

Tab. S1. Chemical composition of the Korvatundra rocks.

Sample	Rock	SiO <sub>2</sub>	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MnO	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	Total
3633	Grt-Bt gneisses	64.02	1.14	14.57	3.42	4.54	0.09	1.46	1.8	5.16	2.1	99.77
3633-1	Blastomylonite after Grt-Bt gneiss	66.58	0.87	15.04	5.07	3.02	0.04	0.47	1.55	5.83	0.37	99.68
3647	Ged-Grt-Bt-Pl metasomatite	61.47	1.18	16.3	3.12	6.01	0.05	3.14	1.03	5.72	0.25	99.68
3652	Ky-Grt two-mica gneisses	56.65	0.81	22.54	3.41	5.77	0.1	2.02	1.61	1.54	2.61	99.57
3686	Feldspar amphibolite	48.64	1.07	14.79	2.45	9.78	0.24	8.76	9.96	1.57	0.22	99.54
3687	plagioamphibolite	46.99	2.54	13.66	3.92	11.34	0.22	5.23	10.13	2.86	0.67	99.53
TAN-5	St-Ky-Grt two-mica gneisses	55.93	1.04	19.98	6.54	4.48	0.12	2.37	3.17	2.52	1.49	96.99
TAN-7	St-Chl-Ms slate	59.49	0.88	20.13	5.24	4.29	0.09	2.07	1.80	1.59	1.46	100.0

Note. Analyzes were done at the Geological Institute of the KSC RAS by the atomic absorption method (AAS).

Tab. S2a. Representative compositions of garnets of the Korvatundra complex.

Sample	3633	3633	3633-1	3633-1	3633-1	3633-1	3633-d	3633-d	3633-d
Analysis *	c	r	c	i	r	r	c-1	r-1	c-2
SiO <sub>2</sub>	38.7	38.79	37.35	37.38	37.61	38.7	39.65	39.26	39.21
TiO <sub>2</sub>	0	0	0.05	0.03	0.06	0	0.06	0.08	0.08
Al <sub>2</sub> O <sub>3</sub>	19.66	19.71	20.84	21.42	21.46	20.64	20.3	20.3	20.26
FeO	32.92	33.2	32.02	33.43	32.92	34.5	32.22	32.86	32.38
MnO	1.72	1.74	2.41	0.52	0.4	1.06	0.95	1.49	1.08
MgO	4.72	4.71	3.24	5.04	6.26	4.31	5.68	5.13	5.87
CaO	1.63	1.68	3.71	1.66	1.01	0.24	0.65	0.64	0.76
K <sub>2</sub> O	0	0	0	0	0.03	0	0	0.07	0.03
Total	99.35	99.83	99.62	99.48	99.75	99.45	99.51	99.83	99.67
Si <sup>4+</sup>	3.098	3.093	3.003	2.983	2.978	3.089	3.126	3.107	3.097
Ti <sup>4+</sup>	0	0	0.003	0.002	0.004	0	0.004	0.005	0.005
Al <sup>3+</sup>	1.855	1.852	1.975	2.015	2.003	1.942	1.886	1.893	1.886
Fe <sup>2+</sup>	2.204	2.214	2.153	2.231	2.18	2.303	2.125	2.175	2.139
Mn <sup>2+</sup>	0.117	0.118	0.164	0.035	0.027	0.072	0.063	0.1	0.072
Mg <sup>2+</sup>	0.563	0.56	0.388	0.6	0.739	0.513	0.668	0.605	0.691
Ca <sup>2+</sup>	0.14	0.144	0.32	0.142	0.086	0.021	0.055	0.054	0.064
K <sup>+</sup>	0	0	0	0	0.003	0	0	0.007	0.003
Total	7.975	7.981	8.006	8.008	8.019	7.94	7.927	7.946	7.957
Alm	0.727	0.728	0.717	0.748	0.735	0.786	0.724	0.736	0.717
Sps	0.039	0.039	0.055	0.012	0.009	0.025	0.021	0.034	0.024
Prp	0.186	0.184	0.129	0.201	0.249	0.175	0.227	0.205	0.232
Grs	0.046	0.047	0.107	0.048	0.029	0.007	0.019	0.018	0.021

Note. \*c – center of grain, i – intermediate zone, r – the edge of the grain in contact with biotite (otherwise, the designation of the contacting mineral is given in brackets), with a hyphen - the grain number. Formulas are rated for 24 charges.

Tab. S2a (continuation).

Sample	3640	3640	3640	3640	3643	3643	3643	3643	3652
Analysis	c	i	r	r(Pl)	c-1	r-1	c-2	r-2	c-1
SiO <sub>2</sub>	39.48	39.9	38.72	39.99	38.67	38.56	38.8	39.17	38.75
TiO <sub>2</sub>	0	0	0	0	0.08	0.07	0	0	0.03
Al <sub>2</sub> O <sub>3</sub>	20.66	20.69	20.48	20.79	20.24	20.48	20.3	20.44	20.14
FeO	24.98	26.21	25.89	25.83	30.98	31.43	30.41	31.82	28.78
MnO	4.49	5.03	5.73	5.07	1.86	0.77	1.6	0.64	4.3
MgO	7.38	6.59	6.42	6.4	2.14	4.6	3.25	3.72	1.47
CaO	2.82	1.39	2.58	1.82	5.87	4.3	5.07	3.7	6.22
K <sub>2</sub> O	0	0	0	0	0.05	0.02	0	0.05	0
Total	99.81	99.81	99.82	99.9	99.89	100.23	99.43	99.54	99.69

Si <sup>4+</sup>	3.072	3.112	3.047	3.114	3.089	3.047	3.093	3.109	3.106
Ti <sup>4+</sup>	0	0	0	0	0.005	0.004	0	0	0.002
Al <sup>3+</sup>	1.895	1.902	1.899	1.908	1.905	1.908	1.907	1.912	1.903
Fe <sup>2+</sup>	1.626	1.709	1.704	1.682	2.069	2.077	2.027	2.112	1.929
Mn <sup>2+</sup>	0.296	0.332	0.382	0.334	0.126	0.052	0.108	0.043	0.292
Mg <sup>2+</sup>	0.856	0.766	0.753	0.743	0.255	0.542	0.386	0.44	0.176
Ca <sup>2+</sup>	0.235	0.116	0.218	0.152	0.502	0.364	0.433	0.315	0.534
K <sup>+</sup>	0	0	0	0	0.005	0.002	0	0.005	0
Total	7.98	7.937	8.003	7.932	7.956	7.996	7.954	7.937	7.941
Alm	0.538	0.580	0.559	0.573	0.697	0.684	0.682	0.720	0.653
Sps	0.098	0.113	0.125	0.114	0.042	0.017	0.036	0.015	0.099
Prp	0.283	0.260	0.247	0.253	0.086	0.179	0.130	0.150	0.060
Grs	0.078	0.039	0.072	0.052	0.169	0.120	0.146	0.107	0.181

Tab. S2a (continuation).

Sample	3652	3652	3652	3652	3652	3652	3652	TAN-5	TAN-5
Analysis	r-1	c-2	r-2	c-3	i-3	i-3	r-3	r	c
SiO <sub>2</sub>	39.2	39.68	39.79	39.68	39.46	39.5	39.5	38.53	37.28
TiO <sub>2</sub>	0.07	0	0	0.08	0.07	0.1	0.07	0	0
Al <sub>2</sub> O <sub>3</sub>	20.4	20.35	20.22	20.61	20.51	20.55	20.58	21.27	20.88
FeO	30.22	30.44	29.5	30.66	29.78	29.78	31.02	27.2	27.93
MnO	0.95	0.83	1.09	1.06	1.04	1.03	0.97	3.56	4.1
MgO	4.62	4.76	4.93	4.47	5.28	5.3	4.04	4.39	3.54
CaO	4.21	3.46	3.94	3.21	3.64	3.43	3.54	4.9	3.13
K <sub>2</sub> O	0	0	0	0.05	0	0	0	0	0
Total	99.67	99.52	99.47	99.82	99.78	99.69	99.72	99.85	96.86
Si <sup>4+</sup>	3.094	3.126	3.131	3.121	3.098	3.101	3.117	3.037	3.045
Ti <sup>4+</sup>	0.004	0	0	0.005	0.004	0.006	0.004	0	0
Al <sup>3+</sup>	1.898	1.89	1.875	1.91	1.898	1.902	1.914	1.976	2.01
Fe <sup>2+</sup>	1.995	2.006	1.941	2.016	1.955	1.955	2.047	1.793	1.908
Mn <sup>2+</sup>	0.064	0.055	0.073	0.071	0.069	0.068	0.065	0.238	0.284
Mg <sup>2+</sup>	0.544	0.559	0.578	0.524	0.618	0.62	0.475	0.516	0.431
Ca <sup>2+</sup>	0.356	0.292	0.332	0.27	0.306	0.289	0.299	0.414	0.274
K <sup>+</sup>	0	0	0	0.005	0	0	0	0	0
Total	7.953	7.929	7.931	7.922	7.949	7.942	7.922	7.974	7.95
Alm	0.671	0.683	0.658	0.693	0.659	0.662	0.702	0.604	0.655
Sps	0.022	0.019	0.025	0.024	0.023	0.023	0.022	0.080	0.097
Prp	0.183	0.190	0.196	0.180	0.208	0.210	0.163	0.174	0.148
Grs	0.120	0.099	0.113	0.093	0.103	0.098	0.103	0.139	0.094



Tab. S2b. Representative compositions of biotites of the Korvatundra complex.

Sample	3633	3633	3633-1	3633-1	3633-d	3633-d	3633-d	3640	3640
Analysis *	m	c	i	c	i-2	m	c-1	i	m
SiO <sub>2</sub>	37.71	36.86	36.64	35	37.32	37.08	37.37	38.27	38.32
TiO <sub>2</sub>	1.84	1.81	1.66	1.59	1.43	1.38	1.16	0.96	1.03
Al <sub>2</sub> O <sub>3</sub>	17.54	17.8	17.49	18.47	17.37	17.25	17.39	17.67	17.66
FeO	16.78	15.85	16.32	16.42	16.78	17.69	17.43	12.94	14.32
MnO	0.03	0.06	0.05	0.03	0.08	0.05	0.05	0.13	0.17
MgO	13.01	13.94	11.41	12.43	13.92	13.38	13.32	16.75	15.06
CaO	0	0	0.02	0	0.05	0.03	0.02	0	0
Na <sub>2</sub> O	0	0.15	0.17	0.05	0	0	0	0	0.09
K <sub>2</sub> O	9.41	9.61	9.72	9.69	9.39	9.61	9.39	9.49	9.51
Total	96.32	96.08	93.48	93.68	96.34	96.47	96.13	96.21	96.16
Si <sup>4+</sup>	2.817	2.760	2.828	2.704	2.787	2.782	2.799	2.798	2.822
Ti <sup>4+</sup>	0.103	0.102	0.096	0.092	0.080	0.078	0.065	0.053	0.057
Al <sup>3+</sup>	1.544	1.571	1.591	1.682	1.529	1.525	1.535	1.523	1.533
Fe <sup>2+</sup>	1.048	0.993	1.053	1.061	1.048	1.110	1.092	0.791	0.882
Fe <sup>3+</sup>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mn <sup>2+</sup>	0.002	0.004	0.003	0.002	0.005	0.003	0.003	0.008	0.011
Mg <sup>2+</sup>	1.449	1.556	1.313	1.432	1.550	1.496	1.488	1.826	1.654
Ca <sup>2+</sup>	0.000	0.000	0.002	0.000	0.004	0.002	0.002	0.000	0.000
Na <sup>+</sup>	0.000	0.022	0.025	0.008	0.000	0.000	0.000	0.000	0.013
K <sup>+</sup>	0.897	0.918	0.957	0.955	0.895	0.920	0.897	0.885	0.894
Total	7.860	7.925	7.868	7.936	7.896	7.916	7.882	7.883	7.865
Al <sup>IV</sup>	1.183	1.240	1.172	1.296	1.213	1.219	1.201	1.202	1.178
Al <sup>VI</sup>	0.361	0.331	0.418	0.386	0.315	0.307	0.335	0.321	0.355
xMg	0.557	0.586	0.532	0.553	0.577	0.556	0.561	0.682	0.635

Note. \*m – rock matrix, c – contact with garnet, i – inclusions in garnet, hyphenated - the number of the garnet grain next to (or inside of which) biotite is located.

The formulas are designed for 7 cations (without K and Na) and 22 charges taking into account substitution  $M^{2+}+2OH^{-}\leftrightarrow Ti^{4+}+2O^{2-}$

Tab. S2b (continuation).

Sample	3640	3643	3643	3652	3652	3652	3652	TAN-5	TAN-5
Analysis	c	m	c	i-3	i-3	m	c-3	c	c
SiO <sub>2</sub>	37.84	37.06	36.89	37.55	38.14	37.12	36.83	37.75	35.18
TiO <sub>2</sub>	1.02	1.43	1.29	1.83	1.3	1.67	1.71	0.34	0.4
Al <sub>2</sub> O <sub>3</sub>	17.3	17.77	17.79	17.93	17.82	17.62	17.71	18.76	18.91

FeO	14.25	15.32	15.73	14.04	14.13	15.43	15.19	14.56	14.88
MnO	0.17	0.1	0	0	0	0	0	0.08	0.09
MgO	15.63	14.57	15.19	14.68	15.14	14.35	14.37	13.96	15.15
CaO	0	0	0	0	0.03	0	0	0	0.02
Na <sub>2</sub> O	0.26	0.13	0.19	0.28	0	0	0	0.22	0.19
K <sub>2</sub> O	9.31	9.47	9.14	9.83	9.64	9.68	10.1	10.26	8.64
Total	95.78	95.85	96.22	96.14	96.2	95.87	95.91	95.93	93.46
Si <sup>4+</sup>	2.801	2.766	2.729	2.784	2.810	2.776	2.759	2.792	2.652
Ti <sup>4+</sup>	0.057	0.080	0.072	0.102	0.072	0.094	0.096	0.019	0.023
Al <sup>3+</sup>	1.510	1.563	1.551	1.567	1.547	1.553	1.564	1.635	1.680
Fe <sup>2+</sup>	0.882	0.956	0.872	0.871	0.871	0.965	0.952	0.901	0.783
Fe <sup>3+</sup>	0.000	0.000	0.101	0.000	0.000	0.000	0.000	0.000	0.155
Mn <sup>2+</sup>	0.011	0.006	0.000	0.000	0.000	0.000	0.000	0.005	0.006
Mg <sup>2+</sup>	1.725	1.621	1.675	1.623	1.663	1.600	1.605	1.539	1.702
Ca <sup>2+</sup>	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.002
Na <sup>+</sup>	0.037	0.019	0.027	0.040	0.000	0.000	0.000	0.032	0.028
K <sup>+</sup>	0.879	0.902	0.863	0.930	0.906	0.923	0.965	0.968	0.831
Total	7.902	7.913	7.890	7.917	7.870	7.910	7.942	7.890	7.860
Al <sup>IV</sup>	1.199	1.234	1.271	1.216	1.191	1.225	1.241	1.208	1.348
Al <sup>VI</sup>	0.311	0.329	0.280	0.351	0.357	0.328	0.323	0.427	0.331
xMg	0.645	0.609	0.616	0.625	0.638	0.602	0.605	0.625	0.638

Tab. S2c. Representative compositions of plagioclases of the Korvatundra complex.

Sample	3633	3633	3633-1	3633-1	3633-1	3633-1	3633-1	3633-1	3633-d
Analysis *	c	r	c-1	r-1	c-2	r-2	c-3	c-4	c
SiO <sub>2</sub>	66.11	66	66.66	66.66	67.09	66.98	66.5	67.26	66.21
Al <sub>2</sub> O <sub>3</sub>	21.01	21.07	20.83	20.63	20.3	20.39	20.77	20.56	19.66
FeO	0	0.05	0.03	0.13	0.06	0	0.03	0.02	0.02
MnO	0	0	0	0	0	0	0	0	0
MgO	0	0	0	0	0	0	0	0	0
CaO	2.92	3.22	1.41	1.72	1.91	1.58	1.54	1.46	2.84
Na <sub>2</sub> O	9.35	9.19	10.62	10.53	10.34	10.66	10.75	10.78	10.44
K <sub>2</sub> O	0.07	0	0	0.02	0.03	0.03	0.03	0.05	0.06
Total	99.46	99.53	99.55	99.69	99.73	99.64	99.62	100.13	99.23
Si <sup>4+</sup>	2.912	2.907	2.931	2.931	2.946	2.943	2.926	2.941	2.936
Al <sup>3+</sup>	1.091	1.094	1.079	1.069	1.05	1.056	1.077	1.06	1.028
Fe <sup>2+</sup>	0	0.002	0.001	0.005	0.002	0	0.001	0.001	0.001
Mn <sup>2+</sup>	0	0	0	0	0	0	0	0	0
Mg <sup>2+</sup>	0	0	0	0	0	0	0	0	0
Ca <sup>2+</sup>	0.138	0.152	0.066	0.081	0.09	0.074	0.073	0.068	0.135
Na <sup>+</sup>	0.799	0.785	0.905	0.898	0.88	0.908	0.917	0.914	0.898
K <sup>+</sup>	0.004	0	0	0.001	0.002	0.002	0.002	0.003	0.003
Total	4.944	4.939	4.982	4.984	4.97	4.984	4.995	4.987	5.001
An	0.147	0.162	0.068	0.083	0.093	0.075	0.074	0.069	0.130
Ab	0.849	0.838	0.932	0.916	0.905	0.923	0.924	0.928	0.867
Or	0.004	0.000	0.000	0.001	0.002	0.002	0.002	0.003	0.003

Note. \*c – center of grain, r – grain edge, with a hyphen - grain number.  
The formulas are designed for 16 charges.

Tab. S2c (continuation).

Sample	3633-d	3640	3640	3643	3643	3652	3652	TAN-5	TAN-5
Analysis	r	c	r	c	r	c	r	c	r
SiO <sub>2</sub>	66.3	66.84	66.03	60.85	60.67	60.9	61.12	59.66	57.43
Al <sub>2</sub> O <sub>3</sub>	19.72	20.32	20.21	23.6	23.99	23.9	23.87	24.07	25.43
FeO	0.17	0.01	0.06	0	0	0	0.01	0.03	0.08
MnO	0	0	0.02	0	0	0	0	0.02	0
MgO	0	0	0	0	0	0.02	0	0	0
CaO	2.87	3.81	4.53	6.19	6.01	6.46	6.33	6.91	8.69
Na <sub>2</sub> O	10.54	8.62	8.58	8.92	8.98	8.46	8.45	7.47	6.94
K <sub>2</sub> O	0.05	0	0	0.09	0.08	0.1	0.11	0.1	0.06
Total	99.65	99.6	99.43	99.65	99.73	99.84	99.89	98.26	98.63
Si <sup>4+</sup>	2.932	2.937	2.918	2.723	2.712	2.718	2.724	2.702	2.611

Al <sup>3+</sup>	1.028	1.052	1.053	1.245	1.264	1.257	1.254	1.285	1.363
Fe <sup>2+</sup>	0.006	0	0.002	0	0	0	0	0.001	0.003
Mn <sup>2+</sup>	0	0	0.001	0	0	0	0	0.001	0
Mg <sup>2+</sup>	0	0	0	0	0	0.001	0	0	0
Ca <sup>2+</sup>	0.136	0.179	0.214	0.297	0.288	0.309	0.302	0.335	0.423
Na <sup>+</sup>	0.904	0.734	0.735	0.774	0.778	0.732	0.73	0.656	0.612
K <sup>+</sup>	0.003	0	0	0.005	0.005	0.006	0.006	0.006	0.003
Total	5.008	4.904	4.923	5.044	5.047	5.023	5.017	4.986	5.015
An	0.130	0.196	0.226	0.276	0.269	0.295	0.291	0.336	0.408
Ab	0.867	0.804	0.774	0.719	0.726	0.699	0.703	0.658	0.590
Or	0.003	0.000	0.000	0.005	0.005	0.006	0.006	0.006	0.003



Tab. S2d. Representative compositions of staurolites of the Korvatundra complex.

Sample	3633-d	3633-d	3643	3643
Analysis *	c	r	c	r
SiO <sub>2</sub>	34.87	35.14	33.56	33.62
TiO <sub>2</sub>	0.54	0.64	0.46	0.45
Al <sub>2</sub> O <sub>3</sub>	48.97	49.04	49.5	49.79
FeO	11.48	11.28	12.3	12.17
MnO	0.1	0.1	0.1	0.1
MgO	2.09	1.89	1.87	2.27
CaO	0.02	0	0	0
K <sub>2</sub> O	0	0	0.03	0
Total	98.07	98.09	97.82	98.4
Si <sup>4+</sup>	9.667	9.727	9.380	9.336
Ti <sup>4+</sup>	0.113	0.133	0.097	0.094
Al <sup>3+</sup>	16.000	15.999	16.306	16.296
Fe <sup>2+</sup>	2.662	2.611	2.875	2.826
Mn <sup>2+</sup>	0.024	0.023	0.024	0.024
Mg <sup>2+</sup>	0.864	0.780	0.779	0.940
Ca <sup>2+</sup>	0.006	0.000	0.000	0.000
K <sup>+</sup>	0.000	0.000	0.011	0.000
Total	29.334	29.274	29.472	29.516
f	0.750	0.765	0.782	0.746

Note. \*c – center of grain, r – grain edge.

Formulas are rated for 94 charges.

Tab. S2e. Representative compositions of muscovites of the Korvatundra complex.

Sample	3640	3643	3652
Analysis	-	-	-
SiO <sub>2</sub>	47.55	46.38	47.78
TiO <sub>2</sub>	0.24	0.31	0.64
Al <sub>2</sub> O <sub>3</sub>	33.56	33.21	35.13
FeO	2.98	3.8	3.14
MnO	0.02	0	0
MgO	0.59	0.79	1.13
Na <sub>2</sub> O	1.55	0.93	0.8
K <sub>2</sub> O	8.77	9.67	9.94
Total	95.26	95.09	98.56
Si <sup>4+</sup>	3.165	3.123	3.091
Ti <sup>4+</sup>	0.012	0.016	0.031
Al <sup>3+</sup>	2.632	2.636	2.678
Fe <sup>2+</sup>	0.166	0.214	0.17
Mn <sup>2+</sup>	0.001	0	0
Mg <sup>2+</sup>	0.059	0.079	0.109
Na <sup>+</sup>	0.2	0.121	0.1
K <sup>+</sup>	0.745	0.831	0.82
Total	6.979	7.02	6.999

Note. Formulas are rated for 22 charges.