

Supplementary Material

Mercury evasion fluxes from sea surfaces of the Tsushima Strait and  
Kuroshio Current in the East China Sea

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The supplementary material includes:

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Table S1. All data on DGM concentrations and Hg fluxes in the surface seawater of the Tsushima Strait

Station	Location		Water depth	Date	Time	TGM	DGM	Dissolved MeHg	Dissolved Hg	Particulate Hg	Total Hg	%DGM of total	Water temperature	Salinity	Saturation	Hg evasion flux	Wind speed (U <sub>10</sub> )	
	Latitude	Longitude	(m)		(JST)	(ng m <sup>-3</sup> )	(pg L <sup>-1</sup> )	(pg L <sup>-1</sup> )	(pg L <sup>-1</sup> )	(pg L <sup>-1</sup> )	(pg L <sup>-1</sup> )	(%)	(°C)	(PSU)	(%)	(ng m <sup>-2</sup> h <sup>-1</sup> )	(m s <sup>-1</sup> )	
<i>Fall 2014</i>																		
St.1	34° 00' 00"N	129° 35' 00"E	105	10/25/2014	9:40	1.61	14.0	2.7	145	28	173	8.1	22.51	34.02	259	0.3	2.5	
				10/25/2014	10:35	1.85	14.6							22.54	34.03	235	0.2	2.0
				10/25/2014	11:35	1.64	15.4							22.60	34.02	279	0.1	1.2
St.2	33° 50' 00"N	129° 35' 00"E	93	10/26/2014	8:50	1.68	16.1	1.6	78	48	126	12.8	22.46	33.99	285	0.1	1.4	
				10/26/2014	10:00	1.60	15.3							22.52	34.00	283	0.0	0.7
				10/26/2014	10:55	1.60	15.9							22.52	34.00	296	0.1	1.1
St.3	33° 40' 00"N	129° 35' 00"E	68	10/2/2014	9:10	3.68	34.5	3.0	91	46	137	25.2	24.09	33.97	291	1.6	3.8	
				10/2/2014	9:50	3.26	31.5							24.20	37.00	301	0.6	2.2
				10/2/2014	10:40	4.05	32.0							24.20	38.00	246	0.3	1.6
St.4	33° 42' 59"N	129° 40' 02"E	42	10/27/2014	9:20	1.37	24.5	3.3	71	57	129	19.1	21.85	34.04	522	2.4	5.5	
				10/27/2014	10:10	1.37	22.4							21.85	34.04	477	2.3	5.7
				10/27/2014	11:00	1.40	20.1							21.86	34.04	420	2.2	6.0
<i>Summer 2015</i>																		
St.1	34° 00' 00"N	129° 35' 00"E	105	8/20/2015	9:15	1.24	23.7	1.1	111	25	135	17.5	27.08	33.23	647	0.7	2.4	
				8/20/2015	10:10	1.42	29.8	0.0	101	71	172	17.3	27.03	33.17	707	1.2	3.0	
St.2	33° 50' 00"N	129° 35' 00"E	93	8/21/2015	8:40	3.01	26.5	0.5	131	38	169	15.7	27.03	32.89	296	3.9	7.1	
				8/21/2015	9:25	3.17	28.4	0.7	57	40	97	29.3	26.89	32.88	300	11.9	12.4	
				8/21/2015	10:10	1.43	34.6	1.2	72	72	144	24.1	26.92	32.87	810	24.6	14.2	
St.3	33° 40' 00"N	129° 35' 00"E	69	8/27/2015	12:10	1.64	37.4	0.6					25.60	33.27	741	3.3	4.7	
				8/27/2015	12:45	1.67	36.7	0.5	55	41	96	38.1	25.61	33.27	711	4.0	5.3	
St.5	33° 50' 00"N	129° 25' 00"E	107	8/27/2015	9:05	1.89	20.5	0.2	54	30	84	24.3	26.19	33.37	356	1.2	4.1	
				8/27/2015	10:05	2.06	19.5	0.4	68	50	118	16.6	26.19	33.37	311	0.7	3.3	
St.6	33° 50' 00"N	129° 15' 00"E	118	8/28/2015	9:05	2.60	25.0	0.9	31	46	77	32.4	26.41	33.23	318	1.4	4.1	
				8/28/2015	9:50	2.33	22.4	0.6	32	58	90	25.0	26.44	33.22	319	0.7	3.0	
				8/28/2015	10:25	2.32	21.9	0.5	37	40	77	28.2	26.48	33.22	313	1.0	3.5	
				8/28/2015	11:00	2.61	22.4	1.8	87	24	111	20.3	26.54	33.22	285	0.7	3.0	

Table S2. All data on DGM concentrations and Hg fluxes in the surface seawater of the Kuroshio Current of the East China Sea

Station	Location		Water depth	Date	Time	TGM	DGM	Dissolved MeHg	Dissolved Hg	Particulate Hg	Total Hg	%DGM of total	Water temperature	Salinity	Saturation	Hg evasion flux	Wind Speed (U10)
	Latitude	Longitude	(m)		(JST)	(ng m <sup>-3</sup> )	(pg L <sup>-1</sup> )	(pg L <sup>-1</sup> )	(pg L <sup>-1</sup> )	(pg L <sup>-1</sup> )	(pg L <sup>-1</sup> )	(%)	(°C)	(PSU)	(%)	(ng m <sup>-2</sup> h <sup>-1</sup> )	(m s <sup>-1</sup> )
<i>Fall 2015 (R/V Hakuho-Maru, KH-15-3 cruise)</i>																	
AND05	29° 55' 30"N	129° 44' 00"E	350														
AND06	29° 39' 00"N	129° 06' 00"E	827	10/18/2015	2:25	1.83	20.5	0.6	116	57	174	11.8	26.5	34.7	371	3.7	7.6
AND07	30° 07' 30"N	128° 34' 00"E	930	10/18/2015	12:40	1.47	17.4	-	-	-	-	-	25.9	34.4	386	4.2	8.9
AND08	30° 27' 58.8"N	128° 05' 11.4"E	407	10/18/2015	18:00	1.45	15.5	-	-	-	-	-	25.3	34.4	345	2.2	6.9
AND09	30° 54' 16.8"N	127° 35' 35.4"E	127	10/19/2015	0:25	1.25	19.1	0.5	114	38	152	12.5	24.5	34.0	478	1.3	4.3
AND10	31° 54' 16.8"N	126° 47' 48"E	105	10/19/2015	7:00	1.69	17.3	0.9	99	50	148	11.7	22.4	32.8	304	1.5	5.7
AND11	32° 24' 17.4"N	126° 23' 53.4"E	108														
AND12	32° 54' 16.8"N	126° 00' 00"E	106	10/19/2015	14:30	1.23	15.4	0.1	105	73	178	8.6	21.5	31.5	362	2.1	7.0
AND13	32° 43' 25.8"N	124° 49' 58.8"E	67	10/19/2015	21:30	1.28	7.3	0.6	85	133	218	3.4	21.7	31.3	167	0.2	4.1
AND14	32° 13' 25.8"N	125° 13' 55.2"E	59														
AND15	31° 43' 25.8"N	125° 37' 48.6"E	61	10/20/2015	7:25	1.53	20.3	2.2	131	72	203	10.0	21.8	31.0	386	3.7	8.1
AND16	31° 13' 25.8"N	126° 01' 42.6"E	71	10/20/2015	12:45	6.60	16.3	0.9	113	50	163	10.0	22.7	32.2	74	-0.7	5.5
AND17	30° 43' 25.8"N	126° 25' 36.6"E	82														
AND18	30° 13' 25.8"N	126° 49' 30"E	95	10/20/2015	21:30	1.36	15.6	12.5	153	44	197	7.9	24.3	33.5	359	2.3	7.1
AND19	29° 46' 12"N	127° 17' 28.2"E	126	10/21/2015	1:25	1.39	17.3	-0.1	240	27	267	6.5	25.4	34.5	399	3.4	8.0
AND20	29° 23' 00"N	127° 49' 30"E	1038														
AND21	28° 59' 24"N	128° 21' 00"E	1040	10/21/2015	15:40	1.82	15.0	0.9	134	49	183	8.2	25.8	34.7	268	3.4	9.4
AND22	25° 10' 00"N	123° 00' 00"E	1671	10/25/2015	14:35	1.80	18.4	0.9	90	25	116	15.9	25.9	34.8	333	4.3	8.9
AND22	25° 10' 00"N	123° 00' 00"E	1671	10/25/2015	17:45	1.91	18.1	0.1	99	26	125	14.5	26.2	34.7	311	3.7	8.5
AND23	26° 22' 00"N	125° 42' 00"E	1899	10/26/2015	12:05	2.12	16.4	1.7	103	28	131	12.5	26.0	34.8	254	0.9	4.4
AND24	26° 35' 30"N	125° 30' 00"E	1271	10/26/2015	18:50	2.08	16.3	-	-	-	-	-	25.9	34.8	256	0.3	2.1
AND25	26° 49' 00"N	125° 18' 00"E	191	10/26/2015	23:30	1.90	16.0	2.3	82	34	117	13.7	26.2	34.8	276	0.3	2.1
AND26	28° 57' 00"N	126° 04' 36"E	105	10/27/2015	10:35	1.94	23.9	-0.2	93	45	138	17.3	24.4	33.9	386	3.8	7.2
AND27	28° 42' 00"N	126° 26' 54"E	127														
AND28	28° 46' 04.2"N	126° 46' 04.2"E	147	10/27/2015	18:35	2.25	17.6	-	-	-	-	-	26.3	34.8	257	6.1	11.9
AND29	28° 35' 06"N	126° 44' 46.2"E	178														
AND30	28° 28' 13.2"N	126° 50' 01.2"E	219	10/28/2015	6:05	1.86	20.5	0.0	98	24	122	16.7	25.0	34.7	351	6.2	10.4
AND31	28° 17' 54"N	127° 08' 18"E	965	10/28/2015	8:55	1.75	14.1	0.4	105	23	127	11.1	25.7	34.8	262	2.5	8.3
AND32	27° 57' 57.6"N	127° 34' 36"E	1315														
AND35	30° 21' 40.2"N	129° 22' 58.2"E	576	10/30/2015	16:40	1.60	20.8	-0.1	95	25	120	17.3	25.3	34.7	417	7.4	10.9
AND36	30° 55' 48"N	128° 49' 13.2"E	690	10/30/2015	22:55	1.77	22.4	1.9	83	29	113	19.8	26.0	34.5	414	6.3	9.5

*Table S3. All data on DGM concentrations and Hg fluxes in the surface seawater of the Pacific Ocean*

Station	Location		Water depth	Date	Time	TGM	DGM	Dissolved MeHg	Dissolved Hg	Particulate Hg	Total Hg	%DGM of total	Water temperature	Salinity	Saturation	Hg evasion flux	Wind speed (U10)
	Latitude	Longitude	(m)		(JST)	(ng m <sup>-3</sup> )	(pg L <sup>-1</sup> )	(pg L <sup>-1</sup> )	(pg L <sup>-1</sup> )	(pg L <sup>-1</sup> )	(pg L <sup>-1</sup> )	(%)	(°C)	(PSU)	(%)	(ng m <sup>-2</sup> h <sup>-1</sup> )	(m s <sup>-1</sup> )
<i>Fall 2015 (R/V Hakuho-Maru, KH-15-3 cruise)</i>																	
AND01	32° 41' 30"N	138° 34' 00"E	3034	10/15/2015	5:40	1.23	22.2	-	-	-	-	-	22.8	33.8	541	4.3	7.8
AND02	31° 07' 30"N	138° 41' 15"E	3296	10/15/2015	14:50	1.62	32.9	-	-	-	-	-	26.0	-	665	2.5	4.3
AND03	30° 54' 25"N	133° 11' 29.4"E	4483	10/16/2015	12:50	1.40	21.1	0.1	164	51	215	9.8	26.2	34.8	496	9.8	12.0
AND04	31° 30' 00"N	132° 12' 40.8"E	2261	10/17/2015	0:00	1.25	19.7	0.4	142	43	184	10.7	25.6	34.7	510	3.2	6.9
AND33	29° 00' 7.2"N	131° 14' 56.4"E	3998	10/29/2015	17:10	1.96	18.6	0.7	92	35	127	14.7	25.5	34.7	306	1.2	4.5
AND34	29° 21' 58.2"N	130° 45' 15"E	2987	10/30/2015	7:25	1.80	21.7	0.8	76	29	104	20.8	25.2	34.8	386	1.8	5.0

*Table S4. All data on DGM concentrations and Hg fluxes in the surface seawater of offshore Kume Island*

Station	Location		Water depth	Date	Time	TGM	DGM	Dissolved MeHg	Dissolved Hg	Particulate Hg	Total Hg	%DGM	Water temperature	Salinity	Saturation	Hg evasion flux	Wind speed (U10)
	Latitude	Longitude	(m)		(JST)	(ng m <sup>-3</sup> )	(pg L <sup>-1</sup> )	(pg L <sup>-1</sup> )	(pg L <sup>-1</sup> )	(pg L <sup>-1</sup> )	(pg L <sup>-1</sup> )	(%)	(°C)	(PSU)	(%)	(ng m <sup>-2</sup> h <sup>-1</sup> )	(m s <sup>-1</sup> )
<i>Summer 2016</i>																	
St.A	26° 30' 00"N	127° 00' 00"E	1800	8/3/2016	10:15	1.38	33.0	0.1	138	81	219	15.1	31.02	34.91	897	0.5	1.5
					11:12	1.77	43.9	0.0	188	64	252	17.5	31.21	34.89	931	0.7	1.5
St.B	26° 30' 00"N	126° 30' 00"E	1750	8/2/2016	11:25	1.51	42.5	-	-	-	-	-	30.95	35.13	1050	0.7	1.5
					12:50	2.52	44.0	0.9	111	45	156	28.1	31.31	35.11	656	1.1	2.0
					14:25	2.27	33.2	0.0	127	55	182	18.2	31.63	35.11	555	0.8	2.0
					15:45	1.70	34.6	0.3	124	80	205	16.9	31.54	35.10	770	1.2	2.5
St.C	26° 30' 00"N	126° 00' 00"E	1900	8/4/2016	11:35	2.73	27.1	0.4	112	50	162	16.7	31.06	34.88	371	1.8	4.1
					12:25	1.35	26.9	0.6	97	55	152	17.7	31.23	34.90	748	2.0	3.9
					13:20	1.49	25.8	0.2	78	98	177	14.6	31.19	34.88	649	3.1	5.2
St.D	26° 30' 00"N	125° 30' 00"E	1140	8/5/2016	11:10	3.77	42.6	0.2	148	94	242	17.6	29.43	34.28	405	4.9	5.5
					12:05	1.43	38.9	0.1	137	77	215	18.1	29.45	34.35	976	5.0	5.4
					12:52	1.48	35.4	0.0	123	64	187	18.9	29.47	34.38	859	4.0	5.1
					13:50	1.50	30.8	0.2	120	63	184	16.7	29.57	34.43	737	5.5	6.6

Table S5. Estimation of the Hg emission amount ( $t\ yr^{-1}$ ) from the sea surface of the entire East China Sea including the Yellow Sea

Sea area	Seasons	Mercury flux ( $ng\ m^{-2}\ h^{-1}$ )			Sea area ( $\times 10^4\ km^2$ )	Duration (days)	Hg emission (t)			Hg emission ( $t\ yr^{-1}$ )		
		Average	$\pm$	SD			Average	$\pm$	SD	Average	$\pm$	SD
Yellow Sea (open sea)	<i>Summer</i>	18.3	$\pm$	11.8	46.6	91	<b>18.6</b>	$\pm$	<b>12.0</b>	<b>24.9</b>	$\pm$	<b>12.8</b>
	<i>Spring</i>	1.06	$\pm$	0.86	46.6	91	<b>1.1</b>	$\pm$	<b>0.9</b>			
	<i>Fall</i>	2.53	$\pm$	2.12	46.6	182	<b>5.1</b>	$\pm$	<b>4.3</b>			
Continental shelf in the ECS	<i>Summer</i>	4.4	$\pm$	3.4	55.0	182	<b>10.6</b>	$\pm$	<b>8.2</b>	<b>19.2</b>	$\pm$	<b>10.6</b>
	<i>Fall</i>	3.6	$\pm$	2.8	55.0	182	<b>8.6</b>	$\pm$	<b>6.7</b>			
Kuroshio current in the ECS	<i>Fall</i>	3.0	$\pm$	2.2	22.0	182	<b>2.9</b>	$\pm$	<b>2.1</b>	<b>5.2</b>	$\pm$	<b>2.7</b>
Offshore Kume Island	<i>Summer</i>	2.4	$\pm$	1.8	22.0	182	<b>2.3</b>	$\pm$	<b>1.7</b>			
Total										<b>49</b>	$\pm$	<b>17</b>