Supporting Information for:

Long-range transport of pollutants to the Falkland Islands and Antarctica: Evidence from lake sediment fly-ash particle records

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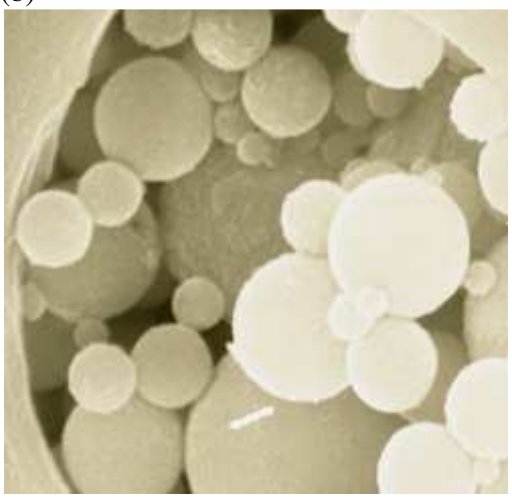
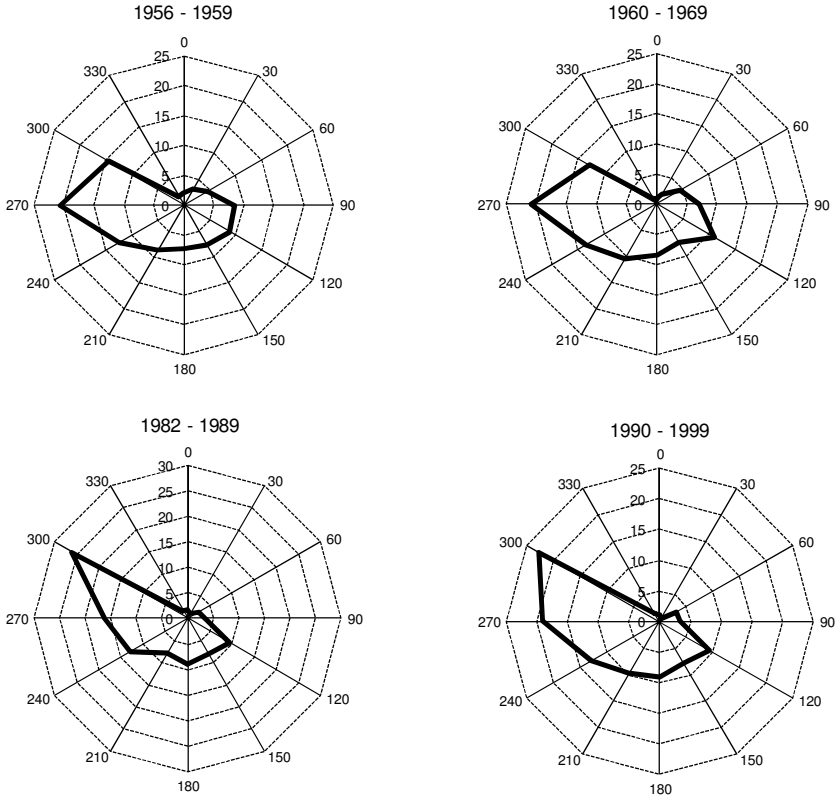
S1. Scanning electron micrographs of (a) spheroidal carbonaceous particle and (b) inorganic ash spheres (diameter of largest particles: c. 4µm) (Micrographs: Neil Rose).

(a)

(b)



S2. Mean daily wind direction data for Signy Island 1956 – 1999. Covering the period from the start of meteorological observations at the British Antarctic Survey base to the date of core retrieval. Data between 1969 and 1982 are unavailable. Data from British Antarctic Survey.



S3. Location and morphological characteristics of the study lakes

	Latitude	Longitude	Altitude (m a.s.l.)	Lake area (ha)	Maximum depth (m)
Signy Island					
Sombre Lake	60° 41’13 S	45° 36’53’’ W	5	2.1	10.8
Heywood Lake	60° 41’24’’ S	45° 36’30 W	5	4.1	6.0
Tranquil Lake	60° 42’15’’ S	45° 38’45’’ W	30	4.0	8.5
Falkland Islands					
Mt. Adam Tarn	51° 34’01’’ S	60° 03’56’’ W	620	6.3	16
Lake Sulivan	51° 52’02’’ S	60° 10’10’’ W	23	500	2.3
Larsemann Hills					
Heart Lake	69º 22’33’’S	76° 22’58’’ E	5	5	4.5

S4. Table of coring details

Core	Date	Depth (m)	Corer type	Extrusion	Storage
HEY1	25 Nov 91	4.0	Gravity	0.2cm to 10cm then 0.5cm to base	4°C
HEY2	25 Nov 91	3.9	Piston	0.5cm	4°C
SOMB2	4 Dec 91	10.4	Piston	0.5cm to 30cm then 1cm to base	4°C
SOMB5	4 Dec 91	10.8	Gravity	1cm intervals	4°C
TRAN1	29 Nov 91	8.5	Gravity	1cm intervals	4°C
FILP1	3 Mar 01	14.0	Gravity	0.2cm to 20cm; 0.5cm to 30cm; 1cm to base	4°C
FILE2	27 Feb 01	2.0	Gravity	1cm	4°C
LH68	21 Nov 97	4.5	Gravity	1cm	Frozen

S5. Chronologies of Falkland Island lake sediment cores (Peter Appleby).

Methods of radiometric analysis are as described in the main paper.

Adam Tarn

Figure S5i plots ^{210}Pb dates in core FILP1 calculated using the CRS and CIC model, together with the 1964/5 depth indicated by the ^{137}Cs record. The ^{210}Pb dates place 1964/5 at depths 2.1 cm (CRS model) and 2.45 cm (CIC model), significantly below the ^{137}Cs peak. It is unlikely that the discrepancy between the ^{210}Pb and ^{137}Cs dates is due to a loss of sediment from the top of the core, and so the most likely cause is a small degree of sediment mixing. The effect of this is relatively greater in cores with very low accumulation rates. In the deeper sections of the core the ^{210}Pb results suggest a uniform sedimentation rate of 0.0045 ± 0.0006 g cm^{-2} y^{-1}. Applying this rate to the upper sections of FILP1 places 1964/5 at a depth of 1.5 cm. Figures S5i and S5ii plot corrected ^{210}Pb dates using this value.

Lake Sulivan

Figure S5iii plots ^{210}Pb dates for FILE 2calculated using the CRS and CIC models, together with the 1964/5 depth indicated by the ^{137}Cs record. The ^{210}Pb dates place 1964/5 at depths 2.1 cm (CRS model) and 2.45 cm (CIC model). The ^{210}Pb dates are in relatively good agreement with each other, and with the ^{137}Cs record, placing 1964/5 at a depth of between 19-20 cm. They suggest a mean sedimentation rate of 0.027 ± 0.006 g cm^{-2} y^{-1}. Figure S5ii plots dates calculated using this value.

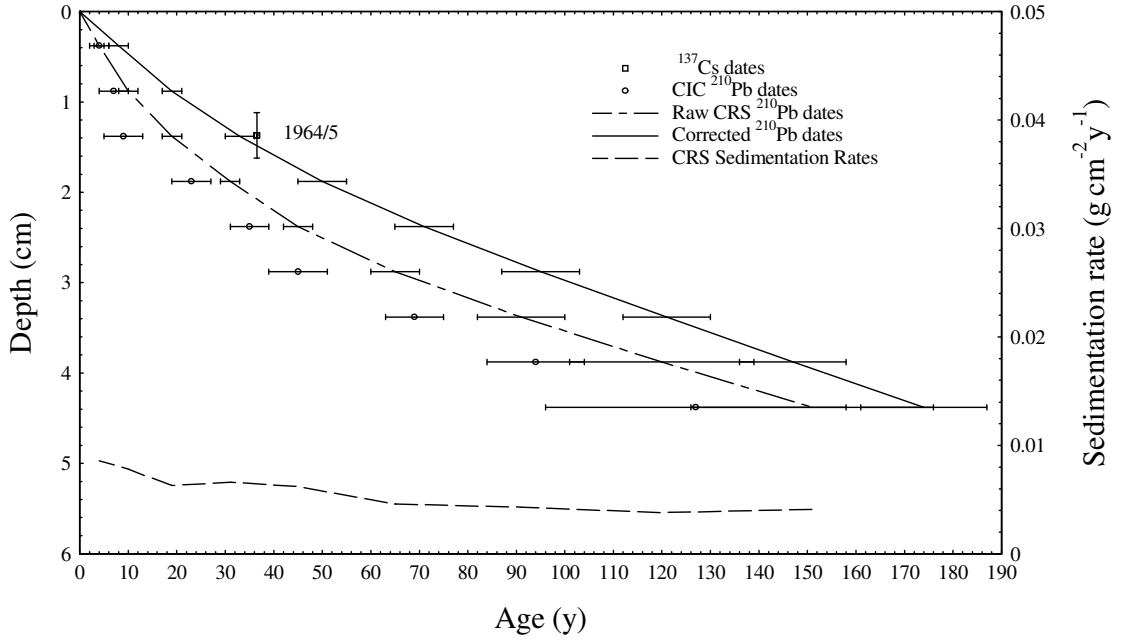


Figure S5i. Radiometric chronology of Adam Tarn core FILP1, showing CRS and CIC model ^{210}Pb dates, the 1963 depth determined from the ^{137}Cs stratigraphy, and the corrected ^{210}Pb dates.

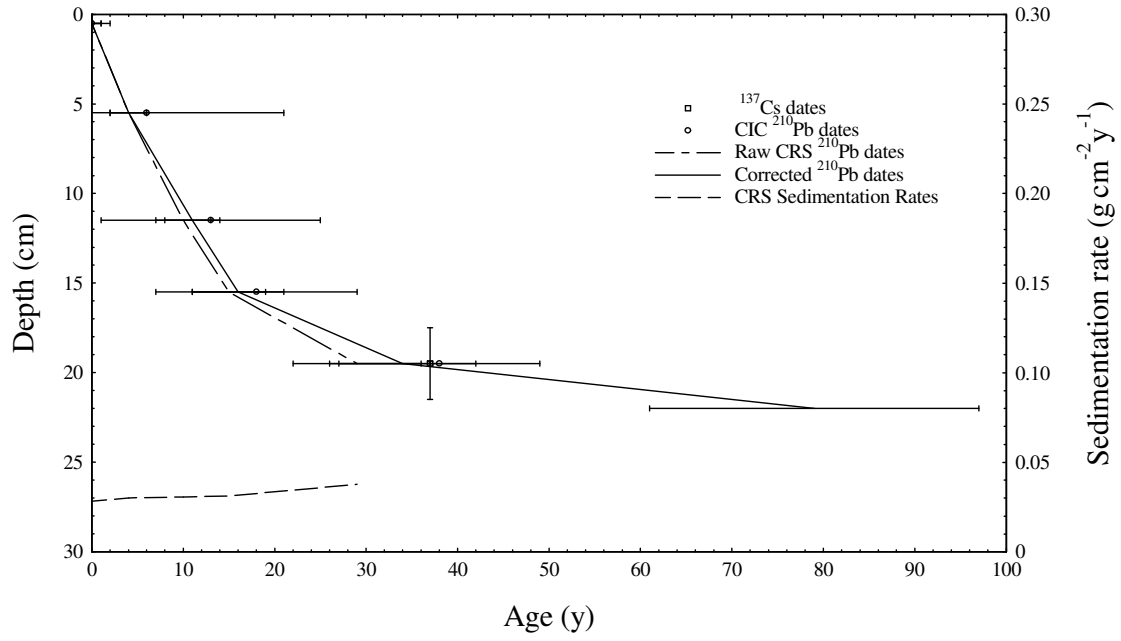
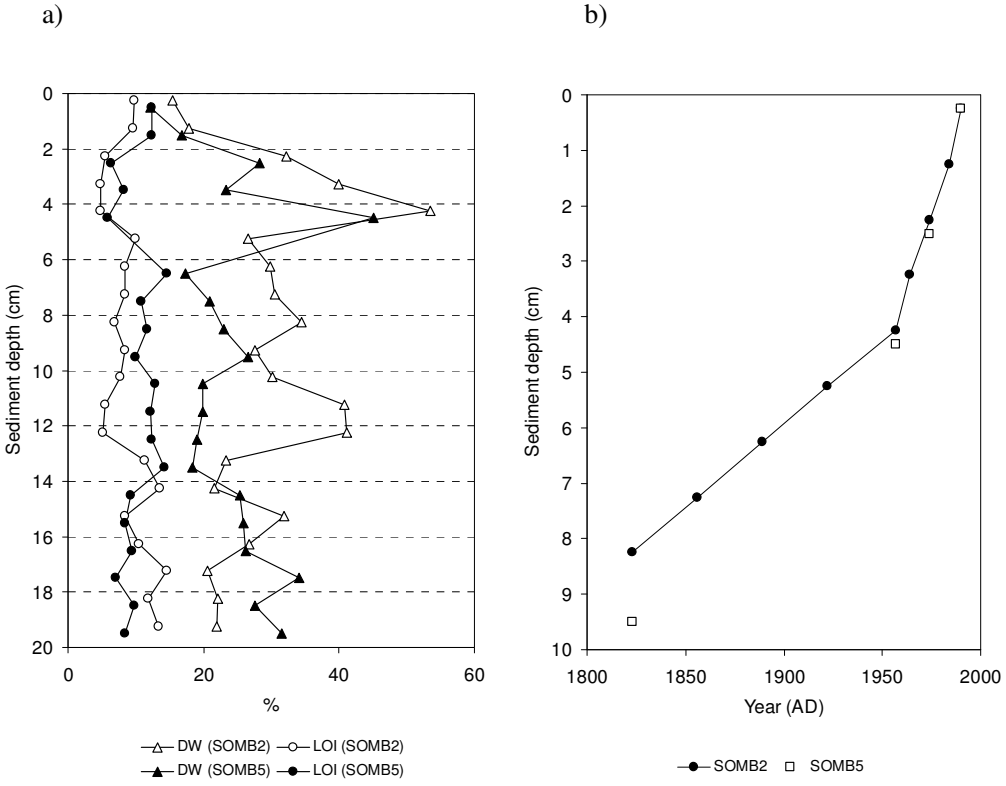


Figure S5ii. Radiometric chronology of Lake Sulivan core FILE2, showing CRS and CIC model ^{210}Pb dates, the 1964/5 depth determined from the ^{137}Cs stratigraphy, and the corrected ^{210}Pb dates.

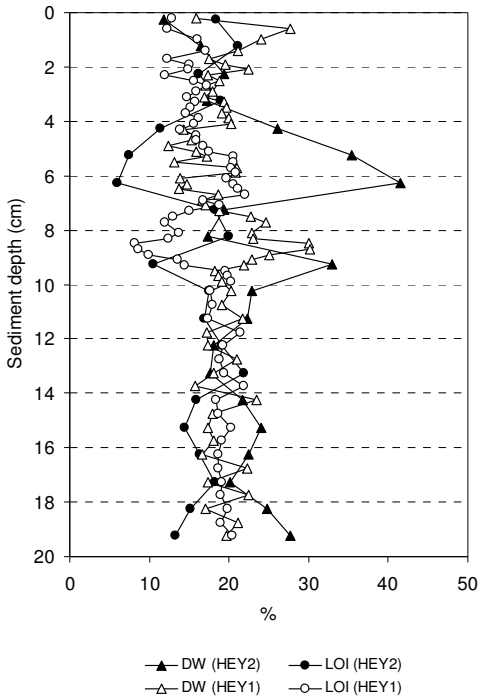
S6. Cross-correlation of cores for Sombre Lake and Heywood Lake (Signy Island)

Sombre Lake: (a) Correlation between SOMB2 (^{210}Pb dated) and SOMB5 (undated) using lithostratigraphic data and (b) depth age profiles for the correlated cores.

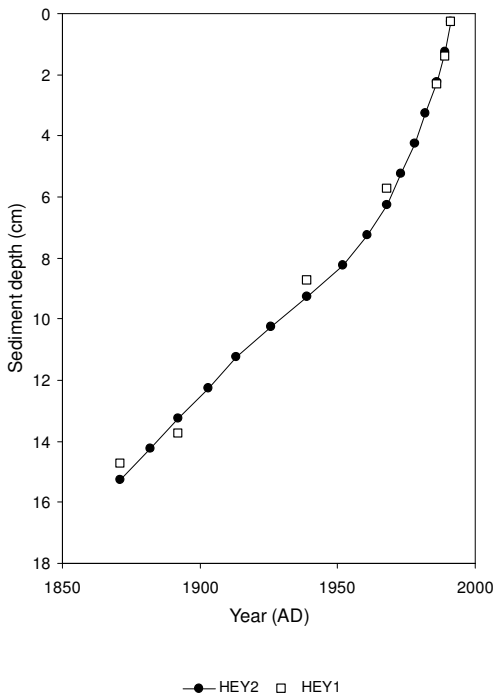


Heywood Lake: (a) Correlation between HEY2 (^{210}Pb dated) and HEY1 (undated) using lithostratigraphic data and (b) depth age profiles for the correlated cores.

a)



b)



S7. Depth-age profiles for the lake sediment cores used in this study derived from ^{210}Pb chronologies. LH68 refers to the core from Heart Lake in the Larsemann Hills; FILP1 is from Mt Adam Tarn and FILE2, Lake Sulivan, on the Falkland Islands; HEY1, SOMB5 and TRAN1 are from Heywood Lake, Sombre Lake and Tranquil Lake respectively, on Signy Island.