AIR AND WATER RESOURCES ENGINEERING SEMINAR

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Date: Monday, April 21, 2014
Place: ETRL 101
Time: 4:10 p.m.—5:00 p.m.

Toward Explicit Representation of Land Management Decision-making in Regional Hydroclimatic Change Impacts Assessments

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Land use and land cover changes like deforestation and cropland expansion play a critically important role in climate change, albeit in a complex and uncertain way. Net global land use and land cover change exerts both a warming influence through associated CO_2 emissions and a cooling influence through increased albedo in seasonally snow-covered regions where vegetation canopy is reduced. In the western United States, public lands comprise more than half of the total area and are critical to the culture and economies of western states because they provide key ecosystem services. Management of public lands in the United States rarely involves permanent conversions of land use. But management actions like grazing, selective thinning, prescribed fire and others involve changing vegetation composition and structure to achieve objectives like fire and disease risk reduction, or prevention of invasive vegetation. Feedbacks between these land management practices and regional climate are not well understood, despite the large spatial footprint of public land management. This presentation reports on preliminary outcomes of a project using extant modeling tools to characterize and quantify the feedbacks between land management decision-making and regional hydroclimate in a large water supply basin in Idaho, USA. Of particular interest are variables like precipitation, snow storage, soil moisture, runoff, and evapotranspiration. The approach captures the natural and human system coupling that is present in managed landscapes. A multi-agent-based simulation model, Envision, is used to simulate the actions of land management policies on terrestrial vegetation in southern Idaho. In this context, a policy is a spatial query (e.g., forest elements with greater than 70% canopy closure) linked to an action that occurs probabilistically (e.g., selective thinning to 40% canopy closure). Vegetation structure within Envision is simulated using a combination of an empirical state-and-transition model and a process-based dynamic global vegetation model, forced by climate and disturbance (e.g., fire). Vegetation outputs from Envision are then supplied to the Weather Research and Forecasting (WRF) model in order to dynamically downscale climate projections from the same region. The experimental setup allows for the quantification of the relative contribution of explicit representation of land management decisions to regional hydroclimate change. This work aims to answer the broader question, to what extent must climate-aware land management activities be represented in land surface models that are used for regional climate modeling?