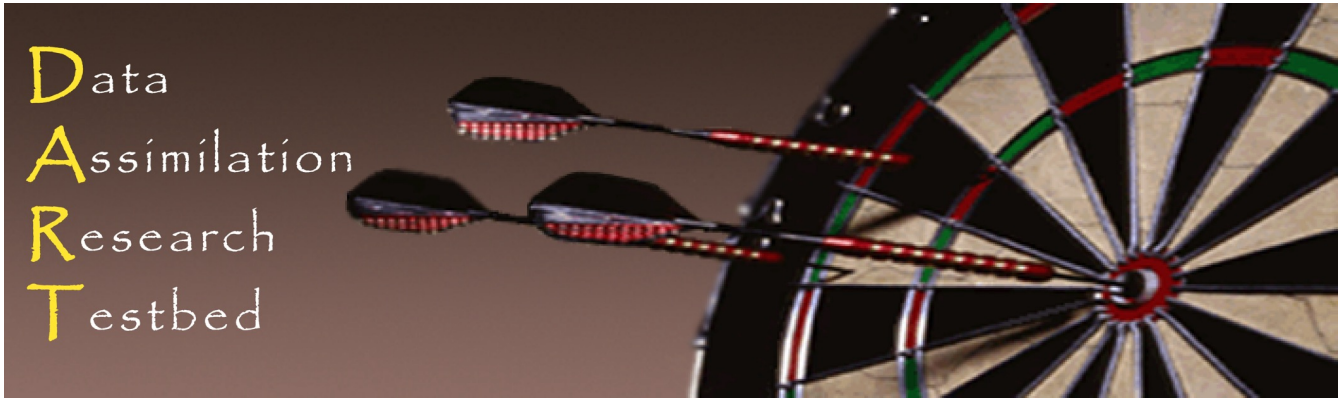
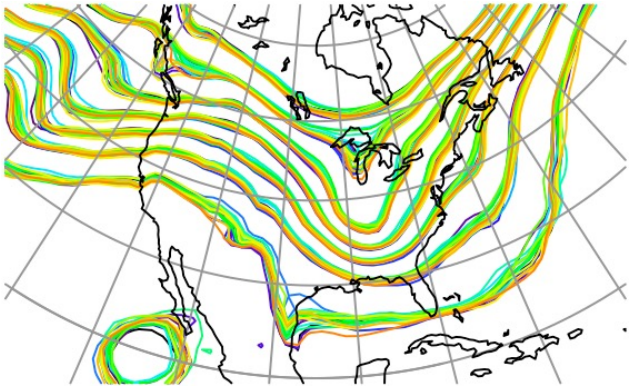


An Ensemble Reanalysis with CAM6: Initial Conditions for Ensemble ESP & Realistic Forcing for CESM Models



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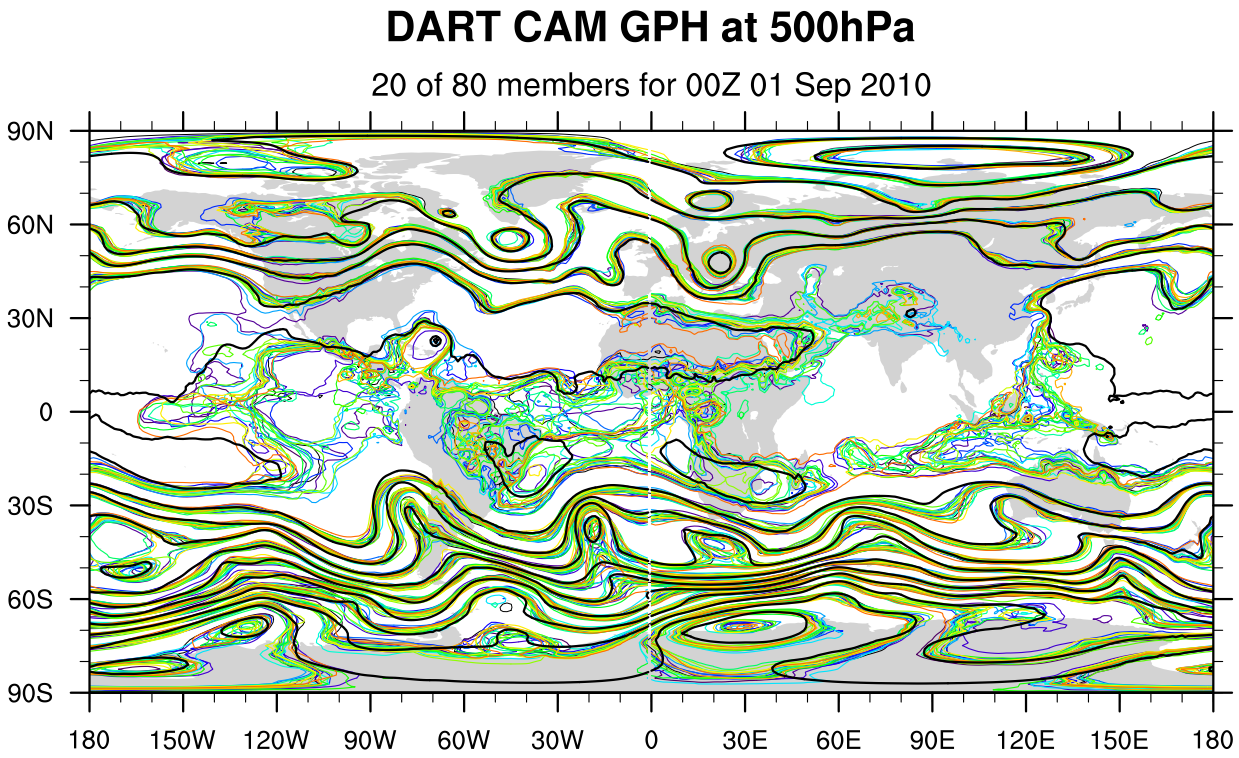
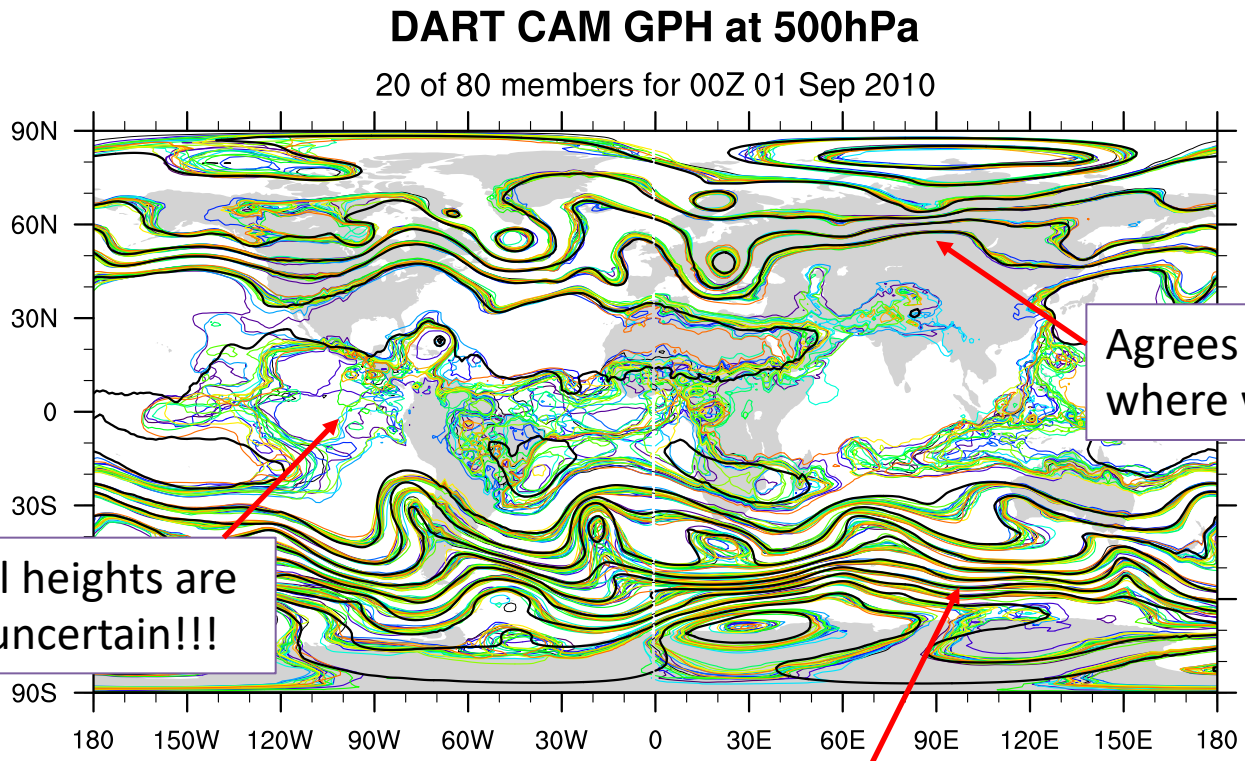
80-Member Ensemble Reanalysis with CAM 6



Example: 500 hPa Heights, 00GMT 1 September 2010
Colored contours are 20 of 80 members from CAM
Black contour is from NCEP FNL, operational analysis

80-Member Ensemble Reanalysis with CAM 6

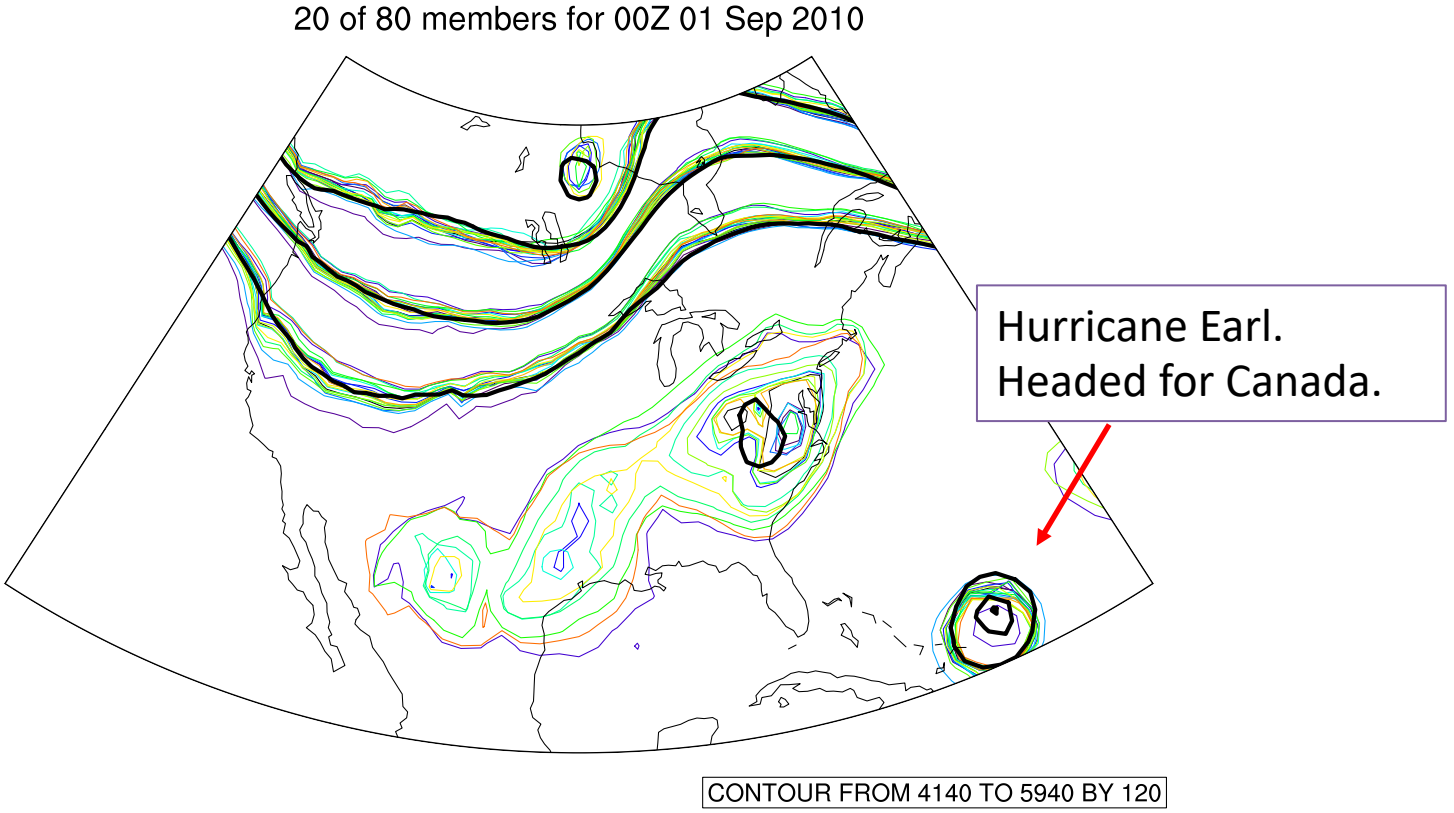


Agrees with NCEP where well-observed.

Yes, tropical heights are really that uncertain!!!

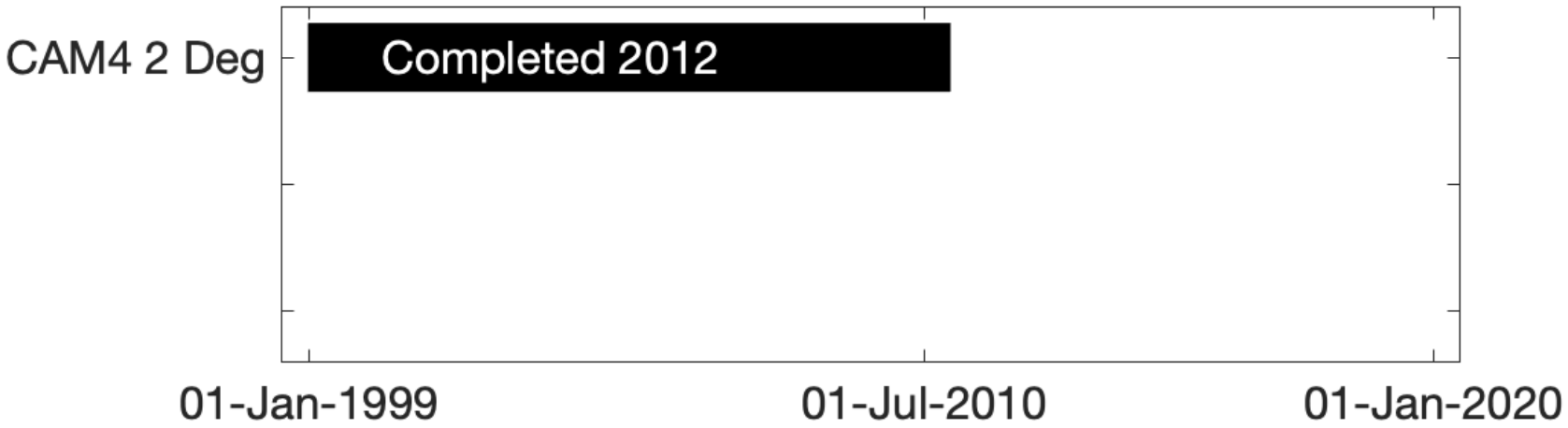
Remote sensing reduces SH uncertainty.

DART: 80-Member Ensemble CAM 6 Reanalysis

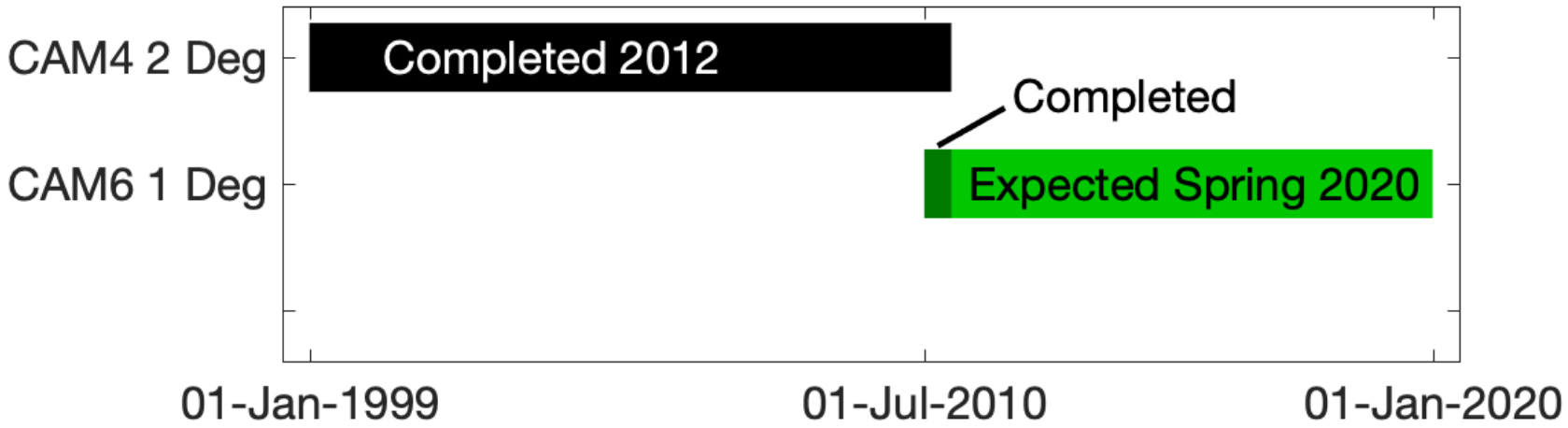


That's hurricane Earl (2010).
Even at 1 degree, CAM6 provides good position.
Strength a bit low but still a hurricane.

DART/CAM 6 Reanalysis Timeline

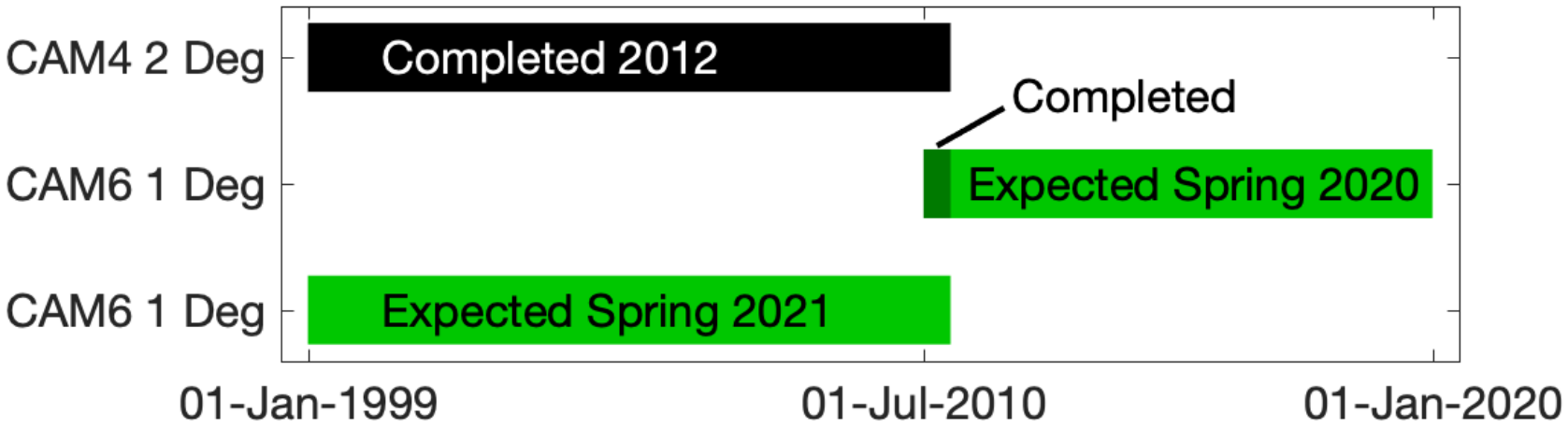


DART/CAM 6 Reanalysis Timeline



CAM 6 Phase 1 Supported by NCAR Strategic Capability (NSC)

DART/CAM 6 Reanalysis Timeline



CAM 6 Phase 2 Contingent on Additional NSC Resources

Products You Can Use

Three output products available as they are completed:

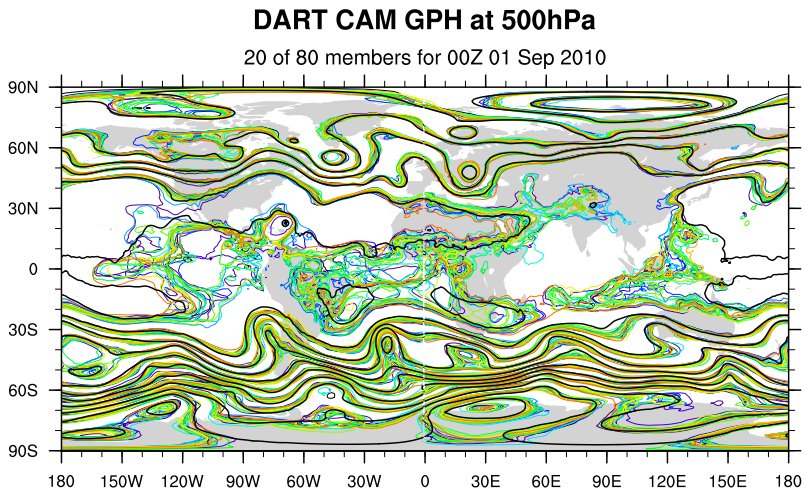
1. 80-Member ensemble of CAM6 initial conditions.
2. 80-Member ensemble of forcing files for other CESM components.
3. Comparison of CAM6 6-hour forecasts to observations.

Products You Can Use

1. 80-Member ensemble of CAM6 initial conditions.

Available once per week.

High-quality, 1 degree initial conditions.
Members sample initial condition uncertainty (not ad hoc perturbations).
Consistent with CAM dynamics, minimize forecast spin-up.
Only biases present are from CAM, not another model.
Can be down/up-scaled for different resolutions.



Products You Can Use

2. 80-Member ensemble of forcing files for other CESM components.

Available at least every 6 hours.

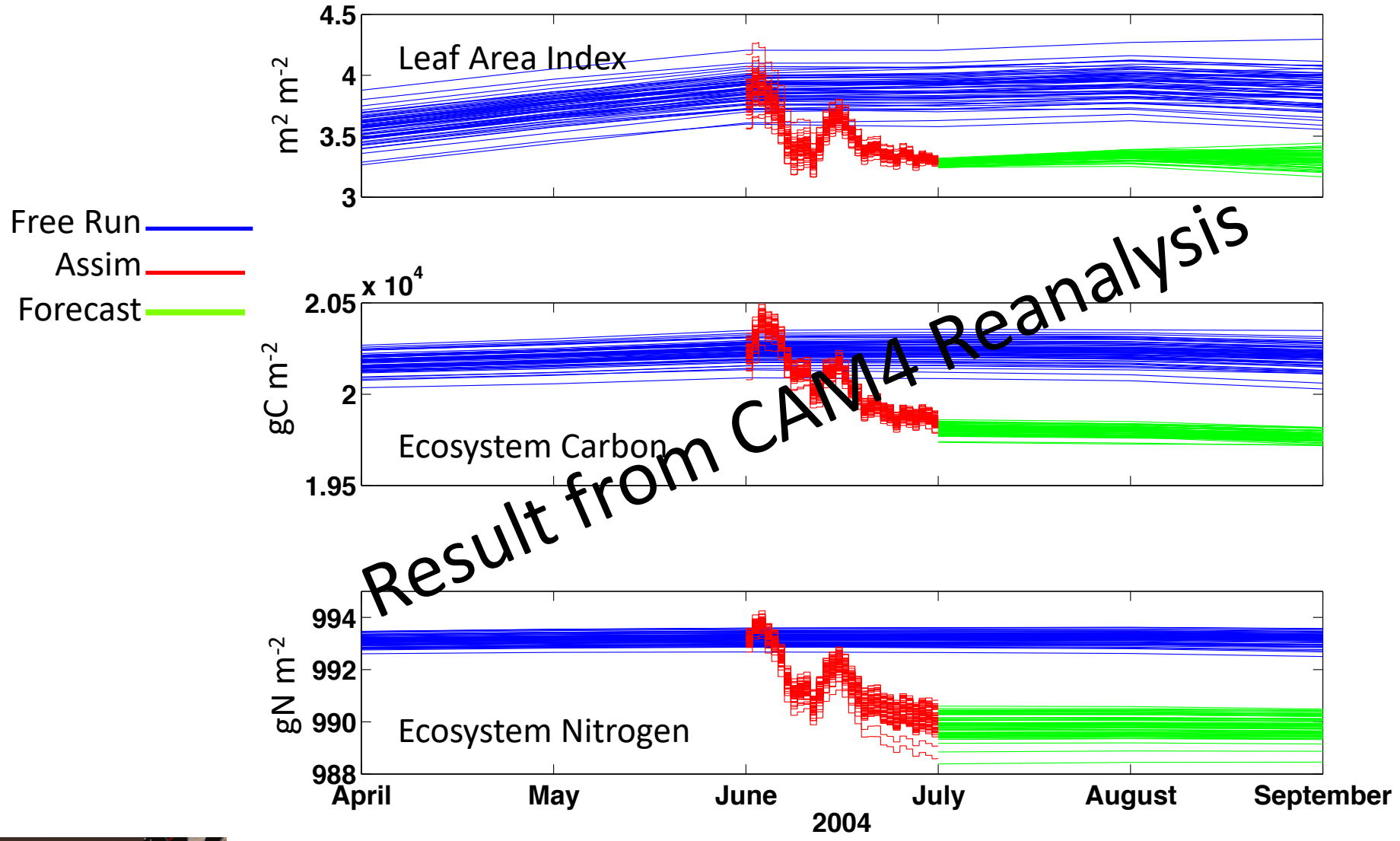
Provide forcing for ensemble simulations or data assimilation.

Can be used directly with CESM coupler to force:

- POP (MOM)
- CLM/CTSM
- CICE

Physically-consistent, realistic, balanced for CESM use.
Realistic ensemble uncertainty consistent with observing network

CLM Ensemble Simulation and DA from Andy Fox.



Products You Can Use

2. 80-Member ensemble of forcing files for other CESM components.

Can be used for many other things including:

- Forcing for off-line chemistry simulations/DA,
- Forcing for simulations/DA of models above troposphere,
- Boundary forcing for regional simulations/DA (WRF, MPAS…),
- Baseline for DA experiments with deeper atmosphere models.

Products You Can Use

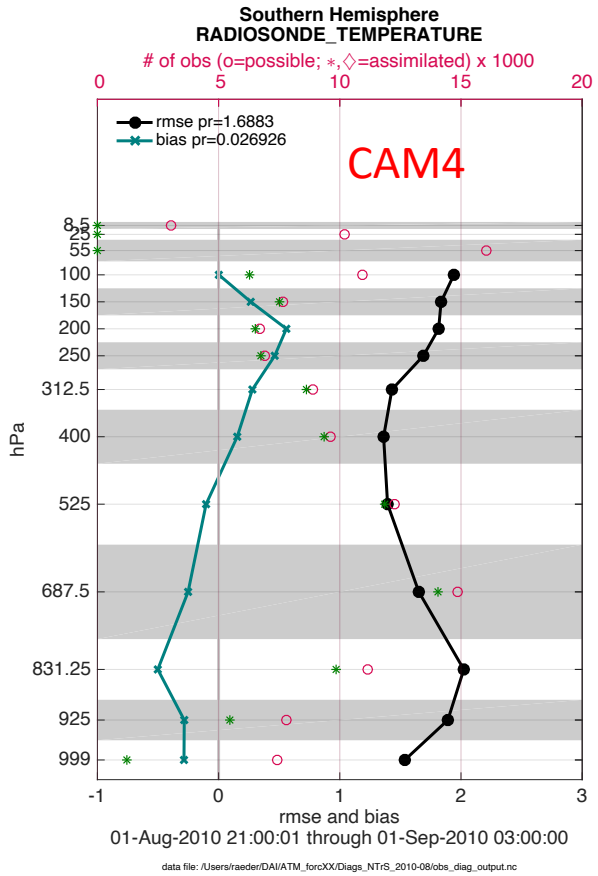
3. Comparison of CAM6 6-hour forecasts to observations.

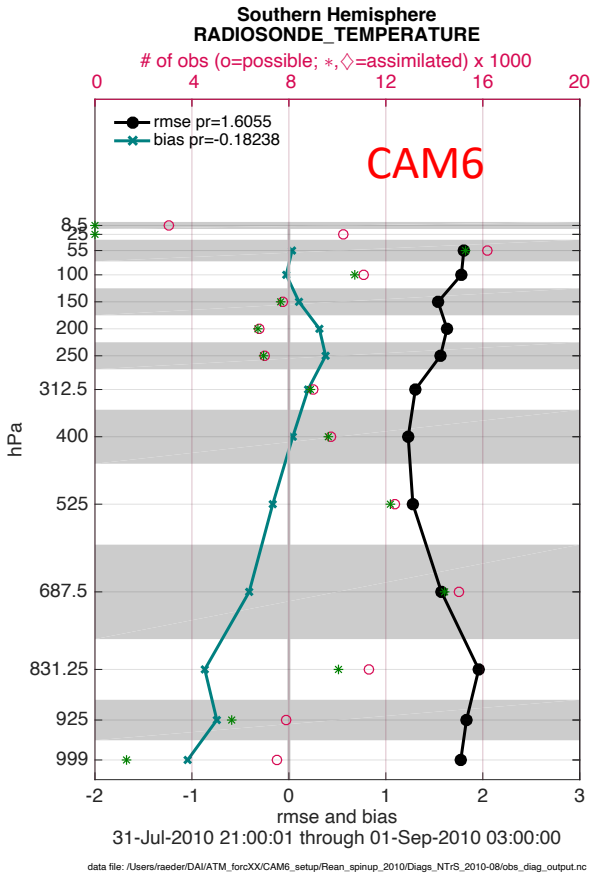
Available every 6 hours.

Reveal CAM6 model systematic differences from observations.
Short-term systematic errors often related to longer-term.
Can focus on specific regions and quantities.
Helpful as baseline for new model development.

Products You Can Use

3. Comparison of CAM6 6-hour forecasts to observations.
   Example: SH Temperature profiles, August 2010.





Products You Can Use

3. Comparison of CAM6 6-hour forecasts to observations.
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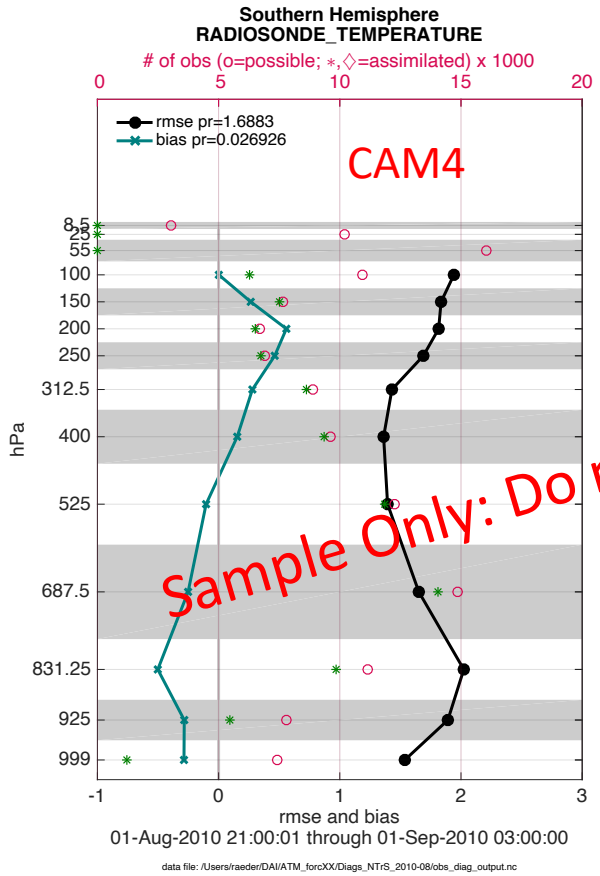
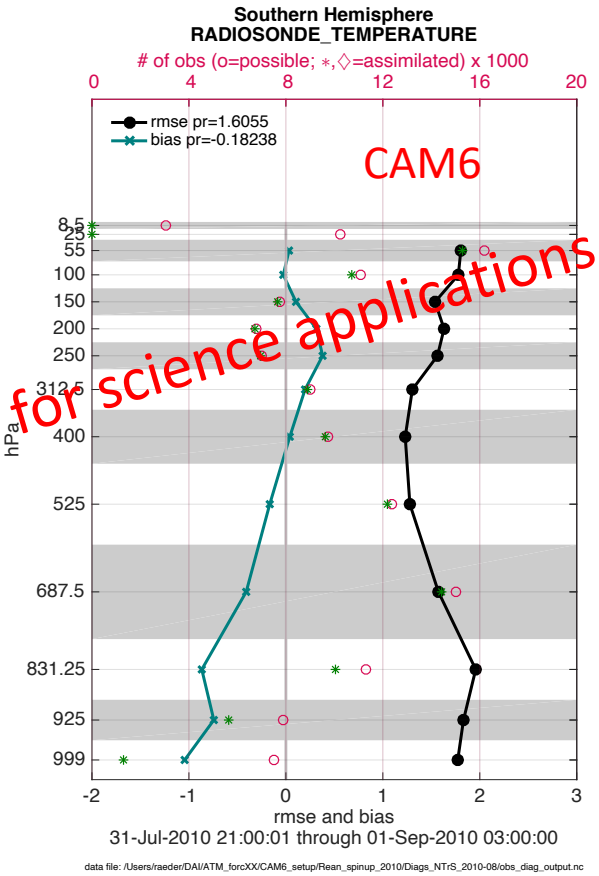




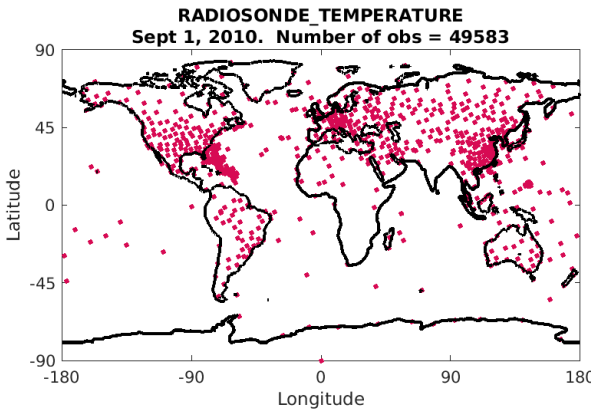
Sample Only: Do not use for science applications.

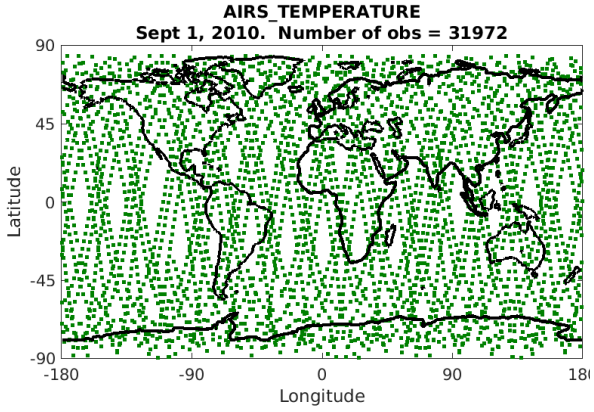
Reanalysis Quick Facts

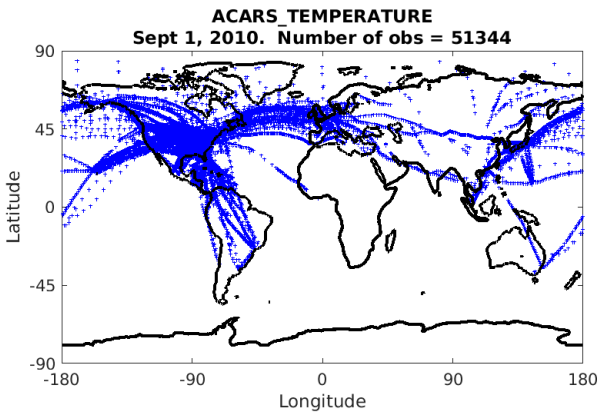
Model: CAM 6, 1 degree in CMIP6 Configuration.

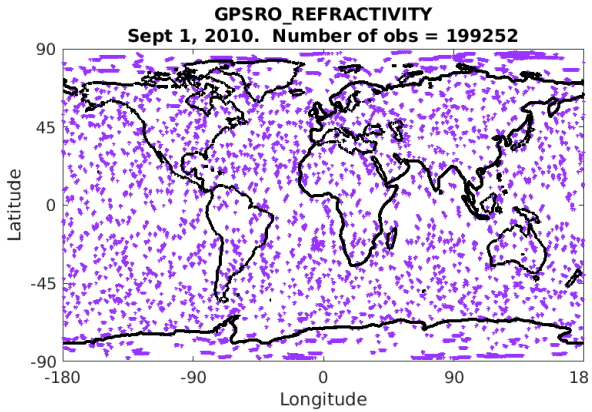
Assimilation: DART Manhattan, tuned parameters, updated inflation.

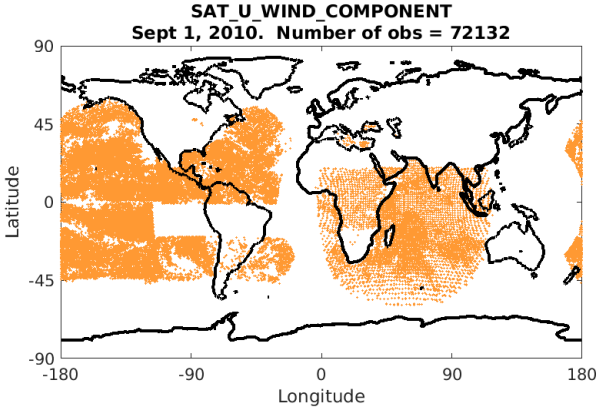
Reanalysis Quick Facts: Observations

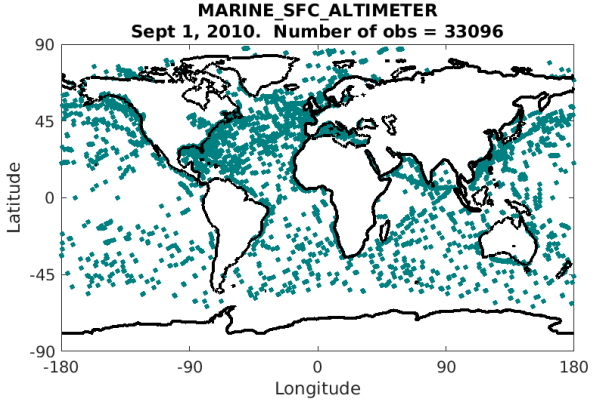












Sample of observations used in 1 day.

Who's doing the work?

Kevin Raeder: Overall project lead, keeps everything running (really hard).

Nancy Collins: Observations, software engineering.

Tim Hoar: Diagnostics, support for forcing other components.

Moha El Gharamti: Improved DART inflation, DART tuning.

Jeff Anderson: Organizational support.

TIME CRITICAL REQUEST

What other output would people like?

Periods with more frequent ensemble state output.
Other diagnostic output.
Ensemble means more frequently.

Contact us at dart@ucar.edu

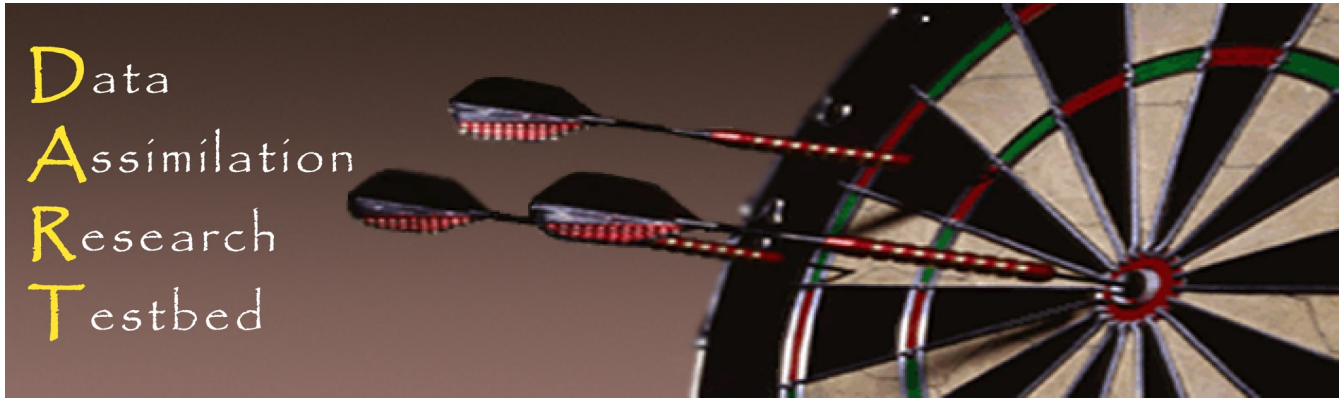
The wheels are turning, don't delay.

For more information:

CAM GCOM CAM-Chem PBL_1d ROMS NOAH-MP

GITM WRF-Hydro CICE WACCM

CLM



POP

AM2

SQG

BGRID

COAMPS

WRF

www.image.ucar.edu/DAReS/DART

MITgcm_ocean

dart@ucar.edu

MPAS_ATM

WACCM-X

NCOMMAS MPAS_OCN TIEGCM COAMPS_nest

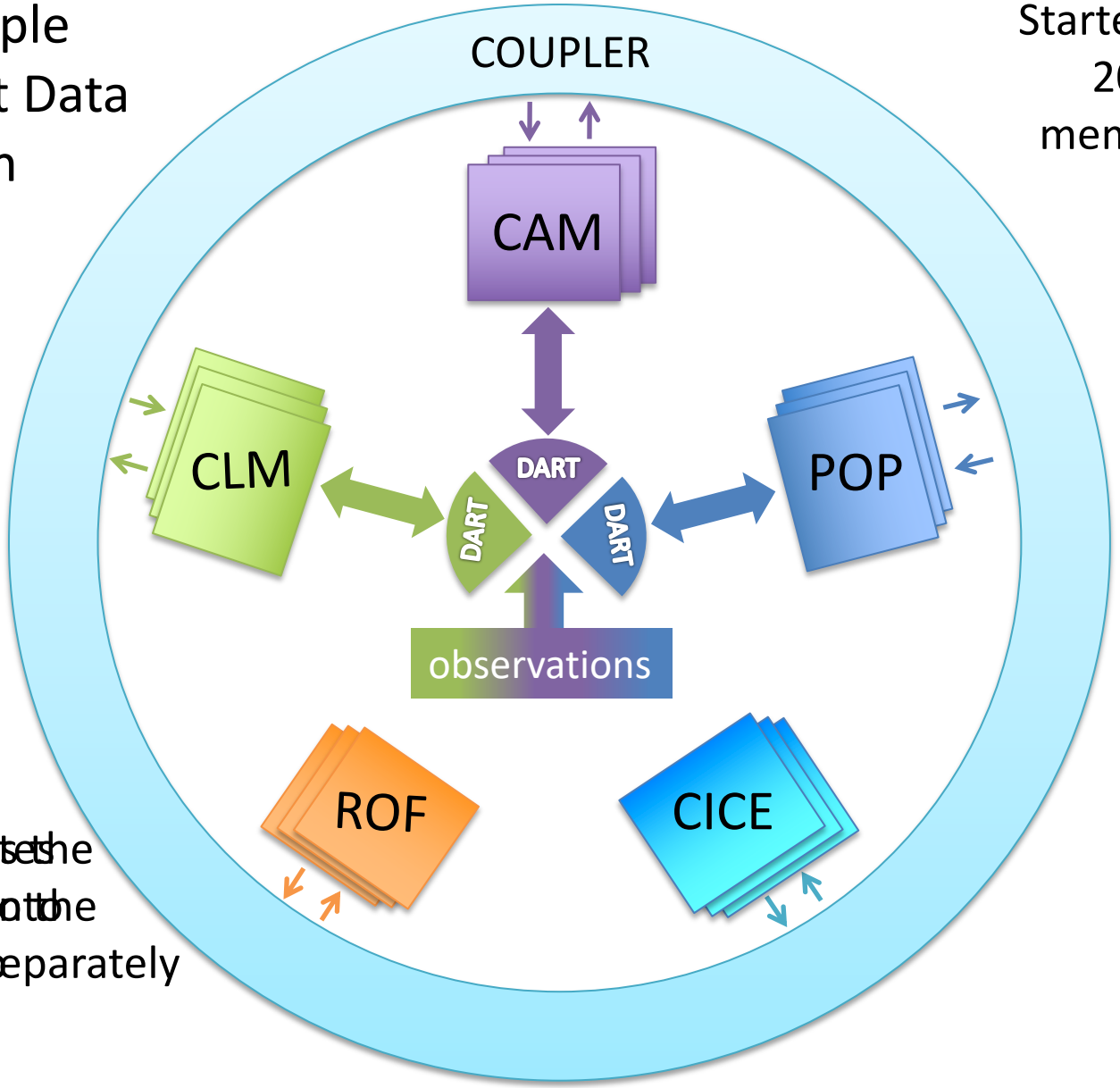
WRF-Chem NAAPS PE2LYR CABLE CM1

CISL Computational & Information Systems Lab

We would like to acknowledge high-performance computing support from Cheyenne (doi:10.5065/D6RX99HX) provided by NCAR's Computational and Information Systems Laboratory, sponsored by the National Science Foundation.

DART Multiple Component Data Assimilation

Started with CCSM4 20th Century 30-member ensemble for all model components



Important!
There are *multiple* instances of each model component.

DART assimilates observations to the next time step

DART assimilates observations to the next time step separately