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DOE Synchrotron* Capabilities and Structural Biology Resources** for Environmental Research

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BER Program: Subsurface Biogeochemistry Research and Structural Biology Infrastructure
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The DOE BER Environmental System Science programs seeks to advance a robust predictive understanding of terrestrial surface and subsurface ecosystems, within a domain that extends from the bedrock to the top of the vegetated canopy and from molecular to global scales. This activity focuses on understanding the interdependencies involving biogeochemical, genomic, ecological, geohydrological, and migration processes involving nutrients and contaminants, diverse landscape systems, and spanning arctic to tropical climates.

Deep understanding at a molecular scale of environmental systems within the terrestrial ecosystem and subsurface research programs requires structure and function studies of system components, which include biological behavior, abiotic-biotic interactions, and molecular transformations that control the mobility of contaminants, nutrients, and critical vegetative and biogeochemical elements.
DOE supports a wide array of synchrotron- and neutron- based techniques for characterizing structure, function and interrelationships among complex molecular components that are relevant to these systems. The spatial and temporal resolutions available from neutron and photon beams enable characterization and imaging of system components and interactions among plants, microbes and minerals. Accessible scales range from subnanometer to centimeter length and over time dimensions from femtoseconds to seconds.

Structural insights at the atomic, molecular and mesoscale level are critical for developing multi-scale, multi-component models that can be used to predict system behaviors. These insights advance the goals of the terrestrial ecosystem program to understand the role of ecosystems in climate, and the subsurface biogeochemical program that pursues a predictive understanding of how watersheds function as complex hydrobiogeochemical systems.

Two posters will present the BES-supported synchrotron capabilities for environmental system science and the BER-supported resources at synchrotron and neutron facilities for biological investigations relevant to environmental systems.