Poster #1-38

Topographic Controls over Greenhouse Gas Emissions from Puerto Rican Tropical Rainforest Soils

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BER Program: TES
Project: Early Career Award (Melanie Mayes)
Project Website: https://science.energy.gov/early-career/

Humid tropical forests emit greenhouse gases including carbon dioxide (CO_2) and methane (CH_4) into the atmosphere, and a large proportion of these emissions are due to soil microbial respiration. Landscape position exerts key controls over emissions of CO_2 and CH_4, and the proportion of redox-active compounds like nitrate, sulfate, and iron in soils and soil water. I will present lab- and field-based measurements of soils from a 6-point valley to ridgetop transect in the Luquillo Experimental Forest in Puerto Rico, over the time frame before and after Hurricanes Irma and Maria. Surface soils were collected seasonally to determine basic soil characteristics, hydrolytic enzymes, and 16S ribosomal RNA gene sequencing. Soil water was collected following rainstorms using rhizon samplers at depths of 10 and 30 cm and analyzed for anions, cations, pH, and dissolved organic carbon and total dissolved nitrogen. Clear chloride and nitrate signatures are observed following the hurricanes, but to different extents depending on depth and landscape position. Soils were also incubated to quantify CO_2 and CH_4 emissions under oxic, anoxic, and fluctuating conditions. Finally, field-scale measurements of CO_2 and CH_4 were performed resulting in strong topographic gradients in gas emissions, e.g., valley soils emitted more CH_4. This poster will summarize key findings from a variety of observations with a focus on building a comprehensive understanding of differences as a function of topographic gradient, in order to build and test a model that considers both the geochemistry and microbiology of the soil environment.