Distribution and source of $^{129}$I, $^{239,240}$Pu, $^{137}$Cs in the environment of Lithuania - DTU Orbit (18/01/2019)

**Distribution and source of $^{129}$I, $^{239,240}$Pu, $^{137}$Cs in the environment of Lithuania**

Fifty five soil samples collected in the Lithuania territory in 2011 and 2012 were analyzed for $^{129}$I, $^{137}$Cs and Pu isotopes in order to investigate the level and distribution of artificial radioactivity in Lithuania. The activity and atomic ratio of $^{238}$Pu/$^{239,240}$Pu, $^{129}$I/$^{127}$I and $^{131}$I/$^{137}$Cs were used to identify the origin of these radionuclides. The $^{238}$Pu/$^{239+240}$Pu and $^{240}$Pu/$^{239}$Pu ratios in the soil samples analyzed varied in the range of 0.02 to 0.24, respectively, suggesting the global fallout as the major source of Pu in Lithuania. The values of 109 to 106 for $^{129}$I/$^{127}$I atomic ratio revealed that the source of $^{129}$I in Lithuania is global fallout in most cases though several sampling sites shows a possible impact of reprocessing releases. Estimated $^{129}$I/$^{131}$I ratio in soil samples from the southern part of Lithuania shows negligible input of the Chernobyl fallout. No correlation of the $^{137}$Cs and Pu isotopes with $^{129}$I was observed, indicating their different sources terms. Results demonstrate uneven distribution of these radionuclides in the Lithuanian territory and several sources of contamination i.e. Chernobyl accident, reprocessing releases and global fallout.

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