

ATS/CIRA Colloquium

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Hosted by Jeff Pierce

3 p.m. Thursday, February 22

ATS 101

Measuring and Modeling Multi-Scale Surface Atmosphere Exchanges

The Earth's surface is heterogeneous at multiple scales owing to spatial variability in various properties. The atmospheric responses to these heterogeneities through fluxes of energy, water, carbon, and other scalars are scale-dependent and nonlinear. Observational studies and large eddy simulations have observed secondary circulations in the turbulent atmospheric boundary layer as coherent turbulent structures or surface induced mesoscale circulations. However, they have been limited in their ability to represent or quantify these events over realistic and heterogeneous land surfaces. This talk will discuss some of the airborne measurements and numerical modeling work done as part of the Chequamegon Heterogeneous Ecosystem Energy-balance Study Enabled by a High-density Extensive Array of Detectors (CHEESEHEAD) field campaign.

I will discuss how airborne eddy covariance measurements can spatially resolve larger scale (meso- β , γ) stationary/slow-moving eddies tied to landscape heterogeneity. The mesoscale flux contributions are evaluated by applying wavelet analysis to the airborne flux measurements during the campaign.

Large Eddy Simulations (LES) of the field campaign days were set up with an interactive land surface model, coupled with a soil and plant canopy model. The land surface and plant canopy models were initialized and constrained by measurements taken during the field campaign to investigate surface atmospheric feedbacks. Secondary circulations induced due to the surface heterogeneities are diagnosed from the 3D LES data using time and ensemble averaging. The dynamical evolution of the secondary circulations, along with their relationship to effective surface length scales will be discussed.

Colloquia page: atmos.colostate.edu/colloquia