

Chemical and isotope data on the deep regolith’s source of mineral nutrients in mountainous temperate forest ecosystems

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Sheets:

- Tab. S1 Soil pH at CON and MIT
- Tab. S2 Compiled concentrations and total deposition rates of atmospheric dust deposition
- Tab. S3 Isotopic composition of leachates from sequential extractions of soil and saprolite and bulk regolith and rock at CON and MIT
- Tab. S4 Isotopic composition of plant samples at CON and MIT
- Tab. S5 Beryllium concentration and isotopic ratio of leachates from sequential extractions of soil and saprolite at CON and MIT
- Tab. S6 Phosphorus concentrations of leachates from sequential extractions of soil and saprolite at CON and MIT

Metric	Units	Sheet	Description
(Pi), (Po)	µg g ⁻¹	Tab. 6	Organic (Po) and inorganic (Pi) phosphorus concentrations of extractants from the Hedley fraction method
UCC	µg g ⁻¹	Tab. S2	Element concentration of the upper continental crust (UCC)
atmospheric dust	µg g ⁻¹	Tab. S2	Element concentration of atmospheric dust
dust deposition rate	mg m ⁻² yr ⁻¹	Tab. S2	Total mass flux of external atmospheric dust deposition
¹⁰ Be(meteoric)	10 ⁶ at/g	Tab. S4	Concentration of meteoric ¹⁰ Be from amorphous oxides (extracted from soil)
¹⁰ Be(meteoric)/ ⁹ Be	dimensionless	Tab. S4, S5	Meteoritic Be ratio of bulk plant tissue and amorphous oxides of soil and saprolite
⁸⁷ Sr/ ⁸⁶ Sr	dimensionless	Tab. S4, S3	Radiogenic Sr composition of bulk bedrock, bulk regolith, bulk plant tissue, water-soluble and NH ₄ OAc extractable fraction of soil and saprolite
soil pH	dimensionless	Tab. S1	pH of soil and saprolite

Tab. S1 Soil pH at CON and MIT

sample ID	IGSN [†]	brief sample description	mean depth (m)	soil pH
<i>CON regolith depth profile</i>				
CON 14	GFDUH00LT	soil, Ah horizon	0.2	4.1
CON 13	GFDUH00LU	soil, Ah + Bw horizon	0.4	4.3
CON 12	GFDUH00LV	soil, Bw1 horizon	0.6	4.5
CON 11	GFDUH00LW	soil, Bw1 horizon	0.8	4.6
CON 10	GFDUH00LX	soil, Bw1 horizon	1.0	4.7
CON 9	GFDUH00LY	soil, Bw1 horizon	1.2	4.5
CON 8	GFDUH00LZ	soil, Bw1 horizon	1.4	4.6
CON 7	GFDUH00M0	soil, Bw1 horizon	1.6	4.6
CON 6	GFDUH00M1	soil, Bw2 horizon	1.8	4.7
CON 5	GFDUH00M2	soil, Bw2 horizon	2.0	4.8
CON 4	GFDUH00M3	soil, Bw2 horizon	2.2	4.7
CON 3	GFDUH00M4	saprolite, Cw horizon	2.4	5.3
CON 2	GFDUH00M5	saprolite, Cw horizon	2.6	5.4
CON 1	GFDUH00M6	saprolite, Cw horizon	2.8	5.8
CON 19	GFDUH00MB	saprolite, Cw horizon	3.4	7.0
CON 20	GFDUH00MC	saprolite, Cw horizon	3.9	7.7
CON 21	GFDUH00MD	saprolite, Cw horizon	4.4	7.3
CON 22	GFDUH00ME	saprolite, Cw horizon	5.0	7.1
CON 23	GFDUH00MF	saprolite, Cw horizon	5.7	7.1
CON 24	GFDUH00MG	saprolite, Cw horizon	6.5	7.1
<i>MIT regolith depth profile</i>				
MIT 14	GFDUH004A	soil, Bw horizon	0.2	3.6
MIT 13	GFDUH004B	soil, Bw horizon	0.4	4.1
MIT 12	GFDUH004C	soil, Bw horizon	0.6	4.5
MIT 11	GFDUH0045	soil, Bw horizon	0.8	4.6
MIT 10	GFDUH0046	soil, Bw horizon	1.0	4.7
MIT 9	GFDUH0047	soil, Bw horizon	1.2	4.7
MIT 8	GFDUH0048	saprolite, Cw horizon	1.4	4.8
MIT 7	GFDUH0049	saprolite, Cw horizon	1.6	4.7
MIT 6	GFDUH004D	saprolite, Cw horizon	1.8	4.8
MIT 5	GFDUH004E	saprolite, Cw horizon	2.0	4.7
MIT 4	GFDUH004F	saprolite, Cw horizon	2.2	4.8
MIT 3	GFDUH004G	saprolite, Cw horizon	2.4	4.9
MIT 2	GFDUH004H	saprolite, Cw horizon	2.6	5.1
MIT 1	GFDUH004J	saprolite, Cw horizon	2.8	5.3
MIT 19	GFDUH00AT	saprolite, Cw horizon	3.2	5.1
MIT 20	GFDUH00AU	saprolite, Cw horizon	3.6	5.2
MIT 21	GFDUH00AV	saprolite, Cw horizon	4.0	5.1
MIT 22	GFDUH00AW	saprolite, Cw horizon	4.7	5.7
MIT 23	GFDUH00AX	saprolite, Cw horizon	5.3	5.6
MIT 24	GFDUH00AY	saprolite, Cw horizon	6.7	5.9
MIT 25	GFDUH00AZ	saprolite, Cw horizon	8.4	6.1
MIT 26	GFDUH00B0	saprolite, Cw horizon	9.5	6.0
MIT 27	GFDUH00B1	saprolite, Cw horizon	12.5	6.4
MIT 28	GFDUH00B2	saprolite, Cw horizon	13.4	6.3
MIT 29	GFDUH00B3	saprolite, Cw horizon	16.3	6.4
<i>International reference material</i>				
IRMM-443-7 (a)			4.8	
IRMM-443-7 (b)			4.7	
IRMM-443-7 (c)			4.8	
IRMM-443-7 (d)			4.7	
IRMM-443-7 (e)			4.7	
IRMM-443-7 (f)			4.8	
IRMM-443-7 mean			4.8	
<i>IRMM-443-7 2SD</i>			<i>0.1</i>	
IRMM-443-7 certified value			4.3	
IRMM-443-7 certified relative uncertainty			0.7	
relative uncertainty (%)			10%	

(a)-(e) indicate individual sample digestion batches
† IGSN (International Geo Sample Number). Metadata of samples are available under: www.igsn.org by adding the IGSN after igsn.org, e.g. igsn.org/GFDUH00LT

Tab. S2 Compiled concentrations and total deposition rates of atmospheric dust deposition

	K	n	Ca	n	Mg	n	P	n	Reference
<i>Concentrations (µg/g)</i>									
atmospheric dust	23100	3	57000	3	16900	3	626	3	Avila et al., 1998
atmospheric dust	15700	5	33200	5	16300	5	601	5	Avila et al., 1998
atmospheric dust	19924	1	25729	1	11459	1			Hladil et al., 2008
atmospheric dust	14943	1	7862	1	9046	1			Hladil et al., 2008
atmospheric dust	20754	1	6432	1	6634	1			Hladil et al., 2008
atmospheric dust	10600	1	26000	1	8500	1			Vanderstraeten et al., 2008
atmospheric dust	23327	9	16510	9	4583	9	873	9	Goudie & Middleton, 2001
atmospheric dust	21833	4	61465	4	18575	4	1047	3	Goudie & Middleton, 2001
atmospheric dust	17682	1	14366	1	18153	1	829	1	Goudie & Middleton, 2001
atmospheric dust	21833	1							Goudie & Middleton, 2001
atmospheric dust	12452	1	10006	1	4825	1	873	1	Castillo et al., 2008
atmospheric dust	20754	1	14294	1	9649	1	873	1	Castillo et al., 2008
atmospheric dust	15773	1	92197	1	17490	1	873	1	Castillo et al., 2008
atmospheric dust	14943	1	11435	1	5428	1	436	1	Castillo et al., 2008
atmospheric dust	23000	14	36000	12	12000	12	1087	10	Lawrence & Neff, 2009
weighted mean	20816		32661		11498		875		
<i>SD</i>	<i>5933</i>		<i>8906</i>		<i>2913</i>		<i>352</i>		
Upper continental crust (UCC)	28000		30000		13300		700		Taylor & McLennan, 1995
<i>Total dust deposition rates (mg m⁻² yr⁻¹)</i>									
	min	max							Reference
atmospheric dust	2000	5000							Jickells et al., 2005
atmospheric dust	1600	6000							Zender et al., 2003
mean	1800	5500							

min: minimum, max: maximum, n: number

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Tab. S3 Isotopic composition of leachates from sequential extractions of soil and saprolite and bulk regolith and rock at CON and MIT

MC-ICP-MS analyses									
sample ID	IGSN [†]	brief sample description	mean depth	(⁸⁷ Sr / ⁸⁶ Sr)	SD	(⁸⁷ Sr / ⁸⁶ Sr)	SD	(⁸⁷ Sr / ⁸⁶ Sr)	SD
<i>CON regolith - bedrock depth profile</i>			(m)	<i>bulk regolith, rock</i>		<i>water soluble (mQ-H₂O)</i>		<i>exchangeable (NH₄OAc)</i>	
CON 14	GFDUH00J0	soil, Ah horizon	0.2	0.72956	0.00015	0.71938	0.00007	0.71924	0.00004
CON 13	GFDUH00J1	soil, Ah/Bw horizon	0.4	0.72956	0.00011	0.71905	0.00005	0.71895	0.00005
CON 12	GFDUH00J2	soil, Bw1 horizon	0.6	0.72898	0.00018	0.71947	0.00006	0.71932	0.00005
CON 11	GFDUH00J3	soil, Bw1 horizon	0.8	0.72901	0.00017	0.71877	0.00007	0.71883	0.00005
CON 10	GFDUH00J4	soil, Bw1 horizon	1.0	0.72895	0.00018	0.71878	0.00006	0.71879	0.00005
CON 9	GFDUH00J5	soil, Bw1 horizon	1.2	0.72961	0.00013	0.71971	0.00006	0.71935	0.00008
CON 8	GFDUH00J6	soil, Bw1 horizon	1.4	0.73221	0.00017	0.72078	0.00006	0.72064	0.00005
CON 7	GFDUH00J7	soil, Bw1 horizon	1.6	0.73237	0.00021	0.72119	0.00006	0.72093	0.00004
CON 6	GFDUH00J8	soil, Bw2 horizon	1.8	0.73099	0.00019	0.71982	0.00006	0.71980	0.00005
CON 5	GFDUH00J9	soil, Bw2 horizon	2.0	0.72922	0.00017	0.71924	0.00007	0.71927	0.00005
CON 4	GFDUH00JA	soil, Bw2 horizon	2.2	0.72898	0.00018	0.71896	0.00006	0.71905	0.00005
CON 3	GFDUH00JB	saprolite, Cw horizon	2.4	0.73031	0.00019	0.71789	0.00006	0.71795	0.00004
CON 2	GFDUH00JC	saprolite, Cw horizon	2.6	0.72957	0.00014	0.71742	0.00006	0.71726	0.00005
CON 1	GFDUH00JD	saprolite, Cw horizon	2.8	0.72883	0.00018	0.71721	0.00006	0.71697	0.00004
CON 19	GFDUH00JJ	saprolite, Cw horizon	3.4	0.72881	0.00008	0.71656	0.00006	0.71653	0.00004
CON 20	GFDUH00JK	saprolite, Cw horizon	3.9	0.72713	0.00006	0.71638	0.00006	0.71633	0.00004
CON 21	GFDUH00HZ	saprolite, Cw horizon	4.4	0.72712	0.00017	0.71656	0.00005	0.71639	0.00007
CON 22	GFDUH00JL	saprolite, Cw horizon	5.0	0.72662	0.00006	0.71790	0.00005	0.71650	0.00005
CON 23	GFDUH00JM	saprolite, Cw horizon	5.7	0.72693	0.00010	0.71668	0.00005	0.71604	0.00005
CON 24	GFDUH00JN	saprolite, Cw horizon	6.5	0.72446	0.00017	0.71648	0.00006	0.71597	0.00005
CON 40.41	GFDUH00N7	weathered paragneiss	10.5	0.71108	0.00012	n.d.	n.d.	n.d.	n.d.
CON 47	GFDUH00N9	weathered paragneiss	13.0	0.70899	0.00016	n.d.	n.d.	n.d.	n.d.
CON 48	GFDUH00NA	unweathered paragneiss	15.2	0.70959	0.00019	n.d.	n.d.	n.d.	n.d.
CON 49	GFDUH00NB	unweathered paragneiss	16.3	0.70957	0.00016	n.d.	n.d.	n.d.	n.d.
CON 50	GFDUH00NC	unweathered paragneiss	18.4	0.70942	0.00020	n.d.	n.d.	n.d.	n.d.
CON 51	GFDUH00ND	unweathered paragneiss	19.5	0.71087	0.00017	n.d.	n.d.	n.d.	n.d.

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Tab. S3 continued - Isotopic composition of leachates from sequential extractions of soil and saprolite and bulk regolith and rock at CON and MIT

MC-ICP-MS analyses									
sample ID	IGSN [†]	brief sample description	mean depth	(⁸⁷ Sr / ⁸⁶ Sr)	SD	(⁸⁷ Sr / ⁸⁶ Sr)	SD	(⁸⁷ Sr / ⁸⁶ Sr)	SD
<i>MIT regolith - bedrock depth profile</i>			(m)	<i>bulk regolith, rock</i>		<i>water soluble (mQ-H₂O)</i>		<i>exchangeable (NH₄OAc)</i>	
MIT 14	GFDUH002Z	soil, Bw horizon	0.2	0.71591	0.00011	0.71556	0.00005	0.71557	0.00005
MIT 13	GFDUH0030	soil, Bw horizon	0.4	0.71647	0.00011	0.71698	0.00005	0.71765	0.00004
MIT 12	GFDUH000K	soil, Bw horizon	0.6	0.71690	0.00009	0.71783	0.00005	0.71798	0.00004
MIT 11	GFDUH0000	soil, Bw horizon	0.8	0.71771	0.00010	0.71926	0.00005	0.71955	0.00004
MIT 10	GFDUH002L	soil, Bw horizon	1.0	0.71810	0.00011	0.71741	0.00005	0.71777	0.00004
MIT 9	GFDUH0002	soil, Bw horizon	1.2	0.71952	0.00007	0.71963	0.00005	0.71094	0.00004
MIT 8	GFDUH002N	saprolite, Cw horizon	1.4	0.72168	0.00010	0.71916	0.00006	0.72002	0.00004
MIT 7	GFDUH0004	saprolite, Cw horizon	1.6	0.72135	0.00011	0.71878	0.00007	0.71998	0.00007
MIT 6	GFDUH0005	saprolite, Cw horizon	1.8	0.72295	0.00010	0.71762	0.00006	0.71813	0.00004
MIT 5	GFDUH003K	saprolite, Cw horizon	2.0	0.72178	0.00011	0.71664	0.00006	0.71725	0.00005
MIT 4	GFDUH003L	saprolite, Cw horizon	2.2	0.72022	0.00010	0.71656	0.00006	0.71706	0.00003
MIT 3	GFDUH003M	saprolite, Cw horizon	2.4	0.72089	0.00011	0.71927	0.00006	0.72000	0.00004
MIT 2	GFDUH0031	saprolite, Cw horizon	2.6	0.72004	0.00011	0.72237	0.00006	0.72382	0.00005
MIT 1	GFDUH0032	saprolite, Cw horizon	2.8	0.71955	0.00012	0.7244	0.00005	0.7243	0.00005
MIT 19	GFDUH008R	saprolite, Cw horizon	3.2	0.71554	0.00009	0.71509	0.00009	0.71507	0.00007
MIT 20	GFDUH008S	saprolite, Cw horizon	3.6	0.71466	0.00007	0.71447	0.00009	0.71433	0.00009
MIT 21	GFDUH008T	saprolite, Cw horizon	4.0	0.71836	0.00009	0.71518	0.00009	0.71513	0.00009
MIT 22	GFDUH008U	saprolite, Cw horizon	4.7	0.71621	0.00006	0.71472	0.00011	0.71480	0.00006
MIT 23	GFDUH008V	saprolite, Cw horizon	5.3	0.71855	0.00006	0.71456	0.00009	0.71457	0.00006
MIT 24	GFDUH008W	saprolite, Cw horizon	6.7	0.72066	0.00006	0.71442	0.00029	0.71444	0.00005
MIT 25	GFDUH008X	saprolite, Cw horizon	8.4	0.71970	0.00012	n.d.	n.d.	0.71576	0.00004
MIT 26	GFDUH008K	saprolite, Cw horizon	9.5	0.71356	0.00005	0.71550	0.00038	0.71557	0.00005
MIT 27	GFDUH008L	saprolite, Cw horizon	12.5	0.71393	0.00006	0.71536	0.00007	0.71532	0.00006
MIT 28	GFDUH008Y	saprolite, Cw horizon	13.4	0.71402	0.00006	0.71539	0.00009	0.71539	0.00005
MIT 29	GFDUH008Z	saprolite, Cw horizon	16.3	0.71515	0.00007	0.71772	0.00007	0.71711	0.00005
MIT 31	GFDUH00BY	weathered gneiss	17.7	0.72586	0.00005	n.d.	n.d.	n.d.	n.d.
MIT 32	GFDUH00BX	weathered gneiss	20.1	0.71429	0.00005	n.d.	n.d.	n.d.	n.d.
MIT 33	GFDUH00BW	weathered gneiss	22.8	0.71438	0.00005	n.d.	n.d.	n.d.	n.d.
MIT 34	GFDUH00BV	weathered gneiss	25.9	0.71675	0.00005	n.d.	n.d.	n.d.	n.d.
MIT 35	GFDUH00BU	unweathered gneiss	26.3	0.71701	0.00006	n.d.	n.d.	n.d.	n.d.
MIT 36	GFDUH00BT	unweathered gneiss	26.5	0.71730	0.00006	n.d.	n.d.	n.d.	n.d.
MIT 37	GFDUH00BS	unweathered gneiss	27.9	0.71475	0.00006	n.d.	n.d.	n.d.	n.d.
MIT 38	GFDUH00BR	unweathered gneiss	28.6	0.72048	0.00006	n.d.	n.d.	n.d.	n.d.
MIT 39	GFDUH00BQ	unweathered gneiss	29.0	0.71758	0.00010	n.d.	n.d.	n.d.	n.d.
MIT 40	GFDUH00BP	unweathered gneiss	29.6	0.71877	0.00006	n.d.	n.d.	n.d.	n.d.

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Tab. S3 continued - Isotopic composition of leachates from sequential extractions of soil and saprolite and bulk regolith and rock at CON and MIT

sample ID	MC-ICP-MS analyses				$(^{87}\text{Sr} / ^{86}\text{Sr})$	SD
	$(^{87}\text{Sr} / ^{86}\text{Sr})$	SD	$(^{87}\text{Sr} / ^{86}\text{Sr})$	SD		
<i>International reference materials for data quality control</i>	<i>bulk regolith, rock</i>		<i>water soluble (mQ-H₂O)</i>		<i>exchangeable (NH₄OAc)</i>	
SRM 2709a San Joaquin Soil (a) N=8	0.70819	0.00004	0.70776	0.00008	0.70774	0.00005
SRM 2709a San Joaquin Soil (b) N=1	0.70810	0.00012				
SRM 2709a San Joaquin Soil (c) N=1	0.70816	0.00013				
SRM 2709a San Joaquin Soil mean, SD	0.70815	0.00005				
TILL-1 (CCRMP) (a) N=1	0.71151	0.00021	0.71033	0.00008	0.71020	0.00004
TILL-1 (CCRMP) (b) N=1	0.71146	0.00006				
TILL-1 (CCRMP) (b) N=1, SD	0.71149	0.00004				
RGM-1 Rhyolite (USGS) N=9	0.70425	0.00004				
<i>RGM-1 Rhyolite (USGS) published data N=5</i>	<i>0.70421</i>	<i>0.00001</i>				
GA granite (CNRS) (a) N=1	0.71386	0.00010				
GA granite (CNRS) (b) N=1	0.71378	0.00004				
GA granite (CNRS) (a) N=1 mean, SD	0.71382	0.00006				
SRM987 processed through column chemistry N=32	0.71026	0.00011				
SRM987 not processed through column chemistry N=240	0.71029	0.00001				
<i>SRM987 published data* (measured with MC-ICP-MS) N=247</i>	<i>0.71029</i>	<i>0.00033</i>				

n.d = not determined, mQ-H₂O = deionised water (Milli-Q water, 18 MΩ).

(a)-(c) indicate individual sample digestion batches; N denotes number of individual analyses

† IGSN (International Geo Sample Number). Metadata of samples are available under: www.igsn.org by adding the IGSN after igsn.org, e.g. igsn.org/GFDUH00LT

Tab. S4 Isotopic composition of plant samples at CON and MIT

sample ID	IGSN [†]	sampling date (month year)	brief sample description	MC-ICP-MS analyses		Q-ICP-MS analyses		AMS analyses			
				(⁸⁷ Sr / ⁸⁶ Sr)	SD	⁹ Be ^(f)	uncertainty	¹⁰ Be _{meteoric}	uncertainty	(¹⁰ Be / ⁹ Be)	uncertainty
						(ng/g)	(ng/g)	(10 ⁶ at/g)	(10 ⁶ at/g)	(10 ⁻⁹)	(10 ⁻⁹)
<i>living foliage</i>											
CON-V-3	GFDUH00Q7	Sep 14	Fagus sylvatica - leaves	0.71695	0.00005	28	8.4	20	0.64	11	3.2
MIT-V-9	GFDUH006W	Sep 14	Fagus sylvatica - leaves	0.71473	0.00005	13	3.9	12	0.38	13	4.0
MIT-V-10	GFDUH006R	Sep 14	Fagus sylvatica - leaves	0.71576	0.00005	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CON-V-4	GFDUH00Q8	Sep 14	Picea abies - needles	0.71781	0.00005	14	4.2	10	0.34	11	3.3
CON-V-5	GFDUH00Q9	Sep 14	Picea abies - needles	0.71788	0.00005	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MIT-V 3	GFDUH006Q	Jul 14	Picea abies - needles	0.71448	0.00013	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MIT-V-11	GFDUH006S	Sep 14	Picea abies - needles	0.71424	0.00004	7.8	2.3	11	0.36	21	6.5
MIT-V-12	GFDUH006T	Sep 14	Picea abies - needles	0.71513	0.00005	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
<i>living wood</i>											
CON-V 1	GFDUH00NE	Jul 14	Fagus sylvatica - heartwood	0.71808	0.00011	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CON-V-10	GFDUH00T9	Sep 14	Fagus sylvatica - heartwood	0.71791	0.00004	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MIT-V-17	GFDUH00TB	Sep 14	Fagus sylvatica - heartwood	0.71529	0.00005	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MIT-V-5,6	GFDUH00TJ	Jul 14	Fagus sylvatica - heartwood	0.71633	0.00011	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CON-V-10	GFDUH00TA	Sep 14	Fagus sylvatica - sapwood	0.71725	0.00004	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MIT-V 5	GFDUH00T3	Jul 14	Fagus sylvatica - sapwood	0.71604	0.00012	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MIT-V-17	GFDUH00T2	Sep 14	Fagus sylvatica - sapwood	0.71505	0.00004	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MIT-V 6	GFDUH00T4	Jul 14	Fagus sylvatica - sapwood	0.71499	0.0001	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CON-V 6,7	GFDUH00TG	Sep 14	Fagus sylvatica - bulk wood	n.d.	n.d.	2.4	0.72	1.2	0.05	7.8	2.4
MIT-V-14,15	GFDUH00TL	Sep 14	Fagus sylvatica - bulk wood	n.d.	n.d.	1.2	0.36	1.4	0.05	19	5.6
CON-V 2	GFDUH00NF	Jul 14	Picea abies - heartwood	0.71860	0.00011	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CON-V-18	GFDUH00TD	Sep 14	Picea abies - heartwood	0.71863	0.00004	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MIT-V 7	GFDUH00TF	Jul 14	Picea abies - heartwood	0.71563	0.00011	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MIT-V-24	GFDUH00T7	Sep 14	Picea abies - heartwood	0.71622	0.00004	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MIT-V 8	GFDUH00T5	Jul 14	Picea abies - heartwood	0.71573	0.00009	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CON-V-18	GFDUH00TE	Sep 14	Picea abies - sapwood	0.71849	0.00004	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MIT-V 7	GFDUH00TC	Jul 14	Picea abies - sapwood	0.71510	0.00009	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MIT-V-24	GFDUH00T8	Sep 14	Picea abies - sapwood	0.71541	0.00004	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MIT-V 8	GFDUH00T6	Jul 14	Picea abies - sapwood	0.71506	0.00011	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CON-V-14,15	GFDUH00TH	Sep 14	Picea abies - bulk wood	n.d.	n.d.	0.48	0.14	0.16	0.01	5.0	1.5
MIT-V-23,25	GFDUH00TK	Sep 14	Picea abies - bulk wood	n.d.	n.d.	0.51	0.15	0.26	0.01	7.7	2.3

continued next page ...

Tab. S4 continued - Isotopic composition of plant samples at CON and MIT

sample ID	IGSN [†]	sampling date (month year)	brief sample description	MC-ICP-MS analyses		Q-ICP-MS analyses		AMS analyses			
				(⁸⁷ Sr / ⁸⁶ Sr)	SD	⁹ Be ^(f)	uncertainty	¹⁰ Be	uncertainty	(¹⁰ Be / ⁹ Be)	uncertainty
						(ng/g)	(ng/g)	(10 ⁶ at/g)	(10 ⁶ at/g)	(10 ⁻⁹)	(10 ⁻⁹)
<i>organic layer on forest floor</i>											
CON-QP1-1	GFDUH00TN	Mai 14	forest floor - L horizon	0.71792	0.00004	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CON-QP1-2	GFDUH00TS	Mai 14	forest floor - Of horizon	0.71792	0.00003	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CON-QP1-3	GFDUH00TP	Mai 14	forest floor - Oh horizon	0.72371	0.00002	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MIT-QP-1	GFDUH00TQ	Feb 14	forest floor - L horizon	0.7158	0.00001	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MIT-QP-2	GFDUH00TR	Feb 14	forest floor - Of horizon	0.71678	0.00002	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
MIT-QP-3	GFDUH00TM	Feb 14	forest floor - Oh horizon	0.71802	0.00001	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
<i>international reference materials for concentration data quality control</i>											
SRM 1515 Apple leaves (a)				0.71400	0.0001	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
SRM 1515 Apple leaves (a)				0.71398	0.00006	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
SRM 1515 Apple leaves (b)				0.71403	0.00005	24	7.2	3.4	0.12	2.1	0.64
SRM 1515 Apple leaves (c)				0.71401	0.00003	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
SRM 1515 Apple leaves (d)				n.d.	n.d.	19	5.7	n.d.	n.d.	n.d.	n.d.
SRM 1515 Apple leaves (e)				n.d.	n.d.	24	7.2	n.d.	n.d.	n.d.	n.d.
SRM 1515 Apple leaves mean				0.714	0.00002	22					
<i>SRM 1515 Apple leaves 2SD</i>						5.8					
<i>SRM 1515 Apple leaves RSD (%)</i>						26%					

AMS analyses are performed at the University of Cologne - Centre for Accelerator Mass Spectrometry (AMS).

n.d. = not determined; (a)-(e) indicate individual sample digestion batches

(f) Beryllium concentrations were previously published in Uhlig, D., Goldberg, T., Frick, D. A., von Blanckenburg, F. (2020) Quantifying beryllium concentrations in plant shoots from forest ecosystems using cation-exchange chromatography and quadrupole ICP-MS. Anal Sci Adv 1–14. doi: 10.1002/ansa.202000036

[†] IGSN (International Geo Sample Number). Metadata of samples are available under: www.igsn.org by adding the IGSN after igsn.org, e.g. igsn.org/GFDUH00LT

Tab. S5 Beryllium concentration and isotopic ratio of leachates from sequential extractions of soil and saprolite at CON and MIT

sample ID	IGSN [†]	brief sample description	extractant	mean depth	ICP-OES		AMS analyses			
					Be	uncertainty	¹⁰ Be _{meteoric}	uncertainty	(¹⁰ Be / ⁹ Be)	uncertainty
					(μg/g)	(μg/g)	(10 ⁶ at/g)	(10 ⁶ at/g)	(10 ⁻⁹)	(10 ⁻⁹)
<i>CON depth profile of amorphous oxide fractions</i>										
CON 14	GFDUH00KX	soil, Ah horizon	0.5M HCl	0.2	0.47	0.02	332	11	11	0.63
CON 12	GFDUH00KZ	soil, Bw1 horizon	0.5M HCl	0.6	0.61	0.03	497	16	12	0.72
CON 10	GFDUH00L1	soil, Bw1 horizon	0.5M HCl	1.0	0.83	0.04	676	22	12	0.73
CON 8	GFDUH00L3	soil, Bw1 horizon	0.5M HCl	1.4	0.47	0.02	307	10	9.8	0.58
CON 5	GFDUH00L6	soil, Bw2 horizon	0.5M HCl	2.0	0.35	0.02	121	4.0	5.1	0.31
CON 2	GFDUH00L9	saprolite, Cw horizon	0.5M HCl	2.6	0.36	0.02	80	2.6	3.3	0.20
CON 21	GFDUH00LH	saprolite, Cw horizon	0.5M HCl	4.4	0.38	0.02	74	2.5	2.9	0.18
CON 24	GFDUH00LL	saprolite, Cw horizon	0.5M HCl	6.5	0.37	0.02	77	2.6	3.1	0.18
<i>MIT depth profile of amorphous oxide fractions</i>										
MIT 14	GFDUH003R	soil, Bw horizon	0.5M HCl	0.2	0.05	0.003	52	1.8	16	0.96
MIT 12	GFDUH003S	soil, Bw horizon	0.5M HCl	0.6	0.42	0.02	649	21	23	1.4
MIT 10	GFDUH003T	soil, Bw horizon	0.5M HCl	1.0	0.39	0.02	479	15	19	1.1
MIT 6	GFDUH0040	saprolite, Cw horizon	0.5M HCl	1.8	0.38	0.02	195	6.3	7.8	0.46
MIT 1	GFDUH0043	saprolite, Cw horizon	0.5M HCl	2.8	0.81	0.04	135	4.4	2.5	0.15
MIT 23	GFDUH009L	saprolite, Cw horizon	0.5M HCl	5.3	1.17	0.06	67	2.2	0.85	0.05
MIT 29	GFDUH009R	saprolite, Cw horizon	0.5M HCl	16.3	0.15	0.01	0.23	0.04	0.02	0.004
<i>international reference material used to determine the reproducibility of the method</i>										
SRM 2709a San Joaquin Soil (a)*			0.5M HCl		0.32	0.02	14	0.57	0.52	0.02
SRM 2709a San Joaquin Soil (b)*			0.5M HCl		0.31	0.02	14	0.53	0.57	0.04
SRM 2709a San Joaquin Soil mean*					0.32	0.02	10	0.38	0.54	0.04
SRM 2709a San Joaquin Soil SD					0.01	-	0.59	-	0.04	-
SRM 2709a San Joaquin Soil RSD (%)					2%	-	6%	-	7%	-
<i>international reference material for concentration data quality control</i>										
RGM-1 Rhyolite (USGS) (a)					2.3					
RGM-1 Rhyolite (USGS) (a)**					2.2					
RGM-1 Rhyolite (USGS) (a)**					2.3					
RGM-1 Rhyolite (USGS) (a)**					2.3					
RGM-1 Rhyolite (USGS) (a)**					2.2					
RGM-1 Rhyolite (USGS) (a)**					2.4					
RGM-1 Rhyolite (USGS) (a)**					2.4					
RGM-1 Rhyolite (USGS) mean					2.3					
RGM-1 Rhyolite (USGS) SD					0.07					
RGM-1 Rhyolite (USGS) RSD (%)					3%					
RGM-1 Rhyolite (USGS) certified value					2.4					
RGM-1 Rhyolite (USGS) certified absolute uncertainty					0.2					
relative uncertainty on the amorphous oxide (%)					-4%					
GA Granite (CNRS) (a)					3.4					
GA Granite (CNRS) (a)**					3.5					
GA Granite (CNRS) mean					3.4					
GA Granite (CNRS) SD					0.05					
GA Granite (CNRS) RSD (%)					1%					
GA Granite (CNRS) certified value					3.6					
GA Granite (CNRS) certified absolute uncertainty					0.3					
relative uncertainty on the amorphous oxides (%)					-5%					

* The reported ¹⁰Be concentrations and the ¹⁰Be/⁹Be ratios refer to a mixed sample comprising the amorphous oxide and the crystalline oxide leachates. The crystalline oxides were extracted with 1M hydroxylamine-hydrochloride (NH₂OH*HCl) following the method described elsewhere (Wittmann et al. 2012).

** Repeat analyses of reference material in different sample batches. Uncertainties on amorphous oxide concentration data are estimated to be ±5% relative for Be based on accuracy of repeat analyses of reference materials.

(a), (b) indicate individuel sample digestion batches

† IGSN (International Geo Sample Number). Metadata of samples are available under: www.igsn.org by adding the IGSN after igsn.org, e.g. igsn.org/GFDUH00LT

Tab. S6 Phosphorus concentrations of leachates from sequential extractions of regolith and unweathered bedrock at CON and MIT

ICP-OES analyses & UV-spectrometry*														
sample ID	IGSN [†]	brief sample description	mean depth	Σ P _{total}	Pi resin	Po resin	Pi HCO ₃	Po HCO ₃	Pi NaOH	Po NaOH	Pi 1M HCl	Po 1M HCl	P _{total} 14M HCl	P _{total} residual
			(m)	(μg/g)	(μg/g)	(μg/g)	(μg/g)	(μg/g)	(μg/g)	(μg/g)	(μg/g)	(μg/g)	(μg/g)	(μg/g)
CON depth profile of Hedley fractionation														
CON 14	GFDUH00LT	soil, Ah horizon	0.2	789	11	3.3	21	49	72	328	35	46	192	31
CON 13	GFDUH00LU	soil, Ah/Bw horizon	0.4	763	3.1	1.9	15	39	89	318	36	20	205	36
CON 12	GFDUH00LV	soil, Bw1 horizon	0.6	762	0.44	1.9	11	33	83	324	42	17	218	31
CON 11	GFDUH00LW	soil, Bw1 horizon	0.8	825	0.23	1.3	19	30	193	247	67	14	220	33
CON 10	GFDUH00LX	soil, Bw1 horizon	1.0	800	0.68	1.2	23	23	196	222	61	19	227	29
CON 9	GFDUH00LY	soil, Bw1 horizon	1.2	590	0.42	1.6	19	10	153	93	73	16	197	26
CON 8	GFDUH00LZ	soil, Bw1 horizon	1.4	487	0.72	3.1	23	5.3	143	43	37	15	186	33
CON 7	GFDUH00M0	soil, Bw1 horizon	1.6	651	4.8	0.77	8.9	0.46	25	1.1	381	n.d.	196	32
CON 6	GFDUH00M1	soil, Bw2 horizon	1.8	534	8.7	1.5	29	5.6	153	24	42	8.9	235	27
CON 5	GFDUH00M2	soil, Bw2 horizon	2.0	501	15	n.d.	23	6.2	126	41	37	10	208	36
CON 4	GFDUH00M3	soil, Bw2 horizon	2.2	478	16	n.d.	22	8.2	121	22	49	12	201	27
CON 3	GFDUH00M4	saprolite, Cw horizon	2.4	526	18	2.7	24	2.6	88	16	139	n.d.	211	26
CON 2	GFDUH00M5	saprolite, Cw horizon	2.6	581	19	n.d.	21	1.4	85	17	196	5.7	214	22
CON 1	GFDUH00M6	saprolite, Cw horizon	2.8	639	14	n.d.	23	0.45	75	13	227	12	248	27
CON 19	GFDUH00MB	saprolite, Cw horizon	3.4	617	4.4	1.9	8.6	n.d.	17	13	321	n.d.	228	23
CON 21	GFDUH00MD	saprolite, Cw horizon	4.4	786	8.2	0.60	8.5	1.4	29	11	376	72	252	26
CON 22	GFDUH00ME	saprolite, Cw horizon	5.0	714	8.2	0.60	10	0.49	37	2.9	385	25	221	23
CON 23	GFDUH00MF	saprolite, Cw horizon	5.7	603	3.4	3.5	7.7	n.d.	16	12	307	n.d.	234	19
CON 24	GFDUH00MG	saprolite, Cw horizon	6.5	661	6.6	3.4	11	0.28	25	7.1	323	34	219	31
CON 40.41	GFDUH00N7, G	weathered paragneiss	10.5	902	3.5	2.5	n.d.	0.90	3	0	590	241	46	15
CON 47	GFDUH00N9	weathered paragneiss	13.0	1477	3.3	3.0	n.d.	0.05	2	1	728	662	61	17
CON 49	GFDUH00NB	unweathered paragneiss	16.3	990	0.4	2.5	n.d.	n.d.	3	2	664	215	75	29
CON 50	GFDUH00NC	unweathered paragneiss	18.4	1362	1.4	2.6	n.d.	n.d.	3	0	706	562	72	16
CON 51	GFDUH00ND	unweathered paragneiss	19.5	1008	n.d.	1.6	n.d.	n.d.	n.d.	0	707	203	85	12

continued on next page ...

Tab. S6 continued - Phosphorus concentrations of leachates from sequential extractions of regolith and unweathered bedrock at CON and MIT

sample ID	IGSN [†]	brief sample description	mean depth	ICP-OES analyses & UV-spectrometry*										Σ P _{total}	Pi resin	Po resin	Pi HCO ₃	Po HCO ₃	Pi NaOH	Po NaOH	Pi 1M HCl	Po 1M HCl	P _{total} 14M HCl	P _{total} residual
				(m)	(μg/g)	(μg/g)	(μg/g)	(μg/g)	(μg/g)	(μg/g)	(μg/g)	(μg/g)	(μg/g)											
MIT depth profile of Hedley fractionation																								
MIT 14	GFDUH004A	soil, Bw horizon	0.2	733	22	5.1	28	178	65	230	26	16	130	34										
MIT 13	GFDUH004B	soil, Bw horizon	0.4	667	2.2	2.8	14	93	56	253	40	23	151	33										
MIT 12	GFDUH004C	soil, Bw horizon	0.6	718	0.40	2.0	12	67	102	202	76	19	149	89										
MIT 11	GFDUH0045	soil, Bw horizon	0.8	694	0.34	0.84	16	27	202	107	54	23	173	92										
MIT 10	GFDUH0046	soil, Bw horizon	1.0	653	1.1	1.1	22	28	219	85	58	26	182	30										
MIT 9	GFDUH0047	soil, Bw horizon	1.2	706	3.0	0.93	38	15	246	79	87	15	186	38										
MIT 8	GFDUH0048	saprolite, Cw horizon	1.4	1311	8.9	1.6	66	18	767	n.d.	117	37	265	30										
MIT 7	GFDUH0049	saprolite, Cw horizon	1.6	1165	4.5	0.56	44	26	626	n.d.	131	15	296	22										
MIT 6	GFDUH004D	saprolite, Cw horizon	1.8	746	2.9	0.56	26	6.9	214	n.d.	77	28	362	29										
MIT 5	GFDUH004E	saprolite, Cw horizon	2.0	946	7.1	n.d.	22	2.1	198	1.7	61	20	606	29										
MIT 4	GFDUH004F	saprolite, Cw horizon	2.2	820	5.3	n.d.	19	6.1	148	n.d.	61	11	543	28										
MIT 3	GFDUH004G	saprolite, Cw horizon	2.4	619	4.1	0.28	12	3.3	94	1.8	36	13	414	40										
MIT 2	GFDUH004H	saprolite, Cw horizon	2.6	587	4.1	0.60	12	4.7	106	1.5	38	8.0	372	40										
MIT 1	GFDUH004J	saprolite, Cw horizon	2.8	911	6.3	0.56	30	9.9	329	65	110	22	311	27										
MIT 19	GFDUH00AT	saprolite, Cw horizon	3.2	2563	18	n.d.	84	n.d.	513	5.8	802	639	467	33										
MIT 20	GFDUH00AU	saprolite, Cw horizon	3.6	16131	40	n.d.	124	n.d.	376	492	1500	11268	2309	21										
MIT 21	GFDUH00AV	saprolite, Cw horizon	4.0	1217	14	n.d.	44	n.d.	230	16	539	7.1	341	27										
MIT 22	GFDUH00AW	saprolite, Cw horizon	4.7	2870	28	0.9	73	n.d.	433	n.d.	1162	428	724	21										
MIT 23	GFDUH00AX	saprolite, Cw horizon	5.3	882	20	2.3	51	n.d.	222	0.21	298	13	245	30										
MIT 24	GFDUH00AY	saprolite, Cw horizon	6.7	443	8.8	0.04	19	n.d.	67	0.33	180	13	133	21										
MIT 25	GFDUH00AZ	saprolite, Cw horizon	8.4	487	11	n.d.	24	n.d.	59	2.6	41	13	296	39										
MIT 26	GFDUH00B0	saprolite, Cw horizon	9.5	2480	29	n.d.	88	n.d.	265	6.8	201	20	1696	175										
MIT 27	GFDUH00B1	saprolite, Cw horizon	12.5	2245	26	n.d.	58	n.d.	196	3.1	750	533	616	62										
MIT 28	GFDUH00B2	saprolite, Cw horizon	13.4	2000	22	n.d.	76	n.d.	243	4.8	534	211	847	62										
MIT 29	GFDUH00B3	saprolite, Cw horizon	16.3	413	5.5	2.2	13	n.d.	39	4.8	27	36	239	47										
MIT 31	GFDUH00BY	weathered paragneiss	17.7	430	4.7	n.d.	n.d.	n.d.	16	0.5	322	2	64	22										
MIT 32	GFDUH00BX	weathered paragneiss	20.1	1262	8.3	n.d.	1	1	24	n.d.	675	432	111	11										
MIT 35	GFDUH00BU	unweathered paragneiss	26.3	1286	9.2	n.d.	n.d.	n.d.	3	n.d.	672	556	40	6										
MIT 38	GFDUH00BR	unweathered paragneiss	28.6	3163	9.7	2.4	n.d.	n.d.	5	n.d.	966	2049	123	8										
MIT 40	GFDUH00BP	unweathered paragneiss	29.6	5691	17.5	2.2	2	0	n.d.	1.9	4230	1214	216	7										

n.d. = not detected

* ICP-OES analyses was performed to analyse total P. UV-spectrometry was performed to analyse inorganic carbon.

[†] IGSN (International Geo Sample Number). Metadata of samples are available under: www.igsn.org by adding the IGSN after igsn.org, e.g. igsn.org/GFDUH00LT