

Appendix I. Microprobe analyses of clinopyroxene and calculated formulae (based on 6 oxygens)

Region Volcano or caldera	Momchilgrad-Arda region									
	Madzharovo volcano			Studen Kladenets volcano				Nano- vitsa	Hisar volcano	
				Svetoslav flow		Konevo				
SiO ₂	52.5	52.6	51.9	50.18	49.89	49.93	49.74	52.04	51.59	51.8
TiO ₂	0.40	0.10	0.12	0.29	0.39	0.28	0.14	0.18	0.29	0.18
Al ₂ O ₃	3.21	2.27	2.52	0.20	0.50	0.35	0.50	0.00	1.29	1.26
Fe ₂ O ₃	0.00	1.51	5.24	0.00	1.40	0.58	0.78	0.00	2.19	2.44
FeO	9.61	7.33	3.42	21.24	19.55	21.65	20.51	14.18	8.28	8.72
MnO	0.01	0.55	0.62	1.50	1.48	1.64	1.38	1.39	0.60	0.77
MgO	12.68	13.68	13.58	7.44	7.97	7.31	8.05	10.67	13.48	13.28
CaO	20.71	21.41	21.84	18.43	18.78	18.03	18.11	21.14	21.72	21.72
Na ₂ O	0.64	0.71	1.28	0.09	0.54	0.23	0.15	0.14	0.29	0.32
K ₂ O	0.24	0.00	0.00	0.10	0.21	0.11	0.00	0.18	0.00	0.00
Total	100.00	100.16	100.53	99.47	100.71	100.11	99.37	99.92	99.73	100.48
Si	1.958	1.952	1.915	1.991	1.942	1.972	1.969	1.996	1.941	1.938
⁴ Al	0.042	0.048	0.085	0.009	0.023	0.016	0.023	0.000	0.057	0.056
⁴ Fe ⁺³	0.000	0.000	0.000	0.000	0.035	0.012	0.008	0.000	0.002	0.006
<i>T</i>	<i>2.000</i>	<i>2.000</i>	<i>2.000</i>	<i>2.000</i>	<i>2.000</i>	<i>2.000</i>	<i>2.000</i>	<i>1.996</i>	<i>2.000</i>	<i>2.000</i>
⁶ Al	0.099	0.051	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000
⁶ Fe ⁺³	0.000	0.042	0.146	0.000	0.006	0.005	0.016	0.000	0.060	0.063
Ti	0.011	0.003	0.003	0.009	0.011	0.008	0.004	0.005	0.008	0.005
Mg	0.705	0.757	0.747	0.440	0.463	0.430	0.475	0.610	0.756	0.741
Fe ²⁺	0.185	0.147	0.080	0.551	0.520	0.556	0.505	0.385	0.176	0.191
<i>M1</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>
Mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe ²⁺	0.115	0.080	0.026	0.154	0.117	0.159	0.174	0.070	0.084	0.082
Mn	0.000	0.017	0.019	0.050	0.049	0.055	0.046	0.045	0.019	0.024
Ca	0.827	0.851	0.863	0.784	0.783	0.763	0.768	0.869	0.875	0.871
Na	0.046	0.051	0.092	0.007	0.041	0.018	0.012	0.010	0.021	0.023
K	0.011	0.000	0.000	0.005	0.010	0.006	0.000	0.009	0.000	0.000
<i>M2</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.000</i>	<i>1.004</i>	<i>1.000</i>	<i>1.000</i>
Wo	45.2	44.9	45.9	39.6	40.4	38.8	38.7	43.9	44.4	44.2
En	38.5	39.9	39.7	22.2	23.9	21.9	23.9	30.8	38.4	37.6
Fs	16.4	15.1	14.4	38.2	35.7	39.4	37.3	25.3	17.2	18.3
Mg [#]	0.70	0.77	0.88	0.38	0.42	0.38	0.41	0.57	0.74	0.73

Note: the data of the Sheinovets caldera clinopyroxenes used in the paper are published in Ivanova (2006); Fe₂O₃ recalculated using the program of Nimis

Appendix I (continued)

Region	Borovitsa region									
Volcano or caldera	Borovitsa caldera (stages)							extracaldera domes		Tatarevo
	1 st	2 nd	4 th	5 th (Yailadere dome)			Gradishte			
SiO ₂	52.5	51.81	46.51	52.29	52.1	52.11	52.16	53.35	53.42	52.47
TiO ₂	0.40	0.00	0.22	0.04	0.15	0.00	0.00	0.00	0.00	0.24
Al ₂ O ₃	3.21	3.01	7.82	1.66	1.85	1.39	1.87	0.00	0.00	0.76
Fe ₂ O ₃	0.00	0.00	4.40	0.00	1.01	2.09	0.98	0.00	0.00	1.66
FeO	8.65	8.87	5.53	9.01	7.30	7.21	8.34	9.01	8.95	6.88
MnO	0.01	0.54	0.69	0.66	0.63	0.68	0.68	0.79	0.69	1.03
MgO	12.68	12.17	11.53	12.78	13.69	12.64	12.63	13.99	13.7	13.67
CaO	20.71	22.04	22.66	23.31	23.08	23.53	23.24	22.82	23.26	22.71
Na ₂ O	0.64	0.52	0.00	0.00	0.08	0.34	0.19	0.00	0.00	0.37
K ₂ O	0.24	0.00	0.00	0.24	0.20	0.21	0.23	0.07	0.00	0.02
Total	99.04	98.96	99.36	99.99	100.09	100.20	100.32	100.03	100.02	99.82
Si	1.972	1.955	1.757	1.960	1.941	1.950	1.949	1.995	2.000	1.964
^{IV} Al	0.028	0.045	0.243	0.040	0.059	0.050	0.051	0.000	0.000	0.034
^{IV} 4Fe ⁺³	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
<i>T</i>	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.995	2.000	2.000
^{VI} Al	0.115	0.089	0.105	0.034	0.023	0.011	0.032	0.000	0.000	0.000
^{VI} Fe ⁺³	0.000	0.000	0.125	0.000	0.028	0.059	0.027	0.000	0.000	0.044
Ti	0.011	0.000	0.006	0.001	0.004	0.000	0.000	0.000	0.000	0.007
Mg	0.710	0.685	0.649	0.714	0.761	0.705	0.704	0.780	0.765	0.763
Fe ²⁺	0.164	0.226	0.114	0.251	0.184	0.225	0.237	0.220	0.235	0.186
<i>M1</i>	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe ²⁺	0.108	0.054	0.061	0.031	0.043	0.001	0.023	0.062	0.045	0.029
Mn	0.000	0.017	0.022	0.021	0.020	0.022	0.022	0.025	0.022	0.033
Ca	0.834	0.891	0.917	0.936	0.921	0.943	0.930	0.914	0.933	0.911
Na	0.047	0.038	0.000	0.000	0.006	0.025	0.014	0.000	0.000	0.027
K	0.012	0.000	0.000	0.011	0.010	0.010	0.011	0.003	0.000	0.001
<i>M2</i>	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.005	1.000	1.000
Wo	45.9	47.6	48.6	47.9	47.1	48.3	47.9	45.7	46.7	46.3
En	39.1	36.6	34.4	36.6	38.8	36.1	36.2	39.0	38.2	38.8
Fs	15.0	15.9	17.0	15.5	14.1	15.7	15.9	15.3	15.1	14.9
Mg [#]	0.72	0.71	0.79	0.72	0.77	0.76	0.73	0.73	0.73	0.78

Appendix II. Microprobe analyses of amphibole and calculated formulae (based on 23 oxygens)

Region	Momchilgrad-Arda region								
	Lozen volcano			Sheinovets caldera*			S. Kladdenets**	Mishevsko dome	
SiO ₂	45.66	46.4	47.3	47.1	46.62	43.36	43.89	42.73	42.9
TiO ₂	1.33	1.13	1.27	1.16	1.39	2.38	3.80	1.05	0.79
Al ₂ O ₃	7.22	7.21	6.72	6.8	6.75	11.01	11.39	12.32	14.28
FeO	13.62	13.51	13.83	14.32	13.92	14.2	13.22	14.61	15.81
MnO	0.89	0.64	0.94	0.93	0.86	0.86	0.30	0.31	0.70
MgO	13.35	14.1	13.19	13.24	13.4	11.83	13.52	11.52	11.11
CaO	11.44	11.75	11.27	11.51	11.28	11.74	11.65	11.07	10.89
Na ₂ O	1.55	1.50	1.35	1.32	1.29	2.04	2.28	1.73	1.82
K ₂ O	0.78	0.73	0.67	0.75	0.58	0.84	0.06	0.35	0.53
Total	95.84	96.97	96.54	97.13	96.09	98.26	100.11	95.69	98.83
Si	6.846	6.843	7.013	6.964	6.940	6.405	6.271	6.386	6.218
^{IV} Al	1.154	1.157	0.987	1.036	1.060	1.595	1.729	1.614	1.782
^{IV} Ti	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<i>T cations</i>	<i>8.000</i>	<i>8.000</i>	<i>8.000</i>	<i>8.000</i>	<i>8.000</i>	<i>8.000</i>	<i>8.000</i>	<i>8.000</i>	<i>8.000</i>
^{VI} Al	0.122	0.096	0.187	0.149	0.124	0.321	0.190	0.557	0.657
Fe ³⁺	0.306	0.397	0.268	0.298	0.356	0.183	0.326	0.494	0.672
^{VI} Ti	0.150	0.125	0.142	0.129	0.156	0.264	0.408	0.118	0.086
Mg	2.983	3.099	2.915	2.918	2.973	2.605	2.880	2.566	2.400
Fe ²⁺	1.402	1.269	1.447	1.473	1.376	1.571	1.197	1.264	1.185
Mn	0.037	0.013	0.041	0.034	0.014	0.056	0.000	0.000	0.000
<i>C cations</i>	<i>5.000</i>	<i>5.000</i>	<i>5.000</i>	<i>5.000</i>	<i>5.000</i>	<i>5.000</i>	<i>5.000</i>	<i>5.000</i>	<i>5.000</i>
Fe ²⁺	0.000	0.000	0.000	0.000	0.000	0.000	0.057	0.067	0.059
Mn	0.076	0.067	0.077	0.083	0.094	0.052	0.036	0.039	0.086
Ca	1.838	1.857	1.790	1.823	1.799	1.858	1.784	1.773	1.691
Na	0.086	0.076	0.133	0.094	0.107	0.090	0.123	0.121	0.164
<i>B cations</i>	<i>2.000</i>	<i>2.000</i>	<i>2.000</i>	<i>2.000</i>	<i>2.000</i>	<i>2.000</i>	<i>2.000</i>	<i>2.000</i>	<i>2.000</i>
Na	0.364	0.352	0.255	0.284	0.265	0.494	0.509	0.380	0.348
K	0.149	0.137	0.127	0.141	0.110	0.158	0.011	0.067	0.098
<i>A cations</i>	<i>0.513</i>	<i>0.490</i>	<i>0.382</i>	<i>0.426</i>	<i>0.375</i>	<i>0.652</i>	<i>0.520</i>	<i>0.447</i>	<i>0.446</i>
Name	edenite		Mg-hornblende		pargas.	Mg-hast.	tschermakite***		
Mg [#]	0.68	0.71	0.67	0.66	0.68	0.62	0.70	0.66	0.66

*the other data used in the paper are taken from Ivanova (2006); **Konevo flow; ***xenocrysts

Appendix II (continued)

Region	Borovitsa region									
Volcano or dome	Borovitsa caldera (stage)									
	2 nd ****									4 th
SiO ₂	47.35	49.03	47.83	48.22	47.35	47.53	45.33	45.51	46.25	47.27
TiO ₂	0.97	1.25	1.24	1.14	1.41	1.50	1.22	1.30	1.11	1.02
Al ₂ O ₃	5.71	5.63	6.13	5.80	6.68	6.57	5.51	6.31	5.26	7.31
FeO	14.02	13.9	15.08	14.73	14.26	15.42	14.68	14.61	14.16	14.75
MnO	0.77	1.08	1.31	1.17	0.80	0.83	1.09	0.84	1.20	0.71
MgO	13.72	16.72	16.35	16.61	15.84	15.75	13.34	13.2	13.42	13.35
CaO	11.92	13.03	13.3	13.07	13.29	13.29	11.94	11.75	11.98	12.24
Na ₂ O	2.34	1.54	1.65	1.72	1.87	1.72	2.02	2.52	1.86	1.00
K ₂ O	0.70	0.55	0.59	0.67	0.69	0.71	0.79	0.80	0.68	0.77
Total	97.5	102.73	103.48	103.13	102.19	103.32	95.92	96.84	95.92	98.42
Si	7.035	6.869	6.729	6.799	6.702	6.680	6.909	6.874	7.017	6.889
^{IV} Al	0.965	0.930	1.016	0.964	1.114	1.088	0.990	1.123	0.941	1.111
^{IV} Ti	0.000	0.132	0.131	0.121	0.150	0.159	0.101	0.003	0.042	0.000
<i>T cations</i>	8.000	7.798	7.745	7.763	7.817	7.769	7.899	7.997	7.958	8.000
^{VI} Al	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.144
Fe ³⁺	0.071	0.286	0.229	0.156	0.327	0.360	0.097	0.000	0.056	0.412
^{VI} Ti	0.108	0.000	0.000	0.000	0.000	0.000	0.039	0.145	0.085	0.112
Mg	3.038	3.491	3.428	3.491	3.342	3.300	3.031	2.972	3.035	2.900
Fe ²⁺	1.670	1.223	1.343	1.353	1.331	1.341	1.774	1.845	1.741	1.385
Mn	0.077	0.000	0.000	0.000	0.000	0.000	0.059	0.038	0.083	0.046
<i>C cations</i>	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000
Fe ²⁺	0.000	0.120	0.202	0.228	0.030	0.112	0.000	0.000	0.000	0.000
Mn	0.020	0.128	0.156	0.140	0.096	0.099	0.082	0.069	0.071	0.041
Ca	1.897	1.956	2.005	1.974	2.015	2.001	1.950	1.901	1.948	1.911
Na	0.082	0.000	0.000	0.000	0.000	0.000	0.000	0.029	0.000	0.047
<i>B cations</i>	2.000	2.204	2.363	2.342	2.141	2.212	2.032	2.000	2.018	2.000
Na	0.592	0.418	0.450	0.470	0.513	0.469	0.597	0.709	0.547	0.235
K	0.133	0.098	0.106	0.121	0.125	0.127	0.154	0.154	0.132	0.143
<i>A cations</i>	0.724	0.517	0.556	0.591	0.638	0.596	0.751	0.863	0.679	0.378
Name	edenite									Mg-hornbl.
Mg [#]	0.65	0.72	0.69	0.69	0.71	0.69	0.63	0.62	0.64	0.68

**** some of them are not stoichiometric;

Appendix II (continued)

Region	Borovitsa region												
Stage or dome	Borovitsa caldera (stages)					extracaldera domes							
	5 th					Gradishte			Ch. Kamak	Tatarevo (Hisar dome)			
SiO ₂	47.46	45.93	48.09	48.12	48.28	47.53	46.6	47.9	47.00	48.19	47.20	46.85	46.16
TiO ₂	1.15	1.15	0.99	0.97	1.00	0.61	0.58	0.91	0.94	1.06	1.25	1.33	1.42
Al ₂ O ₃	6.54	6.66	5.66	4.85	4.92	5.02	5.92	6.57	6.60	6.75	6.42	6.34	7.10
FeO	14.38	13.77	13.48	12.70	13.29	14.66	13.42	14.01	14.17	14.14	14.11	13.32	14.34
MnO	0.70	0.61	0.93	1.20	1.65	0.77	0.69	0.35	0.50	0.95	0.63	0.54	0.51
MgO	13.93	13.61	14.26	14.81	14.83	14.05	14.83	13.48	13.47	13.05	13.84	13.92	13.28
CaO	11.5	11.45	11.46	11.06	10.51	11.67	11.82	11.57	11.9	11.79	11.46	11.5	11.64
Na ₂ O	1.29	1.42	1.38	1.33	1.26	0.00	1.16	1.38	1.42	0.00	1.21	1.24	1.45
K ₂ O	0.74	0.84	0.63	0.45	0.49	1.01	0.67	0.91	0.76	0.62	0.69	0.77	0.85
Total	97.69	95.44	96.88	95.49	96.23	95.32	95.69	97.08	96.76	96.55	96.81	95.81	96.75
Si	6.949	6.905	7.087	7.180	7.167	7.113	6.954	7.070	6.983	7.111	6.967	6.988	6.869
^{IV} Al	1.051	1.095	0.913	0.820	0.833	0.885	1.041	0.930	1.017	0.889	1.033	1.012	1.131
^{IV} Ti	0.000	0.000	0.000	0.000	0.000	0.002	0.005	0.000	0.000	0.000	0.000	0.000	0.000
<i>T cations</i>	8.000	8.000	8.000	8.000	8.000	7.998	7.995	8.000	8.000	8.000	8.000	8.000	8.000
^{VI} Al	0.077	0.084	0.070	0.033	0.027	0.000	0.000	0.213	0.138	0.285	0.084	0.102	0.114
Fe ³⁺	0.425	0.342	0.314	0.221	0.229	0.552	0.439	0.184	0.229	0.253	0.396	0.279	0.273
^{VI} Ti	0.127	0.130	0.110	0.109	0.112	0.067	0.060	0.101	0.105	0.118	0.139	0.149	0.159
Mg	3.040	3.050	3.132	3.294	3.281	3.134	3.298	2.966	2.983	2.870	3.045	3.095	2.946
Fe ²⁺	1.331	1.389	1.347	1.344	1.350	1.248	1.203	1.536	1.531	1.475	1.337	1.374	1.508
Mn	0.000	0.005	0.027	0.000	0.000	0.000	0.000	0.000	0.014	0.000	0.000	0.000	0.000
<i>C cations</i>	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000
Fe ²⁺	0.005	0.000	0.000	0.020	0.070	0.035	0.033	0.009	0.000	0.017	0.009	0.008	0.003
Mn	0.087	0.073	0.089	0.152	0.207	0.098	0.087	0.044	0.049	0.119	0.079	0.068	0.064
Ca	1.804	1.844	1.809	1.768	1.671	1.871	1.890	1.830	1.894	1.864	1.812	1.838	1.856
Na	0.104	0.083	0.101	0.061	0.051	0.000	0.000	0.118	0.057	0.000	0.100	0.086	0.077
<i>B cations</i>	2.000	2.000	2.000	2.000	2.000	2.004	2.010	2.000	2.000	2.000	2.000	2.000	2.000
Na	0.262	0.331	0.293	0.324	0.312	0.000	0.336	0.277	0.353	0.000	0.246	0.272	0.341
K	0.138	0.161	0.118	0.086	0.093	0.193	0.128	0.171	0.144	0.117	0.130	0.147	0.161
<i>A cations</i>	0.400	0.492	0.411	0.410	0.404	0.193	0.463	0.448	0.497	0.117	0.376	0.419	0.503
Name	Mg-hornblende											edenite	
Mg [#]	0.69	0.69	0.70	0.71	0.70	0.71	0.73	0.66	0.66	0.66	0.69	0.69	0.66

Appendix III. Selected microprobe analyses of biotite from the Momchilgrad-Arda region and calculated formulae (based on 22 oxygens)

Volcano or caldera	Lozen volcano					Sheinovets caldera						St. Marina dome		Madhzarovo volcano	
	1 st stage		2 nd stage												
SiO ₂	37.02	37.04	35.67	35.68	35.84	36.91	36.95	36.77	38.15	36.26	36.73	38.94	36.41	35.77	36.82
TiO ₂	4.03	4.55	5.00	4.08	4.34	3.94	4.45	4.55	4.52	4.35	4.54	4.09	4.26	5.27	5.28
Al ₂ O ₃	13.18	13.47	14.13	13.45	13.78	13.86	13.07	13.42	13.16	16.30	15.01	13.22	13.60	15.02	14.38
FeO	16.23	16.55	17.31	17.41	18.01	17.33	16.58	16.32	14.91	14.65	14.81	15.91	17.20	16.13	16.38
MnO	0.40	0.41	0.52	0.56	0.57	0.60	0.43	0.46	0.40	0.46	0.46	0.59	0.67	0.29	0.38
MgO	13.15	13.26	12.86	12.11	12.63	13.02	13.56	13.06	13.44	12.59	13.47	12.33	13.86	12.97	12.35
CaO	0.11	0.08	0.08	0.16	0.03	0.03	0.00	0.13	0.09	0.01	0.00	0.00	0.00	0.08	0.22
Na ₂ O	0.46	0.34	0.42	0.33	0.32	0.47	0.43	0.58	0.51	0.56	0.55	0.42	0.76	1.24	0.23
K ₂ O	8.51	8.93	8.50	8.28	8.94	8.83	8.92	8.48	8.59	8.24	8.72	8.83	8.92	9.00	8.91
BaO	0.33	0.66	1.07	0.50	0.48	0.55	0.20	0.47	0.37	0.84	0.26	0.39	0.50	n.d.	n.d.
F	0.27	0.09	0.13	0.10	0.11	0.51	0.11	0.26	0.21	0.31	0.35	n.d.	n.d.	n.d.	n.d.
Total	93.69	95.38	95.69	92.66	95.05	96.05	94.70	94.50	94.35	94.57	94.90	94.72	96.18	95.77	94.95
Si	5.695	5.619	5.441	5.595	5.508	5.602	5.643	5.622	5.773	5.487	5.541	5.878	5.506	5.387	5.566
^{IV} Al	2.305	2.381	2.540	2.405	2.492	2.398	2.348	2.378	2.227	2.513	2.459	2.122	2.424	2.613	2.434
^{IV} Fe ²⁺	0.000	0.000	0.019	0.000	0.000	0.000	0.009	0.000	0.000	0.000	0.000	0.000	0.070	0.000	0.000
^{VI} Al	0.084	0.026	0.000	0.080	0.004	0.080	0.000	0.040	0.119	0.393	0.209	0.229	0.000	0.052	0.127
Ti	0.466	0.519	0.573	0.481	0.501	0.449	0.510	0.523	0.514	0.495	0.515	0.464	0.484	0.597	0.600
Fe ²⁺	2.087	2.099	2.188	2.282	2.314	2.198	2.104	2.086	1.886	1.853	1.867	2.007	2.104	2.031	2.070
Mn	0.052	0.053	0.067	0.074	0.074	0.077	0.056	0.060	0.051	0.059	0.059	0.075	0.086	0.037	0.049
Mg	3.013	2.996	2.922	2.829	2.892	2.943	3.080	2.975	3.029	2.838	3.027	2.772	3.122	2.910	2.781
Y	5.702	5.693	5.750	5.746	5.785	5.747	5.750	5.684	5.599	5.638	5.677	5.547	5.796	5.627	5.627
Ca	0.018	0.013	0.013	0.027	0.005	0.005	0.000	0.021	0.015	0.002	0.000	0.000	0.000	0.013	0.036
Na	0.137	0.100	0.124	0.100	0.095	0.138	0.127	0.172	0.150	0.164	0.161	0.123	0.223	0.362	0.067
K	1.669	1.727	1.653	1.656	1.752	1.709	1.734	1.653	1.657	1.590	1.677	1.700	1.720	1.728	1.717
Ba	0.020	0.039	0.064	0.031	0.029	0.033	0.012	0.028	0.022	0.050	0.015	0.023	0.030	n.d.	n.d.
Z	1.844	1.879	1.854	1.814	1.881	1.885	1.873	1.874	1.844	1.806	1.853	1.846	1.973	2.103	1.820
F	0.131	0.043	0.063	0.050	0.053	0.245	0.006	0.126	0.100	0.148	0.167	n.d.	n.d.	n.d.	n.d.
Mg [#]	0.59	0.59	0.57	0.55	0.56	0.57	0.59	0.59	0.62	0.60	0.62	0.58	0.59	0.59	0.57

Appendix III (continued)

Volcano or caldera	Silen volcano		Studen Kladenets			Geren domes			St.Iliya volcano	Nano-vitsa	Dambalak volcano			Perperek volcano	
			Konevo	Svetoslav flow											
SiO ₂	36.43	36.43	33.23	33.34	33.58	36.36	35.50	37.10	35.27	37.92	35.22	35.18	35.76	34.81	35.67
TiO ₂	3.87	4.19	5.22	5.63	5.51	4.58	3.89	4.32	4.45	3.10	5.59	4.28	4.93	5.09	5.62
Al ₂ O ₃	12.68	12.55	12.82	12.72	13.01	14.27	12.19	13.97	13.09	17.05	13.96	14.63	14.44	13.28	13.42
FeO	17.79	18.13	26.13	22.02	22.48	17.43	19.07	15.26	19.48	17.14	22.05	18.95	19.07	23.69	23.67
MnO	2.07	2.01	0.48	0.62	0.03	0.81	0.68	0.87	0.44	0.22	0.47	0.35	0.50	0.39	0.37
MgO	13.56	13.65	6.51	7.86	7.78	12.38	13.97	14.10	8.48	12.63	10.12	11.17	11.49	8.57	8.80
CaO	0.00	0.00	0.00	0.02	0.09	0.07	0.11	0.01	0.26	0.28	0.00	0.17	0.00	0.00	0.01
Na ₂ O	0.00	0.00	0.59	0.64	0.70	0.41	0.42	0.44	0.52	0.00	0.63	0.65	0.60	0.57	0.57
K ₂ O	9.95	10.39	9.18	7.78	7.82	9.32	9.26	8.96	8.05	8.01	9.02	8.26	8.65	9.22	9.07
BaO	n.d.	n.d.	0.11	0.31	0.00	n.d.	n.d.	0.23	0.52	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
F	n.d.	n.d.	0.31	n.d.	n.d.	0.36	0.00	0.99	0.28	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Total	96.35	97.35	94.58	90.94	91.00	95.99	95.09	96.25	90.84	96.35	97.06	93.64	95.44	95.62	97.20
Si	5.556	5.521	5.400	5.474	5.488	5.519	5.494	5.586	5.715	5.585	5.389	5.469	5.462	5.467	5.485
^{IV} Al	2.279	2.241	2.455	2.461	2.506	2.481	2.223	2.414	2.285	2.415	2.517	2.531	2.538	2.458	2.432
^{IV} Fe ²⁺	0.165	0.238	0.145	0.065	0.006	0.000	0.283	0.000	0.000	0.000	0.094	0.000	0.000	0.075	0.083
^{VI} Al	0.000	0.000	0.000	0.000	0.000	0.071	0.000	0.064	0.214	0.544	0.000	0.150	0.061	0.000	0.000
Ti	0.444	0.477	0.638	0.695	0.677	0.523	0.453	0.489	0.542	0.343	0.643	0.500	0.566	0.601	0.650
Fe ²⁺	2.103	2.059	3.404	2.957	3.065	2.212	2.184	1.921	2.638	2.110	2.726	2.463	2.435	3.035	2.959
Mn	0.267	0.258	0.066	0.086	0.004	0.104	0.089	0.111	0.060	0.027	0.061	0.046	0.065	0.052	0.048
Mg	3.080	3.082	1.576	1.922	1.894	2.799	3.221	3.162	2.047	2.771	2.307	2.587	2.614	2.005	2.016
Y	5.894	5.876	5.684	5.660	5.640	5.709	5.947	5.747	5.501	5.795	5.737	5.746	5.741	5.693	5.673
Ca	0.000	0.000	0.000	0.004	0.016	0.011	0.018	0.002	0.045	0.044	0.000	0.028	0.000	0.000	0.002
Na	0.000	0.000	0.186	0.204	0.222	0.121	0.126	0.128	0.163	0.000	0.187	0.196	0.178	0.174	0.170
K	1.935	2.008	1.912	1.629	1.630	1.804	1.827	1.720	1.663	1.504	1.720	1.638	1.685	1.847	1.779
Ba	n.d.	n.d.	0.007	0.020	0.000	n.d.	n.d.	0.014	0.033	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Z	1.935	2.008	2.105	1.857	1.868	1.936	1.971	1.864	1.904	1.548	1.907	1.862	1.863	2.021	1.951
F	n.d.	n.d.	0.159	n.d.	n.d.	0.173	0.000	0.562	0.143	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Mg [#]	0.58	0.57	0.31	0.39	0.38	0.56	0.57	0.62	0.44	0.57	0.45	0.51	0.52	0.39	0.40

Appendix III (continued)

Volcano or caldera	Hisar volcano	Ustren domes area					Zli Vrah volcano				
		(Chupenata Planina dome)									
SiO ₂	36.33	37.50	37.30	37.68	36.38	36.05	37.32	37.89	37.02	37.35	
TiO ₂	6.17	3.55	3.43	4.40	4.28	4.41	3.44	3.17	3.37	3.66	
Al ₂ O ₃	14.39	12.77	12.65	13.04	13.41	13.96	13.15	13.25	15.36	12.45	
FeO	16.41	14.25	15.70	16.87	16.65	16.47	16.15	15.13	15.44	17.05	
MnO	0.18	1.75	1.70	0.55	0.45	0.29	1.67	1.74	1.43	1.69	
MgO	13.70	13.37	13.67	14.21	13.67	12.78	13.65	13.43	13.15	13.74	
CaO	0.03	0.04	0.07	0.04	0.00	0.10	0.06	0.02	0.35	1.03	
Na ₂ O	0.73	0.53	0.51	0.44	0.49	0.31	0.37	0.47	0.45	0.45	
K ₂ O	8.82	8.94	9.28	9.49	9.67	8.27	9.49	9.10	8.03	8.49	
BaO	1.04	0.19	0.00	0.27	0.59	0.51	0.00	0.00	0.26	0.00	
F	0.32	0.65	0.51	0.57	0.36	0.30	0.53	1.34	n.d.	n.d.	
Total	98.12	93.54	94.82	97.56	95.95	93.45	95.83	95.54	94.86	95.91	
Si	5.385	5.788	5.717	5.625	5.542	5.572	5.671	5.774	5.579	5.655	
^{IV} Al	2.513	2.212	2.283	2.294	2.407	2.428	2.329	2.226	2.421	2.221	
^{IV} Fe ²⁺	0.102	0.000	0.000	0.081	0.051	0.000	0.000	0.000	0.000	0.124	
^{VI} Al	0.000	0.110	0.002	0.000	0.000	0.115	0.026	0.153	0.306	0.000	
Ti	0.687	0.412	0.395	0.494	0.490	0.512	0.393	0.363	0.382	0.417	
Fe ²⁺	1.932	1.838	2.012	2.024	2.069	2.128	2.051	1.927	1.945	2.034	
Mn	0.023	0.229	0.221	0.070	0.058	0.038	0.215	0.224	0.182	0.217	
Mg	3.025	3.074	3.121	3.160	3.102	2.942	3.090	3.049	2.952	3.099	
Y	5.667	5.663	5.751	5.748	5.719	5.735	5.775	5.716	5.767	5.767	
Ca	0.005	0.077	0.011	0.006	0.000	0.017	0.010	0.003	0.056	0.167	
Na	0.210	0.159	0.152	0.127	0.145	0.093	0.109	0.139	0.131	0.132	
K	1.667	1.759	1.814	1.806	1.878	1.630	1.839	1.768	1.543	1.639	
Ba	0.060	0.011	0.000	0.016	0.035	0.031	0.000	0.000	0.015	0.000	
Z	1.942	2.006	1.977	1.955	2.058	1.771	1.958	1.910	1.745	1.938	
F	0.150	0.317	0.247	0.269	0.173	0.147	0.303	0.771	n.d.	n.d.	
Mg [#]	0.60	0.63	0.61	0.60	0.59	0.58	0.60	0.61	0.60	0.59	

Appendix IV. Selected microprobe analyses of biotite from the Borovitsa region and calculated formulae (based on 22 oxygens)

Caldera Stage	Borovitsa caldera (stages)															
	1 st				2 nd						4 th					
SiO ₂	35.68	35.19	36.36	37.39	37.68	36.05	36.38	41.76	36.97	35.99	37.83	36.52	37.46	36.55	40.69	37.60
TiO ₂	4.25	7.06	4.58	4.64	4.40	4.41	4.28	4.09	4.39	3.62	4.93	3.88	4.35	5.08	4.59	4.18
Al ₂ O ₃	13.76	13.78	14.11	14.4	13.04	13.96	13.41	12.43	13.35	13.17	14.53	13.50	13.50	14.59	12.79	14.24
FeO	16.12	15.92	15.03	16.29	16.87	16.47	16.65	14.84	16.49	17.20	15.19	17.01	16.29	15.90	14.66	17.39
MnO	0.57	0.37	0.48	0.33	0.55	0.29	0.45	0.49	0.68	0.55	0.57	0.48	0.39	0.57	1.15	0.67
MgO	13.95	12.38	13.97	14.42	14.21	12.78	13.67	13.08	13.71	13.67	12.98	13.56	14.12	11.89	11.99	13.68
CaO	0.09	0.09	0.06	0.80	0.04	0.10	0.00	0.06	0.00	0.05	0.22	0.04	0.31	0.14	0.22	0.11
Na ₂ O	0.54	0.41	0.57	1.04	0.44	0.31	0.49	0.43	0.41	0.46	0.39	0.36	0.49	0.40	0.24	0.11
K ₂ O	8.96	8.12	9.06	8.92	9.49	8.27	9.67	7.90	8.89	9.21	7.53	9.25	9.35	8.00	7.76	9.38
BaO	1.14	1.77	0.70	n.d.	0.27	0.51	0.59	0.33	0.60	0.63	0.27	0.14	0.11	0.81	0.00	n.d.
F	0.42	0.29	0.75	n.d.	0.48	0.25	0.3	0.25	n.d.	n.d.	0.69	0.32	0.30	0.10	0.26	n.d.
Total	95.48	95.38	95.67	98.23	97.47	93.40	95.89	95.66	95.49	94.55	95.13	95.06	96.67	94.03	94.35	97.36
Si	5.467	5.385	5.517	5.479	5.625	5.572	5.542	6.142	5.601	5.555	5.670	5.583	5.602	5.585	6.074	5.576
^{IV} Al	2.484	2.485	2.483	2.486	2.294	2.428	2.407	1.858	2.383	2.395	2.330	2.417	2.379	2.415	1.926	2.424
^{IV} Fe ²⁺	0.049	0.131	0.000	0.035	0.082	0.000	0.052	0.000	0.016	0.049	0.000	0.000	0.019	0.000	0.000	0.000
^{VI} Al	0.000	0.000	0.040	0.000	0.000	0.115	0.000	0.296	0.000	0.000	0.236	0.015	0.000	0.213	0.323	0.065
Ti	0.489	0.812	0.522	0.511	0.494	0.512	0.490	0.452	0.500	0.420	0.555	0.446	0.489	0.584	0.515	0.466
^{VI} Fe ²⁺	2.016	1.906	1.906	1.961	2.023	2.128	2.068	1.824	2.072	2.170	1.903	2.174	2.017	2.031	1.829	2.156
Mn	0.074	0.048	0.062	0.041	0.070	0.038	0.058	0.061	0.087	0.072	0.072	0.062	0.049	0.074	0.145	0.084
Mg	3.184	2.822	3.158	3.148	3.160	2.942	3.102	2.865	3.094	3.143	2.898	3.088	3.145	2.707	2.666	3.022
Y	5.763	5.587	5.688	5.660	5.746	5.735	5.718	5.499	5.753	5.805	5.664	5.785	5.701	5.607	5.478	5.793
Ca	0.015	0.015	0.010	0.126	0.006	0.017	0.000	0.009	0.000	0.008	0.035	0.007	0.050	0.023	0.035	0.017
Na	0.160	0.122	0.168	0.295	0.127	0.093	0.145	0.123	0.120	0.138	0.113	0.107	0.142	0.118	0.069	0.032
K	1.751	1.584	1.753	1.667	1.806	1.630	1.878	1.482	1.717	1.813	1.439	1.803	1.783	1.559	1.477	1.774
Ba	0.068	0.106	0.042	n.d.	0.016	0.031	0.035	0.019	0.036	0.038	0.016	0.008	0.006	0.048	0.000	n.d.
Z	1.994	1.827	1.972	2.088	1.956	1.770	2.058	1.633	1.873	1.997	1.604	1.925	1.981	1.749	1.582	1.823
Mg [#]	0.61	0.58	0.62	0.61	0.60	0.58	0.59	0.61	0.60	0.59	0.60	0.59	0.61	0.57	0.59	0.58

Appendix IV (continued)

Stage or dome	Borovitsa caldera (stages)													
	5 th												6 th	
SiO ₂	37.23	36.52	39.45	36.52	36.52	39.45	36.53	37.42	37.69	38.99	36.09	36.52	34.66	34.59
TiO ₂	4.21	4.28	3.96	4.28	4.28	3.96	4.26	3.91	3.86	4.07	4.42	4.28	5.80	4.14
Al ₂ O ₃	13.32	13.12	13.28	13.12	13.12	13.28	13.21	13.29	13.29	13.16	13.66	13.12	14.26	13.25
FeO	17.34	16.56	17.28	16.56	16.56	17.28	16.77	16.77	16.26	16.71	17.09	16.56	18.43	15.75
MnO	0.39	0.24	0.52	0.24	0.24	0.52	0.52	0.56	0.27	0.51	0.36	0.24	0.49	1.00
MgO	13.64	12.82	14.07	12.82	12.82	14.07	13.74	13.93	13.55	13.22	13.59	12.82	13.08	14.47
CaO	0.01	0.07	0.02	0.07	0.07	0.02	0.31	0.12	0.04	0.05	0.00	0.07	n.d.	n.d.
Na ₂ O	0.61	0.37	0.58	0.37	0.37	0.58	0.51	0.39	0.47	0.28	0.43	0.37	0.00	0.00
K ₂ O	9.31	9.05	8.92	9.05	9.05	8.92	9.18	8.69	9.01	9.23	9.02	9.05	8.73	8.70
BaO	0.33	0.34	0.06	0.34	0.34	0.06	0.31	0.12	0.04	n.d.	n.d.	0.34	n.d.	n.d.
F	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.39	0.29	0.28	n.d.	n.d.	n.d.	n.d.	n.d.
Total	96.39	93.37	98.14	93.37	93.37	98.14	95.73	95.49	94.76	96.22	94.66	93.37	95.45	91.90
Si	5.605	5.652	5.768	5.652	5.652	5.768	5.560	5.656	5.721	5.809	5.515	5.652	5.291	5.438
^{IV} Al	2.363	2.348	2.232	2.348	2.348	2.232	2.369	2.344	2.279	2.191	2.460	2.348	2.565	2.455
^{IV} Fe ²⁺	0.033	0.000	0.000	0.000	0.000	0.000	0.071	0.000	0.000	0.000	0.025	0.000	0.144	0.107
^{VI} Al	0.000	0.045	0.056	0.045	0.045	0.056	0.000	0.023	0.098	0.119	0.000	0.045	0.000	0.000
Ti	0.476	0.498	0.435	0.498	0.498	0.435	0.487	0.444	0.440	0.456	0.508	0.498	0.666	0.489
^{VI} Fe ²⁺	2.149	2.142	2.112	2.142	2.142	2.112	2.063	2.119	2.063	2.081	2.157	2.142	2.208	1.962
Mn	0.050	0.031	0.064	0.031	0.031	0.064	0.067	0.072	0.035	0.064	0.047	0.031	0.063	0.133
Mg	3.059	2.956	3.064	2.956	2.956	3.064	3.115	3.136	3.064	2.934	3.093	2.956	2.974	3.389
Y	5.734	5.673	5.732	5.673	5.673	5.732	5.733	5.795	5.700	5.655	5.805	5.673	5.911	5.973
Ca	0.002	0.012	0.003	0.012	0.012	0.003	0.051	0.019	0.007	0.008	0.000	0.012	0.000	0.000
Na	0.178	0.111	0.164	0.111	0.111	0.164	0.150	0.114	0.138	0.081	0.127	0.111	0.000	0.000
K	1.787	1.786	1.663	1.786	1.786	1.663	1.782	1.675	1.744	1.754	1.758	1.786	1.699	1.744
Ba	0.019	0.021	0.003	0.021	0.021	0.003	0.018	0.007	0.002	n.d.	n.d.	0.021	n.d.	n.d.
Z	1.986	1.929	1.834	1.929	1.929	1.834	2.001	1.816	1.891	1.842	1.885	1.929	1.699	1.744
Mg [#]	0.58	0.58	0.59	0.58	0.58	0.59	0.59	0.60	0.60	0.59	0.59	0.58	0.56	0.62

Appendix IV (continued)

Stage or dome	Extracaldera domes							
	Tatarevo (Hisar dome)			Haykanska Chuka	Mineralni Bani		Gradishte	Chernia Kamak
SiO ₂	36.60	36.05	37.10	35.64	36.25	37.79	36.73	35.91
TiO ₂	4.20	4.33	4.64	3.76	4.16	3.24	4.50	4.60
Al ₂ O ₃	13.14	13.35	13.06	14.05	14.40	13.43	13.60	14.35
FeO	15.95	17.10	16.41	15.74	18.20	20.82	16.76	17.83
MnO	0.32	0.26	0.34	0.47	0.75	0.97	0.36	0.06
MgO	13.07	13.29	13.49	13.97	12.58	10.06	13.66	11.85
CaO	0.03	0.01	0.00	0.00	0.00	0.00	0.02	0.06
Na ₂ O	0.40	0.50	0.49	0.56	0.37	0.53	0.38	0.00
K ₂ O	8.63	8.92	8.64	8.43	9.32	9.08	9.11	8.67
BaO	0.36	0.60	0.41	1.07	n.d.	n.d.	0.25	n.d.
F	0.46	0.24	0.21	0.27	0.41	0.29	0.25	n.d.
Total	93.16	94.65	94.79	93.96	96.44	96.21	95.62	93.33
Si	5.675	5.549	5.648	5.504	5.496	5.785	5.564	5.552
^{IV} Al	2.325	2.421	2.343	2.496	2.504	2.215	2.428	2.448
^{IV} Fe ²⁺	0.000	0.030	0.009	0.000	0.000	0.000	0.008	0.000
^{VI} Al	0.076	0.000	0.000	0.060	0.069	0.208	0.000	0.166
Ti	0.490	0.501	0.531	0.436	0.474	0.373	0.512	0.535
^{VI} Fe ²⁺	2.067	2.170	2.080	2.032	2.307	2.664	2.114	2.304
Mn	0.042	0.034	0.044	0.061	0.096	0.126	0.046	0.008
Mg	3.019	3.047	3.059	3.213	2.841	2.294	3.083	2.729
Y	5.694	5.752	5.714	5.803	5.788	5.665	5.756	5.742
Ca	0.005	0.002	0.000	0.000	0.000	0.000	0.003	0.010
Na	0.120	0.149	0.145	0.168	0.109	0.157	0.112	0.000
K	1.706	1.751	1.677	1.660	1.802	1.773	1.760	1.709
Ba	0.022	0.036	0.024	0.065	n.d.	n.d.	0.015	n.d.
Z	1.853	1.938	1.846	1.892	1.911	1.930	1.889	1.719
Mg [#]	0.59	0.58	0.59	0.61	0.55	0.46	0.59	0.54

Appendix V. Selected microprobe analyses of plagioclase from the Momchilgrad-Arda region and calculated formulae (based on 8 oxygens)

Volcano or dome	Lozen (1 st stage)				Lozen (2 nd stage)	Sheinovets caldera						St. Marina		Madzharovo	
	c	r	c	r		c	r	c	r	c	r	c	r	c	r
SiO ₂	57.34	58.89	56.84	58.07	60.37	59.67	60.73	55.97	59.93	61.11	59.69	56.08	62.51	54.89	57.39
Al ₂ O ₃	25.86	25.21	26.00	25.17	24.97	23.73	24.02	27.22	23.99	23.51	23.72	28.01	23.94	28.15	26.67
FeO	0.00	0.00	0.18	0.32	0.15	0.24	0.26	0.20	0.20	0.16	0.25	0.31	0.07	0.51	0.54
CaO	9.14	8.14	9.50	8.67	6.32	6.33	6.25	10.80	6.37	5.68	6.25	9.69	4.58	9.93	7.90
Na ₂ O	7.03	7.05	6.91	7.07	7.52	7.16	7.20	5.38	7.01	6.56	6.92	5.08	7.76	5.19	6.62
K ₂ O	0.64	0.38	0.58	0.70	0.73	0.76	0.78	0.37	0.77	1.74	0.70	0.33	0.82	0.54	0.79
BaO	n.d.	n.d.	n.d.	n.d.	0.04	0.04	0.06	0.07	0.02	0.00	0.04	0.23	0.09	0.36	n.d.
Total	100.0	99.67	100.0	100.0	100.1	97.93	99.30	100.0	98.29	98.76	97.57	99.73	99.77	99.57	99.91
Si	2.586	2.644	2.568	2.616	2.689	2.715	2.723	2.525	2.714	2.754	2.721	2.526	2.772	2.491	2.580
Al	1.374	1.334	1.384	1.336	1.311	1.273	1.269	1.447	1.281	1.249	1.275	1.487	1.251	1.506	1.413
Fe	0.000	0.000	0.006	0.011	0.005	0.008	0.009	0.007	0.007	0.005	0.009	0.011	0.002	0.017	0.018
Ca	0.442	0.392	0.460	0.418	0.302	0.309	0.300	0.522	0.309	0.274	0.305	0.468	0.218	0.483	0.381
Na	0.615	0.614	0.605	0.618	0.649	0.632	0.626	0.471	0.616	0.573	0.612	0.444	0.667	0.457	0.577
K	0.037	0.022	0.033	0.040	0.041	0.044	0.045	0.021	0.044	0.100	0.041	0.019	0.046	0.031	0.045
Ba	n.d.	n.d.	n.d.	n.d.	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.004	0.002	0.006	n.d.
An	40.4	38.1	41.9	38.9	30.4	31.3	30.9	51.5	31.9	28.9	31.9	50.3	23.4	49.7	37.9
Ab	56.2	59.8	55.1	57.4	65.4	64.2	64.5	46.4	63.5	60.5	63.9	47.7	71.6	47.0	57.5
Or	3.4	2.1	3.0	3.7	4.2	4.5	4.6	2.1	4.6	10.6	4.3	2.0	5.0	3.2	4.5

Note: c, core; r, rim; m, microlite

Appendix V (continued)

Volcano or dome	Silen		S. Kladenets		Geren domes		St. Iliya		Nanovitsa				Dambalak			
	c	r	c	r	c	r	c	r	c	m	c	r	c	r	c	r
SiO ₂	62.94	63.69	61.61	62.69	60.19	60.47	61.92	61.72	53.60	54.37	60.19	60.23	60.86	59.90	57.61	58.79
Al ₂ O ₃	23.13	21.23	23.44	23.55	24.86	23.74	22.32	24.09	29.44	28.98	24.86	23.13	24.32	24.49	26.96	25.17
FeO	0.22	0.20	0.24	0.32	0.23	0.28	0.24	0.23	0.67	0.98	0.23	0.22	0.18	0.19	0.35	0.13
CaO	5.10	3.11	5.37	4.79	7.05	6.39	4.84	5.37	10.83	9.90	7.05	5.85	5.91	6.23	8.61	6.97
Na ₂ O	9.07	8.85	7.99	8.37	7.13	7.31	7.76	7.67	4.77	4.85	7.13	7.34	7.51	7.16	6.23	7.17
K ₂ O	1.32	1.48	1.07	1.13	0.67	0.76	1.46	1.45	0.47	0.76	0.67	0.84	1.29	1.27	0.68	0.88
BaO	0.00	n.d.	n.d.	n.d.	0.21	0.08	0.08	0.03	n.d.	n.d.	0.21	0.00	n.d.	n.d.	n.d.	n.d.
Total	101.8	98.56	99.72	100.9	100.3	99.03	98.62	100.6	99.78	99.84	100.3	97.61	100.1	99.24	100.4	99.11
Si	2.765	2.863	2.752	2.766	2.682	2.717	2.795	2.737	2.429	2.459	2.682	2.745	2.715	2.696	2.575	2.654
Al	1.198	1.125	1.234	1.225	1.305	1.275	1.187	1.259	1.573	1.545	1.305	1.243	1.279	1.299	1.420	1.339
Fe	0.007	0.007	0.008	0.011	0.008	0.012	0.008	0.008	0.023	0.033	0.008	0.008	0.006	0.006	0.012	0.004
Ca	0.240	0.150	0.257	0.226	0.337	0.300	0.234	0.255	0.526	0.480	0.337	0.286	0.282	0.300	0.412	0.337
Na	0.773	0.771	0.692	0.716	0.616	0.620	0.679	0.659	0.419	0.425	0.616	0.649	0.650	0.625	0.540	0.628
K	0.074	0.085	0.061	0.064	0.038	0.047	0.084	0.082	0.027	0.044	0.038	0.049	0.073	0.073	0.039	0.051
Ba	0.000	n.d.	n.d.	n.d.	0.001	0.001	0.001	0.001	n.d.	n.d.	0.004	0.000	n.d.	n.d.	n.d.	n.d.
An	22.1	14.9	25.4	22.5	34.0	31.0	23.5	25.6	54.1	50.6	34.0	29.1	28.1	30.1	41.6	33.2
Ab	71.1	76.7	68.5	71.2	62.2	64.1	68.1	66.2	43.1	44.8	62.2	66.0	64.6	62.6	54.5	61.8
Or	6.8	8.4	6.0	6.3	3.8	4.8	8.4	8.2	2.8	4.6	3.8	5.0	7.3	7.3	3.9	5.0

Note: c, core; r, rim; m, microlite

Appendix V (continued)

Volcano or dome	Orman	Perperek		Hisar			Mishevsko		Ortakaya		Zli Vrah	
	r	c	r	c	r	m	c	r	c	r		
SiO ₂	60.35	61.65	60.04	58.73	59.42	56.06	62.29	65.59	63.01	63.08	65.40	66.78
Al ₂ O ₃	25.44	23.69	23.73	25.68	25.51	28.01	23.78	21.22	22.99	23.57	21.34	21.62
FeO	0.32	0.16	0.34	0.50	0.30	0.28	0.00	0.12	0.28	0.10	0.18	0.17
CaO	4.96	6.17	5.33	7.47	7.25	9.60	4.93	2.23	4.07	4.64	2.90	3.03
Na ₂ O	7.81	7.48	7.60	6.59	6.94	5.66	8.54	9.12	8.72	8.48	10.34	10.59
K ₂ O	0.73	1.50	1.47	0.95	1.15	0.71	0.38	1.29	1.29	1.04	1.22	1.22
BaO	n.d.	n.d.	n.d.	0.21	0.27	0.06	0.00	0.11	n.d.	n.d.	0.00	0.00
Total	99.61	100.7	98.51	100.1	100.8	100.4	99.92	99.68	100.4	100.9	101.4	103.4
Si	2.691	2.737	2.722	2.632	2.647	2.517	2.762	2.900	2.791	2.776	2.865	2.868
Al	1.337	1.240	1.268	1.357	1.339	1.482	1.243	1.106	1.200	1.223	1.102	1.094
Fe	0.011	0.005	0.012	0.017	0.010	0.009	0.000	0.004	0.009	0.003	0.006	0.005
Ca	0.237	0.294	0.259	0.359	0.346	0.462	0.234	0.106	0.193	0.219	0.136	0.139
Na	0.675	0.644	0.668	0.573	0.599	0.493	0.734	0.782	0.749	0.724	0.878	0.882
K	0.042	0.085	0.085	0.054	0.065	0.041	0.021	0.073	0.073	0.058	0.068	0.067
Ba	n.d.	n.d.	n.d.	0.004	0.005	0.001	0.000	0.002	n.d.	n.d.	0.000	0.000
An	24.8	28.7	25.6	36.4	34.2	46.4	23.7	11.0	19.0	21.9	12.6	12.8
Ab	70.8	63.0	66.0	58.1	59.3	49.5	74.2	81.4	73.8	72.3	81.1	81.0
Or	4.4	8.3	8.4	5.5	6.5	4.1	2.2	7.6	7.2	5.8	6.3	6.1

Note: c, core; r, rim; m, microlite

Appendix VI. Selected microprobe analyses of plagioclase from the Borovitsa region and calculated formulae (based on 8 oxygens)

Caldera stage	Borovitsa caldera (stages)															
	1 st			2 nd				3 rd		4 th			5 th			
											c	r				
SiO ₂	60.34	60.23	55.02	64.02	62.80	61.15	59.11	60.39	60.40	62.47	61.50	60.31	60.70	61.92	63.97	62.86
Al ₂ O ₃	23.25	23.27	28.58	22.23	23.04	24.15	25.62	25.75	25.27	24.02	24.06	26.37	24.20	22.79	22.93	23.82
FeO	0.25	0.31	0.40	n.d.	0.04	0.24	n.d.	0.17	0.41	0.12	0.10	0.00	0.20	0.26	0.00	0.28
CaO	6.16	6.40	10.5	4.10	4.07	6.37	8.09	5.43	5.32	5.24	5.64	7.03	6.20	4.44	4.54	5.67
Na ₂ O	7.34	7.34	4.37	8.26	7.52	7.17	6.70	7.46	7.61	7.94	8.05	7.22	7.50	8.41	8.51	8.16
K ₂ O	1.14	1.01	0.58	1.17	2.08	0.89	0.48	0.81	0.98	1.04	0.96	0.74	0.70	0.96	0.94	0.95
BaO	0.00	0.00	n.d.	n.d.	0.45	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.03	n.d.
Total	98.48*	98.56**	99.45	99.78	99.55	99.97	100.00	100.01	99.99	100.83	100.31	101.67	99.50	98.78	100.89	101.74
Si	2.731	2.724	2.488	2.838	2.798	2.724	2.642	2.683	2.690	2.753	2.732	2.647	2.716	2.784	2.809	2.752
Al	1.240	1.240	1.524	1.161	1.210	1.268	1.350	1.348	1.326	1.248	1.260	1.364	1.276	1.208	1.187	1.229
Fe	0.008	0.011	0.014	0.000	0.001	0.008	0.000	0.006	0.014	0.004	0.003	0.000	0.007	0.009	0.000	0.009
Ca	0.299	0.310	0.509	0.195	0.194	0.304	0.387	0.258	0.254	0.247	0.268	0.331	0.297	0.214	0.214	0.266
Na	0.645	0.643	0.383	0.710	0.650	0.619	0.581	0.643	0.657	0.679	0.693	0.615	0.651	0.733	0.724	0.693
K	0.066	0.058	0.033	0.066	0.118	0.051	0.027	0.046	0.056	0.058	0.054	0.041	0.040	0.055	0.053	0.053
Ba	0.000	0.000	n.d.	n.d.	0.008	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.001	n.d.
An	29.6	30.6	55.0	20.1	20.2	31.2	38.9	27.3	26.3	25.1	26.4	33.5	30.1	21.3	21.6	26.3
Ab	63.9	63.6	41.4	73.1	67.5	63.6	58.3	67.9	68.0	68.9	68.2	62.3	65.9	73.2	73.1	68.5
Or	6.5	5.8	3.6	6.8	12.3	5.2	2.7	4.8	5.8	5.9	5.4	4.2	4.0	5.5	5.3	5.2

*0.40% SrO; **0.55% SrO

Appendix VI (continued)

Caldera stage	Bororvitsa caldera (stages)															
	5 th															6 th
	c	r		c	r	c	r		c	r		c	r			
SiO ₂	54.33	62.87	63.97	57.35	62.01	55.72	61.41	59.79	63.43	53.82	62.28	59.28	57.00	55.26	63.79	62.28
Al ₂ O ₃	27.45	23.66	21.33	26.24	24.15	28.38	23.97	25.84	23.25	28.92	22.87	25.10	26.88	27.98	23.08	23.82
FeO	0.39	0.19	0.28	0.25	0.05	0.43	0.31	0.33	0.23	0.19	0.05	0.13	0.26	0.24	0.44	n.d.
CaO	11.35	5.45	2.99	8.29	5.97	10.57	6.06	7.35	4.63	11.53	5.33	7.34	8.94	10.89	4.69	4.02
Na ₂ O	5.03	7.68	9.07	6.35	7.16	5.22	7.28	7.15	8.72	4.67	6.93	7.07	6.38	5.18	8.26	8.69
K ₂ O	0.32	0.99	1.20	0.48	0.82	0.37	0.87	0.65	1.10	0.24	2.28	0.64	0.42	0.14	0.73	1.19
BaO	0.03	0.00	n.d.	n.d.	n.d.	0.07	0.00	n.d.	n.d.	0.40	0.00	n.d.	n.d.	0.10	0.00	n.d.
Total	98.87	100.84	98.84	98.96	100.16	100.76	99.90	101.11	101.36	99.37	99.74	99.56	99.88	99.69	100.99	100.00
Si	2.485	2.768	2.863	2.596	2.746	2.494	2.735	2.645	2.783	2.444	2.784	2.661	2.564	2.496	2.798	2.765
Al	1.480	1.228	1.125	1.400	1.261	1.497	1.258	1.347	1.202	1.548	1.205	1.328	1.425	1.490	1.193	1.247
Fe	0.013	0.006	0.009	0.009	0.002	0.014	0.010	0.011	0.008	0.006	0.002	0.004	0.009	0.008	0.015	0.000
Ca	0.556	0.257	0.143	0.402	0.283	0.507	0.289	0.348	0.218	0.561	0.255	0.353	0.431	0.527	0.220	0.191
Na	0.446	0.656	0.787	0.561	0.615	0.453	0.629	0.613	0.742	0.408	0.601	0.615	0.556	0.454	0.703	0.748
K	0.019	0.056	0.069	0.028	0.046	0.021	0.049	0.037	0.062	0.014	0.130	0.037	0.024	0.008	0.041	0.067
Ba	0.001	0.000	n.d.	n.d.	n.d.	0.001	0.000	n.d.	n.d.	0.007	0.000	n.d.	n.d.	0.002	0.000	n.d.
An	54.5	26.6	14.4	40.6	30.0	51.7	29.9	34.9	21.3	57.1	25.9	35.1	42.6	53.3	22.9	19.0
Ab	43.7	67.7	78.8	56.6	65.1	46.2	65.0	61.4	72.7	41.5	60.9	61.2	55.0	45.9	72.9	74.3
Or	1.8	5.7	6.9	2.8	4.9	2.2	5.1	3.7	6.0	1.4	13.2	3.6	2.4	0.8	4.2	6.7

Appendix VI (continued)

Caldera Stage	Extracaldera domes									
	Gradishte	Mineralni Bani	Chernia Kamak			Tatarevo (Hisar dome)			Haykanska Chuka	
SiO ₂	59.99	60.94	63.85	58.14	62.02	61.51	58.69	62.27	61.61	60.24
Al ₂ O ₃	25.81	25.19	22.92	27.78	24.45	23.69	25.5	23.31	23.59	25.41
FeO	0.22	0.23	0.28	0.32	0.10	0.20	0.36	0.17	0.07	0.28
CaO	5.78	6.47	4.02	7.66	4.35	6.09	7.91	4.65	4.81	6.48
Na ₂ O	7.25	7.66	8.72	6.65	8.36	7.31	6.52	8.06	7.87	7.60
K ₂ O	0.95	0.68	1.03	0.35	0.87	0.97	0.61	1.13	1.66	0.70
BaO	n.d.	n.d.	n.d.	n.d.	n.d.	0.00	0.12	0.00	0.00	0.15
Total	100.00	101.17	100.82	100.9	100.15	99.77	99.59	99.59	99.61	100.71
Si	2.671	2.687	2.807	2.575	2.746	2.744	2.636	2.776	2.756	2.669
Al	1.354	1.309	1.188	1.450	1.276	1.245	1.350	1.225	1.244	1.327
Fe	0.007	0.008	0.009	0.011	0.003	0.007	0.012	0.006	0.002	0.009
Ca	0.276	0.306	0.189	0.364	0.206	0.291	0.381	0.222	0.231	0.308
Na	0.626	0.655	0.743	0.571	0.718	0.632	0.568	0.697	0.683	0.653
K	0.054	0.038	0.058	0.020	0.049	0.055	0.035	0.064	0.095	0.040
Ba	n.d.	n.d.	n.d.	n.d.	n.d.	0.000	0.002	0.000	0.000	0.003
An	28.9	30.6	19.1	38.1	21.2	29.7	38.7	22.6	22.9	30.8
Ab	65.5	65.6	75.0	59.8	73.7	64.6	57.7	70.9	67.7	65.3
Or	5.6	3.8	5.8	2.1	5.0	5.6	3.6	6.5	9.4	4.0

Appendix VII. Selected microprobe analyses of sanidine from the Momchilgrad-Arda region and calculated formulae (based on 8 oxygens)

Volcano or caldera	Lozen (1 st stage)			Lozen (2 nd stage)			Sheinovets caldera					Sveta Marina		Madhzarovo		Silen	
					c	r	m	Ca-an	c	r	Ca-an						m
SiO ₂	62.63	61.70	62.79	62.38	61.67	60.92	66.11	62.09	60.62	62.30	63.03	65.45	65.46	63.20	63.56	64.76	66.65
Al ₂ O ₃	20.72	20.70	20.40	19.13	19.05	18.98	16.53	22.66	18.45	18.16	21.27	19.28	19.36	19.43	19.41	18.98	17.40
FeO	0.14	0.07	0.16	0.10	0.08	0.11	0.16	0.10	0.12	0.11	0.11	0.00	0.00	0.28	0.22	0.17	0.47
CaO	0.00	0.14	0.24	0.22	0.12	0.14	0.18	4.94	0.14	0.09	3.79	0.00	0.00	0.42	0.59	0.23	0.26
Na ₂ O	2.33	2.38	2.33	3.07	2.63	3.03	1.47	5.08	2.59	2.53	5.04	3.17	3.09	2.90	3.29	3.68	5.01
K ₂ O	12.16	11.69	11.76	11.31	12.15	11.31	13.18	3.98	11.12	11.43	6.09	11.81	11.90	11.57	12.08	10.97	9.16
BaO	1.79	3.13	2.20	2.13	1.86	2.61	0.14	0.00	2.36	1.42	0.03	0.04	0.00	0.71	0.66	n.d	n.d
Total	99.77	99.81	99.88	98.34	97.56	97.10	97.77	98.85	95.40	96.04	99.36	99.75	99.81	98.51	99.81	98.79	98.95
Si	2.900	2.883	2.908	2.936	2.932	2.921	3.080	2.805	2.945	2.980	2.855	2.982	2.980	2.940	2.931	2.976	3.037
Al	1.131	1.140	1.114	1.061	1.068	1.073	0.908	1.206	1.056	1.024	1.135	1.035	1.039	1.065	1.055	1.028	0.935
Fe	0.005	0.002	0.006	0.004	0.003	0.004	0.006	0.003	0.004	0.004	0.004	0.000	0.000	0.010	0.008	0.006	0.016
Ca	0.000	0.007	0.012	0.011	0.006	0.007	0.009	0.239	0.007	0.005	0.184	0.000	0.000	0.021	0.029	0.011	0.013
Na	0.209	0.216	0.209	0.280	0.242	0.282	0.133	0.445	0.244	0.235	0.443	0.280	0.273	0.262	0.294	0.328	0.443
K	0.718	0.697	0.695	0.679	0.737	0.692	0.783	0.229	0.689	0.698	0.352	0.686	0.691	0.687	0.711	0.643	0.532
Ba	0.032	0.057	0.040	0.039	0.035	0.049	0.003	0.000	0.045	0.027	0.001	0.001	0.000	0.013	0.012	n.d	n.d
An	0.0	0.8	1.3	1.1	0.6	0.7	1.0	26.2	0.8	0.5	18.8	0.0	0.0	2.2	2.8	1.2	1.3
Ab	22.6	23.5	22.8	28.9	24.6	28.7	14.4	48.7	25.9	25.0	45.2	29.0	28.3	27.0	28.4	33.4	44.8
Or	77.4	75.8	75.9	70.0	74.8	70.5	84.7	25.1	73.3	74.5	36.0	71.0	71.7	70.8	68.7	65.5	53.9
Cn	3.4	5.9	4.2	3.9	3.4	4.8	0.3	0.0	4.6	2.8	0.1	0.1	0.0	1.3	1.1	n.d	n.d

Note: c, core; r, rim; m, microlite; an, anorthoclase; Ca-an, Ca-anorthoclase

Appendix VII (continued)

Volcano or dome	Studen Kladenets							Geren domes	St. Iliya	Dambalak			Ormanlar			
	Konevo flow		m	Svetoslav		Golobradovo				m	c	r				
SiO ₂	65.17	64.13	65.59	64.22	66.97	64.61	65.69	64.84	63.28	65.94	66.01	64.29	61.97	62.99	64.06	63.99
Al ₂ O ₃	18.90	18.87	19.01	18.63	19.28	18.09	18.81	18.65	18.79	19.08	18.78	19.36	19.53	19.72	20.61	20.46
FeO	0.05	0.14	0.20	0.11	0.12	0.09	0.08	0.15	0.18	0.21	0.00	0.30	0.25	0.06	0.03	0.12
CaO	0.25	0.52	0.77	0.46	0.37	0.29	0.29	0.21	0.18	0.42	0.10	0.40	0.35	0.19	0.30	0.16
Na ₂ O	3.71	3.78	5.65	4.54	4.44	3.98	4.14	3.28	3.03	3.87	3.94	4.37	3.58	4.12	2.82	3.12
K ₂ O	11.45	10.75	7.85	9.70	10.00	10.63	10.75	10.67	11.21	11.24	11.14	9.77	10.15	9.56	11.93	11.89
BaO	n.d	n.d	n.d	n.d	n.d	0.27	n.d	1.82	2.27	0.10	0.14	n.d	n.d	n.d	0.25	0.25
Tot.	99.53	98.19	99.07	97.66	101.2	97.96	99.76	99.62	98.94	100.9	100.1	98.49	95.83	96.64	100.0	99.99
Si	2.980	2.968	2.976	2.977	2.989	2.999	2.987	2.985	2.958	2.976	2.995	2.955	2.932	2.943	2.922	2.922
Al	1.019	1.029	1.017	1.018	1.014	0.990	1.008	1.012	1.035	1.015	1.004	1.049	1.089	1.086	1.108	1.101
Fe	0.002	0.005	0.007	0.004	0.004	0.003	0.003	0.005	0.006	0.007	0.000	0.010	0.009	0.002	0.001	0.004
Ca	0.012	0.026	0.037	0.023	0.018	0.014	0.014	0.010	0.009	0.020	0.005	0.020	0.018	0.010	0.015	0.008
Na	0.329	0.339	0.497	0.408	0.384	0.358	0.365	0.293	0.275	0.339	0.347	0.389	0.328	0.373	0.249	0.276
K	0.668	0.635	0.454	0.574	0.569	0.629	0.624	0.627	0.668	0.647	0.645	0.573	0.613	0.570	0.694	0.693
Ba	n.d	n.d	n.d	n.d	n.d	0.005	n.d	0.033	0.042	0.002	0.002	n.d	n.d	n.d	0.004	0.004
An	1.2	2.6	3.8	2.3	1.8	1.4	1.4	1.1	0.9	2.0	0.5	2.0	1.9	1.0	1.5	0.8
Ab	32.6	33.9	50.3	40.6	39.6	35.7	36.4	31.5	28.8	33.7	34.8	39.7	34.3	39.2	26.0	28.3
Or	66.2	63.5	45.9	57.1	58.6	62.8	62.2	67.4	70.2	64.3	64.7	58.3	63.9	59.8	72.4	70.9
Cn	n.d	n.d	n.d	n.d	n.d	0.5	n.d	3.4	4.2	0.2	0.2	n.d	n.d	n.d	0.5	0.5

Note: c, core; r, rim; m, microlite; an, anorthoclase; Ca-an, Ca-anorthoclase

Appendix VII (continued)

Volcano or dome	Perperek	Hisar	Mishevsko		Schupena Planina		Zli Vrah	
		m	c	r		m-an		
SiO ₂	64.49	68.70	65.63	65.68	66.46	68.72	67.10	66.61
Al ₂ O ₃	18.84	16.32	18.70	18.84	19.42	18.10	19.11	18.75
FeO	0.24	1.09	0.07	0.13	0.09	0.57	0.22	0.05
CaO	0.38	1.26	0.16	0.18	0.19	0.12	0.13	0.15
Na ₂ O	3.79	3.98	3.70	3.59	4.00	7.49	4.08	4.20
K ₂ O	11.06	5.49	11.66	11.71	11.22	4.30	11.52	11.24
BaO	n.d	0.45	n.d	n.d	n.d	n.d	0.00	0.27
Tot.	98.80	97.29	99.92	100.1	101.4	99.30	102.2	101.3
Si	2.970	3.116	2.990	2.986	2.977	3.051	2.988	2.995
Al	1.023	0.873	1.004	1.010	1.025	0.947	1.003	0.994
Fe	0.008	0.037	0.002	0.004	0.003	0.019	0.007	0.002
Ca	0.019	0.061	0.008	0.009	0.009	0.006	0.006	0.007
Na	0.338	0.350	0.327	0.316	0.347	0.645	0.352	0.366
K	0.650	0.318	0.678	0.679	0.641	0.244	0.654	0.645
Ba	n.d	0.008	n.d	n.d	n.d	n.d	0.000	0.005
An	1.9	8.4	0.8	0.9	0.9	0.6	0.6	0.7
Ab	33.6	48.0	32.3	31.5	34.8	72.1	34.8	36.0
Or	64.5	43.6	66.9	67.6	64.3	27.2	64.6	63.3
Cn	n.d	1.1	n.d	n.d	n.d	n.d	0.0	0.5

Note: c, core; r, rim; m, microlite; an, anorthoclase; Ca-an, Ca-anorthoclase

Appendix VIII. Selected microprobe analyses of sanidine from the Borovitsa region and calculated formulae (based on 8 oxygens)

Caldera stage	Borovitsa caldera (stages)													
	1 ^{st*}				2 nd				3 rd		4 th			
		c	interm.	r					c	r				
SiO ₂	63.14	57.11	60.80	64.20	66.11	64.52	66.12	64.88	61.3	63.5	63.31	63.87	62.57	64.55
Al ₂ O ₃	19.04	19.93	19.33	18.89	18.83	20.17	18.9	19.05	21.29	20.7	19.76	19.66	21.09	19.91
FeO	0.26	0.34	0.19	0.20	0.04	0.12	0.11	0.29	0.01	0.10	0.20	0.17	0.14	0.02
CaO	0.46	0.50	0.44	0.47	0.12	0.59	0.16	0.13	0.70	0.37	0.41	0.31	n.d.	0.65
Na ₂ O	3.33	2.52	2.95	3.61	3.70	3.54	3.57	3.50	3.48	3.34	2.97	3.12	2.64	2.44
K ₂ O	10.33	9.07	10.05	10.36	11.81	10.88	11.73	11.99	10.05	10.8	11.97	12.09	13.25	10.72
BaO	3.93	8.92	5.74	2.51	n.d.	0.10	0.31	0.00	1.78	0.79	1.26	0.57	0.30	2.14
Total	100.48	98.39	99.49	100.24	100.61	99.82	100.59	99.84	96.83	98.81	98.62	99.22	99.69	98.29
Si	2.930	2.810	2.888	2.953	2.991	2.935	2.988	2.967	2.860	2.910	2.924	2.937	2.881	2.950
Al	1.041	1.156	1.082	1.024	1.004	1.081	1.007	1.027	1.171	1.118	1.076	1.066	1.145	1.072
Fe	0.009	0.013	0.007	0.007	0.001	0.004	0.004	0.010	0.000	0.003	0.007	0.006	0.005	0.001
Ca	0.023	0.026	0.022	0.023	0.006	0.029	0.008	0.006	0.035	0.018	0.020	0.015	0.000	0.032
Na	0.299	0.241	0.272	0.322	0.325	0.312	0.313	0.310	0.315	0.297	0.266	0.278	0.236	0.216
K	0.612	0.569	0.609	0.608	0.682	0.631	0.676	0.699	0.598	0.632	0.705	0.709	0.778	0.625
Ba	0.071	0.172	0.107	0.045	n.d.	0.002	0.005	0.000	0.033	0.014	0.023	0.010	0.005	0.038
An	2.4	3.1	2.5	2.4	0.6	3.0	0.8	0.6	3.7	1.9	2.0	1.5	0.0	3.6
Ab	32.1	28.8	30.1	33.8	32.1	32.1	31.4	30.5	33.2	31.4	26.8	27.7	23.2	24.8
Or	65.5	68.1	67.4	63.8	67.4	64.9	67.8	68.8	63.1	66.7	71.1	70.7	76.8	71.6
Cn	7.1	17.1	10.6	4.5	n.d.	0.2	0.5	0.0	3.3	1.5	2.2	1.0	0.5	4.2

Note: c, core; r, rim; interm., intermediate zone; anorth, anorthoclase

*0.52, 0.84, 0.73, 0.55% wt SrO respectively

Appendix VIII (continued)

Stage or dome	Bororvitsa caldera (stages)															
	5 th														6 th	
		c	r	c	interm.	r						c	r	anorth.		
SiO ₂	66.5	66.05	64.51	65.57	64.29	65.66	64.16	64.97	65.51	65.04	65.01	65.60	64.7	65.65	62.17	64.47
Al ₂ O ₃	18.51	18.61	18.87	18.64	19.17	18.34	18.47	19.35	18.49	19.02	19.27	18.39	20.38	18.26	20.74	20.24
FeO	0.00	0.00	0.16	0.00	0.20	0.00	0.11	0.04	0.15	0.24	0.09	0.13	0.18	0.11	n.d.	n.d.
CaO	0.12	0.17	0.32	0.02	0.23	0.46	0.18	0.20	0.14	0.19	0.28	0.27	3.68	0.21	n.d.	n.d.
Na ₂ O	4.18	3.74	3.90	3.22	3.77	3.56	2.57	2.95	3.59	3.08	3.13	3.84	5.85	5.17	3.82	4.18
K ₂ O	10.88	11.50	10.97	11.77	11.19	10.67	12.73	11.71	10.69	11.57	11.74	10.21	5.30	8.84	10.04	10.83
BaO	n.d.	0.14	1.01	0.63	1.84	1.32	0.60	0.65	1.13	1.77	0.71	0.61	n.d.	n.d.	3.23	n.d.
Total	100.19	100.21	99.74	99.85	100.69	100.01	98.22	99.87	99.70	100.91	100.23	99.05	100.09	98.24	96.77	99.72
Si	3.008	2.999	2.965	2.998	2.948	3.001	2.982	2.970	2.999	2.969	2.967	3.005	2.898	3.008	2.885	2.936
Al	0.987	0.996	1.022	1.004	1.036	0.988	1.012	1.043	0.998	1.023	1.037	0.993	1.076	0.986	1.135	1.086
Fe	0.000	0.000	0.006	0.000	0.007	0.000	0.004	0.001	0.005	0.008	0.003	0.004	0.006	0.004	0.000	0.000
Ca	0.006	0.008	0.016	0.001	0.011	0.023	0.009	0.010	0.007	0.009	0.014	0.013	0.177	0.010	0.000	0.000
Na	0.367	0.329	0.348	0.285	0.335	0.316	0.232	0.261	0.319	0.273	0.277	0.341	0.508	0.459	0.344	0.369
K	0.628	0.666	0.643	0.686	0.655	0.622	0.755	0.683	0.624	0.674	0.684	0.597	0.303	0.517	0.594	0.629
Ba	n.d.	0.002	0.018	0.011	0.033	0.024	0.011	0.012	0.020	0.032	0.013	0.011	n.d.	n.d.	0.059	n.d.
An	0.6	0.8	1.6	0.1	1.1	2.3	0.9	1.0	0.7	1.0	1.4	1.4	17.9	1.0	0.0	0.0
Ab	36.7	32.8	34.5	29.3	33.5	32.9	23.3	27.4	33.5	28.5	28.4	35.9	51.4	46.6	36.6	37.0
Or	62.8	66.4	63.9	70.6	65.4	64.8	75.8	71.6	65.7	70.5	70.2	62.7	30.7	52.4	63.4	63.0
Cn	n.d.	0.2	1.8	1.1	3.2	2.4	1.1	1.2	2.1	3.2	1.3	1.1	n.d.	n.d.	5.9	n.d.

Note: c, core; r, rim; interm., intermediate zone; anorth, anorthoclase

Appendix VIII (continued)

Caldera Stage	Extracaldera domes									
	Gradishte		Chernia Kamak		Mineralni Bani		Tatarevo (Hisar dome)		Haykanska Chuka	
SiO ₂	63.92	63.7	64.12	64.12	65.58	65.74	65.27	64.34	64.25	64.65
Al ₂ O ₃	20.00	19.95	20.37	20.5	18.85	18.74	19.06	18.69	19.47	19.05
FeO	0.13	0.04	0.18	0.00	0.12	0.00	0.09	0.08	0.17	0.18
CaO	0.28	0.36	0.25	0.25	0.03	0.11	0.19	0.22	0.31	0.21
Na ₂ O	2.87	2.92	3.26	3.24	3.42	3.63	4.05	3.86	3.64	3.69
K ₂ O	11.78	11.87	12.04	12.06	12.02	11.7	10.84	10.35	11.27	11.57
BaO	0.80	1.12	n.d.	n.d.	n.d.	n.d.	0.30	0.97	0.71	0.24
Total	98.98	98.84	100.22	100.17	100.02	99.92	99.50	97.54	99.11	99.35
Si	2.934	2.930	2.922	2.921	2.987	2.993	2.975	2.979	2.946	2.965
Al	1.082	1.081	1.094	1.101	1.012	1.006	1.024	1.020	1.052	1.030
Fe	0.004	0.001	0.006	0.000	0.004	0.000	0.003	0.003	0.006	0.006
Ca	0.014	0.018	0.012	0.012	0.001	0.005	0.009	0.011	0.015	0.010
Na	0.255	0.260	0.288	0.286	0.302	0.320	0.358	0.347	0.324	0.328
K	0.690	0.696	0.700	0.701	0.698	0.680	0.630	0.611	0.659	0.677
Ba	0.014	0.020	n.d.	n.d.	n.d.	n.d.	0.005	0.018	0.013	0.004
An	1.4	1.8	1.2	1.2	0.1	0.5	0.9	1.1	1.5	1.0
Ab	26.6	26.7	28.8	28.6	30.1	31.9	35.9	35.8	32.4	32.3
Or	71.9	71.5	70.0	70.1	69.7	67.6	63.2	63.1	66.1	66.7
Cn	1.5	2.0	n.d.	n.d.	n.d.	n.d.	0.5	1.8	1.3	0.4

Appendix IX. Microprobe analyses of oxide minerals and calculated formulae (magnetite 4, ilmenite and ferropseudobrookite 3 oxygens)

Region	Momchilgrad-Arda region (MAR)										
Volcano/area	Perperek volcano				Ustren area		Studen Kladenets volcano				Silen volcano
Dome or flow	Yumrukkaya dome				Ortakaya dome		Svetoslav flow		Konevo flow		
Mineral	fpb	mg	mg	Ti-mg	mg	ilm	Ti-mg	fpb	mg	fpb	mg
SiO ₂	0.00	0.00	0.00	0.28	0.55	0.04	0.14	0.26	0.17	0.37	0.00
TiO ₂	38.79	10.24	7.10	16.21	6.10	46.48	18.69	35.12	4.07	31.33	7.07
Al ₂ O ₃	0.00	0.79	2.65	1.66	0.97	0.04	1.17	1.49	0.84	0.78	0.87
FeO	58.74	86.99	88.22	69.33	79.72	46.08	73.79	55.40	86.92	60.59	76.80
MnO	2.32	1.97	2.03	1.70	2.31	6.05	1.69	0.77	0.84	1.47	6.40
MgO	n.d.	n.d.	n.d.	0.57	0.52	1.39	0.15	0.36	0.14	0.55	0.44
Cr ₂ O ₃	0.16	n.d.	n.d.	0.01	0.00	0.01	0.12	0.00	0.00	0.00	0.09
Total	100.01	99.99	100.00	89.76	90.17	100.09	95.75	93.40	92.98	95.09	91.67
<i>Magnetite</i>	0.00	0.63	0.66	0.40	0.71	0.00	0.37	0.00	0.83	0.01	0.55
<i>Ulvospinel</i>	0.93	0.27	0.18	0.49	0.18	0.83	0.53	0.93	0.12	0.91	0.21
<i>Jacobsite</i>	0.06	0.06	0.06	0.06	0.08	0.12	0.05	0.02	0.03	0.05	0.21

Region	MAR		Borovitsa region							
Volcano or caldera	Dambalak volcano		Borovitsa caldera (stages)						extracaldera domes: Mineralni Bani	
			2 nd		4 th	5 th				
Mineral	mg	mg	mg	ilm	mg	Ti-mg	mg	mg	mg	mg
SiO ₂	0.05	3.14	0.00	0.00	0.00	0.87	0.08	5.84	0.07	0.19
TiO ₂	4.98	8.56	4.50	42.33	3.34	21.05	2.12	1.25	0.54	3.49
Al ₂ O ₃	1.07	2.29	1.38	0.00	1.17	1.73	0.98	1.29	0.04	0.88
FeO	87.01	73.63	91.37	53.64	88.13	65.97	84.98	76.7	89.47	84.29
MnO	1.33	0.17	1.78	2.66	1.02	1.24	1.52	0.51	0.33	1.27
MgO	0.29	0.01	0.98	1.37	0.66	0.65	0.75	1.03	0.06	0.44
Cr ₂ O ₃	0.08	0.04	0.01	n.d.	n.d.	n.d.	n.d.	0.8	n.d.	n.d.
Total	94.81	87.84	100.02	100.00	94.32	91.51	90.43	87.42	90.51	90.56
<i>Magnetite</i>	0.78	0.59	0.77	0.00	0.84	0.27	0.84	0.84	0.97	0.83
<i>Ulvospinel</i>	0.14	0.28	0.12	0.88	0.09	0.65	0.06	0.05	0.02	0.10
<i>Jacobsite</i>	0.04	0.01	0.05	0.06	0.03	0.04	0.05	0.02	0.01	0.04

Note: mg, Ti-magnetite to magnetite; ilm, ilmenite; fpb, ferropseudobrookite to ilmenite