

Dr Jing Chen  
Chairperson, UNSCEAR  
UNSCEAR secretariat  
Vienna International Centre  
Wagramer Straße 5  
P.O. Box 500  
Building E  
A-1400 Vienna, AUSTRIA

Dear Dr Chen

16 July 2022

Subject: Fourth Letter to UNSCEAR Chairperson about  $^{137}\text{Cs}$  Bulk Deposition Velocities in Koriyama-City and Fukushima-City

This is my fourth letter to you with respect to Attachment A-9. Issues raised by the last three letters are mainly those with respect to  $^{131}\text{I}$ . In this letter I focus on the issues of  $^{137}\text{Cs}$ .

Table A-9.4 compares modelled and measured time-integrated concentrations of  $^{137}\text{Cs}$ . From this Table I pick up three lines: No.2 (Asahi), No.3 (Daishin), and No.19 (Sugitsumacho). The first two are two nearby SPM stations in Koriyama-City and the third one of the four SPM stations in Fukushima-City.

I calculate bulk deposition velocities by using measured deposition densities of  $^{137}\text{Cs}$  in Koriyama-City and Fukushima-City and by dividing them by concentrations derived from ATDM using scaling method shown in Table A-9.4. In this calculation I assume that the deposition densities at these three SPM stations are 200,000 Bq/m<sup>2</sup>. The result is shown in Table attached to this letter on page 4. (For the purpose of helping readers of my letter to understand the relation among three values, concentration in air (C), deposition density (D), and bulk deposition velocity (V), I show the formulae:  $V = D/C$  and  $C = D/V$ .)

The calculated bulk deposition velocities amount to 100 cm/s or 25 cm/s in Koriyama-City and 40 cm/s in Fukushima-City. I also read corresponding bulk

deposition velocities from Figure A-9.XI, and get ~70 cm/s in Koriyama-City and ~30 cm/s in Fukushima-City, which should be equal to the values shown in the Table in page 4, are indeed roughly equal to these values.

In my first letter, I cited the following sentences from Amano paper<sup>[1]</sup>, which is one of the references listed in Appendix A-9.

“Deposition velocities during 14-17 March, when there was no precipitation, were around 0.2 – 0.3 cm/s for <sup>134</sup>Cs and <sup>137</sup>Cs, and 0.1 – 0.2 cm/s for <sup>131</sup>I. Deposition velocities during 21-24 March, when there was precipitation (38 mm), were around 1 – 14 cm/s for <sup>134</sup>Cs and <sup>137</sup>Cs, and 0.4 – 3 cm/s for <sup>131</sup>I. These differences between radioactive Cs and <sup>131</sup>I were slight but measurable under both wet and dry conditions.” (Please note that Amano’s paper is about the measurement of concentrations in air and bulk deposition velocities of <sup>134</sup>Cs, <sup>137</sup>Cs, and <sup>131</sup>I in Chiba near Tokyo, where it did not rain on March 14-17 and it rained on March 21-24)

Comparing the result of Amano paper with the bulk deposition velocities in Koriyama-City (100 cm/s or 25 cm/s) and Fukushima-City (40 cm/s), these bulk deposition velocities are too large even in Fukushima-City, where it rained from 17:00 of March 15 to 3:00 of March 16 (precipitation 13.5 mm) all of the time during the passage of the plume, and extremely large in Koriyama-City, where there was little, intermittent precipitation (3.5 mm) during the period when the plume passed from 13:00 of March 15 to 8:00 of March 16.

I am grateful to you if you and your experts could explain why UNSCEAR thinks that these large values of deposition velocities are reasonable and acceptable.

Let me also point out that the description of Paragraph 23, “Figures A-9.XIII and A-9.XIV show further comparisons of measured and modelled <sup>137</sup>Cs concentrations in air (the former of modelled concentrations based directly on ATDM and the latter on concentrations estimated from deposition scaling).” is incorrect: Figure A-9.XIII shows comparison of <sup>137</sup>Cs concentrations in air estimated from deposition scaling, while Figure A-9.XIV shows those based directly on ATDM.

[1] Amano, H., M. Akiyama, B. Chunlei et al. Radiation measurements in the Chiba Metropolitan Area and radiological aspects of fallout from the Fukushima Dai-ichi Nuclear Power Plants accident. J Environ Radioact 111: 42-52 (2012).

Sincerely yours,

Handwritten signature in black ink, consisting of the characters '黒川 真一' (Kurokawa Shin-ichi) followed by a horizontal line.

Shin-ichi Kurokawa

Professor Emeritus

High Energy Accelerator Research Organization, KEK, Tsukuba, Japan

## Attachment to the Letter

Table: Calculation of Bulk Deposition Velocities in Koriyama-City and Fukushima-City

No.	Location	<sup>137</sup> Cs measurement (Bq s/m <sup>3</sup> )	<sup>137</sup> Cs concentrations derived directly from ATDM (Bq s/m <sup>3</sup> )	<sup>137</sup> Cs concentrations derived from ATDM and deposition scaling (Bq s/m <sup>3</sup> )	<sup>137</sup> Cs deposition density (Bq/m <sup>2</sup> )	<sup>137</sup> Cs bulk deposition velocity (cm/s)
2	Asahi	2.00E+06	2.00E+05	2.00E+05	2.00E+05	1.00E+02
3	Daishin	2.00E+06	2.00E+05	8.00E+05	2.00E+05	2.50E+01
19	Sigutsmacho	2.00E+06	3.00E+05	5.00E+05	2.00E+05	4.00E+01