

# DEPARTMENT OF ENVIRONMENTAL SCIENCES

## WINTER 2024 SEMINAR SERIES

Wednesday, March 13, 2024 | 3:00 pm  
Room 103 | Materials Science & Engineering



### Eric Slessarev, Ph.D.

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*“Global geochemical thresholds  
and the boundaries of soil fertility”*

Earth’s soils sustain productivity on land by regulating nutrient supply. In this talk I will show how two important aspects of soil fertility—soil pH and soil organic matter content—are constrained by a global-scale geochemical threshold. I will show using a global data synthesis that soil pH responds non-linearly to climate. When water inputs from precipitation are less than atmospheric water demand, base cations released by mineral weathering accumulate in soil, alkalizing soil pH. Conversely, when precipitation exceeds atmospheric water demand, base cations are lost and soil acidifies. At the abrupt transition between these two climate domains geologic inputs of base cations are a dominant control on soil pH. Using a simple process-based model, I will advance the hypothesis that elevated geologic inputs of base cations in this climatic transition zone can explain the high soil organic matter content of grassland soils. This hypothesis stands in contrast to traditional explanations for the carbon-richness of grassland soils focused on belowground allocation. These results suggest that managing soil base cation budgets could be an important tool for conserving soil fertility and carbon storage in grasslands and croplands.

Hosted by:  
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