

Process-Scale Research to Sustain Earth's Natural Resources

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Sustaining Earth's natural resources (i.e., air, water, land, and biological diversity) requires mechanistic understanding of Earth system processes. Process-scale investigation is needed to improve (1) mechanistic understanding of environmental and biogeochemical processing of organic chemicals and climate-forcing gases and aerosols and (2) the ability of models to predict the fate of chemicals in various compartments of the environment and responses of the Earth system to nutrient supply, land use changes, and climatic perturbations. Algorithms for evaluating the exchange of hazardous air pollutants with vegetation will be discussed. Recent work that identified a currently unmeasured, complex mixture of semi-volatile secondary organic aerosol precursors will be presented. The use of nascent laser-based technologies to explore above- and below ground ecosystem processes that control atmosphere-surface exchange of greenhouse gases will also be discussed. The talk will conclude with a presentation of research challenges and opportunities that lie ahead in understanding environmental and biogeochemical processes.