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**ATS/CIRA Colloquium**

**Jason M. Keeler**

University of Illinois

**Radiative and Instability Forcing of Cloud-top Generating Cells in Winter Cyclones**

**Hosted by Russ Schumacher**

**Friday, October 16, 2015**

**ATS room 101; Discussion will begin at 11:15am  
Refreshments will be served at 10:45am in the weather lab**

Recent field observations from the Profiling of Winter Storms (PLOWs) campaign suggest that cloud-top precipitation generating cells (GCs) are ubiquitous in the warm-frontal and comma-head regions of midlatitude winter cyclones. The presence of fall streaks emanating from the GCs, and their persistence either to the surface or until merging into precipitation bands suggests that GCs are a critical component of the precipitation process in these cyclones. Accordingly, an understanding of the dynamics and thermodynamics that control their development and maintenance is needed.

This research investigated the dynamics of GCs through very high-resolution idealized Weather Research and Forecasting (WRF) simulations: first under stability and shear conditions representative of the 14-15 February 2010 cyclone, then under modified radiative forcing, and idealized stability profiles. This talk will discuss the development and maintenance of GCs (or lack thereof) under a wide range of upper-tropospheric conditions in the context of PLOWs observations. Under initially unstable conditions at cloud-top, GCs develop regardless of radiative forcing, but only persist clearly with radiative forcing. Cloud-top destabilization due to longwave cooling leads to development of GCs even under initially neutral and stable conditions, providing a physical explanation for the observed ubiquity of GCs atop winter cyclones. GCs do not develop in initially stable simulations with no radiative forcing. Decreased range in vertical velocity spectra under daytime radiative forcing is consistent with offset of the destabilizing influence of longwave cooling by shortwave heating.

Link to colloquium videos and announcement page: <http://www.atmos.colostate.edu/dept/colloquia.php>