

An Introduction to NCAR's Data Assimilation Initiative (DAI)

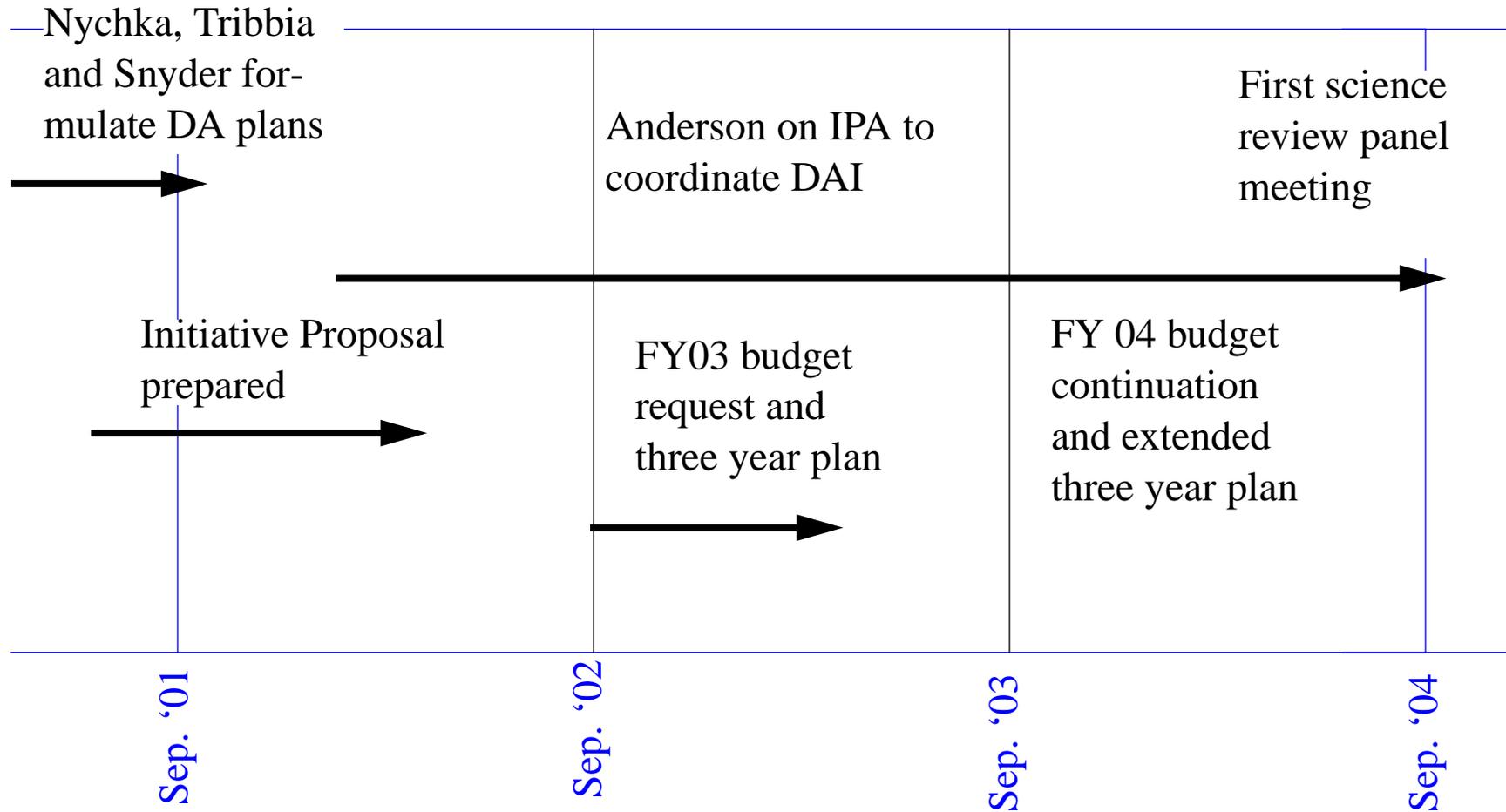
Report to DAI Scientific Review Panel
24 September, 2004

“DAI aims to create and lead a research community for data assimilation where individuals benefit from sharing ideas, methodologies, and software tools as well as access to a data assimilation testbed.”

“With a carefully controlled but rapid expansion of DAI, it should be possible for NCAR to be recognized as a leader in research data assimilation within 3 years (FY07).”

Summary: On track, so far...

History of DAI: Organization



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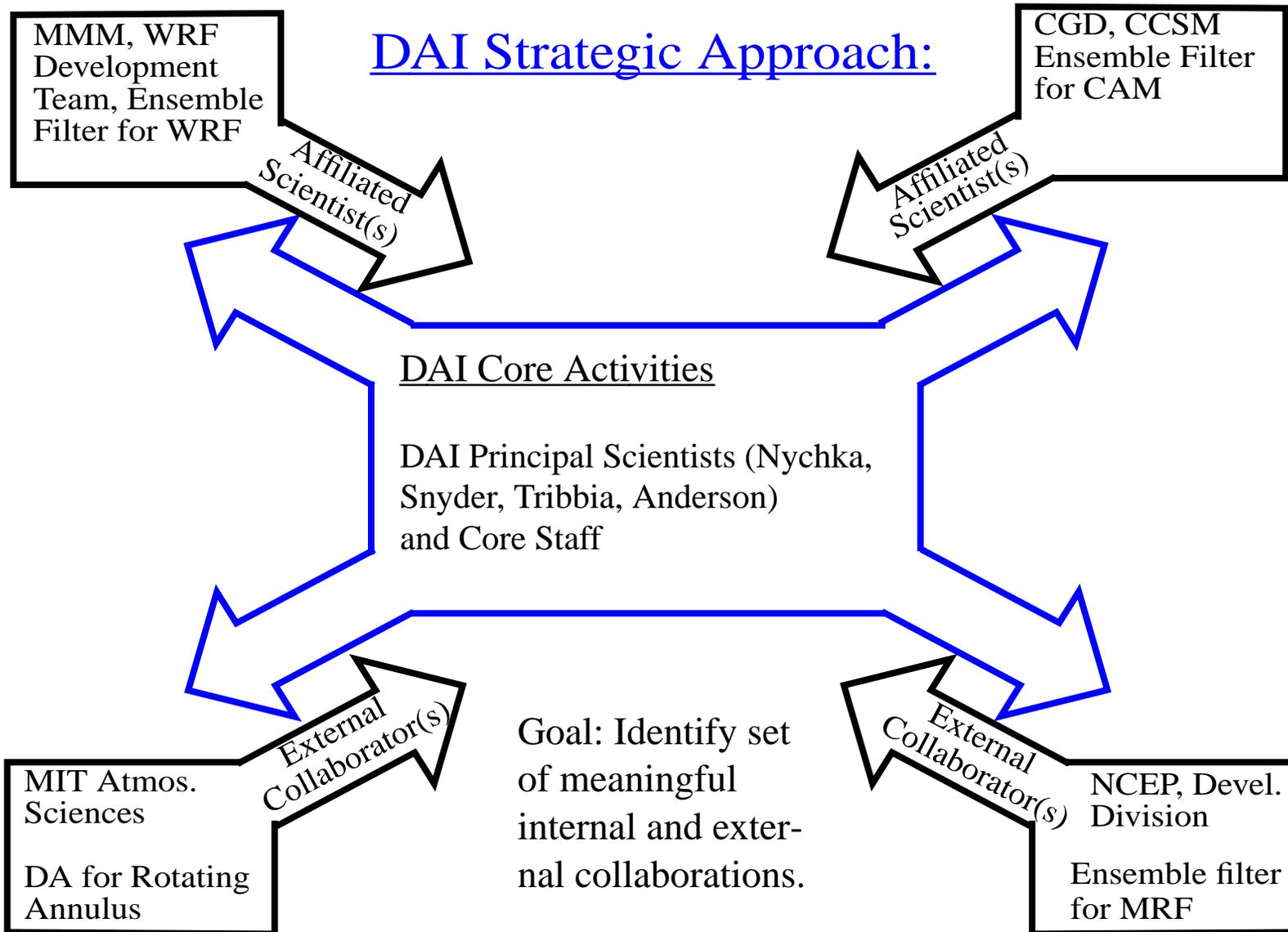
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5. Basic research and implementation support for 'operational' partners, both within NCAR and outside.



DAI: Strategic Approach

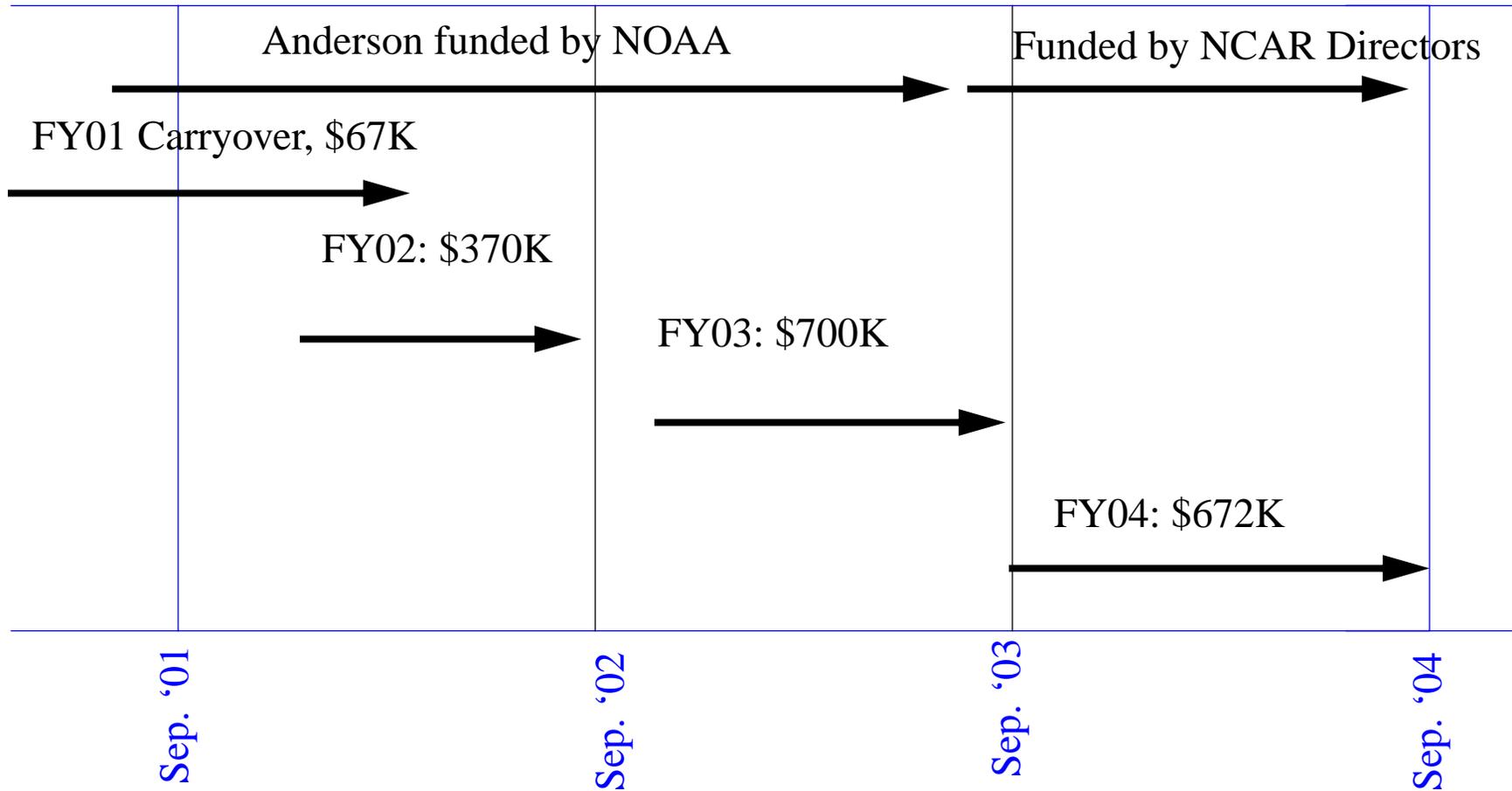
DAI Provides:

Expertise on Assim. Methodologies and Applications
Software Infrastructure (DART)
Basic Research Support
Support for Core Scientists and Staff

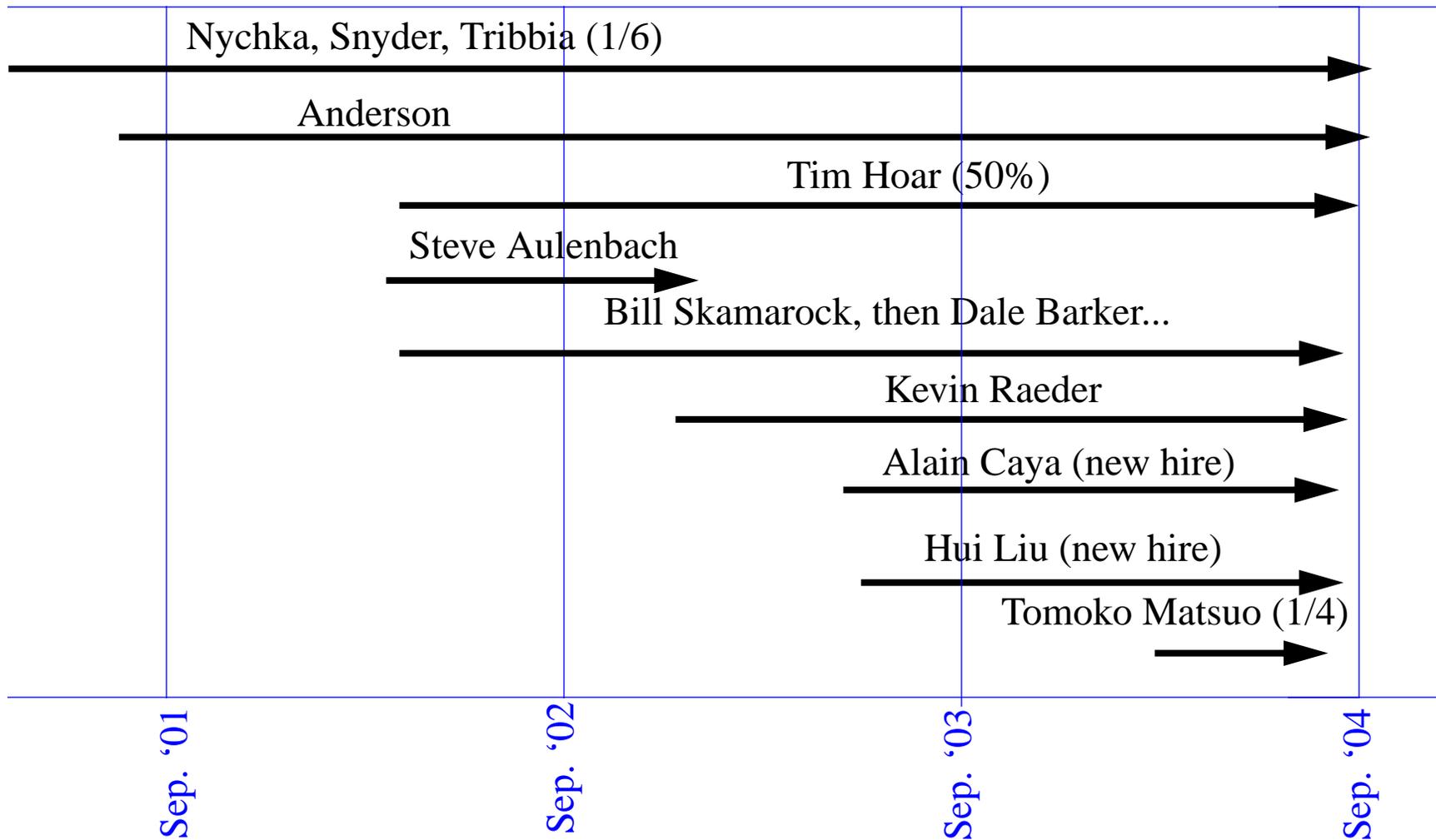
Collaborator Provides:

Expertise on particular application
Model or observational data sets
Affiliated scientists with expertise on application

History of DAI: Funding



History of DAI: Personnel



Current DAI funded staffing (FY04)

Jeff Anderson (funded separately)	Software, ensemble filters
Dale Barker (25%)	WRF variational/filters
Alain Caya	WRF filter, radar assim.
Tim Hoar (50%)	Software, diagnostics, ...
Shree Khare (housing)	Observing system design
Hui Liu	Observation data, GPS
Tomoko Matsuo (25%)	Middle atmosphere assim.
Doug Nychka (1/6)	Statistics, filtering
Kevin Raeder	CAM assimilation
Chris Snyder (1/6)	Ensemble filters, WRF assim.
Joe Tribbia (1/6)	Stochastic prediction

No guidance on FY05 budget so far, so no detailed personnel plans
Current budget will not sustain current personnel level

Selected DAI Supported Publications from 2003-04

- 1) Anderson, J. L., 2004: A scalable least squares implementation of ensemble (Kalman) filters. *J. Atmos. Ocean Technology-A*, submitted.
- 2) Anderson, J. L., B. Wyman, S. Zhang and T. Hoar, 2004: Assimilation of surface pressure observations using an ensemble filter in an idealized global atmospheric prediction system. *J. Atmos. Sci.*, submitted.
- 3) Anderson, J. L., 2004: A hierarchical ensemble filter for data assimilation. *Monthly Weather Review*, submitted.
- 4) Bengtsson, T., C. Snyder, and D. Nychka, 2004: Toward a nonlinear ensemble filter for high dimensional systems. *J. Geophys. Res.*, accepted.
- 5) Tribbia, J. J., and D. P. Baumhefner, 2004: Scale interactions and atmospheric predictability: An updated perspective. *Monthly Weather Review*, 132, 703-713.
- 6) Zhang, F., C. Snyder, and J. Sun, 2004: Impacts of initial estimate and observations on convective-scale data assimilation with an ensemble Kalman filter. *Monthly Weather Review*, accepted.

Selected Publications from 2003-04 (cont.)

- 7) Anderson, J. L., “A local least squares framework for ensemble filtering,” *Monthly Weather Review*, **131**, 634-642, 2003.
- 8) Tippett, M. K., J. L. Anderson, C. H. Bishop, T. M. Hamill, and J. S. Whitaker, “Ensemble square root filters,” *Monthly Weather Review*, **131**, 1485-1490, 2003.
- 9) Zhang, S. and J. L. Anderson, “Impact of spatially and temporally varying estimates of error covariance on assimilation in a simple atmospheric model,” *Tellus*, **55A**, 126-147, 2003.
- 10) Snyder, C. and F. Zhang, “Assimilation of simulated Doppler radar observations with an ensemble Kalman filter,” *Monthly Weather Review*, **131**, 1663--1677, 2003.

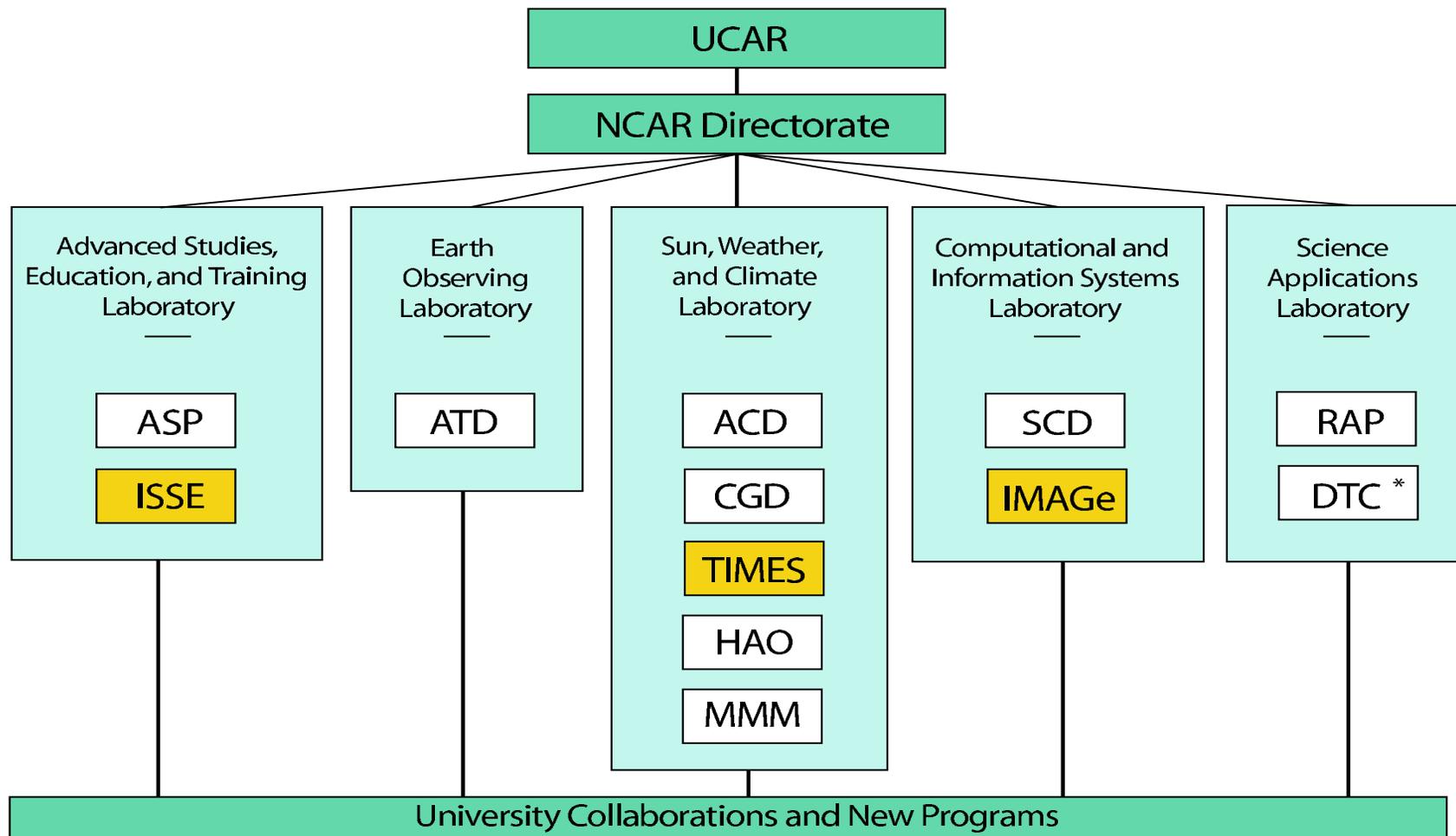
Institute for Mathematical Applications in the Geosciences (IMAGE)

IMAGE will start with NCAR's reorganization on 1 October, 2004

IMAGE part of CISL (Computation and Information Systems Laboratory)
CISL dominated by current Scientific Computing Division (SCD)

DAI will be one 'section' of IMAGE along with
Geophysical Statistics Program (GSP)
Geophysical Turbulence Program (GTP)

Unclear how affiliations of individual participating scientists will change



New Institutes
 ISSE - Institute for the Study of Society and Environment
 TIMES - The Institute for Multidisciplinary Earth Studies
 IMAGe - Institute for Math in Geosciences

Note: Some names on this chart are working names and may be changed
 * DTC - Developmental Testbed Center

Ensemble filters are an essential part of our tactical approach

So...Chris Snyder will give an overview of ensemble filters