



Deposition of radionuclides by fogwater on plants at Houdelaincourt, France

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After a nuclear accident like Fukushima, large quantities of radionuclides attached to particles are released in the atmosphere. Those particles can act as condensation nuclei to form fog droplets. To determine the radiological impact of fog droplets deposition on plants, an analysis of the fogwater radioactivity levels and a quantification of the fogwater deposition have been performed.

To collect fogwater samples, a replica of the Caltech Active Strand Cloudwater Collector (Demoz et al. 1996) is implemented at the atmospheric research platform in Houdelaincourt (North-East region of France). This instrument allows air containing fog drops to be drawn through a cylinder by a fan. In this tube, rows of Teflon strands are collecting the drops by impaction. Other active collectors have been developed on the same principle with a tube and a mesh grid as the impaction surface. Passive collectors are also used; they consist of vertical strings surrounding a container where the drops are collected. Once the fogwater is collected, it is analyzed to determine the activity levels of gamma emitter radionuclides. In previous studies (Bourcier 2009) the mean level activity for cesium 137, beryllium 7 and lead 210 in rainwater at the Puy de Dôme have been previously estimated. A comparison between activity levels found in rainwater and in fogwater highlights the fact that fog deposition of radionuclides is far from negligible. At the same time a fog monitor FM-120 from DMT provides the size distribution of droplets from 1 to 30 microns. A visibility meter and a PVM from Gerber Scientific Inc. provide respectively the visibility and the liquid water content (LWC) to identify and characterize fog events.

In order to quantify the deposition of water on plants, plastic plants were exposed to fog droplet deposition and weighed at the end of the event to measure the amount of water deposited. A second experiment was conducted, during which plastic plants were implemented on a polystyrene support; the whole set was placed on a precision balance and under a protection box to avoid wind induced variations. The box was removed for ten minutes for the fog droplets to be deposited, then the box was put back for weighing. Simultaneously another precision balance was used to determine the deposition of water only on the polystyrene support in order to remove its weight from that of the plastic set. A mass of water deposited by surface or mass unit of plant was measured for each fog event.

The first results of fog activity levels and fogwater deposition on plants are presented along with the characterization of the studied fog events.

References

- Bourcier, L. (2009). "Transport and deposition of radionuclides and particles at the Puy De Dôme, France".
- Demoz, B. B., J. L. Collett Jr, et al. (1996). "On the Caltech Active Strand Cloudwater Collectors." *Atmospheric Research* 41(1): 47-62.