Abstract:

Uncertainties in NH3 emissions poses challenges to air quality modeling, development of pollution control strategies, and understanding the global transport pathways of reactive nitrogen. We aim to constrain NH3 emissions using new remote sensing observations (TES NH3 retrievals), existing speciated surface observations (IMPROVE, NADP/NTN), and recently developed adjoint modeling tools. Capabilities and limitations for constraining specific NH3 sources and variability with this data are first being assessed via inverse modeling tests using “pseudo” observations (generated by the model). The inverse model is then applied over North America using real observations from the year 2005. The resulting constraints on NH3 inventories are evaluated through cross validation with independent data sets and qualified with calculation of uncertainty reductions. Lastly, the impacts of constraining NH3 emissions on control strategies will be determined through novel application of the adjoint model as a sensitivity tool, pinpointing nonattainment to influences from specific emissions locations, sectors, and sources. Benefits of accomplishing these goals will be to further our overall knowledge of the environmental impacts of NH3 emissions by affording better estimates of incidents of excessively harmful PM2.5 levels using air quality models as well as reducing uncertainty in quantifying the sources and fate of ecologically disruptive levels of reactive nitrogen. NH3 inventory improvements will also enhance calculated emission control efficiencies by more precisely accounting for the response of PM2.5 concentrations to existing or proposed mitigation strategies, thereby targeting emissions controls that minimize risk and cost while maximizing societal benefits.

Short Bio:

Dr. Daven Henze recently joined the faculty of the Mechanical Engineering Department at the University of Colorado in Boulder. His research focuses on the role that atmospheric constituents such as ozone, nitrogen oxides (NOx) and particulate matter (aerosols) play in local air quality, long range pollution transport, and climate change. Prior to this position, Dr. Henze was an Earth Institute Postdoctoral Fellow at Columbia University where he worked at NASA GISS from 2007 - 2009. Dr. Henze earned a Ph.D. in Chemical Engineering from Caltech in 2007.