

SES Fall Seminar Series

Dr. Myrna J. Simpson

Environmental NMR Centre and Department of Physical
and Environmental Sciences, University of Toronto
Scarborough

'Molecular biogeochemistry of soil organic matter with global environmental change'

Soil organic matter (SOM) is critical to ecosystem function, soil sustainability and soil fertility. Environmental change, such as increased temperatures, shifts in moisture regimes, and changes in N deposition, may increase the vulnerability of SOM stocks in various ecosystems. It is hypothesized that climate warming may alter the biogeochemical cycling of SOM through enhanced degradation of labile components reducing soil quality in the long-term. Some studies also suggest that increased plant productivity due to climate warming may increase plant detrital inputs and may offset carbon losses due to warming through enhanced carbon sequestration. Other hypotheses propose that chronic nitrogen addition may suppress SOM degradation and result in an increase in carbon stocks while others have provided evidence for accelerated SOM cycling with N addition. The uncertainty surrounding the fate of SOM with climate change stems from the lack of molecular-level information about SOM and its response to various aspects of environmental change. The chemical complexity and heterogeneity of SOM requires the use of advanced, molecular-level methods to determine SOM responses to potential ecosystem shifts. This presentation will provide an overview of two powerful, complementary analytical techniques that have been developed to study SOM biogeochemistry in detail: SOM biomarkers and nuclear magnetic resonance (NMR) spectroscopy. SOM biomarker analysis by gas chromatography-mass spectrometry (GC-MS) is a targeted approach that enables the isolation and quantification of specific SOM components (plant-derived and microbial-derived lipids, lignin phenols, cutin and suberin biomarkers). NMR spectroscopy provides an overview of all structures within soil and can be used to study whole soils, soil extracts and conformation of organic matter at the soil-water interface. Studies from field experiments will be highlighted to demonstrate how these techniques provide a molecular- to ecosystem-level understanding of SOM biogeochemistry.



Friday
September 25,
2015
3:30 - 4:30 pm
Alexander Hall
Room 218

All are welcome to attend!



ses

school of environmental sciences



Food
Agriculture
Communities
Environment