ATS/CIRA Colloquium

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Visiting ATS from NOAA

Have we "resolved" the aerosol effects on deep convection problem?

Hosted by Jeff Pierce and Sue van den Heever

Friday, March 6, 2015

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

A growing interest in the potential effects of aerosol perturbations on deep convective clouds has resulted in numerous publications over the past decade. These studies have primarily focused on aerosol-induced changes in updraft strength, precipitation amount, precipitation patterns, and lightning frequency. In this talk, I will highlight the primary mechanisms for aerosol effects on deep convective clouds that have been proposed in the literature. The magnitude of the response will be compared with the effects due to changes in environmental (e.g., convective available potential energy, low-level wind shear, etc.) and model (e.g., parameterization type) characteristics. An interesting aspect of these results is that they may help us better understand the role of entrainment/detrainment in deep convection.

To do so, a suite of simulations will be presented that encompass a large range of horizontal resolutions. The purpose of these simulations is to examine the effects of resolution on the modeled characteristics of deep convection, which is likely to be a critical factor in determining the extent to which aerosol perturbations may affect deep convection. Previous work has suggested that aerosol-induced effects on deep convection may rely heavily on the presence of mid-level aerosols due to the undiluted nature of the strongest convective cores with the simulated squall line. However, the additional simulations suggest that there is a shift in the storm characteristics that occurs at a horizontal resolution of approximately 250 m. For increasingly higher resolution, the structure of the storm becomes nearly independent of the horizontal resolution. The simulations demonstrate that entrainment and detrainment increase up to this resolution, which may have important implications for both the effect of aerosols on deep convective clouds and the transport and scavenging of these particles.

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