

Supplementary Material

Mercury in an Australian sclerophyll Eucalyptus forest and emissions from fuel reduction prescribed burning

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Table S1. Results of CRM analyses.

SRM	Hg concentration (ng g ⁻¹)	Reference Hg concentration (ng g ⁻¹)	Recovery (%)		
nist1515	44.9	43.2	104		
	44.3		102		
	45.3		105		
	45.9		106		
	45.7		106		
	45.4		105		
	46.9		109		
	45.9		106		
	45.5		105		
	48.5		112		
	45.2		105		
	44.9		104		
	43.3		100		
	43.8		101		
	43.2		100		
	59.3		137		
	44.2		102		
	43.3		100		
	48.6		113		
	47.1		109		
40.8	95				
47.3	110				
44.3	103				
44.2	102				
nist1575a	44.7	39.9	103		
	43.2		100		
	42.0		97		
	41.9		97		
	42.9		99		
	42.4		98		
	42.0		97		
	41.9		97		
	41.8		97		
	42.0		97		
			Mean	45	
			Median	44	
			s.d.	3	
39.0	39.9	98			
39.1	98				
39.0	98				
40.1	100				
40.0	100				
41.3	103				
40.3	101				
39.8	100				
39.7	99				
39.9	100				
40.9	103				
39.7	99				

SRM	Hg concentration (ng g ⁻¹)	Reference Hg concentration (ng g ⁻¹)	Recovery (%)
	38.4		96
	38.7		97
	39.7		100
	38.5		96
	39.0		98
	41.5		104
	47.8		120
	25.5		64
	36.9		92
	38.8		97
	39.2		98
	38.8		97
	39.2		98
	39.3		99
	38.5		97
	37.4		94
		Mean	39
		Median	39
		s.d.	3
nist2706	128	133	96
	131		99
	133		100
	145		109

SRM	Hg concentration (ng g ⁻¹)	Reference Hg concentration (ng g ⁻¹)	Recovery (%)
	126		95
	129		97
	131		98
	127		96
	133		100
	126		95
	133		100
	136		102
	130		98
	130		98
	133		100
	129		97
	133		100
	133		100
	132		100
	132		100
		Mean	132
		Median	132
		s.d.	4
BCR277R	131	128	102
	145		114
	130		101
	131		102

SRM	Hg concentration (ng g ⁻¹)	Reference Hg concentration (ng g ⁻¹)	Recovery (%)
	131		102
	145		114
	123		96
	126		98
	130		102

SRM	Hg concentration (ng g ⁻¹)	Reference Hg concentration (ng g ⁻¹)	Recovery (%)
	133		104
	133		104
		Mean	133
		Median	131
		s.d.	7

Table S2. Mercury (Hg) concentrations (ng g⁻¹) and organic matter (%) for all soil.

Name	Layer	Burning status	Depth (cm)	Site	Organic Matter (%)	Total Hg	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Mean	Unit	Z-scores
gip-0722-2.4	Base of tree	Unburnt	3	2	83	156	176	No data	No data	No data	No data	166	ng g ⁻¹	0.4
gip-0722-4.4	Base of tree	Unburnt	3	4	15	86.1	83.1	No data	No data	No data	No data	84.6	ng g ⁻¹	-1.0
gip-0722-5.4	Base of tree	Unburnt	3	5	60	152	144	No data	No data	No data	No data	148	ng g ⁻¹	0.1
gip-0722-9.4	Base of tree	Unburnt	3	6	38	240	231	224	No data	No data	No data	232	ng g ⁻¹	1.4
gip-0722-10.4	Base of tree	Unburnt	3	7	64	241	No data	No data	No data	No data	No data	241	ng g ⁻¹	1.6
gip-0722-15.4	Base of tree	Unburnt	3	12	37	124	No data	No data	No data	No data	No data	124	ng g ⁻¹	-0.3
gip-0722-16.4	Base of tree	Unburnt	3	13	13	60.8	58.2	No data	No data	No data	No data	59.5	ng g ⁻¹	-1.4
gip-0722-20.4	Base of tree	Unburnt	3	16	90	141	139	137	No data	No data	No data	139	ng g ⁻¹	-0.1
gip-0722-21.4	Base of tree	Unburnt	3	17	18	76.4	75.0	No data	No data	No data	No data	75.7	ng g ⁻¹	-1.1
gip-0722-22.4	Base of tree	Unburnt	3	18	80	161	156	No data	No data	No data	No data	159	ng g ⁻¹	0.3
Mean												143		
Median												144		
s.d.												61.1		
gip-0722-1.1	Organic	Burnt	3	1	22	75.9	70.7	No data	No data	No data	No data	73.3	ng g ⁻¹	-0.1
gip-0722-3.1	Organic	Burnt	1	3	13	73.7	68.9	No data	No data	No data	No data	71.3	ng g ⁻¹	-0.1
gip-0722-11.1	Organic	Burnt	1	8	8	37.9	38.0	37.8	37.7	38.2	No data	37.9	ng g ⁻¹	-0.5
gip-0722-12.1	Organic	Burnt	1	9	6	51.7	50.1	No data	No data	No data	No data	50.9	ng g ⁻¹	-0.3
gip-0722-13.1	Organic	Burnt	1	10	22	256	250	264	259	No data	No data	257	ng g ⁻¹	1.7
gip-0722-14.1	Organic	Burnt	No data available	11	29	100	93.3	No data	No data	No data	No data	96.7	ng g ⁻¹	0.1
gip-0722-18.1	Organic	Burnt	1	14	12	99.3	92.4	No data	No data	No data	No data	95.9	ng g ⁻¹	0.1
gip-0722-19.1	Organic	Burnt	2	15	19	57.8	53.5	No data	No data	No data	No data	55.7	ng g ⁻¹	-0.3
gip-0722-24.1	Organic	Burnt	No data available	19	27	55.1	67.1	No data	No data	No data	No data	61.1	ng g ⁻¹	-0.2
gip-0722-25.1	Organic	Burnt	No data available	20	30	101	119	No data	No data	No data	No data	110	ng g ⁻¹	0.3
gip-0722-2.1	Organic	Unburnt	4	2	65	135.2	153	No data	No data	No data	No data	144	ng g ⁻¹	0.6
gip-0722-4.1	Organic	Unburnt	2	4	24	77.1	No data	No data	No data	No data	No data	77.1	ng g ⁻¹	-0.1
gip-0722-5.1	Organic	Unburnt	10	5	27	446	443	447	No data	No data	No data	446	ng g ⁻¹	3.62
gip-0722-9.1	Organic	Unburnt	1	6	34	176	283	302	284	289	282	269	ng g ⁻¹	1.9
gip-0722-10.1	Organic	Unburnt	8	7	44	97.5	98.5	No data	No data	No data	No data	98.0	ng g ⁻¹	0.1
gip-0722-15.1	Organic	Unburnt	1	12	19	47.6	72.3	No data	No data	No data	No data	59.9	ng g ⁻¹	-0.2
gip-0722-16.1	Organic	Unburnt	8	13	16	89.4	90.0	90.1	No data	No data	No data	89.8	ng g ⁻¹	0.1
gip-0722-20.1	Organic	Unburnt	3	16	18	97.1	191	188	No data	No data	No data	159	ng g ⁻¹	0.8
gip-0722-21.1	Organic	Unburnt	2	17	3	44.4	41.3	41.0	No data	No data	No data	42.2	ng g ⁻¹	-0.4

Name	Layer	Burning status	Depth (cm)	Site	Organic Matter (%)	Total Hg	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Mean	Unit	Z-scores
gip-0722-22.1	Organic	Unburnt	8	18	30	49.7	78.4	No data	No data	No data	No data	64.1	ng g ⁻¹	-0.2
												Mean	118.0	
												Median	83.5	
												s.d.	100.0	
gip-0722-1.2	Mineral	Burnt	6.00	1	7	39.3	39.3	No data	No data	No data	No data	39.3	ng g ⁻¹	-0.1
gip-0722-3.2	Mineral	Burnt	4	3	9	50.2	47.5	No data	No data	No data	No data	48.8	ng g ⁻¹	0.1
gip-0722-11.2	Mineral	Burnt	4	8	8	21.5	19.6	21.9	21.7	No data	No data	21.2	ng g ⁻¹	-0.5
gip-0722-12.2	Mineral	Burnt	4	9	6	48.6	46.0	No data	No data	No data	No data	47.3	ng g ⁻¹	0.1
gip-0722-13.2	Mineral	Burnt	4	10	12	84.7	81.6	No data	No data	No data	No data	83.2	ng g ⁻¹	0.9
gip-0722-14.2	Mineral	Burnt	No data available	11	21	64.7	69.2	71.7	No data	No data	No data	68.5	ng g ⁻¹	0.5
gip-0722-18.2	Mineral	Burnt	4	14	8	27.2	26.6	29.2	29.5	No data	No data	28.1	ng g ⁻¹	-0.4
gip-0722-19.2	Mineral	Burnt	5	15	6	32.1	31.0	33.2	No data	No data	No data	32.1	ng g ⁻¹	-0.3
gip-0722-24.2	Mineral	Burnt	No data available	19	7	33.7	35.6	No data	No data	No data	No data	34.6	ng g ⁻¹	-0.2
gip-0722-25.2	Mineral	Burnt	No data available	20	13	55.5	51.3	53.2	No data	No data	No data	53.3	ng g ⁻¹	0.2
gip-0722-2.2	Mineral	Unburnt	7	2	8	70.2	57.7	No data	No data	No data	No data	63.9	ng g ⁻¹	0.4
gip-0722-4.2	Mineral	Unburnt	5	4	6	43.6	41.7	42.0	No data	No data	No data	42.5	ng g ⁻¹	-0.1
gip-0722-5.2	Mineral	Unburnt	13	5	12	75.7	72.5	No data	No data	No data	No data	74.1	ng g ⁻¹	0.7
gip-0722-9.2	Mineral	Unburnt	4	6	22	231.4	219.0	209.3	No data	No data	No data	219.9	ng g ⁻¹	3.91
gip-0722-10.2	Mineral	Unburnt	11	7	12	120.1	112.2	112.6	110.8	111.5	107.8	112.5	ng g ⁻¹	1.5
gip-0722-15.2	Mineral	Unburnt	4	12	7	28.2	26.7	28.5	No data	No data	No data	27.8	ng g ⁻¹	-0.4
gip-0722-16.2	Mineral	Unburnt	11	13	9	26.6	26.8	28.0	No data	No data	No data	27.1	ng g ⁻¹	-0.4
gip-0722-20.2	Mineral	Unburnt	6	16	10	86.3	83.0	No data	No data	No data	No data	84.6	ng g ⁻¹	0.9
gip-0722-21.2	Mineral	Unburnt	5	17	8	32.4	32.1	32.0	32.3	No data	No data	32.2	ng g ⁻¹	-0.3
gip-0722-22.2	Mineral	Unburnt	11	18	11	42.2	40.5	No data	No data	No data	No data	41.3	ng g ⁻¹	-0.1
												Mean	59.1	
												Median	44.9	
												s.d.	44.7	

Table S3. Mercury (Hg) concentrations (ng g⁻¹) for all leaf samples.

Name	Site	Burning status	Hg	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Mean	Unit	Z-scores
gip-0722-2.3_a	2	Burnt	77.4	83.1	72.1	No data	No data	No data	No data	77.6	ng g ⁻¹	0.43
gip-0722-4.3_a	4	Burnt	76.3	80.0	98.3	76.5	No data	No data	No data	82.8	ng g ⁻¹	0.72
gip-0722-5.3_a	5	Burnt	64.1	63.6	99.1	61.8	62.9	No data	No data	70.3	ng g ⁻¹	0.03
gip-0722-9.3_a	6	Burnt	85.5	81.8	68.5	89.7	No data	No data	No data	81.4	ng g ⁻¹	0.64
gip-0722-10.3_a	7	Burnt	86.1	88.7	80.1	95.1	90.1	87.3	89.1	88.1	ng g ⁻¹	1.01
gip-0722-15.3_a	12	Burnt	77.4	75.7	75.7	No data	No data	No data	No data	76.3	ng g ⁻¹	0.36
gip-0722-16.3_a	13	Burnt	70.9	66.3	71.0	No data	No data	No data	No data	69.4	ng g ⁻¹	-0.02
gip-0722-20.3_a	16	Burnt	70.9	71.4	65.4	No data	No data	No data	No data	69.2	ng g ⁻¹	-0.03
gip-0722-21.3_a	17	Burnt	93.0	91.9	93.9	92.4	89.4	No data	No data	92.1	ng g ⁻¹	1.23
gip-0722-22.3_a	18	Burnt	67.2	67.2	67.0	No data	No data	No data	No data	67.1	ng g ⁻¹	-0.14
gip-0722-1.3_a	1	Unburnt	62.7	62.9	96.4	58.0	No data	No data	No data	70.0	ng g ⁻¹	0.02
gip-0722-3.3_a	3	Unburnt	58.0	54.0	70.6	54.4	No data	No data	No data	59.2	ng g ⁻¹	-0.58
gip-0722-11.3_a	8	Unburnt	65.5	64.9	62.9	No data	No data	No data	No data	64.4	ng g ⁻¹	-0.29
gip-0722-12.3_a	9	Unburnt	56.0	50.5	61.5	55.9	No data	No data	No data	56.0	ng g ⁻¹	-0.76
gip-0722-13.3_a	10	Unburnt	56.0	55.6	52.1	No data	No data	No data	No data	54.6	ng g ⁻¹	-0.83
gip-0722-14.3_a	11	Unburnt	51.2	55.0	52.5	57.0	50.2	50.7	No data	52.8	ng g ⁻¹	-0.93
gip-0722-18.3_a	14	Unburnt	83.1	81.8	80.1	No data	No data	No data	No data	81.7	ng g ⁻¹	0.66
gip-0722-19.3_a	15	Unburnt	154	134	134	138	127	130	No data	136	ng g ⁻¹	3.67
gip-0722-24.3_a	19	Unburnt	67.7	67.0	70.1	69.0	No data	No data	No data	68.4	ng g ⁻¹	-0.07
gip-0722-25.3_a	20	Unburnt	67.0	69.3	67.0	No data	No data	No data	No data	67.8	ng g ⁻¹	-0.11
Mean										74.3		
Median										69.7		
s.d.										18.2		

Table S4. Mercury (Hg) concentrations (ng g⁻¹) for all bark samples.

Sample ID	Hg concentration (ng g ⁻¹)	Z-score
LHD - quadrant-1	7.88	-0.456
LHD - quadrant-2	31.5	0.874
LHD - quadrant-3	12.4	-0.203
FD right side - quadrant 1	62.9	2.65
FD right side - quadrant 2	13.5	-0.141
FD right side - quadrant 3	57.1	2.32
FD left side - quadrant 1	11.1	-0.274
FD left side - quadrant 2	32.6	0.935
FD left side - quadrant 3	13.3	-0.152
Oval - quadrant 1	25.2	0.521
Oval - quadrant 2	42.6	1.50
Oval - quadrant 3	16.0	0.00197
WAL TRK11 - quadrant 1	10.8	-0.290
WAL TRK11 - quadrant 2	31.7	0.889
WAL TRK11 - quadrant 3	94.2	4.41
WAL TRK12 - quadrant 1	15.6	-0.0195
WAL TRK12 - quadrant 2	15.9	-0.00197
WAL TRK12 - quadrant 3	10.9	-0.288
WAL TRK14 right side - quadrant 1	12.8	-0.180
WAL TRK14 right side - quadrant 2	12.4	-0.201
WAL TRK14 right side - quadrant 3	13.4	-0.143
WAL TRK14 left side - quadrant 1	16.6	0.0358
WAL TRK14 left side - quadrant 2	11.9	-0.232
WAL TRK14 left side - quadrant 3	10.1	-0.329
WAL TRK18 right side - quadrant 1	27.1	0.630
WAL TRK18 right side - quadrant 2	14.2	-0.0991
WAL TRK18 right side - quadrant 3	19.6	0.206
WAL TRK18 left side - quadrant 1	12.4	-0.200
WAL TRK18 left side - quadrant 2	11.6	-0.247
WAL TRK18 left side - quadrant 3	14.5	-0.0815
WAL TRK23 left side - quadrant 1	40.3	1.37
WAL TRK23 left side - quadrant 2	20.3	0.242
WAL TRK23 left side - quadrant 3	21.8	0.331
RSG - quadrant 1	16.1	0.00442
RSG - quadrant 2	25.3	0.527
RSG - quadrant 3	28.7	0.719
Mean	23.2	
Median	16.0	
Std	17.7	

Table S5. Mercury (Hg) concentrations (ng g⁻¹) for all twig samples

Sample ID	Concentration (ng g ⁻¹)	Z-score
LHD - quadrant-1	9.11	0.420
LHD - quadrant-2	5.80	-0.0745
LHD - quadrant-3	13.0	0.996
FD right side - quadrant 1	6.27	-0.00502
FD right side - quadrant 2	9.19	0.433
FD right side - quadrant 3	4.64	-0.248
FD left side - quadrant 1	5.51	-0.118
FD left side - quadrant 2	5.77	-0.0800
FD left side - quadrant 3	7.53	0.183
Oval - quadrant 1	6.38	0.0123
Oval - quadrant 2	6.64	0.0511
Oval - quadrant 3	6.46	0.0242
WAL TRK11 - quadrant 1	4.34	-0.294
WAL TRK11 - quadrant 2	5.27	-0.154
WAL TRK11 - quadrant 3	7.36	0.158
WAL TRK12 - quadrant 1	5.16	-0.172
WAL TRK12 - quadrant 2	4.68	-0.243
WAL TRK12 - quadrant 3	5.96	-0.0506
WAL TRK14 right side - quadrant 1	5.13	-0.175
WAL TRK14 right side - quadrant 2	5.95	-0.0524
WAL TRK14 right side - quadrant 3	9.21	0.435
WAL TRK14 left side - quadrant 1	5.81	-0.0742
WAL TRK14 left side - quadrant 2	5.95	-0.0527
WAL TRK14 left side - quadrant 3	5.68	-0.0934
WAL TRK18 right side - quadrant 1	9.98	0.550
WAL TRK18 right side - quadrant 2	10.8	0.668
WAL TRK18 right side - quadrant 3	7.45	0.171
WAL TRK18 left side - quadrant 1	4.88	-0.213
WAL TRK18 left side - quadrant 2	4.45	-0.277
WAL TRK18 left side - quadrant 3	7.26	0.143
WAL TRK23 left side - quadrant 1	40.3	5.09
WAL TRK23 left side - quadrant 2	20.3	2.09
WAL TRK23 left side - quadrant 3	21.8	2.33
RSG - quadrant 1	6.34	0.00502
RSG - quadrant 2	4.95	-0.202
RSG - quadrant 3	7.70	0.209
Mean	8.42	
Median	6.30	
Std	6.68	

Table S6. Results of soil ANOVAs and *post hoc* tests

Source of variation	d.f.	S.S	F-statistic	P-value	HSD P-value
[Hg] in Unburnt Soils					
Type	2.00	1.52	16.4	<0.001	
Residuals	45.0	2.08			
<i>O-Tree Base</i>					0.0936
<i>A-Tree Base</i>					<0.001
<i>A-O</i>					<0.001
	Num d.f.	Denom d.f.			Games-Howell P-value
OM (%) in Unburnt Soils					
Type	2.00	19.4	23.7	<0.001	
<i>O-Tree Base</i>					<0.005
<i>A-Tree Base</i>					<0.005
<i>A-O</i>					<0.05

Bold values denote significant differences at $P = 0.05$. d.f., degrees of freedom; SS, Sum of Squares; type, soil type (Base of tree, O horizon, A horizon).

Table S7. Results of linear mixed models and *post hoc* tests

logOM ~ TYPE * BURN + (1 SITE) REML criterion at convergence = 8.5	Estimated coefficient	s.e.	d.f.	t	P
Fixed Effects					
(Intercept)	0.952	0.0772	32.1	12.3	1.04e-13
Type O	0.269	0.0939	16.8	2.86	0.0109
Burn Unburnt	0.00694	0.112	32.4	0.0620	0.951
TYPEO:BURNUnburnt	0.116	0.138	17.8	0.841	0.411
<i>A Burnt - O Burnt</i>	-0.269	0.0939	16.3	-2.86	0.0495
<i>A Burnt - A Unburnt</i>	-0.00694	0.112	32.3	-0.0620	1.00
<i>A Burnt - O Unburnt</i>	-0.391	0.112	32.3	-3.48	0.00750
<i>O Burnt - A Unburnt</i>	0.262	0.112	32.3	2.33	0.112
<i>O Burnt - O Unburnt</i>	-0.123	0.112	32.3	-1.09	0.697
<i>A Unburnt - O Unburnt</i>	-0.384	0.101	18.1	-3.80	0.00650
	Variance		s.d.		
Random Effects					
SITE/(Intercept)	0.0156		0.125		
Residual	0.0441		0.210		
logCon ~ TYPE * BURN + (1 SITE) REML criterion at convergence: -8.60					
Fixed Effects					
(Intercept)	1.63	0.0713	22.1	22.8	<2.00e-16 ***
Type O	0.270	0.0513	15.5	5.25	8.84e-05 ***
Burn Unburnt	0.108	0.102	22.9	1.06	0.301
TYPEO:BURNUnburnt	-0.0111	0.0763	16.0	-0.146	0.886
<i>A Burnt - O Burnt</i>	-0.269	0.0513	16.0	-5.25	0.000400
<i>A Burnt - A Unburnt</i>	-0.108	0.102	23.4	-1.06	0.718
<i>A Burnt - O Unburnt</i>	-0.366	0.102	23.4	-3.58	0.00780
<i>O Burnt - A Unburnt</i>	0.161	0.102	23.4	1.58	0.410
<i>O Burnt - O Unburnt</i>	-0.0969	0.102	23.4	-0.948	0.780
<i>A Unburnt - O Unburnt</i>	-0.258	0.0567	16.9	-4.55	0.00150
	Variance		s.d.		
Random Effects					
SITE/(Intercept)	0.0377		0.194		
Residual	0.0132		0.115		

Bold values denote significant differences at $P = 0.05$. d.f., degrees of freedom; s.e., standard error.

Table S8. Results of correlations of mercury and organic matter in soils.

Type	<i>R</i> -statistic	<i>R</i> ²	<i>P</i> -value	Conf low	Conf high
Combined	0.777	0.604	0.000000000812	0.633	0.869
Tree base	0.785	0.616	0.00713	0.308	0.947
O horizon	0.576	0.332	0.00979	0.165	0.817
A horizon	0.581	0.337	0.00916	0.172	0.819

Calculations done with log-transformed data

Table S9. Results of litter Kruskal–Wallis test and *post hoc* tests.

Kruskal–Wallis rank sum test	χ^2	d.f.	<i>P</i> -value
	69.6	2	7.76e-16
Dunn test		Z score	
<i>Bark - Leaf</i>		-3.83	6.29e-05
<i>Bark - Twig</i>		5.12	1.56e-07
<i>Leaf - Twig</i>		8.13	2.20e-16

Bold values denote significant differences at $P = 0.05$. d.f., degrees of freedom; s.e., standard error.