

Table S1a: Step-degassing Ne analyses of CRONUS-A and CREU-1 quartz standards run during period of sample measurements.

Sample name	Aliquot	Aliquot weight (g)	Heating temperature (deg C)	Heating time (hr)	Total $^{20}\text{Ne}$ released <sup>1</sup> ( $10^6$ atoms)	Total $^{21}\text{Ne}$ released <sup>2</sup> ( $10^6$ atoms)	Total $^{22}\text{Ne}$ released <sup>3</sup> ( $10^6$ atoms)	$^{21}\text{Ne} / ^{20}\text{Ne}$ <sup>4</sup> ( $10^{-3}$ )	$^{22}\text{Ne} / ^{20}\text{Ne}$ <sup>4</sup> ( $10^{-3}$ )	Cosmogenic $^{21}\text{Ne}$ <sup>5</sup> This heating step ( $10^6$ atoms $\text{g}^{-1}$ )	Cosmogenic $^{21}\text{Ne}$ as % of $^{21}\text{Ne}$ released in this heating step	Percent of total cosmogenic $^{21}\text{Ne}$ released in this step	Total cosmogenic $^{21}\text{Ne}$ ( $10^6$ atoms $\text{g}^{-1}$ )
CREU-1	d	0.061	400	0.25	0.202 +/- 0.013	7.217 +/- 0.19	30.203 +/- 1.856	35.798 +/- 2.315	147.2 +/- 12.6	108.94 +/- 3.19	92	32	345.8 +/- 7.0
			850	0.25	0.936 +/- 0.018	14.866 +/- 0.349	112.523 +/- 2.859	16.020 +/- 0.338	116.1 +/- 2.6	199.05 +/- 5.80	82	58	
			1100	0.2	0.613 +/- 0.013	4.113 +/- 0.126	70.780 +/- 2.492	6.683 +/- 0.219	109.6 +/- 3.7	37.85 +/- 2.17	56	11	
CRONUS-A	a	0.127	400	0.25	0.238 +/- 0.008	18.350 +/- 0.343	45.880 +/- 1.311	77.834 +/- 2.788	192.0 +/- 8.3	139.45 +/- 2.72	97	43	322.7 +/- 4.6
			850	0.25	1.414 +/- 0.014	26.336 +/- 0.519	171.890 +/- 2.523	18.740 +/- 0.284	121.7 +/- 1.5	176.37 +/- 3.64	85	55	
			1100	0.2	0.125 +/- 0.009	1.243 +/- 0.055	15.132 +/- 0.852	9.964 +/- 0.833	121.2 +/- 11.0	6.91 +/- 0.48	71	2	
	b	0.1384	400	0.25	0.255 +/- 0.007	18.920 +/- 0.323	48.196 +/- 1.054	73.505 +/- 2.138	188.1 +/- 6.4	131.74 +/- 2.35	96	41	322.3 +/- 4.2
			850	0.25	1.582 +/- 0.016	30.469 +/- 0.499	192.187 +/- 1.931	19.129 +/- 0.255	121.0 +/- 1.4	185.49 +/- 3.48	84	58	
			1100	0.2	0.121 +/- 0.007	1.061 +/- 0.065	13.827 +/- 0.966	8.777 +/- 0.725	113.8 +/- 10.2	5.10 +/- 0.49	67	2	
	c	0.1353	400	0.25	0.202 +/- 0.009	17.670 +/- 0.287	47.003 +/- 1.204	87.778 +/- 4.048	231.5 +/- 11.8	126.66 +/- 2.14	97	40	320.1 +/- 4.0
			850	0.25	1.656 +/- 0.014	29.860 +/- 0.444	197.884 +/- 1.869	18.015 +/- 0.255	118.7 +/- 1.4	185.17 +/- 3.31	84	58	
			1100	0.2	0.155 +/- 0.011	1.576 +/- 0.067	19.253 +/- 0.850	10.173 +/- 0.815	123.3 +/- 10.0	8.29 +/- 0.55	71	3	

<sup>1</sup> Computed by comparison to  $^{20}\text{Ne}$  signal in air pipettes. 1-sigma uncertainty includes measurement uncertainty of  $^{20}\text{Ne}$  signal in this analysis and the reproducibility of the air pipette signal

<sup>2</sup> Computed by comparison to  $^{21}\text{Ne}$  signal in air pipettes. 1-sigma uncertainty includes measurement uncertainty of  $^{21}\text{Ne}$  signal in this analysis and the reproducibility of the air pipette signal

<sup>3</sup> Computed by comparison to  $^{22}\text{Ne}$  signal in air pipettes. 1-sigma uncertainty includes measurement uncertainty of  $^{22}\text{Ne}$  signal in this analysis and the reproducibility of the air pipette signal

<sup>4</sup> Isotope ratio measured internally during each analysis; does not involve normalization to the Ne isotope signals in the air pipettes.

<sup>5</sup> Computed by comparison of  $^{20}\text{Ne}$  or  $^{21}\text{Ne}$  signal to air pipettes, whichever is more precise. Assumes that Ne in sample is a binary mixture of atmospheric and cosmogenic Ne.