

NCAR Developmental Testbed Center
Project for the
Air Force Weather Agency (AFWA)
Final Report: SOW completed on
January 31, 2012

Developmental Testbed Center
Boulder, Colorado

February 2012

1 Code management, testing and support for the data assimilation system (Task 3.3)

1.1 Community coordination and support (Task 3.3.1)

During this funding cycle, the DTC continued to maintain an administrative structure for the GSI repository, release, and development through the GSI Review Committee (GRC). The duties and functions of the committee were defined by the “GSI Development and Community Support: Concept of Operations” formed in 2010 and have been implemented and adjusted through the year. The DTC hosted quarterly GRC meetings for code development coordination and code management across multiple agencies. These meetings included two teleconferences on February 25 and September 22, 2011, and two onsite meetings on June 28, Boulder and December 9, Camp Springs. At the December meeting, NOAA/NESDIS was accepted with a full membership in addition to the multiple agencies in the GRC, including NCEP/EMC, NOAA/ESRL, NASA/GMAO, NCAR/MMM, DTC and AFWA (special member). This new membership enables the GRC to reach a broader GSI community and have better coordination and communication on GSI development. Active communications among GRC groups also occur through the year by various means, including working group meetings and developer meetings. The GRC continues to take on the duty of reviewing code changes proposed through the GRC members. During this funding cycle, the GRC reviewed 30 code change proposals, 9 of which were from non-EMC developers.

The GSI code is shared through the GSI repositories located in EMC as well as Boulder. Besides overseeing the GSI development as one of the GRC members, DTC is also responsible for maintaining the community GSI repository (Boulder) to store the GSI code under subversion control to accommodate community contributions as well as provide operational capability, carry out regression tests, and improve the portability of the code. To avoid code divergence due to the continuous code development, all the code changes approved by the GRC are committed to the EMC GSI repository trunk. The trunk of the Boulder GSI repository is synced with the EMC GSI repository regularly (weekly or more frequently by demand). The Boulder GSI repository also contains some community features including multiple platform compilation utility released to public annually. Through this dual trunk structure, developers can use branches attached either of the repositories for development with access to the latest version of the code.

The DTC continues to provide support to the community including GSI-help, GSI webpage, online documentation, online tutorial, annual public release of GSI and annual GSI community residential tutorial. Up to now, there are 482 registered users through the DTC GSI webpage: 58% from universities, 24% from government users, 6% from private companies, and 12% from non-profit companies. The DTC continued to receive help requests and answer questions via the GSI helpdesk (gsi_help@ucar.edu). The DTC provides general GSI users the latest documentation and code through the community GSI website

at <http://www.dtcenter.org/com-GSI/users/>. The DTC also maintains a GSI wiki page (<https://wiki.ucar.edu/display/dtcgsi/Home>) on a UCAR server, with authorized access for GSI developers and committee members to share GSI information.

The DTC released a beta version of GSI V3.0 in February, 2011 and an official version in April, 2011. The DTC made a critical update to the code release procedure. No longer concurrent to the “code freeze” at EMC for global applications, which usually occurs in Autumn prior to the implementation year, the release code was taken directly from the latest trunk head of the GSI repository, providing the GSI community with the state-of-art DA capability. The code review procedure implemented by the GRC has enabled code changes to be reviewed and well tested before the code is committed to the GSI repository(ies). Therefore, the DTC was able to reduce the pre-release testing period to less than one month for the beta release and less than three months for an official release. The GSI Users’ Guide V3.0 also contains critical updates to existing contents and two additional chapters were added, including *GSI Applications* and *BUFR and PrepBUFR*. The DTC also developed various community tools released to general GSI uses, including BUFR and PrepBUFR converting code and diagnostic utilities. For the first time, the DTC provided a BUFR/PrepBUFR webcast tutorial, on December 13, 2011, and a dedicated website to the GSI community.

In collaboration with its partners, the DTC hosted the 2011 Community GSI Workshop and 2011 Summer Community GSI tutorial on June 28-July 1, 2011 at the NCAR Foothills Laboratory, Boulder, Colorado. The workshop — the first community GSI workshop — aimed to provide a pathway between operational centers and the research community to communicate and share experiences on:

- GSI development, implementation and future plans
- New techniques and skills in data assimilation

The workshop included five invited talks from major operational and research centers, including NOAA/NCEP/EMC, NASA/GMAO, NOAA/ESRL, NCAR/MMM, and DTC, as well as a general session for community GSI data assimilation system users. Fifty researchers, university students, and agency employees participated in this first workshop. The summer GSI tutorial was the second such event with the purpose of training potential users of the system. The tutorial was a three-day venture (the last day was optional) with 8 hours of lectures and 8 hours of hands-on sessions. Thirty-one students from the United States and several other countries/regions participated. The invited lecturers and practical session instructors, representing several GSI development/support teams, including two from NOAA/NCEP/EMC, one from NASA/GMAO, three from NCAR/MMM, and five from DTC (affiliated with NOAA/ESRL or NCAR/RAL), provided first-hand information on the GSI system. The presentations and lectures from the GSI workshop and tutorial are posted at <http://www.dtcenter.org/com-GSI/users/docs/index.php>

Through the fiscal year, the DTC has been working closely with NCEP/EMC, NOAA/GSD, NCAR/MMM and AFWA to coordinate ongoing GSI efforts. Monthly meetings among various Boulder GSI development/support groups are being held. Communication between the DTC and NCEP/EMC has been enhanced through various meetings and on-site visits, and by having DTC staff working at NCEP/EMC. The DTC staff also presented GSI work at national and international conferences.

In summary, the major milestones and deliverables are as follows:

- Maintained Boulder Community Repository;
- Implemented code review procedure;
- Organized GSI Review Committee activities;
- Issued GSI Beta release v3.0 (Feb 2010) and formal code release and v3.0 (Apr 2011)
- Hosted the First Community GSI Workshop (Jun 2011)
- Hosted the Second Community GSI Tutorial (Jun-Jul 2011)

1.2 Testing and evaluation of DA system in AFWA regional applications (Task 3.3.2)

1.2.1 Baseline GSI tests and GSI-WRFVAR comparison

The DTC completed the tests and a separate report is attached.

1.2.2 Baseline EnKF tests