

Impact of forest canopy on iodine, selenium and cesium atmospheric inputs on forest ecosystems

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Radioisotopes ¹³¹I, ¹²⁹I, ⁷⁹Se, ¹³⁴Cs and ¹³⁷Cs are of health concerns in case of nuclear events. Due to their large interacting surface area by canopy, forests could impact the quantity and speciation of elements incoming from atmospheric inputs to the ground. This study investigated the atmospheric inputs of stable iodine, selenium and cesium, during one year in rainfall (twenty-seven monitored sites) as well as their canopy output in throughfall (fourteen sites) throughout France. Results showed that annual rainfall I concentrations were much higher than those of Se and Cs (mean = 1.57, 0.045 and 0.006 µg L⁻¹, respectively). Annual concentrations of I, Se and Na in rainfall were positively correlated, suggesting common atmospheric scavenging mechanisms by rains and/or common source(s) for these elements. Annual rainfall fluxes of elements varied greatly from one site to another (6.9-47.8, 0.20-1.86 and 0.02-0.11 g ha⁻¹ yr.⁻¹ for I, Se and Cs respectively), mostly influenced by rainfall amounts. For most sites, concentrations and fluxes of elements in throughfall were higher than corresponding rainfall ones. Throughfall enrichments were shown to be mostly due to dry depositions for I and Se, and to leaching after canopy recreation for Cs. Iodine and selenium speciation (i.e., I⁻, IO₃⁻, SeO₃²⁻ and SeO₄²⁻) was also determined. Results evidenced significant modifications of I and Se speciation from rainfall to throughfall, with a substantial increase of unidentified iodine and selenium compounds proportions and a drastic decrease of inorganic I and Se species. Data issued from this work clarified spatial variation of iodine, selenium and cesium inputs and improved our understanding for cycle modelling in forest ecosystems.