Forecasting the regional air quality impacted by anthropogenic pollution remains one of the greatest challenges in the atmospheric sciences. The goal is to reduce the uncertainty in the prediction of chemical and aerosol speciation. Air quality is impacted by the anthropogenic emission of chemical pollutants such as inorganic sulfur compounds, inorganic nitrogen (NO, NO2), ozone (O3), volatile organic compounds (VOCs) and the formation aerosols which are all regulated by the EPA resulting in reduced anthropogenic emissions over the last 30 years. However, biological volatile organic compounds (BVOCs) now make up a larger fraction of the multiphase chemistry and aerosol components.

Aircraft survey, ground, and laboratory measurement data demonstrated the importance of the formation and composition of aerosols due to the multiphase chemistry of anthropogenic chemical emissions and BVOCs. Additionally, the multiphase chemistry vary seasonally and are unique to the regional environment. Current regional models, such as the Community Multiscale Air Quality Model (CMAQ), do not accurately represent the multiphase chemistry involving aerosols resulting under-prediction of multiphase reactivity, phase state, aerosol growth, and reactive uptake of other chemical species. Altering and customizing an existing regional model to fit the experimental data requires the use of a test framework that uses experimental data to evaluate and develop modifications, while remaining computationally inexpensive. The box model, Framework for 0-D Atmospheric Modeling (F0AM), was used to meet this requirement. Custom modules were added to F0AM allowing an evaluation of any explicit aerosol formation mechanism based on field and laboratory data, alongside any mechanism developed for CMAQ.

The learning objectives of this seminar are:
1. An introduction to concepts in multiphase atmospheric chemistry and how interactions between chemical and aerosol components can affect the overall air quality.
2. Increasing the audience understanding of how several data sources are applied to contribute to the continued development of the atmospheric models.
3. Introduction to theory and workflow of a model test framework, using a 0D box model to test the application of chemical mechanisms for subsequent application to existing regional or global models.