Detecting critical zone response to perturbations by climate and base level in central Pennsylvania using *in-situ* produced 10-Be and 26-Al

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Studying the production and transport of regolith is essential to understanding the structure and processes operating within the critical zone. This project, will employ measurements of *in-situ* produced cosmogenic 10-Be and 26-Al to investigate the influence of glacial/interglacial climate cycles and changes in base level on regolith development rates and ages in central Pennsylvania. By widening our lens from the original 8 hectare site at the Susquehanna Shale Hills Critical Zone Observatory (SSHCZO) to different lithologies and other areas in the Valley and Ridge province, we make progress toward understanding the critical zone processes that govern evolution of the Susquehanna River Basin as a whole. We are investigating three sites.

Garner Run, is a HUC-12 watershed within the SSHCZO Shavers Creek research area. The upper reaches of this drainage are dominated by talus, coarse-grained regolith of the Tuscarora Juniata Formation, likely to have been generated by processes that are no longer active in the contemporary climate regime. Investigation at this site will focus on understanding the influence of periglacial activity on the generation and movement of mass through the critical zone.

Blockfields are ubiquitous features of the Valley and Ridge province in Pennsylvania, and our second site, the blockfield at Hickory Run State Park, is the largest of its kind in the eastern United States. The field is thought to have developed from frost-induced weathering processes during the last glacial maximum, but no data exist on the age of this feature, how the field developed, or if it remains active. Ours will be the first quantitative attempt at constraining the age and dynamics of an Appalachian blockfield.

In order to understand the effect of baselevel change on the residence time of material in the critical zone, we will study Young Womans Creek, which has deeply incised its sandstone basin. Here, we will focus on the influence of base level on regolith, contrasting undissected uplands with incised valleys. By collecting sediment from the entire drainage network across a range of sub-basin slopes we aim to address the control that non-equilibrium topography exerts on the rate of regolith generation at a basin scale. Ours will be the first detailed analysis of incision rates and knickpoint distribution in a small Appalachian watershed.