ATS/CIRA Colloquium

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Hosted by Jeff Pierce

3 p.m. Thursday, February 29
ATS 101

From plants to planets: land surface effects on global climate

Climate modulates what plants grow where, but the reverse of this is also true: plants alter climate by controlling fluxes of water and energy between the land surface and the atmosphere. Changes in land surface properties – such as changes in albedo, evaporative resistance, and aerodynamic properties associated with vegetation change – directly drive changes in local terrestrial climate. However, they also trigger atmospheric responses such as changes in cloud cover and air temperatures. These land-driven atmospheric responses feedback on surface climate both locally and remotely.

I will demonstrate how to isolate the effect of individual land surface properties on terrestrial and global climate using a hierarchy of model complexity, and will quantify the magnitude of atmospheric feedbacks to land surface change. I will show how changes in land albedo warm not only by increasing absorbed solar radiation, but also by triggering atmospheric responses in temperatures, water vapor, and cloud cover. Reducing evaporation from the land surface is generally thought to lead to warming; however, I will show that a trade-off exists between surface warming from reduced evaporation and surface cooling from reduced atmospheric water vapor (a strong greenhouse gas). By altering not only fluxes of energy and water at the surface, but also atmospheric processes both locally and remotely, land surface changes alter the climate system on global scales. Colloquia page: atmos.colostate.edu/colloquia