# Nutrient (Ca, Mg, K) behavior in soils located in decline forest (Strengbach catchment, Vosges Mountain, NE France). Development of a new experimental approach

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Since 1970, major symptoms of forest decline have been observed worldwide. Acidity from atmospheric pollution intensifies the leaching of nutrients in soil and decreases their availability. A better understanding of how soil/water/plant interactions can respond to modifications becomes more and more crucial for a better management of natural and renewable resources.

Traditionally, the quantity of exchangeable cations (Ca, Mg, K), are quantified with extracting agent such as cobaltihexamine. But these measurements are not enough to fully characterize the different processes involved in the mobilization of nutrients. This study aims to identify the different pool of nutrient, their reactivity, their stock and their availability over time.

Experiments have been realized with natural soils from two different plots (beech and spruce stands/Strengbach watershed-Vosges massif - OHGE http://ohge.unistra.fr/) in a forest with strong decline. Soil samples from 6 horizons (until 80 cm depth) are disposed on batch series with three different acids (hydrochloric acid, oxalic acid and acetic acid). The solutions are analysed at different time from 24h to 150 days. DRX, SEM, chemical and isotopic (Sr) characterization are determined on soil and solution. Strontium isotope data aimed to decipher mineral weathering, atmospheric deposit and biological activity.

The results show highly variable chemical behaviour versus element, type of soil, horizons and type of acid. We observed unexpected results for Ca. The total quantity of Ca extracted after 150 days corresponds to a very low proportion of the calcium exchangeable obtained with cobaltihexamine, underlining a complex bioavailability of this nutrient in soil.

Furthermore, extraction with acid oxalic seems to be linked with a set of parameters (OM content, clay content, mineralogy), which are variable versus depth. The differences observed between oxalic and chloric acid increase with depth reaching until 15 times more concentrated in oxalic leachate, except for Na dominated by simple inorganic dissolution of albite. These results highlight the complexity of relationship between exchangeable pool, “chemical availability” and the nature of extractant used.