

Data Assimilation

DART/CAM-Chem

Summary

The CAM-Chem model has been interfaced to the Data Assimilation Research Testbed ([DART](#)) in order to assimilate both chemical and meteorological observations.

In this case, the data assimilation scheme is an Ensemble Adjustment Kalman Filter ([EAKF](#)).

This requires an ensemble (or multiple instances) of CAM-Chem simulations, which is currently done within the multi-instance feature of the CESM coupler.

The DART documentation is available [online](#) and the code is on [GitHub](#), below are some specifics needed for chemistry.

Adding a variable

If you want to add a variable to the state vector for evaluation or assimilation. You have to define a DART quantity (QTY_XXX).

The interface between the model and DART for chemistry variables is define in [chem_table_mod.f90](#).

For instance, if you want to add the ozone variable ('O3' in CAM-Chem), you will need to add this to the chem_table_mod.f90

```
call add_entry('O3', 47.9982_r8, 'QTY_O3')
```

The molecular weight (47.9982_r8) is used to convert the mass mixing ratio (in cam initial files) into volume mixing ratio.

The created quantity needs to be define in [model_mod.f90](#) by adding:

```
obs_kind_mod, only: use QTY_O3
```

The quantity (QTY_O3) also needs to be define in [.././assimilation_code/modules/observations/DEFAULT_obs_kind_mod.F90](#)

The procedure to add a quantity in obs_kind_mod is explained in the DART documentation of the [preprocess](#) program.

Other resources

Datasets available:

A reanalysis of [MOPITT](#) Carbon Monoxide (2002-2013) has been performed ([Gaubert et al., 2016](#); [Gaubert et al., 2017](#)) and monthly means outputs are available [here](#).

References:

[DART-CAM-Chem \(CAM6\)](#)

[DART-CAM-Chem \(CAM5\)](#)

[DART-CAM \(CAM4\)](#)

[DART-CAM-Chem \(CAM3\)](#)

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