The use of Silicon and Rare Earth Elements for a better understanding of the traceability and bioavailability of Phosphorus in agricultural soils

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Phosphorus (P) is an essential nutrient for health. It is the second most abundant chemical element in the human body. For plants, P is necessary for their growth and proper development. As a result, this element is commonly used as a fertilizer and has become excessive in some ecosystems, leading to instability in wildlife. In order to reduce and optimize P fertilizers in agricultural soils, it is necessary to better understand P behaviour and its bioavailability. This study attempts to explore the possibility of using silicon (Si) combined with rare earth elements (REE) to trace P.

Different chemical analyses were performed on samples from the regions of Haut de France (France) and Wallonia (Belgium). The P concentration seems to increase when the Si concentration is low. These two elements are anti-correlated. Moreover, REE are commonly used in geochemistry to trace different types of elements due to their unique properties. In combination with total organic carbon (TOC) measurements, which indirectly reflect the amount of organic matter in solution, the concentration of REE increases. Furthermore, some comparisons show that REE and Si are related. Indeed, when the amount of REE increases, Si increases. Because of the relationship between REE, Si and P, Si could be indirectly a tracer of the amount of P in soils solutions. Further analysis looking at Si siotopes and REE patterns will further constrained our results.

Mots-Clés: Silicon, phosphorus, rare earth elements, geochemistry, soils