STANDARD BIOGEOCHEMICAL REFERENCE MATERIAL FOR Au DEPOSITS

25 May 2020

UPDEEP_SPRU_BARK_DRY

KAVA Reference: 16329, UpDeep, Upscaling deep buried geochemical exploration techniques into European business
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This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation

Content

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1. INTRODUCTION

UpDeep standard reference materials (SRM) are intended to be used in vegetation (i.e. biogeochemical) analysis for providing an affordable method of controlling the quality of plant samples for mineral exploration purposes. SRMs are produced less rigorously compared to e.g certified reference materials. The UpDeep SRM samples do not follow the ISO standardization and are therefore not certified reference materials (CRM). However, the UpDeep standard reference materials are more affordable and can thus be inserted in the analysis sequence more frequently than CRMs. For the user of the UpDeep SRMs, the purpose is to externally quantify laboratory accuracy and precision.

2. SOURCE MATERIALS

UPDEEP_SPRU_BARK_DRY SRM is Norway spruce (*Picea abies*) bark collected on top of a Au bearing Tiira prospect in year 2017. UPDEEP_SPRU_BARK_DRY is one of six reference materials (soil Ah- and B-horizon, common juniper foliage, Scots pine bark, Norway spruce bark and foliage) collected in the UpDeep project on the Mäkärä and Tiira exploration targets in nothern Finland.

3. COMMINUTION AND HOMOGENISATION PROCEDURES

The UPDEEP_SPRU_BARK_DRY SRM was prepared as follows:

- sampling of the common juniper foliage samples in the field
- drying at 40°C for 48 h
- milling with Retsch SM 300 heavy metal free cutting mill to 0.5 mm
- homogenizing the milled material by mixing in a mill
- 2 g aliquots were taken from the split homogenized material to be sent to commercial analytical laboratories

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4. ANALYTICAL PROGRAM

UPDEEP_SPRU_BARK_DRY SRM samples were analyzed in three geochemical analytical laboratories:

- Activation Laboratories Ltd. (Actlabs, Ancaster, ON, Canada)
- ALS Minerals/ALS Global (ALS, Vancouver, Canada through, ALS, Sodankylä, Finland), the results were reanalysed at ALS in January 2020
- Bureau Veritas Minerals Acmelabs (BVAcmelabs, Shaughnessy St., Vancouver, BC, Canada)

The analytical methods are presented in table 1.

Table 1. Laboratories, analytical packages and analytical details used to analyse the UPDEEP_SPRU_BARK_DRY.

Laboratory	Analytical package	pretreatment	sample weight (g)	leaching	Instrumentation	# of elements
ALS	ME-VEG41	drying and milling to 0.5 mm	1	cold digested with nitric acid for 8 hours before being transferred to hot block for 15 minutes at 85°C followed by 2 hours at 115°C	Agilent 725-ES (ICP-OES) ja Agilent 7900 (ICP-MS) corrected for spectral interferences	64
BVAcmelabs	VG101-EXT-REE	drying and milling to 0.5 mm	1	HNO3 then aqua regia	ICP-MS/ICP-OES	63
Actlabs	2F-Special	drying and milling to 0.5 mm	0.5	aqua regia at 95°C for 2 hours	Finnegan Mat Element 2 High Resolution ICP/MS (HR-ICP/MS)	61

Ten UPDEEP_SPRU_BARK_DRY SRM aliquots were sent to each laboratory. Tables 2, 3 and 4 present information values for the laboratory results. The RSD% values < 5 are marked as green,

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the 5≤RSD%≥15 are marked with orange and the RSD%>15 are marked with red. Elements having less than four observations between the detection limits are coloured grey.

5. STATISTICAL ANALYSIS

Analysed elements, units, lower (LDL) and upper detection limits (UDL), percentage of <LDL, >UDL and discretized values, mean, median, standard deviation (SD), relative standard deviation (RSD%) and median absolute deviation (MAD) are presented in Chapter 6. Original data, quality control monitoring results and statistical measures are available upon request.

6. PARTICIPANT LABORATORIES

6.1. Actlabs, Ancaster, Canada

Table 2. Statistics for UPDEEP_SPRU_BARK_DRY_Actlabs based on 10 aliquots. LDL = lower detection limit, pct_LDL = percent of samples under lower detection limit, UDL = upper detection limit, pct_UDL = percent of samples over upper detection limit, pct_discr = percent of discretized values, SD = standard deviation, RSD% = relative standard deviation percent and MAD= median absolute deviation. The RSD% values < 5 are marked as green, the 5≤RSD%≥15 are marked with orange and the RSD%>15 are marked with red. Elements having less than four observations between the detection limits are coloured grey.

element	unit	LDL_ ppm	pct_ LDL	UDL	pct_ UDL	pct_ discr	MEAN	MEDIAN	SD	RSD %	MAD
Ag	ppm	NA	0	NA	0	0	1.22	1.1975	0.093035238	7.625839201	0.044478
Al	%	NA	0	NA	0	0	4.079	4.065	0.066741625	1.636225166	0.066717
As	ppm	NA	0	NA	0	0	47.78	46.65	4.635083602	9.700886568	2.14977
Au	ppm	NA	0	NA	0	0	0.12192	0.04865	0.226074348	185.4284348	0.0051891
B	ppm	NA	0	NA	0	30	271.2	272	4.732863826	1.745156278	5.1891
Ba	ppm	NA	0	NA	0	0	708.4	706.5	12.00185171	1.694219609	10.3782

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Be	ppm	NA	0	NA	0	0	0.254	0.25	0.022211108	8.744530839	0.014826
Bi	ppm	NA	0	NA	0	0	1.1789	1.0825	0.350463962	29.72804838	0.3402567
Br	ppm	NA	0	NA	0	0					
Ca	%	NA	0	NA	0	0	27.85	27.7	0.437797518	1.571983906	0.22239
Cd	ppm	NA	0	NA	0	0	12.665	12.675	0.232199627	1.833396184	0.259455
Ce	ppm	NA	0	NA	0	0	12.385	12.425	0.422985421	3.415304169	0.29652
Cl	ppm	NA	0	NA	0	0					
Co	ppm	NA	0	NA	0	0	9.653	9.405	0.602182143	6.238290096	0.481845
Cr	ppm	NA	0	NA	0	0	31.44	30.65	2.42358779	7.708612565	0.7413
Cs	ppm	NA	0	NA	0	0	1.7225	1.73	0.052134974	3.026703884	0.0555975
Cu	ppm	NA	0	NA	0	0	392.5	391	5.720334101	1.457409962	5.1891
Dy	ppm	NA	0	NA	0	0	0.988	0.9915	0.038311588	3.877691097	0.0467019
Er	ppm	NA	0	NA	0	0	0.5122	0.511	0.023155513	4.520795178	0.0214977
Eu	ppm	NA	0	NA	0	0	0.2717	0.275	0.010873515	4.002029895	0.0066717
F	ppm	NA	0	NA	0	0					
Fe	ppm	NA	0	NA	0	30	10010	9550	937.431479	9.36494984	222.39
Ga	ppm	NA	0	NA	0	0	1.9885	1.9775	0.110931661	5.578660329	0.029652
Gd	ppm	NA	0	NA	0	0	1.182	1.185	0.04110961	3.477970354	0.037065
Ge	ppm	NA	0	NA	0	0	0.036	0.0355	0.005077182	14.10328353	0.0051891
Hf	ppm	NA	0	NA	0	0	0.0495	0.0495	0.007261007	14.66870095	0.0066717
Hg	ppm	0.001	30	NA	0	70	0.001525	0.0015	0.000776835	50.93998333	0.0007413
Ho	ppm	NA	0	NA	0	0	0.1847	0.1825	0.006992853	3.786060365	0.0051891
I	ppm	NA	0	NA	0	0					
In	ppm	NA	0	NA	0	0	0.0212	0.02	0.004871687	22.97965523	0.0051891
K	%	NA	0	NA	0	0	3.039	3.02	0.054456915	1.79193533	0.037065
La	ppm	NA	0	NA	0	0	9.592	9.63	0.317588133	3.310968859	0.333585
Li	ppm	NA	0	NA	0	30	4.38	4.35	0.229975844	5.250590049	0.14826
Lu	ppm	NA	0	NA	0	0	0.0602	0.0605	0.002043961	3.395284544	0.0022239
Mg	%	NA	0	NA	0	60	1.232	1.23	0.022509257	1.82705011	0.022239
Mn	ppm	NA	0	NA	0	0	7416	7390	102.5453829	1.382758669	66.717
Mo	ppm	NA	0	NA	0	0	2.632	2.605	0.088543774	3.36412517	0.051891
Na	%	NA	0	NA	0	30	0.3253	0.3245	0.004110961	1.263744531	0.0059304
Nb	ppm	NA	0	NA	0	0	0.3285	0.3255	0.009046178	2.753783206	0.0051891
Nd	ppm	NA	0	NA	0	0	8.157	8.285	0.329580541	4.040462688	0.274281
Ni	ppm	NA	0	NA	0	0	92.19	91.4	2.827032209	3.06652805	1.63086
P	%	NA	0	NA	0	0	1.457	1.4575	0.022997584	1.578420344	0.0259455
Pb	ppm	NA	0	10000	10	0	8633	7665	3335.129683	38.63233734	3017.091

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Pd	ppm	NA	0	NA	0	30	0.0035	0.004	0.001715938	49.0268102	0.0014826
Pr	ppm	NA	0	NA	0	0	2.0595	2.07	0.070255486	3.411288475	0.07413
Pt	ppm	NA	0	NA	0	0	0.0951	0.0935	0.013059267	13.73214155	0.0155673
Rb	ppm	NA	0	NA	0	30	184	183	5.958187644	3.238145459	4.81845
Re	ppm	NA	0	NA	0	100	0.0014	0.001	0.000516398	36.88555568	0
S	%	NA	0	NA	0	30	1.584	1.58	0.024585452	1.552111861	0.029652
Sb	ppm	NA	0	NA	0	30	365.7	353	43.2718795	11.83261676	5.9304
Sc	ppm	NA	0	NA	0	0	2.253	2.225	0.134581656	5.973442358	0.066717
Se	ppm	NA	0	NA	0	0	2.767	2.755	0.165667002	5.987242574	0.140847
Sm	ppm	NA	0	NA	0	0	1.466	1.485	0.07475144	5.099006819	0.0852495
Sn	ppm	NA	0	NA	0	0	1.921	1.925	0.068710342	3.576800734	0.081543
Sr	ppm	NA	0	NA	0	0	510.7	509.5	8.756584824	1.714624011	8.8956
Ta	ppm	NA	0	NA	0	60	0.008	0.008	0.000666667	8.333333333	0
Tb	ppm	NA	0	NA	0	0	0.1737	0.173	0.006896859	3.970557967	0.007413
Te	ppm	NA	0	NA	0	30	0.075	0.05	0.057008771	76.01169501	0.037065
Th	ppm	NA	0	NA	0	0	0.6077	0.6015	0.030481506	5.015880571	0.0207564
Ti	%	NA	0	NA	0	70	0.0149	0.015	0.000567646	3.809706122	0
Tl	ppm	NA	0	NA	0	0	0.7108	0.717	0.079674058	11.20906841	0.0911799
Tm	ppm	NA	0	NA	0	30	0.0671	0.0665	0.003212822	4.788109592	0.0022239
U	ppm	NA	0	NA	0	0	0.2432	0.245	0.006124632	2.518351771	0.0059304
V	ppm	NA	0	NA	0	0	25.04	24.55	1.409649287	5.629589803	1.03782
W	ppm	NA	0	NA	0	0	3.981	3.94	0.213512945	5.363299302	0.118608
Y	ppm	NA	0	NA	0	0	6.213	6.19	0.240834198	3.87629484	0.126021
Yb	ppm	NA	0	NA	0	0	0.4327	0.4335	0.009922477	2.293153984	0.0118608
Zn	ppm	NA	0	NA	0	40	1835.5	1845	32.01128273	1.744008866	37.065
Zr	ppm	NA	0	NA	0	0	1.913	1.91	0.143453438	7.498872873	0.126021

6.2. ALS, Vancouver, Canada

Table 3. Statistics for UPDEEP_SPRU_BARK_DRY_ALS based on 10 aliquots. LDL = lower detection limit, pct_LDL = percent of samples under lower detection limit, UDL = upper detection limit, pct_UDL = percent of samples over upper detection limit, pct_discr = percent of discretized values, SD = standard deviation, RSD% = relative standard deviation percent and MAD= median absolute deviation. The RSD% values < 5 are marked as green, the 5≤RSD%≥15 are marked with orange and

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the RSD%>15 are marked with red. Elements having less than four observations between the detection limits are coloured grey.

element	unit	LDL_ppm	pct_LDL	UDL	pct_UDL	pct_discr	MEAN	MEDIAN	SD	RSD %	MAD
Ag	ppm	NA	0	NA	0	40	0.0139	0.0135	0.0014	10.4255	0.0007
Al	%	NA	0	NA	0	100	0.01	0.01	0	0	0
As	ppm	NA	0	NA	0	30	0.402	0.41	0.0225	5.5993	0.0148
Au	ppm	0.0002	20	NA	0	80	0.0002	0.0002	0.0001	26.677	0
B	ppm	NA	0	NA	0	100	6	6	0	0	0
Ba	ppm	NA	0	NA	0	0	126.1	126.25	1.3292	1.0541	1.4826
Be	ppm	0.01	100	NA	0	100	0.0075	0.0075	0	0	0
Bi	ppm	NA	0	NA	0	90	0.0079	0.008	0.0003	4.0029	0
Ca	%	NA	0	NA	0	40	1.19	1.19	0.0183	1.5342	0.0148
Cd	ppm	NA	0	NA	0	0	0.1362	0.1355	0.0066	4.8431	0.0052
Ce	ppm	NA	0	NA	0	0	0.0871	0.088	0.0086	9.8979	0.0052
Co	ppm	NA	0	NA	0	0	0.1367	0.1375	0.0068	4.9621	0.0059
Cr	ppm	NA	0	NA	0	70	0.17	0.16	0.033	19.4108	0.0148
Cs	ppm	NA	0	NA	0	50	0.0385	0.038	0.0018	4.6221	0.0007
Cu	ppm	NA	0	NA	0	0	5.41	5.425	0.1665	3.0782	0.1705
Fe	ppm	NA	0	NA	0	0	84	85	6.7165	7.9958	4.4478
Ga	ppm	NA	0	NA	0	0	0.022	0.022	0.0015	6.776	0.0015
Ge	ppm	NA	0	NA	0	60	0.0092	0.0095	0.0017	18.332	0.0022
Hf	ppm	0.002	90	NA	0	90	0.0016	0.0015	0.0002	10.2009	0
Hg	ppm	NA	0	NA	0	30	0.1689	0.176	0.0131	7.7772	0.0059
In	ppm	0.005	100	NA	0	100	0.0038	0.0038	0	0	0
K	%	NA	0	NA	0	100	0.1	0.1	0	0	0
La	ppm	NA	0	NA	0	0	0.0611	0.0615	0.0053	8.7442	0.003
Li	ppm	0.1	100	NA	0	100	0.075	0.075	0	0	0
Mg	%	NA	0	NA	0	100	0.024	0.024	0	0	0
Mn	ppm	NA	0	NA	0	0	393.4	392.5	5.2747	1.3408	4.4478
Mo	ppm	NA	0	NA	0	100	0.014	0.01	0.0052	36.8856	0
Na	%	NA	0	NA	0	40	0.0089	0.009	0.0014	15.3969	0.0015
Nb	ppm	NA	0	NA	0	100	0.0064	0.006	0.0005	8.0687	0
Ni	ppm	NA	0	NA	0	0	0.798	0.78	0.0713	8.9355	0.0371
P	%	NA	0	NA	0	80	0.0218	0.022	0.001	4.7376	0
Pb	ppm	NA	0	NA	0	0	1.166	1.17	0.045	3.8609	0.0371
Pd	ppm	0.001	90	NA	0	90	0.0008	0.0008	0.0001	10.2009	0
Pt	ppm	0.001	50	NA	0	90	0.0013	0.0009	0.0013	103.1148	0.0002
Rb	ppm	NA	0	NA	0	0	4.292	4.275	0.1937	4.5136	0.0741
Re	ppm	0.001	100	NA	0	100	0.0008	0.0008	0	0	0
S	%	NA	0	NA	0	100	0.066	0.07	0.0052	7.8242	0
Sb	ppm	NA	0	NA	0	90	0.057	0.06	0.0067	11.8412	0.0074
Sc	ppm	NA	0	NA	0	60	0.084	0.085	0.0117	13.9737	0.0148
Se	ppm	NA	0	NA	0	30	0.0806	0.0805	0.0058	7.2155	0.0096
Sn	ppm	NA	0	NA	0	90	0.034	0.035	0.007	20.5649	0.0074
Sr	ppm	NA	0	NA	0	0	28.22	28.1	1.0881	3.8558	0.9637
Ta	ppm	0.001	10	NA	0	90	0.001	0.001	0.0001	8.1084	0
Te	ppm	0.02	100	NA	0	100	0.015	0.015	0	0	0
Th	ppm	NA	0	NA	0	50	0.0062	0.006	0.0009	14.8216	0.0007
Ti	%	0.001	100	NA	0	100	0.0008	0.0008	0	0	0

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Tl	ppm	NA	0	NA	0	80	0.0212	0.021	0.0008	3.7208	0.0015
U	ppm	0.005	100	NA	0	100	0.0038	0.0038	0	0	0
V	ppm	NA	0	NA	0	70	0.399	0.4	0.0129	3.2248	0.0148
W	ppm	NA	0	NA	0	100	0.01	0.01	0	0	0
Y	ppm	NA	0	NA	0	70	0.0358	0.035	0.002	5.5555	0.0022
Zn	ppm	NA	0	NA	0	30	107	107	1.3123	1.2265	1.4826
Zr	ppm	NA	0	NA	0	70	0.042	0.04	0.0079	18.7812	0
Te	ppm	0.02	90	NA	0	90	0.0155	0.015	0.0016	10.2009	0
Th	ppm	NA	0	NA	0	30	0.0064	0.0065	0.0019	29.6464	0.0015
Ti	%	0.001	100	NA	0	100	0.0008	0.0008	0	0	0
Tl	ppm	NA	0	NA	0	30	0.0186	0.019	0.0028	15.2488	0.0022
Tm	ppm	0.001	100	NA	0	100	0.0008	0.0008	0	0	0
U	ppm	0.005	90	NA	0	90	0.0047	0.0038	0.0029	62.5691	0
V	ppm	NA	0	NA	0	0	0.266	0.265	0.046	17.2914	0.0371
W	ppm	0.01	60	NA	0	100	0.0085	0.0075	0.0013	15.1882	0
Y	ppm	NA	0	NA	0	0	0.0266	0.027	0.0052	19.5103	0.0037
Yb	ppm	0.003	100	NA	0	100	0.0022	0.0022	0	0	0
Zn	ppm	NA	0	NA	0	0	86.49	85.85	14.8379	17.1556	14.6036
Zr	ppm	NA	0	NA	0	70	0.036	0.035	0.0097	26.8359	0.0074

element	unit	LDL_ppm	pct_LDL	UDL	pct_UDL	pct_discr	MEAN	MEDIAN	SD	RSD %	MAD
Ag	ppm	NA	0	NA	0	40	0.0139	0.0135	0.0014	10.4255	0.0007
Al	%	NA	0	NA	0	100	0.01	0.01	0	0	0
As	ppm	NA	0	NA	0	30	0.402	0.41	0.0225	5.5993	0.0148
Au	ppm	0.0002	20	NA	0	80	0.0002	0.0002	0.0001	26.677	0
B	ppm	NA	0	NA	0	100	6	6	0	0	0
Ba	ppm	NA	0	NA	0	0	126.1	126.25	1.3292	1.0541	1.4826
Be	ppm	0.01	100	NA	0	100	0.0075	0.0075	0	0	0
Bi	ppm	NA	0	NA	0	90	0.0079	0.008	0.0003	4.0029	0
Ca	%	NA	0	NA	0	40	1.19	1.19	0.0183	1.5342	0.0148
Cd	ppm	NA	0	NA	0	0	0.1362	0.1355	0.0066	4.8431	0.0052
Ce	ppm	NA	0	NA	0	0	0.0871	0.088	0.0086	9.8979	0.0052
Co	ppm	NA	0	NA	0	0	0.1367	0.1375	0.0068	4.9621	0.0059
Cr	ppm	NA	0	NA	0	70	0.17	0.16	0.033	19.4108	0.0148
Cs	ppm	NA	0	NA	0	50	0.0385	0.038	0.0018	4.6221	0.0007
Cu	ppm	NA	0	NA	0	0	5.41	5.425	0.1665	3.0782	0.1705
Fe	ppm	NA	0	NA	0	0	84	85	6.7165	7.9958	4.4478
Ga	ppm	NA	0	NA	0	0	0.022	0.022	0.0015	6.776	0.0015
Ge	ppm	NA	0	NA	0	60	0.0092	0.0095	0.0017	18.332	0.0022
Hf	ppm	0.002	90	NA	0	90	0.0016	0.0015	0.0002	10.2009	0
Hg	ppm	NA	0	NA	0	30	0.1689	0.176	0.0131	7.7772	0.0059
In	ppm	0.005	100	NA	0	100	0.0038	0.0038	0	0	0
K	%	NA	0	NA	0	100	0.1	0.1	0	0	0

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La	ppm	NA	0	NA	0	0	0.0611	0.0615	0.0053	8.7442	0.003
Li	ppm	0.1	100	NA	0	100	0.075	0.075	0	0	0
Mg	%	NA	0	NA	0	100	0.024	0.024	0	0	0
Mn	ppm	NA	0	NA	0	0	393.4	392.5	5.2747	1.3408	4.4478
Mo	ppm	NA	0	NA	0	100	0.014	0.01	0.0052	36.8856	0
Na	%	NA	0	NA	0	40	0.0089	0.009	0.0014	15.3969	0.0015
Nb	ppm	NA	0	NA	0	100	0.0064	0.006	0.0005	8.0687	0
Ni	ppm	NA	0	NA	0	0	0.798	0.78	0.0713	8.9355	0.0371
P	%	NA	0	NA	0	80	0.0218	0.022	0.001	4.7376	0
Pb	ppm	NA	0	NA	0	0	1.166	1.17	0.045	3.8609	0.0371
Pd	ppm	0.001	90	NA	0	90	0.0008	0.0008	0.0001	10.2009	0
Pt	ppm	0.001	50	NA	0	90	0.0013	0.0009	0.0013	103.1148	0.0002
Rb	ppm	NA	0	NA	0	0	4.292	4.275	0.1937	4.5136	0.0741
Re	ppm	0.001	100	NA	0	100	0.0008	0.0008	0	0	0
S	%	NA	0	NA	0	100	0.066	0.07	0.0052	7.8242	0
Sb	ppm	NA	0	NA	0	90	0.057	0.06	0.0067	11.8412	0.0074
Sc	ppm	NA	0	NA	0	60	0.084	0.085	0.0117	13.9737	0.0148
Se	ppm	NA	0	NA	0	30	0.0806	0.0805	0.0058	7.2155	0.0096
Sn	ppm	NA	0	NA	0	90	0.034	0.035	0.007	20.5649	0.0074
Sr	ppm	NA	0	NA	0	0	28.22	28.1	1.0881	3.8558	0.9637
Ta	ppm	0.001	10	NA	0	90	0.001	0.001	0.0001	8.1084	0
Te	ppm	0.02	100	NA	0	100	0.015	0.015	0	0	0
Th	ppm	NA	0	NA	0	50	0.0062	0.006	0.0009	14.8216	0.0007
Ti	%	0.001	100	NA	0	100	0.0008	0.0008	0	0	0
Tl	ppm	NA	0	NA	0	80	0.0212	0.021	0.0008	3.7208	0.0015
U	ppm	0.005	100	NA	0	100	0.0038	0.0038	0	0	0
V	ppm	NA	0	NA	0	70	0.399	0.4	0.0129	3.2248	0.0148
W	ppm	NA	0	NA	0	100	0.01	0.01	0	0	0
Y	ppm	NA	0	NA	0	70	0.0358	0.035	0.002	5.5555	0.0022
Zn	ppm	NA	0	NA	0	30	107	107	1.3123	1.2265	1.4826
Zr	ppm	NA	0	NA	0	70	0.042	0.04	0.0079	18.7812	0
Te	ppm	0.02	90	NA	0	90	0.0155	0.015	0.0016	10.2009	0
Th	ppm	NA	0	NA	0	30	0.0064	0.0065	0.0019	29.6464	0.0015
Ti	%	0.001	100	NA	0	100	0.0008	0.0008	0	0	0
Tl	ppm	NA	0	NA	0	30	0.0186	0.019	0.0028	15.2488	0.0022
Tm	ppm	0.001	100	NA	0	100	0.0008	0.0008	0	0	0
U	ppm	0.005	90	NA	0	90	0.0047	0.0038	0.0029	62.5691	0
V	ppm	NA	0	NA	0	0	0.266	0.265	0.046	17.2914	0.0371
W	ppm	0.01	60	NA	0	100	0.0085	0.0075	0.0013	15.1882	0

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Y	ppm	NA	0	NA	0	0	0.0266	0.027	0.0052	19.5103	0.0037
Yb	ppm	0.003	100	NA	0	100	0.0022	0.0022	0	0	0
Zn	ppm	NA	0	NA	0	0	86.49	85.85	14.8379	17.1556	14.6036
Zr	ppm	NA	0	NA	0	70	0.036	0.035	0.0097	26.8359	0.0074

element	unit	LDL_ppm	pct_LDL	UDL	pct_UDL	pct_discr	MEAN	MEDIAN	SD	RSD %	MAD
Ag	ppm	NA	0	NA	0	40	0.0139	0.0135	0.0014	10.4255	0.0007
Al	%	NA	0	NA	0	100	0.01	0.01	0	0	0
As	ppm	NA	0	NA	0	30	0.402	0.41	0.0225	5.5993	0.0148
Au	ppm	0.0002	20	NA	0	80	0.0002	0.0002	0.0001	26.677	0
B	ppm	NA	0	NA	0	100	6	6	0	0	0
Ba	ppm	NA	0	NA	0	0	126.1	126.25	1.3292	1.0541	1.4826
Be	ppm	0.01	100	NA	0	100	0.0075	0.0075	0	0	0
Bi	ppm	NA	0	NA	0	90	0.0079	0.008	0.0003	4.0029	0
Ca	%	NA	0	NA	0	40	1.19	1.19	0.0183	1.5342	0.0148
Cd	ppm	NA	0	NA	0	0	0.1362	0.1355	0.0066	4.8431	0.0052
Ce	ppm	NA	0	NA	0	0	0.0871	0.088	0.0086	9.8979	0.0052
Co	ppm	NA	0	NA	0	0	0.1367	0.1375	0.0068	4.9621	0.0059
Cr	ppm	NA	0	NA	0	70	0.17	0.16	0.033	19.4108	0.0148
Cs	ppm	NA	0	NA	0	50	0.0385	0.038	0.0018	4.6221	0.0007
Cu	ppm	NA	0	NA	0	0	5.41	5.425	0.1665	3.0782	0.1705
Fe	ppm	NA	0	NA	0	0	84	85	6.7165	7.9958	4.4478
Ga	ppm	NA	0	NA	0	0	0.022	0.022	0.0015	6.776	0.0015
Ge	ppm	NA	0	NA	0	60	0.0092	0.0095	0.0017	18.332	0.0022
Hf	ppm	0.002	90	NA	0	90	0.0016	0.0015	0.0002	10.2009	0
Hg	ppm	NA	0	NA	0	30	0.1689	0.176	0.0131	7.7772	0.0059
In	ppm	0.005	100	NA	0	100	0.0038	0.0038	0	0	0
K	%	NA	0	NA	0	100	0.1	0.1	0	0	0
La	ppm	NA	0	NA	0	0	0.0611	0.0615	0.0053	8.7442	0.003
Li	ppm	0.1	100	NA	0	100	0.075	0.075	0	0	0
Mg	%	NA	0	NA	0	100	0.024	0.024	0	0	0
Mn	ppm	NA	0	NA	0	0	393.4	392.5	5.2747	1.3408	4.4478
Mo	ppm	NA	0	NA	0	100	0.014	0.01	0.0052	36.8856	0
Na	%	NA	0	NA	0	40	0.0089	0.009	0.0014	15.3969	0.0015
Nb	ppm	NA	0	NA	0	100	0.0064	0.006	0.0005	8.0687	0
Ni	ppm	NA	0	NA	0	0	0.798	0.78	0.0713	8.9355	0.0371
P	%	NA	0	NA	0	80	0.0218	0.022	0.001	4.7376	0
Pb	ppm	NA	0	NA	0	0	1.166	1.17	0.045	3.8609	0.0371
Pd	ppm	0.001	90	NA	0	90	0.0008	0.0008	0.0001	10.2009	0

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Pt	ppm	0.001	50	NA	0	90	0.0013	0.0009	0.0013	103.1148	0.0002
Rb	ppm	NA	0	NA	0	0	4.292	4.275	0.1937	4.5136	0.0741
Re	ppm	0.001	100	NA	0	100	0.0008	0.0008	0	0	0
S	%	NA	0	NA	0	100	0.066	0.07	0.0052	7.8242	0
Sb	ppm	NA	0	NA	0	90	0.057	0.06	0.0067	11.8412	0.0074
Sc	ppm	NA	0	NA	0	60	0.084	0.085	0.0117	13.9737	0.0148
Se	ppm	NA	0	NA	0	30	0.0806	0.0805	0.0058	7.2155	0.0096
Sn	ppm	NA	0	NA	0	90	0.034	0.035	0.007	20.5649	0.0074
Sr	ppm	NA	0	NA	0	0	28.22	28.1	1.0881	3.8558	0.9637
Ta	ppm	0.001	10	NA	0	90	0.001	0.001	0.0001	8.1084	0
Te	ppm	0.02	100	NA	0	100	0.015	0.015	0	0	0
Th	ppm	NA	0	NA	0	50	0.0062	0.006	0.0009	14.8216	0.0007
Ti	%	0.001	100	NA	0	100	0.0008	0.0008	0	0	0
Tl	ppm	NA	0	NA	0	80	0.0212	0.021	0.0008	3.7208	0.0015
U	ppm	0.005	100	NA	0	100	0.0038	0.0038	0	0	0
V	ppm	NA	0	NA	0	70	0.399	0.4	0.0129	3.2248	0.0148
W	ppm	NA	0	NA	0	100	0.01	0.01	0	0	0
Y	ppm	NA	0	NA	0	70	0.0358	0.035	0.002	5.5555	0.0022
Zn	ppm	NA	0	NA	0	30	107	107	1.3123	1.2265	1.4826
Zr	ppm	NA	0	NA	0	70	0.042	0.04	0.0079	18.7812	0
Te	ppm	0.02	90	NA	0	90	0.0155	0.015	0.0016	10.2009	0
Th	ppm	NA	0	NA	0	30	0.0064	0.0065	0.0019	29.6464	0.0015
Ti	%	0.001	100	NA	0	100	0.0008	0.0008	0	0	0
Tl	ppm	NA	0	NA	0	30	0.0186	0.019	0.0028	15.2488	0.0022
Tm	ppm	0.001	100	NA	0	100	0.0008	0.0008	0	0	0
U	ppm	0.005	90	NA	0	90	0.0047	0.0038	0.0029	62.5691	0
V	ppm	NA	0	NA	0	0	0.266	0.265	0.046	17.2914	0.0371
W	ppm	0.01	60	NA	0	100	0.0085	0.0075	0.0013	15.1882	0
Y	ppm	NA	0	NA	0	0	0.0266	0.027	0.0052	19.5103	0.0037
Yb	ppm	0.003	100	NA	0	100	0.0022	0.0022	0	0	0
Zn	ppm	NA	0	NA	0	0	86.49	85.85	14.8379	17.1556	14.6036
Zr	ppm	NA	0	NA	0	70	0.036	0.035	0.0097	26.8359	0.0074

6.3. Bureau Veritas Acmelabs, Vancouver, Canada

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Table 4. Statistics for UPDEEP_SPRU_BARK_DRY_BVAcmelabs based on 10 aliquots. LDL = lower detection limit, pct_LDL = percent of samples under lower detection limit, UDL = upper detection limit, pct_UDL = percent of samples over upper detection limit, pct_discr = percent of discretized values, SD = standard deviation, RSD% = relative standard deviation percent and MAD= median absolute deviation. The RSD% values < 5 are marked as green, the 5≤RSD%≥15 are marked with orange and the RSD%>15 are marked with red. Elements having less than four observations between the detection limits are coloured grey.

element	unit	LDL_ppm	pct_LDL	UDL	pct_UDL	pct_discr	MEAN	MEDIAN	SD	RSD %	MAD
Ag	PPB	2	0	NA	0	70	12.3	12	0.9487	7.7129	1.4826
Al	%	0.01	60	NA	0	100	0.0085	0.0075	0.0013	15.1882	0
As	PPM	0.1	0	NA	0	70	0.32	0.3	0.0789	24.6503	0
Au	PPB	0.2	30	NA	0	60	0.395	0.4	0.1936	49.0069	0.2224
B	PPM	1	0	NA	0	80	6.8	7	0.7888	11.6002	1.4826
Ba	PPM	0.1	0	NA	0	0	119.46	119.15	5.5929	4.6818	4.5219
Be	PPM	0.1	100	NA	0	100	0.075	0.075	0	0	0
Bi	PPM	0.02	90	NA	0	90	0.0155	0.015	0.0016	10.2009	0
Ca	%	0.01	0	NA	0	0	1.064	1.065	0.0401	3.7646	0.0297
Cd	PPM	0.01	0	NA	0	60	0.135	0.135	0.0108	8.0009	0.0074
Ce	PPM	0.1	70	NA	0	100	0.0825	0.075	0.0121	14.6378	0
Co	PPM	0.01	0	NA	0	70	0.168	0.165	0.0132	7.8367	0.0074
Cr	PPM	0.1	0	NA	0	60	1.51	1.5	0.1663	11.0154	0
Cs	PPM	0.02	0	NA	0	100	0.04	0.04	0	0	0
Cu	PPM	0.01	0	NA	0	0	5.5	5.45	0.1994	3.6252	0.1631
Dy	PPM	0.02	100	NA	0	100	0.015	0.015	0	0	0
Er	PPM	0.02	100	NA	0	100	0.015	0.015	0	0	0
Eu	PPM	0.02	100	NA	0	100	0.015	0.015	0	0	0
Fe	%	0.001	0	NA	0	50	0.0136	0.013	0.0012	8.6308	0.0007
Ga	PPM	0.1	100	NA	0	100	0.075	0.075	0	0	0
Gd	PPM	0.02	100	NA	0	100	0.015	0.015	0	0	0
Ge	PPM	0.01	100	NA	0	100	0.0075	0.0075	0	0	0
Hf	PPM	0.001	30	NA	0	70	0.0018	0.002	0.0011	58.8492	0.0015
Hg	PPB	1	0	NA	0	0	161.9	160.5	5.4457	3.3636	6.6717
Ho	PPM	0.02	100	NA	0	100	0.015	0.015	0	0	0
In	PPM	0.02	100	NA	0	100	0.015	0.015	0	0	0
K	%	0.01	0	NA	0	80	0.092	0.09	0.0042	4.583	0
La	PPM	0.01	0	NA	0	100	0.054	0.05	0.0052	9.5629	0
Li	PPM	0.01	10	NA	0	70	0.0278	0.03	0.0118	42.5643	0.0148

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Lu	PPM	0.02	100	NA	0	100	0.015	0.015	0	0	0
Mg	%	0.001	0	NA	0	60	0.0287	0.0285	0.0015	5.2071	0.0007
Mn	PPM	1	0	NA	0	0	390.5	387	15.3713	3.9363	14.826
Mo	PPM	0.01	0	NA	0	90	0.021	0.02	0.0032	15.0585	0
Na	%	0.001	0	NA	0	80	0.0081	0.008	0.0007	9.1094	0.0007
Nb	PPM	0.01	100	NA	0	100	0.0075	0.0075	0	0	0
Nd	PPM	0.02	10	NA	0	50	0.0365	0.03	0.0133	36.5582	0.0074
Ni	PPM	0.1	0	NA	0	90	0.74	0.75	0.0699	9.4487	0.0741
P	%	0.001	0	NA	0	70	0.0204	0.02	0.0016	7.7334	0.0015
Pb	PPM	0.01	0	NA	0	0	1.288	1.31	0.0644	5.0023	0.0519
Pd	PPB	2	100	NA	0	100	1.5	1.5	0	0	0
Pr	PPM	0.02	100	NA	0	100	0.015	0.015	0	0	0
Pt	PPB	1	100	NA	0	100	0.75	0.75	0	0	0
Rb	PPM	0.1	0	NA	0	40	4.61	4.65	0.1729	3.7502	0.0741
Re	PPB	1	100	NA	0	100	0.75	0.75	0	0	0
S	%	0.05	0	NA	0	30	0.088	0.09	0.0169	19.1653	0.0148
Sb	PPM	0.02	0	NA	0	80	0.042	0.04	0.0042	10.039	0
Sc	PPM	0.1	0	NA	0	60	0.16	0.1	0.0843	52.7046	0
Se	PPM	0.1	0	NA	0	100	0.23	0.2	0.0483	21.002	0
Sm	PPM	0.02	100	NA	0	100	0.015	0.015	0	0	0
Sn	PPM	0.02	80	NA	0	80	0.018	0.015	0.0063	35.1364	0
Sr	PPM	0.5	0	NA	0	0	28.92	29.2	1.056	3.6514	1.0378
Ta	PPM	0.001	100	NA	0	100	0.0008	0.0008	0	0	0
Tb	PPM	0.02	100	NA	0	100	0.015	0.015	0	0	0
Te	PPM	0.02	100	NA	0	100	0.015	0.015	0	0	0
Th	PPM	0.1	100	NA	0	100	0.075	0.075	0	0	0
Ti	PPM	1	0	NA	0	100	3	3	0	0	0
Tl	PPM	0.02	0	NA	0	100	0.023	0.02	0.0048	21.002	0
Tm	PPM	0.02	100	NA	0	100	0.015	0.015	0	0	0
U	PPM	0.01	80	NA	0	80	0.041	0.0075	0.1051	256.2459	0
V	PPM	2	100	NA	0	100	1.5	1.5	0	0	0
W	PPM	0.1	100	NA	0	100	0.075	0.075	0	0	0
Y	PPM	0.001	0	NA	0	40	0.0347	0.0335	0.003	8.704	0.0015
Yb	PPM	0.02	100	NA	0	100	0.015	0.015	0	0	0
Zn	PPM	0.1	0	NA	0	0	110.97	109.9	7.4796	6.7402	2.8911
Zr	PPM	0.01	0	NA	0	80	0.048	0.045	0.0092	19.1445	0.0074

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7. PREPARER AND SUPPLIER

UPDEEP_SPRU_BARK_DRY SRMs are prepared by the Geological Survey of Finland (GTK) in a project Upscaling deep buried geochemical exploration techniques into European business (UpDeep) and supplied by GTK and Scandinavian Geopool.

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8. INTENDED USE

UPDEEP_SPRU_BARK_DRY SRM is intended to quantify laboratory accuracy and to monitor laboratory precision, drift, periodic concentration shifts, unusual breaks and outliers in analytical results of vegetation samples for mineral exploration.

9. STABILITY AND STORAGE INSTRUCTIONS

UPDEEP_SPRU_BARK_DRY SRM should be stored in a room temperature unopened in their own plastic containers. Stability of the materials is not tested.

10. INSTRUCTIONS FOR CORRECT USE

UPDEEP_SPRU_BARK_DRY SRM should be only be used to monitor the quality of dry weight biogeochemical samples of the similar matrix and concentration ranges.

11. HANDLING INSTRUCTIONS

Keep dry and do not touch with bare hands to avoid SRM contamination.

12. TRACEABILITY

The analyzed SRM samples represent the entire batch of prepared SRM. All the analyzed samples have individual names and can be traced back into the original analytical results. The laboratories were chosen on the basis of the availability of the analytical services specific to plants and offered range of elements usable for mineral exploration. The laboratories have ISO/IEC 17025:2005 accreditation (ALS Minerals/ALS Global), Quality ISO9001:2008, Environmental Management: ISO14001, Safety Management OH SAS 18001 and AS4801 certificates (Bureau Veritas Minerals Acmelabs) and ISO/IEC 17025 (Activation Laboratories Ltd).

13. LEGAL NOTICE

Geological Survey of Finland and Scandinavian Geopool have prepared and Geological Survey of Finland and Vienna Technical University have statistically evaluated the property values of this reference material to the best of their ability. Geological Survey of Finland, Scandinavian Geopool and Vienna Technical University assume no liability for any errors in this material and information. Geological Survey of Finland, Scandinavian Geopool and Vienna Technical University shall be free from, and indemnified by the user against, any liability for any damage or loss, whether direct or consequential, arising from or as a result of the use of this material and information.

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14. REFERENCES

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