☒ **Talk** ☐ **Poster**

The lab-field discrepancy in weathering rates: why we need to study the critical zone

Susan L. Brantley[1]

[1]*Department of Geosciences, Pennsylvania State University, University Park, PA 16802*

sxb7@psu.edu

Weathering of silicate rocks removes CO_2 from the atmosphere and has been proposed as a way to mitigate global warming. Such 'enhanced rock weathering' includes mining, grinding, and dispersing silicate rock on farmland where it interacts with CO_2 in soils. But the rate a mineral weathers in a lab experiment is faster than its rate of weathering in the field, suggesting that rates of enhanced rock weathering may be slower than predicted. Over the last 40 years, many researchers have perfected ways to estimate rates of weathering in the field by targeting mineral abundances and poreflud chemistries in soil profiles (1-D data), mineral abundances along hillslopes (2-D), or solute fluxes from aquifers or watersheds (3-D). Many researchers now model weathering with elegant and complex reactive transport models. In this talk I will discuss the lab-field discrepancy and reasons why we observe it. For example, one of the reasons is that scaling up from lab to field incorporates new reactive transport steps not important in the lab that become rate-limiting. But only a few minerals have been studied from atomic interface scale to grain scale to pedon scale to borehole scale to watershed scale in ways that can be compared across increasing dimensions of space and time. This is one of the many reasons why we need to study the critical zone – the zone of Earth's surface from vegetation canopy to groundwater -- as a whole entity, and not just as separate parts.