Potential source areas for atmospheric lead reaching Ny-Ålesund from 2010 to 2018

Andrea Bazzano[1]*, Stefano Bertinetti[1], Francisco Ardini[1], David Cappelletti[2] and Marco Grotti[1]

[1] Department of Chemistry and Industrial Chemistry, University of Genoa, via Dodecaneso 31, 16146, Genoa, Italy
[2] Department of Chemistry, Biology and Biotechnologies, University of Perugia, Via Elce Di Sotto 8, 06123, Perugia, Italy
* corresponding author: andrea.bazzano@edu.unige.it, orcid id: https://orcid.org/0000-0002-9353-3919

Supplementary material

The entire data analysis and figures presented in sections 3.1–3.4 are available as R script both on Zenodo at https://doi.org/10.5281/zenodo.4484122 and on GitHub at https://github.com/andreabz/psa_pb_ny-alesund.

Table S1. Pb concentration (pg/m^3), enrichment factors (EFs) and Pb isotope ratio values for PM_{10} samples collected at Ny-Ålesund from 2010 to 2018. The entire dataset is available in electronic format at https://doi.org/10.5281/zenodo.4484136.

ID	Sampling date	Volume (m^3)	Pb (pg/m^3)	EF(Pb/Al)$_c$	^{208}Pb/^{206}Pb	U (95%-conf)	^{207}Pb/^{206}Pb	U (95%-conf)
01-10	2010-03-16	1062.68	122.1	370	2.106	0.006	0.862	0.002
02-10	2010-03-20	1582.75	8.9	63	2.108	0.008	0.869	0.003
03-10	2010-03-23	1004.71	441.9	255	2.102	0.005	0.864	0.002
04-10	2010-03-27	1016.6	173.8	82	2.106	0.005	0.865	0.002
05-10	2010-03-31	826.14	1428.1	183	2.097	0.006	0.863	0.002
06-10	2010-04-08	1073.51	150.9	53	2.104	0.005	0.865	0.002
07-10	2010-04-12	1053.19	59.4	19	2.103	0.005	0.862	0.001
08-10	2010-04-16	739.76	71.8	21	2.105	0.004	0.863	0.001
09-10	2010-04-22	348.84	44.9	32	2.087	0.008	0.863	0.003
10-10	2010-04-24	1042.69	38.3	60	2.100	0.008	0.864	0.004
11-10	2010-04-28	1052.68	68.2	34	2.101	0.006	0.864	0.002
12-10	2010-05-02	2081.14	100.9	31	2.101	0.004	0.863	0.002
13-10	2010-05-10	2178.91	42.4	38	2.105	0.006	0.863	0.001
14-10	2010-05-18	1097.84	98.8	41	2.110	0.004	0.863	0.002
17-10	2010-06-17	1148.89	<4.5	-	-	-	-	-
18-10	2010-06-22	1047.04	<4.5	-	-	-	-	-
19-10	2010-06-26	1031.11	17.3	7	2.086	0.007	0.860	0.005
20-10	2010-06-30	1002.89	84.3	9	2.095	0.006	0.853	0.003
21-10	2010-07-04	1302.86	13.5	2	2.078	0.009	0.851	0.004
22-10	2010-07-09	1329.44	6.1	11	2.084	0.012	0.859	0.003
23-10	2010-07-14	1267.92	10.7	2	2.061	0.008	0.845	0.003
24-10	2010-07-19	1316.31	52.8	174	2.092	0.007	0.853	0.002
25-10	2010-07-24	1319.02	17.6	24	2.076	0.004	0.856	0.001
26-10	2010-07-29	1041.54	<4.5	-	-	-	-	-
27-10	2010-08-02	445.29	31.6	17	2.078	0.012	0.852	0.004
29-10	2010-08-08	1348.79	5.3	4	2.085	0.005	0.859	0.003
30-10	2010-08-14	1323.73	17.3	26	2.092	0.005	0.860	0.003
31-10	2010-08-19	425.35	62.5	27	2.057	0.008	0.842	0.002
32-10	2010-08-24	928.35	14	13	2.079	0.007	0.857	0.004
33-10	2010-08-28	1061.56	<4.5	-	-	-	-	-
34-10	2010-09-01	1009.39	6.6	-	-	-	-	-
35-10	2010-09-05	960	<4.5	-	-	-	-	-
36-10	2010-09-13	445.03	43.5	23	2.101	0.006	0.859	0.004
01-11	2011-03-29	1148.88	555.1	183	2.109	0.003	0.865	0.001
02-11	2011-04-03	956.87	163.2	60	2.103	0.008	0.864	0.003
03-11	2011-04-07	1008.58	126.2	63	2.116	0.005	0.870	0.002
04-11	2011-04-11	1294.32	<4.5	-	2.098	0.005	0.860	0.002

ID	Sampling date	Volume (m^3)	Pb (pg/m^3)	$EF(Pb/Al)_c$	$^{208}Pb/^{206}Pb$	U (95%-conf)	$^{207}Pb/^{206}Pb$	U (95%-conf)
09-11	2011-05-01	787.44	88.1	81	2.099	0.004	0.862	0.002
10-11	2011-05-05	786.05	113.8	54	2.102	0.004	0.865	0.001
11-11	2011-05-09	805.96	44.1	39	2.097	0.005	0.863	0.003
12-11	2011-05-13	790.35	95.4	46	2.107	0.007	0.864	0.003
13-11	2011-05-17	761.33	74.6	16	2.109	0.008	0.863	0.003
14-11	2011-05-21	791.53	60.4	24	2.105	0.007	0.861	0.003
15-11	2011-05-25	756.53	42.3	27	2.094	0.006	0.865	0.003
16-11	2011-05-29	861.66	27.3	16	2.097	0.006	0.870	0.002
17-11	2011-06-05	803.32	21.4	43	2.088	0.011	0.866	0.003
18-11	2011-06-09	776.37	18.8	13	2.099	0.008	0.862	0.005
19-11	2011-06-13	776.02	91.9	20	2.102	0.006	0.864	0.003
20-11	2011-06-17	768.09	39.6	-	-	-	-	-
21-11	2011-06-21	772.73	<4.5	-	-	-	-	-
22-11	2011-06-25	591.2	11.2	-	-	-	-	-
23-11	2011-06-29	764.76	9.9	-	-	-	-	-
24-11	2011-07-03	771.7	11.1	18	2.098	0.007	0.86	0.003
25-11	2011-07-07	775.62	22.8	22	2.093	0.008	0.86	0.003
26-11	2011-07-10	NA	<4.5	-	-	-	-	-
27-11	2011-07-15	763.59	<4.5	-	-	-	-	-
28-11	2011-07-19	766.87	19	-	-	-	-	-
29-11	2011-07-23	760.57	26.8	43	2.098	0.008	0.862	0.003
08-12	2012-04-21	1090.68	52	80	2.108	0.005	0.864	0.003
09-12	2012-04-25	1132.36	65.8	95	2.106	0.006	0.863	0.004
10-12	2012-04-29	1098.59	61	73	2.103	0.005	0.864	0.003
11-12	2012-05-03	1083.1	50.6	82	2.113	0.007	0.863	0.005
12-12	2012-05-07	1059.76	51.3	47	2.113	0.005	0.864	0.005
14-12	2012-05-15	1087.72	121	36	2.102	0.006	0.859	0.003
15-12	2012-05-19	1051.59	71.4	33	2.107	0.004	0.861	0.004
16-12	2012-05-23	997.82	72.3	52	2.099	0.006	0.860	0.004
17-12	2012-05-27	1091.42	29.3	27	2.107	0.008	0.860	0.005
18-12	2012-05-31	1040.93	39.9	23	2.109	0.009	0.864	0.005
19-12	2012-06-04	1054.97	45.4	39	2.106	0.007	0.861	0.003
20-12	2012-06-08	1092.18	22.8	41	2.107	0.009	0.863	0.005
21-12	2012-06-12	998.35	26.1	32	2.108	0.008	0.863	0.005
22-12	2012-06-16	1016.03	30.8	124	2.110	0.008	0.865	0.006
23-12	2012-06-20	1013.04	7	33	2.107	0.012	0.865	0.005
24-12	2012-06-24	1011.73	<4.5	-	-	-	-	-
25-12	2012-06-28	1026.34	14.9	130	2.094	0.013	0.859	0.008
26-12	2012-07-02	1003.29	29.9	57	2.092	0.007	0.856	0.005
27-12	2012-07-06	1037.11	5.3	5	2.091	0.027	0.852	0.01
28-12	2012-07-10	1026.3	118.2	73	2.078	0.005	0.851	0.003
29-12	2012-07-14	1029.54	28.8	49	2.092	0.005	0.857	0.004
30-12	2012-07-18	1004.2	15.4	11	2.099	0.011	0.860	0.005
31-12	2012-07-22	1039.81	35.5	71	2.077	0.005	0.851	0.005
32-12	2012-07-26	1045.77	24	15	2.099	0.008	0.860	0.007
33-12	2012-07-30	1098.77	44.2	67	2.098	0.004	0.860	0.003
34-12	2012-08-03	1075.06	32.7	-	2.102	0.007	0.865	0.002
35-12	2012-08-07	1074.2	45.8	115	2.090	0.007	0.857	0.003
36-12	2012-08-11	919.08	<4.5	-	-	-	-	-
37-12	2012-08-15	1088.64	24.5	54	2.071	0.01	0.852	0.005
39-12	2012-08-23	1074.06	<4.5	-	-	-	-	-
40-12	2012-08-27	1073.32	41.4	141	2.090	0.011	0.858	0.005
41-12	2012-08-31	1082.66	11.1	37	2.082	0.022	0.857	0.01
42-12	2012-09-04	1062.7	<4.5	-	-	-	-	-
01-13	2013-05-01	803.19	42.6	51	2.105	0.007	0.863	0.002
02-13	2013-05-05	1083.26	82.8	63	2.107	0.003	0.863	0.002
03-13	2013-05-09	1071.76	6.7	-	2.084	0.011	0.863	0.009

ID	Sampling date	Volume (m^3)	Pb (pg/m^3)	$EF(Pb/Al)_c$	$^{208}Pb/^{206}Pb$	U (95%-conf)	$^{207}Pb/^{206}Pb$	U (95%-conf)
04-13	2013-05-13	1053.42	19.8	31	2.099	0.010	0.860	0.003
05-13	2013-05-17	1071.53	24.3	23	2.095	0.009	0.862	0.003
06-13	2013-05-21	1052.71	21.8	42	2.106	0.004	0.866	0.002
07-13	2013-05-25	1059.05	26	17	2.106	0.006	0.862	0.003
08-13	2013-05-29	1091.41	20.1	55	2.099	0.006	0.866	0.002
10-13	2013-06-06	1083.81	26.3	10	2.092	0.008	0.857	0.001
11-13	2013-06-10	1080.93	15.6	26	2.104	0.009	0.865	0.004
12-13	2013-06-14	1082.13	<4.5	-	-	-	-	-
13-13	2013-06-18	1098.8	32.1	200	2.072	0.003	0.845	0.002
14-13	2013-06-22	1073.29	6.2	-	2.101	0.004	0.873	0.008
15-13	2013-06-26	1081.78	16.8	40	2.107	0.005	0.865	0.004
16-13	2013-06-30	1092.9	30.7	145	2.101	0.006	0.866	0.004
17-13	2013-07-04	1081.03	32.4	91	2.090	0.007	0.856	0.003
18-13	2013-07-08	1081.96	<4.5	-	-	-	-	-
19-13	2013-07-12	1078.63	25.2	8	2.094	0.006	0.860	0.003
20-13	2013-07-16	1078.31	14.5	3	2.098	0.007	0.864	0.005
21-13	2013-07-20	1081.95	6.7	27	2.095	0.011	0.864	0.006
22-13	2013-07-24	1090.07	<4.5	-	-	-	-	-
25-13	2013-08-05	1080.18	7	28	2.062	0.009	0.847	0.003
27-13	2013-08-13	1080.43	<4.5	-	-	-	-	-
28-13	2013-08-17	1089.15	87	443	2.107	0.004	0.873	0.002
29-13	2013-08-21	1099.04	<4.5	-	-	-	-	-
31-13	2013-08-29	1083.41	<4.5	-	-	-	-	-
32-13	2013-09-02	1082.28	14.9	26	2.103	0.009	0.869	0.004
33-13	2013-09-06	1082.42	6.2	4	2.101	0.012	0.866	0.004
34-13	2013-09-10	784.58	24	-	2.057	0.007	0.839	0.002
01-14	2014-03-31	796.76	88.5	68	2.105	0.005	0.864	0.002
02-14	2014-04-04	817.68	72.1	111	2.105	0.002	0.863	0.001
03-14	2014-04-08	799.46	<4.5	-	2.103	0.004	0.863	0.002
04-14	2014-04-12	799.12	85.8	97	2.109	0.003	0.863	0.002
05-14	2014-04-16	806.6	188.1	-	2.113	0.004	0.866	0.002
06-14	2014-04-20	772.74	307.3	135	2.107	0.003	0.865	0.002
07-14	2014-04-24	783.87	109.8	135	2.102	0.007	0.863	0.002
08-14	2014-04-28	799.59	81.3	53	2.102	0.005	0.861	0.002
09-14	2014-05-02	861.65	62.9	195	2.104	0.004	0.864	0.003
10-14	2014-05-07	821.06	51.6	29	2.100	0.006	0.861	0.003
11-14	2014-05-11	788.8	41	56	2.115	0.005	0.870	0.002
12-14	2014-05-15	838.49	68.7	44	2.106	0.004	0.863	0.001
13-14	2014-05-19	801.65	36.6	7	2.103	0.008	0.868	0.003
14-14	2014-05-23	801.73	65.3	7	2.100	0.005	0.854	0.003
15-14	2014-05-27	802.98	30.3	35	2.098	0.012	0.857	0.006
16-14	2014-05-31	792.31	12.6	62	2.110	0.009	0.864	0.003
17-14	2014-06-04	814.58	75.1	156	2.107	0.003	0.867	0.002
18-14	2014-06-08	799.12	17	47	2.091	0.009	0.864	0.004
19-14	2014-06-12	810.67	15.3	-	-	-	-	-
20-14	2014-06-16	799.85	11.1	-	2.114	0.006	0.867	0.002
21-14	2014-06-20	805.91	34.9	10	2.101	0.009	0.871	0.004
22-14	2014-06-24	804.64	<4.5	-	-	-	-	-
23-14	2014-06-28	861.69	26.6	3	2.049	0.008	0.837	0.003
24-14	2014-07-03	814.61	11	14	2.092	0.010	0.855	0.005
25-14	2014-07-07	792.08	24.5	16	2.072	0.010	0.852	0.006
26-14	2014-07-12	454.1	66.9	476	2.072	0.008	0.850	0.004
27-14	2014-07-17	811.22	43.2	415	2.110	0.005	0.868	0.003
28-14	2014-07-21	818.24	18.3	18	2.099	0.007	0.863	0.004
29-14	2014-07-25	810.25	<4.5	-	-	-	-	-
30-14	2014-07-29	813.75	<4.5	-	-	-	-	-
31-14	2014-08-02	794.5	8.7	25	2.095	0.018	0.860	0.007

ID	Sampling date	Volume (m^3)	Pb (pg/m^3)	$EF(Pb/Al)_c$	$^{208}Pb/^{206}Pb$	U (95%-conf)	$^{207}Pb/^{206}Pb$	U (95%-conf)
32-14	2014-08-06	816.95	14.1	19	2.075	0.014	0.848	0.005
33-14	2014-08-10	811.79	13.6	13	2.081	0.010	0.854	0.005
34-14	2014-08-18	801.84	<4.5	-	-	-	-	-
35-14	2014-08-22	814.68	12.5	48	2.081	0.009	0.856	0.005
36-14	2014-08-26	707.32	23.5	24	2.097	0.010	0.860	0.005
37-14	2014-08-30	817.99	61.5	134	2.095	0.005	0.860	0.002
38-14	2014-09-03	830.1	<4.5	-	-	-	-	-
39-14	2014-09-07	772.85	<4.5	-	-	-	-	-
01-15	2015-02-28	790.33	82	59	2.100	0.006	0.863	0.004
02-15	2015-03-04	781.96	11.8	176	2.076	0.014	0.855	0.01
03-15	2015-03-08	774.24	48.9	349	2.100	0.007	0.867	0.003
04-15	2015-03-12	793.24	358.1	355	2.111	0.004	0.864	0.002
05-15	2015-03-16	798.81	185.3	233	2.107	0.004	0.862	0.002
06-15	2015-03-20	804.22	125	132	2.087	0.004	0.862	0.002
07-15	2015-03-24	799.4	121.4	138	2.087	0.003	0.861	0.002
08-15	2015-03-28	792.52	73.8	116	2.095	0.005	0.865	0.002
09-15	2015-04-01	813.64	141.7	52	2.10	0.004	0.857	0.002
10-15	2015-04-05	802.53	520.5	144	2.113	0.006	0.867	0.002
11-15	2015-04-09	809.16	514.8	512	2.101	0.005	0.865	0.003
12-15	2015-04-13	829.4	505.3	413	2.103	0.005	0.862	0.003
13-15	2015-04-17	818.13	20.1	82	2.101	0.011	0.861	0.005
14-15	2015-04-21	814.81	16.9	49	2.095	0.010	0.862	0.005
15-15	2015-04-25	820.35	20.9	45	2.093	0.009	0.862	0.006
16-15	2015-04-29	813.8	29.8	33	2.086	0.009	0.857	0.004
17-15	2015-05-03	823.41	17.5	38	2.087	0.015	0.857	0.006
18-15	2015-05-07	814.88	17.6	26	2.088	0.010	0.856	0.005
19-15	2015-05-11	809.78	13.5	51	2.086	0.010	0.858	0.006
20-15	2015-05-15	809.52	5.4	24	2.120	0.014	0.867	0.01
21-15	2015-05-19	807.75	26.1	42	2.085	0.006	0.855	0.004
22-15	2015-05-23	814.18	29.3	46	2.072	0.006	0.853	0.002
13-15	2015-05-27	816.16	29.8	37	2.091	0.007	0.858	0.004
24-15	2015-05-31	807.14	18.8	17	2.059	0.013	0.845	0.01
25-15	2015-06-04	808.27	4.5	11	2.088	0.011	0.854	0.006
26-15	2015-06-08	804.09	5.6	10	2.072	0.012	0.849	0.008
27-15	2015-06-12	809.83	13	4	2.069	0.009	0.849	0.005
28-15	2015-06-16	809.55	12.4	12	2.095	0.014	0.861	0.009
29-15	2015-06-20	805.57	32.3	72	2.065	0.009	0.842	0.005
30-15	2015-06-24	812.34	7.4	19	2.053	0.009	0.844	0.006
31-15	2015-06-28	809.95	6.1	21	2.073	0.017	0.855	0.007
32-15	2015-07-02	813.26	15.7	103	2.073	0.009	0.851	0.004
33-15	2015-07-06	807.97	6.2	9	2.062	0.008	0.841	0.005
34-15	2015-07-10	810.35	30.5	11	2.081	0.009	0.853	0.005
35-15	2015-07-14	811.86	6.2	10	2.079	0.010	0.860	0.006
36-15	2015-07-18	807.64	3.5	9	2.081	0.017	0.861	0.009
37-15	2015-07-22	812.89	3.5	14	2.065	0.015	0.848	0.010
38-15	2015-07-26	809.79	27.4	211	2.082	0.017	0.85	0.009
39-15	2015-07-30	811.55	12.7	20	2.095	0.013	0.856	0.005
40-15	2015-08-03	803	13.2	16	2.054	0.009	0.846	0.005
41-15	2015-08-07	810.61	5.1	22	2.064	0.016	0.85	0.008
42-15	2015-08-11	792.37	8.6	15	2.073	0.020	0.843	0.012
43-15	2015-08-15	809.02	8.5	31	2.113	0.018	0.866	0.009
44-15	2015-08-19	810.54	2.9	20	2.080	0.018	0.850	0.010
45-15	2015-08-23	818.81	4.3	38	2.109	0.026	0.864	0.017
46-15	2015-08-27	819.92	7.1	26	2.079	0.015	0.858	0.007
47-15	2015-08-31	809.93	2.8	9	2.073	0.021	0.844	0.012
48-15	2015-09-04	810.22	5.1	15	2.072	0.017	0.845	0.008
49-15	2015-09-08	604.14	10.8	8	2.072	0.014	0.844	0.009

ID	Sampling date	Volume (m^3)	Pb (pg/m^3)	EF$(Pb/Al)_c$	$^{208}Pb/^{206}Pb$	U (95%-conf)	$^{207}Pb/^{206}Pb$	U (95%-conf)
50-15	2015-09-12	812.5	19.5	32	2.086	0.009	0.862	0.006
51-15	2015-09-16	809.78	128.3	36	2.089	0.005	0.848	0.004
52-15	2015-09-20	578.63	9.3	3	2.077	0.014	0.851	0.008
53-15	2015-09-24	807.74	91.6	883	2.099	0.008	0.864	0.004
54-15	2015-09-28	804.16	7.5	12	2.089	0.018	0.856	0.011
55-15	2015-10-02	809.98	9.2	8	2.094	0.010	0.852	0.004
56-15	2015-10-06	741.24	14.4	61	2.096	0.014	0.864	0.010
57-15	2015-10-10	782.29	27	21	2.082	0.008	0.848	0.004
58-15	2015-10-14	779.42	6.6	22	2.075	0.018	0.852	0.012
01-16	2016-03-04	774.77	37.5	NA	2.070	0.005	0.848	0.001
02-16	2016-03-08	770.62	15.7	135	2.103	0.005	0.865	0.003
03-16	2016-03-12	777.31	1.5	10	2.103	0.008	0.870	0.004
04-16	2016-03-16	784.08	35.3	45	2.081	0.002	0.855	0.001
05-16	2016-03-20	798.53	263.5	120	2.100	0.002	0.862	0.001
06-16	2016-03-24	782.44	510.1	282	2.092	0.002	0.856	0.001
07-16	2016-03-28	796.63	80.6	93	2.099	0.003	0.862	0.002
08-16	2016-04-03	861.65	57.7	26	2.094	0.003	0.859	0.001
09-16	2016-04-08	708.22	73.7	130	2.099	0.003	0.862	0.003
10-16	2016-04-12	709.85	97.6	46	2.099	0.004	0.861	0.002
11-16	2016-04-16	731.93	85.2	66	2.100	0.003	0.862	0.001
12-16	2016-04-20	747.67	52.2	78	2.095	0.001	0.858	0.001
13-16	2016-04-24	728.43	42.8	41	2.099	0.004	0.861	0.002
14-16	2016-04-28	820.83	49.3	50	2.100	0.006	0.862	0.001
15-16	2016-05-02	824.39	12.2	51	2.098	0.004	0.863	0.004
16-16	2016-05-06	806.5	<1.0	-	-	-	-	-
17-16	2016-05-10	817.54	16.1	36	2.076	0.004	0.853	0.002
18-16	2016-05-14	757.41	7.8	68	2.109	0.004	0.870	0.002
19-16	2016-05-18	301.55	29.6	35	2.111	0.006	0.865	0.005
04-17	2017-03-01	773.89	135.9	304	2.101	0.002	0.871	0.001
05-17	2017-03-05	861.61	77.1	113	2.108	0.004	0.867	0.002
06-17	2017-03-10	775.83	170.5	120	2.100	0.002	0.865	0.001
07-17	2017-03-22	790.84	298.7	300	2.103	0.003	0.865	0.001
08-17	2017-03-26	762.34	386.8	160	2.105	0.003	0.865	0.002
09-17	2017-03-30	809.45	520.9	229	2.102	0.002	0.865	0.002
10-17	2017-04-03	802.64	241.1	178	2.106	0.001	0.868	0.001
11-17	2017-04-07	793.91	124.9	130	2.096	0.002	0.864	0.002
12-17	2017-04-11	813.72	577.3	455	-	-	-	-
13-17	2017-04-15	788.77	252.5	109	2.102	0.002	0.864	0.002
14-17	2017-04-19	776.94	158.7	69	2.085	0.005	0.859	0.003
15-17	2017-04-23	774.28	67.3	46	2.101	0.003	0.861	0.002
16-17	2017-04-27	785.51	39.5	58	2.099	0.004	0.856	0.001
17-17	2017-05-01	757.91	117.8	147	2.096	0.003	0.867	0.002
18-17	2017-05-05	782.42	72.5	50	2.100	0.002	0.861	0.003
19-17	2017-05-09	794.33	163.5	65	2.110	0.002	0.873	0.002
20-17	2017-05-13	794.05	80.3	48	2.103	0.003	0.862	0.004
21-17	2017-05-17	780.74	63.9	36	2.088	0.006	0.857	0.003
22-17	2017-05-21	791.01	18	27	2.101	0.004	0.863	0.004
23-17	2017-05-25	784.84	26.9	21	2.096	0.004	0.860	0.002
24-17	2017-05-29	796.33	46.1	13	2.097	0.003	0.854	0.002
25-17	2017-06-02	781.23	45.2	20	2.099	0.002	0.854	0.003
26-17	2017-06-06	796.67	153.3	73	2.108	0.005	0.874	0.002
27-17	2017-06-10	792.23	24	61	-	-	-	-
28-17	2017-06-14	778.48	9.4	33	2.099	0.004	0.861	0.003
29-17	2017-06-18	794.71	9.7	21	2.117	0.007	0.863	0.005
30-17	2017-06-22	782.42	11.2	22	2.107	0.006	0.859	0.002
31-17	2017-06-28	790.19	39.8	88	2.100	0.002	0.865	0.002
32-17	2017-06-30	796.33	2.4	5	2.104	0.012	0.859	0.004

ID	Sampling date	Volume (m^3)	Pb (pg/m^3)	$EF(Pb/Al)_c$	$^{208}Pb/^{206}Pb$	U (95%-conf)	$^{207}Pb/^{206}Pb$	U (95%-conf)
33-17	2017-07-04	811.22	<1.0	-	-	-	-	-
34-17	2017-07-08	796.61	1.1	10	2.107	0.007	0.859	0.011
35-17	2017-07-12	787.93	17.2	20	-	-	-	-
36-17	2017-07-16	801.73	11.8	13	2.079	0.006	0.841	0.003
37-17	2017-07-20	806.11	7.4	16	-	-	-	-
38-17	2017-07-24	796.41	3.9	5	-	-	-	-
39-17	2017-07-28	794.16	10.7	3	-	-	-	-
40-17	2017-08-01	792.14	5.8	4	2.092	0.004	0.86	0.004
41-17	2017-08-05	800.6	2.7	9	2.114	0.019	0.862	0.005
42-17	2017-08-09	815.77	5.7	6	2.090	0.003	0.859	0.002
43-17	2017-08-13	772.28	2.8	3	-	-	-	-
44-17	2017-08-17	789.26	<1.0	-	-	-	-	-
45-17	2017-08-21	794.37	1.3	4	2.069	0.012	0.857	0.004
46-17	2017-08-25	801.04	4.7	5	2.071	0.006	0.854	0.004
47-17	2017-08-29	795.51	5.1	5	-	-	-	-
48-17	2017-09-02	795.15	18.8	32	2.099	0.006	0.864	0.004
49-17	2017-09-06	776.42	138.7	80	-	-	-	-
50-17	2017-09-10	791.37	8.2	6	2.103	0.014	0.853	0.006
51-17	2017-09-14	789.42	17.2	47	2.077	0.006	0.849	0.002
52-17	2017-09-18	803.62	7.9	6	2.061	0.006	0.849	0.005
53-17	2017-09-22	891.61	11.8	115	-	-	-	-
01-18	2018-02-23	817.62	8.6	30	2.113	0.008	0.865	0.004
02-18	2018-02-28	773.09	36.4	21	2.095	0.007	0.856	0.002
03-18	2018-03-04	774.37	30.8	23	2.104	0.005	0.858	0.001
04-18	2018-03-08	783.71	42.8	47	2.094	0.004	0.854	0.003
05-18	2018-03-12	775.04	41.7	24	2.097	0.005	0.863	0.001
06-18	2018-03-16	772.87	42.2	27	2.101	0.003	0.854	0.003
07-18	2018-03-20	772.25	166.6	41	2.098	0.003	0.861	0.001
08-18	2018-03-24	762.82	101	97	2.098	0.005	0.865	0.002
09-18	2018-03-28	762.68	55.7	76	2.107	0.003	0.862	0.003
10-18	2018-04-01	766.17	50.2	163	2.107	0.005	0.862	0.002
11-18	2018-04-05	784.6	193.7	75	2.104	0.003	0.862	0.001
12-18	2018-04-09	758.86	96.5	45	2.092	0.002	0.862	0.002
13-18	2018-04-13	760.21	107.8	28	2.103	0.003	0.860	0.001
14-18	2018-04-17	768.99	91.2	40	2.100	0.003	0.860	0.001
15-18	2018-04-21	764.53	179.2	29	2.106	0.003	0.859	0.001
16-18	2018-04-25	771.58	56	22	2.096	0.003	0.861	0.001
17-18	2018-04-29	737.42	65.3	29	2.101	0.005	0.856	0.002
18-18	2018-05-03	780.77	96.9	44	2.077	0.002	0.855	0.002
19-18	2018-05-07	777.38	20.7	12	2.089	0.006	0.865	0.002
20-18	2018-05-11	724.97	7.2	5	2.088	0.008	0.851	0.005
21-18	2018-05-15	719.74	13.1	9	2.095	0.012	0.853	0.003
22-18	2018-05-19	718.02	<2.2	-	-	-	-	-
23-18	2018-05-23	752.66	24.9	11	2.086	0.006	0.856	0.001
24-18	2018-05-27	801.75	42.8	67	2.056	0.005	0.841	0.002
25-18	2018-05-31	810.45	<2.2	-	-	-	-	-
26-18	2018-06-04	799.08	28.2	9	2.092	0.005	0.852	0.002
27-18	2018-06-08	802.48	13.9	13	2.103	0.003	0.855	0.003
28-18	2018-06-12	791.7	9.3	5	2.091	0.010	0.847	0.005
29-18	2018-06-16	808.02	9.5	7	2.087	0.010	0.852	0.004
30-18	2018-06-20	817	20.9	12	2.082	0.008	0.844	0.002
31-18	2018-06-24	767.13	6.8	8	2.082	0.007	0.855	0.003
32-18	2018-06-28	807.52	2.2	8	2.094	0.014	0.852	0.006
34-18	2018-07-06	799.77	14.3	11	2.087	0.006	0.854	0.002
35-18	2018-07-10	809.82	4.1	14	2.093	0.013	0.853	0.004
36-18	2018-07-14	799.07	11	15	2.091	0.009	0.857	0.002
37-18	2018-07-18	785.34	8.2	27	2.058	0.006	0.844	0.005

ID	Sampling date	Volume (m^3)	Pb (pg/m^3)	$EF(Pb/Al)_c$	$^{208}Pb/^{206}Pb$	U (95%-conf)	$^{207}Pb/^{206}Pb$	U (95%-conf)
38-18	2018-07-22	781.9	3.1	10	2.090	0.006	0.865	0.003
39-18	2018-07-26	781.16	2.1	3	2.082	0.017	0.854	0.003
40-18	2018-07-30	805.75	104.3	35	2.098	0.003	0.863	0.002
41-18	2018-08-03	766.89	5.8	5	2.084	0.016	0.846	0.006
42-18	2018-08-08	770.13	4.7	3	2.092	0.008	0.854	0.007
43-18	2018-08-12	806.24	4.6	4	2.093	0.006	0.858	0.006
44-18	2018-08-16	829.66	20.8	13	2.122	0.008	0.883	0.002
45-18	2018-08-20	804.1	11.3	18	2.099	0.010	0.865	0.004
46-18	2018-08-25	762.55	20.6	26	2.049	0.009	0.837	0.002

Table S2. Percentage of monthly BTs calculated from 2010 to 2018 associated to the different geographical macro-sector.

Year	Month	Eurasia	North America	Arctic Ocean
2010	Jannuary	26	20	54
2010	February	100	0	0
2010	March	40	0	60
2010	April	0	0	100
2010	May	42	0	58
2010	June	0	33	67
2010	July	0	64	36
2010	August	0	40	60
2010	September	36	25	39
2010	October	55	45	0
2010	November	0	34	64
2010	December	0	48	52
2011	Jannuary	52	48	0
2011	February	67	33	0
2011	March	0	39	61
2011	April	0	69	32
2011	May	0	44	56
2011	June	9	26	66
2011	July	0	50	50
2011	August	0	0	100
2011	September	0	38	63
2011	October	11	38	51
2011	November	0	46	54
2011	December	30	70	0
2012	Jannuary	24	76	0
2012	February	39	34	27
2012	March	59	41	0
2012	April	0	0	100
2012	May	0	0	100
2012	June	0	13	87
2012	July	0	0	100
2012	August	0	23	77
2012	September	0	56	44
2012	October	33	43	24
2012	November	32	25	43
2012	December	44	0	56
2013	Jannuary	30	17	52
2013	February	25	41	33
2013	March	34	45	21
2013	April	59	41	0
2013	May	0	79	21
2013	June	0	51	49
2013	July	0	56	44
2013	August	0	100	0
2013	September	60	40	0
2013	October	0	24	76

Year	Month	Eurasia	North America	Arctic Ocean
2013	November	38	29	33
2013	December	70	30	0
2014	Jannuary	0	0	100
2014	February	100	0	0
2014	March	0	27	73
2014	April	0	0	100
2014	May	0	19	81
2014	June	0	35	65
2014	July	0	71	29
2014	August	0	63	37
2014	September	44	56	0
2014	October	0	34	66
2014	November	40	60	0
2014	December	32	36	32
2015	Jannuary	30	21	38
2015	February	49	51	0
2015	March	35	32	32
2015	April	29	0	71
2015	May	0	58	42
2015	June	0	60	40
2015	July	4	32	64
2015	August	0	67	33
2015	September	46	15	39
2015	October	0	42	58
2015	November	34	66	0
2015	December	21	27	52
2016	Jannuary	39	61	0
2016	February	48	28	24
2016	March	47	53	0
2016	April	0	25	75
2016	May	0	75	25
2016	June	0	83	16
2016	July	39	18	43
2016	August	0	48	52
2016	September	25	36	39
2016	October	49	51	0
2016	November	70	30	0
2016	December	0	32	68
2017	Jannuary	28	18	54
2017	February	50	50	0
2017	March	0	38	62
2017	April	52	48	0
2017	May	0	72	28
2017	June	0	0	100
2017	July	0	70	30
2017	August	0	59	41
2017	September	13	42	46
2017	October	52	0	48

Year	Month	Eurasia	North America	Arctic Ocean
2017	November	22	34	44
2017	December	57	12	30
2018	Jannuary	54	18	27
2018	February	0	31	69
2018	March	0	36	64
2018	April	25	76	0
2018	May	0	51	49
2018	June	0	50	50
2018	July	0	100	0
2018	August	0	31	69
2018	September	0	37	63
2018	October	0	34	66
2018	November	0	33	67
2018	December	21	40	40

Table S3. Percentage of BTs, distance between the first and last endpoints and altitude of the last endpoint for the classes winter and summer from 2010 to 2018.

Year	Class	%BT			Distance (km)			Altitude (m a.g.l.)		
		Eurasia	North America	Arctic Ocean	Eurasia	North America	Arctic Ocean	Eurasia	North America	Arctic Ocean
2010	winter	32	12	56	1230	2906	1997	2162	2018	1989
2010	summer	0	54	46	-	1124	2044	-	1973	1955
2011	winter	29	30	41	813	2686	1864	1974	2514	1893
2011	summer	0	44	56	-	1560	1838	-	2175	1952
2012	winter	39	27	34	1297	2804	2322	2149	2370	2101
2012	summer	0	41	59	-	1147	1791	-	1958	1727
2013	winter	19	33	48	1568	2007	2298	1804	2443	2137
2013	summer	0	51	49	-	1949	1259	-	1948	1988
2014	winter	40	21	39	1296	2787	2367	1942	2519	2220
2014	summer	0	51	49	-	1493	1842	-	1994	1843
2015	winter	54	18	28	2268	2994	1723	1359	2286	1427
2015	summer	0	38	62	-	1626	1646	-	1495	1176
2016	winter	30	24	46	1743	2619	1704	1387	1822	1114
2016	summer	39	27	34	982	2201	1657	1299	1548	1165
2017	winter	16	13	72	2444	3104	1473	1357	1611	1420
2017	summer	17	26	57	1396	2184	1483	2194	1749	1210
2018	winter	20	22	58	1746	2434	1646	2090	2266	1705
2018	summer	0	55	45	-	1951	1254	-	1664	1632

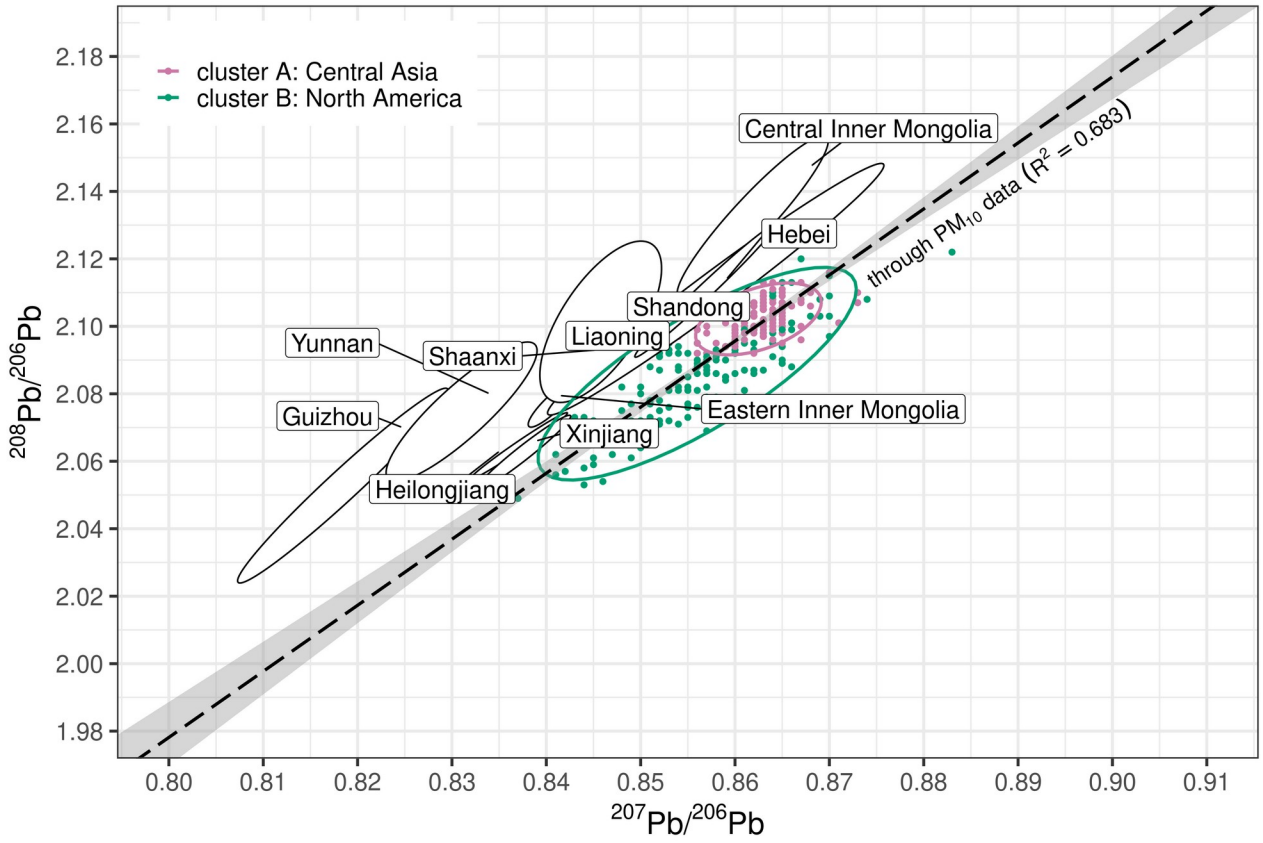

Figure S1: Three isotope plot for PM_{10} samples collected at Ny-Ålesund from 2010 to 2018, compared with Chinese coals. PM_{10} data are classified in two clusters according to the result of the Gaussian Mixture Modeling (GMM) for Pb isotope ratio values, enrichment factors (EFs) and Pb concentrations. The regression line for PM_{10} data was obtained by Deming regression, considering a relative uncertainty on $^{208}Pb/^{206}Pb$ values as twice that for $^{207}Pb/^{206}Pb$ values. Data for Chinese coals: [46]. Black ellipses represent the 95% confidence interval of the mean for literature data.

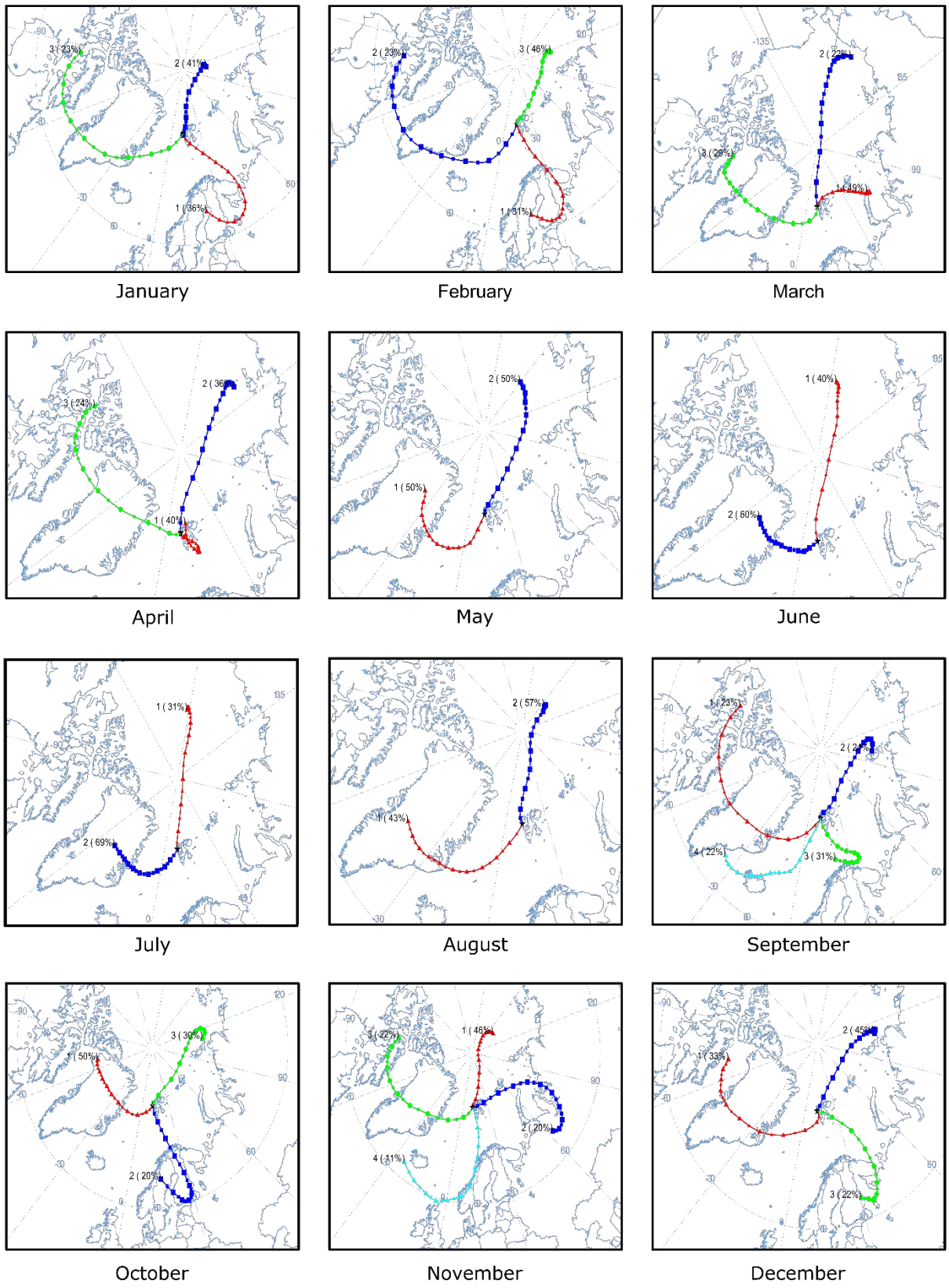

Figure S2: Geographic representation of the centroids obtained from the cluster analysis of the monthly BTs from 2010 to 2018, for 1000 m a.g.l as altitude of the endpoint at Ny-Alesund. For the other altitudes (500 and 1500 m a.g.l.) the results are similar. The percentages of the BTs associated to each cluster are also showed.