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# A multi-scale hydroclimatological assessment of perennial bioenergy cropping systems

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Hydro-climatic sustainability associated with deployment of perennial bioenergy cropping systems requires a holistic approach that extends beyond merely carbon accounting. Here, we present results from a five-year National Science Foundation project (Water Sustainability and Climate initiative) focused on development of geographically explicit maps depicting sustainable regional "hot-spots" of perennial biomass energy expansion in the United States (U.S.). Using short-term/high-resolution (1 year/1km) and climate scale/medium range resolution (10 years/20km) simulations with the Weather Research and Forecasting (WRF) system, an atmospheric code coupled to a suite of land surface models, we quantify impacts on the hydrologic cycle, and examine the effect of energy crops (e.g., miscanthus and switchgrass) on subsurface hydrology (e.g., soil moisture, groundwater impacts) and atmospheric dynamics. We avoid the competition with food crops by focusing energy crop deployment exclusively on abandoned and degraded farmland regions within the Continental U.S. Finally, assessment of photosynthetic production of bioenergy crops is made, based on hydro-climatic constraints associated with varying scenarios of perennial bioenergy crop deployment simulated with WRF.