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Supplementary material for

Phosphorus sorption on tropical soils with relevance to Earth system model needs

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Table S1 Literature survey of phosphorus sorption isotherm methodology and parameters.

Mean maximum sorption capacity (*Qmax*) and binding coefficient (*k*) for phosphorus (P) are provided with standard deviation in parentheses, where **bold** indicates soil orders represented in our analysis.

Study	Environment	Location	Maximum initial P conc. (mg P L^{-1})	Isotherm fit type	Soil order	*Qmax* (mg PO_4-P kg^{-1})	*k* (L mg^{-1})
Fontes and Weed (1996)[a]	Tropical	Brazil	160	Linear	Oxisol	**3,954.3 (796.8)**	NA
Bastounopoulou *et al.* (2011)	Temperate	Greece	80	Linear	Inceptisol	**410.6 (85.8)**	0.429 (0.266)
Auxtero *et al.* (2008)	Subtropical	Portugal	10,000	Linear	Andisol	**22,839.5 (14840.1)**	NA
Anghinoni *et al.* (1996)	Temperate	USA	50	Linear	Alfisol	1,281.0 (505.7)	0.070 (0.034)
					Ultisol	**2,221.9 (614.6)**	0.408 (0.626)
Pinto *et al.* (2013)	Semi-humid tropical	Brazil	160	Linear	Oxisol	**1,384.5 (906.)**	NA
					Entisol	1,045.0	NA
Wisawapipat *et al.* (2009)	NA	Thailand	50	Linear	Oxisol	**668.0 (340.8)**	5.46 (1.711)
					Ultisol	**119.5 (14.8)**	3.84 (1.103)
Poudel and West (1999)	Tropical	Philippines	1000	Linear	Inceptisol	**40,954.3 (33562.7)**	NA
					Ultisol	**11,950.5 (12322.8)**	NA
					Oxisol	**8,514.4 (925.3)**	NA
Hartono *et al.* (2005)	Tropical	Indonesia	100	Linear	Inceptisol	**513.0 (18.4)**	5.665 (0.940)
					Ultisol	**549.1 (298.5)**	3.067 (2.935)
					Alfisol	920.5 (353.7)	3.988 (2.754)
Wang and Liang (2014)[b]	Subtropical	China	60	Linear	Alfisol	131.8 (11.3)	0.044 (0.018)
					Inceptisol	**132.0 (8.3)**	0.032 (0.009)
					Mollisol	162.0 (8.2)	0.048 (0.009)
					Aridisol	167.0 (39.5)	0.034 (0.010)
Cannon (2010)	Temperate	USA	50	Non-linear	Ultisol	**242.7 (206.2)**	1.319 (1.419)
					Inceptisol	**153.5 (114.5)**	0.709 (0.623)
					Alfisol	228.0 (99.3)	0.393 (0.401)
					Entisol	53.0	0.260
Gichangi *et al.* (2008)	Subtropical	South Africa	100	Linear	Planosol	526.3	0.247
					Luvisol	476.2	0.158
					Cambisol	204.1	0.051
					Acrisol	192.3	0.122
					Ferralsol	583.5 (312.6)	0.383 (0.359)
de Campos *et al.* (2016)	Humid tropical	Brazil	260	Linear	Entisol	1,400.0 (2301.3)	NA
					Oxisol	**1,728.7 (1394.9)**	NA
					Alfisol	863.8 (929.6)	NA
					Ultisol	**272.4 (154.6)**	NA
					Mollisol	1,462.0	NA
					Inceptisol	**893.0**	NA

[a]*Qmax* values converted from µmol PO_4 g^{-1} to mg PO_4-P kg^{-1}.

[b]*Qmax* values converted from µg PO_4 g^{-1} to mg PO_4-P kg^{-1}

Table S2 Additional information on soils used in this study.

Identifier	Location	Environment	Elevation (m)	Mean annual precip. (mm)	Mean annual temp. (°C)	Parent material
KA-A	Kakamega, Kenya 0° 14' N 34° 52' E	-	-	-	-	-
HA-FA[a], HA-FB[a]	Laupahoehoe, Hawaii, USA 19° 50' 28.1" N, 155° 7' 28.3" W	Tropical wet forest	-	4000	21	Volcaniclastic
BR-B[b], BR-G[b], BR-N[b]	Atlantic Coastal Forest, Sao Paulo State, Brazil 23° 34'S, 45° 02' W & 23° 17' S, 45° 11' W	Tropical montaine	100-1100	3000	22	Gneiss, migmatite, granite
IC-V[c], IC-RT[c]	El Yunque National Forest, Puerto Rico, USA 18° 30' N, 65° 60' W	Tropical montaine	1000	4000	21	Volcaniclastic
BO-A[d], BO-B[d]	Tapajos National Forest, Para State, Brazil 3° 00' 37.1" S, 54° 34' 53.4" W	Tropical wet forest	-	1911	25	-
CRO-A[e], CRO-B[e]	La Selva Biological Research Station, Costa Rica 10° 26' N, 83° 59' W	Tropical wet forest	40	4210	25.8	Andesitic lava flows
EV-V[c], EV-RT[c]	El Yunque National Forest, Puerto Rico, USA 18° 30' N, 65° 60' W	Tropical wet forest	350	3000	24	Quartz dionite
P-22[f], P-23[f], P-30[f], P-35[f]	Gigante Peninsula, Panama 9° 6' 31" N, 79° 50' 37" W	Lowland tropical rainforest	80	2600	20	Volcaniclastic, andesite
BU-BA[g], BU-BB[g]	Lavras, Brazil 21° 12' S 44° 60' W	-	-	-	-	-
CU-HSA[h], CU-HSB[h]	Hashan National Field Research Station of Forest Ecosystems, Guandong Province, China 22° 34' N, 112° 50' 'E	Subtropical	60.7	1700	21.7	Sandstone
CRU-V[i], CRU-RT[i]	La Selva Biological Research Station, Costa Rica 10° 26' N, 83° 59' 'W	Tropical wet forest	30	4000	26	Andesitic lava flows

[a]Ryan *et al.* (2004); [b]Vieira *et al.* (2011); [c]Mage and Porder (2013); [d]Bruno *et al.* (2006); [e]Russell *et al.* (2007); [f]Mayor *et al.* (2014); Yavitt *et al.* (2011); [g]Jagadamma *et al.* (2013); [h]Wang *et al.* (2010*a*); [i]Porder *et al.* (2006)

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