Speaker: **J.T. Cornelis**
Assistant Professor in Soil Science

Presentation: **Harnessing the complexity of soil-plant interactions to build resilience in agroecosystems**

Date: Friday **Oct 29**, 2021, 3:00-4:00 pm

Abstract

The global importance of the silicon (Si) cycle lies in its interaction with carbon (C) and its influence on global primary productivity. Five years ago, based on a literature review, we proposed the likely existence of a shift from abiotic towards biotic controls on the Si cycle, when the degree of soil weathering increased. By investigating the Si distribution in abiotic and biotic pools from soils developed over the last 2 million years, we demonstrated the essential role of plant community evolution in acquiring Si in nutrient-impoverished soils, this confirming our earlier conceptual model. A central question that has evolved relates to how does the return of leaves on topsoil via litterfall drive the Si cycling compared to root nutrient-acquisition strategies?

The primary "function" of root exudates (organic acids released by roots in the rhizosphere) is an essential point of current debate. Plant growth is generally limited by drought, low temperature, or nutrient limitation, but not by photosynthesis. As photosynthesis continues, while growth is curtailed in nutrient-depleted soils, surplus C as photo-assimilate is removed from the synthesis site in leaves to avoid photo-inhibition. Some of this C-surplus is eliminated via root exudates. It has been argued, by our colleague Dr. Cindy Prescott (UBC, Forestry), that the release of C-surplus under limiting nutrient conditions can provide a new perspective through which to view studies of soil-plant interactions as they relate to nutrient management and regeneration of soil organic matter stock. We have shown that leaf Si concentrations increase in old phosphorus (P)-depleted soils where many species exhibit higher carboxylate release from cluster roots compared to younger, P-rich soils. These results highlighted the fact that the root exudates have an overlooked role in plant Si accumulation by increasing Si mobilization from soil minerals. These discoveries open new exciting research avenues to investigate the role of these bioweathering processes. I believe that their role in the Si terrestrial cycle lays the groundwork for the future success of regenerative agriculture, partly based on benefits induced by Si in agroecosystems.

Biography

Dr. Jean-Thomas (JT) Cornelis, is pedologist and biogeochemist, Assistant Professor in Soil Science at the Faculty of Land and Food Systems, University of British Columbia. JT comes from the University of Liège (Belgium), where he was appointed as an Assistant Professor in Soil Science. He received a PhD from the Earth and Life Institute, Université catholique de Louvain (Belgium) in 2010. His research investigates soil processes controlling biogeochemical cycles of elements and how soil-plant feedback interactions respond to environmental changes. His process-based approach focuses on the soil system, which is by nature multi-scale and interdisciplinary. JT has gained valuable experience in pedogenesis and environmental biogeochemistry and how their application in agriculture has implications for the sustainable management of terrestrial ecosystems. JT takes as an advantage the complexity and diversity of soil processes to teach students the notion of critical thinking and complex thought. Daddy of two little boys, outdoor enthusiast, big fan of surrealism, he loves to brainstorm new ideas.

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