

Supporting information

Experimental conditions of Solid phase extraction (SPE) treatment

The pH, sample volume, and sample flow rate during the SPE procedure were examined. Figure S1 shows the Pb recovery at pH values of 2, 4, 6, and 8 under conditions of a sample volume of 30 mL, a flow rate of 5 mL min⁻¹, and a Pb concentration of 1 µg L⁻¹. The recoveries at pH 4 and 6 were 97.6% and 93.1%, respectively. Based on these results, the pH was set to 5.5 in this study. Figure S2 shows the Pb recovery for sample volumes ranging from 50 to 3000 mL under conditions of pH 5.5, a Pb concentration of 1 µg L⁻¹, and a flow rate of 10 mL min⁻¹. Recovery rates ranged from 94.3% to 104% for sample volumes up to 2000 mL. Accordingly, the maximum sample volume was set at 2000 mL in this study. Figure S3 shows the Pb recovery at flow rates ranging from 3 to 13 mL min⁻¹ under conditions of pH 5.5, a sample volume of 250 mL, and a Pb concentration of 0.5 µg L⁻¹. Recoveries were 90% or higher at flow rates of 10 mL min⁻¹ or less. Based on these results, the sample flow rate was set at 5 mL min⁻¹ in this study.

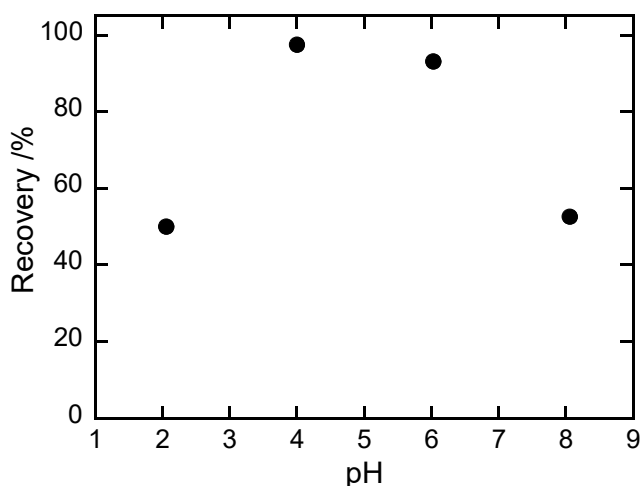


Figure S1 The recovery of Pb for the SPE procedure at pH 2, 4, 6, and 8.

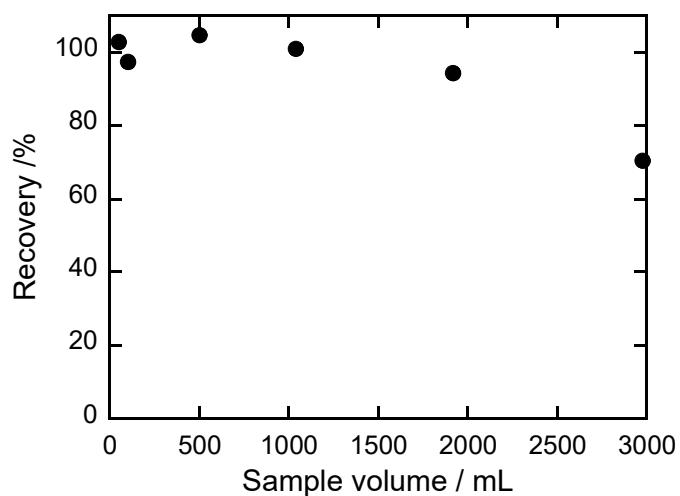


Figure S2 The recovery of Pb for the SPE procedure for sample volumes ranging from 50 to 3000 mL.

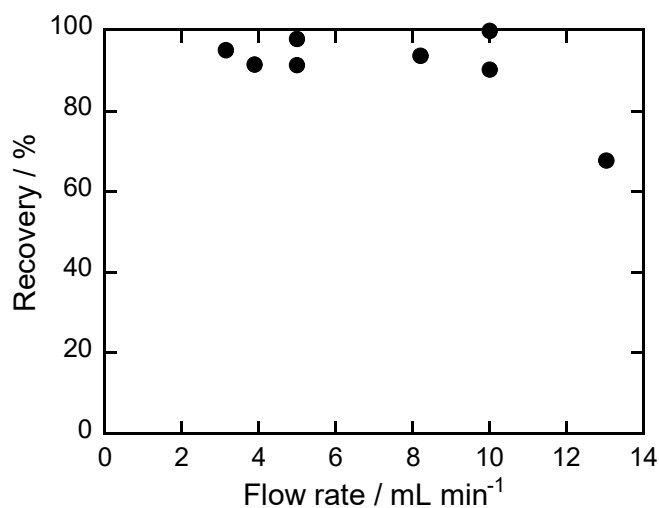


Figure S3 The recovery of Pb for the SPE procedure at flow rates of 3 to 13 ml/min.

Removal of Tl in snow samples by SPE treatment

The effectiveness of SPE treatment in removing Tl was confirmed using snow samples collected in 2017. Tl concentrations in samples collected from Stations 1, 2, 5, 6, 8, and an additional site near Station 8 ranged from 0.0010 to 0.0240 $\mu\text{g L}^{-1}$. On average, $96.3 \pm 1.5\%$ of Tl was removed from the snow samples following SPE treatment.

Table S1 Initial concentration of Tl in snow samples collected in 2017.

No.	Date	Location	Tl / $\mu\text{g L}^{-1}$	Tl removal / %
1	2017, Jan. 15	st. 6	0.0010	94.8
2	2017, Jan. 24	st. 1	0.0157	95.7
3	2017, Jan. 24	st. 6	0.0157	96.7

4	2017, Feb. 9	st. 1	0.0052	97.1
5	2017, Feb. 9	st. 8	0.0073	93.2
6	2017, Feb. 9	near st. 8	0.0052	96.1
7	2017, Feb. 10	st. 6	0.0062	97.8
8	2017, Feb. 11	st. 1	0.0209	97.4
9	2017, Feb. 11	st. 8	0.0177	97.8
10	2017, Feb. 11	near st. 8	0.0230	98.1
11	2017, Feb. 14	st. 5	0.0240	95.0

Tl removal corresponds to the fraction of Tl removed by the SPE treatment.

Samples No. 6 and 10 were collected from Shiozuka Kogen, located 8 km north of Station 8.

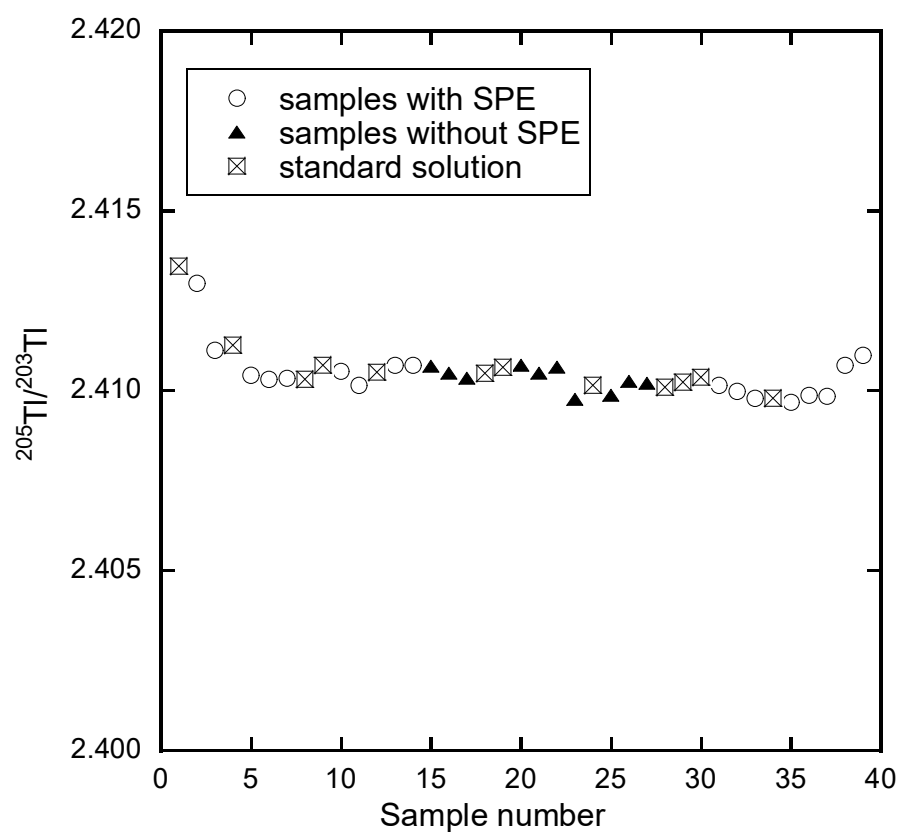


Figure S4 $^{205}\text{Tl}/^{203}\text{Tl}$ ratio of standard solution and samples with and without SPE treatment.

Sample numbers indicate the measurement order. Samples numbered 1–29 and 30–39 were measured on different days.