SUPPLEMENTARY MATERIALS

Table S1. Base and phosphorus depletion, and paleoenvironments of 97 well studied paleosols.

Supplementary Information for **Biotic enhancement of weathering over the past 3,700 million years**

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Table S1. Base and phosphorus depletion, and paleoenvironments of 97 well studied paleosols.

Ma	Pedotype	Formation	Location	Age	Base depletion µmol mm^{-1} a^{-1}	Error base deplet-ion ± 1 st. dev.	P depletion µmol mm^{-1} a^{-1}	Error P deplet-ion ± 1 st. dev.	Years	MAP mm	Depth to water cm	Ref.
7.8	Narangi	Dhok Pathan Formation	Kaulial Kas, Pakistan	Miocene	0.015696	0.00029	0.248758	0.00196	4000	1000	269	1
8.5	Lal	Dhok Pathan Formation	Kaulial Kas, Pakistan	Miocene	0.131857	0.02964	0.006227	7.99E-05	5000	840	129	1
37.5	Sak	John Day Form.	Painted Hills, Oregon	Oligocene	7.657941	0.074023	0.149532	0.00137	20000	900	917	2
39.0	Pasct	Clarno Formation	Clarno, Oregon	Eocene	0.372625	0.403483	0.001119	3.33E-05	8000	1008	136	2
42.0	Luca	Clarno Formation	Clarno, Oregon	Eocene	0.958357	0.001237	0.065177	3.21E-05	1400	1200	272	2
43.0	Lakayx	Clarno Formation	Clarno, Oregon	Eocene	0.965083	0.005348	0.052736	3.22E-05	1000	1350	142	2
65.0	Komono	Tullock Formation	Bug Creek, Montana	Paleocene	0.767479	0.004026	0.105769	8.11E-05	1300	1200	127	3
66.0	Ottsko	Hell Creek Formation	Bug Creek, Montana	Paleocene	0.071329	0.01449	0.047127	3.2E-05	4000	1000	96	3
92.0	Sapa	Dakota Formation	Russell, Kansas	Cretaceous	0.084799	0.011413	0.001859	3.39E-05	6000	1482	199	4
93.0	Sayela	Dakota Formation	Kanapolis, Kansas	Cretaceous	0.084799	0.073428	0.001859	0.001908	5000	1527	167	4
244	Fritz	Fremouw Formation	Graphite Peak, Antarctica	Triassic	0.194794	0.047778	0.024957	3.18E-05	6000	1000	171	5
249.6	Avalon	Newport Formation	Avalon, New South Wales	Triassic	0.034695	0.009828	0.011973	5.65E-05	5000	1400	100	6
249.8	Long Reef	Bald Hill Claystone	Long Reef, NSW	Triassic	4.097689	0.226437	0.012444	0.000101	7000	1400	224	6
250	Karie	Palingkloof Member	Lootsberg Pass, S. Africa	Triassic	0.024665	0.006147	0.014682	0.000161	8000	800	129	7
250	Roy	Fremouw Formation	Graphite Peak, Antarctica	Triassic	0.364381	0.605454	0.009743	4.63E-05	2000	1000	41	5
250.1	David	Fremouw Formation	Graphite Peak, Antarctica	Triassic	0.241062	0.068637	0.034063	3.45E-05	4000	1000	135	5
251	John	Feather Conglomerate.	Allan Hills, Antarctica	Triassic	9.108082	0.022543	0.367577	3.18E-05	1800	1300	191	5
251.1	Gregory	Feather Congomerate.	Allan Hills, Antarctica	Triassic	0.400506	0.403941	0.001575	0.000224	5000	1300	94	5
251.5	Cox	Digby Formation	Coxs Gap, New S. Wales	Triassic	2.577287	0.093116	0.088939	0.011046	2000	1200	62	8
251.5	Wollemi	Digby Formation	Coxs Gap, New S. Wales	Triassic	1.134346	0.364322	0.404540	0.178606	6000	1200	72	8

252.8	Bada	Palingkloof Member	Lootsberg Pass, S. Africa	Permian	0.160463	0.430633	0.016791	0.012677	8000	600	76	7
308.0	Farnberg	Fort Scott Limestone	Drake, Missouri	Pennsylvanian	0.041734	0.010877	0.029413	0.002045	9000	2000	334	9
346.8	Nescopeck	Mauch Chunk Formation	Nescopeck, Pennsylvania	Mississippian	0.372625	0.270137	0.001119	4.53E-05	6000	581	88	10
346.8	Conygham	Mauch Chunk Formation	Nescopeck, Pennsylvania	Mississippian	0.216300	0.01313	0.009664	0.000526	1000	400	103	10
346.8	Mifflinville	Mauch Chunk Formation	Nescopeck, Pennsylvania	Mississippian	0.440206	0.315098	0.070559	0.02477	6000	400	132	10
366.2	Bucktail	Duncannon Member	Hyner, Pennsylvania	Devonian	0.131206	0.003638	0.047419	0.034452	5000	822	133	11
366.3	Hyner	Duncannon Member	Hyner, Pennsylvania	Devonian	0.242573	0.040323	0.000630	3.18E-05	8000	952	170	11
385.1	Rosemary	Aztec Siltstone	Mt Crean, Antarctica	Devonian	3.253421	0.110993	0.050373	5.92E-05	5000	779	353	12
386.1	Bucktail	Manorkill Formation	East Windham, New York	Devonian	12.022654	0.030832	0.204851	0.000135	2000	484	254	13
416.0	Lehigh Gap	Bloomsburg Formation	Palmerton, Pennsylvania	Devonian	26.828405	0.031522	0.434268	0.001546	1200	600	290	14
421.6	Barry	Bloomsburg Formation	Palmerton, Pennsylvania	Silurian	3.741747	0.040338	0.014340	5.98E-05	2000	551	208	15
443.5	Potters Mills	Juniata Formatiuon	Potters Mills, Pennsylvania	Ordovician	0.320351	0.077	0.106892	4.57E-05	6800	827	100	16
450.0	Bedford	Juniata Formation	Loysburg, Pennsylvania	Ordovician	0.032057	0.120309	0.000974	3.18E-05	5000	607	127	16
460.0	MacGillivray	Dunn Point Formation	Arisaig, Nova Scotia	Ordovician	0.908507	0.063289	0.031497	0.000571	5000	800	424	17
461.0	MacGillivray	Dunn Point Formation	Arisaig, Nova Scotia	Ordovician	1.586184	0.192141	0.015165	0.000515	5000	800	304	17
465.0	Doctors Br.	Dunn Point Formation	Arisaig, Nova Scotia	Ordovician	2.203628	0.055703	0.006943	0.000228	1000	1350	142	17
484.2	Adla	Grindstone Range Sandst.	Wirrealpa, South Australia	Ordovician	0.131975	0.049806	0.031709	0.000791	3900	378	48	18
504.9	Warru	Pantapinna Sandstone.	Wirrealpa, South Australia	Cambrian	0.431862	0.482443	0.044647	3.18E-05	6600	426	80	18
508.6	Natala	Moodlatana Foremation	Wirrealpa, South Australia	Cambrian	0.265963	0.00056	0.019521	3.18E-05	500	551	76	18
508.6	Viparri	Moodlatana Formation	Wirrealpa, South Australia	Cambrian	0.325215	0.225463	0.028924	0.000375	8800	599	224	18
508.6	Irkili	Moodlatana Formation.	Wirrealpa, South Australia	Cambrian	0.111715	0.003273	0.014832	0.000312	1000	324	46	18
508.6	Warru	Moodlatana Formation	Wirrealpa, South Australia	Cambrian	0.945568	0.599468	0.051627	0.000889	6600	426	119	18
523.5	Warru	Billys Creek Formation	Wirrealpa, South Australia	Cambrian	1.310983	6.75696	0.033423	0.000254	2000	426	86	18
530.0	Yuntai	Mantou Formation	Yuntaishan, Henan	Cambrian	0.076510	0.052743	0.005859	7.46E-05	6000	500	103	19
539.8	Madla	Parachilna Formation	Parachilna Gorge, S.Aust.	Cambrian	0.037061	3.76E-05	0.120532	0.000129	500	909	98	18
539.9	Mata	Parachilna Formation.	Parachilna Gorge, S.Aust.	Cambrian	0.093947	0.092538	0.000319	3.18E-05	11000	551	102	18
539.9	Vidnapa	Parachilna Formation	Parachilna Gorge, S.Aust..	Cambrian	0.046951	0.092469	0.038383	0.000696	7300	456	74	18
549.3	Inga	Ediacara Member	Brachina Gorge, S.Australia	Ediacaran	2.636754	0.002569	0.521637	0.017299	100	200	63	20
549.5	Yaldati	Ediacara Member	Brachina Gorge, S.Australia	Ediacaran	0.116108	0.003512	0.051223	0.001944	1000	344	85	20
549.5	Muru	Ediacara Member	Brachina Gorge, S.Australia	Ediacaran	0.496346	0.026919	0.138389	0.00498	1000	204	69	20
549.5	Warrutu	Ediacara Member	Brachina Gorge, S.Australia	Ediacaran	0.077156	0.000194	0.490554	0.012358	1000	344	136	20
557.3	Yaldati	Bonney Sandstone	Brachina Gorge, S.Australia	Ediacaran	0.006812	0.037843	0.018425	0.000523	5000	400	63	20
558.0	Baltic	sub-Gdov Formation	Pada Aru, Estonia	Ediacaran	0.028072	0.042352	0.003130	3.18E-05	500000	1000	5719	21
558.0	Baltic	sub-Gdov Formation	Lohu, Estonia	Ediacaran	0.054984	0.310427	0.046392	0.002682	500000	1000	3012	21
633.0	Alpa	Nuccaleena Formation	Enorama Creek, S. Aust.	Ediacaran	0.046592	0.137805	0.001745	0.000115	78600	432	24	22

635.0	Yaldati	Nuccaleena Formation	Enorama Creek, S. Aust.	Cryogenian	0.204701	0.05518	0.014292	0.000456	6000	400	199	22
706	Akngerre	Johnnys Creek Formation	Ellery Creek, N. Territory	Tonian	0.165869	0.813527	0.040740	0.001454	5900	291	63	23
720	Alkynge	Johnnys Creek Formation	Ellery Creek, N. Territory	Tonian	0.020186	0.09735	0.005630	3.18E-05	47400	142	68	23
758	Sekawa	Carbon Canyon Member	Nankoweap Creek, Arizona	Tonian	3.406570	16.14948	0.168750	0.003497	1000	284	45	24
759	Sukwate	Carbon Canyon Member	Nankoweap Creek, Arizona	Tonian	0.007330	0.03505	0.006967	0.000276	8800	386	58	24
770	Ekwatha	Tanner Member	Nankoweap Creek, Arizona	Tonian	0.080467	0.371767	0.064654	0.000647	11800	132	131	24
810	Sheigra	sub-Applecross Formation	Sheigra, Scotland	Tonian	0.011333	0.050527	0.011565	0.000148	100000	1000	717	25
810	Staca	sub-Applecross Formation	Sheigra, Scotland	Tonian	0.427179	0.956648	0.043937	0.002904	100000	683	489	25
1100	Sturgeon	sub-Jacobsville Sandstone	Sturgeon Falls, Michigan	Stenian	0.570858	0.011607	0.004325	3.18E-05	13000	1000	851	26
1710	Wanghua	Baicaoping Formation	Wanghuazhuang, Henan	Statherian	6.810492	2.349431	0.0158692	5.29E-05	40000	689.2462	203	27
1751	Daheitan	Yungmenshan Formation	Wanghuazhuang, Henan	Statherian	0.137799	0.092272	0.001922	0.000863	10910.28	768.6584	218	27
1774	Daquan	Bingmagou Formation	Wananshan, Henan	Statherian	1.444134	0.117605	0.0117214	0.001029	2000	845.8957	115	27
1799	Wanan	Bingmagou Formation	Wananshan, Henan	Statherian	0.202201	0.097604	0.0008143	3.18E-05	14798	438.3632	110	27
1800	Flin Flon	Sub-Missi Arkose.	Flin Flon, Manitoba	Orosirian	0.042266	0.053433	0.0016551	0.000102	100000	1000	470	28
1900	Kumbar	Stirling Range Formation	Barnett Peak, W.Australia	Orosirian	2.299994	4.70504	0.0144177	0.000113	2000	1509	50	29
2000	Ville Marie	sub-Lorrain Formation	Ville Marie, Quebec	Orosirian	0.008842	0.02447	0.001837	9.2E-05	100000	1200	2086	31
2200	Bank Break	sub-Strubenkop Formation	Bank Break, South Africa	Rhyacian	0.152802	0.271487	0.0109448	0.00013	100000	1500	573	31
2200	Waterval O.	Dwaal Heuvel Sandstone	Waterval Onder,South Africa	Rhyacian	0.002035	0.000142	7.959E-05	0.000173	10000	1489	315	32
2200	Mirror	Sugarloaf Quarztite.	Mirror Lake, Wyoming	Rhyacian	0.001880	0.007216	2.965E-06	0.000328	5400	400	47	33
2200	Mirror	Sugarloaf Quartzite	Mirror Lake, Wyoming	Rhyacian	0.109211	0.831046	0.0004258	7.65E-05	3200	400	117	33
2290	Denison	sub-Gowganda Formation	Denison Mine, Ontario	Rhyacian	0.189982	1.103225	0.0323722	3.18E-05	150000	1500	1368	34
2290	Pronto	sub-Gowganda Formation	Pronto Mine, Ontario	Rhyacian	0.000496	0.000414	7.255E-05	3.7E-05	100000	1500	1172	34
2440	diabase	sub-Matinenda Formation	Cooper Lake, Ontario	Siderian	0.060990	0.191601	0.0031771	3.57E-05	100000	1500	417	35
2440	sandstone	sub-Matinenda Formation	Cooper Lake, Ontario	Siderian	0.006683	0.036429	0.0007062	3.35E-05	100000	1500	847	35
2440	Lauzon Bay	sub-Matinenda Formation	Lauzon Bay, Ontario	Siderian	0.008442	0.00894	0.0012308	3.18E-05	100000	1500	1172	35
2700	Mt Roe #1	Mount Roe Basalt	Whim Creek, W. Australia	Neoarchean	0.005176	0.016848	0.0004924	3.2E-05	10000000	1500	762	36
2700	Mt Roe #2	Mount Roe Basalt	Whim Creek, W. Australia	Neoarchean	0.000399	0.000861	2.984E-05	3.19E-05	10000000	1500	599	36
2800	Dominion 1	sub-Renosterspruit Formation	Ottosdal, SouthAfrica	Neoarchean	0.000860	0.002327	6.993E-05	3.19E-05	1000000	1500	651	37
2800	Dominion 1	sub-Renosterspruit Formation	Ottosdal, SouthAfrica	Neoarchean	0.028724	0.06984	0.0016363	3.33E-05	1000000	1500	456	37
2800	Dominion 6	sub-Renosterspruit Formation	Klerksdorp, South Africa	Neoarchean	0.000030	8.4E-05	3.738E-06	3.18E-05	1000000	1500	990	37
3000	pre-Pongola	sub-Matonga Formation	Jerico Dam, South Africa	Neoarchean	0.007220	0.018051	0.0001999	3.61E-05	1000000	1500	221	37
3020	Kari	Farrel Quartzite	Mt Grant, W. Australia	Neoarchean	0.003540	0.008971	1.015E-06	3.19E-05	11600	1319	3	38
3020	Jurl	Farrel Quartzite	Mt Grant, W. Australia	Neoarchean	0.007410	0.018653	4.648E-06	3.18E-05	8200	1443	5	38
3420	Jurl	Strelley Pool Formation	Marble Bar, W. Australia	Palaeoarchean	0.001218	0.003077	6.684E-06	3.18E-05	45644	1443	46	19

3420	Jurl	Strelley Pool Formation	Marble Bar, W. Australia	Palaeoarchean	0.000465	0.001174	1.824E-06	3.2E-05	49631	1443	33	19
3420	Jurl	Strelley Pool Formation.	Marble Bar, W. Australia	Palaeoarchean	0.003223	0.008133	1.718E-05	3.18E-05	45644	1443	44	19
3420	Kartu	sub-Strelley Pool Form.	Trendall Ridge, W.Australia	Palaeoarchean	0.000024	6.95E-05	3.84E-07	3.18E-05	2631269	1443	130	19
3420	Kartu	sub-Strelley Pool Formation	Marble Bar, W. Australia	Archean	0.000054	0.00014	3.814E-06	3.18E-05	2536269	1443	586	19
3420	Kartu	sub-Strelley Pool Form.	Strelley Pool, W.Australia	Archean	0.000088	0.000225	3.178E-06	3.2E-05	2457466	1443	300	19
3450	Juri	Panorama Formation	Panorama, W. Australia	Palaeoarchean	0.001242	0.003134	1.813E-06	3.18E-05	53618	1343	13	39
3450	Juri	Panorama Formation	Panorama, W. Australia	Palaeoarchean	0.000364	0.00092	9.505E-07	6.99E-05	65578	1200	26	39
3700	Isi	Isua Greenstone	Isukasia, Greenland	Eoarchean	0.024101	0.060805	3.049E-05	5.29E-05	4876	1443	11	40

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