

# Ensemble filtering using a 3d chemical-dynamical middle atmosphere model

**Authors:** Tomoko Matsuo, Jeffrey Anderson, Dan Marsh, and Anne Smith

**Presenter:** Tomoko Matsuo

*Institute for Mathematics Applied to Geosciences  
National Center for Atmospheric Research  
Boulder, Colorado 80307-3000*

## **Brief Abstract:**

The mesosphere and lower thermosphere (MLT) region is a transition region where wave energy originating from the troposphere and stratosphere dissipates and is absorbed via dynamical, chemical, and radiative processes. The recently launched Thermosphere, Ionosphere, Mesosphere, Energetics and Dynamics (TIMED) spacecraft, together with a network of ground-based observation sites, provides an unprecedented set of comprehensive global measurements of the region.

With the NCAR Data Assimilation Research Testbed (DART) facility, a prototype ensemble filter assimilation system using a 3-d chemical dynamical middle atmosphere model has been constructed primarily to evaluate the value of observations, the design of the observing system, and also the quality of the model. The chemistry has been a primary diagnostic of the MLT region where the dynamical time scale is about the same as that of chemistry. The ability of an ensemble filter assimilation to produce consistent updates of all state variables given observations of constituent and airglow as well as winds and temperature is essential to producing high-quality assimilations.

Compared to the synoptic meteorological system in the troposphere, the MLT region is significantly more dissipative and strongly forced. We will discuss how an ensemble data assimilation problem can be formulated in such a system especially when the model does not exhibit natural error growth.