ATS/CIRA Colloquium

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Visiting CSU ATS from Harvard University

Teary Eyes to Blue Skies: Using Models and Observations to Establish a Global Picture of Peroxyacetyl Nitrate (PAN)

Hosted by Eric Maloney

Monday, March 19, 2012

ATS room 101; Discussion will begin at 3:30pm
Refreshments will be served at 3:00pm in the coffee lounge

Most reduced trace gases emitted into the atmosphere are removed by oxidation including greenhouse gases, air pollutants, and aerosol precursors. The primary atmospheric oxidants, the hydroxyl radical (OH) and ozone (O_3), play critical roles in chemistry-climate feedbacks. Peroxyacetyl nitrate (PAN), formed in the atmospheric oxidation of non-methane volatile organic compounds (NMVOCs), serves as a thermally unstable reservoir for nitrogen oxide radicals (NO_x = NO + NO_2), permitting anthropogenic NO_x emissions to impact the global distribution of O_3 and OH. Thus PAN provides a pathway by which oxidants respond to changes in climate and emissions.

I will report on free tropospheric measurements of PAN from the summit of Mount Bachelor, OR. The observations are timely given 1) the rapid rise in East Asian emissions of NO_x and NMVOCs, and 2) evidence that springtime O_3 mixing ratios are increasing over western North America. I will present an estimate of O_3 production efficiency from thermal PAN decomposition within Asian plumes. I will also discuss how we can combine the observed variability in PAN and O_3 at Mount Bachelor with a range of possible future trends in these species to determine the requirements to detect such trends. Finally, I will report on efforts to improve the global PAN simulation. PAN is poorly represented in global chemical transport models (CTMs), as indicated by a failure to reproduce many of the existing observations. PAN production involves numerous stages of NMVOC oxidation, and I am examining the budgets of various precursors within the GEOS-Chem CTM.

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