Geophysical Research Abstracts,
Vol. 11, EGU2009-2623, 2009
EGU General Assembly 2009

Prescriptive Land Surface Phenologies: Modeling Possible Futures Arising from Land and Climate Change

G.M. Henebry, C.K. Wright, M.C. Wimberly, and M.C. Hansen

Geographic Information Science Center of Excellence, South Dakota State University, Brookings, USA
(geoffrey.henebry@sdstate.edu)

Much of the contemporary literature on land surface phenologies (LSPs) is descriptive and retrospective. Here we explore prescriptive LSPs that project possible futures given regional climate change and variability and land cover / land use change scenarios. Land cover change across the Northern Great Plains of North America over the past three decades has been driven by changes in agricultural management, government incentives, new crop varieties, and market dynamics. Climate change across the Northern Great Plains over the past three decades has been evident in trends toward earlier warmth in the spring and a longer frost-free season. Together these land and climate changes induce shifts in local and regional LSPs. Perennial grasses grown as feedstocks for cellulosic ethanol have a very different LSP than annual maize grown for grain ethanol. We fit grassland LSP models linking MODIS NBAR NDVI profiles as quadratic functions of accumulated growing degree-days. Then we "transplant" grassland LSP end-members into maize dominated areas to grow the biofuel crops under recent and future climates specified by weather data and IPCC AR4 daily simulations. Resulting shifts in peak vegetation to earlier dates indicate seasonal shifts in evapotranspiration, with consequences for regional hydrometeorology.