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Supplement of

Ice core evidence for a 20th century increase in surface mass balance in coastal Dronning Maud Land, East Antarctica

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Supplementary materials

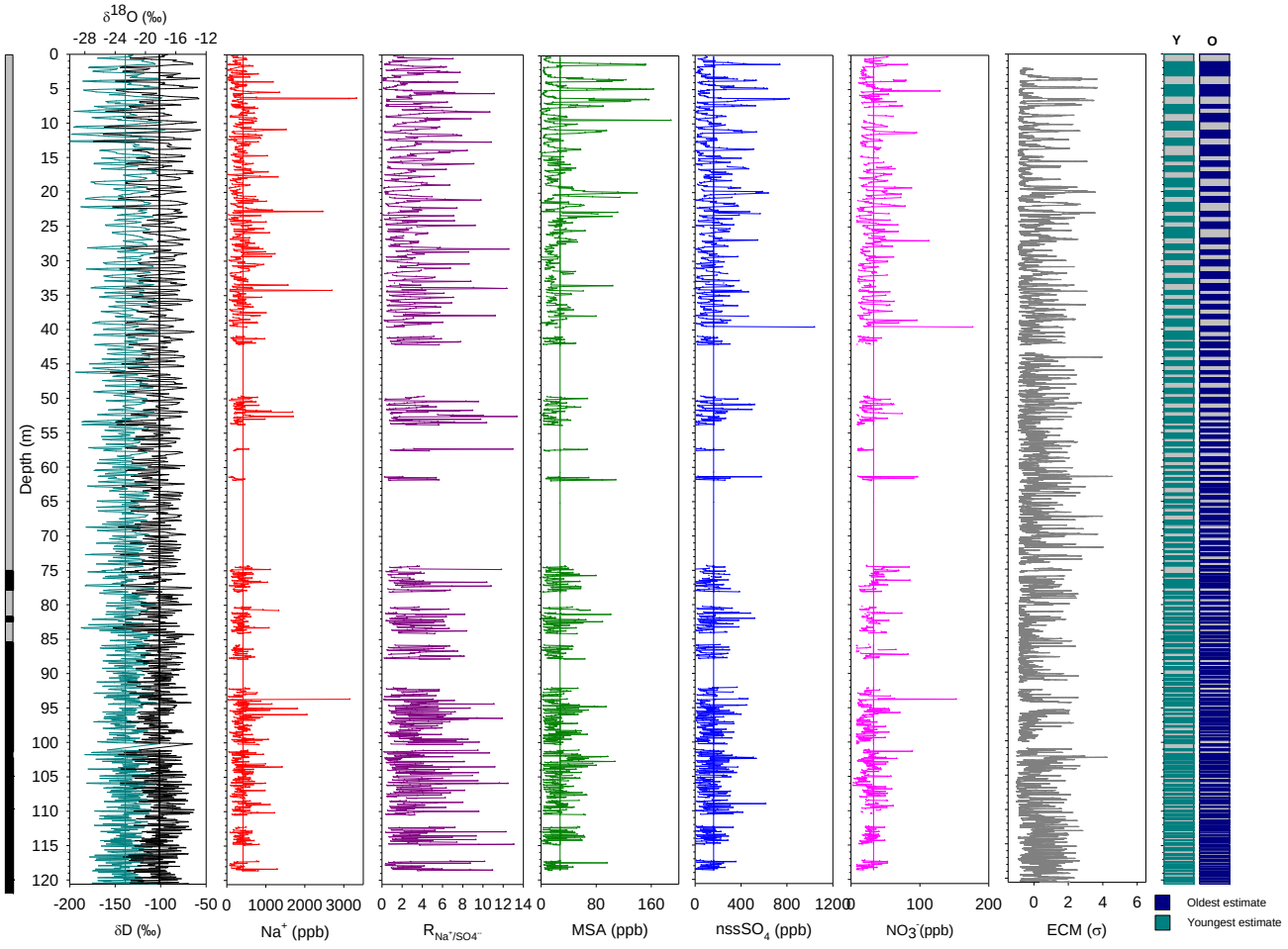
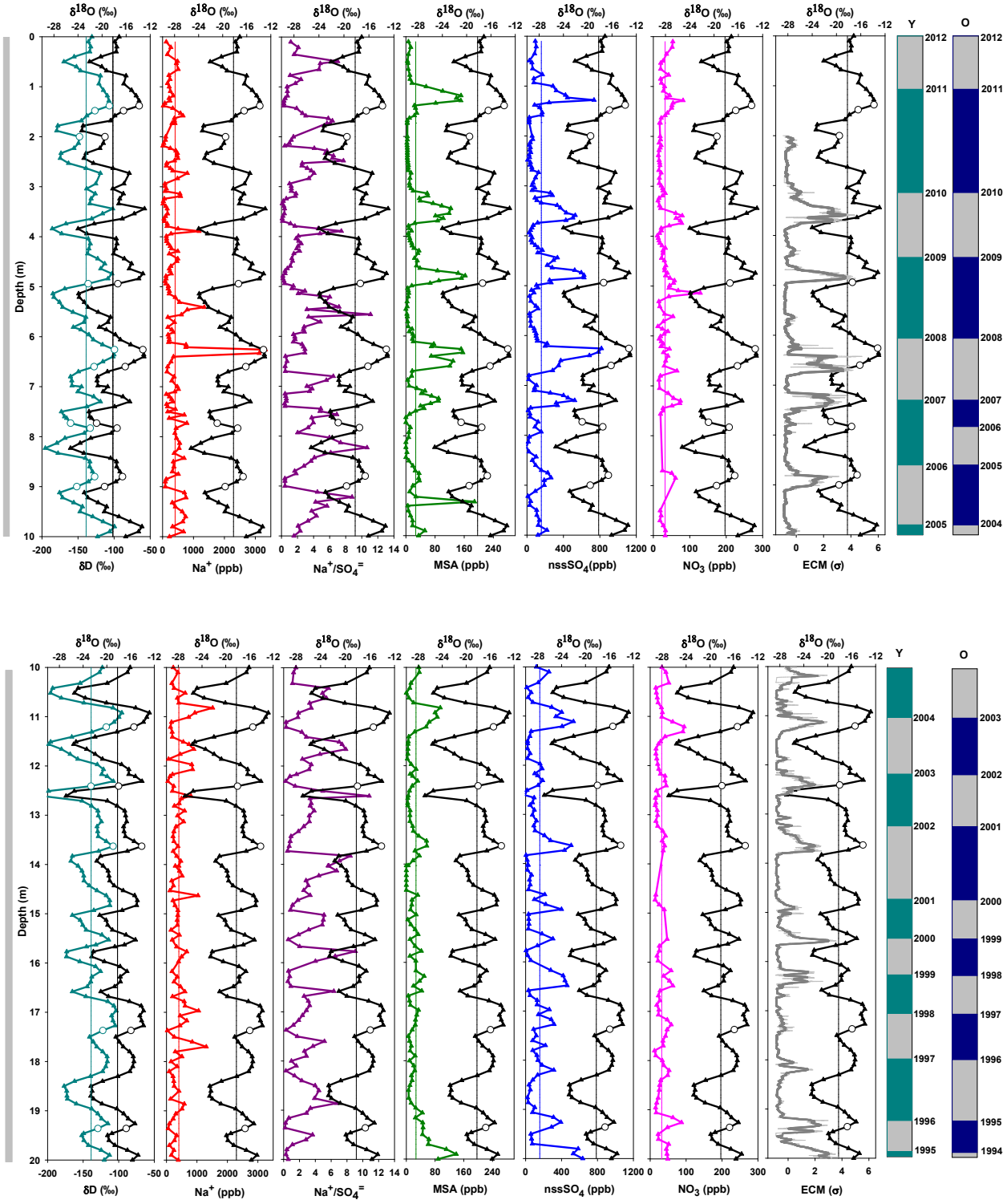
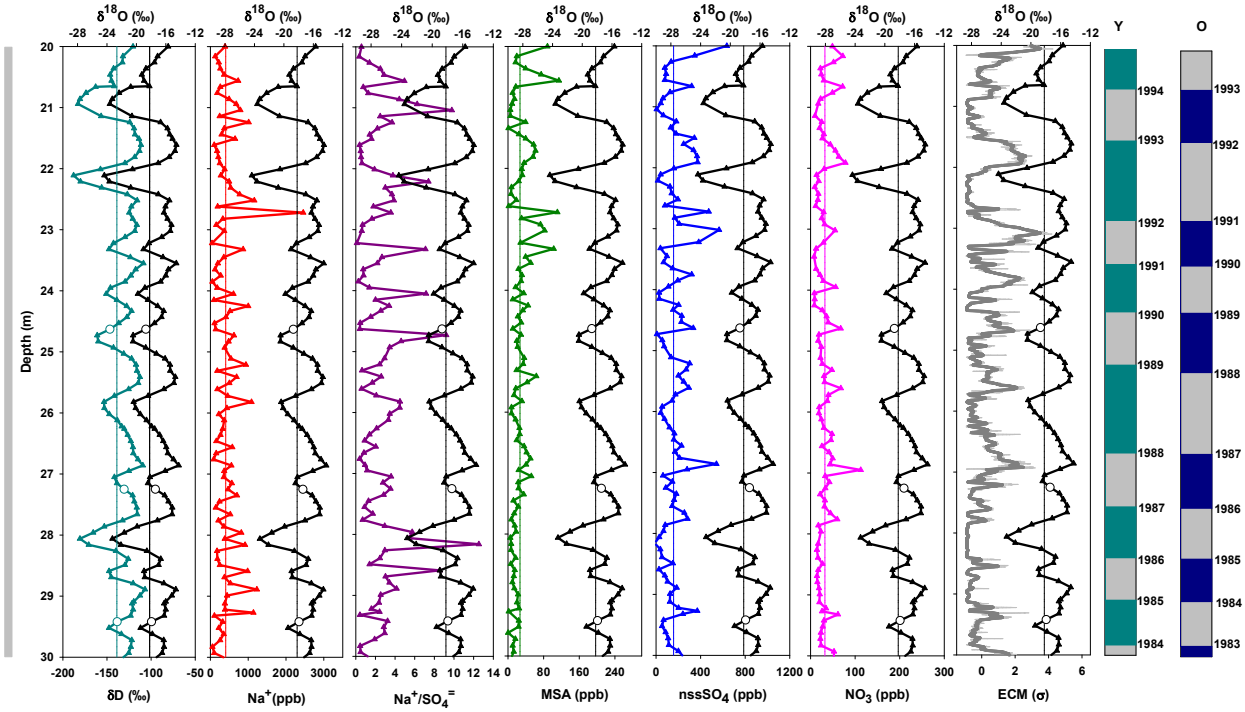


Fig. S1. Full vertical profile of water stable isotopes with, from left to right: a grey and black band indicating sections of sampling for major ions at 10 cm and 5 cm resolution, respectively; water stable isotopes, taken at 5 cm resolution for the entire core; major ions, taken at 5 cm resolution for discrete sections; normalized ECM conductivity (0.05 m running mean, expressed as multiple of standard deviation, σ); annual layer boundaries in the youngest (Green) and the oldest (Blue) estimates (each colour transition indicates a boundary).

Fig. S2. Full vertical profile, as in Fig. S1 but split in 17 sections for more visibility.

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Depth (m)
δD (‰)
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Na+/SO4=
MSA (ppb)
nssSO4 (ppb)
NO3 (ppb)
ECM (σ)
Y
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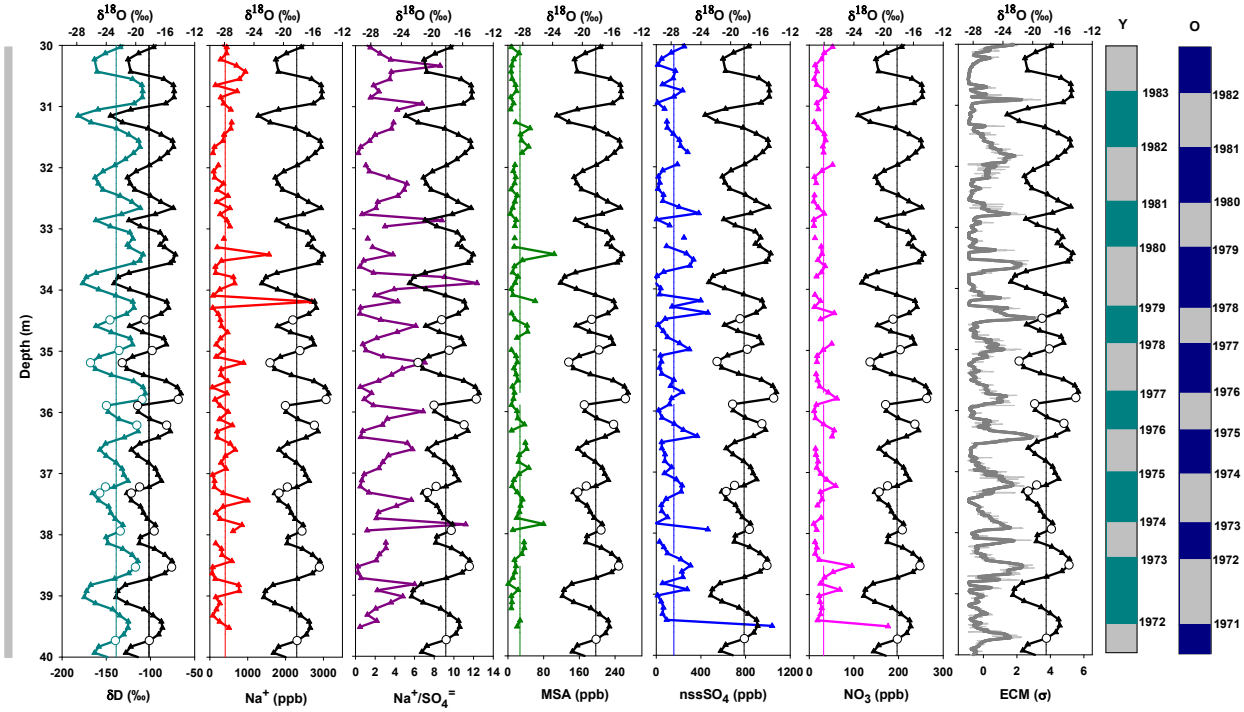
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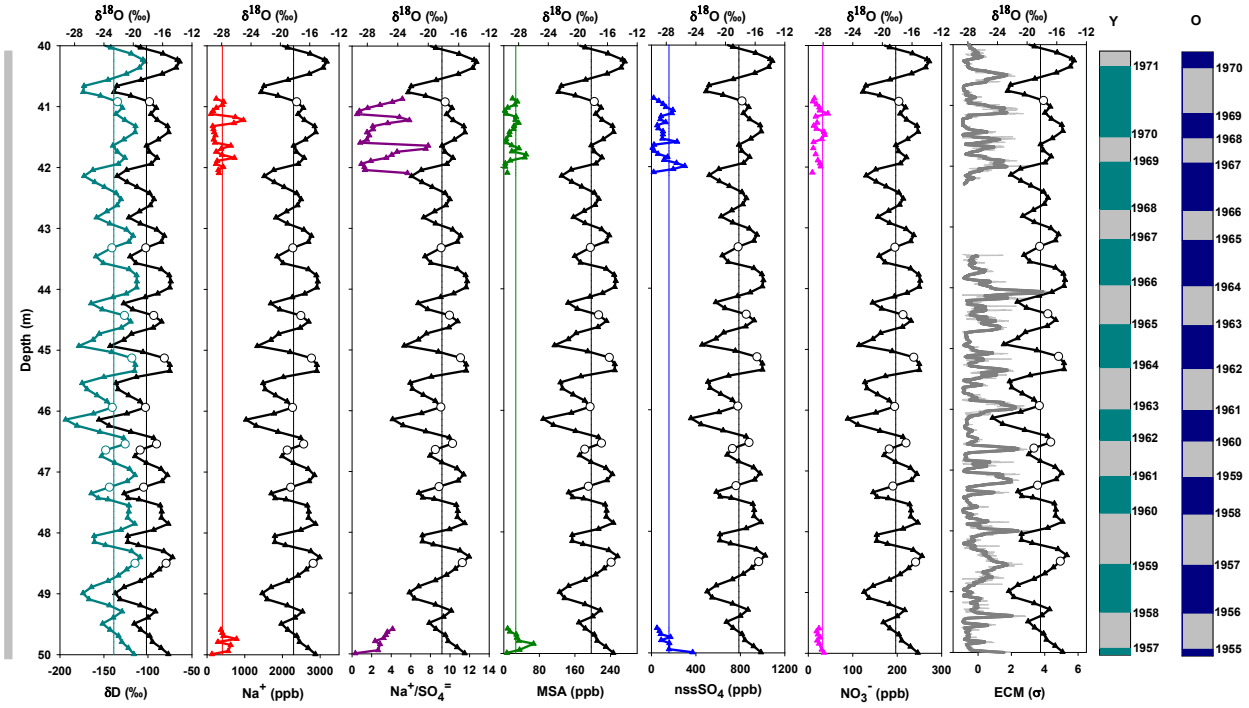
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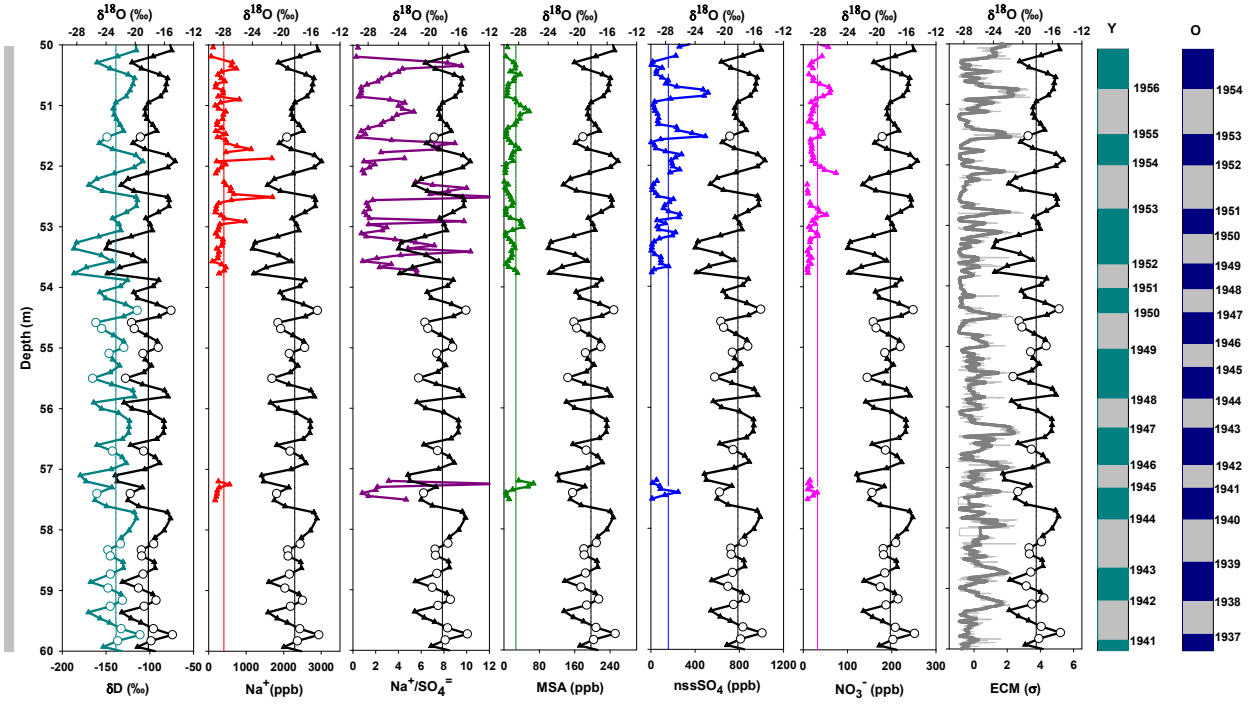
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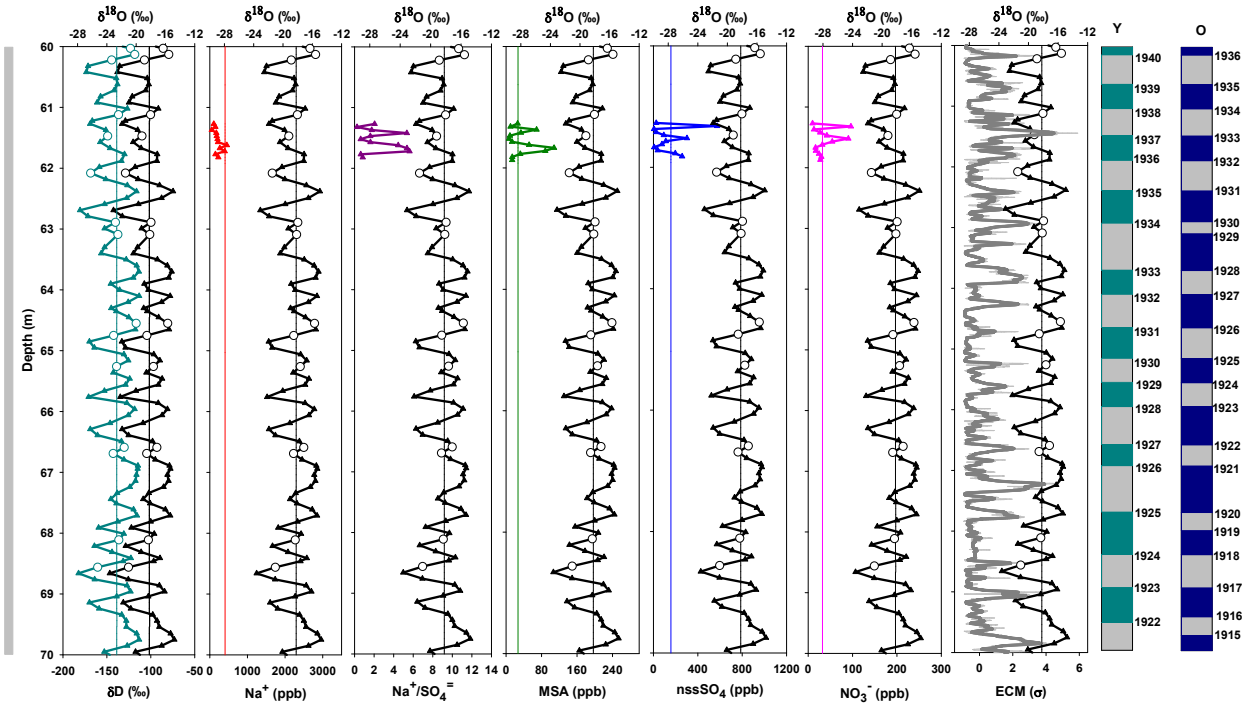
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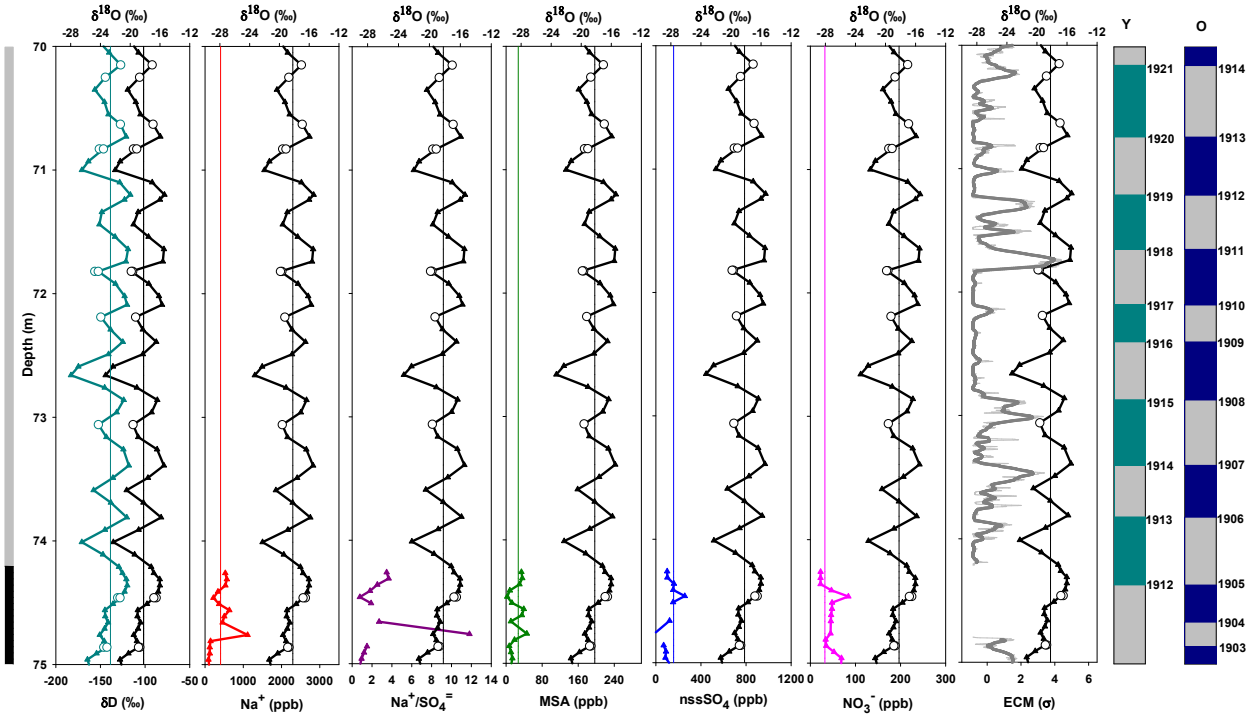
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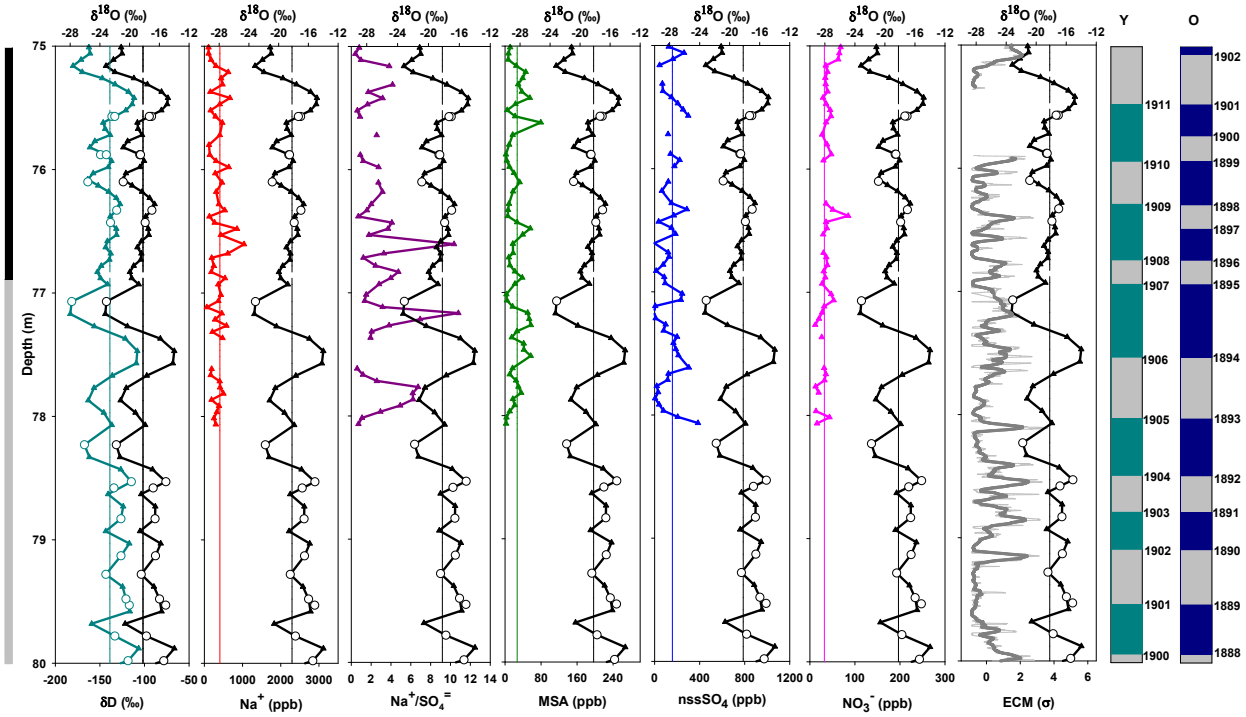
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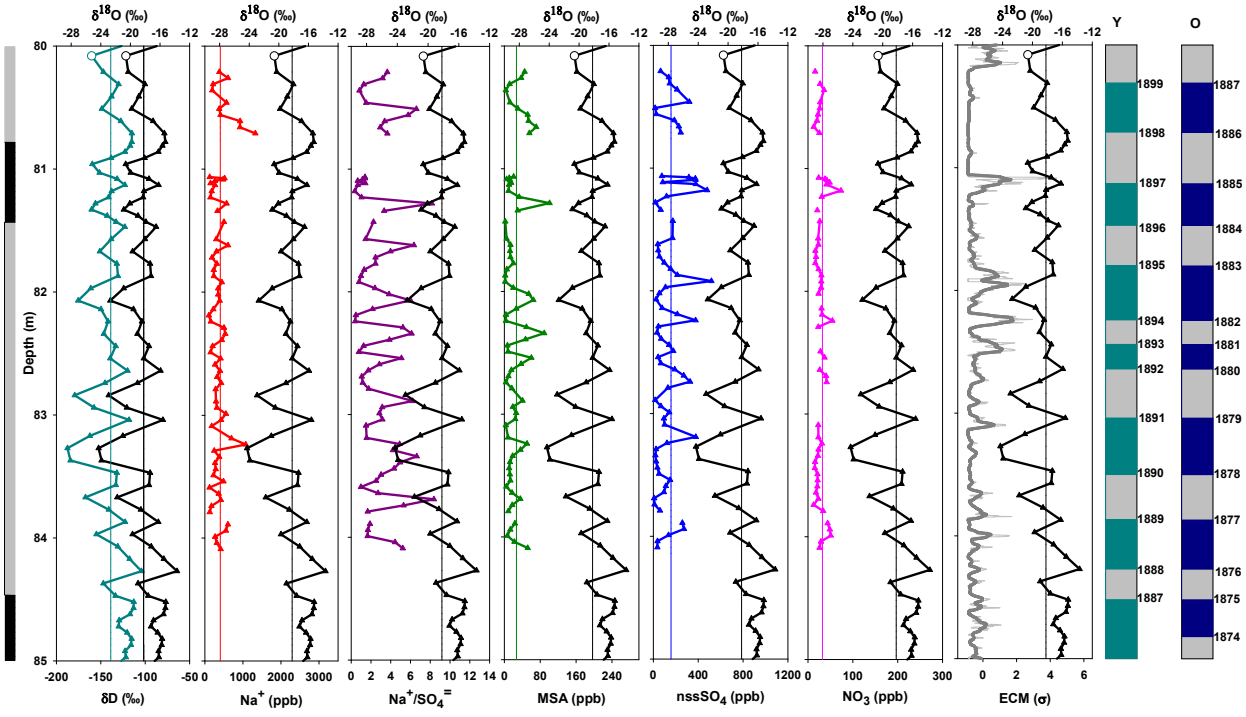
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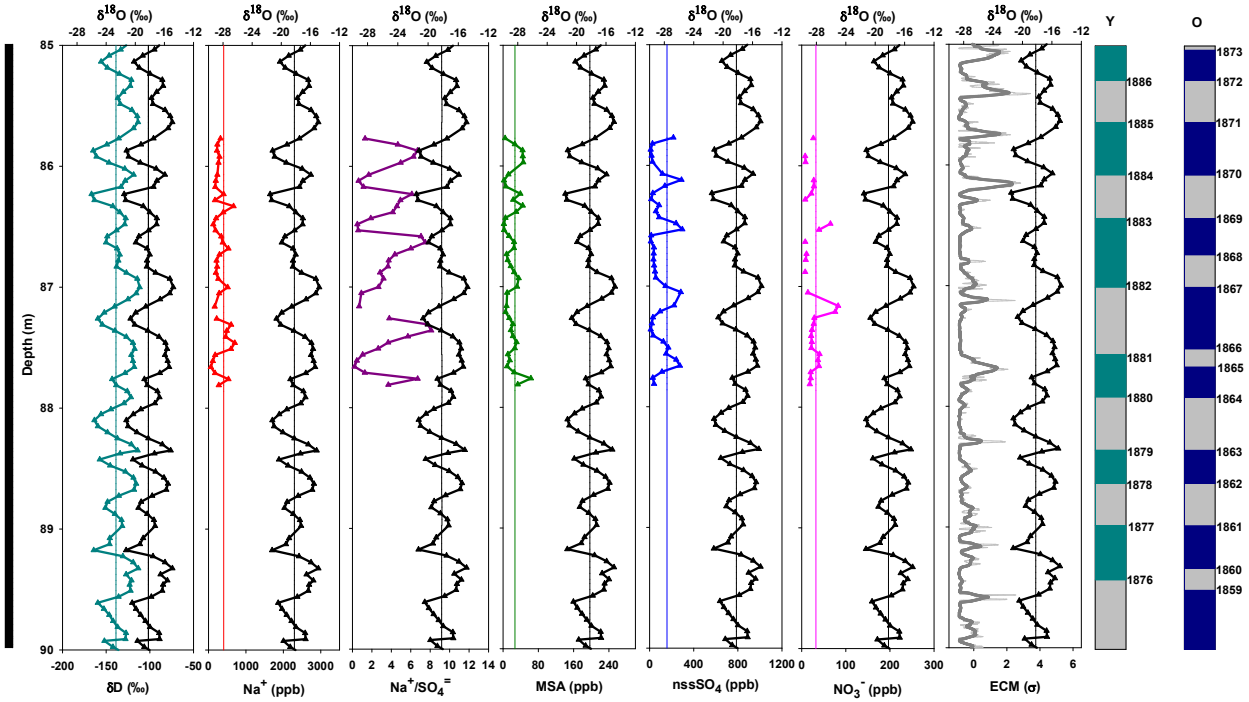
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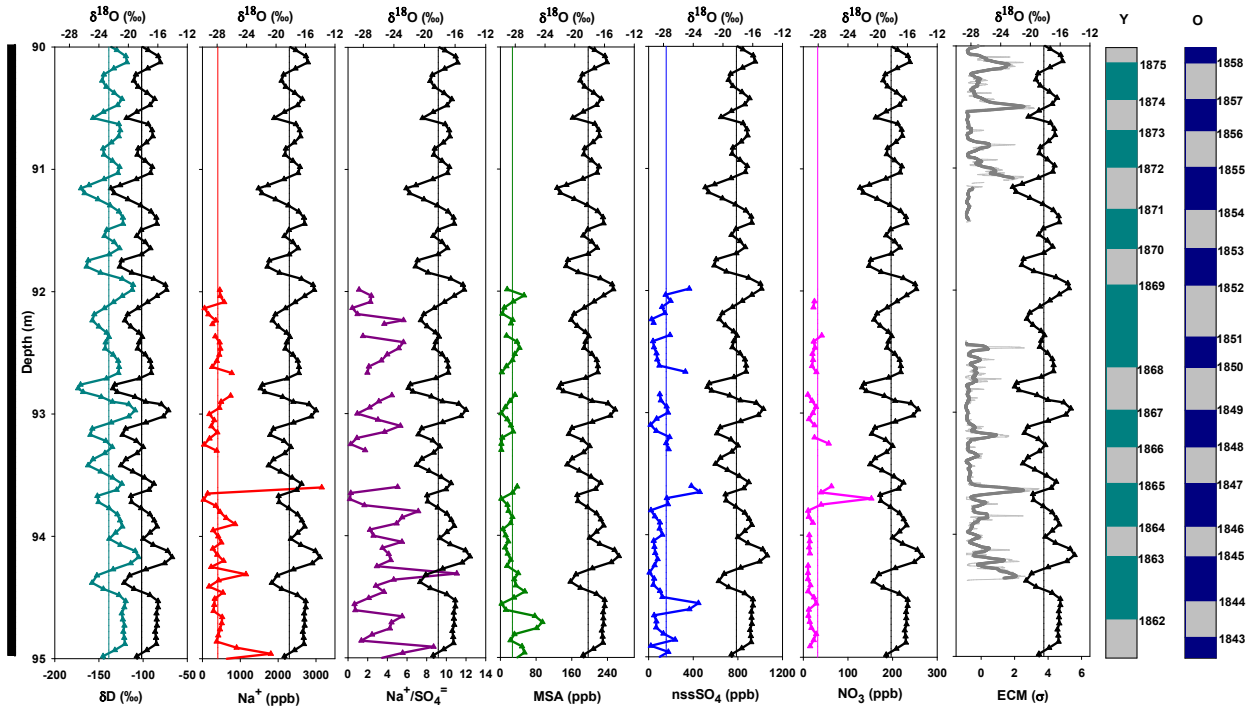
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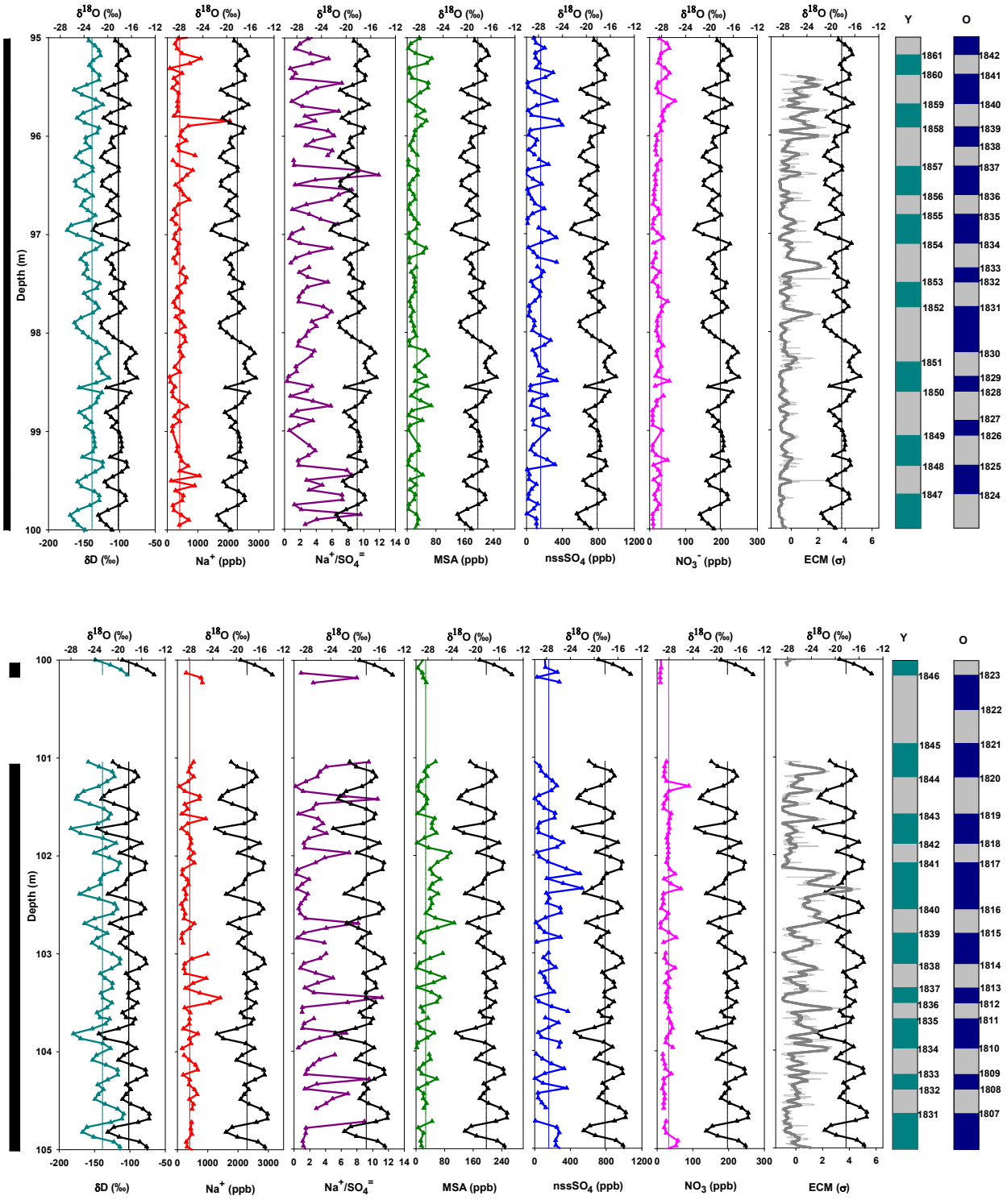
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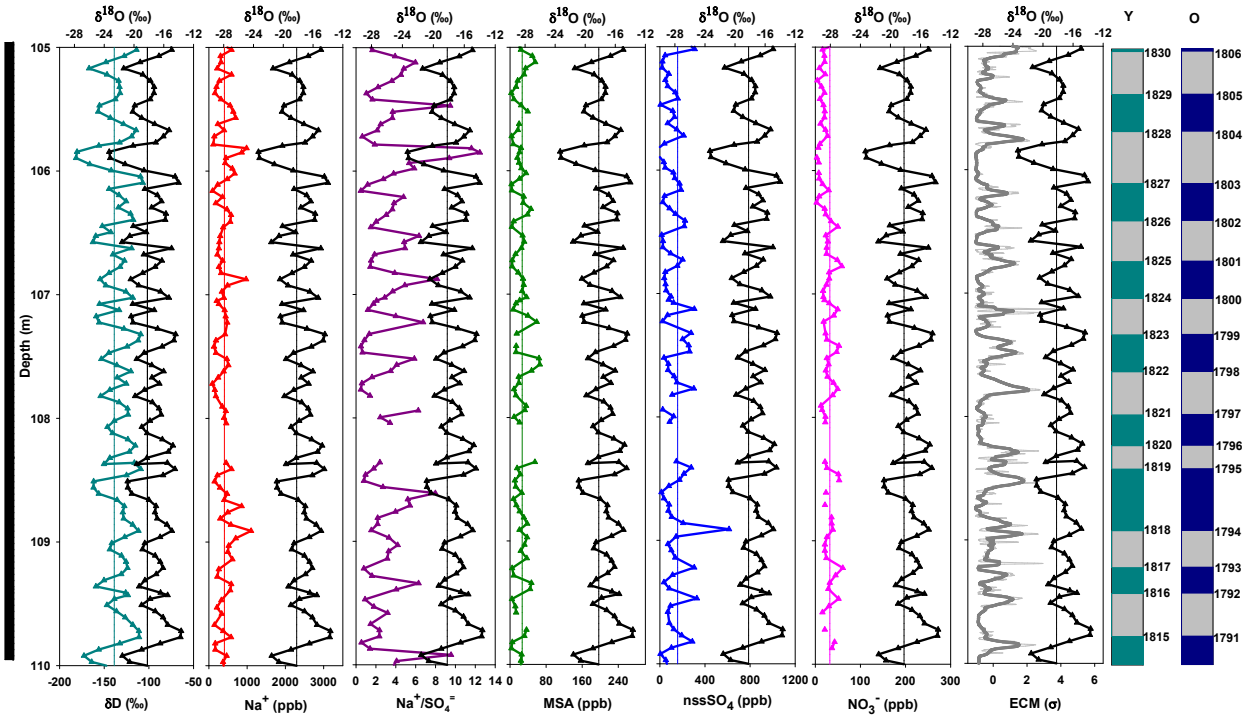
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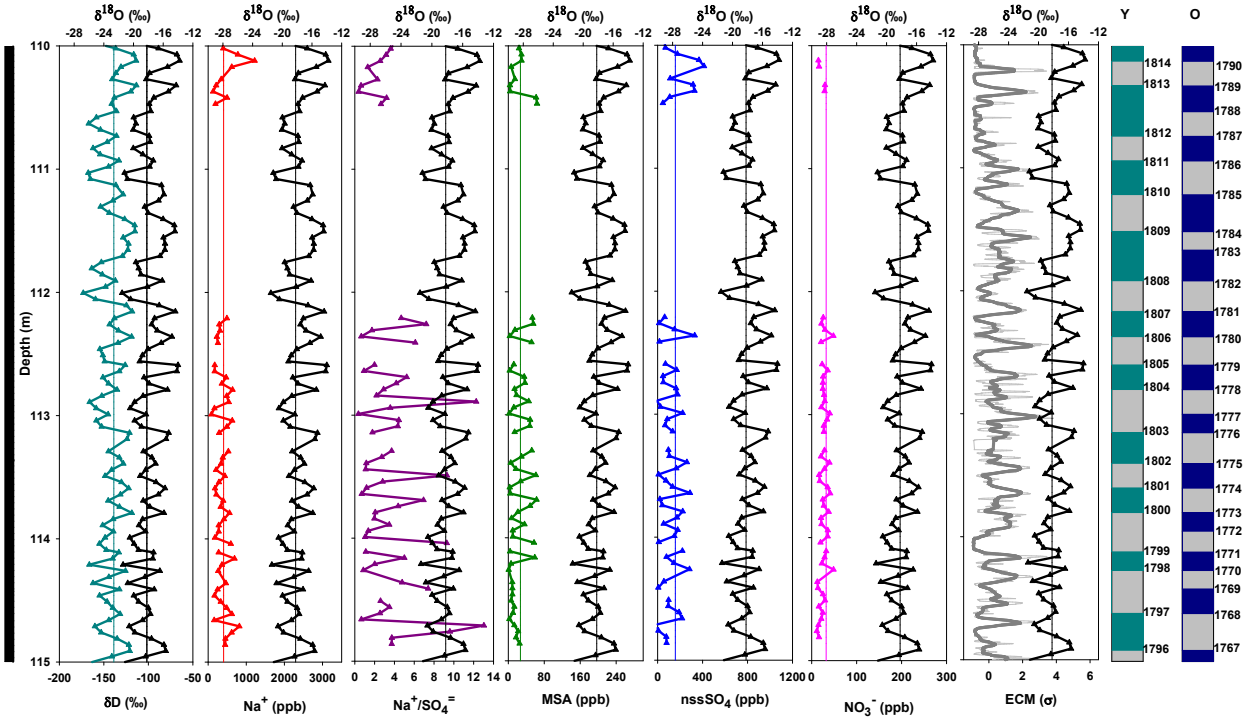
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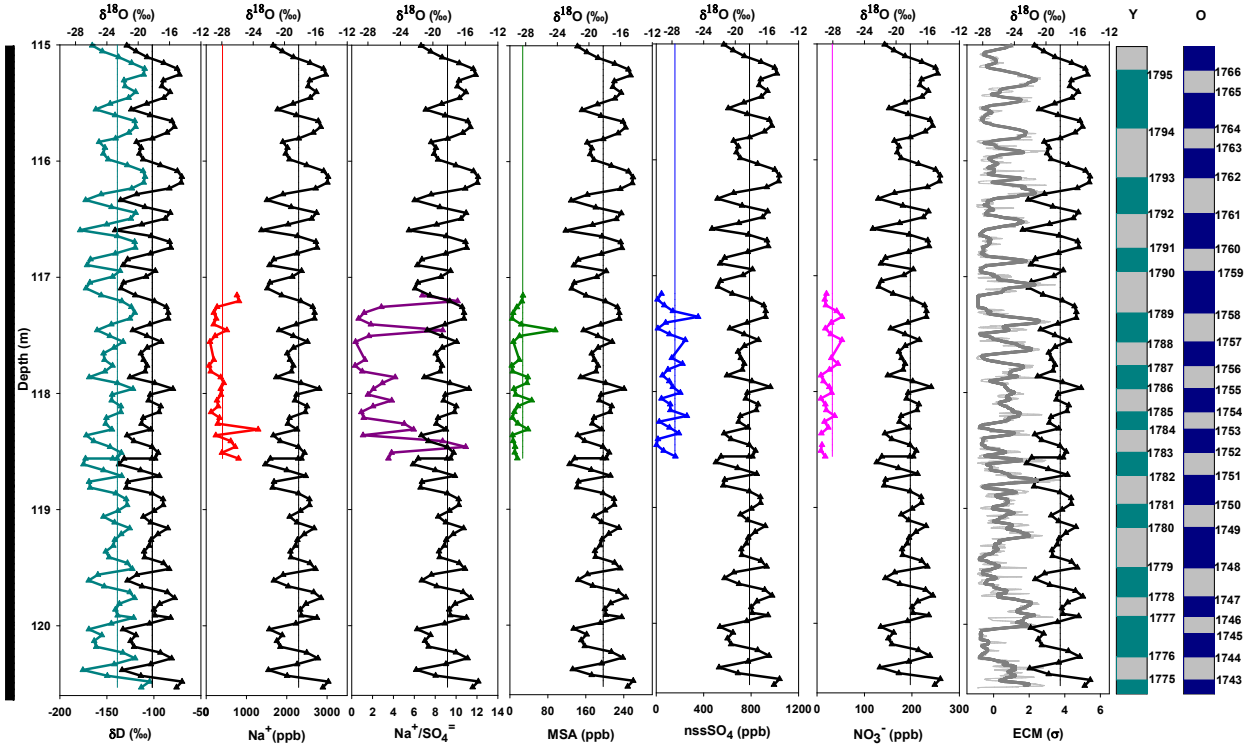
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NO3- (ppb)
ECM (σ)
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Table S1. Sites information and SMB values *no significant trend during the 20th century **short record: only recent periods are compared ***when only a stacked SMB change is given, SMB from individual ice cores are inferred from the stacked record as if it was the same trend for all ice cores. Ref : reference period. Numbers in italic are inferred from the trend given in the referenced paper

Site name	Latitude	Longitude	Elevation (m a.s.l.)	Reference period	SMB (10^{-3} m w.e.) (kg m^{-2} a^{-1})		Recent period	SMB (10^{-3} m w.e.) (kg m^{-2} a^{-1})		Most recent period	SMB (10^{-3} m w.e.) (kg m^{-2} a^{-1})		% change (50a - ref)	% change (20a - ref) except**	Method	Study
Siple Dome	-81.6530	-148.9980	620	1890-1994	120		1922-1991	118					-1.67%		Ice core	Kaspari et al., 2004
ITASE00-5	-77.6830	-123.9950	1828	1716-2000	140		1922-1991	141					0.71%		Ice core	Kaspari et al., 2004
ITAE99-1	-80.6200	-122.6300	1350	1724-1998	139		1922-1991	146					5.04%		Ice core	Kaspari et al., 2004
ITASE00-4	-78.0830	-120.0800	1697	1799-2000	189		1922-1991	193					2.12%		Ice core	Kaspari et al., 2004
RIDS C	-80.0100	-119.4300	1530	1903-1995	112		*1970-1995*	*108.35*					*-3.26%*		Ice core	Kaspari et al., 2004
RIDS B	-79.4600	-118.0500	1603	1922-1995	150		*1970-1995*	*149.37*					*-0.42%*		Ice core	Kaspari et al., 2004
RIDS A	-78.7300	-116.3300	1740	1831-1995	235		1922-1991	234					-0.43%		Ice core	Kaspari et al., 2004
ITASE00-1	-79.3830	-111.2390	1791	1653-2001	220		1922-1991	222					0.91%		Ice core	Kaspari et al., 2004
ITASE01-2	-77.8430	-102.9100	1353	1890-2001	427		1922-1991	436					2.11%		Ice core	Kaspari et al., 2004
ITASE01-3	-78.1200	-95.6460	1633	1859-2001	325		1922-1991	331					1.85%		Ice core	Kaspari et al., 2004
ITASE01-5	-77.0590	-89.1370	1246	1780-2001	388		1922-1991	342					-11.86%		Ice core	Kaspari et al., 2004
ITASE01-6	-76.0970	-89.0170	1232	**			1978-1990	395		*1978-1999*	*392.6*		*-0.61%*		Ice core	Kaspari et al., 2004
Gomez	-73.5900	-70.3600	1400	1855-2006	720		1970s-2006	925		1997-2006	1100		28.47%	53%	Ice core	Thomas et al., 2008
Dyer Plateau	-70.6700	-64.8900	2002	1790-1989	549		1969-1989	593					8.00%		Ice core	Raymond et al., 1996
James Ross Island	-64.2200	-57.6800	1640	1847-1980	443		1964-1990	578					30.47%		Ice core	Aristarain et al., 2004
R1	-78.3075	-46.2728	718	1816-1998	204	±7	*	*204*					0.00%		Ice core	Mulvaney et al., 2002
Berkner B25	-79.5700	-45.7200	890	1816-1956	131		1965-1994	141					7.63%		Ice core	Ruth et al., 2004
A	-72.6500	-16.6333	60	**			1975-1989	380		1980-1989	350			-8%	Ice core	Isaksson & Melvold, 2002
E	-73.6000	-12.4333	700	**			1932-1991	324		1980-1991	277			-15%	Ice core	Isaksson & Melvold, 2002; Isaksson et al., 1996
B39	-71.4100	-9.9000	655	**			1935-2007	818		*1987-2007*	*818*			0.00%	Ice core	Fernandoy et al., 2010
FB0704	-72.0600	-9.5600	760	**			1962-2007	489		*1987-2007*	*489*			0.00%	Ice core	Fernandoy et al., 2010
BAS-depot	-77.0333	-9.5000	2176	1816-1997	*71*		1965-1997	*71*					*0.00%*		Ice core	Hofstede et al., 2004
B04	-70.6200	-8.3700	35	1892-1981	362	±95	1960-1980	*325*					-10.22%			Schlosser & Oerter, 2002
CV	-76.0000	-8.0500	2400	1816-1997	62		1965-1997	68	±2	1992-1997	70		9.68%	13%	Ice core	Karlof et al., 2005
B38	-71.1600	-6.7000	690	**			1960-2007	1257		*1987-2007*	*1257*			0.00%	Ice core	Fernandoy et al., 2010
FB0702	-71.5700	-6.6700	539	**			1959-2007	547		*1987-2007*	*500*			-9%	Ice core	Fernandoy et al., 2010
FB9816	-75.0000	-3.5037	2740	1800-1997	47	±17	1950-1997	*51.5***					*9.57%*		Ice core	Oerter et al., 2000
B31	-75.5800	-3.4300	2669	1816-1997	58.4		1966-1989	59.8					2.40%		Ice core	Oerter et al., 2000
H	-70.5000	-2.4500	53	**			1953-1993	480		1980-1993	425			-11%	Ice core	Isaksson & Melvold, 2002
NUS08-2	-87.8500	-1.8000	2583	1815-2007/8	67.4	±2.6	1963-2007/8	63.4	±4.2				-5.93%		Ice core	Anschutz et al., 2011
S32	-70.3100	-0.8000	53	**			1995-2009	339	±36		*318*			-6%	Ice core	Schlosser et al., 2014
G3	-69.8230	-0.6120	57	**			1993-2009	295	±29		*288*			-2%	Ice core	Schlosser et al., 2014
FB9815	-74.9492	-0.5055	2840	1801-1997	59	±24	1950-1997	*65***					*10.17%*		Ice core	Oerter et al., 2000
G4	-70.9020	-0.4020	60	**			1983-2009	330	±21		*323*			-2%	Ice core	Schlosser et al., 2014
M2	-70.3160	-0.1090	73	**			1981-2009	315	±22		*302*			-4%	Ice core	Schlosser et al., 2014
G5	-70.5450	-0.0410	82	**			1983-2009	298	±21		*290*			-3%	Ice core	Schlosser et al., 2014
K	-70.7500	0.0000	53	**			1954-1996	254		1980-1996	250			0%	Ice core	Isaksson & Melvold, 2002
SPS	-90.0000	0.0000	2850	1816-1956	76.5		1965-1994	84.8	±3.3	1992-1997	84.5	±8.9	10.85%	10%	Ice core and poles	Mosley & Thompson, 1999
B32	-75.0023	0.0070	2882	1816-1997	63		1966-1997	80					26.98%		Ice core	Oerter et al., 2000
EPICA DML	-75.0020	0.0680	2774	1915-2008	73		1964-2008	73.1	±1.7				0.14%		Firn core and radar	Fujita et al., 2011
FB9808	-74.7507	0.9998	2860	1801-1997	68	±22	1950-1997	*74.5***					*9.56%*		Ice core	Oerter et al., 2000
FB9809	-74.4992	1.9608	2843	1801-1997	89	±29	1950-1997	*97.5***					*9.55%*		Ice core	Oerter et al., 2000
EPICA (Amundsenisen)	-75.0000	2.0000	2900	1865-1965	78		1966-1991	76					-2.56%		Ice core	Isaksson et al., 1996
G8	-70.4100	2.0100	58	**			1991-2009	282	±26		273			-3%	Ice core	Schlosser et al., 2014

Site name	Latitude	Longitude	Elevation (m a.s.l.)	Reference period	SMB (10^{-3} m w.e.) (kg m^{-2} a^{-1})		Recent period	SMB (10^{-3} m w.e.) (kg m^{-2} a^{-1})		Most recent period	SMB (10^{-3} m w.e.) (kg m^{-2} a^{-1})		% change (50a - ref)	% change (20a - ref) except**	Method	Study
FB9814	-75.0837	2.5017	2970	1801-1997	64	±21	1950-1997	*71****					*10.94%*		Ice core	Oerter et al., 2000
C	-72.2583	2.8911	2400	1955-1996	119		1965-1996	123					3.36%		Ice core	Isaksson et al., 1999
D	-72.5083	3.0000	2610	1955-1996	112		1965-1996	116					3.57%		Ice core	Isaksson et al., 1999
DML08	-75.7528	3.2828	2971	1919-96	60	±19	*	*60*					0.00%		Ice core	Oerter et al., 1999
E	-72.6750	3.6628	2751	1955-1996	55		1965-1996	59					7.27%		Ice core	Isaksson et al., 1999
DML02	-74.9683	3.9185	3027	1919-95	59	±14	*	*59*					0.00%		Ice core	Oerter et al., 1999
FB9810	-74.6672	4.0017	2980	1801-1997	86	±29	1950-1997	*94.5****					*9.88%*		Ice core	Oerter et al., 2000
F	-72.8583	4.3514	2840	1955-1996	23		1965-1996	24					4.35%		Ice core	Isaksson et al., 1999
S100	-70.2333	4.8000	48	1816-2000	292		1956-2000	284		1991-2000	260	±80	-2.74%	-11%	Ice core	Kaczmarska et al., 2004
S20	-70.2417	4.8111	63	1955-1996	271		1965-1996	265					-2.21%		Ice core	Isaksson et al., 1999
FB0601	-75.2470	4.8440	3090	1915-2008	52		1964-2008	51.6	±1.2				-0.77%		Firn core and radar	Fujita et al., 2011
FB9813	-75.1673	5.0033	3100	1816-1997	48		1950-1997	*53****					*10.42%*		Ice core	Oerter et al., 2000
G	-73.0417	5.0442	2929	1955-1996	28		1965-1996	30					7.14%		Ice core	Isaksson et al., 1999
FB9804	-75.2503	6.0000	2630	1801-1997	50	±16	1950-1997	*55****					*10.00%*		Ice core	Oerter et al., 2000
H	-73.3917	6.4606	3074	1955-1996	44		1965-1996	46					4.55%		Ice core	Isaksson et al., 1999
B33	-75.1670	6.4985	3160	1816-1997	45.9		1966-1989	55					19.83%		Ice core	Oerter et al., 2000, Sommer et al., 2000
FB9811	-75.0840	6.5000	3160	1801-1997	58	±16	1950-1997	*64****					*10.34%*		Ice core	Oerter et al., 2000
DML09	-75.9333	7.2130	3156	1897-1996	45	±12	*	*45*					0.00%		Ice core	Oerter et al., 1999
DML10	-75.2167	7.2130	3364	1900-96	47	±11	*	*47*					0.00%		Ice core	Oerter et al., 1999
DML04	-74.3990	7.2175	3179	1905-1996	53	±15	*	*53*					0.00%		Ice core	Oerter et al., 1999
I	-73.8008	7.9406	3174	1955-1996	52		1965-1996	53					1.92%		Ice core	Isaksson et al., 1999
NUS07-1	74.7200	7.9800	3174	1815–2007/8	52	±2	1963–2007/08	55.9	±3.9				7.50%		Ice core	Anschutz et al., 2009
Site I	-73.7167	7.9833	3174	1815-2007	52	±1.3	1963-2007	56	±4.7	1991-2007	52		7.69%	0%	Ice core	Anschutz et al., 2009
DML06	-75.0007	8.0053	3246	1899-1996	50	±14	*	*50*					0.00%		Ice core	Oerter et al., 1999
NUS08-6	-81.7000	8.5700	2447	1815-2007/8	39.2	±1.5	1963-2007/8	49.2	±3.4				25.51%		Ice core	Anschutz et al., 2011
J	-74.0417	9.4917	3268	1955-1996	44		1965-1996	45	±4				2.27%		Ice core	Isaksson et al., 1999
FB0603	-75.1170	9.7240	3300	1915-2008	41		1964-2008	38	±0.9				-7.32%		Firn core and radar	Fujita et al., 2011
K	-74.3583	11.1036	3341	1955-1996	45		1965-1996	41					-8.89%		Ice core	Isaksson et al., 1999
L	-74.6417	12.7908	3406	1955-1996	45		1965-1996	41					-8.89%		Ice core	Isaksson et al., 1999
A28	-74.8617	14.7420	3466	1915-2008	44		1964-2008	44.5	±1				1.14%		Firn core and radar	Fujita et al., 2011
MC	-75.0112	14.8865	3470.4	1816-1884	40		1955-2000	39		1992-2000	46		-2.50%	15%	Ice core	Karlof et al., 2005
MD	-74.9706	14.9567	3470.8	1816-1884	42		1955-2000	40		1992-2000	53		-4.76%	26%	Ice core	Karlof et al., 2005
M	-75.0000	14.9964	3470	1816-1884	41	±0.7	1955-2000	41	±0.5	1992-2000	50	±1.1	0.00%	22%	Ice core	Karlof et al., 2005
M150	-74.9900	15.0000	3470	1816-1997	43		1965-1997	*48.5*					*12.79%*		Ice core	Hofstede et al., 2004
M	-74.9917	15.0017	3453	1955-1965	51		1965-1996	45					-11.76%		Ice core	Isaksson et al., 1999
MB	-75.0294	15.0435	3470.5	1816-1884	39		1955-2000	42		1992-2000	46		7.69%	18%	Ice core	Karlof et al., 2005
MA	-74.9887	15.1134	3470.4	1816-1884	42		1955-2000	42		1992-2000	48	±1.3	0.00%	14%	Ice core	Karlof et al., 2005
NUS08-5	-82.6300	17.8700	2544	1815-2007/8	35	±0.8	1963-2007/8	37.6	±2.3				7.43%		Ice core	Anschutz et al., 2011
NUS08-4	-82.8167	18.9000	2552	1815-2007/8	36.7	±0.9	1963-2007/8	36.1	±2.1				-1.63%		Ice core	Anschutz et al., 2011
NUS08-3	-84.1300	22.0000	2625	1815-2007/8	40.1	±1	1963-2007/8	45.3	±3.1				12.97%		Ice core	Anschutz et al., 2011
A35	-76.0660	22.4590	3586	1915-2008	35		1964-2008	39.2	±0.9				12.00%		Firn core and radar	Fujita et al., 2011
NUS07-2	-76.0700	22.4700	3582	1815-2007/8	33	±0.7	1963-2007/8	28	±2				-15.15%		Ice core	Anschutz et al., 2011
MP	-75.8880	25.8340	3661	1286-2008	33.1	±1.0	1964-2008	38.7	±0.9	1993-2008	41.9	±2.8	16.92%	27%	Firn core and radar	Fujita et al., 2011
NUS07-3	-77.0000	26.0500	3589	1815-2007/8	22	±0.5	1963-2007/8	23.7	±1.7				7.73%		Ice core	Anschutz et al., 2009
IC12	-70.2458	26.3349	450	1816-2012	480	±10	1955-2012	630	±20	1992-2012	680	±70	31.25%	42%	Ice core	This paper
DK190	-76.7940	31.9000	3741	1286-2008	28.7	± 0.9				1993-2008	34.1	±2.3		19%	Firn core and radar	Fujita et al., 2011
NUS07-4	-78.2167	32.8500	3595	1815-2007/8	19	±0.5	1963-2007/8	17.5	±1.2				-7.89%		Ice core	Anschutz et al., 2009
NUS07-5	-78.6500	35.6300	3619	1815-2007/8	24	±0.5	1963-2007/8	20.1	±1.4				-16.25%		Ice core	Anschutz et al., 2011

Site name	Latitude	Longitude	Elevation (m a.s.l.)	Reference period	SMB (10^{-3} m w.e.) (kg m^{-2} a^{-1})		Recent period	SMB (10^{-3} m w.e.) (kg m^{-2} a^{-1})		Most recent period	SMB (10^{-3} m w.e.) (kg m^{-2} a^{-1})		% change (50a - ref)	% change (20a - ref) except**	Method	Study
DF	-77.3170	39.7030	3810	1816-2001	26.3		1964-2008	28.8	±0.7	1995-2006	27.3	±0.4	9.51%	4%	Ice core	Igarashi et al., 2011
YM85	-71.5800	40.6300	2246	1816-2002	140		1965-2002	135					-3.57%		Ice core	Takahashi et al., 2009
H72	-69.2047	41.0906	1214	1831-1998	311		1973-1998	307					-1.29%		Ice core and poles	Nishio et al., 2002
NUS07-6	-80.7833	44.8500	3672	1815-2007/8	22		1902-2007/8	21					-4.55%		Ice core	Anschutz et al., 2009
G15	-71.2000	45.9800	2544	1816-1964	86		1964-1984	116					34.88%		Ice core	Moore et al., 1991
NUS07-8	-84.1833	53.5333	3452	1815-2007/8	32	±1.2	1963-2007/8	30	±2.1				-6.25%		Ice core	Anschutz et al., 2009
NUS07-7	-82.0700	54.5500	3725	1815-2007/8	29.4	±0.6	1963-2007/8	26.1	±1.9				-11.22%		Ice core	Anschutz et al., 2011
DT217	-75.7167	76.8333	2800	**			1998-2008	12	±1.72	2005-2008	12			0%	Stake arrays	Ding et al., 2011
DT364	-78.3333	77.0000	3380	**			1999-2008	62	±0.14	2005-2008	72			16%	Stake arrays	Ding et al., 2011
DT401	-79.0200	77.0000	3760	1816-1999	19		1963-1999	24		1999–2005	25	±16	26.32%	32%	Ice core	Ren et al., 2010; Ding et al.,
DT001	-70.8300	77.0700	2325	1810-1959	131		1959-1996	131					0.00%		Ice core	Zhang et al., 2006
Dome A	-80.3667	77.3500	4093	**			2005-2008	19	±0.25	2008-2009	21			11%	Stake arrays	Ding et al., 2011
DomeA	-80.3600	77.3600	4092	1815-1998	23		1963-1998	23					0.00%		Ice core	Jiang et al., 2012
LGB65	-71.8500	77.9200	1850	1815-1996	131		1960-1996	131					0.00%		Ice core	Xiao et al., 2004
DT008	-72.1667	77.9333	2390	**			1998-2008	118	±0.30	2005-2008	80			-32%	Stake arrays	Ding et al., 2011
VOSTOK	-78.4500	106.8300	3488	1816-2010	20.6	±0.3	1955-2010	21.5	±0.5	1958-2010	20.8		4.37%	1%	Snow pits and poles	Ekaykin et al., 2004
DSS	-66.7697	112.8069	1370	1816-2000	680		1970-2009	750					10.29%		Ice core	Roberts et al., 2015
LAW DOME	-66.7700	112.9800	1370	1816-1966	687		1966-2005	742					8.01%		Ice core	Morgan et al., 1991; van Ommen & Morgan, 2010
DomeC	-75.1200	123.3100	3233	1816-1998	25.3		1965-1998	28.3		1996-1998	39		11.86%	54%	Ice core and poles	Frezzotti et al., 2005
D6 A	-75.4400	129.8100	3027	1816-1998	36	±1.8	1966-1998	29	±1.4	1998-2002	39		-19.44%	8%	Ice core and poles	Frezzotti et al., 2005
D66	-68.9400	136.9400	2333	1966-1864	196		1965-2001	213	±13	2001-2003	197		8.67%	1%	Ice core and poles	Magand et al., 2004;Frezzotti et al., 2013
D2 A	-75.6200	140.6300	2479	1816-1998	20	±1.0	1966-1998	31	±1.6	1998-2002	30		55.00%	50%	Ice core and poles	Frezzotti et al., 2005
GV1	-70.8700	141.3800	2244	1816-2001	114		1965-2001	117	±7	2001-2003	96		2.63%	-16%	Ice core and poles	Magand et al., 2004;Frezzotti et al., 2013
GV2	-71.7100	145.2600	2143	1816-2001	112		1965-2001	112	±7	2001-2003	92		0.00%	-18%	Ice core and poles	Magand et al., 2004;Frezzotti et al., 2013
MdPtA	-75.5300	145.8600	2454	1816-1998	36	±1.8	1966-1998	45	±2.7	1998-2010	47		25.00%	31%	Ice core and poles	Frezzotti et al., 2005
GV3	-72.6300	150.1700	2137	1816-2001	81		1965-2001	84	±5	2001-2003	73		3.70%	-10%	Ice core and poles	Magand et al., 2004;Frezzotti et al., 2013
M2 A	-74.8000	151.2700	2278	1816-1998	17	±0.8	1966-1998	15	±7.5	1998-2002	8.5		-11.76%	-50%	Ice core and poles	Frezzotti et al., 2005
GV4	-72.3900	154.4800	2126	1816–2001	119		1965–2001	100	±6	2001–2003	96		-15.97%	-19%	Ice core and poles	Magand et al., 2004;Frezzotti et al., 2013
31DPT A	-74.0300	155.9600	2069	1816-1998	98	±4.9	1966-1998	112	±5.6	1998-2002	98		14.29%	0%	Ice core and poles	Frezzotti et al., 2005
GPS2A	-74.6400	157.5020	1804	1816-1998	60	±3.0	1966-1998	54	±2.7	1993-2000	55		-10.00%	-8%	Ice core and poles	Frezzotti et al., 2005
GV5	-71.8900	158.5400	2184	1816-2001	129		1965-2001	129	±7	2001-2004	135		0.00%	5%	Ice core and poles	Magand et al., 2004;Frezzotti et al., 2007
GV7	-70.6800	158.8600	1947	1854-2001	237		1965-2001	241	±13	2001-2004	252		1.69%	6%	Ice core and poles	Magand et al., 2004;Frezzotti et al., 2007
Talos Dome	-72.7700	159.0800	2316	1816-2001	83.6		1966-1996	86.6		2001-2010	68		3.59%	-19%	Ice core and poles	Magand et al., 2004;Frezzotti et al., 2007; 2013
Hercules Neve	-73.1000	165.4000	2960	1816-1966	118		1966-1992	129					9.32%		Ice core	Stenni et al., 1999

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