Submitted Abstract

ID IMC22-FSAbstr- 387

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Country	France
Region	Western Europe
Title	Climate Change Influence On The Dynamic Of Organic Pollutants In Alpine Soils.
Keywords	Moutain Soils - Alpine Grasslands - Pahs - Climate Change - Soil Organic Matter
Type	List Of Focus Session
Focus Session ID	39

Abstract

However isolated they may be, Alpine soils are not spared from contamination by pollutants. In particular, they are affected by the atmospheric deposition of Polycyclic Aromatic Hydrocarbons (PAH). PAH are a large family of organic pollutants, mainly released into the atmosphere by the incomplete combustion of organic matter (OM). Today, the most important sources are household heating and road traffic. PAH are problematic because many of them are known to be toxic. Once released into the atmosphere, PAHs can be transported over long distances and deposite on vegetation and soils, where there are stored. Due to their high hydrophobicity and lipophilicity, these pollutants have a great tendency to bind to soil organic matter (SOM). By this way, soils store most of the PAHs present in the environment, giving them an essential role in the trapping and, in fine, the protection of aquatic ecosystems.

At the same time, the current climate change has a significant impact on moutainous areas. In the Alps, minimal temperaturesare rising faster than on the global scale. These evolutions cause changes in soil compositions and properties, including notably a loss in organic carbon, i.e. OM.

In sum, in response to changing SOM dynamics due to climate change, PAH dynamics will in turn be impacted. Soil capacities to trap PAH could decrease and cause a remobilization of PAHs stocks built up over decades. This phenomenon could lead to a transfer of PAH to rivers, and thus to significant pollution of aquatic ecosystems. Given the potentially rapid response of soils to climate change, and in view of deleterious effects of PAH on ecosystems and human health, it seems essential to better understand these mecanisms.

Therefore, our study focused on the potential remobilization of PAH in French alpine grasslands. Between Galibier and Lautaret passes, pollutant and SOM contents in soils were investigated on several plots (~40 samples), in order to explore drivers of the constitution of PAH stocks and to better understand how changes may lead to pollutant remobilization.

Our results showed that all studied soils were polluted with PAH (> 200 ng/g for the sum of 14 compounds) and that a change in the quality and/or the quantity of OM can change the storage capacity of PAH in soils.