EnKF implementation at NRL Stennis

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EnKF implementation at NRL Stennis

- Address the need of advanced data assimilation techniques with high resolution regional models for cycles of analysis and prediction.

- EnKF code downloaded from Bergen (EnKF website: http://www.nersc.no/~geir/EnKF)

- HYCOM model: 1/12th degree GOM (NRL in-house with P. Hogan, A. Wallcraft).

- MODAS (SST, SLA) and some in-situ data (operational NAVY product)

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Minor modifications to the bulk package

Initial ensemble

1. Read in a HYCOM standard restart file

2. Apply perturbations to layer thicknesses according to a log-normal distribution:

- Keep layer thickness positive
- Assign larger perturbations to thicker layers respectively
- Respect the total depth of water column

3. Write each ensemble member as a standard restart file.

4. Nuts and bolts?

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Minor modifications to the bulk package

Ensemble integration/forecast: handled through a script, and not the HYCOM main program.

    1. Members are integrated through a loop in the script.

    2. The script tells the HYCOM main program which member(s) to integrate.

    3. The forecasted members are stored as standard restart files

➔➔ No modification to the HYCOM main program

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Data preprocessing

Interpolate the model observed variables to the data grid

Initial data set: MODAS SLA & SST.

Can accommodate other data types, as long as we are able to define the model-data relationship

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Main EnKF code:

– Reads the data, mean SSH and forecast ensemble members and assign them to the ensemble matrix

– Then EnKF business as usual

– Write the analyzed ensemble as standard output files

– The coding is done, except for bugs in some LAPACK library calls and ...?

– As of 10-22-04?

EnKF implementation at NRL Stennis   **bugs matter**

To the help desk

I am calling a LAPACK subroutine **"dgesvd"** that is supposed to do a double precision SVD, using double precision matrices as input arguments. When I run the code, I get a traceback error at the call of the subroutine. I did call the single precision version of that same routine, **"sgesvd"** with single precision input arguments, and the code did run without problem. attached is a log file for the run that crashed. I will greatly appreciate your help.

Hans

Date: Fri, 15 Oct 2004 15:05:23 -0500

From: "Bryan Comstock, Contractor" <comstock@navo.hpc.mil

Hans,I've searched and may have found some help for your situation.I found this site, which has a thread about the 'dgesvd' problem:

http://www.octave.org/octave-lists/archive/octave-maintainers.1999/msg00038.html

If you compile the sample code on that site with your options, you will see the floating point overflow message that you get in your code. I believe this is an intrinsic problem with the 'dgesvd' routine in LAPACK. Development on LAPACK has stopped, however, they do have a support page with an email address: http://www.netlib.org/lapack/support.html

One other note, I've noticed that people have re-written or converted the LAPACK routines. If you search the web (via Google) you may be able to find one you could use.Please let me know if you need anything else.

Thanks,Bryan

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Temporary alternatives to LAPACK subroutines

- DGESVD replaced by (ESSL) DGESVF (more expensive)

- DGEMM and DGEMV replaced by appropriate use of MATMUL and TRANSPOSE (intrinsic in F90, F95)

Get a bug-free LAPACK version?

EnKF implementation at NRL Stennis: planned use

The EnKF with 1/12° GOM initial runs include

Comparison experiments with:

- EnOI (collaboration with FUGRO, 3-month)
- MVOI (in-house with O. M. Smedstad), duration TBD
- SEEK (in-house with L. Parent)

Further use: assimilation with a higher resolution nested model of the Northern GOM, boundary conditions provided by the assimilative 1/12° GOM

GOT A POTENTIAL POST-DOC?