**Title:** Modeling bioenergy crops in the E3SM land model

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**Abstract:**

Agriculture can alter the climate through its impact on biogeophysical and biogeochemical properties of the terrestrial ecosystem. To study these impacts the Energy Exascale Earth System Model (E3SM) Land Model (ELM) now includes representation of select cereal crops. In this study, we expand ELM’s crop model to include bioenergy crops that are projected to increase in cultivation in the future owing to their potential for mitigating climate change. We focus on *Miscanthus* and switchgrass, high-productivity crops with deep and dense roots well suited to the ELM crop model’s advanced capability for modeling dynamic root growth, and estimate various parameters associated with their different growth stages and harvest. We perform global sensitivity analysis to identify and optimize the ELM crop parameters that the bioenergy carbon fluxes are most sensitive to. Preliminary analysis reveals that the carbon fluxes are most sensitive to parameters associated with carbon-nitrogen allocation in plants and water uptake and transpiration. Site-level data collected at the University of Illinois Energy Farm is used for calibrating the model. The updated ELM crop model will be used to study the impact of bioenergy cultivation on energy, water, and biogeochemical fluxes at various spatial scales.