

Supporting Information for

**Unraveling clay-mineral genesis and climate change on Earth and Mars using
machine learning-based VNIR spectral modeling**

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Table S1

Table S1. Soils from varied regions around the world.

Region	Latitude	Longitude	MAT (°C)	MAP (mm)	CMAI	Source
Ganga Plain, India	29.70	78.32	25.2	951	-14.2	Srivastava and Parkash (1998)
Itaguaí, Brasil	-21.75	-42.12	22.9	1317	-84.0	Wattel-Koekkoeck et al. (2001)
Aparibe, Brasil	-21.63	-42.62	22.8	1234	-96.0	Wattel-Koekkoeck et al. (2001)
Nairobi, Kenya	1.25	36.68	18	973	-90.0	Wattel-Koekkoeck et al. (2001)
Koulikoro, Mali	12.03	-8.40	26.9	1087	-92.0	Wattel-Koekkoeck et al. (2001)
N'Tentou, Mali	11.42	-7.88	27.3	1337	-100.0	Wattel-Koekkoeck et al. (2001)
Virginia, USA	37.39	-80.10	13.3	1156	20.9	Kelly et al. (2015)
South Africa	-24.01	31.49	23	470	-58.0	Khomo et al. (2017)
Minnesota, USA	47.34	-94.21	7.6	928	78.3	Lyttle (2013)
New Mexico, USA	36.70	-105.51	12.6	1111	53.7	McLemor (2009)
Ukraine	49.00	24.30	-2.6	736	27.3	Nikorych et al. (2014)
Poland	51.41	21.93	-2.3	736	58.9	Skoneczna et al. (2019)
Trenton, USA	40.61	-75.18	12.9	1106	-6.1	Sun et al. (2008)
Taiwan, China	23.05	121.20	18.5	2344	-59.1	Hseu et al. (2007)
Wuhan, China	30.50	114.30	16.7	1487	28.0	Zhao and Tan (2018)
Tai'an, China	36.20	117.10	13.2	748	27.3	Zhao and Tan (2018)
Canada	43.70	-79.66	8.1	1061	26.1	Doram and Evans (1983)
New Jersey, USA	40.07	-74.56	9.6	1187	-16.5	Sun et al. (2009)
NE Patagonia	-42.48	-64.13	13.8	271	30.6	Bouza c (2007)
Iran	30.35	50.79	22.0	581	25.0	Owliaie et al. (2006)
Ordos, China	40.00	109.65	7.0	376	100.0	Jeong (2008)
Colorado, USA	40.09	-103.60	10.3	542	-15.8	Kemp et al. (2005)
Wyoming, USA	44.28	-106.37	3.8	659	16.7	Bern et al. (2013)
Swiss Alps	46.40	9.93	3.8	1200	28.5	Mavris et al. (2011)
Central Italy	43.31	11.13	11.7	1051	38.5	Costantini and Damiani (2004)
Taiwan, China	23.05	121.20	18.5	2344	-35.7	Hseu et al. (2007)
Canada	42.94	-82.28	8.8	1084	21.5	Doram and Evans (1983)
Alpine, Sweden	68.38	18.34	-0.4	1137	93.3	Allen et al. (2001)
South Africa	-24.01	31.49	17.7	1187	-66.0	Khomo et al. (2017)
Northern England	53.15	-1.01	9.9	705	47.6	Tye et al. (2012)
SW Spitsbergen	77.01	15.55	-8.3	546	41.9	Szymański et al. (2015)
Glen Dye, Scotland	56.95	-2.58	6.4	1091	100.0	Parry et al. (2014)
Dartmoor, England	50.53	-3.95	10.3	798	59.4	Parry et al. (2014)
New Jersey, USA	40.07	-74.56	12.7	1170	-3.1	Sun et al. (2009)
Pennsylvania, USA	40.67	-77.90	9.1	1250	98.9	Brantley et al. (2013)
Ganga Plain, India	29.70	78.32	22.8	1061	21.5	Srivastava and Parkash (1998)
North Taiwan, China	25.17	121.58	22.2	1639	-23.3	Chen et al. (2001)
Wales, USA	52.47	-3.69	8.7	1422	17.6	Dere et al. (2018)
Virginia, USA	37.93	-79.55	12.1	1089	60.7	Dere et al. (2018)

Tennessee, USA	36.27	-83.91	13.7	1308	46.1	Dere et al. (2018)
Alabama, USA	34.42	-86.21	15.8	1394	-26.7	Dere et al. (2018)
Puerto Rico, USA	18.30	-66.91	25.7	1325	-95.5	Dere et al. (2018)
Alaska, USA	64.51	-165.42	-5.6	586.3	94.2	Gough et al. (2008)
Daxinganling, China	51.87	124.11	-0.8	614	60.4	Hao et al. (2015)
Pennsylvania	40.67	-77.90	11.0	1062	94.2	Holleran (2011)
Colorado USA	38.07	-107.45	2.4	886	83.1	Lawrence et al. (2011)
Morocco	34.00	4.50	19.7	145	9.8	Mulder et al. (2013).
Poland	50.39	18.80	8.7	926	0.6	Skoneczna et al. (2019)
São Paulo State, Brazil	-22.06	-46.97	21.8	1395	-100.0	Alves and Omotoso (2009)
Hawaii, USA	20.00	-155.01	23.0	1466	-100.0	Bish and Post (1993)
Colorado, USA	37.20	-122.19	16.2	344	69.1	Brewer et al. (2018)
Ponta Grossa, Brazil	-25.05	-50.05	17.8	1685	-100.0	Brinatti et al. (2010)
Central Italy	43.31	11.13	14.3	836	28.9	Costantini and Damiani (2004)
Brazil	-19.24	-48.52	23.4	1494	-100.0	Fontes and Weed (1996).
Brazil	-18.58	-45.45	23.3	1194	-100.0	Bartoli et al. (1992)
Brazil	-25.22	-50.02	17.9	1583	-100.0	Dias et al. (2013)
Brazil	-2.65	-56.19	26.3	3127	-100.0	Negrao et al. (2018)
West Cameroon	5.45	9.95	19.8	2965	-100.0	Ranst et al. (2019)
Kohala Hawai	20.20	-155.06	22.4	2141	-95.7	Sowards et al. (2017)
Congo	-11.51	27.44	22.2	1191	-16.0	Timmermans (2015)
New Caledonia	-21.69	164.31	23.8	839	-26.1	Ulrich et al. (2019)
Guangxi, China	21.15	110.38	24.1	1490	-95.6	Zhang et al. (2016)
Shaanxi, China	34.05	108.02	10.3	696	63.1	Zhao and Tan (2018)
Sweden	57.35	12.12	7.4	919	63.4	Casetou-Gustafson et al. (2018)
Taiwan, China	23.51	120.80	23.1	1309	-57.9	Liu and Chen (2004)
Brazil	-2.50	-60.00	27.0	2032	-100.0	Bravard and Righi (1990).
Baveria, Germany	50.13	11.85	8.7	806	61.8	Eusterhues et al. (2003)
France	48.87	4.64	10.2	1004	-36.4	Flogeac et al. (2005).
Russia	67.08	65.33	-5.1	577	9.7	Lessovaya (2016)
Jiangxi, China	28.96	117.75	17.4	1776	-47.7	Huang et al. (2014)
Puerto Rico	10.45	-84.02	25.0	2667	-100.0	Kautz and Ryan (2003)
Georgia, USA	33.65	-82.97	16.7	1200	-100.0	Schroeder et al. (2000)
New Jersey, USA	40.29	-74.88	11.4	1179	-2.1	Sun et al. (2014)
Ethiopia	7.67	36.84	18.3	2312	-53.0	Cornelis et al. (2019)
Indonesia	-7.62	112.83	25.1	2084	-100.0	Wattel-Koekkoek et al. (2001)
Kenya	-2.13	37.47	18.9	2216	-100.0	Wattel-Koekkoek et al. (2001)
Nicaragua	12.25	-86.03	27.6	1301	-100.0	Wattel-Koekkoek et al. (2001)
Ethiopia	7.37	37.35	18.3	2312	-28.8	Dumon et al. (2014)
Oklahoma, USA	35.45	-97.52	16.2	865	-33.5	Lin and Cerato (2012)
Pakistan	34.43	72.22	21.6	1150	0.0	Zada et al. (2016)
Brazil	-23.38	-51.18	22.5	1448	-100.0	Costa et al. (2004)
Denmarl	56.23	11.54	8.9	719	25.5	Jensen et al. (2005)

South Korea	36.42	128.16	11.2	1271	15.1	Jeong et al. (2012)
Northern Chad	17	18	27.8	9	24.6	Chudnovsky et al. (2011).
Siberian peatland	60.89	68.70	0	604	100.0	Fialkiewicz-Koziel et al. (2016)
Chinese Loess Plateau	34.59	105.73	10.6	1064	20.7	Jeong et al. (2011)
Korea	37.49	126.92	12.4	1198	-6.7	Jeong (2008)
Chinese Loess Plateau	34.37	107.20	11.8	708	59.2	Kalm et al. (1996)
Colorado, USA	38.07	-107.45	2.4	886	88.4	Lawrence et al. (2010)
Tunisia	33.42	9.03	21.0	114	23.4	Nowak et al. (2018)
St. Elias Mountains, Canada	60.50	-139.50	-9.3	681	90.0	Zdanowicz et al. (2006)
Western Portugal	40.71	-8.15	12.6	1315	-4.0	Dinis and Soares (2007)
Alaska, USA	66.24	-147.53	-5.2	391	66.4	Eberl (2004)
Lake District, UK	54.23	-3.39	8.9	1038	73.2	Griffiths et al. (2016)
Montana USA	46.01	-112.73	6.4	458	45.5	Hochella et al. (2005)
Amazon River, Brazil	-2.58	-65.47	26.2	3007	-48.0	Johnson and Meade (1990).
Czech Republic	48.89	17.26	9.9	663	79.9	Kadlec et al. (2009)
Mulde River, eastern Germany	50.78	12.61	9.0	775	51.1	Knittel et al. (2005).
Sava River Croatia	45.84	15.92	10.7	1152	47.4	Lučić et al. (2019)

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