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Re-suspension of Cesium-134/137 into the Canadian Environment and the Contribution Stemming from the Fukushima-Daiichi Nuclear Incident

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Cesium-137 (t1/2 = 30 yr) and cesium-134 (t1/2 = 2yr) constitute major fission by-products observed as the result of a nuclear incident. Such radioisotopes become integrated into the soil and biomass, and can therefore undergo re-suspension into the environment via activities such as forest fires. The Canadian Radiological Monitoring Network (CRMN), which consists of 26 environmental monitoring stations spread across the country, commonly observes cesium-137 in air filters due to re-suspension of material originating from long-past weapons testing. Cesium-134 is not observed owing to its relatively short half-life.

The Fukushima-Daiichi nuclear power plant incident of March 2011 caused a major release of radioactive materials into the environment. In Canada, small quantities of both cesium-137 and cesium-134 fallout were detected with great frequency in the weeks which followed, falling off rapidly beginning in July 2011. Since September 2011, the CRMN has detected both cesium-137 and cesium-134 from air filters collected at Yellowknife, Resolute, and Quebec City locations.

Using the known initial cesium-134/cesium-137 ratio stemming from this incident, along with a statistical assessment of the normality of the data distribution, we herein present evidence that strongly suggests that these activity spikes are due to re-suspended hot particles originating from the Fukushima-Daiichi nuclear power plant incident. Moreover, we have evidence to suggest that this re-suspension is localized in nature.

This study provided empirical insight into the transport and uptake of radionuclides over vast distances, and it demonstrates that the CRMN was able to detect evidence of a re-suspension of Fukushima-Daiichi related isotopes.