Supplementary Material for

Isotopic identification of global nitrogen hotspots across natural terrestrial ecosystems

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15 Supplementary Table 1. Ratios of N_2O-N/(N_2O-N+NO-N) and N_2O/(N_2O-N+N_2-N) compiled from laboratory and field studies

Location	Ecosystem type	Method	WFPS (%)	N_2O/ (N_2O+NO)	N_2O/ (N_2O+N_2)	Note	Reference
Michigan, USA	Successional forest	C_2H_2	85	NR	0.34	Cropped soils are not included	(Bergsma et al., 2002)
			85	NR	0.33		
Mississippi, USA	Forest	C_2H_2	70	NR	0.28	No difference between control and NO_3 treatment	(Ullah et al., 2005)
			85	NR	0.12		
			85	NR	0.12		
Gottinger and Solling, Germany	Forest	N-15	70	NR	0.73	8-day average	(Wolf and Brumme, 2003)
			73	NR	0.88		
			84	NR	1		
Buenos Aires Province, Argentina	Native grassland	C_2H_2	40	NR	0.32	n=204	(Ciarlo et al., 2007)
			80	NR	0.27		
			100	NR	0.19		
Oberbutschel, Switzerland	Grassland (fertilized)	C_2H_2	72.2	NR	0.44	three samples each plot	(Rudaz et al., 1999)
			72.2	NR	0.71		
			80.4	NR	0.23		
			74	NR	0.40		
			74.8	NR	0.32		
			77.9	NR	0.15		
			87.4	NR	0.06		
			56.7	NR	0.06		
			77.2	NR	0.35		
			69.6	NR	0.08		
			66.5	NR	0.10		
			75.3	NR	0.19		
Colorado, USA	Agricultural (fertilized)	N-15 recovery	60	NR	0.34	14-day average, only no-tillage data are included	(Liu et al., 2007)
			60	NR	0.27		
			75	NR	0.24		
Vila do Conde, Portugal	Agricultural	C_2H_2	60	NR	0.44	Only control sites are included	(Fangueiro et al., 2008)

Buenos Aires Province, Argentina	Agricultural	C_2H_2	100	NR	0.21	Only control sites are included	(Ciarlo et al., 2008)
Dijon, France	Agricultural (fertilized)	N-15	74	NR	0.69	n=36	(Mathieu et al., 2006)
Scheyern, Germany	Agricultural (fertilized)	N-15	40-70	NR	1	n=2	(Ruser et al., 2006)
			90-98	NR	0.39		
Nebraska, USA	Agricultural	C_2H_2	60	NR	0.29	Only control sites are included	(Weier et al., 1993)
			75	NR	0.28		
			90	NR	0.07		
Arizona, USA	Agricultural (fertilized)	C_2H_2	90	NR	0.07	ratio is based on the fitted line	(Welzmiller et al., 2008)
Six provinces of China	Agricultural (fertilized)	C_2H_2	80	NR	0.33	n=11	(Cheng et al., 2004)
Various locations from The Trace Gas Network (TRAGNET)	Various	NR	10	0.09	NR	ratio is based on the fitted line	(Davidson and Verchot, 2000)
			20	0.12	NR		
			30	0.17	NR		
			40	0.23	NR		
			50	0.30	NR		
			60	0.39	NR		
			70	0.48	NR		
Tsukuba, Japan	Agricultural (fertilized)	Chamber	60	0.71	NR	average of 5 temporal samples	(Ding et al., 2007)
Derio, Spain	Grassland	Chamber	40	0.59	NR	ratio is based on the fitted line	(del Prado et al., 2006)
			55	0.79	NR		
			70	0.91	NR		
Central Japan	Forest	Chamber	44.3	0.27	NR	n=25	(Nishina et al., 2009)
Costa Rica, Brazil, and Puerto Rico	Tropical forest	Chamber	25	0.27	NR	ratio is based on the fitted line	(Davidson et al., 2000)
			35	0.32	NR		
			45	0.38	NR		
			55	0.44	NR		
			65	0.51	NR		
			75	0.57	NR		
Gorliz, Spain	Perennial	Chamber	40	0.25	NR	ratio is estimated from the	(Pinto et al., 2004)

	pasture		60	0.81	NR	figure	
			80	0.69	NR		
Bush Estate, UK	Agricultural (fertilized)	Chamber	40	0.16	NR	ratio is based on poultry litter treatment	(Akiyama et al., 2004)
			60	0.35	NR		
			80	0.59	NR		

NR: Not Reported

18 Supplementary Table 2. Comparison of estimations of N gas productions by N isotope model with previously published estimates

19 (NO fluxes are soil-surface emissions without accounting for canopy effect)

Site/ Biome	N isotope model estimations (g N/m^2/yr)				Previously published fluxes (g N/m^2/yr)					
	Area (10^{12} m^2)	NO	N_2O	N_2	Area (10^{12} m^2)	NO	N_2O	N_2	Method	Refer-ence
Global-scale										
Global land average	103.45 (natural soils only)	0.108-0.196	0.071-0.128	0.146-0.260	130.0	0.162			statistical modelling	(Davidson and Kingerlee, 1997)
					97.7 (natural)	0.051			statistical modelling	(Yan et al., 2005)
					NR	0.078			statistical modelling	(Yienger and Levy, 1995)
					99.2 (natural)	0.055			statistical modelling	(Lee et al., 1997)
					NR (natural)	0.030-0.078			IPCC summary	(Denman et al., 2007)
					135.3	0.072	0.045		process-based modelling	(Potter et al., 1996)
					NR	0.05-0.26	0.07-0.16		statistical modelling	(Bowden, 1986)
					NR		0.063-0.142		statistical modelling	(Xu et al., 2008)
					89.05 (natural)		0.051-0.066		statistical modelling	(Bouwman et al., 1993;Bouwman et al., 1995)
					NR		0.087		process-based modelling	(Liu, 1996)
					135.2		0.079		statistical modelling	(Dalal and Allen, 2008)
					NR		0.064-0.115		inverse modelling	(Hirsch et al., 2006)
					NR		0.085-0.111		inverse modelling	(Huang et al., 2008)

					NR (natural)		0.032-0.096		IPCC summary	(Ehhalt et al., 2001)
Biome/regional-scale										
Closed tropical forest	9.0	0.099-0.229	0.180-0.418	0.602-1.396	8.54	0.022	0.137		statistical modelling	(Stehfest and Bouwman, 2006)
					16.8		0.137		statistical modelling	(Bouwman et al., 1993;Bouwman et al., 1995)
Tropical rainforests	9.2	0.095-0.217	0.176-0.400	0.610-1.390	14.8		0.162		statistical modelling	(Matson and Vitousek, 1990)
					10.9		0.123		process-based modelling	(Werner et al., 2007)
					14.9		0.238		statistical modelling	(Breuer et al., 2000)
					24.5		0.29		statistical modelling	(Bowden, 1986)
					10.0	0.07-0.14			statistical modelling	(Davidson and Kingerlee, 1997)
					NR	0.22-0.37			statistical modelling	(Yienger and Levy, 1995)
					12.3	0.22			statistical modelling	(Lee et al., 1997)
					17.6		0.254-0.356		statistical modelling	(Dalal and Allen, 2008)
					10.2	0.118	0.136		process-based modelling	(Potter et al., 1996)
Tropical savanna /woodland	17.6	0.267-0.711	0.150-0.398	0.210-0.560	24.0	0.31			statistical modelling	(Davidson and Kingerlee, 1997)
					15.3	0.23-0.35			statistical modelling	(Poth et al., 1995)
					22.5		0.050-0.072		statistical modelling	(Dalal and Allen, 2008)
					12.2	0.113	0.064		process-based modelling	(Potter et al., 1996)
Brazilian Amazon forest	5.5	0.067-0.285	0.129-0.553	0.406-1.734	5.4		0.444		statistical modelling	(Melillo et al., 2001)
					NR		0.175-		empirical	(Garcia-Montiel et al., 2004)

							0.298		measurements	
Grassland/ steppe	22.3	0.101-0.179	0.037-0.065	0.028-0.050	27.7	0.056	0.015		statistical modelling	(Stehfest and Bouwman, 2006)
					27.4	0.031			statistical modelling	(Lee et al., 1997)
					31.5		0.048		statistical modelling	(Bouwman et al., 1993)
					12.5		0.024-0.046		statistical modelling	(Dalal and Allen, 2008)
					9.0	0.122			statistical modelling	(Davidson and Kingerlee, 1997)
Temperate / boreal forest	21.1	0.023-0.055	0.029-0.069	0.104-0.244	2.30	0.046	0.064		statistical modelling	(Stehfest and Bouwman, 2006)
					22.5		0.022		statistical modelling	(Bouwman et al., 1993)
					9.0	0.039			statistical modelling	(Davidson and Kingerlee, 1997)
					27.0	0.031			statistical modelling	(Lee et al., 1997)
					10.4		0.064-0.136		statistical modelling	(Dalal and Allen, 2008)
					7.7	0.066	0.042		process-based modelling	(Potter et al., 1996)
Deserts and semi-deserts	16.2	0.120-0.266	0.003-0.007	0.001-0.003	18.0	0.03			statistical modelling	(Davidson and Kingerlee, 1997)
					45.5		0.024-0.046		statistical modelling	(Dalal and Allen, 2008)
					20.7	0.015	0.002		process-based modelling	(Potter et al., 1996)
Chihuahu-an Desert	0.005	0.020-0.323	0.003-0.049	0.000	0.0006	0.15-0.38			empirical measurements	(Hartley and Schlesinger, 2000)
Tundra	10.7	0.000-0.007	0.000-0.007	0.000-0.010	NR	0.002			statistical modelling	(Yienger and Levy, 1995)
					NR	0.000			statistical modelling	(Davidson and Kingerlee, 1997)
					7.3	0.032			statistical	(Lee et al., 1997)

									modelling	
					9.5		0.008-0.054		statistical modelling	(Dalal and Allen, 2008)
					8.9	0.011	0.003		process-based modelling	(Potter et al., 1996)
Africa (18˚ N - 30˚ S)	16.0	0.213-0.657	0.165-0.507	0.239-0.737	NR	0.094-0.319			inverse modelling	(Jaegle et al., 2004)
European forest	3.0	0.026-0.118	0.042-0.184	0.038-0.162	1.41	0.060-0.070	0.055-0.062		process-based modelling	(Kesik et al., 2005)
United States	5.33	0.023-0.119	0.008-0.044	0.106-0.544	3.63	0.029			statistical modelling	(Williams et al., 1992)

NR: Not Reported

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