Data Assimilation with Multi-Instance CESM Components and DART

National Center for Atmospheric Research
Boulder, Colorado, USA
dart@ucar.edu

1. DART and Multi-Instance CESM

CESM can advance multiple instances of one or more model components simultaneously, which enables it to use DART to assimilate observations and bring the model state(s) closer to the truth.

2. CLM Single Column Preliminaries

The interface between CLM and DART has enabled assimilation of MODIS snow cover observations into CLM, and investigations are underway to assimilate flux tower data into CLM run in single-column mode.

3. Global Atmosphere Assimilation

DART assimilated all the observations that were used in the NCEP-NCAR Reanalysis into CAM4 to produce a global, 6-hourly, 80-member ensemble reanalysis for 1998 through 2010 — with plans to continue. The dataset is ideal for research that would benefit from an ensemble of equally-likely atmospheric states that are consistent with observations.

4. Global Ocean Assimilation

The CESM interfaces for the Parallel Ocean Program (POP) and the Community Land Model (CLM) support multiple instances, allowing data assimilation experiments to exploit unique atmospheric forcing for each POP or CLM model instance. To understand the role that data can play in constraining the ocean model, we force each POP instance with a unique atmospheric forcing. Then we compare the ensemble mean ocean analysis which includes assimilation of WOD09 data (“Assim”), against the ensemble mean ocean simulation without assimilation (“NoAssim”).

5. Observation-Space Diagnostics

The performance of the assimilation is assessed by comparing the short-term forecast state to the observations about to be assimilated; a metric that is not dependent on a third party analysis. DART has a wide range of observation-space diagnostic tools to evaluate the performance of the assimilation.

6. Future CESM+DART Development

The DART interfaces will keep pace with developments in CESM, such as the adoption of the HOMME, cubed-sphere grid, and possibly the MPAS grid.

7. Further Information

http://www.image.ucar.edu/DAReS/DART has information about downloading DART from our subversion server, a full DART tutorial (included with the distribution), and contacting us.

8. References


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