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Supplement of

Overview and preliminary results of the Surface Ocean Aerosol Production (SOAP) campaign

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Voyage	Location	Date	Science focus	Observational framework	Summary publication
ACE-1	Sub-Antarctic 40-58°S 135-157°E	Nov-Dec 1995	Aerosol processes and production in the remote MBL	Shipboard biogeochemistry & processes coordinated, ground stations and over flight atmospheric sampling	Griffiths et al (1999)
GASEX - 98	Atlantic	May-June 1998	Direct & indirect estimates of KCO ₂ , and associated physical drivers & biogeochemistry	Lagrangian dual tracer study in algal bloom in warm core eddy	McGillis et al (2001)
ACSOE	N. Atlantic	June-July 1998	Trace gases, biogeochemistry and productivity	Lagrangian SF ₆ tracer in anti-cyclonic eddy	Jickells et al (2008)
DISCO	N. Sea	June 1999	Processes, rates and controls on marine DMS cycling	Lagrangian SF ₆ tracer in a coccolithophore bloom	Burkill et al (2002)
SAGE	S. W. Pacific sub-Antarctic	March-April 2004	The influence of iron addition on trace gas cycling and biogeochemistry, with estimates of K and physical processes	Lagrangian dual tracer study with iron addition in cyclonic eddy	Harvey et al (2010)
P2P	Offshore, Tasmania	2006	Secondary organic aerosol, MBL nucleation, coastal macroalgae, iodine	Cape Grim station based with offshore coastal vessel measurements	Cainey et al (2007)
DOGEE-SOLAS	N. Atlantic	June-July 2007	Parameterizing the gas exchange by constraining K and its physical controls	Artificial surfactant release in 3 Lagrangian dual tracer experiments	Salter et al (2011)
GASEX III	Southern Ocean	Feb-April 2008	K and air-sea CO ₂ flux estimation, including physical controls and some biogeochemistry	2 Lagrangian dual tracer studies	Ho et al (2011)
ACSOS	Arctic	Aug-Sept 2008	Formation and life cycle of low-level Arctic clouds; the interaction with the sea ice and ocean and associated physical, chemical, and biological processes	Repeat regional shipborne transects, complemented by on-ice & airborne measurements	Tjernström et al (2014)
VAMOS	S.E. Pacific	Oct-Nov 2008	Determine links between aerosols, clouds and precipitation and impacts on stratocumulus radiative properties, and the physical and chemical couplings between the upper ocean and the lower atmosphere	Airborne & shipborne platforms complemented by fixed coastal sites & moorings	Wood et al (2011)
SIPEX(II)	Australian Antarctic Sector	Sep-Nov 2011	Biogeochemical processes and aerosol associated with sea-ice	East Antarctic pack ice (south of 61.5 S, between 112 and 122 E)	Vancoppenolle et al 2013; Humphries et al 2016

SOAP	S. W. Pacific Frontal waters	Feb 2011 & March-April 2012	Determine the physical and biogeochemical controls of k, DMS and CO ₂ fluxes, and also on aerosol & MBL composition	Lagrangian drifter study of 3 different phytoplankton blooms	This paper
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Table S1. Selected related multidisciplinary studies of air-sea interaction related to the SOAP campaign.

References

- Burkill PH, Archer SD, Robinson C, Nightingale PD, Groom SB, Tarran GA, Zubkov MV. Dimethyl sulphide biogeochemistry within a coccolithophore bloom (DISCO): an overview. *Deep Sea Research Part II: Topical Studies in Oceanography* 49(15): 2863-2885. 2002.
- Cainey JM, Keyword M, Grose MR, Krummel P, Galbally IE, Johnston P, Gillett RW, Meyer M, Fraser P, Steele P, Harvey M, Kreher K, Stein T, Ibrahim O, Ristovski ZD, Johnson G, Fletcher CA, Bigg EK, Gras JL. Precursors to Particles (P2P) at Cape Grim 2006: Campaign Overview, Environmental Chemistry, 4:143-150, doi:10.1071/EN07041, 2007.
- Griffiths FB, Bates TS, Quinn PK, Clementson LA, Parslow JS. Oceanographic context of the First Aerosol Characterization Experiment (ACE 1): A physical, chemical, and biological overview. *Journal of Geophysical Research: Atmospheres*, 104(D17): 21649-21671. 1999.
- Harvey MJ, Law CS, Smith MJ, Hall JA, Abraham ER, Stevens C, Hadfield M, Ho DT, Ward B, Archer SD, Cainey J, Currie K, Devries D, Ellwood M, Hill P, Jones GB, Katz D, Kuparinen J, Macaskill B, Main W, Marriner A, McGregor J, McNeil C, Minnett PJ, Nodder S, Peloquin J, Pickmere S, Pinkerton M, Safi K, Thompson R, Walkington M, Wright SW, Ziolkowski L. The SOLAS Air-Sea Gas Exchange Experiment (SAGE) 2004. *Deep-Sea Res II*, 58:753-763. 2011.
- Ho DT, Sabine CL, Hebert D, Ullman DS, Wanninkhof R, Hamme RC, Strutton PG, Hales B, Edson JB, Hargreaves BR. Southern Ocean Gas Exchange Experiment: Setting the Stage. *J. Geophys. Res.*, 116, C00F08, doi:10.1029/2010JC006852. 2011.
- Humphries RS, Klekociuk, AR, Schofield, R, Keyword, M, Ward, J, and Wilson, SR. Unexpectedly high ultrafine aerosol concentrations above East Antarctic sea ice, *AtmosChemPhys*, 16, 2185-2206, doi:105194/acp-16-2185-2016. 2016.
- Jickells TD, Liss PS, Broadgate W, Turner S, Kettle AJ, Read J, Baker J, Cardenas LM, Carse F, Hamren-Larssen M, Spokes L, Steinke M, Thompson A, Watson AJ, Archer SD, Bellerby RGJ, Law CS, Nightingale PD, Liddicoat MI, Widdicombe CE, Bowie A, Gilpin LC, Moncoiffé G, Savidge G, Preston T,

Hadziabdic P, Frost T, Upstill-Goddard RC, Pedrós-Alió C, Simó R, Jackson A, Allen A, DeGrandpre. Lagrangian biogeochemical study of an eddy in the North East Atlantic, *Prog. Oceanography* 76:366–398. 2008.

McGillis WR, Edson JB, Ware JD, Dacey JW, Hare JE, Fairall CW, Wanninkhof R. Carbon dioxide flux techniques performed during GasEx-98. *Marine Chemistry* 75(4):267-80. 2001.

Salter ME, Upstill-Goddard RC, Nightingale PD, Archer SD, Blomquist B, Ho DT, Huebert B, Schlosser P, Yang M. Impact of an artificial surfactant release on air-sea gas fluxes during Deep Ocean Gas Exchange Experiment II. *Journal of Geophysical Research: Oceans* 116, C11. 2011

Tjernström M, Leck C, Birch CE, Bottenheim JW, Brooks BJ, Brooks IM, Bäcklin L, Chang RW, de Leeuw G, Di Liberto L, De La Rosa S. The Arctic Summer Cloud Ocean Study (ASCOS): overview and experimental design. *Atmospheric Chemistry and Physics*. 14(6):2823-69. 2014.

Wood R, Mechoso CR, Bretherton CS, Weller RA, Huebert B, Straneo F, Albrecht BA, Coe H, Allen G, Vaughan G, Daum P. The VAMOS ocean-cloud-atmosphere-land study regional experiment (VOCALS-REx): goals, platforms, and field operations. *Atmospheric Chemistry and Physics* 11(2):627-54. 2011.

Vancoppenolle M, Meiners KM, Michel C, Bopp L, Brabant F, Carnat G, Delille B, Lannuzel D, Madec G, Moreau S, Tison J-L, van der Merwe, P. Role of sea ice in global biogeochemical cycles: emerging views and challenges, *Quaternary Science Reviews*, 79:207-230. 2013.

Station	NZST Date	NZST Time	Latitude	Longitude	SST (°C)	Salinity	MLD (m)	Chl-a (mg m ⁻³)	Nitrate (umol L ⁻¹)	Location
7502	15-Feb-12	9:00	-44.608	174.773	13.92	34.43	14.2	1.02	5.91	B1
7503	16-Feb-12	9:28	-44.583	174.700	14.44	34.49	13.33	0.68	5.56	B1
7504	17-Feb-12	9:14	-44.550	174.712	14.99	34.56	14.35	1.08	4.02	B1
7505	18-Feb-12	9:19	-44.574	174.736	n/a	n/a	14.35	0.52	0.11	B1
7506	19-Feb-12	7:34	-44.336	175.243	14.68	34.44	16	0.88	5.86	North of B1
7507	20-Feb-12	7:21	-45.960	173.645	13.58	34.40	22.94	0.74	3.77	S.W. station
7508	21-Feb-12	7:02	-43.741	176.965	15.12	34.61	22.95	0.65	1.26	Enroute to E
7509	21-Feb-12	17:20	-43.483	179.114	15.88	34.77	21.8	0.28	<0.07	East of B2
7510	22-Feb-12	9:22	-43.717	180.157	15.88	34.65	21.12	1.39	0.08	B2
7511	22-Feb-12	13:28	-43.597	180.179	15.90	34.66	21.12	n/a	n/a	B2
7512	22-Feb-12	18:01	-43.627	180.208	16.34	34.64	14.25	n/a	n/a	B2
7513	23-Feb-12	7:17	-43.710	180.238	15.72	34.56	18.96	0.58	2.62	B2
7514	23-Feb-12	9:43	-43.699	180.228	15.65	34.55	18.24	0.55	2.50	B2
7515	23-Feb-12	12:06	-43.691	180.257	15.92	34.64	24.91	0.64	0.47	B2
7516	23-Feb-12	17:14	-43.641	180.247	15.53	34.60	38.89	0.53	1.56	B2
7517	24-Feb-12	7:03	-43.667	180.236	15.56	34.58	38.89	0.61	1.32	B2
7518	24-Feb-12	15:17	-43.601	180.235	15.73	34.65	11.23	0.48	1.15	B2
7519	25-Feb-12	9:26	-43.557	180.316	15.44	34.56	29.23	0.67	2.86	B2
7520	25-Feb-12	14:31	-43.630	180.260	15.59	34.55	26.92	0.63	2.92	B2
7521	26-Feb-12	6:55	-43.963	180.692	15.77	34.78	25	0.51	0.13	South of B2
7522	27-Feb-12	15:28	-44.112	175.475	14.70	34.51	28.93	0.44	3.94	NE B3a
7523	28-Feb-12	7:25	-44.491	174.850	14.24	34.53	30.9	0.39	2.21	B3 a
7524	28-Feb-12	13:10	-44.542	174.873	14.36	34.49	29.46	0.29	4.40	B3 a
7525	29-Feb-12	8:52	-44.607	174.870	14.19	34.49	27.03	0.44	4.42	B3 a
7526	29-Feb-12	13:03	-44.545	174.883	14.39	34.50	27.03	n/a	n/a	B3 a
										Storm
7527	2-Mar-12	7:58	-44.191	174.925	13.62	34.52	39.07	0.42	5.28	B3 b
7528	2-Mar-12	14:57	-44.192	174.927	13.71	34.54	44.79	0.45	2.93	B3 b
7529	3-Mar-12	7:42	-44.759	174.640	13.27	34.38	30.72	0.61	5.34	B3 b
7530	3-Mar-12	14:45	-44.781	174.652	13.03	34.39	44.11	0.49	5.49	B3 b
7531	4-Mar-12	9:26	-44.243	174.523	12.88	34.50	49.55	0.74	3.86	B3 b
7532	4-Mar-12	15:23	-44.243	174.522	12.83	34.48	39.51	1.01	3.81	B3 b
7533	5-Mar-12	9:57	-44.191	174.307	12.79	34.50	40.14	0.97	2.84	B3 b

Supplementary Table 2. SOAP CTD station information, including surface water characteristics. Individual bloom occupation is indicated by the different colours. SST: Sea Surface Temperature; MLD: Surface Mixed layer depth; Chl-*a*: Chlorophyll-*a*.