

Seasons, Soils, and Sensors: Field application of novel oxygen measurement technique for enhanced understanding of subsurface biogeochemical responses to environmental change

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The ability to quantify physical and chemical changes in soils, particularly during winter conditions, can help to explain the connection between climatic changes and soil health. To this point, integrating established methods for characterizing the soil environment using emerging techniques for monitoring analytes that were previously difficult to measure in-situ (such as soil oxygen), can be particularly useful.

In a novel field application, a custom-designed multi-fibre optic oxygen sensor has been installed in a lysimeter system located in an agricultural site in Southern Ontario with the aim of simultaneously monitoring seasonal changes in soil oxygen and porewater chemistry along a soil profile. The results presented here demonstrate how optical sensing in soils can be combined with more established methods for porewater sampling and analysis, along with weather data to better understand climatic influences on soil biogeochemical processes. Specifically, the integration of soil oxygen measurements with seasonal variations in precipitation and temperature will provide a new dimension in the understanding of nutrient cycling (with a focus on nitrogen) in the soil system.