Radionuclide concentrations in the air in Japan, five years after the Fukushima Daiichi accident

In 2015, measurement results relating to the monitoring of radionuclides present in the atmosphere - obtained during 2014 - show that there are still perceptible traces in the ambient air five years after the accident at the Fukushima Dai-Ichi nuclear power plant.

The main driving force behind this atmospheric remanence is linked to the re-suspension by wind erosion of particles from the soils upon which radionuclides released at the time of the accident were deposited. Biomass fires (more or less contaminated at the time of the accident) are also part of this remanence through the ash that can be dispersed in the atmosphere. These particles and ash, more generally called "aerosols", can be transported by the wind towards territories where deposits were lower and thus lead to a temporary increase in concentrations in the air.

Among the different sites where measurements are carried out continuously on the levels of radionuclide concentrations in the air[1], here we have chosen to represent the values obtained, on the one hand, **in the outskirts of Tokyo city, in Tsukuba (170 km south-west of the nuclear power plant)** and, on the other hand, **in a rural area, in Tsushima (40 km north-west of the nuclear power plant) in the zone evacuated due to high levels of contamination** (Fig. 1).

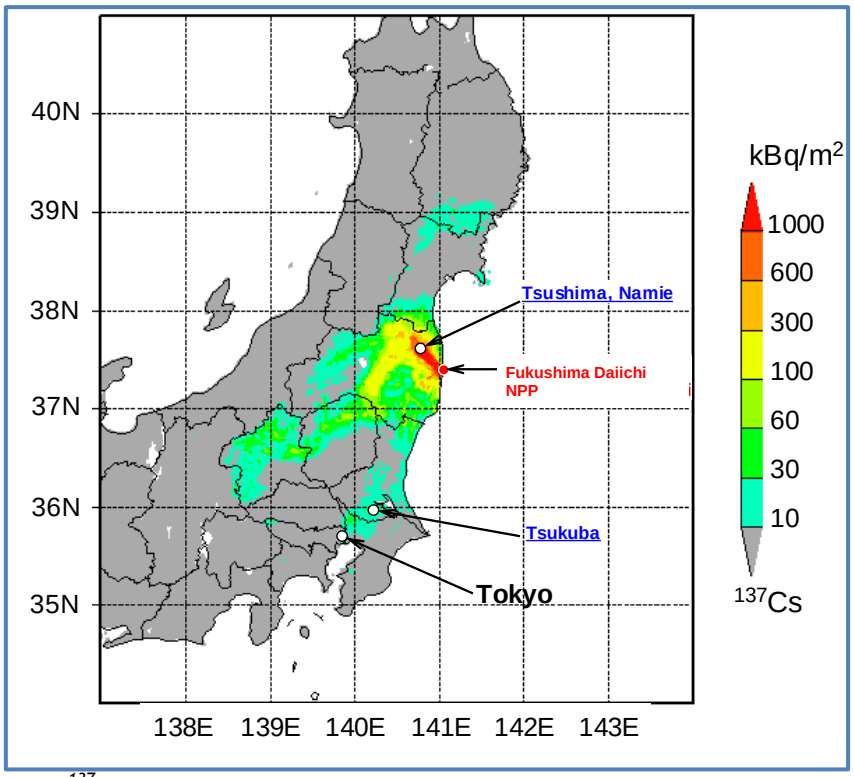

Fig. 1: Map of ^{137}Cs deposits (airborne measurements according to Torii et al., 2012) and localisation of two of the measurement sites of ^{137}Cs concentrations in the air.

Figure 2 below shows that, in Tsukuba, the concentration of ^{137}Cs in the air fell by around a million-fold compared to the maximum value (38 Bq/m^3) found in March 2011. Over the period March to August 2014, the average is 12 µBq/m^3 or around 10 times the value measured on the eve of the accident in 2011. The level can temporarily rise to around 50 µBq/m^3. These increases can be explained by re-suspension from the most affected territories and *via* the transport of the air mass to places less exposed to fallout during the days following the releases.

[1] Research conducted by Pr. K. Kita (University of Ibaraki) and Dr. Y. Igarashi (JMA-MRI, Tsukuba)

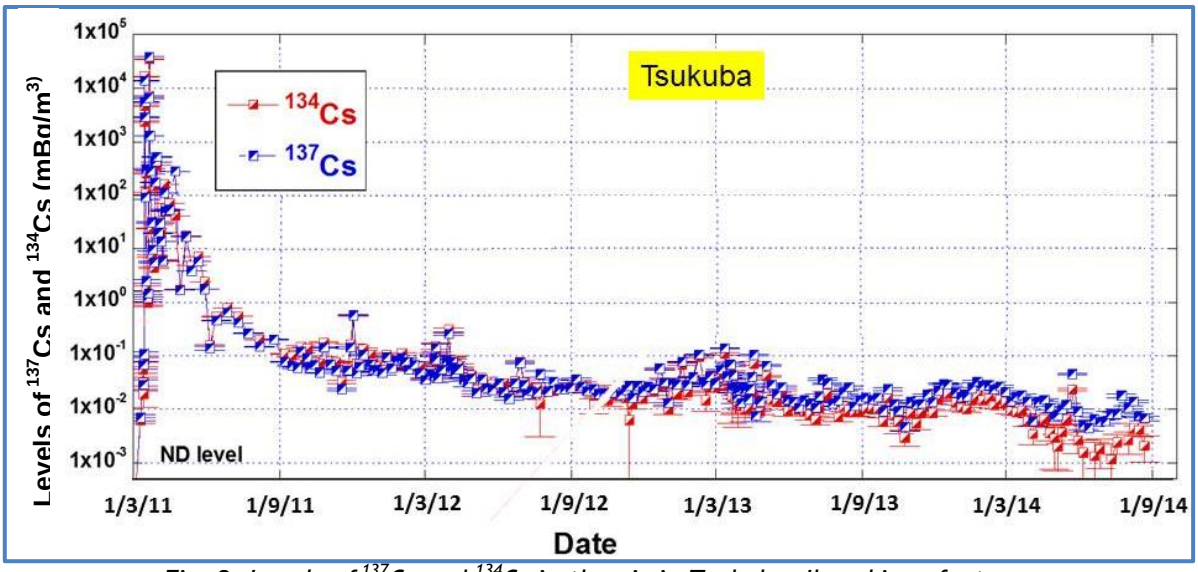

Fig. 2: Levels of ^{137}Cs and ^{134}Cs in the air in Tsukuba, Ibaraki prefecture.
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In Tsushima[2], within the evacuated zone, measurements began at the end of 2012. They **show that concentrations are distinctly higher than in Tsukuba - by around factor 100** - and vary from less than 100 µBq/m^3 to 1,000 µBq/m^3 with, from time to time, as is the case of Tsukuba, concentration peaks linked to episodes of re-suspension of radionuclides deposited previously as well as to the origin of the air masses. The presence of biomass fires surrounding this rural site can also influence concentration levels. Similarly, the production of aerosols from plants (in particular spores) or from mushrooms seems to have an effect on the concentration level.

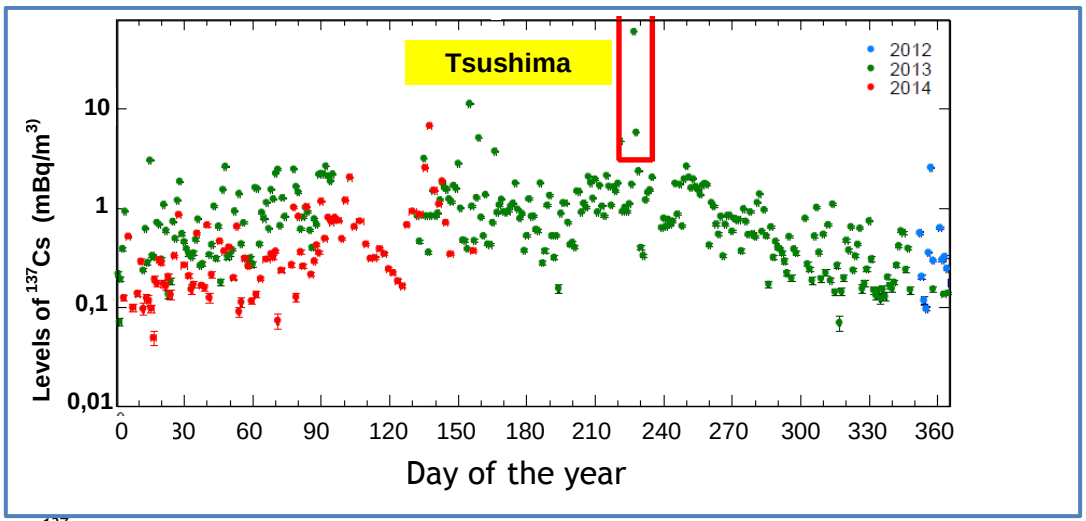

Fig. 3: ^{137}Cs levels in the air at Tsushima, Namie: Fukushima prefecture, between 2012 and 2014.
(With the kind permission of Pr. K. Kita)

Reference

Torii T. et al. (2012). Investigation of radionuclide distribution using aircraft for surrounding environmental survey from Fukushima Dai-ichi Nuclear Power Plant. JAEA-Technologoy 2012-036, Japan Atomic Energy Agency, 182 pp (in Japanese, with English summary).

[2] Tsushima, Namie; district of Futaba; Fukushima prefecture