Supplement of:

Aeolian dust and diatoms at Roosevelt Island (Ross Sea, Antarctica) over the last two millennia reveal the local expression of climate changes and the history of the Ross Sea polynya.

Serena Lagorio et al.

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Lagorio et al_2024_Supplemental Figures_and_Tables.docx

FIGURE S1

Mean dust fluxes at different East Antarctic sites calculated over the entire Holocene (from Delmonte et al., 2020 and references therein), compared to RICE. The altitude of each drilling site is also reported. The Late Holocene dust fluxes for RICE (this work) and WAIS (Koffman et al., 2014) are also reported.

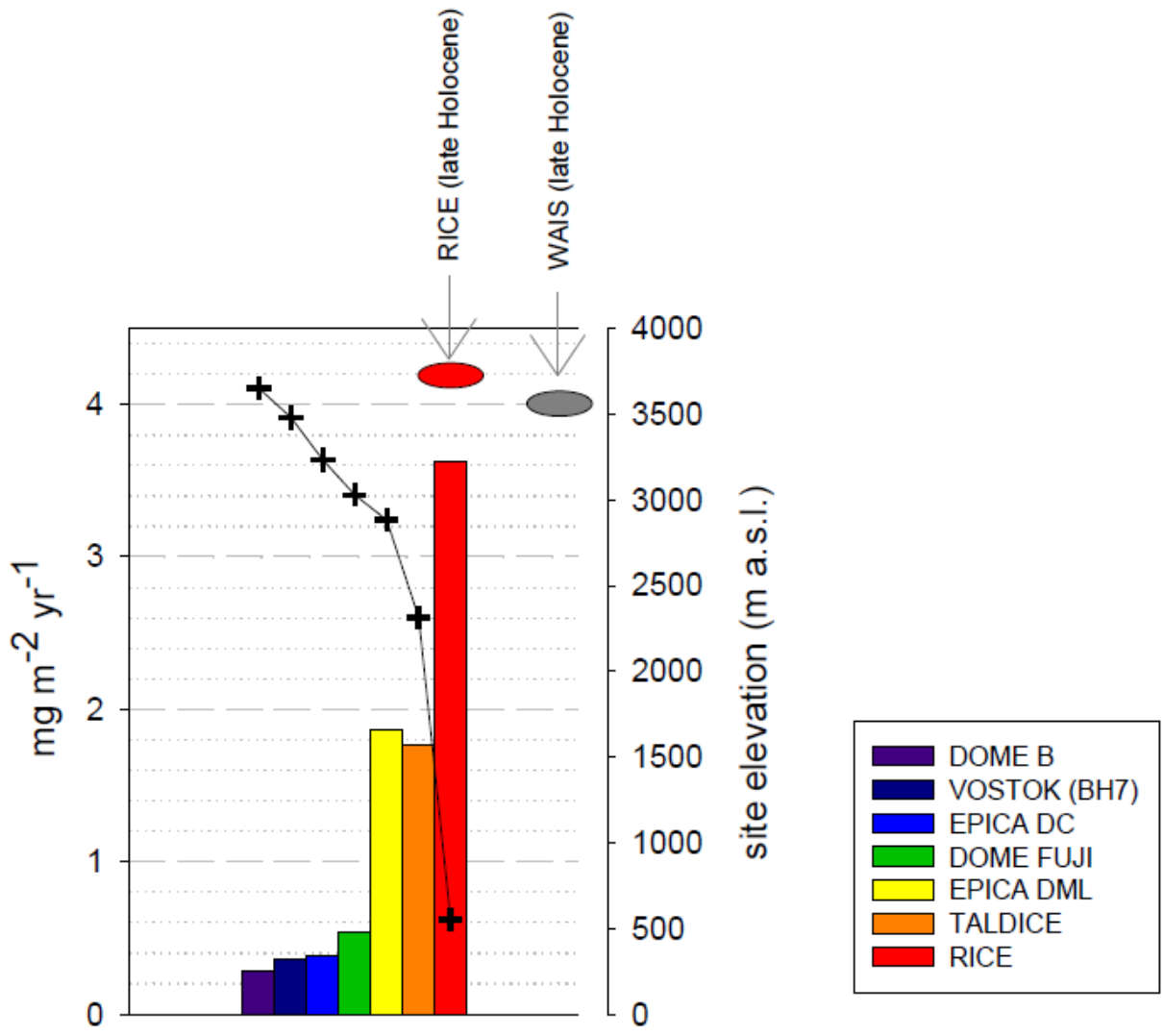


FIGURE S2

Fine Particle Percent (FPP, %) vs Coarse Particle Percent (CPP, %) calculated according to Delmonte et al., (2005) for East Antarctic plateau sites (Dome B, Dome C) and for RICE. Small 'x' symbols correspond to Holocene data from Dome B (pink) and Dome C (red) while large 'X' symbols correspond to data for the same sites but from the last 2700 years. Similarly, open and filled circles represent RICE data for the Holocene and the last 2000 years, respectively.

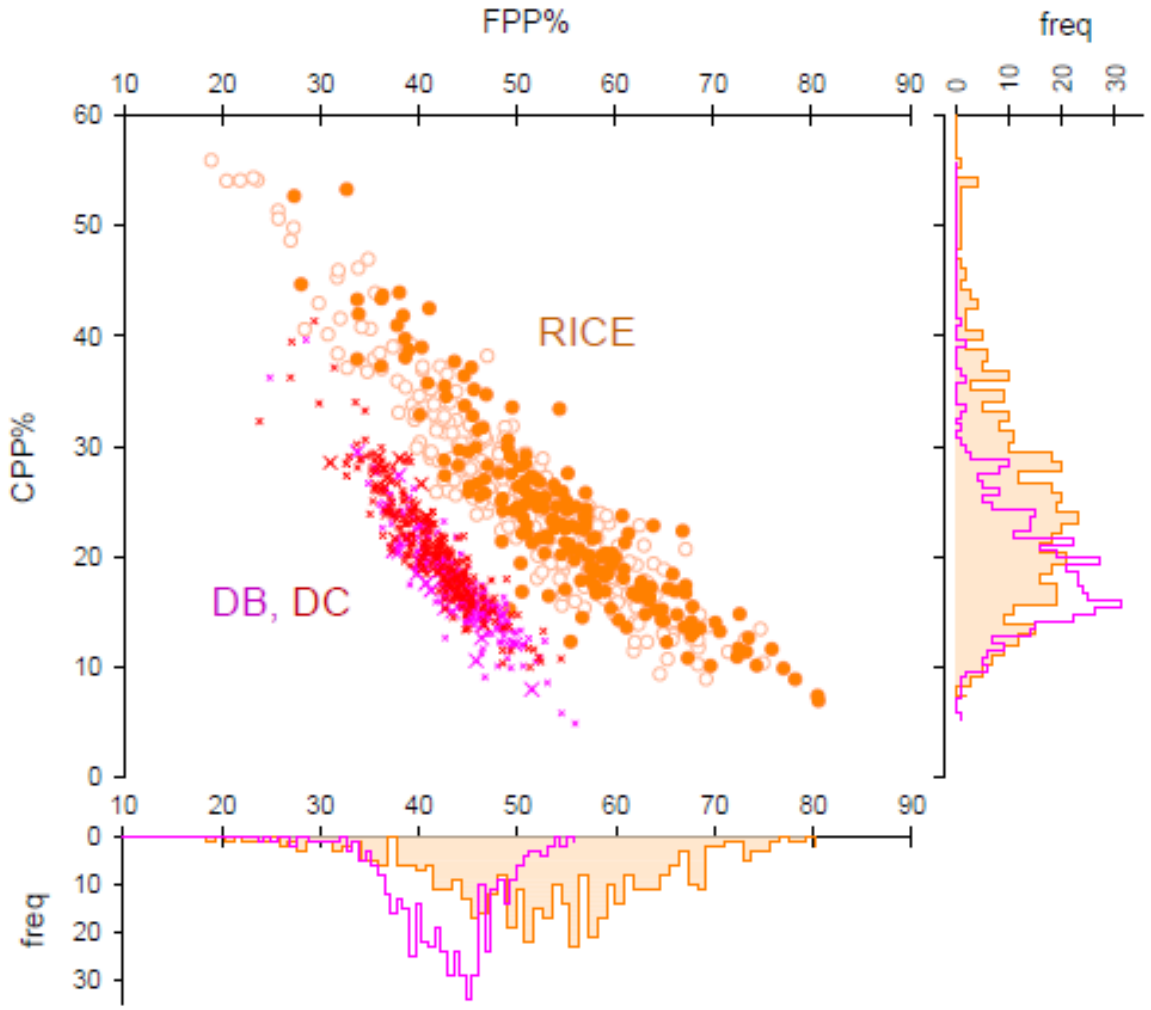
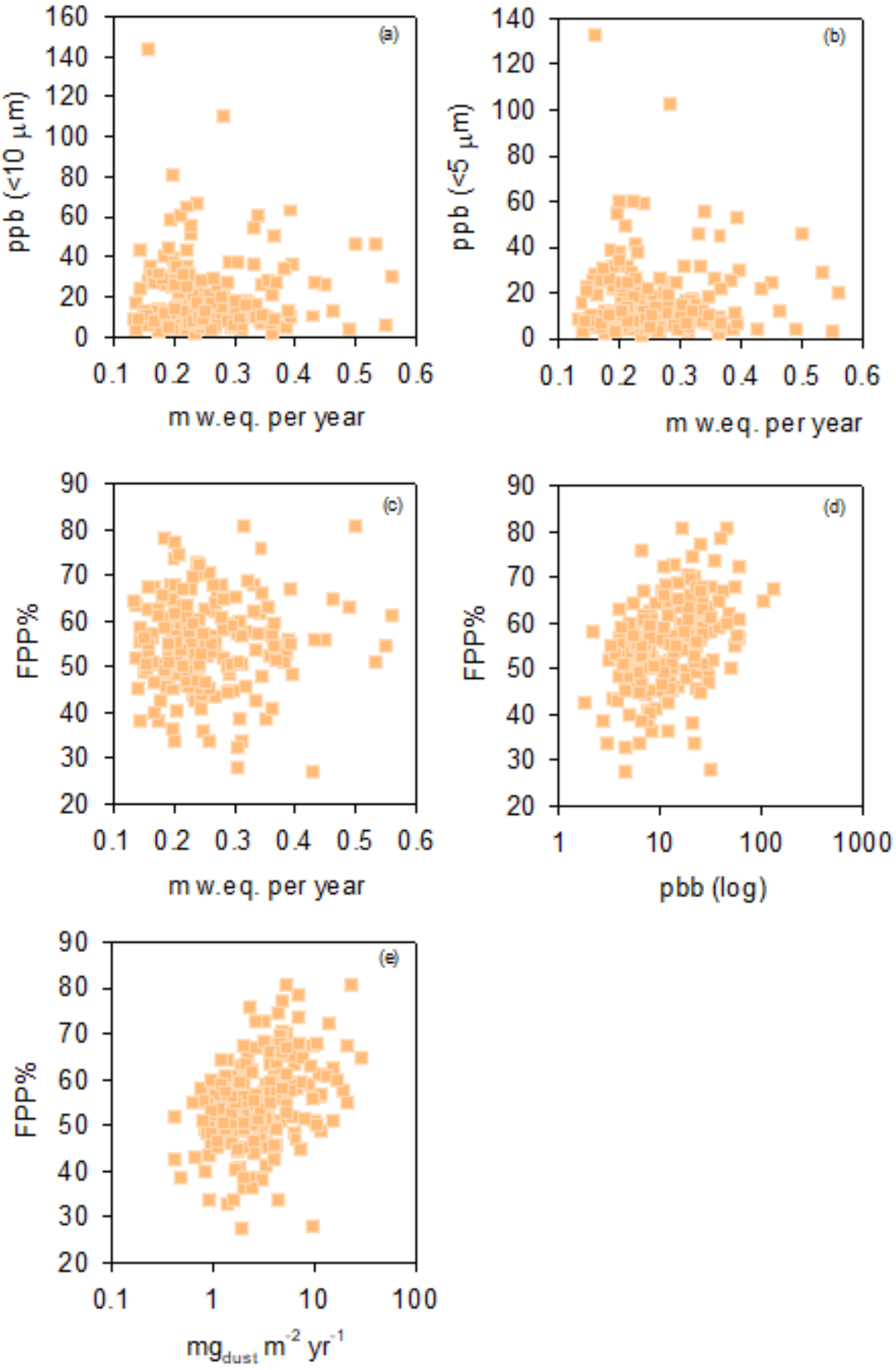
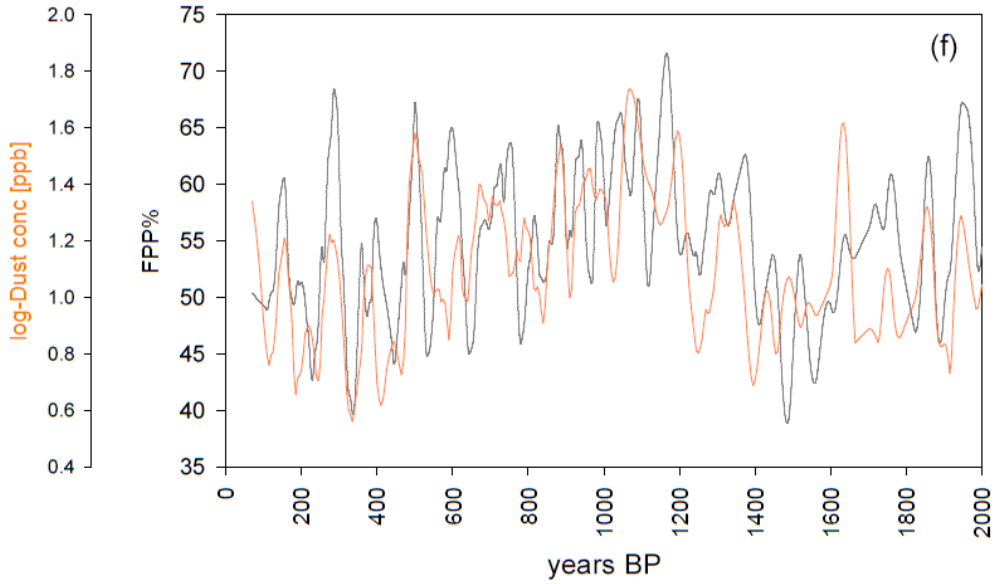


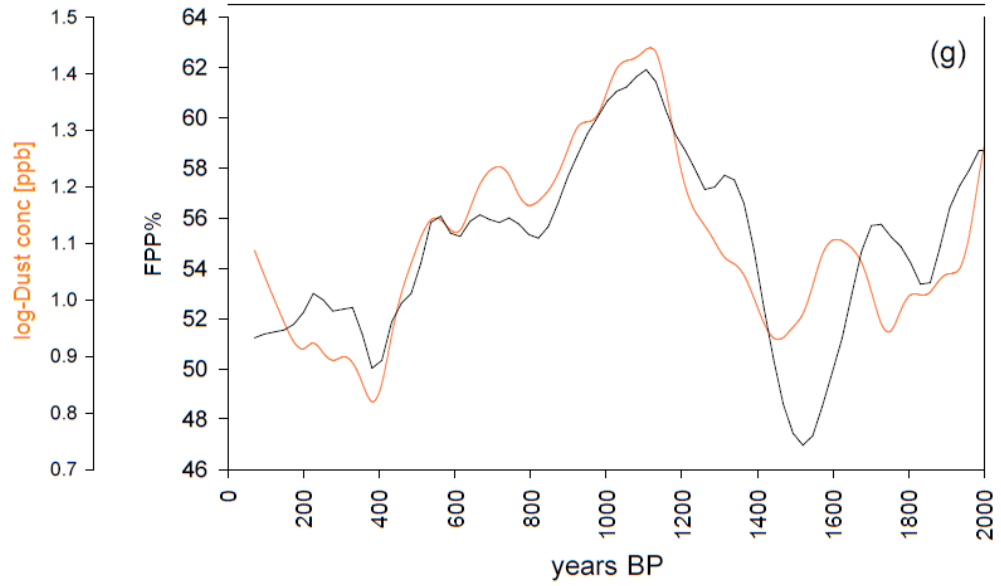
FIGURE S3

Plots (a) and (b) show the lack of correlation between snow accumulation rate and dust concentration. Plot (c) shows the lack of correlation between snow accumulation rate and the Fine Particle Percentage (FPP%) while plots (d) and (e) display dust concentration data (< 5 μm, ppb, log scale) and flux (mg m^{-2} yr^{-1}) versus FPP%. The Pearson Product Moment Correlation confirms that the two variables are moderately correlated and tend to increase together (plot d: correlation coefficient 0.335, P_value=0.00000245; plot e: correlation coefficient 0.311, P_value=0.0000129, n. samples=189).

Plot (f) displays the stratigraphic profile of dust concentration (log) and dust size (FPP%) vs age as in fig. 2c and 2d, 20-yrs running average. Plot (g) is the Loess local smoothing of original data (polynomial degree 1, sampling proportion 0.1) highlighting the similarities in the long-term trend of the records. Plot (h) shows the log-dust concentration and grain size anomalies normalized (%).


(a)
ppb (<10 µm)
m w.eq. per year
(b)
ppb (<5 µm)
m w.eq. per year
(c)
FPP%
m w.eq. per year
(d)
FPP%
pbb (log)
(e)
FPP%
mg$_{dust}$ m^{-2} yr^{-1}


(f)
log-Dust conc [ppb]
FPP%
years BP
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
75
70
65
60
55
50
45
40
35
0
200
400
600
800
1000
1200
1400
1600
1800
2000


(g)
log-Dust conc [ppb]
FPP%
years BP
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
64
62
60
58
56
54
52
50
48
46
0
200
400
600
800
1000
1200
1400
1600
1800
2000

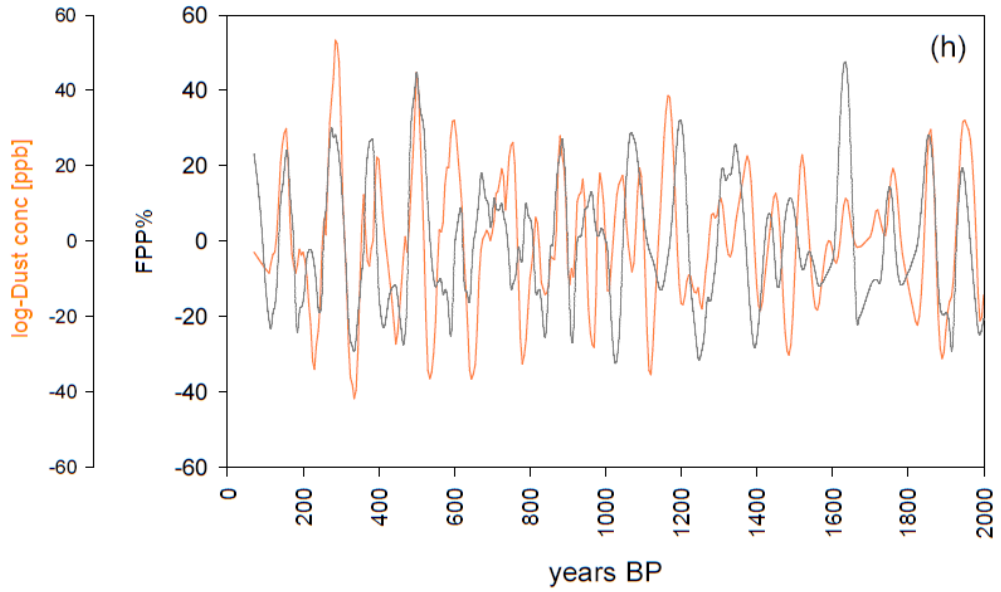

(h)
log-Dust conc [ppb]
FPP%
years BP
60
40
20
0
-20
-40
-60
60
40
20
0
-20
-40
-60
0
200
400
600
800
1000
1200
1400
1600
1800
2000

FIGURE S4

Diatom data from RICE. (a) 50-years running average of RICE δD (‰VSMOW), (b) diatom valves (entire) per liter per year, (c) Fragilariopsis spp. Valves (entire) per liter per, (d) Valve fragments per liter per year, (e) Valves per liter.

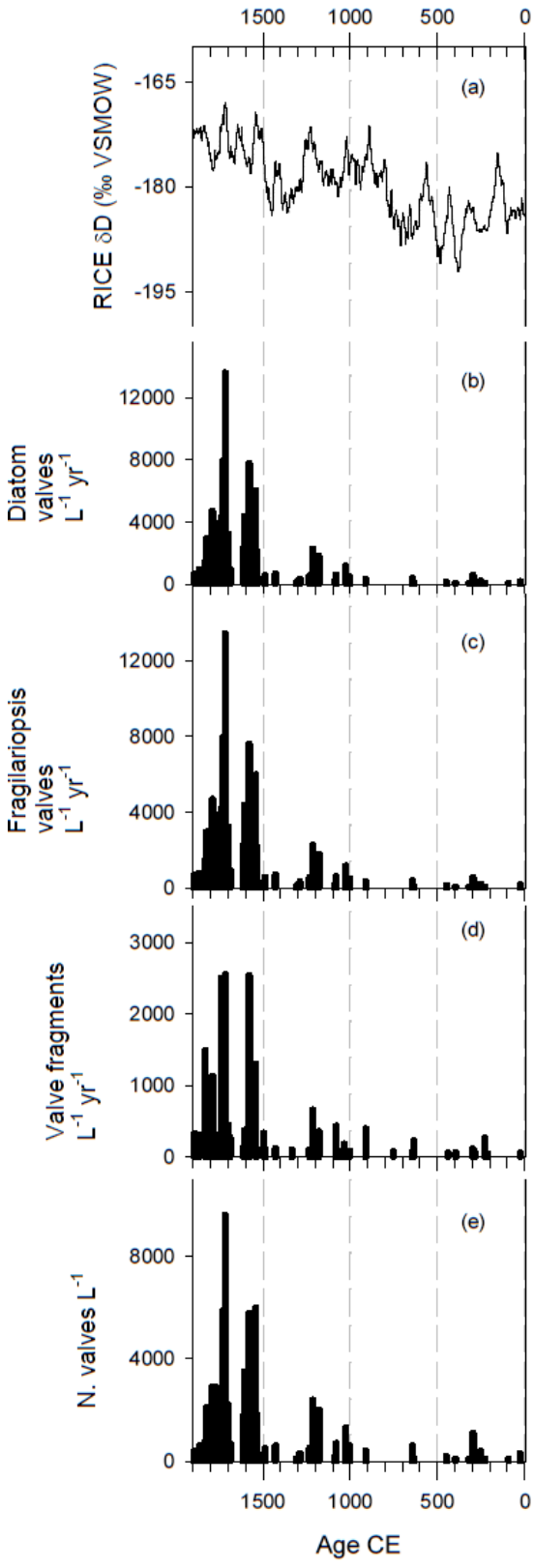
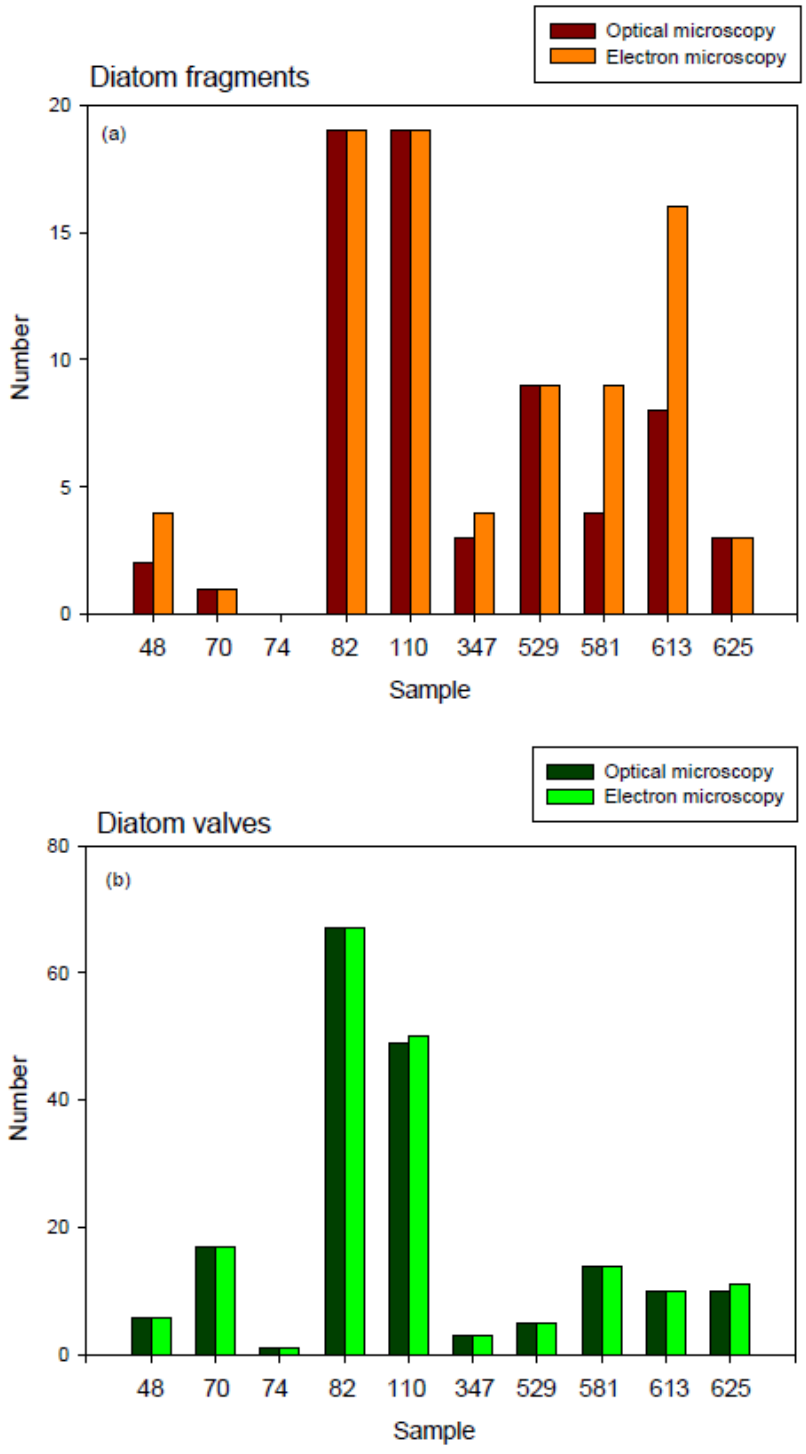


FIGURE S5

Number of diatom fragments (a) and entire diatom valves (b) identified in a set of 10 different samples along the RICE ice core using two independent microscopic techniques: optical microscopy (a: dark orange, b: dark green) and Scanning Electron Microscopy (a: light orange, b: light green). Sample number (x-axis) corresponds to the approximate depth of the sample. For this comparison, the age of samples span the whole Holocene.



References:

Delmonte, Barbara, et al. "Ice core evidence for secular variability and 200-year dipolar oscillations in atmospheric circulation over East Antarctica during the Holocene." Climate dynamics 24 (2005): 641-654.

Delmonte, Barbara, et al. "Holocene dust in East Antarctica: Provenance and variability in time and space." *The Holocene* 30.4 (2020): 546-558.

Koffman, Bess G., et al. "Centennial-scale variability of the Southern Hemisphere westerly wind belt in the eastern Pacific over the past two millennia." *Climate of the Past* 10.3 (2014): 1125-1144.

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col 1: Age dust sample (regularly reinterpolated)
col 2: Dust concentration (ppb) _ particles <5 micron
col 3: Dust grain size (FPP, %)

Age	[ppb]	FPP%
1890.2	26.5	50.7
1885.2	24.2	50.6
1880.2	21.8	50.4
1875.2	19.5	50.2
1870.2	17.1	50.0
1865.2	14.8	49.8
1860.2	12.5	49.6
1855.2	10.1	49.4
1850.2	7.8	49.2
1845.2	5.5	49.0
1840.2	5.7	48.9
1835.2	5.9	48.7
1830.2	6.1	48.6
1825.2	5.7	53.3
1820.2	8.0	52.4
1815.2	6.4	49.9
1810.2	10.0	55.1
1805.2	15.4	62.0
1800.2	20.7	69.0
1795.2	13.1	59.7
1790.2	13.4	54.8
1785.2	18.6	57.2
1780.2	10.6	50.7
1775.2	4.4	45.0
1770.2	3.7	46.1
1765.2	4.2	50.4
1760.2	4.6	54.6
1755.2	5.8	54.6
1750.2	7.5	51.5
1745.2	4.5	44.3
1740.2	5.2	52.0
1735.2	8.4	51.9
1730.2	11.6	48.8
1725.2	9.3	41.8

1720.2	5.2	36.7
1715.2	3.7	38.4
1710.2	5.4	48.4
1705.2	7.2	58.4
1700.2	4.6	47.0
1695.2	4.5	47.0
1690.2	7.2	60.3
1685.2	20.3	59.5
1680.2	12.3	51.6
1675.2	17.1	67.5
1670.2	17.4	69.8
1665.2	16.2	68.9
1660.2	15.1	68.0
1655.2	13.9	67.0
1650.2	12.7	66.1
1645.2	11.1	62.6
1640.2	7.3	45.5
1635.2	4.3	36.4
1630.2	3.6	51.4
1625.2	3.7	48.2
1620.2	4.0	40.1
1615.2	4.4	32.0
1610.2	3.4	33.6
1605.2	2.7	44.8
1600.2	5.1	50.5
1595.2	7.1	55.4
1590.2	7.0	55.8
1585.2	7.0	56.2
1580.2	7.2	56.1
1575.2	21.8	33.9
1570.2	16.9	43.2
1565.2	11.9	52.5
1560.2	7.0	61.8
1555.2	5.9	59.3
1550.2	4.9	56.7
1545.2	3.9	54.1
1540.2	3.2	51.8
1535.2	4.0	51.1
1530.2	4.8	50.4
1525.2	5.6	49.7
1520.2	6.3	48.8
1515.2	6.5	47.2
1510.2	6.8	45.7
1505.2	7.0	44.1
1500.2	7.2	42.5
1495.2	7.5	40.9

1490.2	4.9	52.2
1485.2	4.2	55.9
1480.2	4.5	54.7
1475.2	5.5	53.2
1470.2	10.3	49.8
1465.2	15.0	46.4
1460.2	46.7	65.0
1455.2	47.3	70.6
1450.2	28.1	67.6
1445.2	28.6	66.7
1440.2	39.8	65.7
1435.2	31.5	58.1
1430.2	26.5	53.5
1425.2	21.6	48.9
1420.2	16.7	44.3
1415.2	11.8	39.8
1410.2	9.0	39.6
1405.2	12.2	51.8
1400.2	11.1	51.9
1395.2	10.0	52.1
1390.2	8.8	52.2
1385.2	10.4	60.8
1380.2	13.2	67.7
1375.2	10.8	50.8
1370.2	4.9	55.0
1365.2	9.9	66.7
1360.2	8.8	67.1
1355.2	7.4	66.9
1350.2	4.5	62.5
1345.2	11.4	61.1
1340.2	29.4	67.0
1335.2	17.9	60.9
1330.2	13.3	57.3
1325.2	10.5	54.3
1320.2	7.7	51.4
1315.2	4.9	48.5
1310.2	14.1	49.2
1305.2	12.4	41.9
1300.2	9.4	37.5
1295.2	18.1	48.0
1290.2	19.8	50.7
1285.2	21.3	53.2
1280.2	22.9	55.8
1275.2	24.4	58.4
1270.2	37.1	59.0
1265.2	18.4	54.8

1260.2	10.8	54.5
1255.2	18.6	57.6
1250.2	21.4	56.9
1245.2	24.2	56.1
1240.2	24.6	57.7
1235.2	24.9	59.2
1230.2	11.9	68.2
1225.2	20.4	57.6
1220.2	24.3	60.2
1215.2	28.2	62.8
1210.2	15.7	56.4
1205.2	6.2	55.0
1200.2	11.2	67.7
1195.2	11.1	71.2
1190.2	15.2	67.2
1185.2	16.4	57.5
1180.2	7.3	46.7
1175.2	15.7	45.8
1170.2	19.1	45.5
1165.2	9.4	44.4
1160.2	15.6	47.0
1155.2	24.4	49.8
1150.2	26.9	51.6
1145.2	11.7	57.2
1140.2	7.4	56.2
1135.2	10.9	52.4
1130.2	11.6	57.4
1125.2	12.3	62.5
1120.2	10.7	54.9
1115.2	9.1	46.9
1110.2	7.4	38.9
1105.2	5.0	55.4
1100.2	8.5	60.5
1095.2	16.5	55.9
1090.2	24.5	51.4
1085.2	22.4	50.5
1080.2	7.4	55.5
1075.2	25.6	61.0
1070.2	39.7	68.3
1065.2	45.1	79.9
1060.2	36.3	61.4
1055.2	25.5	49.2
1050.2	12.5	56.9
1045.2	6.9	57.4
1040.2	7.4	53.0
1035.2	10.1	55.5

1030.2	12.9	56.4
1025.2	15.9	54.4
1020.2	30.6	69.9
1015.2	30.5	71.9
1010.2	14.8	59.1
1005.2	14.0	58.2
1000.2	23.6	60.6
995.15	43.2	62.1
990.15	32.5	49.2
985.15	21.2	40.4
980.15	22.3	49.2
975.15	23.7	56.7
970.15	25.6	61.6
965.15	21.7	71.0
960.15	17.7	78.3
955.15	27.3	60.4
950.15	29.1	53.0
945.15	23.8	54.9
940.15	18.6	56.9
935.15	13.4	58.8
930.15	8.1	60.8
925.15	9.8	62.9
920.15	11.7	65.0
915.15	13.6	67.2
910.15	15.2	67.8
905.15	16.3	65.0
900.15	27.5	64.7
895.15	48.7	67.1
890.15	53.7	61.8
885.15	53.7	55.1
880.15	58.6	56.6
875.15	56.0	59.3
870.15	51.2	62.5
865.15	46.4	65.6
860.15	41.6	68.7
855.15	36.8	71.9
850.15	32.7	69.0
845.15	29.4	59.3
840.15	26.1	49.5
835.15	24.8	46.2
830.15	25.4	49.4
825.15	25.3	53.1
820.15	24.1	57.1
815.15	21.6	59.0
810.15	19.1	60.8
805.15	16.7	62.6

800.15	16.2	65.3
795.15	18.2	69.0
790.15	20.1	72.7
785.15	20.8	73.6
780.15	20.5	72.0
775.15	20.1	70.5
770.15	23.4	67.4
765.15	30.3	62.8
760.15	37.2	58.1
755.15	44.1	53.5
750.15	46.4	50.7
745.15	35.9	52.8
740.15	25.3	54.9
735.15	14.7	57.0
730.15	12.4	56.4
725.15	11.0	55.5
720.15	9.6	54.6
715.15	8.2	53.7
710.15	6.8	52.8
705.15	6.0	53.0
700.15	5.8	54.4
695.15	5.5	55.8
690.15	7.7	47.0
685.15	8.4	49.6
680.15	8.0	58.4
675.15	10.9	62.9
670.15	10.3	61.8
665.15	6.4	56.0
660.15	8.8	57.2
655.15	11.9	59.3
650.15	15.1	61.3
645.15	18.2	63.4
640.15	21.6	61.6
635.15	25.1	59.2
630.15	17.8	56.7
625.15	8.9	54.1
620.15	15.4	55.4
615.15	24.3	57.3
610.15	24.4	58.3
605.15	22.2	59.0
600.15	20.0	59.6
595.15	17.7	60.3
590.15	15.5	61.0
585.15	13.2	61.7
580.15	11.0	62.4
575.15	8.7	63.1

570.15	6.5	63.8
565.15	5.2	62.1
560.15	5.0	57.6
555.15	4.8	53.1
550.15	4.6	48.6
545.15	4.8	45.8
540.15	6.1	46.8
535.15	7.4	47.9
530.15	8.7	48.9
525.15	10.0	50.0
520.15	11.3	51.0
515.15	12.3	52.1
510.15	10.3	52.9
505.15	8.3	53.7
500.15	6.3	54.5
495.15	4.4	55.3
490.15	5.4	52.0
485.15	7.1	47.8
480.15	8.9	43.6
475.15	10.6	39.4
470.15	11.9	36.7
465.15	11.9	38.0
460.15	11.8	39.4
455.15	11.8	40.8
450.15	11.8	42.1
445.15	10.5	46.9
440.15	8.4	53.5
435.15	7.3	56.2
430.15	7.2	55.0
425.15	7.7	53.2
420.15	8.5	51.0
415.15	9.4	48.9
410.15	10.2	46.7
405.15	10.6	44.5
400.15	9.3	42.4
395.15	8.0	40.3
390.15	8.3	41.8
385.15	8.6	43.3
380.15	8.9	44.7
375.15	9.3	46.2
370.15	9.6	47.7
365.15	9.9	49.2
360.15	10.2	50.7
355.15	10.7	50.3
350.15	11.1	49.4
345.15	11.6	48.5

340.15	12.0	47.6
335.15	15.4	47.7
330.15	26.4	50.4
325.15	37.5	53.1
320.15	48.6	55.7
315.15	51.4	57.0
310.15	40.2	56.0
305.15	29.0	54.9
300.15	17.8	53.8
295.15	6.7	52.8
290.15	6.8	53.1
285.15	6.9	53.5
280.15	7.0	53.9
275.15	7.1	54.2
270.15	7.3	54.6
265.15	7.4	54.9
260.15	7.5	55.3
255.15	7.6	55.6
250.15	7.7	56.0
245.15	7.8	56.3
240.15	7.9	56.7
235.15	7.6	58.0
230.15	7.2	59.5
225.15	6.8	60.0
220.15	6.6	56.8
215.15	6.4	53.6
210.15	9.6	54.4
205.15	13.6	56.4
200.15	16.4	58.5
195.15	13.3	60.9
190.15	10.3	63.3
185.15	8.4	62.6
180.15	7.6	59.3
175.15	6.8	56.1
170.15	6.9	54.5
165.15	7.2	53.6
160.15	7.5	52.7
155.15	7.8	51.8
150.15	8.2	50.9
145.15	8.5	50.1
140.15	8.8	49.2
135.15	9.2	48.3
130.15	9.5	47.4
125.15	9.8	46.5
120.15	10.1	45.6
115.15	11.6	46.9

110.15	14.5	51.2
105.15	17.5	55.5
100.15	20.4	59.9
95.15	23.4	64.2
90.15	24.7	67.0
85.15	18.8	62.7
80.15	12.8	58.4
75.15	9.1	53.2
70.15	7.3	47.3
65.15	5.4	41.4
60.15	5.9	43.2
55.15	7.1	47.2
50.15	8.0	50.7
45.15	7.1	51.2
40.15	6.2	51.7
35.15	5.4	52.2
30.15	4.5	52.7
25.15	3.7	53.2
20.15	11.4	59.1
15.15	19.9	65.5
10.15	21.9	67.7
5.15	20.2	67.5
0.15	18.4	67.2

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col 1: Age diatom sample
col 2: Number of diatoms per liter per year
col 3: Number of Fragliariopsis diatoms per liter per year
col 4: Number of diatom fragments per liter per year

AGE CE	Diat L^-1 yr^-1	Fragilariopsis L^-1 yr^-1	Fragments L^-1 yr^-1
1893.6	656.0	656.0	328.0
1885.4	166.7	166.7	166.7
1881.4	0.0	0.0	0.0
1866.4	923.1	769.2	307.7
1840.4	0.0	0.0	0.0
1832.6	424.6	424.6	1486.2
1829.4	1523.8	1523.8	0.0
1822.4	2964.6	2964.6	705.9
1790.8	4689.1	4689.1	1131.8
1785.4	161.0	161.0	0.0
1781.3	1965.6	1965.6	0.0
1773.2	3889.1	3889.1	134.1
1749.1	165.1	165.1	0.0
1748.0	0.0	0.0	320.7
1744.3	666.7	666.7	133.3
1739.3	4333.3	4166.7	2500.0
1727.3	7978.4	7978.4	676.1
1717.4	13578.5	13437.1	2546.0
1703.3	411.5	411.5	274.3
1698.4	3209.3	3209.3	437.6
1689.3	933.3	933.3	266.7
1679.3	0.0	0.0	0.0
1612.4	2272.7	2272.7	126.3
1607.2	4366.3	4366.3	374.3
1580.4	7733.3	7600.0	2533.3
1575.4	3791.5	3791.5	1390.2
1541.7	5982.9	5982.9	1296.3
1537.0	2159.1	2159.1	119.9
1526.4	0.0	0.0	0.0
1495.0	334.3	334.3	334.3
1488.2	567.3	567.3	113.5
1429.4	682.1	682.1	113.7
1353.2	0.0	0.0	0.0
1347.2	0.0	0.0	0.0

1334.1	0.0	0.0	99.9
1315.1	0.0	0.0	0.0
1308.1	105.6	105.6	0.0
1289.2	312.5	312.5	0.0
1257.2	0.0	0.0	0.0
1234.1	527.6	527.6	105.5
1214.2	2255.6	2255.6	657.9
1192.9	512.8	512.8	102.6
1179.9	1782.5	1782.5	356.5
1157.4	0.0	0.0	0.0
1151.2	0.0	0.0	0.0
1102.9	0.0	0.0	0.0
1087.4	171.1	171.1	0.0
1080.6	604.5	604.5	431.8
1065.2	0.0	0.0	0.0
1048.2	0.0	0.0	83.3
1032.2	0.0	0.0	181.7
1024.6	1161.4	1161.4	89.3
1002.4	482.9	482.9	80.5
911.3	316.0	316.0	394.9
894.4	0.0	0.0	0.0
851.9	0.0	0.0	0.0
751.4	0.0	0.0	73.2
644.9	378.8	378.8	63.1
634.3	75.1	75.1	225.2
625.4	0.0	0.0	0.0
471.3	0.0	0.0	0.0
448.3	135.0	135.0	0.0
438.4	0.0	0.0	61.1
394.8	58.7	58.7	58.7
317.0	66.1	66.1	0.0
295.3	605.1	550.1	110.0
283.2	126.6	63.3	63.3
251.6	211.0	211.0	0.0
226.3	53.1	53.1	265.4
213.8	0.0	0.0	51.3
200.8	0.0	0.0	0.0
91.3	49.8	0.0	0.0
24.3	172.3	172.3	57.4