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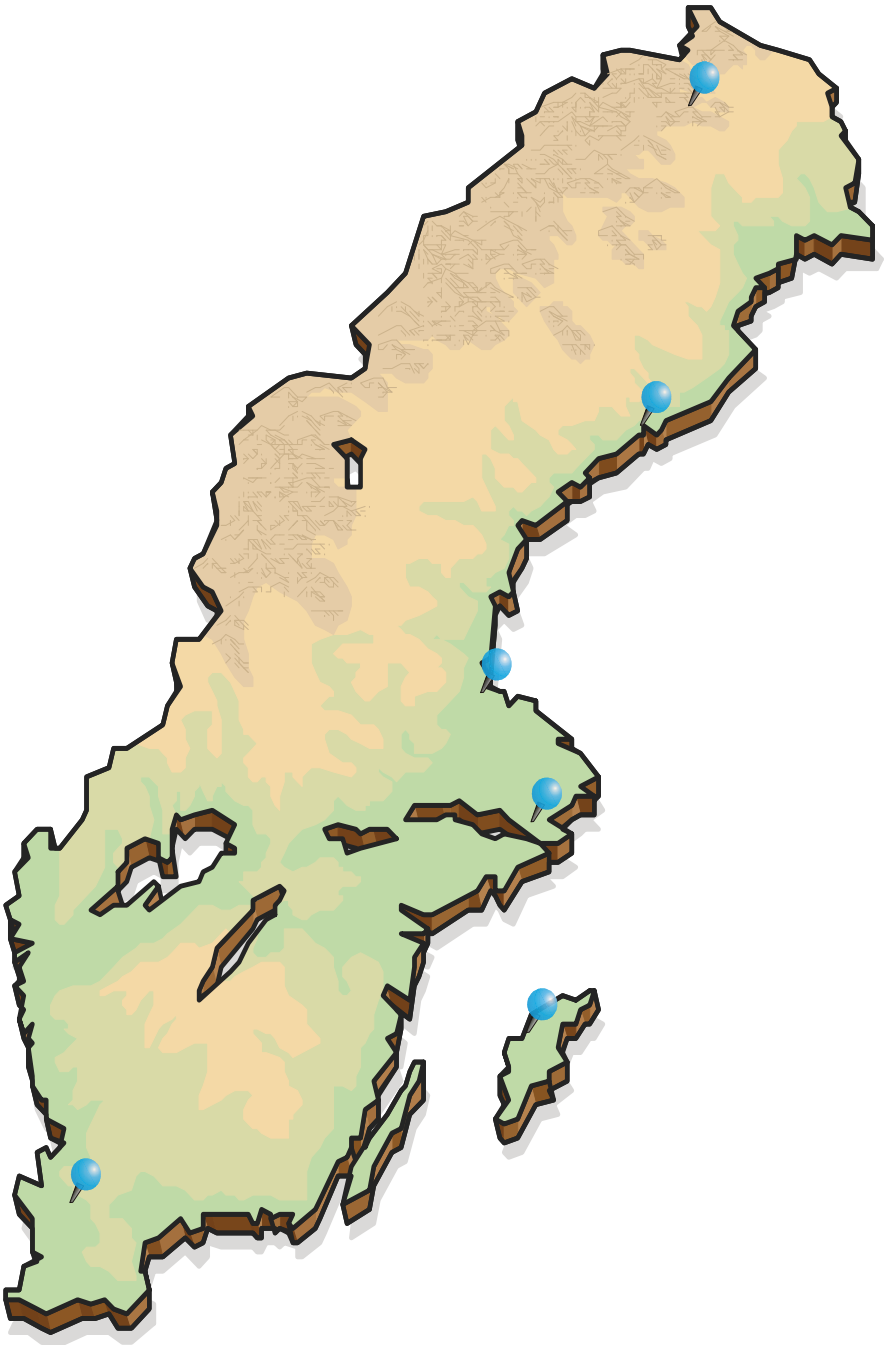

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Sammanfattning

Stationer för filtrering av markluft finns på sex ställen i Sverige: Kiruna, Umeå, Gävle, Kista, Visby och Ljungbyhed. Filtren pressas och analyseras veckovis med hjälp av gammaspektroskopi med germaniumdetektor. Nederbörd samlas in på fyra av stationerna: Kiruna, Gävle, Kista och Ljungbyhed. Nederbördsproverna askas in och mäts därefter med hjälp av gammaspektroskopi.

Veckovisa aktivitetskoncentrationer av ^{7}Be och ^{137}Cs under 2017 för luft och nederbörd presenteras för de olika stationerna. I de fall andra antropogena radionuklider detekterats presenteras även dessa.

Nyckelord: Luftburen radioaktivitet, deposition, ^{7}Be, ^{131}I, ^{137}Cs , ^{106}Ru, ^{103}Ru

Summary

Filtering of ground level air is performed continuously at six different locations in Sweden: Kiruna, Umeå, Gävle, Kista, Visby and Ljungbyhed. The filters are combined and pressed into weekly samples and the contents of different radionuclides are measured by gamma spectroscopy. Precipitation samples are collected at four of the stations: Kiruna, Gävle, Kista and Ljungbyhed. These samples are ashed and the contents of radionuclides are measured monthly.

Weekly activity concentrations of ^{7}Be and ^{137}Cs during 2017 in air and precipitation are presented for the different stations. Other anthropogenic radionuclides detected are also presented.

Keywords: Airborne radionuclides, deposition, ^{7}Be, ^{131}I, ^{137}Cs, ^{106}Ru, ^{103}Ru

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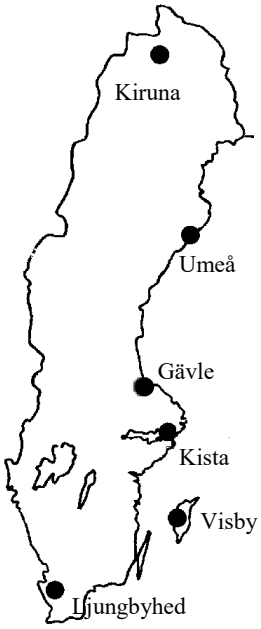
Sampling and analysis procedures

Sampling of ground level air is performed at six different locations in Sweden, as follows:

Location	Latitude	Longitude	Height above sea level
Kiruna	67.84° N	20.42° E	415 m
Umeå	63.85° N	20.34° E	46 m
Gävle	60.67° N	17.19° E	7 m
Kista	59.40° N	17.95° E	30 m
Visby	57.61° N	18.32° E	59 m
Ljungbyhed	56.08° N	13.22° E	45 m



At five stations, 1000 m^3/h of air is filtered through glass fibre filters (HB5773). At each station the filters are changed twice a week (Monday and Thursday or Friday) and then sent by mail to FOI's laboratory in Kista for activity measurement and analysis. At the station in Kista 1600 m^3/h of air is filtered and the filters are changed every 28th hour.

Weekly samples are made from each station by taking 3/4 of each filter (1/4 of the filter is archived) and compressing them together into a disc (60 mm diameter and 13 mm thick). These samples are measured 3-4 days after collection, on shielded High Purity Germanium (HPGe) detectors. The filters from the station in Kista are pressed into one circular disc (94 mm diameter, 16 mm thickness) and six rectangular bricks (77 × 48 × 13 mm)*.)* The disc is placed on top of the detector and the bricks are placed around the detector in a Marinelli-like geometry.

At four of the stations (Kiruna, Umeå, Kista and Ljungbyhed) a small part of the air flow (12 m^3/h) downstream the filter is passed through an activated charcoal cartridge in order to collect gaseous iodine. The cartridges are changed weekly but only analysed if particulate iodine has been detected in the filter.

The stations at Kiruna, Gävle, Kista and Ljungbyhed are each equipped with a stainless steel funnel (1 m radius) to collect precipitation. The precipitation is passed through a column consisting of a filter part, an an-ion exchanger part and a cat-ion exchanger part. The columns are changed weekly and sent by mail to FOI's laboratory in Kista. Four samples are combined into a single monthly sample and is then ashed in an oven. The ashed samples are measured on HPGe detectors. From these measurements the total deposition is calculated.

The particulate radionuclides detected in the filters are normally due to the naturally occurring radon daughters and ^{7}Be. In addition, ^{137}Cs is commonly detected at most stations due to resuspension of the Chernobyl fallout. In Tables I and II and Figures I and II the activity concentrations of ^{7}Be and ^{137}Cs are presented. The precipitation measurement results are presented in Table III, and all other anthropogenic radionuclides detected are presented in Table IV.

Uncertainties are given as relative combined standard uncertainty according to GUM[1]. For a more detailed description of uncertainty estimations see FOI Report "Implementation of uncertainty of measurement according to GUM" (FOI-D--0643--SE, internal report, in Swedish).

[1] Guide to the Expression of Uncertainty in Measurement, JCGM 100:2008.

^{7}Be concentrations in air

Table Ia. ^{7}Be concentrations in Sweden, Jan -Jun 2017.

Week starting	Kiruna		Umeå		Gävle		Kista		Visby		Ljungbyhed	
2-Jan	2360	(3.3)	1610	(9.1)	1440	(3.5)	2030	(4.0)	2840	(4.8)	2270	(9.1)
9-Jan	1300	(3.4)	1150	(9.1)	920	(3.5)	2050[13]	(4.7)	2180	(3.5)	2140	(9.2)
16-Jan	2710	(3.3)	2090	(9.2)	810	(3.5)	760	(4.1)	820	(3.4)	1420	(4.8)
23-Jan	3080	(3.4)	3260	(9.1)	2080	(3.5)	3650	(4.0)	3500	(7.0)	3070	(5.1)
30-Jan	1470	(3.4)	1780	(9.2)	2010	(3.5)	3220	(4.0)	3690	(4.8)	3050	(9.1)
6-Feb	5080	(3.3)	3390	(3.5)	4080	(4.8)	4970	(4.0)	4470	(9.1)	4350	(9.2)
13-Feb	2850	(3.3)	1750	(2.1)	2160	(9.2)	3380	(4.0)	3160	(4.8)	3190	(4.8)
20-Feb	2120	(9.2)	2230	(9.2)	1380	(2.1)	1350	(4.7)	1700	(2.1)	1410	(3.4)
27-Feb	2030	(2.1)	1190	(2.1)	1320	(2.1)	2110	(2.8)	2520	(9.2)	2620	(3.4)
6-Mar	2060	(3.4)	1790	(2.1)	1690	(2.1)	2010	(4.0)	1960	(2.1)	2590	(2.1)
13-Mar	1430	(4.8)	1710	(9.1)	1870	(3.5)	2320	(4.0)	2920	(9.1)	2830	(3.5)
20-Mar	2030	(3.3)	2210	(9.1)	1590	(9.2)	2320	(4.0)	2550	(4.8)	2870	(4.8)
27-Mar	1990	(3.3)	1530	(9.2)	1460	(9.1)	2050	(4.0)	2660	(4.8)	2120	(3.5)
3-Apr	1830	(4.8)	1930	(2.1)	1850	(3.4)	2260	(4.0)	2290	(3.5)	2330	(9.1)
10-Apr	3310	(2.8)	3390[3]	(2.1)	2370[9]	(2.7)	3310	(2.8)	3450	(2.1)	2620	(2.1)
17-Apr	2980	(2.7)	2680[4]	(2.1)	2390[10]	(5.1)	3950	(2.9)	4010	(2.1)	3390	(2.1)
24-Apr	2900	(2.7)	3220[5]	(2.8)	2050[11]	(2.7)	2210	(2.8)	2900	(2.8)	3220	(2.7)
1-May	2290	(2.7)	3230[6]	(2.8)	3090[12]	(2.8)	4390	(2.9)	3900	(2.8)	4460	(2.7)
8-May	2240	(2.7)	2150	(2.8)	2030	(2.8)	3040	(2.9)	3130	(2.8)	4360	(2.8)
15-May	2800[1]	(2.7)	1840	(2.8)	2320	(2.8)	3610	(2.8)	4800	(2.7)	5520	(2.7)
22-May	2330[2]	(2.8)	2440	(2.9)	1980	(2.9)	3400	(2.8)	3380	(2.7)	3000	(2.8)
29-May	1840	(2.8)	2780	(2.8)	1800	(2.7)	2680	(2.9)	2810	(2.7)	3680	(2.8)
5-Jun	4220	(2.8)	2810[7]	(2.7)	1920	(2.8)	3340	(2.8)	3630	(2.7)	3560	(2.7)
12-Jun	2870	(2.7)	3360[8]	(2.7)	2730	(2.8)	3670	(2.8)	3190	(2.8)	2450	(2.7)
19-Jun	2380	(2.8)	1310	(2.8)	1470	(2.8)	2220	(2.9)	2980	(2.8)	2720	(2.8)
26-Jun	3640	(2.7)	3210	(2.8)	1830	(2.8)	2900	(2.9)	3020	(2.8)	3550	(2.7)

Values are reported in μBq/m^{3}.

Relative combined standard uncertainty (1σ %) within brackets.

[1] Six days sampling 15 – 21/5
[2] Eight days sampling 21 – 29/5
[3] Eight days sampling 10 – 18/4
[4] Six days sampling 18 – 24/4
[5] Eight days sampling 24/4 – 2/5
[6] Six days sampling 2 – 8/5
[7] Eight days sampling 5 – 13/6
[8] Six days sampling 13 – 19/6
[9] Six days sampling 10 – 16/4
[10] Eight days sampling 16 – 24/4
[11] Eight days sampling 24/4 – 2/5
[12] Six days sampling 2 – 8/5
[13] Six days sampling 9 – 15/1, no data collection 15/1

^{7}Be concentrations in air

Table Ib. ^{7}Be concentrations in Sweden, Jul - Dec 2017.

Week starting	Kiruna	Umeå	Gävle	Kista	Visby	Ljungbyhed
3-Jul	3110 (2.8)	2300 (2.8)	3030 (2.7)	3370 (2.9)	3750 (2.7)	3650 (2.8)
10-Jul	2370 (2.8)	2960 (2.9)	2840 (2.8)	4060 (2.9)	3860 (2.8)	3890 (2.8)
17-Jul	1370 (2.7)	1460 (2.8)	1210 (2.8)	2020 (2.9)	2050 (2.7)	3300 (2.8)
24-Jul	4040 (2.7)	3450 (2.8)	2020 (2.7)	3070 (2.9)	3160 (2.8)	3260 (2.8)
31-Jul	1600 (2.7)	2370 (2.8)	1770 (2.7)	2920 (2.9)	3280 (2.8)	2740 (2.8)
7-Aug	2200 (2.8)	2920 (2.8)	3030 (2.7)	4180 (2.9)	4260 (2.8)	4020[10] (2.8)
14-Aug	2760 (2.7)	2650 (2.8)	2800 (2.7)	4180 (2.9)	4080 (2.8)	3740[11] (2.8)
21-Aug	1340 (2.7)	1360 (2.8)	1530 (2.7)	2810 (2.8)	2860 (2.8)	2510 (2.7)
28-Aug	1960 (2.7)	1680 (2.8)	2580 (2.8)	3370 (2.9)	3860 (2.8)	3180 (2.8)
4-Sep	3140 (2.8)	2270 (2.7)	3050 (2.8)	4290 (2.9)	3900 (2.7)	2400 (2.7)
11-Sep	1260[1] (4.2)	1060 (2.8)	1200 (2.8)	2040 (2.8)	2050 (2.8)	1460 (2.8)
18-Sep	-[2] -	1060 (2.8)	1070[5] (2.8)	1730 (2.9)	2240 (2.8)	1920 (2.7)
25-Sep	1130 (2.8)	2990 (2.8)	3540[6] (2.8)	4460 (2.8)	4370 (2.8)	4790 (2.7)
2-Oct	670 (2.7)	1270 (2.8)	510[7] (2.8)	2100 (2.9)	1970 (2.8)	-[12] -
9-Oct	560 (2.8)	610 (2.9)	1150 (2.8)	1680 (2.9)	2120 (2.7)	2520[13] (2.8)
16-Oct	1420 (2.7)	1350 (2.9)	1100 (2.8)	1910 (2.9)	3030 (2.8)	3050 (2.8)
23-Oct	1310 (2.8)	1000 (2.8)	930 (2.8)	1320 (2.9)	1520 (2.8)	1750 (2.8)
30-Oct	1190 (2.9)	2750 (2.8)	2220 (2.8)	3210 (2.9)	3240 (2.8)	3930 (2.8)
6-Nov	880 (2.8)	1390 (2.8)	1030 (2.8)	2020 (2.9)	2110 (2.8)	2720[14] (2.9)
13-Nov	990 (2.8)	800 (2.8)	800 (2.8)	1380 (2.9)	1820 (2.8)	-[15] -
20-Nov	880 (2.8)	1260 (2.8)	1560 (2.8)	2330 (2.9)	2650 (2.8)	2290 (2.8)
27-Nov	1230 (2.8)	1080 (2.8)	840 (2.8)	920 (2.9)	1350 (2.7)	1320 (2.9)
4-Dec	1180 (2.8)	1260 (2.8)	760 (2.8)	1260[9] (2.8)	1870 (2.7)	1860 (2.7)
11-Dec	1270 (2.7)	1450 (2.7)	930 (2.8)	1040 (2.8)	1210 (2.8)	1600 (2.8)
18-Dec	1050 (2.7)	1160[3] (2.7)	730 (2.8)	1190 (2.8)	1360 (2.8)	1220 (2.8)
25-Dec	1060 (2.7)	1110[4] (2.8)	790[8] (2.7)	2020 (2.8)	2080 (2.7)	2110 (2.8)

Values are reported in μBq/m^{3}.

Relative combined standard uncertainty (1σ %) within brackets.

[1] Four days sampling 11 – 15/9
[2] No data collection 15 – 25/9
[3] Nine days sampling 18 – 27/12
[4] Six days sampling 27/12 – 2/1 2018
[5] Eight days sampling 18 – 26/9
[6] Seven days sampling 26/9 – 3/10
[7] Six days sampling 3 – 9/10
[8] Eight days sampling 25/12 – 2/1 2018
[9] Six days sampling 4 – 10/12, no data collection 10/12
[10] Nine days sampling 7 – 16/8
[11] Five days sampling 16 – 21/8
[12] No data collection 2 – 10/10
[13] Six days sampling 10 – 16/10
[14] Four days sampling 6 – 10/11
[15] No data collection 10 – 20/11

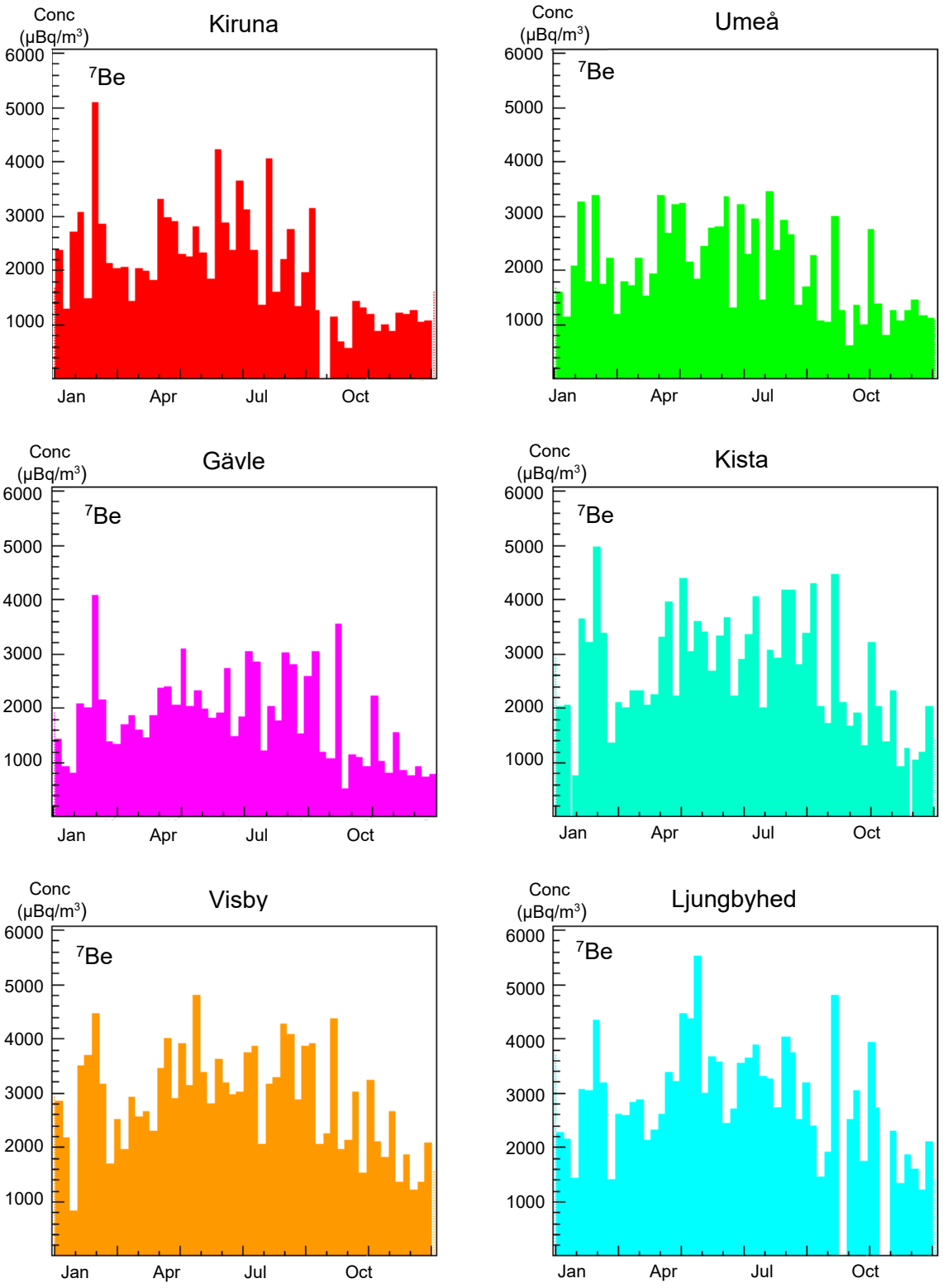


Figure I. Activity concentrations (μBq/m³) in ground level air of ^{7}Be in the Swedish network during 2017.

^{137}Cs concentrations in air

Table IIa. ^{137}Cs concentrations in Sweden, Jan - Jun 2017.

Week starting	Kiruna	Umeå	Gävle	Kista	Visby	Ljungbyhed
2-Jan	0.1 (25)	1.1 (10)	0.8 (15)	0.7 (5)	0.3 (15)	0.8 (16)
9-Jan	0.3 (15)	<0.5 -	0.7 (13)	0.2[13] (14)	0.6 (18)	0.9 (24)
16-Jan	<0.2 -	1.2 (13)	0.8 (19)	0.4 (8)	0.5 (7)	0.6 (10)
23-Jan	<0.2 -	1.1 (13)	0.6 (20)	0.5 (7)	0.5 (9)	0.7 (8)
30-Jan	0.1 (70)	0.9 (19)	1.3 (6)	0.8 (5)	1.9 (4)	0.6 (26)
6-Feb	<0.2 -	2.1 (4)	1.3 (6)	0.7 (6)	1.0 (16)	1.0 (10)
13-Feb	<0.2 -	0.8 (14)	1.0 (12)	0.9 (5)	0.3 (26)	1.4 (4)
20-Feb	<0.4 -	1.5 (11)	0.6 (20)	0.3 (9)	0.5 (7)	0.3 (24)
27-Feb	<0.4 -	0.6 (7)	0.7 (9)	0.4 (8)	0.4 (43)	0.8 (6)
6-Mar	0.1 (70)	1.1 (18)	0.9 (8)	0.8 (5)	0.6 (28)	0.8 (21)
13-Mar	<0.2 -	0.7 (9)	1.6 (8)	0.3 (10)	0.3 (35)	0.9 (9)
20-Mar	0.1 (15)	0.6 (26)	1.0 (19)	0.4 (7)	0.4 (15)	0.6 (7)
27-Mar	<0.2 -	0.8 (16)	1.4 (9)	0.3 (10)	0.4 (20)	0.7 (13)
3-Apr	<0.2 -	0.8 (12)	1.7 (4)	0.4 (8)	0.7 (17)	0.5 (37)
10-Apr	<0.2 -	0.5[3] (11)	0.9[9] (8)	0.3 (8)	0.4 (13)	0.6 (34)
17-Apr	<0.2 -	0.7[4] (17)	1.1[10] (6)	0.5 (5)	0.4 (13)	0.6 (11)
24-Apr	<0.2 -	0.8[5] (16)	1.4[11] (5)	0.3 (10)	0.5 (14)	0.6 (7)
1-May	<0.2 -	0.6[6] (27)	1.5[12] (11)	0.5 (6)	0.3 (18)	0.6 (8)
8-May	<0.2 -	0.9 (14)	1.1 (12)	0.4 (7)	0.5 (30)	0.4 (18)
15-May	<0.2[1] -	1.3 (11)	2.6 (8)	0.4 (7)	1.3 (4)	0.7 (11)
22-May	<0.2[2] -	1.0 (25)	2.0 (4)	0.9 (4)	0.8 (5)	0.5 (26)
29-May	<0.2 -	1.3 (9)	2.5 (4)	1.2 (4)	0.7 (10)	0.2 (17)
5-Jun	0.4 (31)	3.0[7] (4)	6.6 (3)	0.3 (9)	0.5 (15)	0.1 (68)
12-Jun	0.1 (51)	15.3[8] (3)	2.4 (4)	0.5 (6)	0.7 (17)	<0.2 -
19-Jun	0.1 (20)	7.6 (4)	1.2 (13)	0.2 (11)	0.4 (10)	0.1 (74)
26-Jun	0.3 (9)	2.7 (6)	2.0 (5)	0.4 (7)	0.2 (20)	0.2 (25)

Values are reported in μBq/m^3.

When ^{137}Cs is not detected minimal detectable concentration (MDC) is given.

Relative combined standard uncertainty (1σ %) within brackets.

[1] Six days sampling 15 – 21/5
[2] Eight days sampling 21 – 29/5
[3] Eight days sampling 10 – 18/4
[4] Six days sampling 18 – 24/4
[5] Eight days sampling 24/4 – 2/5
[6] Six days sampling 2 – 8/5
[7] Eight days sampling 5 – 13/6
[8] Six days sampling 13 – 19/6
[9] Six days sampling 10 – 16/4
[10] Eight days sampling 16 – 24/4
[11] Eight days sampling 24/4 – 2/5
[12] Six days sampling 2 – 8/5
[13] Six days sampling 9 – 15/1
no data collection 15/1

^{137}Cs concentrations in air

Table IIb. ^{137}Cs concentrations in Sweden, Jul – Dec 2017.

Week starting	Kiruna	Umeå	Gävle	Kista	Visby	Ljungbyhed
3-Jul	0.1 (44)	1.7 (10)	1.4 (5)	0.2 (9)	0.3 (15)	<0.6 -
10-Jul	0.2 (47)	1.7 (5)	1.5 (7)	0.2 (13)	0.2 (23)	<0.6 -
17-Jul	0.1 (19)	1.6 (11)	0.8 (19)	0.2 (11)	0.3 (18)	<0.2 -
24-Jul	0.3 (27)	1.8 (8)	1.2 (6)	0.3 (8)	0.4 (16)	0.4 (18)
31-Jul	0.1 (32)	2.5 (4)	1.0 (5)	0.2 (12)	0.2 (37)	0.1 (65)
7-Aug	0.1 (92)	2.6 (4)	1.2 (5)	0.2 (10)	0.4 (9)	0.2[10] (35)
14-Aug	0.2 (22)	2.5 (7)	1.4 (4)	0.1 (18)	0.2 (16)	0.2[11] (19)
21-Aug	<0.2 -	2.7 (6)	1.6 (4)	0.4 (7)	0.2 (24)	0.2 (14)
28-Aug	0.1 (42)	4.1 (4)	1.4 (11)	0.3 (9)	0.2 (29)	0.2 (16)
4-Sep	0.2 (19)	4.4 (3)	1.4 (9)	0.3 (7)	0.2 (23)	0.2 (15)
11-Sep	<14.8[1] -	4.4 (5)	2.2 (7)	0.3 (9)	0.6 (28)	<0.7 -
18-Sep	-[2] -	4.0 (5)	1.5[5] (8)	0.7 (5)	0.8 (6)	1.0 (8)
25-Sep	<0.3 -	3.7 (5)	2.3[6] (10)	0.8 (6)	1.5 (11)	2.0 (6)
2-Oct	<0.2 -	2.4 (8)	1.7[7] (9)	0.6 (43)	<1.3 -	-[12] -
9-Oct	<0.2 -	1.8 (5)	1.2 (8)	0.4 (7)	0.3 (11)	0.4[13] (47)
16-Oct	<0.2 -	1.2 (18)	1.9 (5)	0.5 (5)	0.4 (14)	0.4 (20)
23-Oct	<0.2 -	0.9 (8)	0.8 (8)	0.6 (5)	0.5 (11)	0.5 (13)
30-Oct	0.1 (68)	1.1 (7)	1.0 (16)	0.4 (7)	0.3 (11)	0.5 (15)
6-Nov	<0.2 -	1.2 (8)	1.0 (8)	0.4 (6)	0.4 (14)	1.1[14] (12)
13-Nov	<0.2 -	1.6 (9)	0.7 (9)	0.3 (8)	<0.5 -	-[15] -
20-Nov	<0.2 -	0.5 (23)	0.7 (10)	0.5 (7)	0.4 (17)	0.6 (12)
27-Nov	<0.4 -	0.9 (9)	0.9 (8)	0.3 (8)	0.4 (14)	0.2 (53)
4-Dec	<0.2 -	1.2 (8)	0.5 (33)	0.4[9] (7)	0.2 (19)	0.1 (50)
11-Dec	0.1 (37)	1.1 (5)	0.8 (11)	0.4 (6)	0.2 (10)	1.1 (7)
18-Dec	<0.2 -	1.2[3] (4)	0.5 (23)	0.5 (6)	0.2 (11)	0.9 (13)
25-Dec	<0.2 -	0.8[4] (10)	0.5[8] (9)	0.4 (10)	0.4 (16)	0.7 (12)

Values are reported in μBq/m^3.

When ^{137}Cs is not detected minimal detectable concentration (MDC) is given.

Relative combined standard uncertainty (1σ %) within brackets.

[1] Four days sampling 11 – 15/9
[2] No data collection 15 – 25/9
[3] Nine days sampling 18 – 27/12
[4] Six days sampling 27/12 – 2/1 2018
[5] Eight days sampling 18 – 26/9
[6] Seven days sampling 26/9 – 3/10
[7] Six days sampling 3 – 9/10
[8] Eight days sampling 25/12 – 2/1 2018
[9] Six days sampling 4 – 10/12, no data collection 10/12
[10] Nine days sampling 7 – 16/8
[11] Five days sampling 16 – 21/8
[12] No data collection 2 – 10/10
[13] Six days sampling 10 – 16/10
[14] Four days sampling 6 – 10/11
[15] No data collection 10 – 20/11

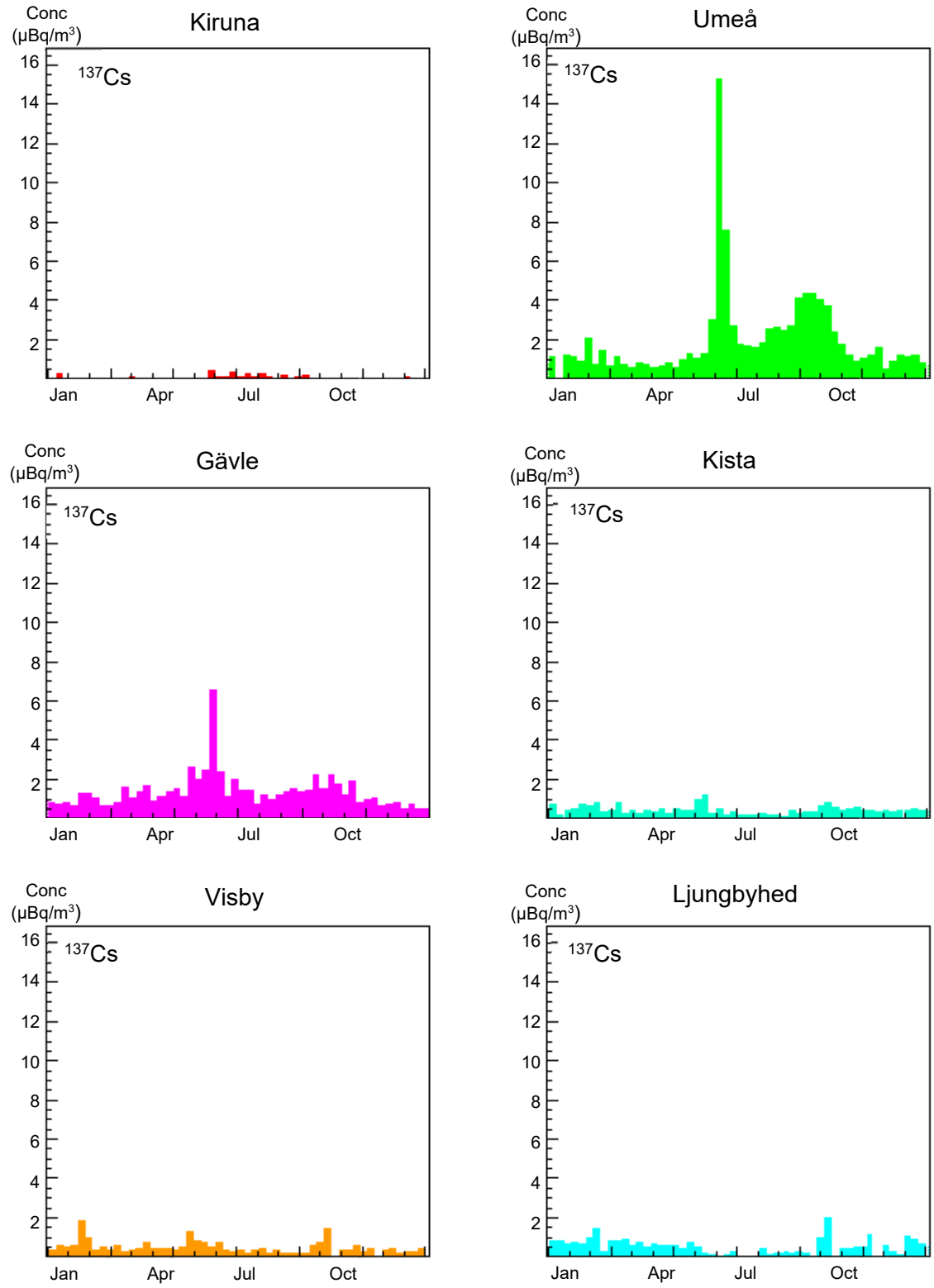


Figure II. Activity concentrations (μBq/m³) in ground level air of ^{137}Cs in the Swedish network during 2017. The increased levels during summer for the stations in Umeå and Gävle are within normal seasonal variations for the stations.

Deposition measurements

Table IIIa. Deposition measurements in Kiruna, 2017.

Kiruna

Week	Period	^{7}Be	^{137}Cs	Precipitation (mm)
1 - 4	2/1 -2017 - 30/1 - 2017	12000 (5)	<9 -	15.6
5 - 8	30/1 - 27/2	5300 (5)	<8 -	8.3
9 - 12	27/2 - 27/3	21600 (6)	<10 -	16.2
13 - 16	27/3 - 24/4	13200 (5)	<7 -	15.3
17 - 20	24/4 - 21/5	11400 (5)	<8 -	9.6
21 - 24	21/5 - 19/6	9800 (5)	<8 -	19.7
25 - 28	19/6 - 17/7	117500 (5)	22 (11)	124.2
29 - 32	17/7 - 14/8	92800 (5)	6 (28)	111.5
33 - 36	14/8 - 11/9	79600 (5)	13 (15)	86.0
37 - 40	11/9 - 9/10	39500 (5)	3 (52)	48.7
41 - 44	9/10 - 6/11	20400 (5)	<8 -	43.6
45 - 48	6/11 - 4/12	15800 (5)	2 (64)	47.8
49 - 52	4/12 - 1/1	17700 (5)	<6 -	26.4

Table IIIb. Deposition measurements in Gävle, 2017.

Gävle

Week	Period	^{7}Be	^{137}Cs	Precipitation (mm)
52 - 3	27/12 -2016 - 23/1 - 2017	2500 (6)	10 (30)	11.5
4 - 7	23/1 - 20/2	1600 (5)	14 (17)	10.2
8 - 11	20/2 - 20/3	1900 (7)	19 (12)	15.9
12 - 15	20/3 - 16/4	1000 (6)	12 (19)	12.1
16 - 19	16/4 - 15/5	61800 (5)	69 (6)	21.3
20 - 23	15/5 - 12/6	23100 (5)	196 (5)	34.4
24 - 27	12/6 - 10/7	93900 (5)	122 (5)	59.6
28 - 31	10/7 - 7/8	95700 (5)	60 (6)	87.9
32 - 35	7/8 - 4/9	68700 (5)	47 (6)	39.8
36 - 39	4/9 - 3/10	76500 (5)	44 (8)	56.7
40 - 43	3/10 - 30/10	57000 (5)	45 (6)	138.9
44 - 47	30/10 - 27/11	43300 (5)	14 (14)	61.8
48 - 51	27/11 - 26/12	45000 (5)	28 (9)	56.1

Values are reported in mBq/m^2.

When ^{137}Cs is not detected minimal detectable concentration (MDC) is given.

Relative combined standard uncertainty (1σ %) within brackets.

Deposition measurements

Table IIIc. Deposition measurements in Kista, 2017.

Kista

Week	Period	^{7}Be	^{137}Cs	Precipitation (mm)
51 - 2	19/12 -2016 - 16/1 - 2017	44600 (7)	3 (69)	21.9
3 - 6	16/1 - 13/2	18300 (4)	<8 -	0.6
7 - 10	13/2 - 13/3	38200 (6)	<18 -	31.1
11 - 14	13/3 - 10/4	7400 (8)	<12 -	17.2
15 - 18	10/4 - 8/5	21400 (7)	<18 -	22.2
19 - 22	8/5 - 5/6	42800 (13)	<37 -	23.5
23 - 26	5/6 - 3/7	52700 (5)	11 (18)	49.0
27 - 30	3/7 - 31/7	19600 (6)	<12 -	22.0
31 - 34	31/7 - 28/8	45900 (5)	<10 -	47.4
35 - 38	28/8 - 25/9	119900 (5)	10 (29)	83.2
39 - 42	25/9 - 23/10	37200 (5)	<23 -	73.9
43 - 46	23/10 - 20/11	47800 (5)	<12 -	49.5
47 - 50	20/11 - 18/12	84100 (5)	6 (50)	57.4

Table IIId. Deposition measurements in Ljungbyhed, 2017.

Ljungbyhed

Week	Period	^{7}Be	^{137}Cs	Precipitation (mm)
50 - 1	12/12 -2016 - 9/1 - 2017	43800 (6)	<8 -	18.8
2 - 5	9/1 - 6/2	41700 (5)	8 (15)	11.1
6 - 9	6/2 - 6/3	75500 (5)	8 (34)	56.7
10 - 13	6/3 - 3/4	20100 (5)	8 (27)	26.4
14 - 17	3/4 - 1/5	22400 (5)	<20 -	38.2
18 - 21	1/5 - 29/5	22100 (5)	13 (17)	12.1
22 - 25	29/5 - 26/6	69500 (5)	10 (24)	71.7
26 - 29	26/6 - 24/7	89700 (5)	10 (21)	62.1
30 - 33	24/7 - 21/8	111800 (5)	13 (16)	93.9
34 - 37	21/8 - 18/9	96300 (5)	5 (35)	96.2
38 - 41	18/9 - 16/10	57500 (5)	5 (32)	66.9
42 - 45	16/10 - 13/11	69300 (5)	6 (29)	70.7
46 - 49	13/11 - 15/12	75600 (5)	9 (25)	87.9

Values are reported in mBq/m^2.

When ^{137}Cs is not detected, minimal detectable concentration (MDC) is given.

Relative combined standard uncertainty (1σ %) within brackets.

Other anthropogenic radionuclides detected

Detections of ^{131}I

Low concentrations of ^{131}I were detected in late September 2017 at the stations in Visby and Kista and again at the station in Kista in late November, see Tables IVa and IVb. No source for the detections have been identified. Minimal detectable concentration (MDC) for ^{131}I is in the order of 0.5 µBq/m^3 and detections of low concentrations of ^{131}I within the network are not unusual.

Table IVa. Concentrations of ^{131}I in September 2017.

Sampling period	Station	Isotope	Concentration
18-Sep – 25-Sep	Visby	^{131}I	0.38 (39)
23-Sep – 24-Sep	Kista	^{131}I	0.39 (41)
24-Sep – 1-Oct	Kista	^{131}I	0.38 (39)

Table IVb. Concentrations of ^{131}I in November 2017.

Sampling period	Station	Isotope	Concentration
26-Nov – 3-Dec	Kista	^{131}I	0.36 (20)

Values are reported in µBq/m^3.

Relative combined standard uncertainty (1σ %) within brackets.

Detections of ^{106}Ru and ^{103}Ru

For a few days during September-October, 2017, relatively high concentrations of ^{106}Ru were detected at all stations in Sweden, see Table IVc. Detections started in the southern parts of the country during 29 September – 1 October and in the northern parts of the country a day or two later. No detections were made after 6 October. ^{106}Ru was also detected in precipitation at three of the stations, see Table IVd.

Detections of ^{106}Ru were reported from a number of other countries[2], mainly in the eastern parts of Europe during this period. The weather situation during the period was dominated by easterly winds, indicating a possible source in the southern Ural region. Data was sent to IAEA and a commission has started investigations of a possible source for the detections[3].

A complete report on the detections of ^{106}Ru in Sweden has been published elsewhere[4].

Table IVc. Concentrations of ^{106}Ru and ^{103}Ru in air in September-October 2017.

Sampling period	Station	^{106}Ru Concentration	^{103}Ru Concentration
29-Sep – 3-Oct	Gävle	4080 (3)	1.0 (40)
30-Sep – 1-Oct	Kista	7580 (3)	<8.7
28-Sep – 2-Oct	Visby	5890 (3)	1.4 (21)
29-Sep – 2-Oct	Ljungbyhed	980 (3)	<0.81
2-Oct – 6-Oct	Kiruna	92 (4)	<0.36
2-Oct – 6-Oct	Umeå	620 (3)	<1.4
1-Oct – 3-Oct	Kista	16630 (3)	4.0 (39)
2-Oct – 6-Oct	Visby	5260 (3)	<2.4

Table IVd. Total deposition of ^{106}Ru in September-October 2017.

Sampling period	Station	^{106}Ru Deposition	Precipitation (mm)
2-Oct – 9-Oct	Kiruna	3360 (5)	22.3
26-Sep – 30-Oct	Gävle	19600 (4)	145
2-Oct – 9-Oct	Kista	21200 (4)	50.8

Values are reported in μBq/m^3 for air concentrations and in mBq/m^2 for deposition.

When ^{103}Ru is not detected minimal detectable concentration (MDC) is given.

Relative combined standard uncertainty (1σ %) within brackets.

[2] France: http://www.irsn.fr/EN/newsroom/News/Pages/20171109_Detection-of-Ruthenium-106-in-France-and-in-Europe-Results-of-IRSN-investigations.aspx
Germany: https://www.bfs.de/SharedDocs/Kurzmeldungen/BfS/EN/2017/1003-ruthenium-106.html
Austria: https://www.bmnt.gv.at/umwelt/strahlen-atom/strahlenschutz/Ruthenium-in-der-Luft.html
Romania: http://www.cncan.ro/assets/comunicate-presa/2017-eng/Romanian-Information-Report.pdf

[3] Nuclear Safety Institute of the Russian Academy of Sciences(IBRAE): http://en.ibrae.ac.ru/newstext/911/

[4] Ramebäck et al., ”Measurements of ^{106}Ru in Sweden during the autumn 2017: Gamma-ray spectrometric measurements of air filters, precipitation and soil samples, and in situ gamma-ray spectrometry measurement”, *Applied Radiation and Isotopes*, vol. 140, pp. 179-184, 2018.

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