

2015 GSI/EnKF Community Tutorial
August 11-14, 2014,
Foothills Lab NCAR, Boulder CO

Introduction to Practice Session

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Practice sessions: List of content

http://www.dtcenter.org/com-GSI/users/tutorial/online_tutorial/Practical_2015

- Introduction
- Practical Sessions
 - *Tuesday 3:45-5:30 pm*
 - *Wednesday 3:15-5:30 pm*
- Basic Exercises
 - Single observation tests
 - Conventional data
 - Conventional data + radiance + GPSRO + radar radial wind
- Advanced Exercises:
 - Session A: Repeat of basic exercises with new data
 - Session B: Cycling of GSI ARW
 - Session C: Test with Hybrid GSI
 - Session D: GSI NMMB Analysis
 - Session E: GSI Global Analysis
- Building GSI from Scratch



Introduction

- Basic application skills on Yellowstone
- Setup GSI and WRF system on your own account space
 - Precompiled GSI
 - Precompiled WRF-ARW
- Get data for practice
 - Where is the data
 - What kind of data available

GSI Practical Session Summer Tutorial 2015

Exercises for the version 3.4 release of the Community GSI ONLY!

Welcome to 2015 GSI Tutorial Practical Session Guide!

Both the DTC community GSI analysis system V3.4 and the WRFV3.6 have been pre-compiled on the NCAR supercomputer Yellowstone for the tutorial exercises. Before starting the exercises, read the section on [Setting up the GSI system](#) and follow the instruction found there. Since building the community GSI system from scratch takes a significant amount of time, we strongly recommended that users use the pre-compiled binaries to make the best use of their laboratory time.

If upon completion of the exercise you want to experiment with building GSI, please check [here](#) for instructions.

[Using Yellowstone](#)

[Setting up the GSI system](#)

[Case data summary and download](#)

Basic Practical Cases

- Introduction
- Background and data
- Setting up the run script
 - Line to line instruction
 - Sample script
- Running the script
- Results
 - Standard out (stdout)
 - Fit files
 - convergence
- Visualizing the Analysis

BUFR Practical Cases

- 1). Basic BUFR/PrepBUFR tools [[practice](#)]
- 2). Make your own BUFR/PrepBUFR tools [[practice](#)]

Basic Practical Cases

- 0). Build basic GSI run script for the classroom:
 - To run any of the following practical cases, start with the basic run script `run_gsi_regional.ksh`, found in the `comGSIv3.4_EnKFv1.0/run` directory
 - Copy `run_gsi_regional.ksh` as `run_gsi_regional.ksh_basic`
 - Make the following [modifications](#) to `run_gsi_regional.ksh_basic`.

Note: These changes are used by all the basic exercises, and are specific to the classroom. If you are running these exercises elsewhere, additional modifications will be necessary.
- 1). Single Observation Tests:
 - [a]. [ARW background with global BE](#)
 - [b]. [ARW background with NAM BE](#)
- 2). Test with conventional data (prepbufr):
 - [a]. [ARW background](#)
 - [b]. [NMM background](#)
- 3). Test with conventional, satellite radiance, gpsro and radar data:
 - [a]. [ARW background](#)

Basic Practical Cases

Basic Practical Cases

0. BUFR/PrepBUFR tools
1. Single Observation Tests
2. Test with conventional data (prepbufr)
3. Test with conventional data, satellite radiances, gpsro and radar radial wind data

- Introduction
- Background and Data
- Setting up the Run Script
 - Line to line instruction
 - Sample script
- Running the Script
- Results
 - Standard out (stdout)
 - Fit files
 - convergence
- Visualizing the Analysis

GSI fundamentals

(1): Setup and
Compilation

(2): Run and
Namelist

(3): Diagnostics

GSI fundamentals

(4): Applications

GSI tools

Observation processing

Advanced Practical Session A:

- Introduction
- Setting up the Run Script
 - **No instruction!**
 - Sample script
- Running the Script
- Results
 - stdout,
 - Fit file
 - fort.220
- Visualizing the Analysis

Advanced Practical Session A: Repeat basic practice with new data

Please repeat the basic case 1 to 3 using the new data at 12Z June 17, 2014. Users can get the data following the instruction at: [Case data summary and download](#). For the practical session, these files are located in the directory `/glade/p/ral/jnt/GSI_DTC/data/20140617/2014061712` on Yellowstone.

A1). Single Observation Tests:

- [a]. [ARW background with global BE](#)
- [b]. [ARW background with NAM BE](#)

A2). Test with conventional data (prepbufr):

- [a]. [ARW background](#)
- [b]. [NMM background](#)

A3). Test with conventional, satellite radiance, gpsro and radar data:

- [a]. [ARW background](#)

Advanced Practical Session A and Basic Practical Cases

Repeat basic practice with **new data**

A0). BUFR/PrepBUFR tools [[practice](#)] ←

A1). Single Observation Tests: ←

* [a]. [ARW background with global BE](#)

* [b]. [ARW background with NAM BE](#)

A2). Test with conventional data (prepbuf): ←

* [a]. [ARW background](#)

* [b]. [NMM background](#)

A3). Test with conventional plus other data: ←

* [a]. [ARW background](#)

Basic Practical Cases

0). BUFR/PrepBUFR tools [[practice](#)]

1). Single Observation Tests:

* [a]. [ARW background with global BE](#)

* [b]. [ARW background with NAM BE](#)

2). Test with conventional data (prepbuf):

* [a]. [ARW background](#)

* [b]. [NMM background](#)

3). Test with conventional plus other data:

* [a]. [ARW background](#)

Advanced Practical Session B - Cycling

- Introduction
- Setting up the GSI Run Script
 - **No instructions**
 - Sample script
- Running the GSI run Script and checking the results
 - Same as other cases
- Setting up ARW run environment
 - **With detailed instructions**
- Running the ARW and checking the forecast results

Advanced Practical Session B: cycling

This section is to illustrate the basic structure and flow of a cycling data assimilation system. The flow chart of this practical cycling data assimilation system can be found at [here](#). To run this practice exercise on a local machine, the data used for the practical can be downloaded from [Case data summary and download](#).

To run the following exercises, add the following to your environment:

- `setenv LAPACK_PATH /ncar/opt/intel/ics-2013-sp1/mkl`
- `setenv UNGRIB_LIBRARIES /glade/u/home/wrfhelp/UNGRIB_LIBRARIES`
- `setenv LD_LIBRARY_PATH`
`/ncar/opt/intel/12.1.0.233/composer_xe_2013.1.117/mkl/lib/intel64:/ncar/opt/lsf/8.3/linux2.6-glibc.2.3-x86_64/lib`

B1). GSI and ARW Cycling exercise:

This exercise is to do cycling with GSI and ARW. We will use the data on June 17, 2014 (**Advanced Practical Session A**) to manually run data assimilation cycles from 12z to 18z with 6 hour interval on June 17.

- [12z]. [cycle 2014061712](#)
- [18z]. [cycle 2014061718](#)

Advanced Practical Session C - Hybrid

- Introduction
- Background and Data (global ensemble forecast provided)
- Setting up the Run Script and namelist
 - Line to line instruction
 - Sample scripts
- Running the Script
- Results
 - Standard out (stdout)
 - Fit files
 - convergence
- Visualizing the Analysis

Advanced Practical Session C: Hybrid GSI using global ensemble forecasts

After compiling GSI and running the GSI introductory exercises successfully, interested users can practice the GSI hybrid function by running an ARW test with the global ensemble forecast. For this practice, only 20 out of 80 ensemble members are used to save space and computer resources.

An important part of the GSI hybrid data assimilation system is ensemble forecasts used to generate flow dependent background error covariance. Besides using the global ensemble forecast, users can also generate their own regional ensemble forecasts using tools such as EnKF. How to generate a good set of ensemble forecasts is out of the scope of this tutorial. For this practice, we assume the ensemble forecasts are already available and saved under directory: `/glade/p/ral/jnt/GSI_DTC/data/20140617/gfs_ens`.

C). GSI Hybrid with global ensemble forecast

- [c1]. [Exercise 01](#): Setup GSI Hybrid Run

Advanced Practical Session D and E

- Session D
 - Regional NMMB
 - Sample run script
- Session E
 - GSI global analysis
 - GFS background
 - New run script for GFS
 - New namelist script

Advanced Practical Session D: GSI Analysis with NMMB

After finishing the above basic and advanced GSI exercises with WRF ARW and NMM model background in netcdf format, interested users can practice running GSI for the NOAA Environmental Modeling System (NEMS) Nonhydrostatic Multiscale Model on the B-grid (NMMB). This exercise will show users how to run a regional NMMB analysis with conventional data.

d). GSI Analysis with NMMB

- [d1]. [Exercise 01](#): Setup GSI Run for NMMB

Advanced Practical Session E: GSI global Analysis

E). GSI Global Analysis

- [e1]. [Exercise 01](#): Setup GSI Run for global analysis

Suggestions and notes

- Basic cases: try to go through
- Advanced cases:
 - A: Pick up cases based on needs
 - B, C, D, E: Pick cases based on needs
- 4 instructors in classroom to help

Questions?
