3D–Var analysis system

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Topics

- Review status and progress
- Release of Basic version
- NWS Risk reduction
- Future work

Basic System Components NCAR

- External iteration
- Ensuring code runs on various machines
- Include pseudo–obs for study of background error structures
- B grid to A grid in analysis
- Bug fixes and code efficiencies
- Parallel version for part of code

Basic System Components NCEP

Input of data from BUFR format

Stagger/unstagger grid interface

Bug fixes and code efficiencies

New (optional) background error covariance formulation

Grid I/O

Basic System Components
AFWA

Use of original vertical coordinate for observations

Comprehensive performance diagnostics

Basic System Components
FSL

Inclusion of Profiler data

Conversion to I, K, J

Basic System Components
OU/CAPS

Basic System Components
CIMSS

Comprehensive documentation

Major Milestones

- June 2002 (Oct. 2001) – Release of Basic version
  - Simple version with limited data, but basic structure of more advanced versions
- June 2003 (Nov. 2002) – Release of Research version
  - Includes current state–of–the–art in data assimilation
  - Additional time (> 1 year) necessary to improve results.
- 2006 – Release of Advanced version
  - Includes additional data assimilation science developed under auspices of WRF

Release of Basic Version

- Code enhancements
  - Grid I/O
  - Profilers
  - I,K,J
  - Original coordinate
  - Parallel code
- Basic Documentation

Release of Basic Version

- Ability to cycle model
  - Connection to SI
  - Mass coordinate model
  - Availability of BUFR input data
- Single point analyses – Eta, RUC, WRF
- Validation? Who is the release for?
- Who provides support?

Risk Reduction

- Modification of Eta analysis system to handle WRF I/O
  - Risk reduction for operational WRF system
  - Basis for comparison for research version of WRF

Research version

- Situation dependent Background error covariances – NCEP/FSL
- Appropriate Balance constraints (J_c) – CAPS
- MPI/single processor, many machine capable – NCAR/NCEP
- Quality control
- First Guess at Appropriate Time

Research version

- Inclusion of additional observations
  - Radiances over ocean and above surface – NCEP/FSL
  - Doppler winds and reflectivities – ground based and aircraft – CAPS

Potential advanced version components

- Enhanced definition of background errors
- Model bias correction
- Additional analysis variables
  - Cloud/Precipitation
  - Ozone/aerosols/etc.
  - Land Surface (snow, soil moisture, soil temperature, etc.)

Potential advanced version components

- Additional Observations
  - GPS radio–occultation/ground based
  - Satellite imagery/new sounders/over land, ice and snow
  - cloud observations,
  - land surface observations,
  - etc.

Procedures for inclusion of new observation types

- Documentation of proposed forward model
- BUFRization and platform dependent QC of data
- Include in observation data structure
- Update BUFR read of data in 3D–Var
- Testing of forward model, tangent linear and adjoint model for consistency

Procedures for inclusion of new observation types

- Addition of appropriate variational QC and observational diagnostics
- Passive testing of forward model and QC (examine statistics and individual obs.)
- Specification of observational/representativeness error
- Inclusion of appropriate terms in J and Grad J
- Testing of data impact

Final Comments

- October 2001 release likely to be delayed a few months (at least)
- November 2002 release will be only a working version, not necessarily of equal skill to current operational analysis systems
- It is likely that >1 year’s work will be necessary to bring up research version to level of current operational after release.

·Data Assimilation System

·Code Structure – NCAR

·Primitive capability

·Development areas

– Interface to model (staggered/unstaggered grids) – NCAR, NCEP

– Balance constraint – NCEP

– Background error formulation – NCEP

– Do–loop structure – FSL

– Observations capability – NCEP, NCAR

·Risk reduction – connect WRF model with operational Eta analysis

Timeline for WRF Project