	0.06	0.30	1.50	3.77	3.80	0.25	100.00	5.90		
	Old Crow_008	75.24	0.32	13.10	1.61	0.05	0.28	1.50	3.75	3.92	0.29	100.00	5.07		
	Old Crow_009	75.37	0.31	13.08	1.58	0.04	0.32	1.43	3.96	3.69	0.28	100.00	4.12		
	Old Crow_010	75.53	0.31	13.04	1.68	0.07	0.27	1.41	3.76	3.71	0.28	100.00	4.36		
	Mean	75.33	0.32	13.10	1.64	0.05	0.29	1.45	3.80	3.80	0.27	100.00	4.91	5	
	St. Dev.	0.12	0.01	0.05	0.06	0.01	0.02	0.04	0.09	0.10	0.02	0.00	0.70		
															Unknowns: Casc13-16, -19, -21, -24, -27
	ID 3506_011	74.13	0.09	12.87	1.56	0.04	0.04	0.75	4.06	5.21	0.34	99.02	0.98		
	ID 3506_012	74.22	0.09	13.00	1.61	0.04	0.06	0.73	4.12	5.22	0.36	99.37	0.63		
	ID 3506_013	73.62	0.09	13.00	1.60	0.07	0.02	0.72	3.87	5.20	0.34	98.46	1.54		
	ID 3506_014	74.24	0.05	13.05	1.55	0.02	0.04	0.73	4.31	5.18	0.32	99.41	0.59		
	ID 3506_015	73.57	0.06	12.98	1.51	0.10	0.05	0.72	4.30	5.13	0.33	98.67	1.33		
	Mean	73.95	0.08	12.98	1.57	0.05	0.04	0.73	4.13	5.19	0.34	98.99	1.01	5	
	St. Dev.	0.33	0.02	0.07	0.04	0.03	0.01	0.01	0.18	0.04	0.01	0.42	0.42		
	Old Crow_011	75.33	0.33	13.03	1.73	0.07	0.31	1.43	3.66	3.85	0.31	100.00	3.63		
	Old Crow_012	75.63	0.28	13.11	1.67	0.07	0.29	1.39	3.71	3.64	0.26	100.00	5.50		
	Old Crow_013	75.00	0.29	13.24	1.71	0.10	0.34	1.47	3.80	3.84	0.27	100.00	4.82		
	Old Crow_014	75.41	0.31	13.09	1.61	0.07	0.30	1.38	3.99	3.63	0.28	100.00	4.10		
	Old Crow_015	75.53	0.28	13.03	1.67	0.05	0.32	1.35	3.88	3.71	0.22	100.00	3.98		
	Mean	75.38	0.30	13.10	1.68	0.07	0.31	1.40	3.81	3.73	0.27	100.00	4.40	5	
	St. Dev.	0.24	0.02	0.09	0.04	0.02	0.02	0.05	0.13	0.11	0.03	0.00	0.75		
															Unknowns: Casc13-33, -36, -43, -144/146
	ID 3506_016	74.44	0.07	13.17	1.56	0.04	0.06	0.73	4.20	5.17	0.36	99.73	0.27		
	ID 3506_017	74.20	0.09	13.02	1.57	0.06	0.05	0.72	4.06	5.33	0.33	99.36	0.64		
	ID 3506_018	74.31	0.08	13.09	1.61	0.08	0.06	0.73	4.34	5.22	0.35	99.78	0.22		
	ID 3506_019	74.39	0.12	13.10	1.61	0.08	0.05	0.73	4.14	5.10	0.36	99.60	0.40		
	ID 3506_020	74.00	0.10	13.09	1.58	0.11	0.05	0.68	4.02	5.06	0.33	98.93	1.07		

Rejected analyses

SAMPLE	SiO_2	TiO_2	Al_2O_3	FeO_t	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total	H_2O_d
Old Crow_013	78.50	0.26	13.55	1.75	0.11	0.33	1.55	0.00	4.17	0.28	100.00	9.09
ID 3506_018	75.80	0.09	13.11	1.54	0.13	0.03	0.73	2.59	5.09	0.33	99.37	
Old Crow_020	76.13	0.37	13.32	1.62	0.05	0.31	1.45	0.00	3.96	0.26	97.05	8.02
Old Crow-9	74.17	0.36	13.09	1.61	0.04	0.17	1.31	4.87	4.15	0.28	100.00	5.46
Old Crow-12	78.23	0.29	13.38	1.74	0.08	0.28	1.57	1.12	3.10	0.29	100.00	6.15
Old Crow-15	75.11	0.26	12.86	1.83	0.04	0.33	1.47	4.00	3.86	0.31	100.00	12.99
ID 3506_004	72.45	0.08	12.91	1.55	0.04	0.02	0.72	4.29	5.07	0.33	97.39	
ID 3506_005	72.72	0.03	12.93	1.50	0.07	0.04	0.70	4.25	5.22	0.35	97.74	
Old Crow_004	75.05	0.28	12.97	1.56	0.06	0.29	1.43	4.36	3.83	0.23	100.00	3.59

Table S2 (cont.)- Secondary standard data for EPMA analyses

Date Analysed	SAMPLE	SiO_2	TiO_2	Al_2O_3	FeO_t	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total	H_2O_d	n	Analytical notes
	Mean	74.27	0.09	13.09	1.58	0.07	0.05	0.72	4.15	5.17	0.35	99.48	0.52	5	
	St. Dev.	0.18	0.02	0.05	0.02	0.02	0.01	0.02	0.13	0.11	0.02	0.35	0.35		
	Old Crow_016	75.30	0.33	13.15	1.71	0.08	0.30	1.45	3.71	3.73	0.30	100.00	3.88		
	Old Crow_018	74.91	0.32	12.97	1.85	0.02	0.30	1.47	4.11	3.82	0.30	100.00	1.29		
	Old Crow_019	75.08	0.32	13.07	1.73	0.08	0.27	1.50	4.00	3.74	0.28	100.00	3.90		
	Old Crow_020	75.18	0.33	13.11	1.66	0.07	0.29	1.42	4.02	3.72	0.26	100.00	3.78		
	Old Crow_021	75.44	0.33	13.00	1.66	0.09	0.25	1.44	3.96	3.60	0.30	100.00	5.11		
	Mean	75.18	0.32	13.06	1.72	0.07	0.28	1.46	3.96	3.72	0.29	100.00	3.59	5	
	St. Dev.	0.20	0.00	0.07	0.08	0.03	0.02	0.03	0.15	0.08	0.02	0.00	1.40		
Nov 16 2018	**ID 3506**	73.80	0.07	13.07	1.57	0.07	0.05	0.72	3.92	5.17	0.33	98.70	1.30	27	No TDI applied (10 micron analyses)
Whole run averages	**St. Dev.**	0.50	0.03	0.12	0.06	0.03	0.01	0.03	0.11	0.11	0.02	0.61	0.61		Na corrected up and K corrected down (from ID 3506)
	Old Crow	75.29	0.32	13.16	1.69	0.05	0.30	1.46	3.74	3.77	0.28	100.00	5.18	18	
	St. Dev.	0.24	0.04	0.11	0.05	0.03	0.03	0.03	0.17	0.08	0.02	0.00	1.28		
Nov 16 2018	**ID3506_014**	73.00	0.03	13.04	1.57	0.05	0.03	0.67	3.91	5.31	0.35	97.88	2.12		
Single point data	**ID3506_015**	73.21	0.08	13.02	1.61	0.07	0.04	0.69	4.01	5.05	0.32	98.03	1.97		
bracketing unknowns	**ID3506_016**	72.97	0.12	12.79	1.57	0.10	0.06	0.76	3.99	5.01	0.35	97.63	2.37		
	Mean	73.06	0.08	12.95	1.58	0.07	0.04	0.71	3.97	5.13	0.34	97.85	2.15	3	
	St. Dev.	0.13	0.04	0.14	0.02	0.03	0.01	0.04	0.05	0.16	0.02	0.20	0.20		
	Old Crow_014	75.66	0.34	13.22	1.61	0.08	0.30	1.45	3.44	3.69	0.28	100.00	5.28		
	Old Crow_015	74.64	0.32	13.10	1.77	0.06	0.34	1.47	4.20	3.89	0.27	100.00	8.23		
	Mean	75.15	0.33	13.16	1.69	0.07	0.32	1.46	3.82	3.79	0.27	100.00	6.76	2	
	St. Dev.	0.72	0.01	0.08	0.11	0.01	0.03	0.01	0.53	0.14	0.01	0.00	2.09		
	ID3506_017	73.79	0.07	12.96	1.62	0.02	0.05	0.77	3.84	5.10	0.32	98.47	1.53		
	ID3506_018	74.56	0.05	13.32	1.51	0.09	0.04	0.67	4.01	5.19	0.33	99.69	0.31		
	ID3506_019	73.88	0.13	13.20	1.63	0.10	0.05	0.71	3.92	5.09	0.34	98.97	1.03		
	ID3506_020	74.42	0.11	13.23	1.65	0.04	0.05	0.69	3.96	5.18	0.31	99.57	0.43		
		74.16	0.09	13.18	1.60	0.06	0.05	0.71	3.93	5.14	0.32	99.18	0.82	4	
		0.39	0.04	0.15	0.06	0.04	0.01	0.04	0.07	0.05	0.01	0.56	0.56		
	Old Crow_017	75.38	0.26	13.21	1.70	0.03	0.29	1.46	3.72	3.75	0.27	100.00	4.70		
	Old Crow_020	75.11	0.28	13.18	1.74	0.04	0.30	1.47	3.90	3.77	0.28	100.00	2.39		
	Mean	75.24	0.27	13.19	1.72	0.03	0.30	1.46	3.81	3.76	0.28	100.00	3.54	2	
	St. Dev.	0.19	0.02	0.03	0.03	0.00	0.01	0.01	0.13	0.02	0.00	0.00	1.64		
Aug 22 2019	**ID 3506**	73.96	0.07	13.15	1.56	0.07	0.04	0.72	4.10	5.14	0.33	99.06	0.94	19	NaTDI file
Whole run averages	**St. Dev.**	0.35	0.03	0.08	0.04	0.02	0.02	0.02	0.20	0.09	0.02	0.38	0.38		No corrections
	Old Crow	75.16	0.31	13.13	1.71	0.06	0.30	1.46	3.94	3.71	0.28	100.00	3.36	18	
	St. Dev.	0.28	0.03	0.07	0.05	0.03	0.03	0.03	0.23	0.07	0.02	0.00	1.21		
Aug 22 2019	**ID3506_010**	74.59	0.05	13.45	1.50	0.08	0.05	0.76	4.06	5.21	0.34	100.00	1.21		
Single point data	**ID3506_011**	74.61	0.06	13.27	1.64	0.02	0.03	0.74	4.24	5.13	0.33	100.00	1.33		
bracketing unknowns	**ID3506_012**	74.41	0.09	13.33	1.54	0.09	0.04	0.73	4.29	5.21	0.35	100.00	0.42		
	ID3506_013	74.68	0.05	13.27	1.53	0.08	0.07	0.71	4.13	5.20	0.35	100.00	0.62		
	Mean	74.57	0.06	13.33	1.55	0.07	0.05	0.73	4.18	5.19	0.34	100.00	0.90		
	St. Dev.	0.11	0.02	0.08	0.06	0.03	0.01	0.02	0.11	0.04	0.01	0.00	0.44		
	OldCrow_010	75.29	0.30	13.14	1.70	0.06	0.28	1.45	3.92	3.64	0.27	100.00	4.56		
	OldCrow_011	74.95	0.32	13.08	1.74	0.04	0.27	1.45	4.21	3.73	0.27	100.00	4.38		
	OldCrow_012	75.36	0.37	13.11	1.69	0.10	0.33	1.48	3.63	3.71	0.27	100.00	4.02		
	OldCrow_013	75.36	0.32	13.13	1.77	0.04	0.29	1.43	3.76	3.67	0.28	100.00	4.26		
	Mean	75.24	0.33	13.11	1.72	0.06	0.30	1.45	3.88	3.69	0.28	100.00	4.31		
	St. Dev.	0.20	0.03	0.03	0.04	0.03	0.02	0.02	0.25	0.04	0.00	0.00	0.23		
	ID3506_014	74.33	0.08	13.12	1.52	0.10	0.04	0.73	4.43	5.38	0.34	100.00	0.91		
	ID3506_015	74.83	0.08	13.28	1.51	0.05	0.05	0.72	3.94	5.27	0.34	100.00	0.83		
	ID3506_016	74.75	0.07	13.40	1.57	0.06	0.03	0.75	3.86	5.22	0.35	100.00	1.56		
	ID3506_017	74.64	0.05	13.22	1.54	0.07	0.01	0.75	4.26	5.19	0.34	100.00	0.12		
	ID3506_018	74.21	0.08	13.31	1.60	0.08	0.02	0.74	4.51	5.20	0.31	100.00	1.08		
	ID3506_019	74.43	0.05	13.33	1.66	0.09	0.04	0.68	4.26	5.20	0.34	100.00	1.46		
	Mean	74.53	0.07	13.28	1.57	0.07	0.03	0.73	4.21	5.24	0.34	100.00	0.99		
	St. Dev.	0.25	0.01	0.10	0.06	0.02	0.01	0.03	0.26	0.07	0.01	0.00	0.52		
	OldCrow_014	75.30	0.34	13.19	1.68	0.06	0.27	1.49	3.83	3.62	0.29	100.00	4.21		
	OldCrow_015	74.90	0.31	13.18	1.79	0.13	0.32	1.46	3.89	3.81	0.28	100.00	4.91		
	OldCrow_016	75.55	0.31	12.99	1.79	0.02	0.26	1.44	3.70	3.72	0.31	100.00	4.33		
	OldCrow_017	77.61	0.31	13.54	1.77	0.04	0.30	1.48	1.46	3.29	0.25	100.00	7.33		
	OldCrow_018	75.03	0.27	13.11	1.67	0.04	0.28	1.42	4.24	3.69	0.30	100.00	2.84		
	OldCrow_019	75.58	0.28	13.16	1.67	0.08	0.27	1.41	3.63	3.71	0.26	100.00	4.80		
	Mean	75.66	0.30	13.20	1.73	0.06	0.28	1.45	3.46	3.64	0.28	100.00	4.74		
	St. Dev.	0.99	0.02	0.18	0.06	0.04	0.02	0.03	1.00	0.18	0.02	0.00	1.47		

Ref: Opala

Ref: WRAn (UT1480, UT1482)

Rejected analyses

SAMPLE	SiO_2	TiO_2	Al_2O_3	FeO_t	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total	H_2O_d
Old Crow_017	75.05	0.27	12.98	1.75	0.06	0.32	1.39	4.32	3.66	0.27	100.00	4.23
Old Crow_016	74.91	0.31	13.13	1.64	0.06	0.32	1.44	4.39	3.59	0.27	100.00	3.31
Old Crow_018	77.01	0.27	13.48	1.72	0.02	0.14	1.50	1.91	3.73	0.27	100.00	6.24
Old Crow_019	75.52	0.36	13.20	1.71	0.07	0.26	1.44	3.39	3.82	0.30	100.00	6.32

Table S3 – Final age model output for 0-3 m, Cascade Lake. Produced using OxCal v4.2. All ages are rounded to five years.

Depth	Mean age (cal yr BP)	Mean age (CE)	1 SD	68.2% range (cal yr BP)		95.4% range (cal yr BP)		Sedimentation rate (cm/yr)	Date at this depth?	Comment
0	-60	2010	0	-60	-65	-60	-65	0.022	Y - coring date	
1	-15	1965	0	-10	-20	-10	-20	0.023	Y - 210Pb	
2	15	1935	5	20	10	23	8	0.033	Y - 210Pb	
3	50	1900	5	55	45	60	40	0.022	Y - 210Pb, 14C	
4	110	1840	35	126	70	179	61	0.016		
5	180	1770	90	217	70	377	63	0.015		
6	255	1695	135	319	89	536	71	0.014	*14C outlier*	
7	330	1620	145	450	154	608	90	0.014		
8	400	1550	150	570	230	672	117	0.014		
9	475	1475	145	646	356	705	179	0.014		
10	545	1405	130	715	480	737	251	0.014		
11	620	1330	90	718	575	759	410	0.017		Sed rates <0.020
12	695	1255	50	720	670	780	570	0.020	Y - 14C	
13	720	1230	60	752	676	842	599	0.026		
14	745	1205	70	784	683	905	628	0.032		
15	770	1180	80	816	689	967	656	0.038		Sed rates >0.035
16	795	1155	85	851	705	1000	668	0.039		
17	825	1125	90	886	723	1029	678	0.039		
18	850	1100	95	921	741	1058	688	0.039		
19	875	1075	100	954	763	1085	701	0.039		
20	900	1050	100	986	787	1113	715	0.039		
21	925	1025	105	1018	811	1140	730	0.039		
22	950	1000	105	1049	837	1166	749	0.039		
23	975	975	105	1079	864	1192	771	0.039		
24	1005	945	105	1110	891	1217	794	0.039		
25	1030	920	105	1139	920	1240	818	0.039		
26	1055	895	105	1168	951	1261	843	0.039		
27	1080	870	105	1197	981	1282	869	0.039		
28	1105	845	100	1224	1012	1302	896	0.039		
29	1130	820	100	1248	1044	1319	927	0.039		
30	1160	790	95	1272	1076	1337	957	0.039		
31	1185	765	90	1294	1108	1354	989	0.039	*14C outlier*	
32	1210	740	85	1312	1142	1368	1024	0.039		
33	1235	715	80	1330	1176	1382	1059	0.039		
34	1260	690	75	1346	1209	1396	1097	0.039		
35	1285	665	65	1358	1237	1404	1151	0.039		
36	1315	635	50	1369	1266	1412	1206	0.038		
37	1340	610	40	1380	1295	1420	1260	0.038	Y - tephra	
38	1365	585	50	1411	1308	1469	1269	0.038		
39	1390	560	60	1442	1320	1518	1278	0.038		
40	1420	530	70	1474	1336	1563	1290	0.037		
41	1445	505	70	1508	1362	1594	1308	0.037		
42	1475	475	75	1543	1387	1625	1326	0.037		
43	1500	450	75	1575	1415	1652	1348	0.037		
44	1525	425	75	1604	1446	1675	1373	0.037		
45	1555	395	75	1633	1477	1699	1399	0.037		
46	1580	370	70	1655	1508	1719	1434	0.036		
47	1605	345	65	1675	1539	1737	1472	0.034		
48	1635	315	60	1695	1570	1755	1510	0.032	Y - tephra	
49	1670	280	75	1735	1587	1823	1522	0.031		
50	1705	245	90	1775	1603	1892	1533	0.030		
51	1740	210	105	1815	1620	1960	1545	0.029		
52	1775	175	110	1858	1645	2008	1565	0.029		
53	1810	140	120	1902	1670	2057	1585	0.029		
54	1845	105	125	1945	1695	2105	1605	0.029		
55	1875	75	130	1987	1727	2148	1630	0.029		
56	1910	40	135	2028	1758	2192	1655	0.029		
57	1945	5	140	2070	1790	2235	1680	0.029		
58	1980	-30	140	2108	1825	2272	1710	0.029		
59	2015	-65	140	2147	1860	2308	1740	0.029		
60	2050	-100	145	2185	1895	2345	1770	0.029	Y - PSV	
61	2085	-135	145	2222	1926	2385	1796	0.029		
62	2120	-170	150	2259	1957	2425	1821	0.030		
63	2155	-205	155	2296	1986	2465	1847	0.030		
64	2185	-235	155	2334	2017	2504	1874	0.030		
65	2220	-270	160	2371	2051	2541	1903	0.030		
66	2255	-305	160	2410	2088	2578	1936	0.030		
67	2290	-340	160	2450	2125	2615	1970	0.030		
68	2320	-370	160	2481	2156	2649	2001	0.030		
69	2355	-405	160	2514	2189	2683	2034	0.030		
70	2390	-440	160	2548	2226	2714	2068	0.030		
71	2425	-475	160	2582	2264	2744	2102	0.030		
72	2455	-505	155	2616	2301	2773	2136	0.030		

Table S3 (cont.) – Final age model output for 0-3 m, Cascade Lake. Produced using OxCal v4.2. All ages are rounded to five years.

Depth	Mean age (cal yr BP)	Mean age (CE)	1 SD	68.2% range (cal yr BP)		95.4% range (cal yr BP)		Sedimentation rate (cm/yr)	Date at this depth?	Comment
73	2490	-540	155	2649	2336	2804	2175	0.029		
74	2525	-575	150	2680	2370	2835	2215	0.029	Y - tephra	
75	2560	-610	150	2715	2407	2867	2250	0.029		
76	2595	-645	150	2750	2443	2898	2285	0.029		
77	2630	-680	150	2785	2480	2930	2320	0.029		
78	2665	-715	150	2817	2515	2963	2362	0.029		
79	2700	-750	145	2848	2550	2997	2403	0.029		
80	2735	-785	145	2880	2585	3030	2445	0.029	Y - PSV	
81	2770	-820	145	2917	2617	3068	2471	0.029		
82	2800	-850	150	2954	2649	3107	2496	0.030		
83	2835	-885	155	2990	2681	3145	2522	0.030		
84	2870	-920	155	3026	2713	3181	2553	0.030		
85	2905	-955	155	3061	2745	3216	2585	0.030		
86	2935	-985	160	3096	2777	3251	2617	0.030		
87	2970	-1020	160	3133	2813	3284	2649	0.030	*14C outlier*	
88	3005	-1055	160	3169	2849	3316	2681	0.030		
89	3035	-1085	160	3206	2886	3348	2713	0.030		
90	3070	-1120	155	3241	2924	3377	2749	0.030		
91	3105	-1155	155	3275	2962	3404	2787	0.030		
92	3135	-1185	155	3308	3001	3431	2826	0.030		
93	3170	-1220	150	3341	3040	3457	2865	0.030		
94	3205	-1255	145	3373	3080	3481	2905	0.030		
95	3235	-1285	145	3405	3120	3505	2945	0.030		
96	3270	-1320	140	3436	3162	3525	2988	0.030		
97	3305	-1355	130	3465	3207	3540	3036	0.030		
98	3340	-1390	125	3493	3251	3554	3084	0.030		
99	3370	-1420	120	3520	3297	3567	3132	0.030		
100	3405	-1455	110	3539	3345	3573	3180	0.030		
101	3440	-1490	100	3558	3393	3579	3228	0.030		
102	3470	-1520	85	3575	3440	3585	3281	0.030		
103	3505	-1555	60	3579	3480	3587	3371	0.031		
104	3540	-1590	35	3582	3520	3588	3460	0.033		
105	3570	-1620	10	3585	3560	3590	3550	0.034	Y - tephra	
106	3595	-1645	30	3614	3563	3659	3552	0.036		Sed rates >0.035
107	3625	-1675	50	3643	3566	3728	3553	0.038		
108	3650	-1700	70	3671	3570	3796	3555	0.040		
109	3675	-1725	80	3706	3580	3840	3559	0.040		
110	3700	-1750	85	3741	3591	3880	3564	0.040		
111	3725	-1775	95	3776	3602	3920	3569	0.040		
112	3750	-1800	105	3810	3619	3959	3577	0.040		
113	3775	-1825	110	3844	3639	3997	3587	0.040		
114	3800	-1850	115	3877	3658	4036	3596	0.040		
115	3825	-1875	120	3910	3678	4072	3608	0.040		
116	3850	-1900	125	3942	3699	4107	3621	0.040		
117	3875	-1925	130	3974	3720	4142	3634	0.040		
118	3900	-1950	135	4006	3740	4177	3647	0.040		
119	3925	-1975	140	4038	3761	4210	3662	0.040		
120	3950	-2000	145	4070	3782	4244	3676	0.040		
121	3975	-2025	150	4101	3804	4277	3692	0.040		
122	4000	-2050	150	4132	3828	4309	3709	0.040		
123	4025	-2075	155	4162	3852	4341	3727	0.040		
124	4050	-2100	160	4192	3876	4373	3744	0.040		
125	4075	-2125	160	4221	3898	4403	3762	0.040		
126	4100	-2150	165	4250	3920	4433	3780	0.040		
127	4125	-2175	165	4279	3943	4464	3798	0.040		
128	4150	-2200	170	4307	3967	4494	3818	0.040		
129	4175	-2225	170	4336	3991	4525	3839	0.040		
130	4200	-2250	175	4365	4015	4555	3860	0.040		
131	4225	-2275	175	4394	4039	4584	3881	0.040		
132	4250	-2300	175	4423	4063	4613	3902	0.040		
133	4275	-2325	180	4451	4087	4641	3922	0.040		
134	4305	-2355	180	4479	4112	4669	3943	0.040		
135	4330	-2380	180	4506	4138	4696	3964	0.040		
136	4355	-2405	185	4533	4164	4723	3985	0.040		
137	4380	-2430	185	4560	4188	4752	4007	0.040		
138	4405	-2455	185	4588	4212	4780	4029	0.040		
139	4430	-2480	190	4615	4236	4809	4052	0.040	*14C (not in model)*	
140	4455	-2505	190	4642	4260	4836	4074	0.040		
141	4480	-2530	190	4669	4284	4862	4096	0.040		
142	4505	-2555	190	4696	4308	4887	4119	0.040		
143	4530	-2580	190	4724	4333	4914	4142	0.040		
144	4555	-2605	190	4751	4358	4941	4166	0.040		
145	4580	-2630	195	4778	4384	4968	4190	0.040		
146	4605	-2655	195	4805	4410	4995	4214	0.040		
147	4630	-2680	195	4830	4435	5020	4238	0.040		
148	4655	-2705	195	4856	4461	5046	4262	0.040		
149	4680	-2730	195	4881	4487	5071	4286	0.040		

Table S3 (cont.) – Final age model output for 0-3 m, Cascade Lake. Produced using OxCal v4.2. All ages are rounded to five years.

Depth	Mean age (cal yr BP)	Mean age (CE)	1 SD	68.2% range (cal yr BP)		95.4% range (cal yr BP)		Sedimentation rate (cm/yr)	Date at this depth?	Comment
150	4705	-2755	195	4907	4514	5095	4310	0.040		
151	4730	-2780	195	4933	4541	5119	4334	0.040		
152	4755	-2805	195	4958	4568	5143	4358	0.039		
153	4780	-2830	195	4984	4592	5169	4384	0.037		
154	4805	-2855	195	5009	4616	5194	4409	0.034		
155	4830	-2880	195	5035	4640	5220	4435	0.031	*PSV (not in model)*	
156	4870	-2920	200	5077	4675	5267	4464	0.029		
157	4910	-2960	205	5119	4709	5315	4493	0.027		
158	4950	-3000	205	5160	4744	5361	4523	0.026		
159	4985	-3035	210	5202	4778	5407	4556	0.026		
160	5025	-3075	215	5244	4813	5452	4589	0.026		
161	5065	-3115	215	5286	4849	5496	4621	0.026		
162	5100	-3150	220	5328	4887	5538	4654	0.026		
163	5140	-3190	220	5370	4925	5580	4687	0.026		
164	5180	-3230	220	5410	4964	5620	4722	0.026		
165	5220	-3270	225	5450	5002	5660	4759	0.026		
166	5255	-3305	225	5490	5040	5700	4795	0.026		
167	5295	-3345	225	5528	5080	5740	4835	0.026		
168	5335	-3385	225	5566	5120	5780	4875	0.026		
169	5370	-3420	225	5605	5160	5819	4915	0.026		
170	5410	-3460	225	5643	5198	5855	4955	0.026		
171	5450	-3500	220	5681	5236	5892	4995	0.026		
172	5490	-3540	220	5717	5275	5927	5037	0.026		
173	5525	-3575	220	5752	5315	5962	5080	0.026		
174	5565	-3615	215	5786	5355	5996	5124	0.026		
175	5605	-3655	215	5822	5396	6028	5169	0.026		
176	5645	-3695	210	5859	5438	6059	5215	0.025		
177	5680	-3730	205	5895	5480	6090	5260	0.025	*PSV (not in model)*	PSV dates not in agreement
178	5725	-3775	210	5938	5518	6138	5297	0.025		
179	5765	-3815	210	5982	5557	6187	5333	0.024		
180	5805	-3855	215	6025	5595	6235	5370	0.024		
181	5850	-3900	215	6067	5637	6278	5412	0.024		
182	5890	-3940	215	6108	5678	6322	5453	0.024		
183	5930	-3980	215	6150	5720	6365	5495	0.024		
184	5975	-4025	215	6192	5763	6405	5540	0.024		
185	6015	-4065	215	6233	5807	6445	5585	0.024		
186	6055	-4105	210	6275	5850	6485	5630	0.024		
187	6100	-4150	210	6315	5895	6522	5677	0.024		
188	6140	-4190	205	6355	5940	6558	5723	0.024		
189	6180	-4230	205	6395	5985	6595	5770	0.025	*PSV (not in model)*	
190	6220	-4270	205	6432	6019	6638	5804	0.025		
191	6260	-4310	210	6471	6054	6681	5839	0.025		
192	6300	-4350	210	6514	6091	6727	5873	0.025		
193	6340	-4390	215	6556	6129	6771	5909	0.025		
194	6380	-4430	215	6599	6166	6814	5946	0.025		
195	6420	-4470	215	6640	6205	6857	5983	0.025		
196	6460	-4510	215	6680	6245	6900	6020	0.025		
197	6500	-4550	215	6720	6285	6937	6060	0.025		
198	6540	-4590	215	6760	6325	6974	6100	0.025	Y - 14C	
199	6580	-4630	215	6800	6365	7011	6140	0.025		
200	6620	-4670	215	6837	6404	7050	6183	0.025		
201	6660	-4710	215	6871	6441	7090	6229	0.025		
202	6700	-4750	210	6912	6484	7128	6274	0.026		
203	6740	-4790	210	6955	6530	7165	6320	0.026	*PSV (not in model)*	
204	6775	-4825	215	6992	6562	7207	6349	0.027		
205	6810	-4860	215	7029	6594	7248	6378	0.027		
206	6850	-4900	220	7065	6626	7290	6406	0.028		
207	6885	-4935	220	7104	6659	7331	6438	0.028		
208	6920	-4970	225	7142	6693	7373	6470	0.028		
209	6955	-5005	225	7180	6727	7415	6502	0.028		
210	6995	-5045	230	7219	6761	7454	6534	0.028		
211	7030	-5080	230	7257	6797	7492	6566	0.028		
212	7065	-5115	230	7296	6832	7531	6598	0.028		
213	7100	-5150	230	7334	6868	7569	6632	0.028		
214	7140	-5190	235	7372	6905	7607	6667	0.028		
215	7175	-5225	235	7411	6942	7646	6702	0.028		
216	7210	-5260	235	7448	6978	7683	6737	0.028		
217	7245	-5295	235	7485	7013	7718	6770	0.028		
218	7280	-5330	235	7522	7048	7753	6804	0.028		
219	7320	-5370	235	7558	7084	7788	6839	0.028		
220	7355	-5405	235	7593	7123	7821	6878	0.028		
221	7390	-5440	235	7629	7161	7855	6916	0.028		
222	7425	-5475	230	7664	7199	7889	6955	0.028		
223	7465	-5515	230	7699	7236	7924	6995	0.028		
224	7500	-5550	230	7734	7273	7959	7035	0.028		
225	7535	-5585	230	7769	7310	7994	7075	0.028		
226	7570	-5620	225	7805	7348	8026	7115	0.027		

Table S3 (cont.) – Final age model output for 0-3 m, Cascade Lake. Produced using OxCal v4.2. All ages are rounded to five years.

Depth	Mean age (cal yr BP)	Mean age (CE)	1 SD	68.2% range (cal yr BP)		95.4% range (cal yr BP)		Sedimentation rate (cm/yr)	Date at this depth?	Comment
227	7610	-5660	225	7840	7387	8058	7155	0.027		
228	7645	-5695	220	7875	7425	8090	7195	0.026	*PSV (not in model)*	PSV dates not in agreement
229	7685	-5735	225	7917	7458	8139	7228	0.026		
230	7725	-5775	230	7959	7492	8188	7262	0.025		
231	7765	-5815	230	8002	7528	8233	7295	0.025		
232	7805	-5855	235	8044	7566	8278	7328	0.025		
233	7845	-5895	235	8086	7604	8323	7365	0.025		
234	7885	-5935	240	8128	7642	8370	7405	0.025		
235	7925	-5975	240	8171	7681	8415	7444	0.025	Y - 14C	
236	7965	-6015	240	8213	7723	8455	7479	0.025		
237	8010	-6060	245	8255	7765	8495	7515	0.025		
238	8050	-6100	245	8295	7803	8537	7555	0.025		
239	8090	-6140	245	8335	7841	8579	7595	0.025		
240	8130	-6180	245	8377	7882	8618	7633	0.025		
241	8170	-6220	245	8419	7924	8656	7671	0.025		
242	8210	-6260	245	8460	7966	8696	7713	0.025		
243	8250	-6300	245	8500	8008	8738	7760	0.025		
244	8290	-6340	240	8539	8051	8779	7805	0.025		
245	8330	-6380	240	8577	8093	8814	7845	0.024		
246	8370	-6420	240	8615	8135	8850	7885	0.024	*PSV (not in model)*	
247	8415	-6465	245	8663	8171	8909	7917	0.023	*14C outlier*	
248	8460	-6510	250	8712	8207	8968	7948	0.023		
249	8505	-6555	260	8762	8244	9026	7981	0.022		
250	8550	-6600	265	8812	8282	9082	8015	0.022		
251	8595	-6645	270	8863	8321	9139	8049	0.022		
252	8640	-6690	275	8913	8363	9193	8085	0.022		
253	8685	-6735	280	8964	8405	9248	8121	0.022		
254	8730	-6780	285	9011	8443	9299	8156	0.022		
255	8775	-6825	285	9057	8481	9350	8192	0.022		
256	8815	-6865	290	9105	8522	9400	8229	0.022		
257	8860	-6910	295	9156	8566	9451	8267	0.022		
258	8905	-6955	295	9206	8610	9501	8305	0.022		
259	8950	-7000	300	9254	8652	9552	8343	0.022		
260	8995	-7045	305	9303	8694	9602	8381	0.022		
261	9040	-7090	305	9350	8737	9651	8422	0.022		
262	9085	-7135	305	9396	8779	9700	8464	0.022		
263	9130	-7180	310	9443	8822	9747	8505	0.022		
264	9175	-7225	310	9492	8869	9794	8545	0.022		
265	9220	-7270	315	9540	8915	9840	8585	0.022		
266	9265	-7315	315	9588	8963	9886	8627	0.022		
267	9310	-7360	315	9637	9012	9933	8669	0.022		
268	9355	-7405	315	9684	9058	9978	8711	0.022		
269	9400	-7450	315	9730	9102	10022	8753	0.022		
270	9445	-7495	315	9776	9147	10066	8796	0.022		
271	9490	-7540	315	9820	9193	10108	8840	0.022		
272	9530	-7580	315	9864	9239	10150	8884	0.022		
273	9575	-7625	315	9911	9286	10192	8931	0.022		
274	9620	-7670	315	9957	9332	10234	8977	0.022		
275	9665	-7715	310	10002	9379	10276	9023	0.022		
276	9710	-7760	310	10046	9428	10318	9069	0.022		
277	9755	-7805	310	10091	9476	10360	9116	0.022		
278	9800	-7850	305	10135	9522	10400	9167	0.022		
279	9845	-7895	305	10179	9568	10440	9217	0.022		
280	9890	-7940	305	10222	9616	10480	9266	0.022		
281	9935	-7985	300	10264	9665	10520	9315	0.022		
282	9980	-8030	300	10307	9712	10560	9364	0.022		
283	10025	-8075	295	10351	9759	10600	9414	0.020		
284	10070	-8120	290	10395	9805	10640	9465	0.019	*PSV (not in model)*	PSV dates not in agreement
285	10130	-8180	295	10459	9871	10702	9524	0.018		
286	10195	-8245	295	10522	9936	10763	9584	0.017		
287	10255	-8305	295	10585	10001	10823	9646	0.016		
288	10315	-8365	295	10646	10064	10883	9709	0.016		
289	10380	-8430	295	10708	10129	10941	9774	0.016		
290	10440	-8490	290	10769	10203	10993	9843	0.016		
291	10505	-8555	285	10831	10277	11044	9913	0.016		
292	10565	-8615	280	10890	10349	11090	9987	0.016		
293	10630	-8680	275	10947	10421	11133	10063	0.016		
294	10690	-8740	265	11004	10495	11174	10139	0.016		
295	10750	-8800	260	11059	10575	11209	10217	0.016		
296	10815	-8865	250	11115	10655	11243	10295	0.016		
297	10875	-8925	235	11160	10737	11272	10378	0.016		
298	10940	-8990	220	11203	10819	11298	10462	0.016		
299	11000	-9050	205	11240	10899	11326	10557	0.016		
300	11065	-9115	180	11267	10977	11354	10667	0.016		
301	11125	-9175	160	11293	11055	11383	10778	0.016		
302	11190	-9240	115	11303	11125	11389	10947	0.016		
303	11250	-9300	70	11311	11195	11393	11119	0.015	Y - 14C	Sed rates <0.020

Table S4:Dates for tephras reviewed within this study, listed by associated tephra.

Dating methods: Con = conventional ^{14}C dating; AMS = accelerator mass spectrometery ^{14}C dating; Ice = GICC05 ice core chronology; nd = not defined
**x,xxx*: Dates marked with a star and italicised were not included in our ages models for the reason listed under Comments (column K)

Eruption		Radiocarbon age (^{14}C yr BP)	Laboratory number	Material dated	Stratigraphic context	Dating method	Location		Reference	Comments
Aniakchak CFE II		2,200±25	UCIAMS-154508	Leaf fragments	26.5cm above cryptotephra	AMS	Ruppert Lake	67°4.28'N 154°14.65'W	Monteath et al. (2017)	100.5cm depth in core RC
		2,590±85	NSRL-11364	Wood	16cm above tephra	AMS	Arolik Lake	N 59.47°, W 161.12°	Kaufman et al (2003); Hu et al. (2003)	11cm depth
		2,875±15	UCIAMS 37821	Leaf fragments	~15cm above tephra	AMS	Lone Spruce Pond	N 60.01°, W 159.14°	Kaufman et al (2012)	140.5cm in core 07-LSP-3
		2,890±40	Beta-182371	Sphagnum	28cm above cryptotephra	AMS	Nordon's Pond Bog	49° 9' 50" N 53° 36' 0"W	Hughes et al. (2006), Pyne-O'Donnell et al. (2012)	272cm depth in core NDN02/1
		2,910±35	UCIAMS-172056	Vegetation macrofossils	11.5cm above cryptotephra	AMS	Ruppert Lake	67°4.28'N 154°14.65'W	Monteath et al. (2017)	104.5cm depth in core RS
		2,990 ± 35	GrA-28723	Cyperaceous macrofossils	10-15mm above tephra	AMS	northern Seward Peninsula	N 66°28′22″, W 163°56′56″	Blackford et al. (2014)	
		3,040 ± 40	GrA-28722	Cyperaceous macrofossils	5-10mm above tephra	AMS	northern Seward Peninsula	N 66°28′22″, W 163°56′56″	Blackford et al. (2014)	
		3,065 ± 35	GrA-28720	Cyperaceous macrofossils	0-5mm above tephra	AMS	northern Seward Peninsula	N 66°28′22″, W 163°56′56″	Blackford et al. (2014)	
		3,140±35	NSRL-11772	Vegetation macrofossils	8cm above tephra	AMS	Waskey Lake	N 59°52'46", W 159°12'24"	Levy et al (2004)	280-282cm in core WL-1
		3,280±20	UCIAMS-128457	Leaf fragment	20cm above tephra	AMS	St. Paul Lake	57.17809°N, 170.24828°W	Graham et al. (2016)	77.5cm depth in core LAHI-LAHI13 1D-2B-1; 274.5cm composite depth
	TEPHRA									
		3,335 ± 40	GrA-28712	Cyperaceous macrofossils	5-10mm below tephra	AMS	northern Seward Peninsula	N 66°28′22″, W 163°56′56″	Blackford et al. (2014)	
		3,350±200	W-3125	Charcoal twigs	At base of ashflow tuff	nd	Waterfall Creek	N 56°48.2', W 158°07.1'	Miller & Smith (1987)	
		3,410±90	1-14,221	Charcoal log in tuff	In ashflow tuff	nd	Port Heiden Quarry	N 56°56.3', W 158°37.2'	Miller & Smith (1987)	
		3,520±140	1-14,226	Charcoal	In pumice at base of tuff	nd	King Salmon River	N 57°30.1', W 157°31.2'	Miller & Smith (1987)	
		3,560±25	UCIAMS-172057	Vegetation macrofossils	24.5cm below cryptotephra	AMS	Ruppert Lake	67°4.28'N 154°14.65'W	Monteath et al. (2017)	150.5cm depth in core RS
		3,575±20	UCIAMS 37822	Leaf fragments	10cm below tephra	AMS	Lone Spruce Pond	N 60.01°, W 159.14°	Kaufman et al (2012)	186.5cm in core 07-LSP-3
		3,630±85	NSRL 12336	Wood	1cm below tephra	AMS	Sunday Pond	N 59.67°, W 159.47°	Kaufman et al (2012)	328cm in core SP-1
		3,691±40	SUERC-538	Sphagnum	34cm below cryptotephra	AMS	Nordon's Pond Bog	49° 9' 50" N 53° 36' 0"W	Hughes et al. (2006), Pyne-O'Donnell et al. (2012)	334cm depth in core NDN02/1
		4,360±35	NRSL 11549	Twig	22cm below tephra	AMS	Nimgun Lake	N 59.56°, W 160.77°	Kaufman et al (2012)	228cm depth in core NL-2
		4,450±60	NSRL-11773	Vegetation macrofossils	48cm below tephra	AMS	Waskey Lake	N 59°52'46", W 159°12'24"	Levy et al (2004)	478-480cm in core WL-1
		4,635±25	UCIAMS-164425	Vegetation macrofossils	18cm below cryptotephra	AMS	Ruppert Lake	67°4.28'N 154°14.65'W	Monteath et al. (2017)	145cm depth in core RC
		5,295±30	CAMS 86531	Leaves and plant macros	57cm below tephra	AMS	Arolik Lake	N 59.47°, W 161.12°	Kaufman et al (2003); Hu et al. (2003)	111-112cm depth in core AL-4
	Rejected	3,270 ± 40	GrA-28718	Cyperaceous macrofossils	0-5mm below tephra	AMS	northern Seward Peninsula	N 66°28′22″, W 163°56′56″	Blackford et al. (2014)	Not reconcilable in model with ice core ages
	Rejected	3,305 ± 40	GrA-28711	Cyperaceous macrofossils	10-15mm below tephra	AMS	northern Seward Peninsula	N 66°28′22″, W 163°56′56″	Blackford et al. (2014)	Not reconcilable in model with ice core ages
Not included in model:		**2,400±80*	*Beta-7760*	*Peat*	*Above tephra*	*nd*	*Dome Creek*	*65° 18 N, 164° 44'W*	*Kaufman & Hopkins (1985)*	*Bulk analysis*
		**2,770±95*	*GX-21371*	*Peat*	*40cm above basal ash*	*AMS*	*Dillingham section*	*nd*	*Waythomas & Neal (1998)*	*Bulk analysis*
		**2,840±85*	*GX-21372*	*Peat*	*10cm above basal ash*	*AMS*	*Protection Point section*	*nd*	*Waythomas & Neal (1998)*	*Bulk analysis*
		**2,910±135*	*GX-21375*	*Peat*	*10cm above basal ash*	*AMS*	*Nushagak Peninsula*	*nd*	*Waythomas & Neal (1998)*	*Bulk analysis*
		**3,280±140*	*GC-21324*	*Peat*	*30cm above basal ash*	*AMS*	*Igushik section*	*nd*	*Waythomas & Neal (1998)*	*Bulk analysis*
		**3,370±90*	*1-14,223*	*Peat horizon*	*Underlying air fall*	*nd*	*Chignik Bay*	*56°27.51N, 158°23.11W*	*Miller & Smith (1987)*	*Bulk analysis*
		**3,400±750*	*W-3776*	*Lake sediments*	*12cm above tephra*	*nd*	*Tungak Lake*	*nd*	*Ager (1982)*	*Bulk analysis*
		**3,570±100*	*B-19643*	*Hearth site*	*Above tephra*	*AMS*	*Cape Espenberg*	*nd*	*Beget et al (1992)*	*Unknown material dated*
		**3,570±80*	*1-14,236*	*Peat horizon*	*Overlying tephra*	*nd*	*Pacific Ocean coast*	*56°55.7 ' N, 156°48.4'W*	*Miller & Smith (1987)*	*Bulk analysis*
		**3,605±30*	UCIAMS-154532	*Carex* seed, beetle fragment, wood fragment	*2cm above cryptotephra peak*	*AMS*	*Woody Bottom Pond*	*67°4.55'N, 154°13.88'W*	*Monteath et al. (2017)*	*63cm in core WBP; described erroneously old in paper*
		**3,840±40*	*NRSL 11068*	*Mixed macros*	*1-6cm above tephra*	*AMS*	*Little Swift Lake*	*60.21°N, 159.76°W*	*Axford & Kaufman (2004)*	*202-207cm in core LS-A; all ages in paper too old*
		**4,830±79*	*W-4929*	*Bulk sediment*	*10cm above tephra*	*Con*	*Zagoskin Lake*	*63°26.9' N, 162° 06.3' W*	*Ager (2003); Muhs et al. (2003)*	*Bulk analysis*
	TEPHRA									
		**3,650±40*	*NRSL 10554*	*Macro*	*Within tephra*	*AMS*	*Nimgun Lake*	*59.56°N, 160.77°W*	*Kaufman et al (2012)*	*159cm, core NL-2; tephra not geochemically analysed*
		**3,684±98*	*WSU-2759*	*Charred wood*	*Within tephra*	*nd*	*Site 4*	*nd*	*Riehle et al. (1987)*	*May be cryoturbated from above*
		**2,800±45*	*NRSL 11365*	*Wood*	*Below tephra*	*AMS*	*Arolik Lake*	*59.47°N, 161.12°W*	*Kaufman et al (2003)*	*65cm in core AL-4; rejected in paper (too young)*
		**3,220±100*	*GX-21323*	*Peat*	*Below basal ash contact*	*AMS*	*Dillingham section*	*nd*	*Waythomas & Neal (1998)*	*Bulk analysis*
		**3,340±90*	*Beta-7761*	*Peat*	*Below tephra*	*nd*	*Dome Creek*	*65° 18 N, 164° 44'W*	*Kaufman & Hopkins (1985)*	*Bulk analysis*
		**3,490±200*	*W-4052*	*Peaty material*	*Below tuff*	*nd*	*Pumice Creek*	*57°08'N, 158°18'W*	*Miller & Smith (1987)*	*Bulk analysis*
		**3,500±80*	*1-14,228*	*Organic material*	*Below ash flow tuff*	*nd*	*N flank Aniakchak cone*	*57°02.7' N, 158°02'W*	*Miller & Smith (1987)*	*Bulk analysis*
		**3,535±100*	*GX-21373*	*Peat*	*Below basal ash contact*	*AMS*	*Protection Point section*	*nd*	*Waythomas & Neal (1998)*	*Bulk analysis*
		**3,560±145*	*GX-21325*	*Peat*	*Below basal ash contact*	*AMS*	*Igushik section*	*nd*	*Waythomas & Neal (1998)*	*Bulk analysis*
		**3,610±200*	*W-3466*	*Peaty material*	*3-5cm below tephra*	*nd*	*Bering Sea cliff*	*57°06.61 N, 158°31.8'W*	*Miller & Smith (1987)*	*Bulk analysis*
		**3,670±60*	*W-4582*	*Peaty material*	*Below tuff*	*nd*	*NE of Cinder River*	*57°07.5'N, 157°40. 5' W*	*Miller & Smith (1987)*	*Bulk analysis*

Table S4 (cont.): Dates for tephras reviewed within this study, listed by associated tephra.

Dating methods: Con = conventional ^{14}C dating; AMS = accelerator mass spectrometery ^{14}C dating; Ice = GICC05 ice core chronology; nd = not defined
x,xxx: Dates marked with a star and italicised were not included in our ages models for the reason listed under Comments (column K)

Eruption		Radiocarbon age (^{14}C yr BP)	Laboratory number	Material dated	Stratigraphic context	Dating method	Location		Reference	Comments
Aniakchak CFE II		**3,700±90*	*B-23170*	*Soil complex*	*Below tephra*	*nd*	*Cape Espenberg*	*nd*	*Beget et al (1992)*	*Bulk analysis*
		**3,750±80*	*B-33758*	*Soil complex*	*Below tephra*	*nd*	*Cape Espenberg*	*nd*	*Beget et al (1992)*	*Bulk analysis*
		**4,000±100*	*I-13,990*	*Peat*	*Below tephra*	*nd*	*Pargon River bluff*	*nd*	*Riehle et al. (1987)*	*Bulk analysis*
		**4,415±150*	*GX-21376*	*Peat*	*Below basal ash contact*	*AMS*	*Nushagak Peninsula*	*nd*	*Waythomas & Neal (1998)*	*Bulk analysis*
		**5,645±250*	*W-3934*	*Lake sediments*	*13-44cm below tephra*	*nd*	*Tungak Lake*	*nd*	*Ager (1982)*	*Bulk analysis*
		**6,930±90*	*W-4626*	*Bulk sediment*	*20cm below tephra*	*Con*	*Zagoskin Lake*	*nd*	*Ager (2003); Muhs et al. (2003)*	*Bulk analysis*
Opala										
		1240±100	IVAN-400	Peat	Overlying tephra	nd	Petropavlovsk Kamchatsky	-	Braitseva et al. (1995)	Thick peat layer
		1440±100	IVAN-189	Soil	Overlying tephra	nd	Karymsky	-	Braitseva et al. (1995)	
		1450±70	IVAN-171	Charcoal	Overlying tephra	nd	Zhupanovo	-	Braitseva et al. (1995)	Charcoal from cultural layer overlying ash
		1490±80	IVAN-316	Soil	Overlying tephra	nd	Krasheninnikov	-	Braitseva et al. (1995)	
	TEPHRA									
		1400±50	IVAN-317	Buried soil	Underlying tephra	nd	Krasheninnikov	-	Braitseva et al. (1995)	
		1490±70	GIN-1034	Charcoal	Within tephra	nd	Opala	-	Braitseva et al. (1995)	Carbonised wood from within the pyroclastic deposits
		1500±80	IVAN-192	Buried soil	Underlying tephra	nd	Karymsky	-	Braitseva et al. (1995)	
		1530±30	GIN-3026	Buried soil	Underlying tephra	nd	Kronotskoye Lake	-	Braitseva et al. (1995)	
		1550±100	IVAN-172	Charcoal	Underlying tephra	nd	Zhupanovo	-	Braitseva et al. (1995)	Charcoal from cultural layer underlying ash
		1560±90	IVAN-328	Buried soil	Underlying tephra	nd	Uzon Caldera	-	Braitseva et al. (1995)	
		1620±80	IVAN-399	Peat	Underlying tephra	nd	Petropavlovsk Kamchatsky	-	Braitseva et al. (1995)	Thick peat layer
	Rejected	1610±80	IVAN-323	Soil	Overlying tephra	nd	Uzon Caldera		Braitseva et al. (1995)	Out of stratigraphic order with other dates
Not included in model:		**1420±50*	*IVAN-372*	*Buried soil*	*Soil enclosing tephra layer*	*nd*	*Kikhpinych*	-	*Braitseva et al. (1995)*	*Unclear how organic material dated would have related to the tephra horizon*
		**1430±60*	*IVAN-467*	*Buried soil*	*Soil enclosing tephra layer*	*nd*	*Kamchatka River*	-	*Braitseva et al. (1995)*	*Unclear how organic material dated would have related to the tephra horizon*
		**1891±40*	*UBA-12582*	*Bulk sediment*	*Below tephra (see comment)*	*AMS*	*Olive-backed Lake*	*56°12.074' N, 158°51.493' E*	*Plunkett et al. (2015)*	*14C date taken from core OBA; tephra identified in OBD*