Supporting Information for

Probing the Limits of Sampling Gaseous Elemental Mercury Passively in the Remote Atmosphere

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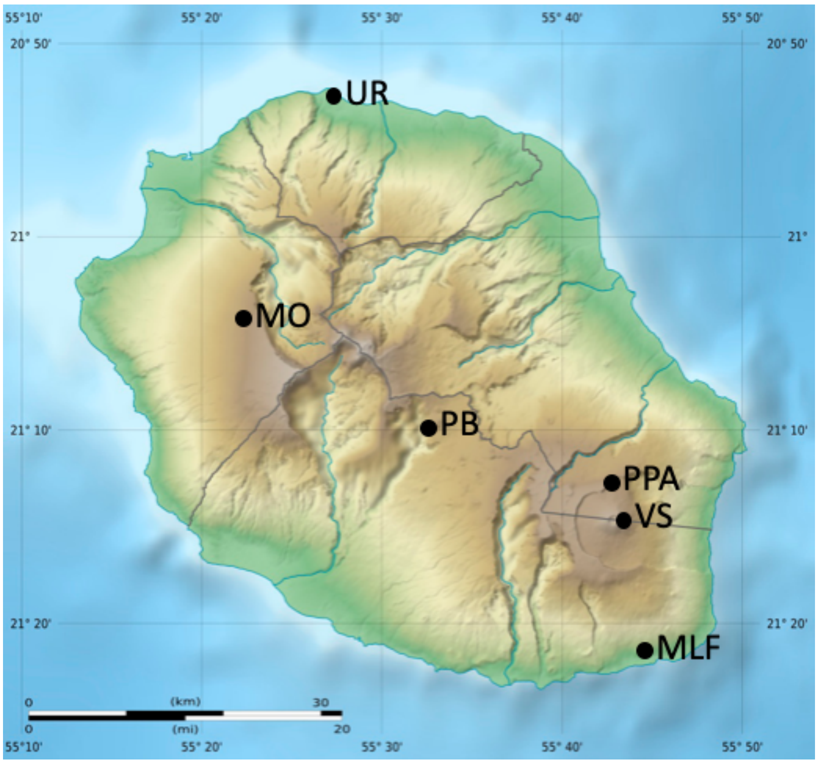

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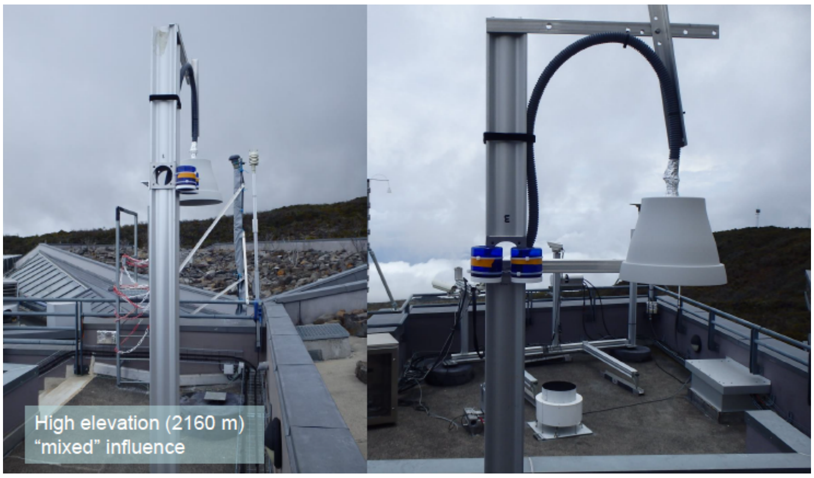

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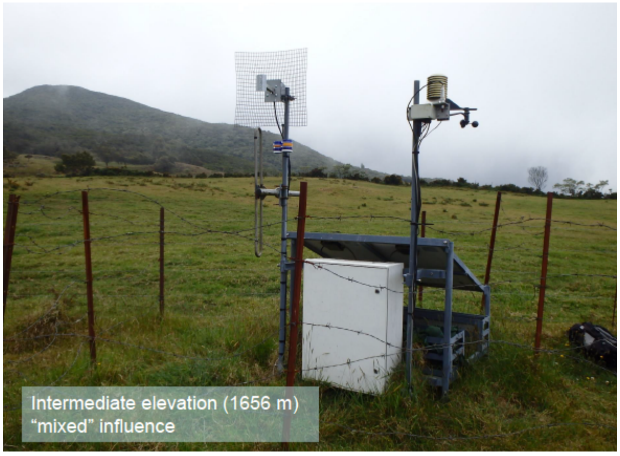

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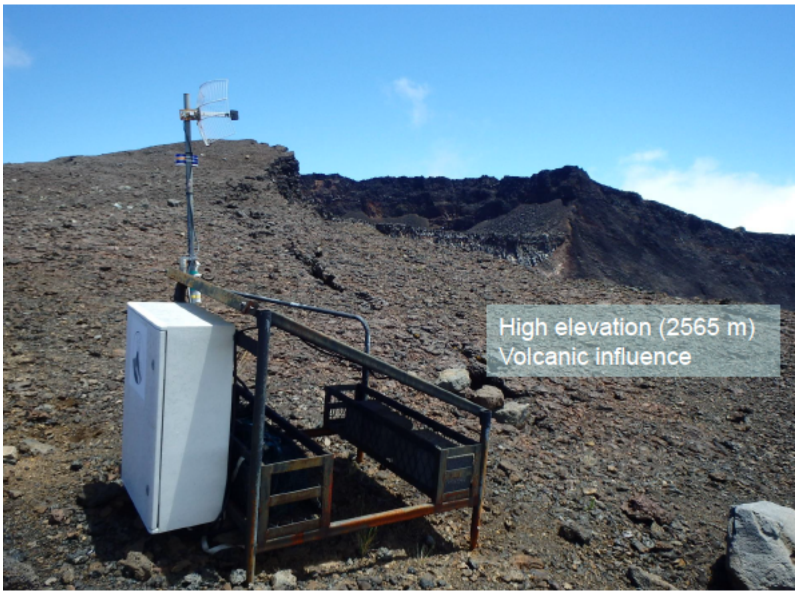

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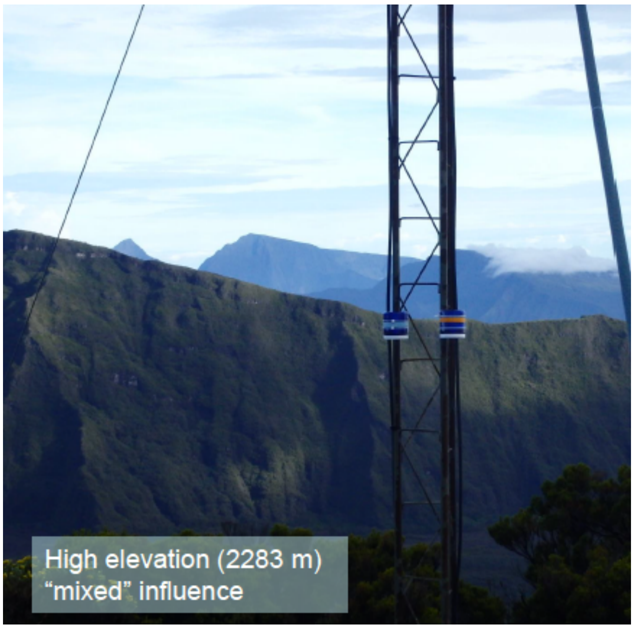

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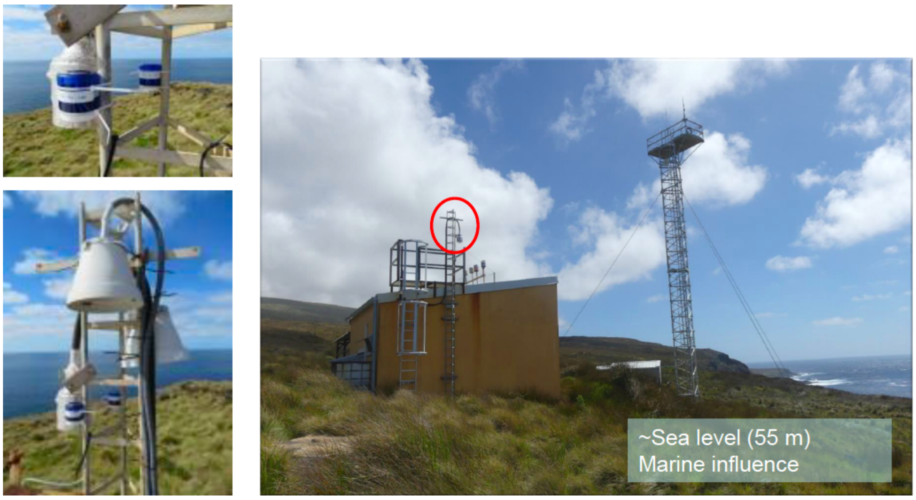

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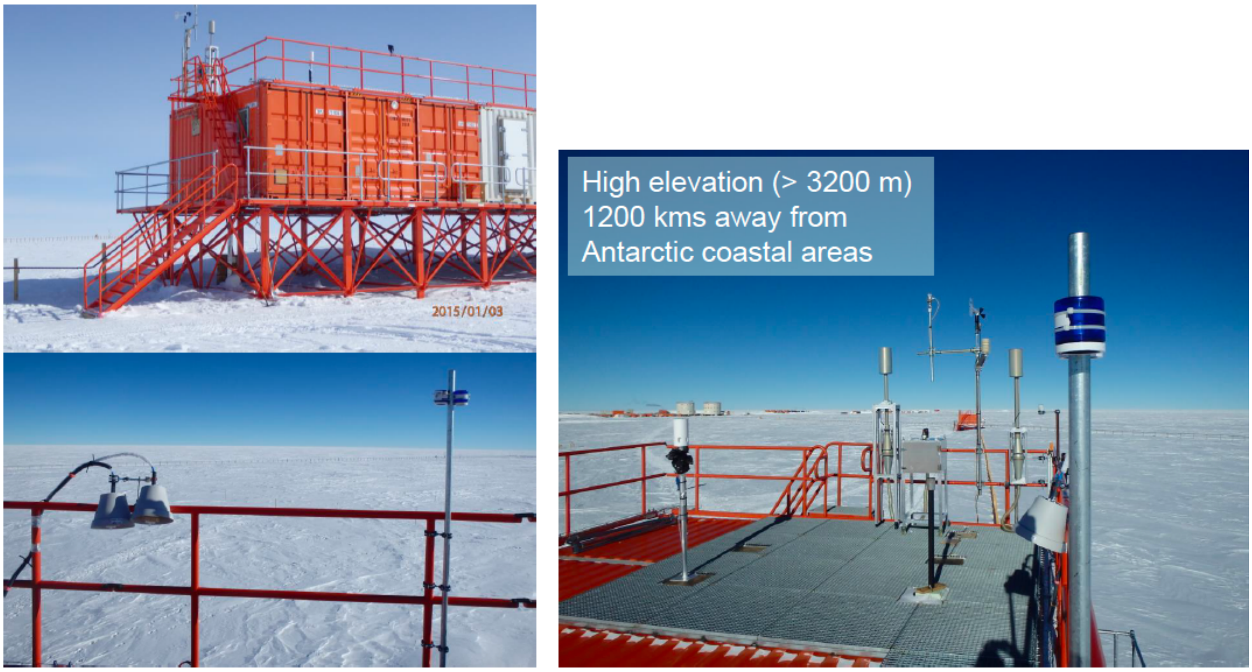

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Table S1 Analytical detail on the field blank samples, including the figures of merit derived from the standard deviation of the mean of a batch of field blank samples.

Code	site	m_C g	m_{Hg} ng	C_{Hg} ng/g	
La Réunion (11/17 to 06/18)					
RU-Blank-B1	MO	0.6499	0.274	0.42	$C_{Hg\text{-}avg}$= 1.14±0.42 ng/g
RU-Blank-B2	MO	0.6390	0.500	0.78	MDL = 0.84 ng, PQL = 2.8 ng
RU-Blank-B8	MO	0.6432	0.804	1.25	
RU-Blank-B10	MFL	0.6627	0.721	1.09	
RU-Blank-B5	MFL	0.6607	0.889	1.35	
RU-Blank-B6	UR	0.7350	0.916	1.25	
RU-Blank-B7	UR	0.6604	1.06	1.61	
RU-Blank-B4	VS	0.6708	0.403	0.60	
RU-Blank-B9	VS	0.6712	1.15	1.71	
RU-Blank-B3	PB	0.6686	0.892	1.33	
La Réunion (06/18 to 02/19)					
RU-Blank-B11	PB	0.6362	2.44	3.83	$C_{Hg\text{-}avg}$= 4.36±0.75 ng/g
RU-Blank-B12	PB	0.6260	3.06	4.89	MDL = 1.4 ng, PQL = 4.7 ng
Amsterdam Island (11/18 to 12/19)					
AMS-Blank-B1		0.7087	3.92	5.53	$C_{Hg\text{-}avg}$= 6.15±3.74 ng/g
AMS-Blank-B2		0.6810	5.47	8.04	MDL = 7.9 ng, PQL = 26 ng
AMS-PB-B3		0.6646	6.97	10.5	
AMS-PB-B4		0.7296	4.59	6.30	
AMS-PB-B5		0.7292	0.279	0.38	
Amsterdam Island (12/19 to 11/21)					
AMS-PB-B6		0.7217	1.13	1.57	$C_{Hg\text{-}avg}$= 1.02±0.55 ng/g
AMS-PB-B7		0.7464	0.577	0.77	MDL = 1.1 ng, PQL = 3.7 ng
AMS-PB-B8		0.7684	0.403	0.52	
AMS-PB-B9		0.7334	1.27	1.72	
AMS-PB-B10		0.679	0.357	0.53	
AMS-PB-B11		0.505	0.738	1.46	
AMS-PB-B12		0.544	0.288	0.53	
Concordia Station (11/18 to 12/19)					
DMC-TB1		0.6525	3.18	4.87	$C_{Hg\text{-}avg}$= 4.11±0.90 ng/g
DMC-B1		0.6945	2.82	4.06	MDL = 1.8 ng, PQL = 6.0 ng
DMC-B2		0.6498	1.86	2.86	
DMC-B3		0.6524	3.03	4.65	
Concordia Station (12/19 to 10/20)*					
DMC-TB2		0.6697	1.99	2.97	$C_{Hg\text{-}avg}$= 2.64±0.31 ng/g
DMC-B4		0.7234	1.86	2.58	MDL = 0.7 ng, PQL = 2.2 ng
DMC-B6		0.7323	1.72	2.35	

*DMC-B5 was not properly handled and could not be used as a field blank.

Note: Blanks AMS-PB-B10 to AMS-PB-B12 were analyzed by Tekran Instruments Corporation and not at the University of Toronto Scarborough.

Table S2 Analytical detail on the passive air samplers deployed on Amsterdam Island.

Code	From	To	Length	T_{avg}	WS_{avg}	SR_{adj}	m_C	m_{Hg}	Blank	C_{Hg}	$C_{Hg\text{-}avg}$	Precision	Comt.
			days	°C	m/s	m^3/day	g	ng	%	ng/m^3	ng/m^3	%	
AMS-PB-S1	28-11-18	27-12-18	28.8	16.2	7.80	0.154	0.722	(6.940)	64%	0.563	0.816	62%	
	3:00 PM	10:10 AM					0.763	(9.440)	50%	1.069			
AMS-PB-S2	27-12-18	23-1-19	27.0	16.4	7.69	0.154	0.711	(6.240)	70%	0.450	0.822	90%	
	10:10 AM	9:04 AM					0.733	(9.465)	48%	1.194			
AMS-PB-S3	23-1-19	20-2-19	28.3	17.7	6.15	0.151	0.742	(10.53)	43%	1.402	1.487	12%	
	9:10 AM	3:10 PM					0.748	(11.29)	41%	1.573			
AMS-PB-S4	20-2-19	20-3-19	27.8	17.5	5.93	0.150	0.721	(8.540)	52%	0.984	0.876	25%	
	3:25 PM	11:43 AM					0.730	(7.687)	58%	0.767			
AMS-PB-S5	20-3-19	24-4-19	35.0	16.5	7.34	0.153	0.705	(9.481)	46%	0.959	1.169	36%	
	11:45 AM	12:48 PM					0.737	(11.93)	38%	1.379			
AMS-PB-S6	24-4-19	15-5-19	20.9	14.3	8.05	0.153	0.698	(7.980)	54%	1.151	1.193	7%	
	12:45 PM	10:55 AM					0.690	(8.204)	52%	1.235			
AMS-PB-S7	15-5-19	12-6-19	27.9	13.2	8.77	0.155	0.775	(7.700)	62%	0.680	1.166	83%	
	10:55 AM	8:55 AM					0.716	(11.53)	38%	1.652			
AMS-PB-S8	12-6-19	31-7-19	49.1	12.3	10.11	0.158	0.751	(10.80)	43%	0.799	0.599	67%	
	8:57 AM	11:19 AM					0.781	(7.885)	61%	0.398			
AMS-PB-S9	31-7-19	25-9-19	56.0	11.2	10.70	0.159	0.756	(12.01)	39%	0.829	0.820	2%	
	11:30 AM	11:50 AM					0.735	(11.72)	39%	0.812			
AMS-PB-S10	25-9-19	5-12-19	71.5	12.7	9.54	0.156	0.786	(11.98)	40%	0.640	0.630	3%	
	12:00 AM	11:02 AM					0.780	(11.71)	41%	0.619			
AMS-PB-S11	5-12-19	30-1-20	56.2	14.8	8.88	0.1562	0.768	20.95	4%	2.285	2.069	21%	glass jar
	11:05 AM	3:57 PM					0.724	17.09	5%	1.852			
AMS-PB-S12	30-1-20	26-3-20	55.8	15.9	6.86	0.1512	0.759	10.09	9%	1.094	1.057	7%	glass jar
	4:30 PM	10:43 AM					0.763	9.47	9%	1.020			
AMS-PB-S13	26-3-20	28-5-20	63.0	14.6	9.17	0.1569	0.785	11.16	8%	1.037	1.076	7%	glass jar
	10:48 AM	11:48 AM					0.772	11.92	7%	1.115			
AMS-PB-S14	28-5-20	30-7-20	63.0	11.7	11.47	0.1612	0.754	11.42	8%	1.039	1.017	4%	glass jar
	11:48 AM	12:15 PM					0.782	11.02	8%	0.996			
AMS-PB-S15	30-7-20	29-10-20	91.0	11.5	10.54	0.1583	0.760	15.54	6%	1.018	1.040	4%	glass jar
	12:20 PM	12:08 PM					0.774	16.19	5%	1.063			

Table S2 ctd.

Code	From	To	Length days	T_{avg} °C	WS_{avg} m/s	SR_{adj} m^3/day	m_C g	m_{Hg} ng	Blank %	C_{Hg} ng/m^3	C_{Hg-avg} ng/m^3	Precision %	Comt.
AMS-PB-S16	29-10-20 12:16 PM	13-2-21 4:30 PM	107.2	15.5	7.03	0.1513	0.763	26.77	3%	1.603	1.054	n.a.	outlier
							0.800	17.09	5%	1.054			glass jar
AMS-PB-S17	13-2-21 4:40 pm	12-5-21 9:50 am	87.7	16.3	7.39	0.1532	0.593	14.104	4%	1.005	0.975	6%	glass jar
							0.521	13.235	4%	0.946			
AMS-PB-S18	12-5-21 9:50 am	5-8-21 9:52 am	85.0	12.5	8.59	0.1533	0.524	12.929	4%	0.951	0.987	7%	glass jar
							0.557	13.887	4%	1.022			
AMS-PB-S19	5-8-21 10:25 am	4-11-21 4:00 pm	91.2	11.5	9.69	0.1556	0.627	14.529	4%	0.978	0.978	n.a.	glass jar
AMS-PB-S19b	5-8-21 10:25 am	21-9-21 2:00 pm*	47.1	11.2	11.06	0.1595	0.562	7.594	8%	0.934			glass jar

* This sampler's deployment period is much shorter than that of its duplicate, because it was blown away during a storm. It was retrieved from the ground on Sept. 21, 2021, sealed and analyzed, but not used to calculate an average or replicate precision.

Note: Samples from deployment periods AMS-PB-S16 to AMS-PB-S19 were analyzed by Tekran Instruments Corporation and not at the University of Toronto Scarborough.

Table S3 Analytical detail on the passive air samplers deployed Concordia Station, Dome C, Antarctica.

Code	From	To	Length days	T_{avg} °C	WS_{avg} m/s	SR_{adj} m^3/day	m_C g	m_{Hg} ng	Blank %	C_{Hg} ng/m^3	C_{Hg-avg} ng/m^3	Precision %	Comt.
DMC-AS-S1	26-11-18	24-12-18	27.9	-30.81	4.37	0.1017	0.684	*7.529*	37%	1.662	1.521	19%	
	10:45 AM	9:00 AM					0.622	*6.469*	39%	1.379			
DMC-AS-S2	24-12-18	28-1-19	35.0	-30.88	3.66	0.0994	0.711	*8.731*	33%	1.670	1.468	28%	
	9:30 AM	9:30 AM					0.676	*7.180*	39%	1.266			
DMC-AS-S3	28-1-19	25-2-19	28.0	-40.08	4.48	0.0936	0.674	9.551	29%	2.586	2.519	5%	
	9:43 AM	10:08					0.671	9.192	30%	2.453			
DMC-AS-S4	25-2-19	25-3-19	28.0	-49.43	4.72	0.0859	0.698	*8.333*	34%	2.273	1.857	45%	
	10:23 AM	10:08					0.642	*6.102*	43%	1.440			
DMC-AS-S5	25-3-19	25-4-19	31.0	-56.55	4.58	0.0791	0.689	*7.371*	38%	1.851	1.573	35%	
	10:24 AM	10:22					0.677	*5.955*	47%	1.295			
DMC-AS-S6	25-4-19	25-5-19	30.0	-59.30	3.98	0.0748	0.694	*7.121*	40%	1.902	2.043	14%	
	10:45 AM	10:35					0.624	*7.468*	34%	2.185			
DMC-AS-S7	25-5-19	25-7-19	60.9	-60.41	5.40	0.0781	0.704	11.120	26%	1.729	1.617	14%	
	10:47 AM	9:25 AM					0.708	10.074	29%	1.506			
DMC-AS-S8	25-7-19	25-9-19	62.0	-59.20	4.97	0.0779	0.607	*7.978*	31%	1.134	1.380	36%	
	9:35 AM	10:43					0.670	10.616	26%	1.626			
DMC-AS-S9	25-9-19	18-11-19	54.0	-49.68	4.82	0.0860	0.596	*6.353*	39%	0.841	1.104	48%	
	11:04 AM	10:52					0.622	*8.901*	29%	1.367			
DMC-AS-S10	18-11-19	16-1-20	59.2	-29.84	3.84	0.1009	0.695	15.323	12%	2.256	1.864	42%	glass jar
	11:18 AM	4:50 PM					0.681	10.593	17%	1.472			
DMC-AS-S11	16-1-20	16-3-20	59.9	-36.00	3.97	0.0958	0.729	11.759	16%	1.713	1.585	16%	glass jar
	5:08 PM	3:45 PM					0.677	10.149	18%	1.457			
DMC-AS-S12	16-3-20	18-5-20	62.8	-57.67	4.34	0.0774	0.721	10.693	18%	1.808	1.763	5%	glass jar
	3:50 PM	11:38					0.710	10.223	18%	1.717			
DMC-AS-S13	18-5-20	20-7-20	63.1	-60.65	4.58	0.0754	0.711	9.570	20%	1.616	1.966	36%	glass jar
	11:42 AM	2:56 PM					0.690	12.842	14%	2.315			
DMC-AS-S14	20-7-20	21-9-20	63.0	-60.09	5.24	0.0779	0.756	10.439	19%	1.721	1.621	12%	glass jar
	3:08 PM	2:53 PM					0.775	9.503	22%	1.520			
DMC-AS-S15	21-9-20	21-12-20	91.0	-43.92	5.10	0.0920	0.662	16.121	11%	1.716	1.780	7%	glass jar
	3:02 PM	3:15 PM					0.723	17.355	11%	1.844			

Table S4 Analytical detail on the passive air samplers deployed at Piton Bleu, La Réunion.

Code	From	To	Length days	T_{avg} °C	WS_{avg} m/s	SR_{adj} m^3/day	m_C g	m_{Hg} ng	Blank %	C_{Hg} ng/m^3	$C_{Hg\text{-}avg}$ ng/m^3	Precision %	Comt.
RU-PB-S1	7-11-17	11-12-17	33.9	14.26	3.04	0.1382	0.600	5.721	12%	1.076	1.087	2.0%	
	14:30	11:30					0.619	5.845	12%	1.098			
RU-PB-S2	11-12-17	13-1-18	33.1	15.56	4.79	0.1446	0.612	7.090	10%	1.336	1.295	6.4%	
	11:50	13:50					0.693	6.785	12%	1.253			
RU-PB-S3	13-1-18	17-2-18	34.9	16.64	2.75	0.1395	0.651	6.986	11%	1.284	1.299	2.4%	
	14:00	11:00					0.651	7.136	10%	1.314			
RU-PB-S4	17-2-18	10-3-18	21.2	15.96	4.47	0.1440	0.642	5.009	15%	1.404	1.391	1.9%	
	11:15	15:00					0.692	4.986	16%	1.377			
RU-PB-S5	10-3-18	4-4-18	24.8	15.66	3.92	0.1421	0.637	5.526	13%	1.359	1.247	18%	
	15:15	11:30					0.642	4.735	15%	1.134			
RU-PB-S6	4-4-18	29-4-18	24.9	14.27	3.48	0.1396	0.680	4.555	17%	1.088	1.127	6.9%	
	11:45	9:30					0.643	4.785	15%	1.166			
RU-PB-S7	29-4-18	28-5-18	28.9	12.47	3.01	0.1365	0.678	5.280	15%	1.141	1.112	5.2%	
	9:35	8:00					0.670	5.044	15%	1.084			
RU-PB-S8	28-5-18	25-6-18	28.4	11.51	2.47	0.1340	0.703	5.422	15%	1.215	1.065	28%	
	8:05	5:00					0.638	4.207	17%	0.915			
RU-PB-S9	25-6-18	6-8-18	42.5	9.32	3.62	0.1355	0.624	11.57	24%	1.555	1.073	n.a.	outlier
	12:00	10:55					0.666	9.016	32%	1.073			
RU-PB-S10	6-8-18	4-9-18	29.1	10.44	4.58	0.1394	0.564	6.458	38%	0.988	1.059	13%	
	11:00	13:42					0.648	7.395	38%	1.129			
RU-PB-S11	4-9-18	12-10-18	37.7	11.14	4.23	0.1390	0.630	8.318	33%	1.054	0.986	14%	
	13:52	07:45					0.635	7.616	36%	0.917			
RU-PB-S12	12-10-18	10-12-18	59.1	13.07	2.95	0.1369	0.645	5.840	48%	0.374	0.910	n.a.	outlier
	07:45	10:55					0.620	10.06	27%	0.910			
RU-PB-S13	10-12-18	13-02-19	64.9	15.87	3.37	0.1407	0.649	10.93	26%	0.885	0.895	2%	
	11:00	09:10					0.642	11.07	25%	0.904			

Table S5 Analytical detail on the passive air samplers deployed at University of Réunion, Saint-Denis, La Réunion.

Code	**From**	**To**	**Length** days	$\mathbf{T_{avg}}$ °C	$\mathbf{WS_{avg}}$ m/s	$\mathbf{SR_{adj}}$ m^3/day	$\mathbf{m_C}$ g	$\mathbf{m_{Hg}}$ ng	**Blank** %	$\mathbf{C_{Hg}}$ ng/m^3	$\mathbf{C_{Hg\text{-}avg}}$ ng/m^3	**Precision** %	**Comt.**
RU-UR-S1	30-10-17	1-12-17	31.8	24.9	5.18	0.1542	0.636	6.418	11%	1.160	1.160	n.a	
	15:15	11:30					0.639	14.086	5%	2.721			outlier
RU-UR-S2	1-12-17	5-1-18	34.9	27.0	5.51	0.1571	0.641	5.823	13%	0.928	1.091	30%	
	11:40	10:00					0.628	7.598	9%	1.254			
RU-UR-S3	5-1-18	5-2-18	31.2	27.0	4.95	0.1554	0.711	6.237	13%	1.119	1.145	4.6%	
	10:30	15:20					0.665	6.439	12%	1.172			
RU-UR-S4	5-2-18	8-3-18	31.0	27.1	4.69	0.1547	0.653	5.858	13%	1.068	1.142	13%	
	15:30	14:45					0.620	6.536	11%	1.217			
RU-UR-S5	8-3-18	4-4-18	27.1	26.7	5.54	0.1569	0.639	5.069	14%	1.022	1.046	4.6%	
	15:15	17:00					0.680	5.320	15%	1.070			
RU-UR-S6	4-4-18	2-5-18	28.0	25.4	5.37	0.1553	0.628	6.057	12%	1.228	1.212	2.6%	
	17:15	17:30					0.684	5.982	13%	1.196			
RU-UR-S7	2-5-18	28-5-18	25.8	24.5	5.31	0.1543	0.716	5.021	16%	1.057	1.001	11%	
	17:35	12:15					0.700	4.556	17%	0.945			
RU-UR-S8	28-5-18	25-6-18	27.8	23.0	4.79	0.1513	0.623	4.808	15%	0.976	0.910	15%	
	12:20	6:30					0.635	4.269	17%	0.844			

Table S6 Analytical detail on the passive air samplers deployed at Piton Partage, La Réunion.

Code	**From**	**To**	**Length** days	$\mathbf{T_{avg}}$ °C	$\mathbf{WS_{avg}}$ m/s	$\mathbf{SR_{adj}}$ m^3/day	$\mathbf{m_C}$ g	$\mathbf{m_{Hg}}$ ng	**Blank** %	$\mathbf{C_{Hg}}$ ng/m^3	$\mathbf{C_{Hg\text{-}avg}}$ ng/m^3	**Precision** %	**Comt.**
RU-PPA-S1	4-4-18	29-4-18	25.19	12.79	3.51	0.1383	0.745	4.671	18%	1.097	1.071	4.9%	
	8:00	12:30					0.688	4.422	18%	1.044			
RU-PPA-S2	29-4-18	28-5-18	28.87	10.87	3.43	0.1363	0.712	5.201	16%	1.115	0.943	16%	
	12:35	9:30					0.715	4.606	18%	0.963			
RU-PPA-S3	28-5-18	25-6-18	28.23	9.29	3.39	0.1348	0.729	4.911	17%	1.072	1.072	n.a.	
	9:35	15:00					0.735	6.251	13%	1.423			outlier

Table S7 Analytical detail on the passive air samplers deployed at Maïdo Observatory, La Réunion.

Code	**From**	**To**	**Length**	**T_{avg}**	**WS_{avg}**	**SR_{adj}**	**m_C**	**m_{Hg}**	**Blank**	**C_{Hg}**	**$C_{Hg\text{-}avg}$**	**Precision**	**Comt.**
			days	°C	m/s	m^3/day	g	ng	%	ng/m^3	ng/m^3	%	
RU-MO-S1	2-11-17	29-11-17	27.0	12.3	3.00	0.1364	0.6419	4.937	15%	1.141	1.20	10.3%	
	10:15	10:50					0.6415	5.394	14%	1.265			
RU-MO-S2	29-11-17	4-1-18	35.9	13.4	3.01	0.1374	0.6196	6.608	11%	1.197	1.18	3.3%	
	11:15	9:00					0.6172	6.415	11%	1.158			
RU-MO-S3	4-1-18	5-2-18	32.0	14.8	4.24	0.1423	0.6923	5.740	14%	1.089	1.09	0.8%	
	9:23	8:30					0.6223	5.702	12%	1.098			
RU-MO-S4	5-2-18	8-3-18	30.9	14.3	4.37	0.1422	0.7064	5.940	14%	1.168	1.11	9.7%	
	8:35	6:45					0.6796	5.433	14%	1.059			
RU-MO-S5	8-3-18	3-4-18	26.1	14.2	4.26	0.1418	0.6344	4.687	15%	1.071	1.11	6.7%	
	7:10	9:30					0.6821	5.014	15%	1.145			
RU-MO-S6	3-4-18	2-5-18	29.0	13.1	3.28	0.1379	0.6497	5.199	14%	1.116	1.05	11.7%	
	9:45	9:00					0.6242	4.678	15%	0.993			
RU-MO-S7	2-5-18	31-5-18	29.3	10.9	3.36	0.1362	0.6519	5.002	15%	1.066	1.22	25%	
	9:15	17:15					0.6579	6.222	12%	1.370			
RU-MO-S8	31-5-18	25-6-18	24.7	9.4	3.45	0.1351	0.6222	4.554	16%	1.154	1.26	17%	
	17:30	9:30				0.1163	0.6777	5.314	15%	1.363			

Table S8 Analytical detail on the passive air samplers deployed at Volcano Summit, La Réunion.

Code	**From**	**To**	**Length**	**T_{avg}**	**WS_{avg}**	**SR_{adj}**	**m_C**	**m_{Hg}**	**Blank**	**C_{Hg}**	**$C_{Hg\text{-}avg}$**	**Precision**	**Comt.**
			days	°C	m/s	m^3/day	g	ng	%	ng/m^3	ng/m^3	%	
RU-VS-S1	7-11-17	11-12-17	33.9	11.01	4.25	0.1389	0.635	6.808	11%	1.290	1.233	9.3%	
	10:30	9:15					0.673	6.309	12%	1.175			
RU-VS-S2	11-12-17	10-3-18	89.0	12.50	5.43	0.1438	0.668	15.058	5%	1.117	1.117	n.a.	
	9:30	10:00					0.649	n.a.		n.a.			lost
RU-VS-S3	10-3-18	26-6-18	108.0	11.64	4.58	0.1405	0.738	17.737	5%	1.114	1.122	1.5%	
	10:15	10:00					0.717	17.969	5%	1.131			

Table S9 Analytical detail on the passive air samplers deployed at the Mare-Longue Forest, La Réunion.

Code	From	To	Length	T_{avg}	WS_{avg}	SR_{adj}	m_C	m_{Hg}	Blank	C_{Hg}	$C_{Hg\text{-}avg}$	Precision	Comt.
			days	°C	m/s	m^3/day	g	ng	%	ng/m^3	ng/m^3	%	
RU-MLF-S1	8-11-17	10-12-17	32.06	24.95	2.90	0.1474	0.6627	5.555	14%	1.016	1.032	3.1%	
	9:00	10:30					0.6789	5.726	14%	1.048			
RU-MLF-S2	10-12-17	11-1-18	31.94	26.25	3.28	0.1497	0.6954	4.835	16%	0.845	0.807	9.5%	
	11:00	9:30					0.697	4.472	18%	0.769			
RU-MLF-S3	11-1-18	12-2-18	27.98	25.96	2.86	0.1482	0.6659	4.462	17%	0.893	0.991	20%	
	9:45	8:15					0.6185	5.22	13%	1.089			
RU-MLF-S4	12-2-18	12-3-18	27.98	26.24	3.00	0.1489	0.7423	4.444	19%	0.864	0.889	5.6%	
	8:30	8:00					0.6989	4.603	17%	0.914			
RU-MLF-S5	12-3-18	7-4-18	26.04	25.69	3.04	0.1485	0.6860	4.409	18%	0.938	0.900	8.3%	
	8:15	9:15					0.6960	4.13	19%	0.863			
RU-MLF-S6	7-4-18	1-6-18	55.10	23.40	2.82	0.1458	0.7635	7.895	11%	0.875	0.856	4.3%	
	9:30	12:00					0.6638	7.486	10%	0.838			
RU-MLF-S7	1-6-18	27-6-18	25.82	21.72	2.67	0.1438	0.7119	4.024	20%	0.865	1.008	28%	
	12:15	8:00					0.6974	5.066	16%	1.150			

Table S10 Analytical detail on the passive air samplers deployed at the Eruptive Cone, La Réunion.

Code	From	To	Length	T_{avg}	WS_{avg}	SR_{adj}	m_C	m_{Hg}	Blank	C_{Hg}	$C_{Hg\text{-}avg}$	Precision	Comt.
			days	°C	m/s	m^3/day	g	ng	%	ng/m^3	ng/m^3	%	
RU-EC-S1	28-4-18	4-5-18	6.1	11.65	3.923	0.1385	0.6609	1.909	39%	1.366	1.437	10%	
	13:17	15:55					0.6982	2.071	38%	1.507			

Discussion of whether a number of factors could provide an explanation of the larger than expected discrepancy between passive and actve sampling at Maïdo Observatory

Insufficient Blank Correction: As was discussed above, the blank-correction applied in this study was quite substantial, namely amounted to on average 14 % of the sequestered mass of Hg. It was further identified as the main reason for the relatively poor duplicate precision. In order for PAS-derived concentrations to match the TEKRAN-derived concentrations, the blank-adjustment would have to be increased by 1 ng (i.e. 1.75 ng instead of 0.75 ng, 32 % instead of 14 %). This, in turn, would require the (average) field blank concentration to be 2.65 ng Hg/g C (instead of 1.14 ng/g). However, even the most contaminated field blank only had a concentration of 1.7 ng/g. Therefore, it is not plausible that an insufficient blank correction is responsible for the discrepancy.

Sampling Rate Dependence on Meteorological Conditions: The sampling rate of the passive air sampler is dependent on the temperature and wind speed conditions during the time period of deployment. Therefore, we adjust the generic global sampling rate of 0.135 m^3/day, which is applicable to a temperature of 9.89 °C and a wind speed to 3.4 m/s, to the local meteorological conditions using the empirical equation by McLagan et al. (2018b). The meteorological conditions prevailing in Maïdo (see Table 2) are quite close to the average of the conditions encountered at the sampling sites contributing to the global calibration of the PAS. The average temperature (13.28 °C during the eight months of the study) was only slightly higher than 9.89 °C, and the average wind speed (3.65 m/s) is almost the same as 3.4 m/s. Accordingly, the adjustment to the sampling rate were minor, i.e., the sampling rate was increased by at most 5 % to 0.142 m^3/day. In order for the PAS-derived concentrations to match the TEKRAN-recorded values, we would have to apply a sampling rate around 1.85 m^3/day. Such high sampling rates had previously only been recorded at Cape Grim in Australia, which is a site experiencing sustained high winds. While there is some uncertainty in the adjustment of the sampling rate for temperature and wind speed, it is difficult to believe that an error in that procedure would lead to such a large underestimation of the sampling rate.

Bias in Sampling Rate Caused by Diurnal Variability. The TEKRAN measurements reveal that the GEM concentrations at Maïdo have a strong diurnal variability with levels that peak around noon. Temperature, of course, also has a diurnal pattern with a peak around noon, so that GEM concentrations and air temperature are synchronized. An example is shown in Figure S13, which shows the diurnal variability of each hour's median temperature, wind speed and GEM concentration during the deployment period 5 at Maïdo.

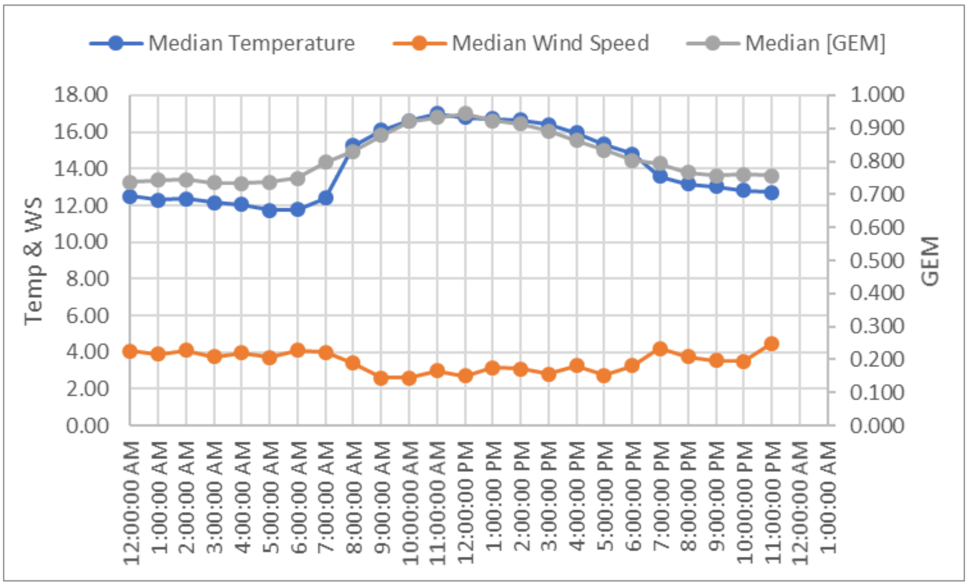

Figure S13 Diurnal variability of ambient air temperature, wind speed and gaseous elemental mercury concentration at Maïdo Observatory during the fifth passive sampler deployment period.

Because the sampling rate of the passive air sampler increases with increasing temperature (due to an increase in the diffusivity of gaseous mercury) (McLagan et al. 2017a), the sampling may be slightly biased towards time periods of higher GEM concentration, i.e. does not provide a true time-averaged concentration. We estimated the size of that bias as follows:

- We first estimated a sampling rate SR_i for each hour of deployment i using the average temperature T_i and wind speed WS_i during that hour (as recorded at Maïdo).
- The average of all of these hourly uptake rates equals the sampling rate for the entire length of deployment using the average temperature and wind speed during that month-long deployment period.

$$SR1 = \frac{\sum_i SR_i(T_i, WS_i)}{n_i} = SR_{avg}(T_{avg}, WS_{avg})$$

  Where n_i is the number of hours in the deployment period. This is the sampling rate listed in Table 3 and was used to calculate the PAS-derived GEM concentration in that table.

- Alternatively, we calculated the sampling rate by dividing the sum of the hourly uptake rates (calculated as the product of the hourly sampling rate and the hourly GEM concentration) by the product of the average GEM concentration and the deployment period t in days.

$$SR2 = \frac{\sum_i (SR_i \cdot GEM_i)}{GEM_{avg} \cdot t}$$

The extent to which SR2 deviates from SR1 indicates the bias incurred by ignoring the diurnal variability in the sampling rate. The data in Table S11 suggest that the synchronicity of temperature and GEM concentration leads to an effective sampling rate that is slightly higher than the one estimated from average meteorological data seven out of eight times. However, that bias overall is very small (at most a third of a percent) and cannot explain the much larger discrepancy in the GEM concentrations derived by PAS and TEKRAN.

Table S11 Estimation of the bias introduced by ignoring the diurnal variability in temperature, wind speed and gaseous elemental mercury concentration.

Sample ID	SR1	SR2	Bias
RU-MO-S1	0.1364	0.1366	0.14 %
RU-MO-S2	0.1373	0.1375	0.14 %
RU-MO-S3	0.1420	0.1416	-0.29 %
RU-MO-S4	0.1422	0.1426	0.27 %
RU-MO-S5	0.1418	0.1423	0.32 %
RU-MO-S6	0.1379	0.1380	0.07 %
RU-MO-S7	0.1361	0.1362	0.06 %
RU-MO-S8	0.1351	0.1352	0.12 %

Elevation Effect on Sampling Rate. Maïdo Observatory is located at 2160 m above sea level. The lower atmospheric pressure at that altitude implies that the air is on average 23 % thinner there than at sea level. Because the air is thinner, we should lower the sampling rate to an extent that is proportional to the lower atmospheric pressure. On the other hand, the diffusivity of mercury at higher altitude is faster, which would require us to increase the sampling rate at higher altitude, again to an extent that is proportional to the lower atmospheric pressure. Lowering and increasing the sampling rate to the same extent means that the two effects cancel each other out and no adjustment should be necessary for a comparison with TEKRAN data, which are based on 1 atm of atmospheric pressure (i.e. sea level) (McLagan et al., 2018b).

Figure S14 Hoar frost and material failures encountered during deployments of passive air samplers at Concordia Station, Dome C, Antarctica (credit: Julien Moye).