

DATA REPO APPENDIX DR1: ADDITIONAL INFORMATION ON MATERIAL AND METHODS

Here follows an account of all the various sample treatments used in this study. Each process has been tested on separated spinel grains, which have shown no signs of alterations in chemical composition. The samples and treatments are shown in the compilation below. Twelve samples were recovered from -1.7 m to +32.3 m with the top of the Bonarelli level as the zero reference level. Sample weights vary from ~26 kg to ~124 kg. Reference samples of 2-3 kg were taken from each sample and stored. All samples were dissolved in 6 M HCl. Samples were neutralized using NaOH. Most samples contained undissolved larger nodules, which were removed and weighed after leaching and the weight subtracted from the original total weight. The dissolved residue was poured into plastic beakers and sieved at 32 μm mesh size to remove the clay fraction. The residue was again treated with HCl and KOH to remove remainder carbonate and radiolarian spicules as well as disintegrate clay aggregates, and sieved a second time. To remove silicate minerals the residue was leached in 11 M HF for 2 days with stirring at room temperature. In some cases there was much material left after HF and the sample was further treated with 18 M H_2SO_4 at room temperature, to leach barite, fluorite and terrestrial hydroxide minerals. The majority of samples contained a significant amount of organic matter, and all samples were density separated using LST (lithium heteropolytungstate). The light fraction was burned in an oven at 550°C for 10 hours to remove organic material. The residues were sieved and separated into fractions 32-63 μm and 63-355 μm . Grains recovered from the burned residue are listed in the compilation below.

Samples and sample weights from the Turonian Bottaccione section. The different chemical treatments are listed below. Burned grains are numbered as in DR1 Table.

Sample	Total weight/weight after removed nodules (kg)	Sample treatments						
		HCl	NaOH	KOH	HF	H_2SO_4	LST	Burned grains
Bot -1.5	103/95	x	x	x	x	x	x	Cr 2:1-2:12
Bot +0.5	105/49	x	x	x	x	-	x	Cr 3:1-3.6
Bot 5	101/97	x	x	x	x	x	x	Cr 3
Bot 9	29/13	x	x	x	x	-	x	-
Bot 11	103/93	x	x	x	x	x	x	-
Bot 15	101/85	x	x	x	x	x	x	-
Bot 20	101	x	x	x	x	x	x	-
B2	26	x	x	x	x	x	x	-
Bot 23	104/98	x	x	x	x	-	x	-
Bot 27+B1	124	x	x	x	x	-	x	-
Bot 29	101/97	x	x	x	x	x	x	-
Bot 32	101	x	x	x	x	x	x	-

DATA REPOSITORY APPENDIX DR2: ADDITIONAL INFORMATION ON TERRESTRIAL SPINELS FOUND IN THE TURONIAN BOTTACCIONE SECTION

Discussion of OC grains

The OC grains are plotted with compositional fields of terrestrial mafic spinel from ophiolites and continental mafic intrusions (Figure 1 DR 2). As for the continental mafic intrusions, the lower Fe# could possibly be an artifact of diagenesis, as reported in the EC Outlier grains with enrichment of MgO. The majority of the OC grains from the Turonian in the present study have somewhat similar chemical composition as those from the Maiolica limestone, perhaps indicating similar origins, (D. Lenaz et al., pers. comm. 2018). However, many grains in our study (particularly in the Pre-³He dataset) have higher TiO₂ contents. Perhaps the source region is similar throughout the sampled interval except for the latest part of the Cenomanian. As the provenance of the OC grains is not the focus of this study, we have not proceeded with any further processing of these grains or discussions on their origin.

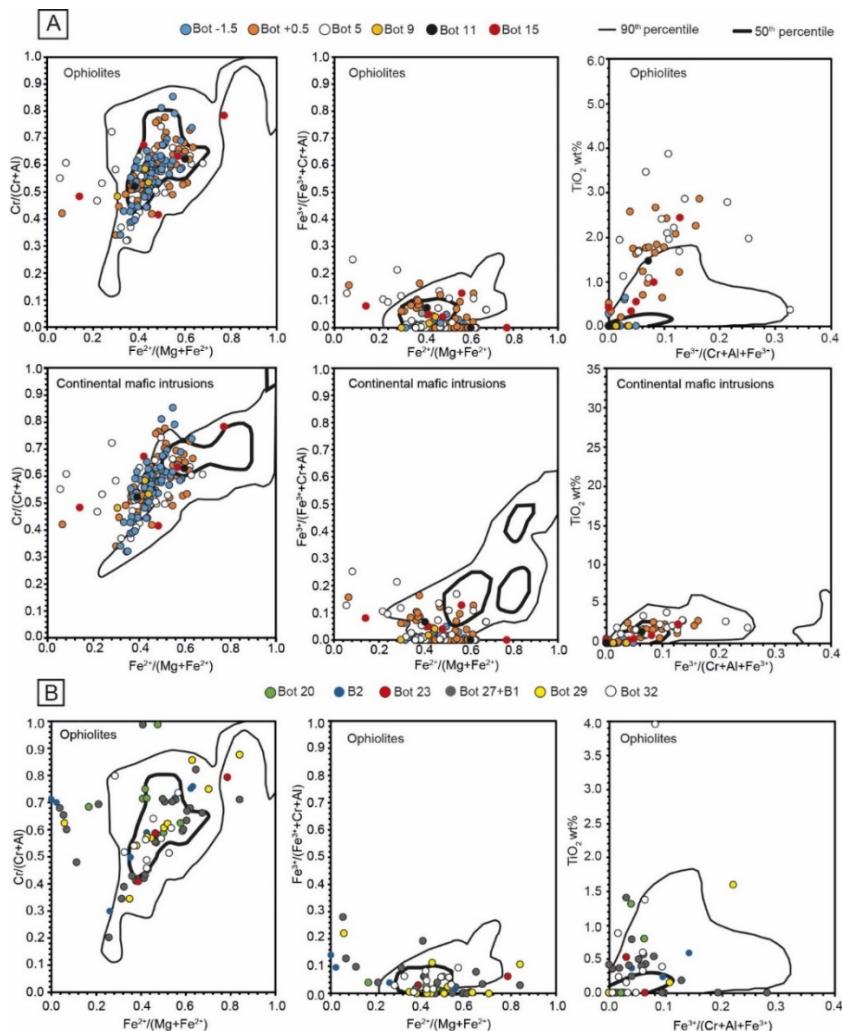


Figure 1 DR2 caption: OC grains found in the Turonian Bottaccione section plotted with compositional fields from Barnes and Roeder (2001). Grains with low Cr₂O₃/FeO ratios are excluded as they plot too far outside of the density contours as they have very high TiO₂ and Fe³⁺.

Discussion of Mg-Al spinels

Iron-rich Mg-Al spinels can form in terrestrial metamorphic rocks. In Barnes and Roeder (2001) they mention one of these, where they are present as xenoliths inside basalts. When plotting the grains Cr#, Fe#, Fe/3+#+ and TiO₂, the grains deviate mainly in Fe# (Figure 2 DR2). Marble is another source for Mg-Al spinels and marble deposits of Jurassic age are present in Northern Italy. The grains vary in color from translucent grey, green-grey to pink and opaque and are angular to sub-angular in shape. In polished cross-section, most of the grains are featureless with few to no fractures, inclusions, or reaction rims. The grains appear to be more fractured with higher FeO contents (Figure 3 DR2)

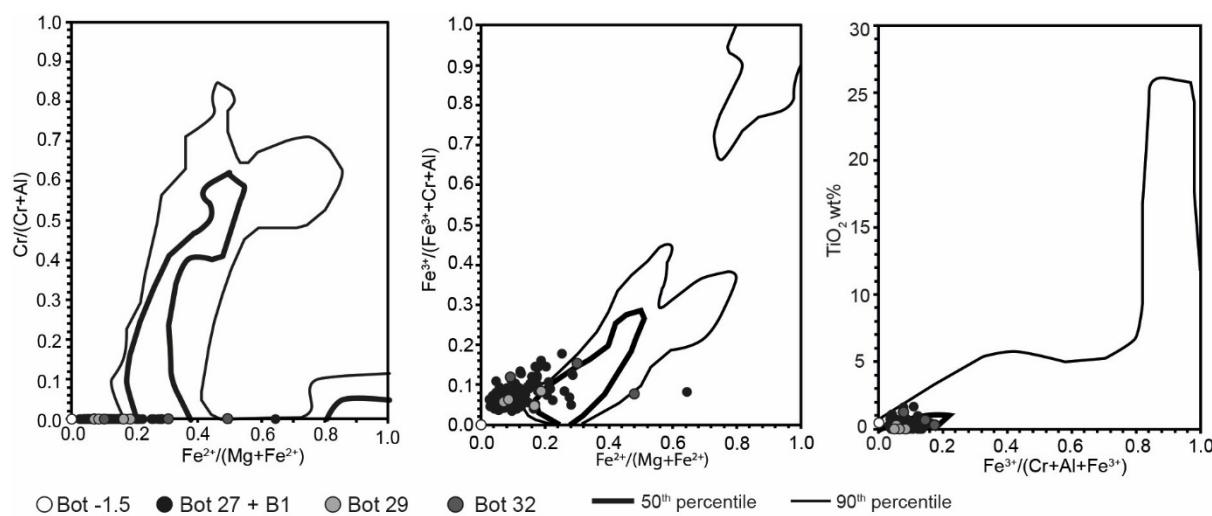


Figure 2 DR2 caption: Mg-Al grains plotted with the compositional fields of spinels from xenoliths in basalts. Bold line is the 50th percentile and thin line is the 90th percentile.

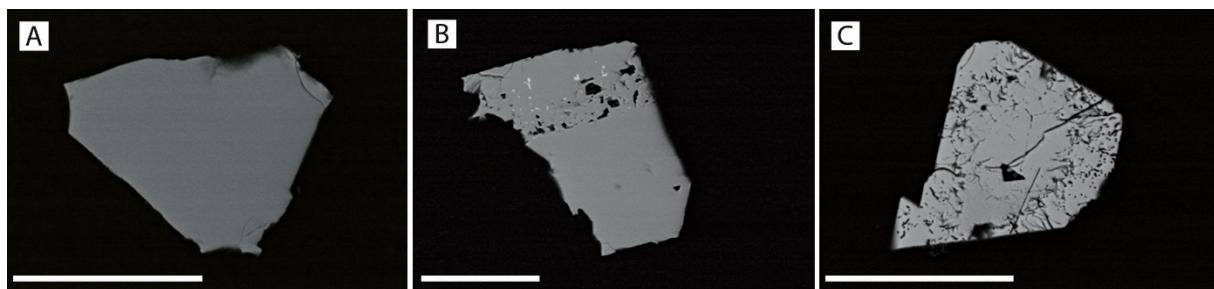


Figure 3 DR2 caption: SEM image of three Mg-Al spinels from sample Bot 27+B1. A) Grain Tr 3:2, a typical featureless grain with few fractures and no visual zoning or inclusions, B) Grain Tr 3:14, containing V₂O₃, with rim of inclusions with no/below detection of V₂O₃ content. C) Grain Tr 4:35 P259, with FeO content of ~24 wt%, grains with higher FeO also often have a fractured and “rough” appearance.

DATA REPOSITORY TABLE DR1. SUMMARY OF RESULTS OF ELEMENTAL ANALYSES OF SPINEL GRAINS FROM THE TURONIAN BOTTACCIONE SECTION

Site and section

For more detailed information on the Bottaccione section and lithostratigraphy of the Scaglia Rossa Formation, see Arthur and Fischer, 1977.

Division of grains in different groups

Recovered spinel grains are categorized as follows:

- EC – Grains from equilibrated ordinary chondrites (petrological types 4-6) with oxide weight percentages within the ranges of Cr₂O₃: ~53.0-62.0, FeO: ~23.0-32.0, Al₂O₃: ~4.5-8.5, MgO: ~1.3-4.5, V₂O₃: ~0.55-0.95, TiO₂: ~1.40-4.5 (for more extensive discussions, see, Schmitz, 2013, p. 127). Small deviations from these values in one or two oxides are marked with red color in the table. The FeO values of EC grains can sometimes be lower than 23% because of replacement by MnO and/or ZnO (see, Schmitz et al., 2001).
- Outlier EC – Grains that significantly deviate in one or several oxides, but still can be considered an EC grain are assigned to the Outlier EC categories. We divide these grains further into two categories:
 - MgO-depleted grains – Low content of MgO (<1.0 wt%) and usually accompanied by an elevated ZnO content (*not present in this study*).
 - MgO-enriched grains – High content of MgO (>6.0 wt%) and usually low (<24%) values of MnO+FeO+ZnO.
- OC-V – Other chrome spinel, i.e. grains that do not have the typical equilibrated ordinary chondritic composition, but contain ≥ 0.45 wt% V₂O₃ and a Cr₂O₃/FeO ratio ≥ 1.45 , indicating a likely meteoritic origin.
- OC – Other chrome-spinel grains, but with V₂O₃ < 0.45 wt% or ≥ 0.45 wt% V₂O₃ together with a Cr₂O₃/FeO ratio < 1.45. The latter grains are marked with an asterisk (*) in the table. OC grains are likely of terrestrial origin.
- Mg-Al – Spinel grains that have very low Cr₂O₃ values (mostly absent/below detection) and an average composition of ~24 wt% MgO, ~63 wt% Al₂O₃, and ~11 wt% FeO. These type of grains can be of both meteoritic and terrestrial origin. However, in this study they are most likely terrestrial.

Further explanation to the table

- Sample weights are displayed as original weight/weight after removal of undissolved nodules.
- Cr – chrome-rich grain
- Tr – translucent grain
- n.d. – not detected
- Puck – epoxy mount

References

- Arthur and Fischer, 1977. Upper Cretaceous–Paleocene magnetic stratigraphy at Gubbio; Italy I, Lithostratigraphy and sedimentology: Geological Society of America Bulletin, v. 88, p. 367-371.
- Schmitz, B., Tassinari, M., Peucker-Ehrenbrink, B., 2001. A rain of ordinary chondritic meteorites in the early Ordovician: Earth and Planetary Science Letters, v. 194, p. 1-15.
- Schmitz, B., 2013, Extraterrestrial spinels and the astronomical perspective on Earth's geological record and evolution of life: Chemie der Erde/Geochemistry, v. 73, p. 117-145.

Bottaccione section – Turonian Pre-³He

BOT -1.5 (102.6 kg/94.5 kg) - PUCKS 250 & 251

-1.4 to -1.7 m below 0 reference level

Puck 250 = Cr 1, Puck 251 = Cr 2

EC 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:10	2.52	5.85	2.88	0.79	57.39	0.79	29.31	n.d.	99.53
Cr 1:11	2.80	6.35	2.36	0.71	59.51	0.96	27.48	n.d.	100.16
Cr 1:13	3.15	6.38	2.23	0.75	59.72	0.98	26.96	0.51	100.68
Cr 1:24	1.99	4.05	2.01	0.81	61.97	0.80	29.61	0.61	101.85
Cr 1:34	2.77	6.30	2.44	0.65	60.02	0.83	27.40	n.d.	100.42
Cr 1:38	3.05	5.84	1.54	0.73	62.75	0.87	25.12	0.55	100.44
Cr 1:39	1.82	4.67	3.32	0.86	59.71	0.57	28.26	0.63	99.83
Cr 2:1	3.41	6.34	2.17	0.69	60.47	0.85	26.41	n.d.	100.35
Cr 2:4	3.43	6.25	2.35	0.64	59.37	1.08	26.98	0.49	100.58
Cr 2:34	1.39	4.68	2.79	0.76	61.86	0.84	27.28	0.43	100.02
Cr 2:42	2.66	5.88	3.15	0.83	59.47	0.89	26.00	0.49	99.37

OC-V 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:35	7.26	17.91	0.99	0.46	42.67	n.d.	28.69	n.d.	97.98
Cr 2:22	2.72	6.39	n.d.	0.58	57.77	0.66	30.21	0.46	98.79

OC 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:1	11.17	24.98	n.d.	0.38	43.31	n.d.	19.19	0.40	99.43
Cr 1:2	11.70	22.01	n.d.	n.d.	47.66	n.d.	18.27	n.d.	99.64
Cr 1:3	11.04	22.14	n.d.	n.d.	46.49	0.62	18.65	n.d.	98.95
Cr 1:4	14.25	32.41	n.d.	n.d.	38.06	n.d.	15.19	n.d.	99.91
Cr 1:5	9.72	23.17	n.d.	n.d.	48.09	n.d.	17.05	n.d.	98.03
Cr 1:6	10.01	9.45	n.d.	n.d.	61.00	0.55	18.91	n.d.	99.93
Cr 1:7	13.03	27.38	n.d.	n.d.	43.50	n.d.	14.93	n.d.	98.83
Cr 1:8	12.13	23.02	n.d.	0.23	47.57	n.d.	15.53	n.d.	98.50
Cr 1:9	11.48	22.06	n.d.	0.34	49.46	n.d.	15.54	n.d.	98.88
Cr 1:12	12.27	25.11	0.59	0.31	40.78	n.d.	19.87	n.d.	98.94
Cr 1:14	9.97	23.37	n.d.	0.28	48.16	n.d.	16.46	n.d.	98.22
Cr 1:15	10.74	21.88	n.d.	0.26	49.70	0.58	16.40	n.d.	99.56

Cr 1:16	10.99	29.54	n.d.	0.32	41.25	0.42	15.22	0.26	98.00
Cr 1:17	12.68	31.30	n.d.	n.d.	37.40	n.d.	17.26	n.d.	98.64
Cr 1:18	7.69	19.52	n.d.	0.26	52.21	n.d.	18.03	0.36	98.06
Cr 1:19	15.74	40.20	n.d.	n.d.	31.12	n.d.	13.11	n.d.	100.17
Cr 1:20	9.89	20.50	n.d.	n.d.	51.78	n.d.	17.56	n.d.	99.73
Cr 1:21	11.28	18.88	n.d.	0.30	52.97	n.d.	15.37	n.d.	98.80
Cr 1:22	8.80	21.48	n.d.	0.42	51.41	n.d.	16.77	n.d.	98.88
Cr 1:23	11.24	19.64	n.d.	n.d.	49.89	n.d.	19.42	n.d.	100.19
Cr 1:25	8.98	16.23	n.d.	0.35	55.75	n.d.	17.47	n.d.	98.78
Cr 1:26	9.36	23.74	n.d.	n.d.	46.41	n.d.	18.97	n.d.	98.48
Cr 1:27	12.97	29.14	n.d.	0.35	40.53	n.d.	17.11	n.d.	100.11
Cr 1:28	10.44	22.83	n.d.	0.38	46.59	0.42	17.51	0.27	98.43
Cr 1:29	9.45	21.08	n.d.	0.42	47.73	n.d.	19.67	n.d.	98.36
Cr 1:30	11.64	24.94	n.d.	n.d.	46.24	n.d.	15.43	n.d.	98.25
Cr 1:31	9.68	23.49	n.d.	n.d.	47.79	n.d.	17.05	n.d.	98.02
Cr 1:32	10.63	20.74	n.d.	n.d.	45.37	n.d.	22.69	n.d.	99.43
Cr 1:33	8.68	20.79	n.d.	n.d.	49.88	n.d.	18.65	0.44	98.45
Cr 1:36	12.34	22.9	n.d.	n.d.	47.67	n.d.	16.13	n.d.	99.04
Cr 1:37	9.91	16.63	n.d.	0.32	52.98	n.d.	18.71	0.49	99.03
Cr 1:40	7.37	13.15	n.d.	n.d.	55.44	n.d.	22.46	n.d.	98.43
Cr 2:2	8.27	19.58	n.d.	n.d.	49.45	0.54	21.88	n.d.	99.71
Cr 2:3	13.09	20.54	n.d.	n.d.	49.26	n.d.	16.03	n.d.	98.92
Cr 2:5	10.32	22.14	n.d.	0.27	50.65	n.d.	15.25	n.d.	98.63
Cr 2:6	13.88	32.13	n.d.	n.d.	37.72	n.d.	14.70	n.d.	98.43
Cr 2:7	12.74	26.01	n.d.	n.d.	45.25	n.d.	14.38	n.d.	98.37
Cr 2:8	12.30	25.93	n.d.	0.31	42.24	n.d.	17.43	n.d.	98.21
Cr 2:9	8.41	15.76	n.d.	0.30	52.36	0.66	21.50	n.d.	99.00
Cr 2:10	15.24	32.63	n.d.	n.d.	36.67	n.d.	14.33	n.d.	98.87
Cr 2:11	11.67	24.87	n.d.	n.d.	46.93	0.46	15.31	n.d.	99.25
Cr 2:12	9.92	22.64	n.d.	0.31	50.64	0.49	13.62	0.27	97.90
Cr 2:13	8.94	10.09	0.63	n.d.	57.35	0.56	21.98	n.d.	99.55
Cr 2:14	15.22	39.50	n.d.	n.d.	28.01	n.d.	15.99	n.d.	98.72
Cr 2:15	11.99	19.77	n.d.	n.d.	49.56	n.d.	18.42	n.d.	99.75
Cr 2:16	12.16	27.52	n.d.	n.d.	41.99	n.d.	16.79	n.d.	98.46
Cr 2:17	11.30	28.16	n.d.	0.24	42.82	n.d.	16.00	n.d.	98.52
Cr 2:18	11.78	25.43	n.d.	0.26	44.19	0.39	18.00	n.d.	100.04
Cr 2:19	14.45	31.45	n.d.	0.15	38.24	n.d.	15.48	n.d.	99.77
Cr 2:20	7.44	22.93	n.d.	n.d.	49.17	0.52	18.80	0.62	99.48
Cr 2:21	12.45	27.65	n.d.	n.d.	45.55	n.d.	13.35	n.d.	99.00
Cr 2:23	12.74	32.70	0.29	n.d.	39.31	n.d.	14.80	n.d.	99.84
Cr 2:24	9.58	17.55	n.d.	0.42	54.07	n.d.	17.50	n.d.	99.12
Cr 2:25	10.57	20.19	n.d.	n.d.	50.18	n.d.	18.61	n.d.	99.55
Cr 2:26	10.79	24.19	n.d.	0.33	47.83	n.d.	16.00	n.d.	99.13
Cr 2:27	14.79	35.36	n.d.	n.d.	33.41	n.d.	16.06	n.d.	99.62
Cr 2:28	8.78	7.41	n.d.	0.33	64.77	0.72	18.91	0.58	101.52

Cr 2:29	11.01	25.55	n.d.	n.d.	46.50	n.d.	15.98	n.d.	99.04
Cr 2:30	13.10	22.68	n.d.	n.d.	48.29	n.d.	16.43	n.d.	100.49
Cr 2:31	14.31	33.55	n.d.	n.d.	37.55	n.d.	14.45	n.d.	99.86
Cr 2:32	10.71	22.24	0.28	n.d.	46.78	n.d.	18.96	n.d.	98.97
Cr 2:33	13.95	35.71	n.d.	n.d.	34.27	n.d.	14.69	n.d.	98.63
Cr 2:35	14.05	35.54	n.d.	n.d.	34.88	n.d.	15.46	n.d.	99.93
Cr 2:36	8.98	17.89	n.d.	0.31	55.63	n.d.	16.18	n.d.	98.99
Cr 2:37	9.58	20.08	n.d.	0.27	52.08	n.d.	16.68	n.d.	98.68
Cr 2:38	11.27	22.84	n.d.	n.d.	50.16	n.d.	15.17	n.d.	99.44
Cr 2:39	13.50	22.30	n.d.	0.24	48.03	n.d.	15.33	n.d.	99.40
Cr 2:40	8.41	22.30	n.d.	0.26	46.84	n.d.	20.59	n.d.	98.40
Cr 2:41	12.10	25.56	n.d.	n.d.	47.41	n.d.	12.35	1.23	98.65

Mg-Al 32-63 μm

Grain #	MgO	Al ₂ O ₃	SiO ₂	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	Total
Tr 2:1	28.06	69.17	n.d.	0.41	n.d.	n.d.	n.d.	n.d.	97.64

BOT +0.5 (105 kg/48.6 kg) – PUCKS 255, 256, 257 & 326

0.55-0.80 m above 0 reference level

Puck 255 = Cr 1, Puck 256 = Cr 2, Puck 257 = Cr 3, Puck 326 = Cr 4

EC >63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 4:12	3.42	6.47	2.46	0.68	60.48	0.96	26.61	n.d.	101.08
Cr 4:14	3.14	7.18	2.24	0.67	60.08	0.73	24.47	0.42	98.94

EC 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:11	2.92	6.09	2.81	0.82	58.20	0.91	27.63	0.45	99.83
Cr 1:14	3.09	6.46	2.21	0.71	59.87	0.97	26.38	0.44	100.13
Cr 1:21	4.54	6.65	2.23	0.67	59.18	1.04	26.16	0.60	101.08
Cr 2:15	3.34	6.57	2.27	0.54	58.24	0.86	26.31	0.52	98.64
Cr 2:19	5.98	6.69	1.87	0.71	61.14	0.90	23.51	0.58	101.37
Cr 2:23	2.62	5.65	3.15	0.62	58.84	0.85	27.95	0.40	100.08
Cr 3:4	2.90	6.27	3.51	0.77	59.75	0.66	25.98	0.57	100.42
Cr 4:4	2.56	5.47	3.29	0.70	59.30	0.99	28.73	0.40	101.44

OC >63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 4:13	11.78	26.87	n.d.	0.29	45.63	n.d.	16.42	n.d.	100.99

OC 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:1	8.32	18.44	n.d.	0.24	53.23	n.d.	19.88	0.41	100.53
Cr 1:2	7.86	18.57	n.d.	0.28	51.76	n.d.	21.07	0.41	99.95
Cr 1:3	14.08	22.88	1.82	n.d.	38.18	n.d.	22.05	n.d.	99.01
Cr 1:4	10.32	22.70	n.d.	n.d.	49.79	n.d.	16.65	n.d.	99.46
Cr 1:5	9.74	20.41	n.d.	0.31	46.80	n.d.	23.11	0.39	100.76
Cr 1:6	8.16	27.83	n.d.	0.24	45.15	n.d.	16.62	0.28	98.29
Cr 1:7	11.17	34.30	n.d.	0.27	36.94	0.55	16.63	0.53	100.38
Cr 1:8	13.80	26.39	n.d.	n.d.	44.92	n.d.	15.24	n.d.	100.35
Cr 1:9	12.08	32.63	n.d.	n.d.	39.09	n.d.	16.67	n.d.	100.46
Cr 1:10	10.17	20.31	n.d.	0.38	52.83	n.d.	15.25	n.d.	98.93
Cr 1:12	9.20	11.54	n.d.	0.18	60.02	n.d.	17.30	n.d.	98.25
Cr 1:13	9.78	12.37	n.d.	0.30	60.46	0.52	16.39	n.d.	99.82

Cr 1:15	13.29	19.80	2.99	n.d.	32.86	n.d.	29.97	n.d.	98.91
Cr 1:16	7.44	17.11	0.45	n.d.	50.84	n.d.	23.04	0.35	99.23
Cr 1:17	8.38	22.02	n.d.	0.41	50.99	n.d.	17.36	0.45	99.62
Cr 1:18	9.97	14.38	n.d.	0.33	55.38	0.53	20.19	n.d.	100.79
Cr 1:19	11.11	10.23	2.07	0.30	47.96	0.54	26.02	n.d.	98.23
Cr 1:20	14.00	21.31	2.98	n.d.	30.78	0.54	27.77	n.d.	97.38
Cr 1:22	12.62	31.47	n.d.	n.d.	41.32	n.d.	14.61	n.d.	100.03
Cr 1:23	7.77	11.61	1.21	0.23	46.82	0.56	31.62	n.d.	99.82
Cr 1:24	15.82	29.52	0.69	n.d.	35.65	0.37	17.73	n.d.	99.78
Cr 2:1	9.21	23.09	2.56	n.d.	38.51	n.d.	26.49	0.34	100.20
Cr 2:2	16.86	35.67	1.23	n.d.	27.54	n.d.	17.83	n.d.	99.14
Cr 2:3	9.65	21.78	n.d.	0.42	47.64	0.61	19.96	0.49	100.55
Cr 2:4	8.04	16.50	n.d.	0.26	52.76	0.61	21.16	0.43	99.75
Cr 2:5	13.46	24.12	1.75	n.d.	37.60	n.d.	21.35	n.d.	98.28
Cr 2:6	10.58	25.17	n.d.	0.25	45.44	n.d.	16.90	n.d.	98.34
Cr 2:7	12.20	26.09	n.d.	0.33	43.68	0.47	17.64	n.d.	100.42
Cr 2:8	7.80	18.98	0.20	0.34	46.47	0.43	24.16	n.d.	98.38
Cr 2:9	14.17	19.56	2.85	n.d.	34.73	0.44	27.36	n.d.	99.11
Cr 2:10	12.33	21.51	n.d.	n.d.	49.52	n.d.	17.77	n.d.	101.14
Cr 2:11	14.59	21.64	2.42	n.d.	37.45	n.d.	22.8	n.d.	98.90
Cr 2:12	14.51	24.33	1.77	n.d.	37.59	n.d.	20.44	n.d.	98.63
Cr 2:13	12.27	22.59	n.d.	n.d.	47.87	n.d.	16.37	n.d.	99.10
Cr 2:14	12.58	23.58	1.73	n.d.	39.69	n.d.	20.97	n.d.	98.55
Cr 2:16	13.27	23.65	1.69	n.d.	39.36	0.39	20.42	n.d.	98.78
Cr 2:17	10.00	25.46	0.97	n.d.	36.65	0.37	26.74	n.d.	100.19
Cr 2:18	7.77	25.27	0.51	0.29	43.33	n.d.	21.65	0.49	99.32
Cr 2:20*	9.35	11.43	5.69	0.75	34.06	0.48	36.80	n.d.	98.55
Cr 2:21	13.98	26.27	n.d.	n.d.	43.25	n.d.	14.98	n.d.	98.48
Cr 2:22	9.41	18.65	0.63	0.38	42.18	n.d.	28.51	n.d.	99.75
Cr 3:1	13.20	31.65	n.d.	0.23	39.15	n.d.	15.18	0.29	99.70
Cr 3:2	12.11	29.15	n.d.	0.28	41.35	n.d.	15.58	n.d.	98.47
Cr 3:3	9.11	16.53	n.d.	n.d.	58.53	n.d.	17.01	n.d.	101.19
Cr 3:5	10.95	27.23	n.d.	0.35	44.86	n.d.	16.06	n.d.	99.45
Cr 3:6	22.69	27.86	2.25	n.d.	30.27	1.09	15.43	n.d.	99.59
Cr 4:1	14.60	20.86	2.65	0.28	39.63	n.d.	21.82	n.d.	99.85
Cr 4:2	8.38	16.19	n.d.	0.38	55.07	0.53	19.16	0.23	99.95
Cr 4:3	13.30	23.82	1.62	n.d.	39.88	n.d.	20.40	n.d.	99.01
Cr 4:5	10.91	17.22	0.33	0.23	52.66	0.54	18.45	n.d.	100.33
Cr 4:7	9.90	21.71	n.d.	0.33	50.69	n.d.	16.28	n.d.	98.91
Cr 4:8†	14.28	22.60	1.77	n.d.	38.48	0.51	22.72	n.d.	100.66
Cr 4:9§	15.07	25.30	1.65	n.d.	36.55	n.d.	20.28	0.5	99.35
Cr 4:10	9.70	19.31	n.d.	0.29	50.94	n.d.	21.33	n.d.	101.57
Cr 4:11	12.24	20.47	2.44	n.d.	34.96	n.d.	28.86	n.d.	98.98

† 0.30 wt% NiO, § 0.50 wt% NiO.

BOT 5 (100.5 kg/ 96.8 kg) – PUCKS 209 & 210

+4.1 to 4.7 m above 0 reference level

Puck 209 = Cr 1, Puck 210 = Cr 2

EC >63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:3	2.76	5.35	3.19	0.81	59.43	0.58	26.11	0.4	98.64
Cr 1:4	5.12	6.47	2.29	0.64	58.87	0.97	23.78	0.51	98.65
Cr 2:24	1.44	6.50	2.63	0.83	61.98	0.60	24.53	0.86	99.36
Cr 2:27	1.53	5.02	2.93	0.64	59.27	n.d.	30.84	0.45	100.69
Cr 2:29	1.57	5.04	3.02	0.68	59.15	0.78	31.09	0.44	101.78
Cr 2:34	5.60	7.01	1.63	0.66	61.40	1.28	20.47	1.04	99.09

EC 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:6	2.88	5.92	3.18	0.56	59.62	0.90	25.63	0.38	99.05
Cr 1:9	3.31	5.55	2.40	0.83	59.66	1.45	23.67	2.60	99.47
Cr 1:10	3.91	5.35	2.35	0.75	59.99	0.58	25.91	0.46	99.29
Cr 1:16	1.61	5.22	3.03	0.53	58.96	0.54	30.25	0.68	100.80
Cr 1:18	2.36	5.62	3.14	0.75	58.26	1.05	21.53	6.35	99.06
Cr 1:22	2.63	3.15	1.79	0.80	64.52	1.15	18.24	7.90	100.20
Cr 1:25	5.05	5.49	4.03	0.66	58.87	0.82	24.44	0.52	99.87
Cr 1:29	3.68	5.96	2.00	0.69	60.44	1.19	24.94	1.30	100.20
Cr 1:35	3.96	6.70	1.65	0.83	60.06	1.59	24.35	0.86	100.00
Cr 1:37	2.29	5.62	3.02	0.64	58.76	0.82	27.73	0.51	99.39
Cr 1:38	3.15	5.53	3.15	0.74	59.04	0.88	26.80	0.59	99.90
Cr 1:39	3.23	6.17	2.28	0.74	58.60	1.04	26.30	0.45	98.81
Cr 2:6	2.99	5.64	2.44	0.81	61.96	1.51	22.66	2.52	100.53
Cr 2:7	1.99	5.00	3.00	0.60	59.21	1.00	28.72	1.11	100.64
Cr 2:13	2.31	3.78	3.36	0.83	59.49	0.73	29.03	0.86	100.39
Cr 2:18	4.15	6.68	2.23	0.76	61.29	1.05	24.22	0.94	101.34
Cr 2:37	2.60	6.17	2.87	0.74	60.19	1.07	26.15	0.72	100.51

OC-V 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 2:26	5.64	15.25	0.63	0.59	51.11	n.d.	27.08	n.d.	100.30

OC >63 μm

Grain #	MgO	Al_2O_3	TiO_2	V_2O_3	Cr_2O_3	MnO	FeO	ZnO	Total
Cr 1:1	10.17	13.08	n.d.	0.40	56.56	0.50	17.82	n.d.	98.52
Cr 1:2	10.72	21.05	n.d.	0.25	46.46	0.43	19.14	n.d.	98.05
Cr 1:5	13.26	32.35	n.d.	0.18	35.85	0.32	16.03	0.34	98.32
Cr 2:22	13.85	21.61	2.78	n.d.	32.06	0.49	28.82	n.d.	99.61
Cr 2:23	14.39	30.36	n.d.	n.d.	40.38	n.d.	15.73	n.d.	100.87
Cr 2:33	22.18	21.81	1.68	0.19	40.06	0.76	12.32	n.d.	99.01
Cr 2:41	7.33	21.28	n.d.	n.d.	48.42	0.60	22.06	1.54	101.23

OC 32-63 μm

Grain #	MgO	Al_2O_3	TiO_2	V_2O_3	Cr_2O_3	MnO	FeO	ZnO	Total
Cr 1:7	12.70	18.85	3.59	0.21	32.26	n.d.	30.85	n.d.	98.47
Cr 1:8	11.81	23.79	1.08	0.18	38.00	0.37	23.64	n.d.	98.87
Cr 1:11	12.88	18.55	2.86	n.d.	37.18	0.44	26.93	n.d.	98.84
Cr 1:12	5.86	10.59	7.53	0.20	29.45	0.55	44.13	n.d.	98.31
Cr 1:13	21.62	6.11	1.20	n.d.	14.76	2.47	51.39	0.51	98.04
Cr 1:14	15.80	37.37	n.d.	n.d.	32.67	0.42	14.35	0.4	101.00
Cr 1:15	15.91	10.81	2.77	n.d.	42.21	0.43	26.05	0.24	98.42
Cr 1:17*	5.48	4.37	13.93	0.56	22.43	0.82	51.67	n.d.	99.25
Cr 1:19	12.49	24.82	n.d.	n.d.	46.95	n.d.	15.43	n.d.	99.69
Cr 1:20	11.20	14.13	5.58	n.d.	30.40	0.44	37.01	n.d.	98.76
Cr 1:21	20.50	1.66	1.17	n.d.	29.55	0.83	45.77	n.d.	99.48
Cr 1:23	12.80	20.03	n.d.	n.d.	51.16	0.55	16.06	n.d.	100.6
Cr 1:24	14.21	22.11	2.34	n.d.	34.47	n.d.	24.96	n.d.	98.09
Cr 1:26	3.06	13.92	5.83	n.d.	30.23	0.44	22.83	5.44	81.75
Cr 1:27	13.84	33.58	n.d.	0.26	34.88	0.40	15.84	n.d.	98.79
Cr 1:28	9.23	14.68	4.02	n.d.	36.15	0.46	34.21	n.d.	98.75
Cr 1:30	8.94	9.87	6.03	n.d.	34.41	0.49	38.99	n.d.	98.73
Cr 1:31	10.57	14.02	4.97	0.27	34.49	0.49	35.61	0.18	100.60
Cr 1:32 [†]	2.91	13.47	5.44	n.d.	30.65	0.38	22.15	5.67	88.17
Cr 1:33	10.39	13.14	4.28	n.d.	38.73	n.d.	33.56	n.d.	100.10
Cr 1:34	16.46	12.47	5.81	n.d.	32.50	0.67	30.12	0.50	98.52
Cr 1:36	10.85	28.46	n.d.	0.31	42.06	n.d.	17.61	0.37	99.66
Cr 1:40	18.61	26.64	2.08	n.d.	35.00	0.84	17.50	n.d.	100.70
Cr 1:41	11.84	14.43	2.88	n.d.	41.69	n.d.	27.99	n.d.	98.84
Cr 2:1	15.53	37.75	1.12	0.21	26.55	0.26	16.66	n.d.	98.08
Cr 2:2	11.45	15.86	5.22	n.d.	30.88	0.48	35.33	n.d.	99.23
Cr 2:3	20.17	15.88	1.96	n.d.	36.79	2.24	22.45	0.38	99.87
Cr 2:4	11.59	24.47	4.42	0.27	26.87	0.60	32.84	n.d.	101.07
Cr 2:5	8.40	15.37	3.86	n.d.	39.83	0.56	31.81	n.d.	99.84
Cr 2:8	1.23	0.86	11.28	0.44	7.64	n.d.	69.62	n.d.	91.06
Cr 2:9*	1.44	1.75	10.24	0.48	3.02	0.33	73.85	n.d.	91.11
Cr 2:11*	10.30	12.44	10.65	0.47	13.49	0.41	52.06	n.d.	99.82

Cr 2:12	14.44	37.21	n.d.	n.d.	32.61	n.d.	14.67	n.d.	98.93
Cr 2:14	10.94	23.57	1.95	0.20	34.78	0.86	28.59	n.d.	100.91
Cr2:15	11.71	20.22	2.06	n.d.	28.42	0.81	35.38	n.d.	98.60
Cr2:16	23.16	4.32	2.29	n.d.	11.57	1.39	56.43	n.d.	99.16
Cr2:17	10.98	13.17	6.35	0.26	34.53	0.35	34.18	n.d.	99.84
Cr2:19	21.81	2.65	0.79	n.d.	9.33	1.50	62.61	n.d.	98.69
Cr2:20	12.44	17.32	6.44	0.29	24.84	n.d.	38.11	n.d.	99.45
Cr 2:21	10.54	24.15	1.94	n.d.	40.57	0.58	22.26	0.26	100.28
Cr 2:25	7.12	17.26	3.45	0.34	39.74	n.d.	31.14	0.51	99.55
Cr 2:28	11.56	27.25	n.d.	n.d.	41.73	n.d.	18.66	n.d.	99.21
Cr 2:30	14.18	24.87	1.66	n.d.	39.99	n.d.	20.31	n.d.	101.02
Cr 2:31	16.06	19.56	2.21	n.d.	40.88	0.74	20.94	n.d.	100.40
Cr 2:32	22.00	14.44	0.36	n.d.	35.46	1.69	25.88	n.d.	99.84
Cr2:35	3.88	4.52	5.02	n.d.	13.26	0.71	71.55	0.40	99.35
Cr2:36	22.41	7.22	0.97	n.d.	27.49	1.60	40.76	n.d.	100.45
Cr2:38	12.17	15.18	3.77	n.d.	35.60	n.d.	33.28	n.d.	100.00
Cr2:39	21.51	14.29	0.74	n.d.	27.17	1.37	34.74	n.d.	99.84
Cr 2:40	6.91	15.27	3.09	n.d.	43.45	0.40	30.59	0.33	100.04
Cr 2:42	17.73	22.75	2.40	0.19	38.74	1.02	17.14	n.d.	99.98
Cr 2:43	10.43	18.34	4.06	n.d.	34.39	n.d.	31.81	0.76	99.80

[†] contains ~6 wt% W.

BOT 9 (29 kg/13.2kg) – PUCK 252

+8.9 to 9.1 m above 0 reference level

OC 32-63 μm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1	11.95	24.73	n.d.	n.d.	41.95	n.d.	20.09	n.d.	98.72
Cr 2	12.57	22.47	n.d.	0.36	46.77	n.d.	17.55	n.d.	99.73
Cr 3	15.66	29.46	n.d.	n.d.	41.42	n.d.	12.06	n.d.	98.60

BOT 11 (103.3 kg/ 92.45 kg) – PUCK 206

+10.1 to 10.5 m above 0 reference level

EC >63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 11a	3.68	5.67	3.63	0.83	61.12	0.71	24.44	0.46	100.55
Cr 11b	2.61	5.52	4.05	0.90	62.25	0.80	23.27	0.56	99.97

a, b: Two fragments of one grain.

EC 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1	2.36	6.16	2.37	0.92	66.61	0.56	20.46	n.d.	99.43
Cr 2	2.97	6.38	3.02	0.93	58.36	1.10	27.41	0.58	100.76
Cr 3	3.25	6.82	1.89	0.78	59.17	1.12	26.58	0.39	99.99
Cr 4	3.82	5.31	1.13	0.75	60.21	0.61	25.27	1.57	98.66
Cr 8	2.51	6.09	3.57	0.75	59.70	0.73	26.10	n.d.	99.44
Cr 9	2.45	6.33	2.88	0.76	61.15	1.03	25.11	0.69	100.40

Outlier EC 32-63 µm

MgO-enriched grains

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 6	6.94	5.74	3.25	0.64	59.14	0.78	23.62	0.46	100.57

OC 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 7	14.00	23.91	1.65	n.d.	39.19	n.d.	21.08	n.d.	99.83
Cr 10	7.95	20.56	n.d.	0.27	49.72	n.d.	21.50	n.d.	100.00

BOT 15 (100.65 kg/ 84.7 kg) – PUCK 208

+15.2 to 15.8 m above 0 reference level

EC 32-63 μm

Grain #	MgO	Al_2O_3	TiO_2	V_2O_3	Cr_2O_3	MnO	FeO	ZnO	Total
Cr 1	2.68	5.71	3.15	0.67	60.30	0.99	27.68	n.d.	101.20
Cr 9	2.79	5.80	3.40	0.78	58.63	0.64	27.83	0.72	100.59
Cr 15	2.58	5.77	3.16	0.82	58.14	0.69	28.44	0.74	100.33
Cr 22	3.76	6.63	2.26	0.72	60.29	1.10	26.48	n.d.	101.20

Outlier EC 32-63 μm

MgO-enriched grains

Grain #	MgO	Al_2O_3	TiO_2	V_2O_3	Cr_2O_3	MnO	FeO	ZnO	Total
Cr 6	7.58	6.06	2.67	0.64	62.09	0.77	20.57	n.d.	100.40
Cr 7	8.70	6.62	2.00	0.85	61.64	0.75	19.65	0.55	100.78
Cr 19	6.17	5.85	2.45	0.65	61.67	0.81	20.90	1.89	100.39

OC-V 32-63 μm

Grain #	MgO	Al_2O_3	TiO_2	V_2O_3	Cr_2O_3	MnO	FeO	ZnO	Total
Cr 17	1.82	3.32	0.98	0.69	63.35	n.d.	28.00	2.17	100.40

OC 32-63 μm

Grain #	MgO	Al_2O_3	TiO_2	V_2O_3	Cr_2O_3	MnO	FeO	ZnO	Total
Cr 2*	2.85	8.63	2.82	0.59	32.78	0.93	49.91	0.43	98.95
Cr 3	11.21	20.04	5.51	0.34	26.51	n.d.	36.00	n.d.	99.60
Cr 4	11.96	14.16	4.32	n.d.	34.56	n.d.	34.75	n.d.	99.80
Cr 5	9.60	16.02	2.43	n.d.	41.31	n.d.	31.63	n.d.	101.00
Cr 10	4.34	10.22	5.81	n.d.	36.13	0.64	43.00	n.d.	100.10
Cr 11	10.42	17.92	5.15	n.d.	32.58	n.d.	34.27	n.d.	100.00
Cr 12	10.97	12.34	4.91	n.d.	37.16	n.d.	35.42	n.d.	101.00
Cr 13	11.65	31.83	0.33	n.d.	33.84	n.d.	22.72	0.44	100.80
Cr 14	12.65	16.67	0.55	n.d.	51.38	n.d.	20.11	n.d.	101.00
Cr 16	8.68	7.22	11.11	n.d.	11.78	0.42	59.90	n.d.	99.09
Cr 18	20.08	27.37	0.98	n.d.	38.29	0.80	12.40	n.d.	99.90
Cr 20	6.89	1.12	8.69	n.d.	4.89	1.13	76.90	n.d.	99.58
Cr 21	4.29	10.79	0.41	0.39	58.42	n.d.	25.70	n.d.	99.99
Cr 23	9.44	15.96	3.14	n.d.	42.66	n.d.	28.00	n.d.	99.20

Bottaccione section – Turonian Syn-³He

BOT 20 (101 kg) – PUCKS 217 & 349

+19.1 to 19.3 m above 0 reference level

Puck 217 = Cr 1, Puck 349 = Cr 2

EC 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:5	1.88	5.70	4.30	0.80	57.68	0.73	29.56	0.55	101.19
Cr 1:6	3.19	7.25	1.56	0.84	59.70	1.32	25.65	0.90	100.40
Cr 1:8	1.91	6.35	2.35	0.83	61.14	0.90	24.58	2.96	101.02
Cr 1:14	3.55	6.12	2.37	0.62	59.33	1.04	25.61	1.27	99.90
Cr 1:15	3.40	6.83	1.79	0.83	59.93	1.00	24.13	1.27	99.18
Cr 1:19	2.62	5.65	3.15	0.71	58.67	0.72	27.23	0.45	99.21
Cr 1:26	3.57	6.09	2.52	0.74	59.48	1.25	22.84	3.7	100.20
Cr 1:27	3.53	7.32	1.70	0.75	59.23	1.33	24.75	1.62	100.23
Cr 1:32	3.55	6.35	2.30	0.68	59.11	0.89	25.57	0.75	99.21
Cr 1:33	2.60	5.75	3.16	0.65	58.71	1.00	26.53	0.90	99.30
Cr 2:1	4.21	5.88	2.80	0.64	57.82	0.61	24.86	1.11	97.93
Cr 2:3	5.04	6.85	2.14	0.59	59.69	0.97	24.12	0.43	99.83
Cr 2:4	5.13	7.32	1.43	0.79	58.48	1.31	23.42	1.14	99.02

Outlier EC 32-63 µm

MgO-enriched grains

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:13	11.44	5.44	2.83	0.63	60.15	0.46	18.63	n.d.	99.58
Cr 1:17	8.69	5.45	3.04	0.65	59.73	n.d.	21.95	n.d.	99.52
Cr 2:2	6.04	5.82	3.10	0.79	57.58	0.57	24.45	n.d.	98.36
Cr 2:6	8.59	5.87	2.93	0.75	58.63	0.67	21.57	n.d.	99.00
Cr 2:8	7.96	7.34	1.81	0.66	60.06	0.84	20.89	0.42	99.97

OC-V 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:7	2.70	12.41	1.48	0.62	51.95	0.60	29.49	n.d.	99.25
Cr 1:11	5.48	11.38	0.70	0.77	57.40	0.65	22.60	n.d.	98.98
Cr 1:12	4.81	7.97	0.66	0.74	59.74	0.72	24.98	0.73	100.35
Cr 1:18	5.18	0.75	1.67	0.84	66.15	0.74	24.07	0.51	99.92
Cr 1:29	4.01	9.18	0.89	0.72	56.81	0.74	22.32	5.11	99.54
Cr 2:5	5.64	12.88	0.80	0.65	52.43	n.d.	26.89	n.d.	99.30

OC >63 μm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:34	12.57	23.54	n.d.	0.29	46.70	n.d.	15.39	n.d.	98.49

OC 32-63 μm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:1	10.76	14.53	n.d.	n.d.	54.27	0.57	18.29	n.d.	98.41
Cr 1:2*	6.50	8.59	9.11	0.55	19.50	0.42	54.06	n.d.	98.73
Cr 1:3	11.02	22.18	0.8	0.42	40.93	n.d.	24.28	n.d.	99.64
Cr 1:4	11.71	22.87	n.d.	0.29	48.87	n.d.	15.01	n.d.	98.75
Cr 1:9	8.05	13.00	n.d.	0.36	58.17	n.d.	20.15	n.d.	99.73
Cr 1:10	12.57	22.24	n.d.	0.28	48.78	0.42	16.56	n.d.	100.85
Cr 1:21*	0.27	0.56	0.49	0.84	3.73	n.d.	93.35	n.d.	99.25
Cr 1:22	12.92	26.82	n.d.	n.d.	42.49	n.d.	19.13	n.d.	101.36
Cr 1:23	7.63	14.47	n.d.	0.34	54.52	0.61	20.52	n.d.	98.10
Cr 1:24	5.58	2.25	8.91	n.d.	10.61	0.87	72.60	n.d.	100.82
Cr 1:25	20.20	32.72	1.31	0.26	34.31	0.40	10.41	n.d.	99.61
Cr 1:28	10.69	16.34	n.d.	0.31	52.84	0.48	18.57	n.d.	99.24
Cr 1:30	7.99	14.03	3.88	n.d.	23.77	n.d.	48.66	n.d.	98.33
Cr 2:7	8.26	0.42	2.70	n.d.	16.67	0.51	59.33	n.d.	87.88
Cr 2:9	8.69	15.71	3.62	n.d.	40.42	0.40	29.70	n.d.	98.54
Cr 2:10	1.88	0.47	n.d.	0.40	65.99	0.66	24.11	6.79	100.30

B2 (25.6 kg) – PUCK 166

+21.4 to 21.6 m above 0 reference level

EC 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 2	2.76	6.76	1.81	0.73	59.78	1.06	18.40	6.75	98.05
Cr 7	3.57	6.42	2.01	0.67	59.80	1.12	23.69	2.79	100.06
Cr 10	3.10	5.97	2.58	0.64	58.14	1.19	22.70	4.58	98.90
Cr 13	3.21	6.40	2.02	0.72	58.49	1.08	20.85	6.43	99.19
Cr 14	2.34	5.61	4.15	0.75	57.11	0.70	28.79	0.39	99.86
Cr 15	3.52	6.55	1.99	0.79	58.96	1.14	23.13	3.95	100.04
Cr 17	3.23	7.10	1.69	0.68	60.28	1.22	23.97	1.43	99.61
Cr 19	3.50	6.30	2.47	0.74	60.34	1.33	26.08	0.67	101.45

OC-V 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 4	5.23	4.84	0.66	0.64	62.20	0.70	25.58	n.d.	99.85

OC 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1	8.26	10.16	1.68	0.25	43.04	0.39	36.35	0.38	100.51
Cr 3	12.43	22.08	n.d.	0.29	47.28	0.36	17.48	n.d.	99.92
Cr 5	21.95	15.46	0.23	n.d.	53.91	0.63	8.58	n.d.	100.75
Cr 8	7.69	9.61	1.67	0.23	43.34	0.51	35.72	0.44	99.23
Cr 9	15.17	23.40	2.29	n.d.	34.68	n.d.	24.27	n.d.	99.80
Cr 11	23.11	13.91	0.58	0.17	51.12	0.64	10.19	n.d.	99.72
Cr 12	9.05	14.27	n.d.	0.41	53.82	0.51	20.93	0.31	99.30
Cr 16	17.82	40.67	0.36	n.d.	25.94	0.31	14.57	n.d.	99.67
Cr 18	7.41	9.67	1.51	n.d.	45.62	0.59	33.77	0.34	98.91

BOT 23 (104.2 kg/ 97.7 kg) – PUCKS 213 & 325

+21.9 to 22.4 m above 0 reference level

Puck 213 = Cr 1, Puck 325 = Cr 2

EC 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:2	3.80	7.08	2.10	0.75	59.11	1.07	25.40	1.03	100.35
Cr 1:7	3.66	7.22	1.55	0.80	59.30	1.62	24.41	1.53	100.10
Cr 1:10	5.82	5.90	1.84	0.91	61.13	0.71	23.61	0.63	100.55
Cr 2:1	1.94	5.91	2.85	0.77	58.95	0.84	28.38	n.d.	99.63

Outlier EC 32-63 µm

MgO-enriched grains

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:8	7.71	6.93	1.63	0.83	60.67	0.87	20.88	n.d.	99.52

OC-V >63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:11	3.10	8.58	0.75	0.80	60.25	0.76	25.39	0.49	100.12

OC-V 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:4	6.22	6.01	1.01	0.57	61.76	0.65	23.99	0.94	101.15
Cr 1:6	0.26	6.03	5.57	1.31	52.62	0.76	33.57	n.d.	100.12

OC 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:1	10.65	23.11	n.d.	0.26	49.05	n.d.	16.39	n.d.	99.46
Cr 1:3	14.15	32.71	0.52	n.d.	33.83	n.d.	18.39	n.d.	99.61
Cr 1:5	4.14	9.43	n.d.	n.d.	54.04	n.d.	31.28	n.d.	98.89
Cr 1:9*	8.28	22.59	0.73	0.52	34.81	n.d.	33.04	n.d.	99.98

B1 (25 kg) – PUCKS 253, 254, 258, 259 & 260

+27.0 to 27.2 m above 0 reference level

Puck 253 = Cr 1, Puck 254 = Cr 2, Puck 258 = Cr 3, Puck 259 = Cr 4, Puck 260 = Cr 5

Outlier EC 32-63 µm

MgO-enriched grains

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:2	6.85	6.33	2.16	0.70	61.65	1.22	22.61	n.d.	101.52

OC-V 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 2:2	20.67	14.16	0.69	0.57	51.72	n.d.	10.35	n.d.	98.17
Cr 2:9	2.21	1.52	0.43	0.50	64.25	n.d.	30.28	n.d.	99.19

OC >63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:1	6.84	7.98	0.53	n.d.	54.95	0.95	27.54	n.d.	98.79

OC 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 2:1	11.67	24.30	n.d.	0.39	45.29	n.d.	17.90	n.d.	99.56
Cr 2:3	21.09	19.68	0.18	0.29	44.18	0.31	12.95	n.d.	98.67
Cr 2:4	20.58	27.47	n.d.	n.d.	37.81	n.d.	12.68	n.d.	98.54
Cr 2:5	13.71	30.90	0.56	0.38	33.52	n.d.	22.10	n.d.	101.17
Cr 2:6	3.13	13.05	1.40	n.d.	48.03	0.60	31.21	n.d.	97.41
Cr 2:7	6.57	16.53	0.40	n.d.	48.30	0.60	26.57	n.d.	98.97
Cr 2:8	9.37	15.80	n.d.	0.27	55.84	0.47	17.05	n.d.	98.80
Cr 2:10	7.88	16.35	0.35	n.d.	51.76	n.d.	23.21	n.d.	99.55
Cr 2:11	13.43	33.96	n.d.	n.d.	36.56	n.d.	14.80	n.d.	98.76

Mg-Al >63 µm

Grain #	MgO	Al ₂ O ₃	SiO ₂	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	Total
Tr 1:1	18.41	61.13	n.d.	n.d.	n.d.	n.d.	0.95	18.69	99.19
Tr 1:2	22.97	61.83	n.d.	n.d.	n.d.	n.d.	0.47	14.18	99.46
Tr 1:3	26.92	62.45	n.d.	1.26	n.d.	n.d.	n.d.	8.61	99.24
Tr 1:4	25.46	64.73	n.d.	0.32	n.d.	0.25	n.d.	8.50	99.25

Tr 1:5	22.69	60.64	n.d.	n.d.	n.d.	n.d.	0.43	13.86	97.61
Tr 1:6	25.88	63.63	0.46	1.06	n.d.	n.d.	n.d.	6.61	97.64

Mg-Al 32-63 μm

Grain #	MgO	Al ₂ O ₃	SiO ₂	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	Total
Tr 3:1	22.08	59.49	n.d.	0.35	n.d.	n.d.	0.40	16.92	99.25
Tr 3:2	24.47	64.91	n.d.	n.d.	n.d.	n.d.	0.38	9.47	99.23
Tr 3:3	25.79	66.27	n.d.	0.19	n.d.	n.d.	n.d.	7.19	99.44
Tr 3:4	24.75	66.10	n.d.	n.d.	n.d.	n.d.	n.d.	9.34	100.20
Tr 3:5	23.97	63.24	n.d.	0.33	n.d.	n.d.	0.27	12.38	100.18
Tr 3:6	23.58	62.39	n.d.	0.35	n.d.	n.d.	0.28	13.50	100.10
Tr 3:7	22.21	58.94	n.d.	0.41	n.d.	n.d.	0.35	16.69	98.60
Tr 3:8	23.55	62.32	n.d.	0.29	n.d.	n.d.	n.d.	13.62	99.79
Tr 3:9	26.47	64.70	0.39	0.98	n.d.	n.d.	n.d.	5.88	98.42
Tr 3:10	25.41	62.54	0.36	0.27	n.d.	n.d.	n.d.	9.50	98.07
Tr 3:11	24.21	63.53	n.d.	0.24	n.d.	n.d.	0.28	11.39	99.66
Tr 3:12	24.70	62.93	n.d.	0.23	n.d.	n.d.	0.26	10.64	98.76
Tr 3:13	26.18	66.56	n.d.	0.26	n.d.	n.d.	n.d.	7.72	100.71
Tr 3:14	25.51	65.25	0.11	0.27	0.39	n.d.	n.d.	7.43	98.95
Tr 3:15	24.01	62.50	n.d.	0.28	n.d.	n.d.	0.26	12.72	99.77
Tr 3:16	24.78	62.96	n.d.	0.18	n.d.	n.d.	n.d.	11.90	99.82
Tr 3:17	25.55	61.14	0.21	0.45	n.d.	n.d.	n.d.	11.66	99.00
Tr 3:18	25.48	63.25	n.d.	0.31	n.d.	n.d.	n.d.	11.01	100.05
Tr 3:19	25.74	66.52	n.d.	n.d.	n.d.	n.d.	n.d.	7.64	99.90
Tr 3:20	24.80	62.67	n.d.	n.d.	n.d.	n.d.	0.21	11.12	98.79
Tr 3:21	21.08	54.42	n.d.	0.43	n.d.	n.d.	0.40	20.78	97.12
Tr 3:22	26.26	66.01	n.d.	0.70	n.d.	n.d.	n.d.	6.26	99.23
Tr 3:23	24.97	65.28	n.d.	n.d.	n.d.	n.d.	n.d.	9.73	99.98
Tr 4:1	25.49	64.54	0.30	0.29	n.d.	n.d.	n.d.	7.70	98.30
Tr 4:2	24.36	64.00	n.d.	n.d.	n.d.	n.d.	n.d.	11.76	100.11
Tr 4:3	20.42	62.96	n.d.	n.d.	n.d.	n.d.	0.38	16.18	99.94
Tr 4:4	24.49	63.72	n.d.	0.29	n.d.	n.d.	0.24	11.23	99.98
Tr 4:5	21.63	60.83	n.d.	0.28	n.d.	n.d.	0.44	16.10	99.28
Tr 4:6	25.32	64.33	0.23	0.37	n.d.	n.d.	n.d.	8.00	98.26
Tr 4:7	24.91	63.72	0.22	0.22	n.d.	n.d.	n.d.	10.87	99.94
Tr 4:8	26.47	59.25	n.d.	1.61	n.d.	n.d.	0.18	12.42	99.93
Tr 4:9	25.43	65.39	n.d.	0.28	n.d.	n.d.	n.d.	7.55	98.65
Tr 4:10	22.67	57.43	n.d.	n.d.	n.d.	n.d.	0.62	18.07	98.79
Tr 4:11	23.34	63.18	n.d.	0.24	n.d.	n.d.	0.20	13.26	100.21
Tr 4:12	24.03	62.59	n.d.	0.30	n.d.	n.d.	0.29	11.89	99.10
Tr 4:13	22.68	60.43	n.d.	0.40	n.d.	n.d.	0.32	15.49	99.31
Tr 4:14	22.94	64.01	n.d.	0.30	n.d.	n.d.	0.32	12.36	99.93
Tr 4:15	26.31	65.07	n.d.	n.d.	n.d.	n.d.	n.d.	8.24	99.62

Tr 4:16	25.49	64.85	n.d.	0.34	n.d.	n.d.	n.d.	7.78	98.47
Tr 4:17	25.41	66.13	n.d.	0.19	n.d.	n.d.	0.18	8.14	100.05
Tr 4:18	25.28	65.80	n.d.	0.18	n.d.	n.d.	n.d.	9.20	100.46
Tr 4:19	25.76	65.67	n.d.	0.24	n.d.	n.d.	n.d.	7.75	99.41
Tr 4:20	24.63	62.87	n.d.	0.56	n.d.	n.d.	n.d.	11.60	99.66
Tr 4:21	24.76	63.86	n.d.	0.39	n.d.	n.d.	0.23	11.12	100.36
Tr 4:22	18.33	62.55	n.d.	n.d.	n.d.	n.d.	0.96	17.22	99.05
Tr 4:23	25.39	63.9	n.d.	n.d.	n.d.	n.d.	n.d.	8.93	98.22
Tr 4:24	18.64	60.21	n.d.	n.d.	n.d.	n.d.	1.36	19.37	99.58
Tr 4:25	26.06	65.65	0.13	0.22	n.d.	n.d.	n.d.	7.39	99.46
Tr 4:26	23.98	60.75	n.d.	0.26	n.d.	n.d.	0.30	14.92	100.21
Tr 4:27	20.54	60.42	n.d.	0.26	n.d.	n.d.	0.51	18.35	100.07
Tr 4:28	21.17	55.56	n.d.	0.45	n.d.	n.d.	0.62	21.07	98.86
Tr 4:29	20.27	58.62	n.d.	n.d.	n.d.	n.d.	0.43	19.57	98.89
Tr 4:30	20.91	54.45	n.d.	0.44	n.d.	n.d.	0.57	23.28	99.66
Tr 4:31	8.45	55.17	n.d.	0.23	n.d.	n.d.	0.40	34.21	98.47
Tr 4:32	22.27	59.81	n.d.	0.21	n.d.	n.d.	0.53	15.53	98.36
Tr 4:33	24.46	59.99	n.d.	0.51	n.d.	n.d.	0.42	15.13	100.51
Tr 4:34	18.35	56.78	n.d.	0.29	0.18	n.d.	0.57	24.36	100.52
Tr 4:35	17.98	55.23	0.13	0.39	n.d.	n.d.	0.56	24.21	98.50
Tr 4:36	21.38	58.18	n.d.	n.d.	n.d.	n.d.	0.46	19.38	99.39
Tr 5:1	26.15	65.83	n.d.	n.d.	n.d.	n.d.	n.d.	8.02	100.00
Tr 5:2	24.28	63.25	n.d.	0.26	n.d.	n.d.	n.d.	11.08	98.87
Tr 5:3	25.36	64.69	n.d.	0.24	n.d.	n.d.	n.d.	8.49	98.77
Tr 5:4	22.21	60.50	n.d.	n.d.	n.d.	n.d.	0.39	15.32	98.42
Tr 5:6	25.74	65.36	0.38	0.44	n.d.	n.d.	n.d.	7.72	99.63
Tr 5:7	25.43	65.62	n.d.	n.d.	n.d.	n.d.	0.33	8.69	100.07
Tr 5:8	25.54	65.65	n.d.	0.25	n.d.	n.d.	n.d.	8.50	99.95
Tr 5:9	26.99	67.11	n.d.	n.d.	n.d.	n.d.	n.d.	5.84	99.94
Tr 5:10	25.14	65.57	n.d.	n.d.	n.d.	n.d.	0.48	10.26	101.46
Tr 5:11	24.63	64.22	n.d.	n.d.	n.d.	n.d.	0.41	10.59	99.85
Tr 5:12	23.51	61.88	n.d.	n.d.	n.d.	n.d.	0.39	14.36	100.14
Tr 5:13	25.53	65.32	n.d.	0.25	n.d.	n.d.	n.d.	7.95	99.04
Tr 5:14	24.16	63.30	n.d.	n.d.	n.d.	n.d.	0.36	11.41	99.24
Tr 5:15	22.76	60.66	n.d.	0.32	n.d.	n.d.	n.d.	14.08	97.81
Tr 5:16	26.25	64.58	n.d.	n.d.	n.d.	n.d.	n.d.	8.46	99.28
Tr 5:17	23.85	62.41	n.d.	0.32	n.d.	n.d.	n.d.	12.46	99.05
Tr 5:18	24.15	62.73	n.d.	0.25	n.d.	n.d.	n.d.	11.39	98.52
Tr 5:19	24.28	63.99	n.d.	n.d.	n.d.	n.d.	0.25	10.06	98.59
Tr 5:20	23.45	62.36	n.d.	n.d.	n.d.	n.d.	0.38	12.95	99.14
Tr 5:21	24.93	64.06	n.d.	n.d.	n.d.	n.d.	0.24	10.84	100.07
Tr 5:22	24.58	64.45	n.d.	n.d.	n.d.	n.d.	0.23	10.01	99.27
Tr 5:23	21.46	57.58	n.d.	0.45	n.d.	n.d.	0.45	19.05	98.99
Tr 5:24	22.30	56.95	n.d.	0.94	n.d.	0.24	0.21	18.52	99.15
Tr 5:25	25.85	62.51	n.d.	0.29	n.d.	n.d.	n.d.	9.92	98.57

Tr 5:26	24.84	62.07	n.d.	0.75	n.d.	n.d.	n.d.	11.93	99.59
Tr 5:27	23.57	61.51	n.d.	n.d.	n.d.	n.d.	0.30	14.29	99.67
Tr 5:28	25.87	65.79	n.d.	0.21	n.d.	n.d.	n.d.	7.70	99.58
Tr 5:29	24.88	64.74	0.17	0.26	n.d.	n.d.	n.d.	8.94	98.99
Tr 5:30	22.75	57.88	n.d.	n.d.	n.d.	n.d.	0.43	17.66	98.72
Tr 5:31	26.35	64.74	0.21	0.66	n.d.	n.d.	n.d.	7.92	99.89
Tr 5:32	25.81	66.34	n.d.	n.d.	n.d.	n.d.	n.d.	7.15	99.29
Tr 5:33	24.62	60.06	0.35	1.58	n.d.	n.d.	n.d.	11.98	98.58
Tr 5:34	24.11	64.02	n.d.	n.d.	n.d.	n.d.	0.36	11.63	100.12
Tr 5:35	25.22	61.50	n.d.	0.66	n.d.	n.d.	n.d.	12.53	99.90

Bot 27 (98.5 kg) – PUCKS 167, 168 & 325

+27.0 to 27.2 m above 0 reference level

Puck 167 = Cr 1, Puck 168 = Cr 2, Puck 325 = Cr 3

EC 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:3	3.29	7.17	2.11	0.82	62.08	1.23	22.82	1.00	100.50
Cr 1:4	3.11	6.74	2.49	0.80	61.07	1.06	18.96	5.15	99.38
Cr 1:7	2.07	5.39	3.18	0.71	59.87	0.77	27.59	0.43	100.00
Cr 1:8	3.30	6.99	2.06	0.58	58.91	1.19	26.61	0.87	100.51
Cr 1:14	4.09	6.29	2.03	0.75	61.91	0.79	25.12	n.d.	100.99
Cr 1:26	1.69	6.47	3.43	0.80	64.64	0.68	21.12	0.50	99.34
Cr 1:27	2.72	6.02	3.44	0.69	60.39	0.81	26.31	0.83	101.21
Cr 1:28	3.93	4.51	1.51	0.84	64.74	1.52	21.59	1.76	100.40
Cr 1:37	3.68	6.92	2.35	0.70	60.26	1.06	25.82	0.43	101.22
Cr 1:38	4.52	6.55	2.32	0.68	61.40	0.93	22.48	1.06	99.94
Cr 1:49	3.36	7.29	2.01	0.65	59.15	1.07	26.29	0.75	100.56
Cr 2:31	1.20	5.03	1.79	0.66	64.04	0.90	25.18	n.d.	98.80
Cr 3:1	2.72	5.88	3.08	0.66	56.96	0.93	26.59	1.12	97.93

Outlier EC 32-63 µm

MgO-enriched grains

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:13	6.13	7.33	0.94	0.65	61.75	0.51	21.02	1.95	100.29

OC-V 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:1	2.35	8.25	2.00	0.91	67.02	1.16	15.25	2.39	99.33
Cr 1:2	2.23	8.12	2.57	0.78	67.05	0.89	16.48	2.05	100.16
Cr 1:15	3.73	11.16	1.91	0.68	61.73	n.d.	19.54	0.87	99.62
Cr 1:20	2.91	7.33	1.66	0.88	67.11	1.19	17.72	1.35	100.15
Cr 1:48	5.65	16.22	0.45	0.47	49.79	0.53	27.71	n.d.	100.83
Cr 1:51	7.99	20.33	0.68	0.63	45.52	0.59	23.69	0.53	99.95

OC 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:6	7.44	20.94	n.d.	n.d.	47.18	n.d.	18.96	n.d.	94.52

Cr 1:11	13.97	21.23	3.21	0.18	33.14	n.d.	29.34	n.d.	101.07
Cr 1:16	10.57	14.12	0.49	0.23	52.53	0.48	22.36	n.d.	100.76
Cr 1:17 [†]	12.66	17.51	3.81	n.d.	34.52	0.45	31.58	n.d.	101.02
Cr 1:18	13.19	32.72	n.d.	n.d.	37.39	0.44	17.12	n.d.	100.87
Cr 1:19	7.65	19.72	n.d.	n.d.	50.96	0.57	20.73	0.46	100.10
Cr 1:22	11.48	22.64	n.d.	0.30	46.79	n.d.	18.99	n.d.	100.19
Cr 1:23	15.95	35.93	n.d.	n.d.	34.21	n.d.	14.64	n.d.	100.73
Cr 1:25	9.03	14.08	0.42	n.d.	51.48	1.28	24.75	n.d.	101.02
Cr 1:30	9.86	0.64	0.41	n.d.	72.94	2.43	12.11	2.14	100.52
Cr 1:32	16.15	37.04	0.24	n.d.	29.21	n.d.	16.48	0.14	99.25
Cr 1:33	12.55	19.48	4.28	0.31	30.41	n.d.	32.82	n.d.	99.85
Cr 1:34	14.15	33.16	n.d.	n.d.	34.63	n.d.	17.10	0.25	99.30
Cr 1:35	21.21	16.00	n.d.	n.d.	45.15	0.46	17.71	n.d.	100.53
Cr 1:41	16.90	15.20	n.d.	n.d.	51.43	0.53	15.26	n.d.	99.32
Cr 1:45	9.48	14.52	0.39	n.d.	51.45	0.64	23.93	n.d.	100.41
Cr 1:50	12.88	29.86	0.36	0.25	37.08	n.d.	18.77	n.d.	99.20
Cr 1:47	20.85	12.87	n.d.	n.d.	40.85	0.86	23.52	n.d.	98.96
Cr 1:43	8.44	16.28	0.79	0.34	49.20	n.d.	25.95	n.d.	100.99
Cr 1:42	14.69	33.04	n.d.	n.d.	37.13	n.d.	14.82	n.d.	99.68
Cr 2:42	18.78	50.16	n.d.	n.d.	19.04	n.d.	12.71	n.d.	100.69

[†] 0.48 wt% NiO.

Mg-Al >63 µm

Grain #	MgO	Al ₂ O ₃	SiO ₂	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	Total
Tr 3:1	24.57	64.58	n.d.	n.d.	n.d.	n.d.	0.28	9.08	98.51

Mg-Al 32-63 µm

Grain #	MgO	Al ₂ O ₃	SiO ₂	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	Total
Tr 1:9	23.16	57.85	n.d.	0.36	n.d.	n.d.	0.51	17.94	99.82
Tr 1:10	21.19	61.94	n.d.	0.23	n.d.	n.d.	n.d.	16.85	100.22
Tr 1:21	20.66	55.40	n.d.	0.55	n.d.	n.d.	0.36	22.57	99.54
Tr 1:24	19.01	52.06	n.d.	0.64	n.d.	n.d.	0.40	27.21	99.31
Tr 1:29	24.48	61.80	n.d.	0.28	n.d.	n.d.	n.d.	12.66	99.22
Tr 1:36	23.12	61.07	n.d.	0.32	n.d.	n.d.	n.d.	14.88	99.39
Tr 1:39	21.74	59.98	n.d.	0.30	n.d.	n.d.	0.32	17.60	99.94
Tr 1:52	23.02	62.60	n.d.	n.d.	n.d.	n.d.	n.d.	13.69	99.30
Tr 1:44	24.35	62.41	n.d.	0.38	n.d.	n.d.	0.31	13.60	101.05
Tr 1:40	24.43	61.99	n.d.	0.32	n.d.	n.d.	0.40	12.45	99.59
Tr 2:1	23.44	62.60	n.d.	0.21	n.d.	n.d.	n.d.	13.92	100.17
Tr 2:2	26.56	65.29	n.d.	0.30	n.d.	n.d.	n.d.	7.74	99.90
Tr 2:3	25.59	66.16	n.d.	0.28	n.d.	n.d.	0.27	7.38	99.68
Tr 2:4	25.68	64.22	n.d.	0.43	n.d.	n.d.	n.d.	8.51	98.83
Tr 2:5	25.30	63.55	n.d.	0.41	n.d.	n.d.	n.d.	9.95	99.21

Tr 2:6	24.98	67.06	n.d.	0.23	n.d.	n.d.	n.d.	7.99	100.26
Tr 2:7	26.18	62.91	n.d.	0.49	n.d.	n.d.	n.d.	10.13	99.72
Tr 2:8	24.48	65.40	n.d.	0.24	n.d.	n.d.	0.27	10.8	101.19
Tr 2:9	25.13	63.72	0.62	0.91	n.d.	n.d.	n.d.	8.49	98.87
Tr 2:12	25.98	63.60	n.d.	0.41	n.d.	n.d.	n.d.	9.70	99.69
Tr 2:13	23.92	66.92	n.d.	n.d.	n.d.	n.d.	0.72	9.21	101.26
Tr 2:14	22.14	64.47	n.d.	n.d.	n.d.	n.d.	0.39	12.86	99.86
Tr 2:15	24.19	65.75	0.20	0.23	n.d.	n.d.	n.d.	9.81	100.17
Tr 2:16	26.33	67.19	n.d.	n.d.	n.d.	n.d.	n.d.	7.40	100.92
Tr 2:17	24.35	64.13	n.d.	0.21	n.d.	n.d.	n.d.	10.92	99.60
Tr 2:18	22.74	65.09	n.d.	0.43	n.d.	n.d.	n.d.	11.75	100.02
Tr 2:19	25.48	65.66	n.d.	n.d.	n.d.	n.d.	n.d.	8.43	99.57
Tr 2:20	24.29	63.95	n.d.	0.24	n.d.	n.d.	n.d.	10.65	99.13
Tr 2:21	24.43	63.95	n.d.	0.39	n.d.	n.d.	n.d.	11.63	100.40
Tr 2:22	26.70	63.57	0.47	0.61	n.d.	n.d.	n.d.	7.21	98.55
Tr 2:23	24.22	64.76	n.d.	n.d.	n.d.	n.d.	n.d.	10.05	99.03
Tr 2:24	24.40	63.83	n.d.	0.25	n.d.	n.d.	0.15	10.97	99.60
Tr 2:25	22.07	59.91	n.d.	n.d.	n.d.	n.d.	0.33	16.35	98.67
Tr 2:26	25.86	64.29	n.d.	0.31	n.d.	n.d.	n.d.	8.71	99.18
Tr 2:27	25.74	65.11	0.26	0.33	n.d.	n.d.	0.25	8.44	100.13
Tr 2:28	26.68	65.85	0.26	0.63	n.d.	n.d.	n.d.	8.00	101.42
Tr 2:29	23.67	65.57	n.d.	n.d.	n.d.	n.d.	0.19	10.49	99.92
Tr 2:30	23.80	62.14	0.15	0.34	n.d.	n.d.	n.d.	12.96	99.40
Tr 2:32	24.03	63.43	0.36	n.d.	n.d.	n.d.	n.d.	12.14	99.97
Tr 2:33	24.25	64.51	n.d.	n.d.	n.d.	n.d.	n.d.	10.58	99.34
Tr 2:39	22.70	65.43	n.d.	n.d.	n.d.	n.d.	0.32	11.6	100.05
Tr 2:40	25.48	66.20	n.d.	n.d.	n.d.	n.d.	0.33	8.54	100.56
Tr 2:41	24.26	64.11	0.25	n.d.	n.d.	n.d.	n.d.	10.89	99.52
Tr 2:43	25.14	64.21	n.d.	n.d.	n.d.	n.d.	0.27	9.82	99.63
Tr 2:44	24.90	63.95	n.d.	n.d.	n.d.	n.d.	n.d.	10.94	99.80
Tr 2:45	26.26	62.31	0.66	n.d.	n.d.	n.d.	n.d.	9.25	98.99
Tr 2:46	26.40	66.75	0.25	n.d.	n.d.	n.d.	n.d.	9.25	98.99
Tr 2:47	24.75	65.73	n.d.	n.d.	n.d.	n.d.	n.d.	8.84	99.31
Tr 2:48	23.70	64.17	0.24	n.d.	n.d.	n.d.	n.d.	12.54	100.65

[†] 0.50 wt% ZnO.

BOT 29 (101 kg/ 96.8 kg) – PUCKS 186 & 187

+28.7 to 29.3 m above 0 reference level

Puck 186 = Cr 1, Puck 187 = Cr 2

EC >63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 2:12	4.54	6.15	2.87	0.78	59.46	0.99	26.16	0.46	101.42
Cr 2:13	5.44	5.85	2.23	0.67	60.55	1.03	24.52	n.d.	100.28

EC 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:9	2.81	7.07	1.54	0.77	59.55	1.30	27.00	0.70	100.75
Cr 1:12	3.54	6.68	2.21	0.76	59.14	1.16	26.34	n.d.	99.82
Cr 1:13	4.90	5.84	3.92	0.83	56.96	0.61	25.03	0.43	98.51
Cr 1:17	2.18	5.73	3.13	0.76	57.55	0.81	29.01	0.40	99.57
Cr 1:20	2.29	6.02	2.49	0.81	58.89	0.86	28.33	0.54	100.22
Cr 1:21	3.04	7.23	2.53	0.72	62.24	0.83	17.93	5.23	99.76
Cr 1:26	3.02	6.73	2.60	0.78	61.94	1.13	23.13	1.28	100.61
Cr 1:27	4.05	6.68	1.91	0.80	60.49	1.01	24.48	1.06	100.48
Cr 1:28	4.83	6.03	3.00	0.77	58.54	0.72	26.23	n.d.	100.13
Cr 1:29	3.64	6.63	2.37	0.69	59.11	1.20	25.84	0.64	100.13
Cr 1:31	4.26	6.79	2.11	0.75	59.30	0.98	24.67	0.91	99.77
Cr 1:32	3.36	6.98	1.82	0.79	59.82	1.34	26.10	0.66	100.87
Cr 1:35	3.44	7.04	1.81	0.76	59.50	1.22	26.31	0.56	100.66

Outlier EC 32-63 µm

MgO-enriched grains

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:36	9.58	5.84	3.95	0.72	59.87	0.56	20.18	n.d.	100.71

OC-V 32-63 µm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:6	5.96	16.88	0.81	0.64	49.15	0.71	26.61	n.d.	100.76
Cr 1:14	3.45	n.d.	0.69	0.71	66.85	1.08	20.89	6.19	99.86
Cr 1:15	4.50	9.14	0.65	0.56	57.73	0.51	25.45	n.d.	98.54
Cr 1:18	5.10	10.14	0.87	0.67	56.25	0.67	26.16	n.d.	99.87
Cr 1:22	7.29	3.00	2.12	0.69	63.16	0.85	23.11	0.55	100.76

Cr 1:30	5.63	12.48	0.64	0.53	54.03	n.d.	25.85	n.d.	99.16
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OC 32-63 μm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:7	12.28	21.00	5.79	0.28	22.81	n.d.	36.49	n.d.	98.64
Cr 1:8	10.72	21.31	n.d.	0.32	49.12	n.d.	19.31	n.d.	100.79
Cr 1:10*	0.81	2.78	0.69	0.84	53.45	0.86	38.35	0.75	98.53
Cr 1:11	21.10	16.05	1.59	n.d.	39.87	1.41	19.36	0.26	99.63
Cr 1:16	6.95	6.96	n.d.	0.28	62.20	0.93	21.15	0.65	99.12
Cr 1:19	3.01	5.25	0.15	0.32	55.77	0.87	35.35	n.d.	100.72
Cr 1:23	11.96	23.97	n.d.	0.28	47.34	n.d.	17.04	n.d.	100.60
Cr 1:24	10.27	19.82	n.d.	n.d.	48.82	n.d.	21.50	n.d.	100.40
Cr 1:25	12.78	17.91	3.41	0.29	38.68	n.d.	26.48	n.d.	99.55
Cr 1:33	13.59	25.82	n.d.	n.d.	45.48	n.d.	14.81	n.d.	99.70
Cr 1:34	11.52	23.93	n.d.	0.26	47.94	0.41	15.25	n.d.	99.31
Cr 1:37	15.16	38.56	n.d.	n.d.	30.36	n.d.	14.95	0.33	99.36
Cr 1:45	5.70	12.54	n.d.	0.30	56.09	0.70	23.87	0.59	99.79

Mg-Al 32-63 μm

Grain #	MgO	Al ₂ O ₃	SiO ₂	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	Total
Tr 1:2	25.30	64.77	n.d.	0.24	n.d.	n.d.	0.28	8.83	99.43
Tr 1:3	21.18	61.16	n.d.	n.d.	n.d.	n.d.	0.66	16.58	99.57
Tr 1:4	24.86	64.92	0.31	n.d.	n.d.	n.d.	0.32	10.34	100.76
Tr 1:5	22.03	64.60	n.d.	n.d.	n.d.	n.d.	0.73	12.39	99.75

BOT 32 (101.25 kg) – PUCKS 214, 347 & 348

+31.7 to 32.3 m above 0 reference level

Puck 214 = Cr 1, Puck 347 = Cr 2, Puck 348 = Cr 3

EC 32-63 μm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:2	3.53	6.69	1.88	0.78	59.22	1.17	25.09	0.77	99.11
Cr 1:4	1.59	6.06	3.32	0.86	58.38	0.94	28.71	0.55	100.41
Cr 1:5	2.90	5.98	1.66	0.70	60.48	1.06	27.15	0.56	100.49
Cr 1:6	2.05	5.62	3.06	0.70	59.26	0.82	28.64	0.48	100.62
Cr 1:11	2.43	6.28	2.21	0.78	59.60	0.94	28.06	0.63	100.93
Cr 1:16	2.93	6.05	2.08	0.71	60.59	0.92	25.14	0.75	99.17
Cr 1:20	3.69	6.80	2.07	0.73	60.39	1.14	24.76	1.19	100.76

OC-V 32-63 μm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 2:1	4.76	8.52	0.78	0.85	59.83	n.d.	26.27	n.d.	101.00

OC 32-63 μm

Grain #	MgO	Al ₂ O ₃	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	ZnO	Total
Cr 1:1	9.66	20.33	n.d.	0.20	46.72	0.62	22.22	0.34	100.09
Cr 1:3	15.33	24.67	1.37	n.d.	39.42	0.39	18.09	n.d.	99.27
Cr 1:7	14.01	25.64	n.d.	0.17	45.02	0.29	14.98	n.d.	100.12
Cr 1:8	10.93	21.54	0.59	0.35	42.27	0.52	23.18	0.3	99.68
Cr 1:9	14.90	10.33	0.15	n.d.	61.13	0.52	12.69	n.d.	99.72
Cr 1:12	12.85	27.49	0.88	0.22	39.03	0.46	18.14	n.d.	99.07
Cr 1:13	11.53	18.92	0.23	n.d.	50.36	0.51	18.30	n.d.	99.85
Cr 1:15 [†]	13.86	20.01	3.95	0.26	38.46	n.d.	23.71	n.d.	100.60
Cr 1:17	12.82	29.11	n.d.	0.34	36.79	0.51	20.62	n.d.	100.20
Cr 1:18	8.75	12.22	0.38	n.d.	50.89	0.84	27.10	n.d.	100.19
Cr 1:19	0.50	0.25	n.d.	n.d.	46.76	2.64	37.12	1.45	88.72
Cr 1:21	10.30	24.69	0.32	0.30	38.98	0.46	24.77	n.d.	99.82

[†] 0.35 wt% NiO.

Mg-Al 32-63 μm

Grain #	MgO	Al ₂ O ₃	SiO ₂	TiO ₂	V ₂ O ₃	Cr ₂ O ₃	MnO	FeO	Total
Tr 3:1	13.35	56.38	n.d.	1.23	n.d.	n.d.	n.d.	27.05	98.00
Tr 3:2	17.19	52.97	n.d.	0.34	n.d.	n.d.	0.34	26.93	97.77
Tr 3:3	24.78	57.54	n.d.	0.80	n.d.	n.d.	n.d.	15.56	98.69