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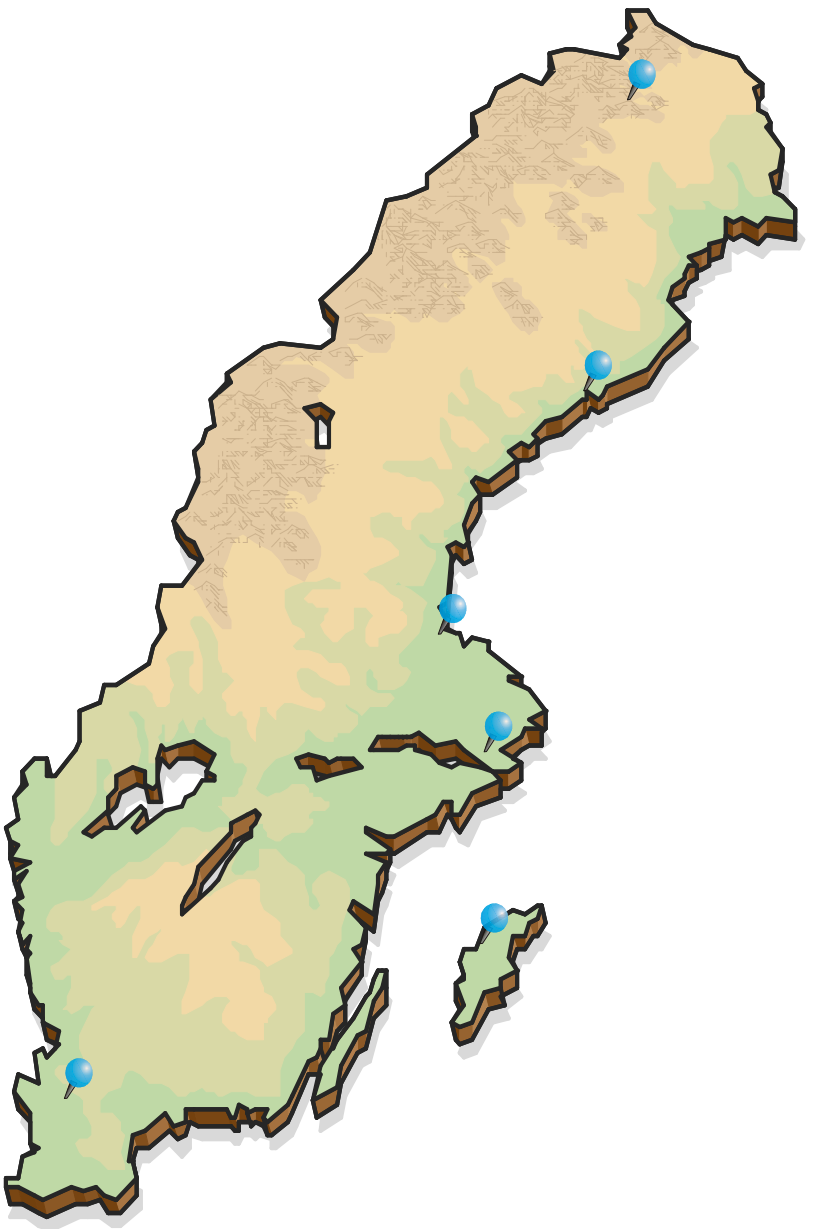

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Sammanfattning

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.
I denna rapport presenteras vecko- respektive månadsvisa aktivitetskoncentrationer av ^{7}Be och ^{137}Cs under 2024 för luft och nederbörd för de olika stationerna. I de fall andra antropogena radionuklider detekterats presenteras även dessa.

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

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 pressed into weekly samples and the contents of different radionuclides are measured by gamma spectroscopy.
Precipitation is collected at four of the stations: Kiruna, Gävle, Kista and Ljungbyhed. The samples are ashed and the contents of radionuclides are measured.
In this report weekly respectively monthly activity concentrations of ^{7}Be and ^{137}Cs during 2024 in air and precipitation are presented for the different stations. Other anthropogenic radionuclides detected are also presented.

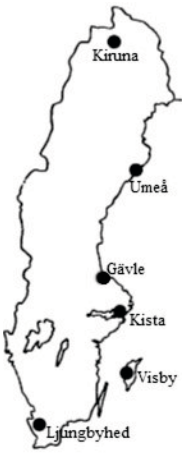
Keywords: Airborne radionuclides, deposition, ^{7}Be, ^{131}I, ^{137}Cs

Contents

1 Sampling and analysis procedures

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

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



At all stations, except Kista, 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 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. From the station in Kista, the filters are assembled in a Marinelli-like geometry by pressing them into one circular disc (94 mm diameter, 16 mm thickness), placed on top of the detector, and into six rectangular bricks (77x48x13 mm) placed around the detector.

At five of the stations (Kiruna, Umeå, Gävle, Kista and Ljungbyhed) a small part of the air flow (12 m^3/h) downstream the filter is passed through an active 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 to a monthly sample by ashing. The 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 isotopes i.e. radon daughters and ^{7}Be. In addition ^{137}Cs is commonly detected at most stations due to resuspension of the Chernobyl fallout. In Sections 2 and 3, the activity concentrations of ^{7}Be and ^{137}Cs are presented, respectively. The precipitation measurement results are presented in Section 4. Other anthropogenic radionuclides detected are presented in Section 5.

Uncertainties are given as relative combined standard uncertainty according to GUM. 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).

2 Concentrations of ^{7}Be in air

Table 2. ^{7}Be concentrations in Sweden, 2024.

Week starting	Kiruna	Umeå	Gävle	Kista	Visby	Ljungbyhed
1 Jan	1430 (2.7)	1350[3] (4.9)	2120[3] (2.8)	3930[6] (2.8)	3560 (2.8)	2190[3] (2.7)
8 Jan	1340 (2.7)	1120 (4.9)	810 (2.8)	1190[7] (2.9)	1110 (2.8)	1320 (2.7)
15 Jan	1130 (2.7)	1070 (4.9)	1110 (2.8)	1430 (2.8)	1330 (2.8)	1400 (2.7)
22 Jan	810 (2.7)	660 (4.9)	800 (2.8)	950 (2.8)	820 (2.8)	1220 (2.7)
29 Jan	2050 (2.8)	1820 (4.9)	1590 (2.8)	1730 (2.8)	1440 (4.9)	1850 (2.8)
5 Feb	960 (2.8)	1310 (4.9)	1710 (2.8)	2090 (2.8)	1330 (2.7)	1220 (2.7)
12 Feb	1090 (2.7)	1300 (4.9)	1140 (2.8)	1100 (2.8)	900 (2.8)	940 (2.7)
19 Feb	1380 (2.7)	1100 (4.9)	1070 (2.8)	1470 (2.8)	1540 (2.8)	1190 (6.8)
26 Feb	1220 (2.7)	1280 (4.9)	1450 (2.8)	2540 (2.8)	2100 (2.8)	1700 (2.7)
4 Mar	2900 (2.7)	1600 (4.9)	2240 (2.8)	2750 (2.8)	2140 (2.8)	3680 (2.7)
11 Mar	1970 (2.7)	1560 (4.9)	1410 (2.8)	1680 (2.8)	1780 (2.8)	1900 (2.7)
18 Mar	3420 (2.7)	2320 (4.9)	1670 (2.8)	2150 (2.8)	1380 (2.8)	1590 (2.7)
25 Mar	2060[1] (2.8)	1320 (4.9)	1080[1] (2.9)	2070[8] (2.8)	2770 (2.8)	1270[1] (2.7)
1 Apr	1540[2] (5.9)	1850 (4.9)	2010[2] (2.7)	1980[2] (2.8)	1590 (2.8)	1920[2] (2.7)
8 Apr	1220 (2.7)	1980 (4.9)	1880 (2.8)	2770 (2.8)	2490 (2.8)	2210 (2.7)
15 Apr	4850 (2.7)	4860 (4.9)	4040[4] (2.8)	4400 (2.8)	3040 (2.8)	3220 (2.7)
22 Apr	2170 (2.7)	2530 (4.9)	2720[5] (2.8)	3420 (2.8)	3080 (2.8)	3480 (2.7)
29 Apr	1830 (2.7)	1690 (4.9)	1990 (2.8)	2590 (2.8)	2430 (2.8)	2680 (2.7)
6 May	1850 (2.8)	1660 (4.9)	1960 (5.0)	3120 (2.8)	2520 (2.8)	2340 (2.7)
13 May	3220 (4.9)	3430 (4.9)	3610 (2.8)	4240 (2.8)	3350 (2.8)	4380 (2.7)
20 May	3080 (2.7)	2930 (4.9)	2190 (2.8)	4100 (2.8)	3440 (2.8)	3340 (2.7)
27 May	4180 (4.9)	4580 (4.9)	3470 (2.8)	5270 (2.8)	3440 (2.9)	3610 (2.8)
3 Jun	3660 (2.8)	2370 (4.9)	2300 (2.9)	2920 (2.8)	2440 (2.8)	2210 (2.7)
10 Jun	2470 (4.9)	1650 (4.9)	1430 (2.8)	1910 (2.8)	1430 (2.8)	2060 (2.8)
17 Jun	1870 (2.7)	1590 (11.1)	1730 (2.8)	2230 (2.8)	1940 (4.9)	2130 (2.8)
24 Jun	2610 (2.7)	2510 (4.9)	2560 (5.3)	3600 (3.4)	2600 (2.8)	2510 (2.8)

Values are reported in μBq/m^{3}.
Relative combined standard uncertainty (1σ%) within brackets.

[1] Sampling 8 days: 25/3-2/4
[2] Sampling 6 days: 2/4-8/4
[3] Sampling 6 days: 2/1-8/1
[4] Sampling 8 days: 15/4-23/4
[5] Sampling 6 days: 23/4-29/4
[6] Sampling 5 days: 1/1-5/1
[7] Sampling 5 days: 10/1-15/1
[8] Sampling 6 days: 25/3-31/3

Table 2, continued. ^{7}Be concentrations in Sweden, 2024.

Week starting	Kiruna	Umeå	Gävle	Kista	Visby	Ljungbyhed
1 Jul	2430 (2.7)	1780 (4.9)	1350 (2.8)	2150 (2.8)	1890 (2.8)	1920 (2.7)
8 Jul	2160 (5.0)	1310 (4.9)	1250 (2.8)	2250[5] (2.8)	2020 (2.8)	2110 (2.7)
15 Jul	4060 (2.7)	2270 (4.9)	1370 (2.8)	2260[6] (2.9)	2400 (2.8)	2610 (2.7)
22 Jul	3330 (4.9)	2580 (4.9)	1750 (2.8)	2720 (2.9)	2090 (2.8)	2020 (2.7)
29 Jul	4000 (2.7)	2040 (4.9)	2010[1] (2.8)	2700 (2.9)	2430 (2.8)	2530 (2.8)
5 Aug	5410 (2.7)	2550 (4.9)	1500 (2.8)	3370[7] (2.9)	2040 (2.8)	1870 (2.7)
12 Aug	2910 (2.7)	2090 (4.9)	1930[2] (2.8)	2550[8] (2.9)	2290 (2.8)	2370[18] (2.8)
19 Aug	2030 (2.8)	2420 (4.9)	2110 (2.8)	2710 (2.8)	2420 (2.8)	2500[19] (4.9)
26 Aug	1940 (2.8)	1910 (4.9)	1930 (2.7)	2990[9] (2.9)	1890[16] (2.8)	1960 (4.9)
2 Sep	3160 (2.7)	3070 (4.9)	2440 (2.8)	3510[10] (5.2)	4320[17] (2.8)	3940[20] (2.7)
9 Sep	2930 (2.7)	2100 (2.8)	2000 (4.9)	2780[11] (3.2)	2290 (2.8)	2230[21] (2.7)
16 Sep	1060 (2.7)	1610 (2.8)	2170 (4.9)	2540 (2.8)	2260 (2.8)	1690 (2.7)
23 Sep	930 (2.7)	1780 (4.9)	1740 (2.8)	2970 (2.8)	2340 (2.8)	2590 (2.7)
30 Sep	630 (2.7)	780 (4.9)	2050 (2.8)	1790 (2.9)	2170 (2.8)	1420 (2.7)
7 Oct	830 (2.7)	1060 (5.0)	1220 (2.8)	2060[12] (2.8)	2030 (2.9)	1730 (2.7)
14 Oct	1260 (2.7)	2100 (4.9)	2150 (2.8)	2710 (2.8)	1960 (2.8)	2530 (2.7)
21 Oct	910 (2.7)	1110 (2.7)	1520 (2.8)	1800[13] (2.8)	1710 (2.8)	1950[22] (2.7)
28 Oct	890 (2.7)	690 (2.7)	1010 (2.8)	1260 (2.8)	1480 (2.8)	1700[23] (2.7)
4 Nov	1540 (2.8)	630 (4.9)	570 (5.0)	1050[14] (2.8)	1060 (2.8)	2660 (2.7)
11 Nov	500 (2.8)	980 (4.9)	1260 (2.8)	1740 (2.8)	1150 (2.7)	1370 (4.9)
18 Nov	1100 (2.8)	1030 (4.9)	1140 (2.7)	1890 (2.8)	1630 (2.7)	1760 (2.8)
25 Nov	810 (2.7)	850 (2.8)	1200 (5.0)	1380 (3.3)	1370 (4.7)	1480 (2.8)
2 Dec	1300 (2.7)	1610 (4.9)	1420 (2.8)	1780 (3.6)	1240 (2.8)	1190 (2.7)
9 Dec	1040 (2.7)	1420 (4.9)	1690 (2.8)	1930 (3.1)	1760 (2.8)	1150 (2.7)
16 Dec	1510 (2.7)	1870 (2.4)	640[3] (4.5)	1010 (3.7)	1010 (2.6)	1180 (2.6)
23 Dec	960 (2.7)	1250 (4.9)	730[4] (1.9)	890[15] (2.9)	410 (2.8)	470 (2.7)

Values are reported in µBq/m^3.
Relative combined standard uncertainty (1σ%) within brackets.

[1] Sampling 8 days: 29/7-6/8
[2] Sampling 6 days: 13/8-19/8
[3] Sampling 4 days: 16/12-20/12
[4] Sampling 6 days: 20/12-26/12
[5] Sampling 6 days: 8/7-14/7
[6] Sampling 8 days: 14/7-22/7
[7] Sampling 4 days: 5/8-9/8
[8] Sampling 4 days: 14/8-18/8
[9] Sampling 4 days: 26/8-30/8
[10] Sampling 8 days: 30/8-7/9
[11] Sampling 8 days: 7/9-15/9
[12] Sampling 6 days: 7/10-13/10
[13] Sampling 6 days: 20/10-26/10
[14] Sampling 6 days: 4/11-10/11
[15] Sampling 5 days: 22/12-27/12
[16] Sampling 8 days: 26/8-3/9
[17] Sampling 6 days: 3/9-9/9
[18] Sampling 6 days: 12/8-18/8
[19] Sampling 8 days: 18/8-26/8
[20] Sampling 6 days: 2/9-8/9
[21] Sampling 8 days: 8/9-16/9
[22] Sampling 6 days: 21/10-27/10
[23] Sampling 8 days: 27/10-4/11

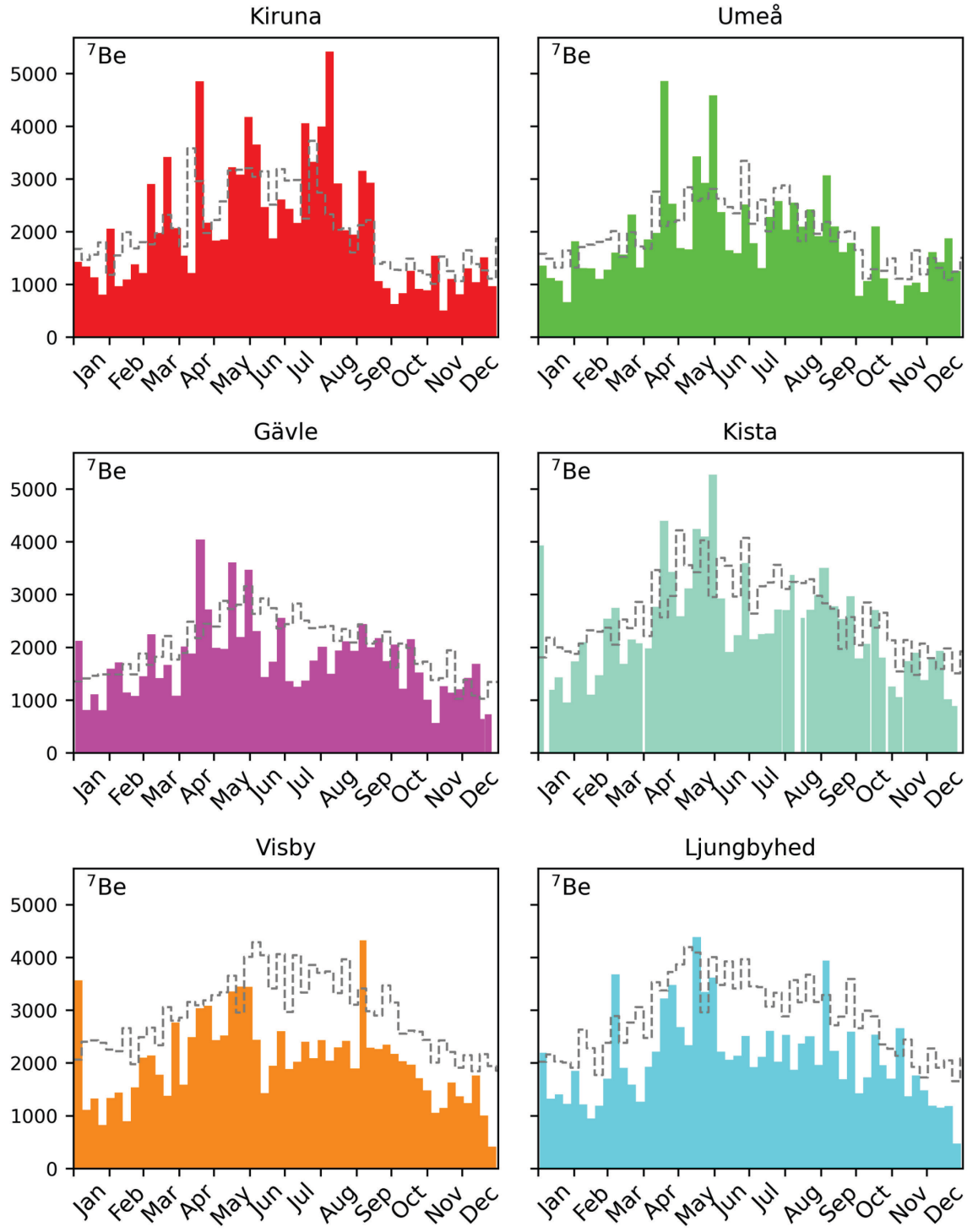


Figure 1. Activity concentrations (μBq/m^3) in ground level air of ^{7}Be in the Swedish network during 2024. The dotted line shows average concentration for the preceding ten years.

3 Concentrations of ^{137}Cs in air

Table 3. ^{137}Cs concentrations in Sweden, 2024.

Week starting	Kiruna	Umeå	Gävle	Kista	Visby	Ljungbyhed
1 Jan	< 0.2	1.6[3] (6)	1.6[3] (10)	0.9[6] (5)	0.1 (35)	0.2[3] (27)
8 Jan	< 0.2	0.3 (16)	0.5 (27)	0.6[7] (6)	0.1 (18)	0.2 (25)
15 Jan	0.1 (43)	0.7 (10)	1.5 (8)	1.0 (4)	0.2 (27)	0.5 (11)
22 Jan	< 0.2	0.6 (11)	0.5 (13)	0.2 (10)	< 0.2	0.2 (28)
29 Jan	< 0.2	1.0 (8)	0.6 (22)	0.2 (12)	0.1 (67)	0.1 (58)
5 Feb	0.2 (33)	1.4 (6)	1.6 (8)	1.1 (4)	0.1 (41)	0.3 (19)
12 Feb	< 0.2	0.7 (10)	0.6 (22)	0.2 (11)	0.1 (54)	0.2 (21)
19 Feb	< 0.2	0.4 (18)	0.5 (28)	0.2 (14)	< 0.2	0.3 (24)
26 Feb	< 0.2	0.6 (14)	0.5 (23)	0.7 (5)	0.4 (7)	0.5 (10)
4 Mar	< 0.2	1.1 (8)	0.8 (18)	0.9 (4)	0.2 (30)	0.3 (15)
11 Mar	< 0.2	0.5 (12)	1.2 (10)	0.8 (4)	0.4 (14)	0.7 (6)
18 Mar	0.1 (46)	0.3 (17)	0.7 (15)	0.3 (7)	0.2 (27)	0.3 (10)
25 Mar	0.1[1] (41)	0.7 (11)	0.4[1] (11)	0.4[8] (4)	0.6 (18)	0.3[1] (14)
1 Apr	< 0.3[2]	0.7 (9)	0.6[2] (13)	0.3[2] (10)	0.1 (45)	< 0.2[2]
8 Apr	< 0.2	0.4 (16)	0.4 (27)	0.3 (8)	0.2 (13)	0.1 (17)
15 Apr	< 0.3	0.3 (24)	0.6[4] (25)	0.6 (6)	0.1 (38)	0.2 (37)
22 Apr	< 0.3	0.6 (13)	1.0[5] (15)	0.5 (6)	0.1 (21)	0.2 (13)
29 Apr	< 0.3	0.6 (13)	1.6 (8)	0.6 (6)	0.2 (25)	0.4 (17)
6 May	< 0.2	0.6 (15)	1.6 (6)	0.6 (5)	0.2 (14)	0.5 (11)
13 May	< 0.3	2.3 (4)	2.8 (6)	0.7 (5)	0.6 (10)	0.8 (8)
20 May	0.1 (53)	2.9 (4)	5.3 (4)	0.5 (6)	0.7 (8)	0.4 (17)
27 May	0.7 (8)	8.6 (3)	4.5 (5)	0.7 (5)	0.4 (14)	0.2 (28)
3 Jun	0.1 (36)	4.7 (4)	1.2 (7)	0.1 (14)	0.3 (33)	0.1 (31)
10 Jun	< 0.3	1.3 (6)	1.2 (11)	< 0.2	< 0.2	0.1 (40)
17 Jun	< 0.3	1.4 (12)	0.7 (15)	0.2 (13)	0.2 (37)	< 0.1
24 Jun	0.1 (38)	1.1 (8)	0.8 (19)	0.2 (12)	0.1 (33)	< 0.2

Values are reported in µBq/m^3.
Relative combined standard uncertainty (1σ%) within brackets.

[1] Sampling 8 days: 25/3-2/4
[2] Sampling 6 days: 2/4-8/4
[3] Sampling 6 days: 2/1-8/1
[4] Sampling 8 days: 15/4-23/4
[5] Sampling 6 days: 23/4-29/4
[6] Sampling 5 days: 1/1-5/1
[7] Sampling 5 days: 10/1-15/1
[8] Sampling 6 days: 25/3-31/3

Table 3, continued. ^{137}Cs concentrations in Sweden, 2024.

Week starting	Kiruna	Umeå	Gävle	Kista	Visby	Ljungbyhed
1 Jul	0.1 (73)	1.1 (8)	1.0 (13)	< 0.2	< 0.2	< 0.1
8 Jul	< 0.5	1.4 (6)	1.2 (7)	< 0.2[5]	0.1 (65)	< 0.2
15 Jul	< 0.2	1.6 (5)	1.4 (10)	0.2[6] (21)	0.1 (44)	< 0.2
22 Jul	0.2 (46)	2.0 (5)	0.7 (16)	0.1 (22)	0.1 (39)	< 0.2
29 Jul	0.1 (37)	2.3 (5)	0.9[1] (13)	0.3 (10)	< 0.2	< 0.1
5 Aug	0.2 (15)	2.6 (5)	0.7 (20)	0.2[7] (17)	0.2 (26)	< 0.2
12 Aug	0.3 (22)	2.5 (3)	0.7[2] (26)	< 0.4[8]	0.2 (13)	0.3[18] (35)
19 Aug	0.7 (22)	2.8 (4)	0.7 (18)	0.2 (14)	0.1 (15)	0.2[19] (30)
26 Aug	0.6 (20)	4.4 (4)	0.8 (5)	0.4[9] (13)	0.2[16] (11)	0.1 (49)
2 Sep	8.9 (3)	1.9 (6)	5.3 (3)	5.5[10] (5)	9.8[17] (3)	5.0[20] (3)
9 Sep	4.1 (3)	6.2 (4)	2.2 (5)	2.3[11] (4)	0.4 (14)	0.2[21] (24)
16 Sep	0.1 (27)	3.4 (5)	1.6 (6)	0.4 (6)	1.0 (6)	0.7 (13)
23 Sep	< 0.3	2.0 (5)	0.9 (15)	0.3 (9)	0.2 (27)	0.2 (37)
30 Sep	< 0.3	1.5 (6)	0.5 (22)	0.3 (11)	0.1 (39)	1.7 (4)
7 Oct	< 0.3	1.6 (6)	1.1 (13)	0.1[12] (15)	0.1 (16)	0.2 (22)
14 Oct	< 0.2	1.4 (6)	1.4 (6)	0.5 (6)	0.5 (12)	0.3 (11)
21 Oct	< 0.2	1.7 (5)	0.7 (15)	0.2[13] (14)	0.2 (31)	0.3[22] (12)
28 Oct	< 0.3	0.7 (9)	0.7 (16)	0.2 (11)	< 0.2	< 0.1[23]
4 Nov	< 0.5	0.8 (10)	1.3 (11)	0.2[14] (12)	0.1 (35)	0.3 (19)
11 Nov	< 0.2	0.6 (11)	1.4 (8)	0.3 (9)	0.1 (26)	0.1 (47)
18 Nov	< 0.2	0.4 (21)	1.6 (4)	0.3 (8)	0.2 (26)	0.3 (37)
25 Nov	< 0.3	0.6 (19)	0.3 (13)	0.2 (12)	0.2 (14)	0.3 (19)
2 Dec	< 0.3	0.6 (13)	1.7 (9)	0.5 (7)	0.2 (21)	0.2 (14)
9 Dec	< 0.2	0.4 (18)	1.0 (7)	0.3 (9)	0.2 (40)	0.1 (33)
16 Dec	< 0.2	0.4 (57)	0.6[3] (12)	0.2 (13)	< 1.4	< 0.4
23 Dec	< 0.2	0.6 (12)	0.5[4] (25)	< 0.2[15]	< 0.2	0.1 (52)

Values are reported in µBq/m^3.
Relative combined standard uncertainty (1σ%) within brackets.

[1] Sampling 8 days: 29/7-6/8
[2] Sampling 6 days: 13/8-19/8
[3] Sampling 4 days: 16/12-20/12
[4] Sampling 6 days: 20/12-26/12
[5] Sampling 6 days: 8/7-14/7
[6] Sampling 8 days: 14/7-22/7
[7] Sampling 4 days: 5/8-9/8
[8] Sampling 4 days: 14/8-18/8
[9] Sampling 4 days: 26/8-30/8
[10] Sampling 8 days: 30/8-7/9
[11] Sampling 8 days: 7/9-15/9
[12] Sampling 6 days: 7/10-13/10
[13] Sampling 6 days: 20/10-26/10
[14] Sampling 6 days: 4/11-10/11
[15] Sampling 5 days: 22/12-27/12
[16] Sampling 8 days: 26/8-3/9
[17] Sampling 6 days: 3/9-9/9
[18] Sampling 6 days: 12/8-18/8
[19] Sampling 8 days: 18/8-26/8
[20] Sampling 6 days: 2/9-8/9
[21] Sampling 8 days: 8/9-16/9
[22] Sampling 6 days: 21/10-27/10
[23] Sampling 8 days: 27/10-4/11

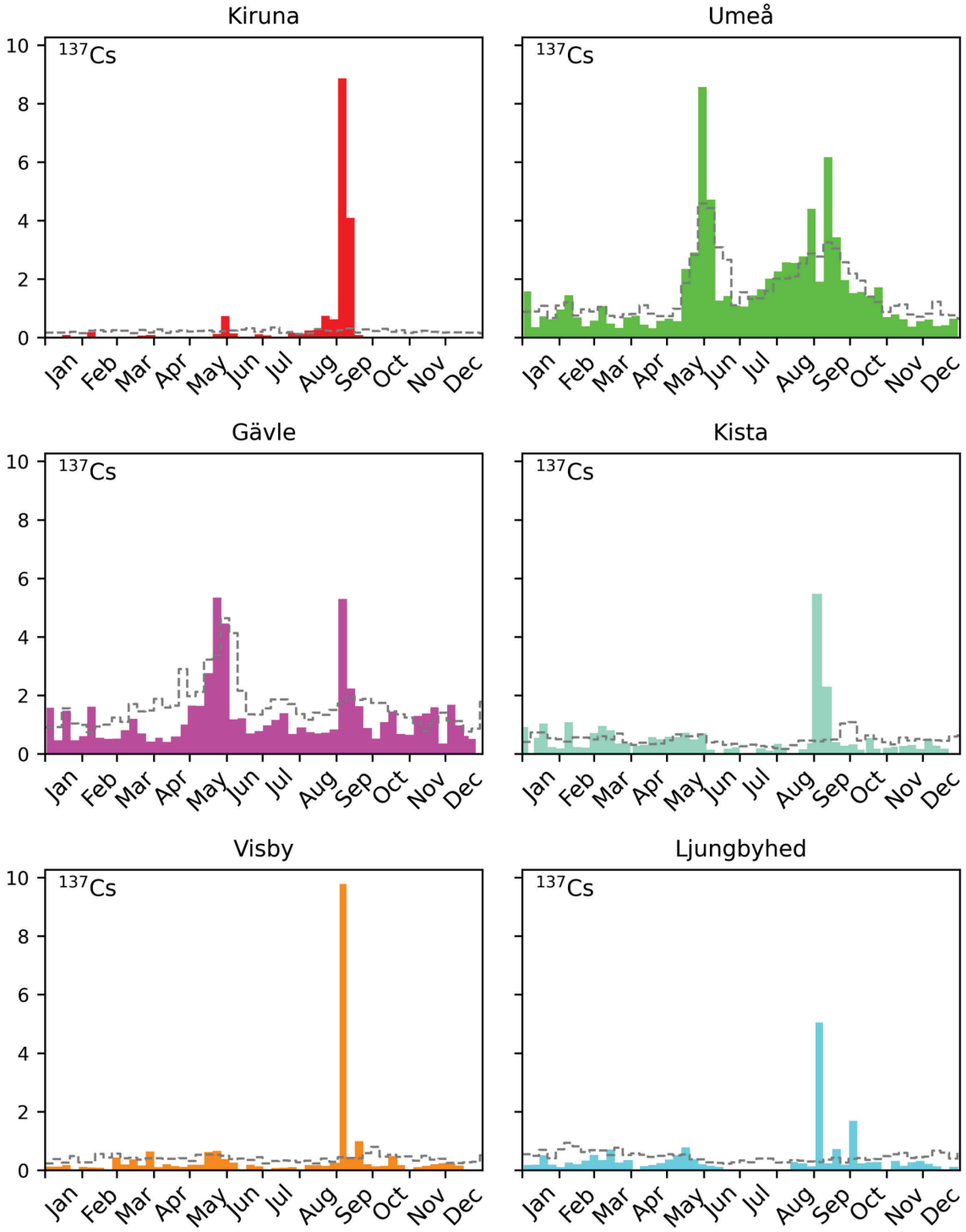


Figure 2. Activity concentrations (µBq/m^3) in ground level air of ^{137}Cs in the Swedish network during 2024. The dotted line shows average concentration for the preceding ten years.

4 Deposition measurements

Table 4.1. Kiruna

Period	^{7}Be		^{137}Cs		Precipitation (mm)
25 Dec - 29 Jan	7000	(5)	< 5		10
29 Jan - 26 Feb	4100	(5)	< 8		5
26 Feb - 18 Mar	3300	(5)	< 8		3
18 Mar - 15 Apr	13600	(5)	< 7		22
15 Apr - 13 May	15700	(5)	2	(67)	4
13 May - 10 Jun	33300	(5)	23	(7)	20
10 Jun - 8 Jul	65900	(5)	13	(12)	80
8 Jul - 5 Aug	145000	(5)	6	(33)	60
5 Aug - 2 Sep	44900	(5)	8	(24)	88
2 Sep - 30 Sep	25100	(5)	19	(11)	47
30 Sep - 28 Oct	17300	(5)	6	(16)	49
28 Oct - 25 Nov	17600	(5)	< 4		8
25 Nov - 23 Dec	1400	(5)	< 7		10

Values are reported in mBq/m^2.
When a nuclide is not detected, minimal detectable concentration (<MDC) is given.
Relative combined standard uncertainty (1σ%) within brackets.

Table 4.2. Gävle

Period	^{7}Be		^{137}Cs		Precipitation (mm)
18 Dec - 15 Jan	16600	(5)	12	(14)	54
15 Jan - 12 Feb	2700	(5)	12	(22)	30
12 Feb - 11 Mar	6600	(5)	10	(23)	46
11 Mar - 8 Apr	7500	(5)	14	(12)	80
8 Apr - 6 May	8400	(5)	11	(38)	38
6 May - 3 Jun	3800	(5)	5	(34)	8
3 Jun - 1 Jul	2200	(5)	5	(38)	33
1 Jul - 29 Jul	12500	(5)	16	(12)	99
29 Jul - 26 Aug	1100	(5)	4	(36)	18
26 Aug - 23 Sep	2600	(5)	3	(65)	32
23 Sep - 21 Oct	36900	(5)	34	(9)	72
21 Oct - 18 Nov	2600	(5)	12	(18)	21
18 Nov - 9 Dec	29600	(5)	79	(6)	96

Values are reported in mBq/m^2.
Relative combined standard uncertainty (1σ%) within brackets.

Table 4.3. Kista

Period	^{7}Be		^{137}Cs		Precipitation (mm)
11 Dec - 8 Jan	48600	(5)	< 7		46
8 Jan - 5 Feb	19800	(5)	4	(39)	33
5 Feb - 4 Mar	56300	(5)	4	(44)	56
4 Mar - 2 Apr	6400	(5)	< 7		18
2 Apr - 29 Apr	33000	(5)	4	(53)	47
29 Apr - 27 May	18300	(5)	< 5		18
27 May - 3 Jun	3900	(5)	2	(61)	1
3 Jun - 24 Jun	68900	(5)	9	(30)	70
24 Jun - 22 Jul	55700	(5)	< 7		64
22 Jul - 19 Aug	25600	(5)	< 9		39
19 Aug - 16 Sep	31000	(5)	9	(25)	58
16 Sep - 14 Oct	41800	(5)	2	(61)	93
14 Oct - 11 Nov	9900	(5)	< 8		17
11 Nov - 9 Dec	28700	(5)	3	(54)	33

Values are reported in mBq/m^2.
When a nuclide is not detected, minimal detectable concentration (<MDC) is given.
Relative combined standard uncertainty (1σ%) within brackets.

Table 4.4. Ljungbyhed

Period	^{7}Be		^{137}Cs		Precipitation (mm)
2 Jan - 29 Jan	74100	(5)	3	(64)	76
29 Jan - 26 Feb	94600	(5)	4	(39)	97
26 Feb - 25 Mar	24000	(5)	< 8		13
25 Mar - 22 Apr	58300	(5)	4	(44)	49
22 Apr - 13 May	19500	(5)	6	(32)	20
13 May - 10 Jun	65400	(5)	7	(30)	43
10 Jun - 8 Jul	81700	(5)	6	(35)	89
8 Jul - 5 Aug	96300	(5)	< 9		79
5 Aug - 2 Sep	48200	(5)	< 8		44
2 Sep - 7 Oct	68100	(5)	10	(21)	88
7 Oct - 4 Nov	78400	(5)	< 6		12
4 Nov - 2 Dec	49700	(5)	2	(56)	35
2 Dec - 30 Dec	56300	(5)	2	(71)	42

Values are reported in mBq/m^2.
When a nuclide is not detected, minimal detectable concentration (<MDC) is given.
Relative combined standard uncertainty (1σ%) within brackets.

5 Other detections

5.1 Detections of ^{137}Cs in September 2024

During the beginning of September 2024, elevated levels of ^{137}Cs were detected at all of the Swedish stations. Increased levels of ^{137}Cs were also reported from other European countries, including Norway, Finland, Estonia, Poland, Czech Republic and a few more.

A map of the reported detections is shown in Figure 3, where the squares indicate a station with a detection, the colour of the square indicate measured activity concentration. Circles indicate stations without a detection above detection limits. Note that sampling times and collection start times differ between stations and hence the measured concentration values are not directly comparable but mainly gives an indication of the spread of the plume.

Measured activity concentrations of ^{137}Cs at the Swedish stations during the period 2-16 September are shown in Table 5.1.

From the station in Kista some of the individual samples from the week were measured separately to give a better estimation of the time interval of the detections, the results from these measurements are shown in Table 5.2.

A possible source was releases of organic material from wild fires in the Chornobyl exclusion zone, marked with a red star in Figure 1. The wild fires started during the end of August and was quenched by rain starting on September 10th.

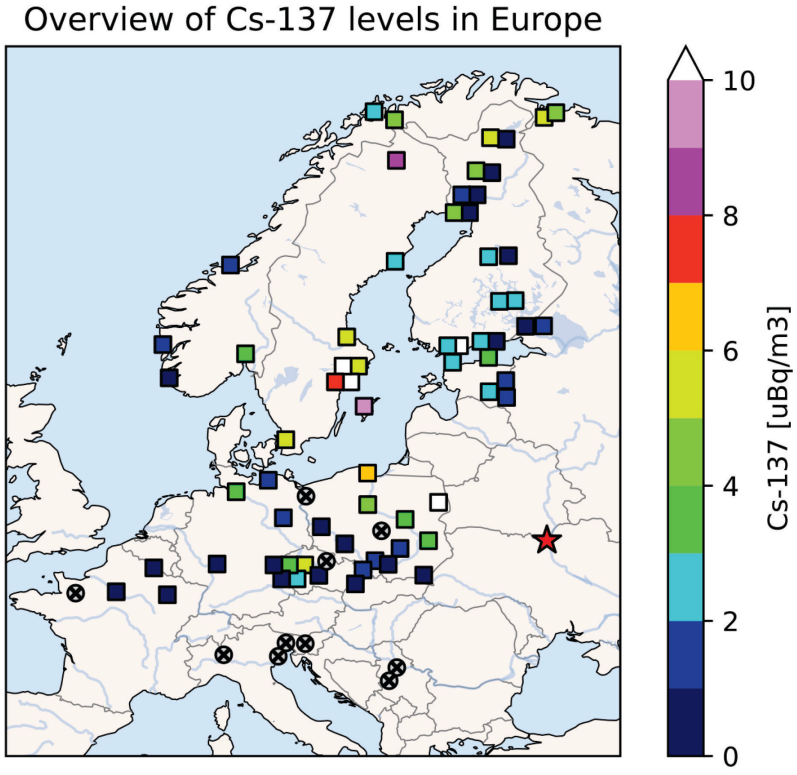


Figure 3. Schematic overview of the reported detections of ^{137}Cs in Europe during the first week of September 2024. Squares indicate stations that have reported detection of ^{137}Cs, the colour indicate the activity concentration at the station. The circles indicate stations with no detection of 137Cs. The red start indicate the position of Chornobyl. At some stations ^{137}Cs was detected in more than one sample, these detections are shown as a cluster around the station coordinate.

Table 5.1. Activity concentrations of ^{7}Be and ^{137}Cs at the Swedish stations during the period 2-16 September 2024.

Station	Sampling period	^{7}Be		^{137}Cs	
Kiruna	2 Sep - 9 Sep	3160	(2.7)	8.9	(3)
Umeå	2 Sep - 9 Sep	3070	(4.9)	1.9	(6)
Gävle	2 Sep - 9 Sep	2440	(2.8)	5.3	(3)
Kista	30 Aug - 7 Sep	3510	(5.2)	5.5	(5)
Visby	3 Sep - 9 Sep	4320	(2.8)	9.8	(3)
Ljungbyhed	2 Sep - 8 Sep	3940	(2.7)	5.0	(3)
Kiruna	9 Sep - 16 Sep	2930	(2.7)	4.1	(3)
Umeå	9 Sep - 16 Sep	2100	(2.8)	6.2	(4)
Gävle	9 Sep - 16 Sep	2000	(4.9)	2.2	(5)
Kista	7 Sep - 15 Sep	2780	(3.2)	2.3	(4)
Visby	9 Sep - 16 Sep	2290	(2.8)	0.4	(14)
Ljungbyhed	8 Sep - 16 Sep	2230	(2.7)	0.2	(24)

Values are reported in µBq/m^3
Relative combined standard uncertainty (1σ%) within brackets.

Table 5.2. Measurements of individual 28 hours filters from the station in Kista.

Station	Sampling period	^{7}Be		^{137}Cs	
Kista	4 Sep 20:09 - 6 Sep 00:09	1440	(1.8)	< 0.6	
Kista	6 Sep 00:09 - 6 Sep 09:28	12790	(1.8)	5.5	(17)
Kista	6 Sep 09:28 - 7 Sep 17:28	6220	(1.8)	33.5	(3)
Kista	7 Sep 17:28 - 10 Sep 05:28	5390	(1.8)	12.8	(5)
Kista	10 Sep 05:28 - 11 Sep 09:29	2220	(1.9)	< 0.8	
Kista	11 Sep 09:29 - 12 Sep 13:29	2530	(1.8)	< 0.9	

Values are reported in µBq/m^3
When a nuclide is not detected, minimal detectable concentration (<MDC) is given.
Relative combined standard uncertainty (1σ%) within brackets.

5.2 ATM calculations

ATM (Atmospheric Transport Model) calculations were performed based on the hypothesis that the wild fires were the source for the detections. Forward modelling were performed using HYSPLIT[1] using weather data from NOAA (National Oceanic and Atmospheric Administration).

Since the wild fires were raging for a longer period a series of forward modelling scenarios were set up. For each scenario a presumed release during 24 hours was assumed and the emitted plume was followed for a number of days. An example of such a

[1] Draxler, R. D., & Hess, G. (1997). *Description of the HYSPLIT_4 modeling system.* Silver Spring, MD: NOAA Air Resources Laboratory.

calculation is shown in Figure 4, when the transport and dilution of a release during Sept 5th is shown for the following three days. The colour scale indicate the logarithm of the dilution factor. It shows clearly that the plume spreads over Eastern Europe and Scandinavia.

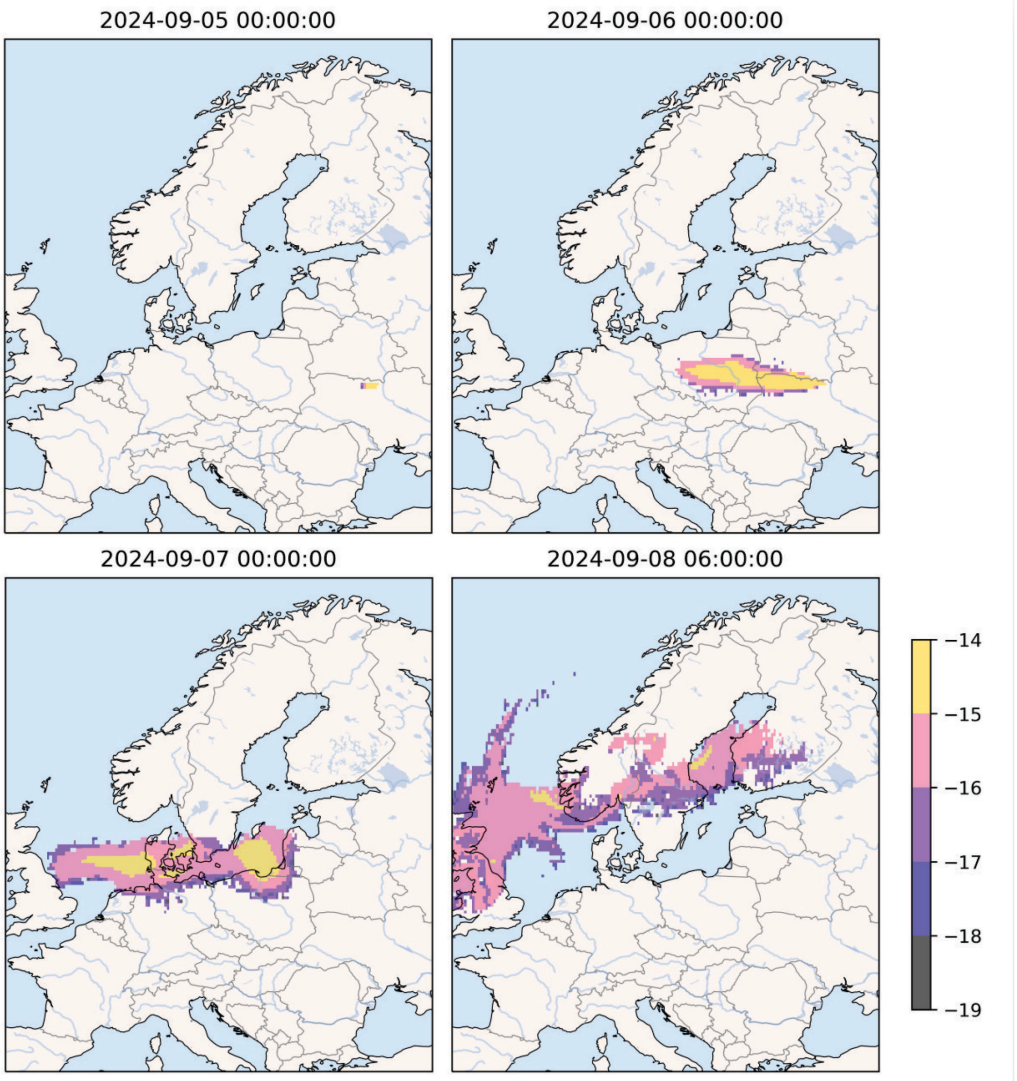


Figure 4. Transport modelling for a release from the Chornobyl area during September 5th. The plume position and dilution for the release date and the three following days are shown. The colour indicates the logarithm of the dilution factor of the plume.

A compilation of all dispersion calculations for the period Aug 20th – Sept 8th and the connection to a measurement station is shown in Figure 5. All stations that have reported a detection of ^{137}Cs during the period is shown along the y-axis and all release dates are shown on the x-axis. If the plume for a certain release day covers the station for a specific date and there is a coincident detection of 137Cs, the corresponding square is coloured green. A red square indicates that the plume does not cover the station at the time when there is a detection of ^{137}Cs.

It is seen that for releases during the period Aug 25th and Sept 7th there is a clear connection between all stations and the Chornobyl area, which enhances the assumption that the increased levels of ^{137}Cs is due to releases from the wild fires in the area.

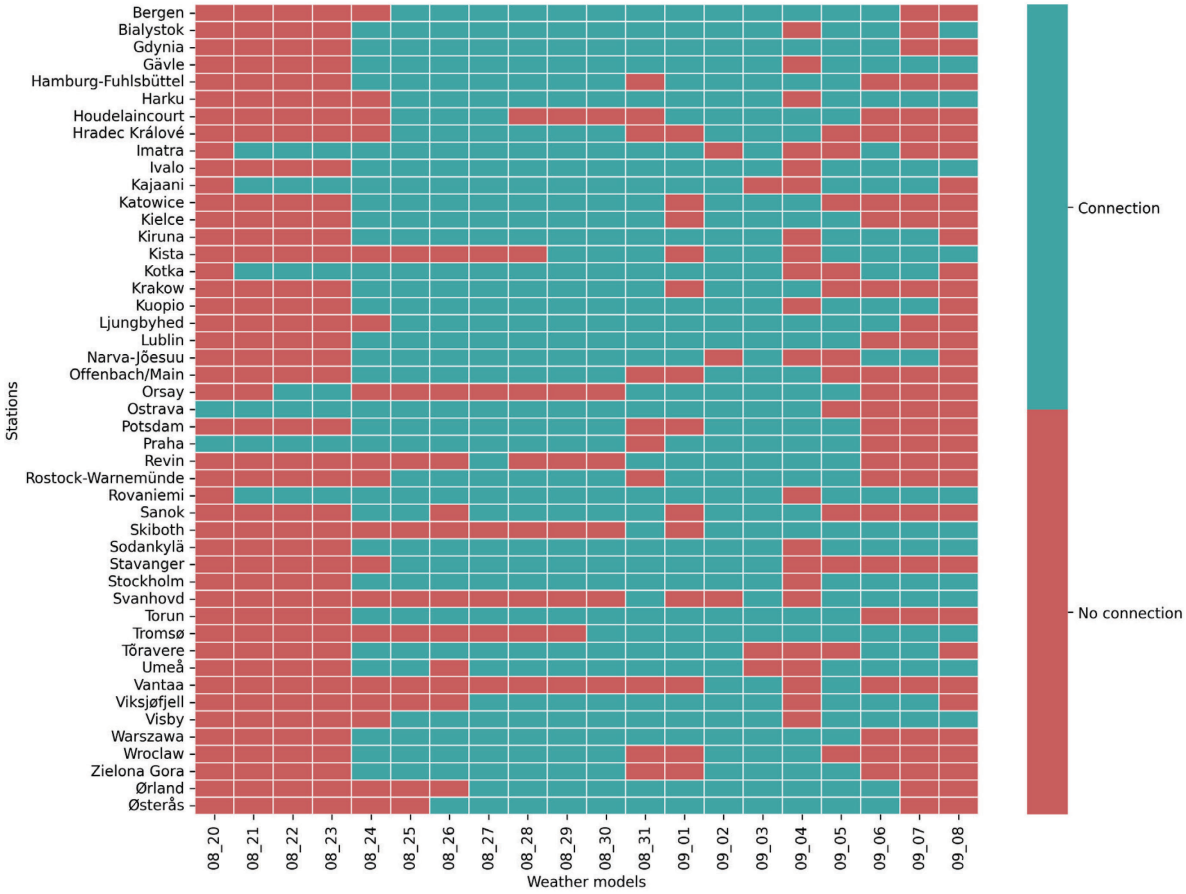


Figure 5. Compilation of the connection between the dispersion models and the detection of ^{137}Cs at the stations. A green square indicate that the plume from the release during that day coincides with a detection of ^{137}Cs, a red square indicate that there is no coincident detection or that the plume does not cover the station.

Acknowledgement

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5.3 Other anthropogenic radionuclides detected during 2024

At a few occasions during the year, ^{131}I was detected in the network. Detections of low concentrations of ^{131}I are common. The sources for the detections have not been established.

Table 5.3. Detections of ^{131}I during 2024.

Station	Sampling period	^{131}I	
Ljungbyhed	2 Sep - 8 Sep	0.6	(26)
Kista	2 Dec - 9 Dec	0.4	(26)

Values are reported in µBq/m^3
Relative combined standard uncertainty (1σ%) within brackets.

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