Electronic Supplementary Information

PCBs and PBDEs in environmental samples from King George Island and Ardley Island, Antarctica

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Materials and methods

1. *Sampling and shipment*

The sampling sites are situated in the Fildes Peninsula at King George Island, west Antarctic, where many international research stations are located including the Chinese Great Wall station, and Ardley Island which is an important settlement for the penguins and migrating birds. During the 26th Chinese Antarctic Expedition in the austral summer between December 2009 and January 2010, twenty-five samples including seven natural soils, three dropping-amended soils, one sediment, six lichens and eight mosses were collected from nine sampling sites that could be reached by our research staff in this area. During the sampling period, the air temperature is around 0 ^{o}C in the Fildes Peninsula and Ardley Island. The soil samples were collected using a stainless steel spade and combined to form a composite sample for the site; the moss and lichen samples were mainly scratched off from rock and ground surfaces; the sediment was obtained using a grab from Great Wall Bay close to the Chinese Great Wall Station. All the samples were stored at -20 ^{o}C in the fridge in Chinese Great Wall Station. The sediment was air-dried for several days before the shipment. The samples were sealed in clean plastic bags and packed in a case. After being transported to Chile airport, they were transferred by DHL express to our laboratory in Beijing, China, and then stored at -20 ^{o}C. The shipment was finished within 2 weeks. After customs declaration, the package and each sample were checked, and no taint or spoilage was observed for all the samples including the sediment.

2. *Sample extraction and cleanup*

For soil and sediment samples, the extraction was performed on Accelerated Solvent Extraction (ASE300, Dionex, USA), and the conditions were as follows: the solvent is DCM: n-hexane (1:1, v:v) (100 mL), the temperature was 150 ^{o}C and

pressure was 1500 psi (10.3 MPa) with 7 min for heating and 8 min in the static state. After solvent exchange with DCM and concentrated to 5 mL, the extracts were fractioned using auto-gel permeation chromatography (GPC, AccuPrep^{TM}, J_2-Scientific; Bio-Beads S-X3 with DCM as the mobile phase) to remove humic substance and sulfur. Then they were loaded to multilayer silica columns packed from the bottom up with 1 g silica gel, 4 g basic silica gel, 1 g silica gel, 8 g acid silica gel, 2 g silica gel and 2 cm anhydrous sodium sulfate, and eluted with 100 mL n-hexane.

For lichen and moss samples, different from the above extraction and cleanup procedures, 3.0 g lichen or moss samples were weighed and the ASE temperature was selected as 100 ^{o}C. The extracts were evaporated to dryness for lipid determination, and then dissolved into 50 mL n-hexane. After about 10 g acidic silica was added to remove lipids, the solution was filtered by a column packed with anhydrous sodium sulfate. The filtrate was thereafter concentrated and loaded to a multilayer silica column as previously described, and thereafter through a basic alumina column (6 g basic alumina, 1 cm anhydrous sodium sulfate from the bottom up, eluted with 40 mL *n*-hexane/DCM (1:1, v:v)) and carbon column (1.5 g carbon mixture, 2 cm anhydrous sodium sulfate from the bottom up, eluted with 50 mL *n*-hexane) for further treatment.

All the eluates were finally concentrated into 20 μL nonane and then spiked with recovery standard (68A-IS) for the instrumental analysis.

Fig. S1. Relative distribution of PCBs in soil and sediment samples.

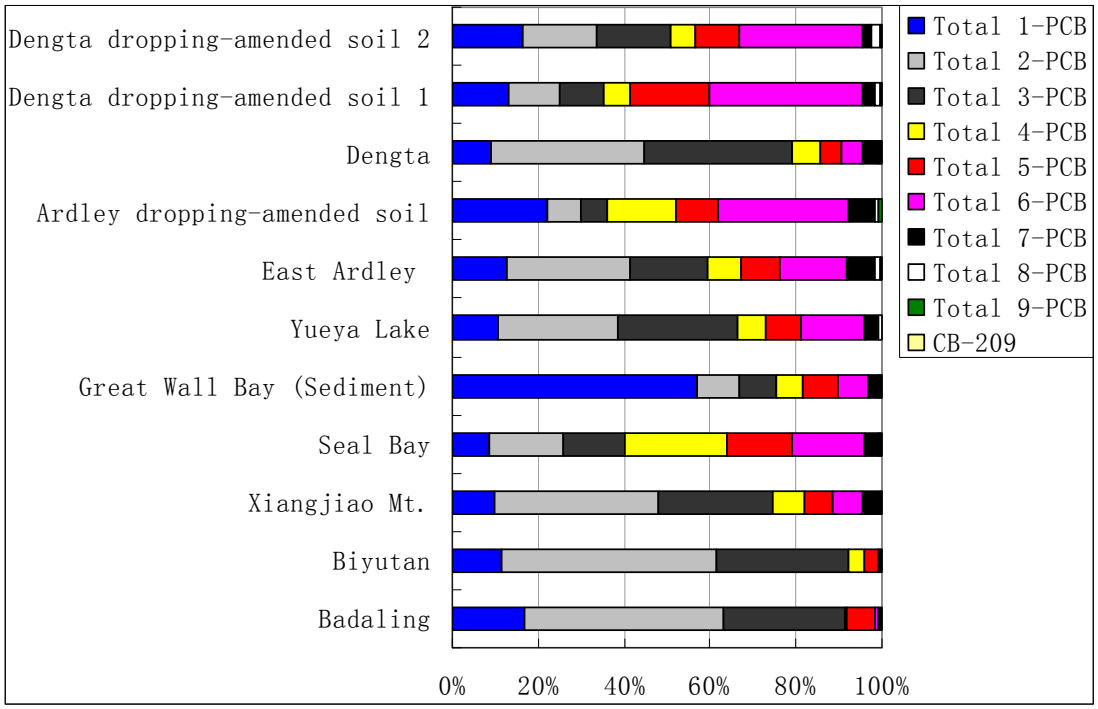
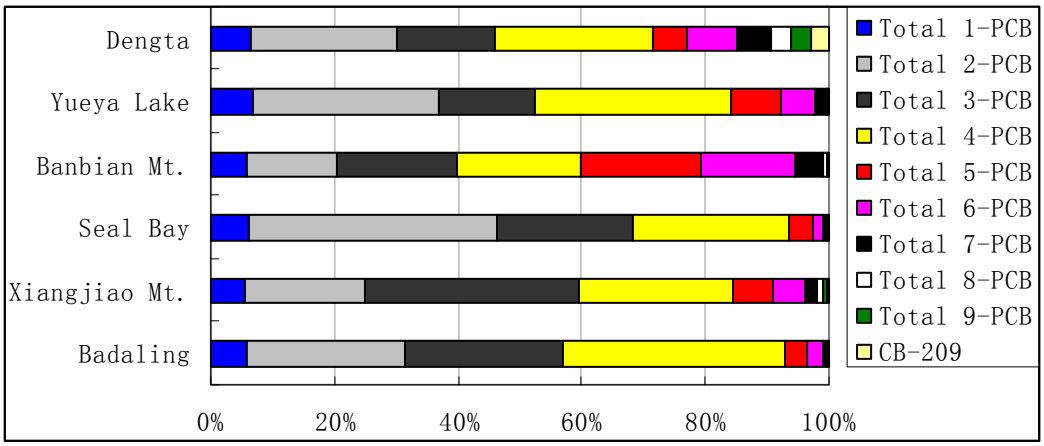
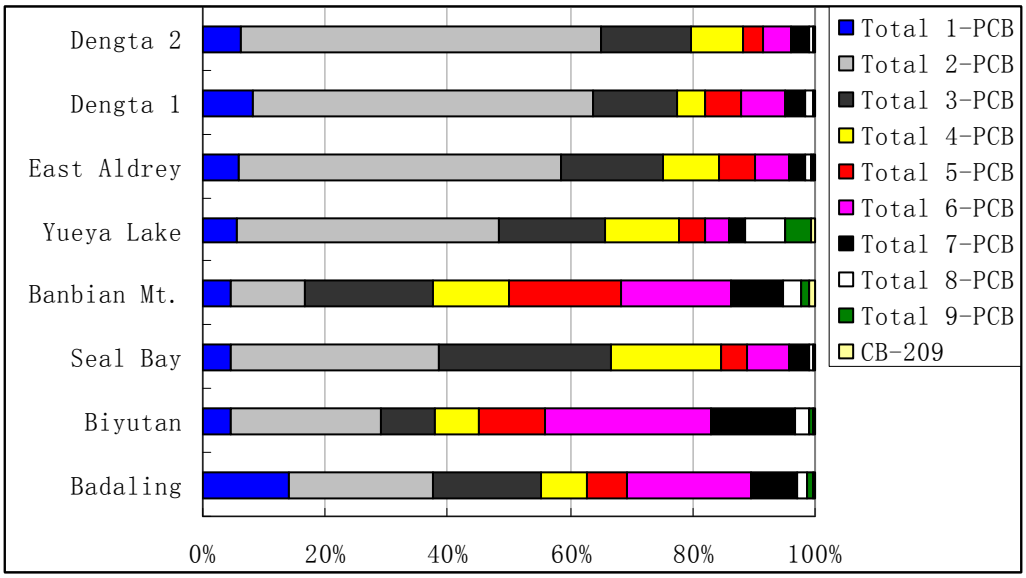


Fig. S2. Relative distribution of PCBs in lichen samples.



70 **Fig. S3. Relative distribution of PCBs in moss samples.**



71

Table S1. Average concentrations of PCB and PBDE congeners (ranges) in each sample type.

Compound	Soil (pg g^{-1}dw)	Sediment (pg g^{-1}dw)	Lichen (pg g^{-1}dw)	Moss (pg g^{-1}dw)
CB-11	41.7 (19.2-67.9)	5.10	95.4 (45.7-171)	131 (27.5-258)
CB-209	0.60 (n.d.*-2.30)	0.17	3.22 (0.11-16.2)	2.23 (n.d.-5.68)
Dioxin-like PCBs				
CB-77	2.31 (0.04-11.1)	0.42	2.19 (0.79-6.25)	1.36 (0.39-1.80)
CB-81	0.12 (n.d.-0.24)	0.03	0.42 (n.d.-0.75)	0.56 (n.d.-0.71)
CB-105	3.84 (0.04-17.4)	1.13	4.02 (0.97-14.2)	3.17 (1.67-5.87)
CB-114	0.27 (0.02-1.05)	0.05	0.60 (0.18-1.30)	0.26 (0.14-0.41)
CB-123	0.30 (0.02-0.90)	0.07	0.30 (n.d.-0.54)	0.21 (0.12-0.31)
CB-126	0.96 (0.03-2.51)	0.16	1.15 (0.18-2.82)	0.59 (0.26-0.91)
CB-156	2.12 (0.10-8.03)	0.46	2.23 (0.54-4.79)	2.33 (0.93-4.08)
CB-157	0.85 (0.03-2.76)	0.14	0.54 (0.15-1.24)	0.75 (0.27-1.27)
CB-167	1.39 (0.05-4.92)	0.21	0.98 (0.24-2.08)	1.36 (0.34-2.16)
CB-169	1.52 (0.07-3.39)	0.09	0.43 (0.17-0.86)	0.57 (0.31-1.33)
CB-189	0.28 (0.02-1.00)	0.09	0.68 (n.d.-2.01)	0.53 (0.28-0.87)
Indicator PCBs				
CB-28	25.2 (5.87-78.9)	2.39	50.9 (24.1-76.9)	48.6 (14.3-108)
CB-52	3.67 (0.44-11.5)	1.11	4.05 (1.82-5.72)	3.92 (0.59-6.86)
CB-101	6.64 (0.86-22.5)	2.16	4.82 (3.03-11.2)	5.74 (4.16-8.82)
CB-118	12.0 (0.11-49.1)	2.81	10.9 (2.77-35.5)	9.88 (3.80-19.4)
CB-138	46.5 (n.d.-174)	3.87	9.29 (1.94-28.1)	17.8 (10.2-31.8)
CB-153	36.3 (n.d.-143)	4.51	13.4 (3.93-30.3)	27.7 (8.83-59.5)
CB-180	10.2 (0.19-62.5)	1.93	7.26 (1.90-18.2)	20.4 (12.8-40.7)
PBDEs				
BDE-17	1.00 (0.03-5.16)	0.03	0.68 (0.40-0.99)	1.10 (n.d.-2.11)
BDE-28	3.26 (0.17-15.8)	0.17	1.76 (1.10-2.27)	3.63 (0.87-6.44)
BDE-47	3.84 (1.39-7.37)	1.39	3.93 (2.58-6.48)	4.65 (3.25-6.54)
BDE-66	3.11 (n.d.-8.04)	n.d.	0.52 (n.d.-1.12)	1.18 (n.d.-2.29)
BDE-71	7.25 (n.d.-17.1)	n.d.	1.05 (0.33-2.01)	1.93 (0.45-5.28)
BDE-85	1.64 (n.d.-4.07)	n.d.	0.40 (n.d.-0.64)	1.77 (n.d.-2.06)
BDE-99	5.84 (n.d.-13.8)	1.11	2.99 (1.40-4.75)	3.87 (n.d.-6.26)
BDE-100	0.43 (n.d.-0.74)	n.d.	0.62 (n.d.-0.86)	2.05 (n.d.-2.26)
BDE-138	1.46 (n.d.-3.79)	n.d.	n.d.	n.d.
BDE-153	1.07 (n.d.-2.31)	0.48	1.91 (n.d.-3.77)	2.95 (n.d.-6.78)
BDE-154	n.d.	n.d.	n.d.	n.d.
BDE-183	n.d.	n.d.	2.18 (n.d.-3.59)	n.d.
BDE-209	n.d.	n.d.	n.d.	n.d.

*n.d., not detected.

Table S2. Pearson correlation coefficients between the concentrations and TOC in the soil and sediment.

Compound	log(POPs) vs. log(TOC)	Compound	log(POPs) vs. log(TOC)
	Pearson coefficient		Pearson coefficient
CB77	0.889**	CB118	0.862**
CB81	0.779*	CB138	0.766**
CB105	0.758**	CB153	0.670*
CB114	0.759**	CB180	0.763**
CB123	0.891**	CB209	0.727*
CB126	0.893**	BDE17	0.689*
CB156	0.917**	BDE28	0.770**
CB157	0.866**	BDE47	0.697*
CB167	0.907**	BDE66	0.830**
CB169	0.564	BDE71	0.844**
CB189	0.872**	BDE85	0.435
CB11	0.562	BDE99	0.415
CB28	0.711*	BDE100	0.894*
CB52	0.642*	BDE138	-0.082
CB101	0.695*	BDE153	0.899**

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).