Supplement of Earth Syst. Sci. Data, 15, 2517–2532, 2023
https://doi.org/10.5194/essd-15-2517-2023-supplement

Open Access Earth System Science Data

Supplement of

Ice core chemistry database: an Antarctic compilation of sodium and sulfate records spanning the past 2000 years

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Table S1 CLIVASH2k chemistry data site metadata and reference. Analytical duplicates indicated in italics.

Name	**Latitude (°S)**	**Longitude (E/-W)**	**Elevation (m)**	**Start year (CE)**	**End year (CE)**	**Reference**
105km	-67.43	93.38	1416	1774	1981	This study
ABN_13/14_ snowpit	-71.17	110.37	2964	2004	2013	(Winton et al., 2022; Winton and Edwards, 2022)
B40	-75.00	0.06	2892	0	2012	(Sigl et al., 2014; Sigl et al., 2015); This study
BER11C95_25	-79.61	-45.72	886	957	1992	(Ruth et al., 2004)
BH-2	-78.47	106.80	3488	0	1541	This study
BH-1	-78.47	106.80	3488	1520	1541	This study
Bouvet Island	-54.42	3.39	350	2001	2016	(King et al., 2019; Thomas et al., 2021)
Bruce Plateau	-66.03	-64.07	1975	1400	2009	This study
cDML	-71.33	11.58	1300	1904	2006	(Rahaman et al., 2016; Naik et al., 2010)
CWA_a_2013	-82.37	-119.29	950	1939	1993	(Reusch et al., 1999)
CWA_d_2013	-81.37	-107.28	1930	1952	1993	(Reusch et al., 1999)
DF01	-77.37	39.70	3810	607	1904	(Motizuki et al., 2017; Motizuki et al., 2014)
DFS10	-77.40	39.62	3800	0	2010	(Sigl et al., 2014); This study
DIR	-70.23	26.33	450	1752	2011	(Philippe et al., 2016)
DIV2010	-77.95	-95.96	1329	1785	2010	(Pasteris et al., 2014; Sigl et al., 2014)
DML03C98_09 (FB9809)	-74.50	1.96	2843	1731	1996	(Sommer et al., 2000)
DML05	-75.00	0.02	2892	150	1998	(Traufetter et al., 2004)
DML07	-75.58	3.43	2680	454	1996	(Traufetter et al., 2004)
DML15C98_14 (FB9814)	-75.08	2.50	2970	1766	1996	(Sommer et al., 2000)
DML17C98_33 (B33)	-75.17	6.50	3160	0	1996	(Sommer et al., 2000)
DSS0506	-66.77	112.81	1370	1927	1989	(Vallelonga et al., 2016)
DT401	-79.02	77.00	3760	0	1998	(Ren et al., 2010a; Li et al., 2015; Li et al., 2012; Yang et al., 2019; Ren et al., 2010b)
EDC	-75.10	123.35	3233	N/A	N/A	(Wolff et al., 2006; Wolff et al., 2010)

EDC_50y	-75.10	123.35	3233	N/A	N/A	(Röthlisberger et al., 2002)
EPICA DC	-75.10	123.35	3233	N/A	N/A	(Fischer et al., 2007)
EPICA DomeC	-75.10	123.35	3233	N/A	N/A	(Castellano et al., 2005; Fujita et al., 2015)
EDC96	-75.10	123.35	3232	1	1907	(Castellano et al., 2005; Sigl et al., 2014)
EDML	-75.00	0.07	2892	N/A	N/A	(Fischer et al., 2007)
Ferrigno	-74.57	-86.90	1354	1703	2010	(Thomas et al., 2015; Thomas et al., 2013)
FIS_BI	-70.40	-3.03	394	1996	2012	(Vega et al., 2018)
FIS_KC	-70.52	2.95	264	1958	2007	(Vega et al., 2018)
FIS_KM	-70.13	1.20	268	1995	2012	(Vega et al., 2018)
FIS_S100	-70.23	4.80	48	1737	1999	(Vega et al., 2018)
GIP (ICPMS)	-79.97	160.20	380	2000	2007	This study
GIP (IC)	-79.97	160.20	380	2000	2007	(Markle et al., 2012); This study
Gomez	-73.59	-70.36	1400	1854	2006	(Thomas et al., 2008; Thomas and Bracegirdle, 2009)
H15	-69.08	40.78	1050	1992	1632	(Kohno and Fujii, 2002; Kohno et al., 1999; Kohno et al., 1995)
IC-06	-81.05	-79.84	750	1935	2002	(Schwanck et al., 2017)
ISO-ICE_spa	-75.00	0.08	2892	2009	2016	(Winton et al., 2020)
ISO-ICE_spb	-75.00	0.08	2892	2008	2016	(Winton et al., 2020)
ITASE-00-1	-79.38	-111.24	1791	1653	2000	(Mayewski and Dixon., 2005)
ITASE-00-2	-78.73	-111.50	1675	1987	2000	(Mayewski and Dixon., 2005)
ITASE-00-3	-78.43	-115.92	1742	1888	2000	(Mayewski and Dixon., 2005)
ITASE-00-4	-78.08	-120.08	1697	1798	2000	(Mayewski and Dixon., 2005)
ITASE-00-5	-77.68	-124.00	1828	1715	2000	(Mayewski and Dixon., 2005)
ITASE-01-1	-79.16	-104.97	1842	1857	2001	(Mayewski and Dixon., 2005)
ITASE-01-2	-77.84	-102.91	1336	1889	2001	(Mayewski and Dixon., 2005)
ITASE-01-3	-78.12	-95.65	1620	1858	2001	(Mayewski and Dixon., 2005)
ITASE-01-4	-77.61	-92.25	1483	1863	2001	(Mayewski and Dixon., 2005)
ITASE-01-5	-77.06	-89.14	1239	1779	2001	(Mayewski and Dixon., 2005)

ITASE-01-6	-76.10	-89.02	1228	1977	2000	(Mayewski and Dixon., 2005)
ITASE-02-1	-82.00	-110.01	1746	1783	2002	(Mayewski and Dixon., 2005)
ITASE-02-4	-86.50	-107.99	2586	1593	2002	(Mayewski and Dixon., 2005)
ITASE-02-5	-88.00	-107.98	2745	1967	2002	(Mayewski and Dixon., 2005)
ITASE-02-6	-89.93	144.39	2808	1911	1996	(Dixon et al., 2012)
ITASE-02-7	-89.00	59.97	3000	1900	2002	(Mayewski and Dixon., 2005)
ITASE-03-1	-86.84	95.31	3124	1768	2003	(Mayewski and Dixon., 2005)
ITASE-03-3	-82.08	101.96	3444	1737	1965	(Mayewski and Dixon., 2005)
ITASE-99-1	-80.62	-122.63	1350	1723	1999	(Mayewski and Dixon., 2005)
Jurassic	-74.30	-73.05	1139	1874	2011	(Thomas and Bracegirdle, 2015; Emanuelsson et al., 2022)
LawDome_DSS	-66.77	112.81	1370	0	2016	(Jong et al., 2022)
LGB69	-70.83	77.07	1850	1708	2001	(Yang et al., 2019; Li et al., 2015; Li et al., 2012; Ren et al., 2010b)
MES2012 (IC)	-77.52	167.68	1600	1794	2006	(Rhodes et al., 2012)
MES2012 (ICPMS)	-77.52	167.68	1600	1473	2006	(Rhodes et al., 2012)
MI0910	-65.55	100.79	500	1913	2009	(Inoue et al., 2017)
Mount Johns	-79.92	-94.39	2100	1883	2008	(Thoen., 2018; Schwanck et al., 2017)
NFL-1	-77.09	95.38	3760	1997	2007	(Khodzher et al., 2020)
NUS07-1	-73.72	7.98	3174	1754	2007	(Pasteris et al., 2014); This study
NUS07-2	-76.07	22.47	3582	336	1993	(Pasteris et al., 2014); This study
NUS07-5	-78.65	35.63	3619	0	1982	(Pasteris et al., 2014); This study
NUS07-7	-82.07	54.88	3725	5	2007	(Pasteris et al., 2014); This study
NUS08-4	-82.82	18.90	2552	1621	2008	(Pasteris et al., 2014); This study
NUS08-5	-82.63	17.87	2554	346	2000	(Pasteris et al., 2014); This study
NUS08-7	-74.88	1.60	2700	1258	2008	(Pasteris et al., 2014); This study
NVFL00	-76.70	102.17	3530	1977	2009	(Khodzher et al., 2020)
NVFL-1	-77.09	95.38	3760	1774	2007	(Khodzher et al., 2020)
Palmer	-73.86	-65.46	1897	1621	2011	(Emanuelsson et al., 2022)
PIG2010	-78.00	-96.00	1593	1918	2009	(Pasteris et al., 2014; Sigl et al., 2014)

PIG	-78.00	-96.00	1593	1980	2009	(Criscitiello et al., 2013)
PV-10	-72.81	79.93	2800	1976	2009	(Osipov et al., 2020)
Rendezvous	-74.45	-78.17	1006	1843	2011	(Emanuelsson et al., 2022), This study
RICE12-13pit	-79.36	-161.71	500	2011	2012	(Winton et al., 2016)
RIDS95A_2013	-78.73	-116.33	1740	1831	1995	(Kreutz et al., 2000)
RIDS95B_2013	-79.46	-118.05	1603	1922	1995	(Kreutz et al., 2000)
RIDS95C_2013	-80.01	-119.43	1530	1903	1995	(Kreutz et al., 2000)
SCH2	-79.55	-84.05	1059	1975	2014	(Hoffmann et al., 2020)
SDM1994_2013	-81.65	-148.79	620	1891	1994	(Kreutz et al., 1997)
SHIC	-72.67	-99.63	474	1999	2019	(Tetzner et al., 2022)
SKBL	-74.85	-71.59	1419	1999	2019	(Tetzner et al., 2022)
SouthPole1995_ 2013	-90.00	0.00	2850	1430	1989	(Meyerson et al., 2002)
SP01	-89.95	17.67	2835	905	2000	(Budner and Cole-Dai, 2004)
SP04C5	-89.95	17.67	2835	176	2004	(Ferris et al., 2011)
SP04C6	-89.95	17.67	2835	1073	2004	(Ferris et al., 2011)
SPICE	-89.99	-98.16	2835	0	2014	(Winski et al., 2021)
SW-42	-78.74	105.59	3590	1985	2012	(Osipov et al., 2020)
SW-80	-79.01	104.47	3590	1989	2014	This study
TA192A	-66.78	139.56	602	1997	2015	(Goursaud et al., 2019)
TD05	-72.80	159.10	2316	542	1986	(Severi et al., 2012; Severi et al., 2017)
TD96	-72.48	159.06	2316	1212	2009	(Stenni et al., 2002; Sigl et al., 2014)
TaylorDome	-77.81	158.72	2365	1	1953	(Mayewski et al., 1996; Baggenstos et al., 2018)
THW2010	-77.00	-121.20	2020	1867	2009	(Sigl et al., 2014)
THW	-77.00	-121.20	2020	1980	2009	(Criscitiello et al., 2013)
UpC_2013	-82.44	-135.97	525	1870	1995	(Mayewski and Dixon., 2005)
VFL-1	-78.09	102.80	3570	1806	1888	(Khodzher et al., 2020)
VK07	-78.45	106.84	3488	1634	1946	This study
VK55	-78.45	106.84	3488	1976	2009	(Osipov et al., 2020)

VKT55	-78.45	106.84	3488	1854	1972	This study
VLG	-77.33	162.53	624	1300	2000	(Bertler et al., 2004; Bertler et al., 2011; Bertler et al., 2005)
Vostok5G (ICPMS)	-78.47	106.80	3488	7	1620	This study
Vostok5G (IC)	-78.47	106.80	3488	0	1857	This study
W10k	-66.75	112.83	1390	1735	2007	(Sigl et al., 2014); This study
WDC05Q	-79.46	-112.23	1759	1521	2004	(Sigl et al., 2013); This study
WDC05A	-79.46	-112.23	1759	1774	2005	(Banta et al., 2008); This study
WDC06A	-79.47	-112.09	1806	0	2004	(Sigl et al., 2015; Sigl et al., 2013); This study
WHG (IC)	-72.90	169.08	400	1883	2006	(Sinclair et al., 2014); This study
WHG (ICPMS)	-72.90	169.08	400	1977	2004	(Sinclair et al., 2014)
WP	-75.25	163.17	50	N/A	N/A	(Bertler et al., 2004)

Table S2. List of sites in the CLIVASH2k chemistry database which have been identified as having a statistically significant correlation with sea ice concentration (SIC), winds (v850 and u850) or geopotential height (z500). Sites with a clear connection as determined by a panel of experts are marked with a Y. Sites where the mechanism was not clear are marked as uncertain (?). Sites where no correlation was observed are not shown.

	[Na+]			**Na^+ Flux**			**[SO_4^{2-}]**			**SO_4^{2-} Flux**			**xs [SO_4^{2-}]**			**xs SO_4^{2-} Flux**		
Site	**SIC**	**Wind**	**z500**	**SIC**	**Wind**	**z500**	**SIC**	**Wind**	**z500**	**SIC**	**Wind**	**z500**	**SIC**	**Wind**	**z500**	**SIC**	**Wind**	**z500**
B40	Y			Y			Y			Y			Y			Y		
Bouvet Island	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y			Y	Y	Y

Bruce Plateau	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	Y	Y	Y	Y	Y
cDML	Y	Y	Y	Y	Y	Y	Y						Y					
CWA_a_2013	?	?	Y		Y		Y	Y	Y	?	Y	Y	Y	Y	Y	Y	Y	Y
CWA_d_2013	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
DFS10							Y						Y					
DIR	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
DIV2010	Y	Y	Y	Y	Y	Y				Y	Y	?	Y			Y		
DML03C98_09(FB9809)	?	Y	Y	Y	Y	Y												
DML05	Y	Y	Y	Y	Y	Y		Y			Y	Y	Y	Y	Y	Y	Y	Y
DML07	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
DML15C98_14(FB9814)	Y		Y	Y	Y	Y												
DML17C98_33(B33)	Y	Y		Y		Y												
DSS0506		Y		Y	Y	Y												
DT401	Y	Y	Y				?	?	?				?	?	?			
Ferrigno	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y		Y	Y	Y
FIS_BI	Y						Y	Y	Y				Y	Y	Y			
FIS_KC	Y						Y	?	?				Y					
FIS_KM	Y	Y	Y				Y	Y					Y	Y				
FIS_S100	Y		Y	Y		Y	Y		Y	Y			Y			Y	Y	Y
Gomez		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
IC-06	Y	Y	Y	Y			Y	?					Y			?	?	
ITASE-00-1	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
ITASE-00-2		Y		Y			Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
ITASE-00-3		Y		Y		Y	Y			Y	Y	Y	Y	Y				
ITASE-00-4	Y	Y		Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
ITASE-00-5	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y		Y	Y	Y
ITASE-01-1	Y	Y		Y	Y		Y	Y	Y	Y	Y		Y		Y	Y	Y	
ITASE-01-2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	
ITASE-01-3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
ITASE-01-4	Y	Y	Y	Y	Y	Y	?	?	?				Y	Y	Y			
ITASE-01-5	Y	Y	Y	Y			Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
ITASE-01-6	Y	Y		Y	Y		Y	Y	Y				Y	Y				
ITASE-02-1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
ITASE-02-4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y

ITASE-02-5							Y	Y	Y									
ITASE-02-6	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
ITASE-02-7	Y	Y	Y	Y	Y	Y	Y	Y		?	?		Y	Y		Y		
ITASE-03-1	Y	Y	Y				Y	Y					Y	Y				
Jurassic	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			
LawDome_DSS				Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y		Y	Y
LGB69	Y						Y	Y					Y	Y				
MES2012 (IC)	Y	Y					Y	Y					Y	Y				
MES2012 (ICPMS)		Y	Y															
MI0910	Y						Y						Y					
Mount Johns	Y	Y		Y	?		Y			Y	Y	Y	Y			Y	Y	Y
NFL-1	Y	Y					Y	Y					Y	Y	?			
NUS07-1	Y	Y		Y	Y		Y			Y			Y	Y	Y	Y	Y	Y
NUS07-2	Y	Y		Y	Y			Y						Y			Y	
NUS07-7	Y	Y	Y	Y	Y	Y		Y	Y	?	Y	Y	Y	Y	Y	Y	Y	Y
NUS08-4	Y	Y		Y	Y								?	?	?		?	
NUS08-5	Y	Y		Y	Y		Y	Y			Y		?	Y	?	Y	Y	
NUS08-7	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
NVFL00	?	?	?				Y	Y	Y				Y	Y	Y			
NVFL-1	Y	Y	Y				Y	Y	Y				Y	Y	Y			
Palmer	Y	Y	Y	Y	Y	Y	Y	?	Y	Y	Y		?		Y	Y	Y	
PIG2010	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
PIG	Y	Y	Y	Y	Y	Y												
PV-10	Y							Y						Y				
Rendezvous	Y	Y	Y	Y	Y	Y	?			Y	Y		Y	Y	Y			
RIDS95A_2013	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
RIDS95B_2013	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
RIDS95C_2013	Y	Y	Y	Y	Y	Y					?						Y	
SCH2	Y	Y	Y		Y		Y			Y			Y			Y		
SDM1994_2013		Y		Y	Y	Y	Y	Y		Y	Y	Y	Y	Y		Y	Y	Y
SHIC	Y			?			Y						Y					
SKBL	Y			Y		Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y
SouthPole1995_2013	?	Y		Y	Y	Y	?	Y	?	?	Y	?	Y	Y	Y		Y	?

SP01	Y	Y		Y	Y	Y	Y	?	?	Y	Y		Y	Y	Y	Y	Y	?
SP04C5	Y	Y	Y	?	?	?		Y			?	?	Y	Y	Y	Y		
SP04C6	Y			?	?	?	?	Y		?	Y		Y	Y		Y	Y	
SPICE	Y	Y	Y	?	?	?							?	?	?	?	?	?
SW-80	Y												Y					
TA192A__Adelie_Land	?	?	?				Y	Y	Y				Y	Y	Y			
TD96							Y	Y	Y	Y	Y	Y						
THW2010	Y	Y	Y	Y	Y	Y	Y	Y		Y			Y	Y	Y	Y	Y	
THW	Y	Y	Y	Y	Y	Y												
UpC_2013				Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
vk55	Y	Y					?	?	?				Y	Y	Y			
VLG	Y	Y	Y				Y	Y	Y				Y	Y	Y			
W10k	?		Y				Y	Y	Y				Y		?			
WDC05Q	Y	Y	Y				Y	Y					Y	Y				
WDC06A	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
WHG (IC)							Y	?						Y				
WHG (ICPMS)	Y																	
H15	Y	Y					Y	Y	Y				Y	Y	Y			

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