Radionuclide resuspension: driving force of the persistence of anthropogenic radionuclides at trace level in the atmosphere

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Resuspension is a generic term encompassing several processes either induced by environmental conditions or by human activities. Resuspension can lead to the long-term persistence of formerly deposited substances, among them long-lived radionuclides, especially when they are located at the interface between the Earth's compartment and the atmosphere or more simply in the biomass.

Resuspension is rather permanent, ubiquitous and can operate at small and large scales. Various examples of radionuclide resuspension will be provided showing the wide range of resuspension conditions and the associated processes. In the early stage after a massive radionuclide deposition and when the plume has spread away, resuspension is the almost unique process that can contribute to the persistence of a tail of activity levels int the atmosphere. Conversely, long after a radiological pulse such as a nuclear accident release and deposition or after a long period of regular releases as it was the case during the nuclear weapons testing era, resuspension can explain most of the variability of the anthropogenic radionuclide background.

A rather simple method can allow to distinguish the respective contribution of local and remote resuspension. Due to climate change, resuspension from soil surface is exacerbated. This can be seen through the increased variability of the airborne ^{137}Cs background level.

Due to more and more coercive regulations, routine releases from the nuclear industry are historically low. In such context, resuspension from soil can compete with the contribution from stack release. Some examples from France will be provided.

Resuspension is usually expressed through a coefficient corresponding the ration between the airborne activity and soil surface activity. The time variation of such coefficient is characterized by an exponential relationship. However, there is a rather large uncertainty of the value to be chosen.

Visualization of dust resuspension due to ploughing