The Evaluation of the Dry Deposition Velocity of Iodine after Fukushima Releases

INSTITUT DE RADIOPROTECTION ET DE SÛRETÉ NUCLÉAIRE

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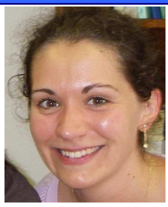

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1

INTRODUCTION: The major release of radioactive materials into the atmosphere from the reactors accident occurring at the Fukushima Dai-ichi nuclear power station (Japan) lasted nearly 10 days (12 to 22 March 2011). In France IRSN carried out environmental monitoring in spring 2011 (1) to evaluate the radiological situation and to inform the government, the French nuclear authority and the population (2) to acquire *in situ* environmental data representative of the deposition soon after the accidental releases.

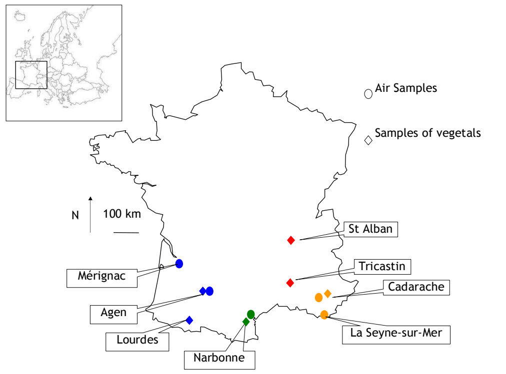

Figure 1 : Location of the sampling sites.

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OBJECTIVES:

The aim of this work, is to better constrain the transfer of radio-iodine to plants. Thus the *in situ* time trends of the iodine activity in the air and vegetals allow us to propose transfer parameters for iodine derived from field observations.

3

METHODS:

The methodology used for the sampling is detailed by Masson et *al.* (2011) and Parache et *al.* (2011). ^{131}I activity has been determined using very low background Ge-gamma spectrometers, based on main peak occurring at 364.5 keV (81%). Although the determination of ^{131}I occurred less than 24 hours after sampling, the activity of ^{131}I was decay-corrected to the sampling date.

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RESULTS:

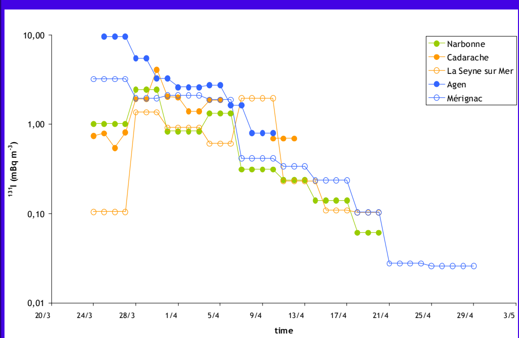

Figure 2 : Activity measured in the air.

The time trends of activity in vegetation show that the highest values in vegetal (a few Bq kg^{-1} fresh weight, depending on site) were reached by 28 March and thereafter the activity slowly decreased and reached detection limit (< 0.1 Bq kg^{-1} fresh weight) by 10 May (Figure 1), in conjunction with the variability recorded in the air (Figure 2).

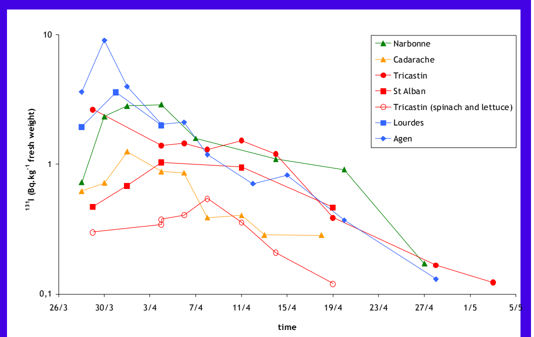

Figure 3 : Activity measured in the vegetals.

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DISCUSSION:

The activity measured in the air and empirical equations from ASTRAL model were used to fit iodine in the vegetal with activity measured in field samples. Such approach allows us to evaluate dry deposition velocity of iodine on grass, ranging between 1 10^{-3} and 5 10^{-3} m s^{-1} from site to site, which was mainly derived from experiments up to now.

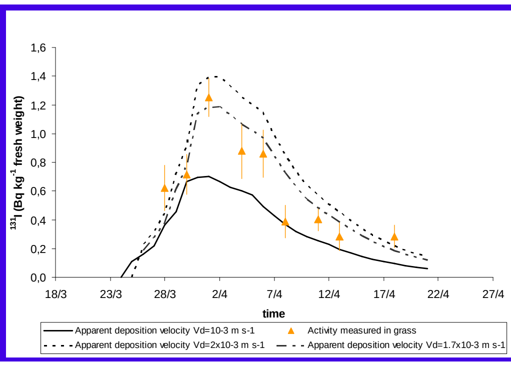

Figure 4 : ^{131}I activity in grass deduced from apparent dry deposition velocity compared with ^{131}I activity measured in grass (Cadarache).

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CONCLUSION: The dry apparent deposition velocities of iodine on the vegetals were deduced from the environmental monitoring carried out by the IRSN son after the Fukushima releases. The reliability of the predicted velocity used up to now for the modeling is improved.

References:

Masson, O. et al. Tracking of airborne radionuclides from the damaged Fukushima Dai-Ichi nuclear reactors by european networks. *Environ. Sci. Technol.* 2011, *45*, 7670-7677.

Parache, V. et al. Transfer of ^{131}I from Fukushima to the vegetation and milk in France, *Environ. Sci. Technol.* 2011, *45*, 9998-10003.