Monthly Report for April 2009

FY 2009

Submitted 15 May 2009

With contributions from Geoff DiMego and Mary Hart (NCEP/EMC);

Stan Benjamin, John Brown, Steve Weygandt (NOAA/ESRL/GSD);

Jordan Powers, Roy Rasmussen (NCAR);

And Ming Xue (OU/CAPS)

(Compiled and edited by S. Benjamin and B. Johnson)

Executive Summary

Task 09.5.1: Infrastructure support related to operational running of the RUC and NAM operational modeling systems.

- Continued evaluation of RUC and NAM, new investigation into RUC cloud analysis, smaller resulting changes into GSD development RUC cycle.

Task 09.5.4 Develop, test, and implement Rapid Refresh configuration of the WRF modeling system.

- Continued real-time feed of RR files to other AWRP RTs and Alaska Region NWS and getting feedback from them
- Improvements in RR - DFI, terrain detail, cycling of land-surface variables, development of land-surface physics modifications for snow and ice cover

Task 09.5.5: Develop, test, and implement 3DVARs for RR and NAM

- RR GSI – continued development of new forward model for surface obs to match RUC techniques, sensitivity tests for surface obs, profiler, satellite. RR ARW- New development for application of LSM for snow on top of sea-ice

Task 09.5.6: Improve WRF model

- Version 3.1 released 9 April 2009 (NCAR). Work underway at ESRL to merge changes in RR-WRF with recent WRFv3.1 upgrades.

Task 09.5.15: Develop, test, and implement 3DVARs for RR and NAM

- Further modifications to WRFpost to provide consistency with RUC post-processing (e.g., ceiling, visibility, MSLP)

Task 08.5.24/19: Begin 3km High-Resolution Rapid Refresh testing / Improve radar assimilation

- Evaluation of larger-domain HRRR over eastern 2/3 CONUS – some very good cases, including 13 May case with strong convection across central US.
- Additional GSD progress on a time-lagged HRRR-based convective probability forecast
- Added new HRRR post-processing for additional storm parameters

Test 08.5.20 Probabilistic forecasts

- Initial VSREF framework developed by NCEP/EMC

- **<u>Task 09.5.1</u> Infrastructure Support Related to Operational running of the non-WRF Rapid Update Cycle System in NCEP Operations**

GSD

RUC change package implemented on 3/31/2009 to improve snow cover and forecast retention of analyzed clouds/ceiling/visibility using METAR and satellite data. Also see Task 9.15.

Background:
GSD investigated a possible problem with the new RUC data after the 3/31 change package. Apparently the saturation code at the end of the RUC analysis will, under very rare occasions, add large amounts of water vapor that is technically correct, but results in a very cool layer after de-virtualizing the virtual potential temperature in the RUC. A change has been developed and is now in testing in the development RUC13 at ESRL.

NCEP
Dennis Keyser reports that NCEP/NCO is investigating radiosonde sites that report an invalid instrument type. The MADIS to GTS feed for NOAA Profiler Network wind and RASS data is now the permanent replacement for the NWS to GTS feed (discontinued last October). Still waiting for NESDIS to respond to two problems with the GOES 1x1 field-of-view cloud data where a few random files have data problems, and the GOES-East data arrives later. All sources of TAMDAR data were shut off on 7 April pending renewal of AiRDAT's contract with the NWS. Once these return, work will continue on getting TAMDAR airframe type and airline code into the PrepBUFR file for ESRL's bias correction work.

Subtasks

October 2008 through September 2009

09.5.1.1 Maintain hourly RUC runs and provide grids of SAV and AHP guidance products

09.5.1.2 Provide vendors with gridded model data via Family of Services and the FAA Bulk Weather Data Telecommunications Gateway.

09.5.1.3 Provide full grids from RUC runs on NCEP and NWS/OPS servers. (30 Sept 09)

09.5.1.4 Maintain access to model verification data. (30 Sept 09)

09.5.1.5 Working with NCEP/NCO and NCEP/EMC, complete the design, compilation, debugging, test runs and parallel testing of RUC codes on new CCS computer.

Deliverables

09.5.1. E1 Perform ingest, quality control and preparation of both existing and new observations in support of the operational RUC runs. (NCEP, GSD)

CURRENT EFFORTS:

PLANNED EFFORTS:

PROBLEMS / ISSUES ENCOUNTERED OR ANTICIPATED: None.

INTERFACE WITH OTHER ORGANIZATIONS: NCO.

UPDATES TO SCHEDULE: None.
09.5.1E2 (30 September 2009) (Manikin)
Perform configuration management for RUC, including thorough documentation, and respond promptly to

any code malfunctions or performance issues.

CURRENT EFFORTS:

PLANNED EFFORTS:

Continue work with NCO/PMB to verify the accuracy of RUC codes and scripts on the new computer. Prepare to push RUC forecast range to 18 hours with hourly output by Q4 FY2009 as promised to SPC and AWC. (Manikin)

PROBLEMS / ISSUES ENCOUNTERED OR ANTICIPATED: Lack of disk space on the new computer.

INTERFACE WITH OTHER ORGANIZATIONS: NCO.

UPDATES TO SCHEDULE: None.

09.5.1E3 (30 September 2009) (Manikin, Keyser)
Monitor RUC performance, respond to any problems detected by ESRL, NCEP, or any RUC users, diagnose cause, develop solution to RUC software, test changes and coordinate with NCO on implementation.

CURRENT EFFORTS:

PLANNED EFFORTS: Continue monitoring efforts.

PROBLEMS / ISSUES ENCOUNTERED OR ANTICIPATED: None.

INTERFACE WITH OTHER ORGANIZATIONS: NCO.

UPDATES TO SCHEDULE: None.

Task 09.5.17 Infrastructure support for operational running of WRF-based modeling system in North American Mesoscale and HiResWindow at NCEP.

NCEP
Since many of his activities listed under Task 09.5.1 also pertain to NAM, they are not duplicated here. For the NAM specifically, Dennis Keyser reports that AIRS radiance data and MODIS wind data counts have been lower for the last 12 months because of NESDIS hardware issues, and these data were not available on 12-13 April and 20-22 April. Some Alaskan radiosonde sites still need to move up their launch time so the NAM-GSI can use their data. GOES-11 06Z radiance data counts were low in early April due to eclipse season. NOAA-16 AMSU-B radiance quality has been gradually degrading and NESDIS declared channel 4 unfit for use in mid-April, so NAM-GSI stopped using all NOAA-16 AMSU-B radiances on 17 April. NOAA-18 MHS was not usable on 19-20 April due to satellite problems. Methods to speed up dump processing of NEXRAD Level II data are being explored. The following data types are monitored by the NAM-GSI: RASS virtual temperature profiles (NPN and MAP), QuikSCAT 0.5 deg. scatterometer wind superobs, Mesonet mass data, and MDCRS moisture data). Work continues with NCO/PMB to transition observation ingest, dump and quality control and processing codes and scripts to the new computer. Cron runs are generating NAM/NDAS PrepBUFR files with 50 km ASCAT and WindSat scatterometer wind data (both non-superobed) and NAM/NDAS dumps of METOP IASI radiances, GPS-RO data and (since 21 April) SBUV-2 data. These changes to obs monitoring plus several NMM bug-fixes are being tested in Eric Rogers' real-time parallel NDAS/NAM continuing to run on the new P6 computer.

Keyser also added WindSat and 50 km ASCAT data to his RTMA PrepBUFR cron runs, for eventual testing in the parallel RTMA. Efforts have begun to remove a legacy restriction that surface data must

have a pressure report to be processed into the PrepBUFR files. This will allow many new surface observations (land, marine and Mesonet) to be assimilated in the RTMA.

Subtasks

09.5.17.1 Maintain four-per-day North American Mesoscale runs and provide aviation guidance grids. (30 Sept 09)

09.5.17.2 Maintain four-per-day HiRes Window runs and provide aviation guidance grids. (30 Sept 09)

09.5.17.3 Provide vendors with gridded NAM model data via Family of Services and the FAA Bulk Weather Data Telecommunications Gateway. (30 Sept 09)

09.5.17.4 Provide full grids from NAM, and the HiRes Window on NCEP and NWS/OPS servers. Maintain access to model verification data. (30 Sept 09)

09.5.17.5 Working with NCO, complete the design, compilation, debugging, test runs and parallel testing of NAM and HRW (and SREF) codes on new CCS computer. (30 Sept 09)

Deliverables

09.5.17.E1 30 September 2009 **EMC** (Rogers, Pyle, Keyser, Liu)
Perform ingest, quality control and preparation of both existing and new observations in support of the operational WRF runs.

CURRENT EFFORTS:

PLANNED EFFORTS:

PROBLEMS / ISSUES ENCOUNTERED OR ANTICIPATED:

INTERFACE WITH OTHER ORGANIZATIONS: GSD & NCO.

UPDATES TO SCHEDULE:

09.5.17.E2 30 September 2009 **EMC** (Rogers, Pyle, Keyser)
As requested by other RT's, incorporate new AHP calculations into Operational WRF Model post-processor and product generator.

CURRENT EFFORTS: No requests from other RT's were received during the second quarter.

PLANNED EFFORTS:

PROBLEMS / ISSUES ENCOUNTERED OR ANTICIPATED:

INTERFACE WITH OTHER ORGANIZATIONS: NCO

UPDATES TO SCHEDULE: None

Task 09.5.4 Develop, test, and implement the Rapid Refresh.
NCEP
Dennis Keyser reports that his experimental RR PrepBUFR files containing 50 km ASCAT, WindSat data (non-superob) and expanded (time-window) QuikSCAT data (0.5 deg lat/lon superobs) are being copied to a private ESRL directory on the NCEP ftpprd server. RR dumps of expanded (time-window) Level 2.5/3 NEXRAD radial wind data are copied (since 27 April) to a public ftp directory. These and hourly

lightning data are being tested in ESRL's experimental RR runs. ESRL plans to test other new data types present in the production RR PrepBUFR and dump files, to include Multi-Agency Profiler winds, Canadian AMDAR data, QuikSCAT data (up to 2 hours old) and METOP-2 radiances.

GSD
We are in the process of converting the Rapid Refresh to run Version 3.1 of WRF, which was released 9 April 2009, merging with the recent ESRL-developed changed to the RR-WRF. This includes the WRF Preprocessing System (WPS), the WRF ARW model and the WRFpost, although our focus at present is on WPS and the model.

The persistent problem of crashes along the lateral boundaries once every few days continues under active investigation. We are now satisfied that the GSI is properly handling the sigma coordinate of the background WRF-ARW 1-h forecasts. We have also investigated the procedure for blending tendencies from the WRF and from the GFS in the blending zone bordering the lateral boundaries of the WRF. So far, no "smoking guns" have emerged. Heavy usage of the ESRL supercomputer has been causing some dropped cycles on the GSD primary (not development) version of the RR and forced us to temporarily turn off the dev RR. The dropped cycles have complicated efforts to diagnose and solve this periodic model crashing problem. A mechanism for reserving cores for regularly scheduled jobs such as the RR is now available on the ESRL supercomputer and we are migrating the RR cycle to this system, which we hope will increase the reliability of the RR cycles.

GSD has upgraded its retrospective run capability to accommodate 1-h cycling (previously, retrospective runs were restricted to 3-h cycling). A new retrospective period encompassing a powerful spring storm in the central CONUS has been constructed: 1800 UTC 15 through 22 April 2009. This period also included a boundary crash of the primary RR cycle, and we plan to use this retro period to diagnose this crash case in detail and as a means of testing remedies for it.

The cycling of land-surface variables was redesigned and re-scripted during April to allow for snow-cover trimming in the RR cycles as is done in the RUC (3/31/09 change package to operational NCEP RUC, see 15 April Q2 MDE report) when the daily NESDIS snow-cover and sea-ice product detects no snow cover, but snow cover is present in the RUC 1h forecast, and certain other criteria are met. Daily updating of sea ice is also now accomplished through use of this product, which is available through NCEP and also used by the NAM. (Formerly, sea ice in the RR was only updated upon cold starts from the GFS.) The cycling of land-surface variables was also redesigned to be more robust in order to better ensure continuity of cycling of soil properties and snow variables in the event of missed RR cycles.

GSD also introduced several additional severe-storm indices into the NCEP version of WRFpost. This was done at the request of the Storm Prediction Center, primarily for HRRR output. These include vertical shear of the horizontal wind, echo top, total column rainwater and snow, as well as a number of variables for which the output is the maximum value during the previous hour (updraft-helicity, updraft, downdraft, 10m wind gust speed, total column graupel, and composite reflectivity).

Subtasks

09.5.4.1 Ongoing evaluation of performance of real-time and retrospective runs of RR system.

GSD
Starting in late October 2008, two parallel full hourly cycled versions of the Rapid Refresh have been running at GSD, with files from the primary RR going to many users (including AWR RTs), also with verification and web-based plots.

Verification of standard atmospheric variables (temp, RH, wind) through early March over the RUC verification domain continued to indicate the experimental Rapid Refresh is competitive with the RUC at most forecast lengths and output times. Upper level wind RMS errors were almost an exact match to the RUC, except near the tropopause where scores were a bit worse. Beginning in mid-late March, however,

performance of the RR got worse, particularly for winds and temperature near the tropopause. Investigation is underway, but likely candidates are 1) the fact that we had turned off aircraft data as part of our investigation of the lateral boundary related crashes and they were not turned back on until 13 April, and 2) the increased number of missed runs and breaks in the cycle caused by the excessive load on the ESRL supercomputer. (In order to improve reliability of the primary RR cycle, we temporarily turned off the devRR cycle in late March, as noted above.) After we resumed using the aircraft data in the GSI, verification improved back to the levels of February and early March, particularly for winds near the tropopause, indicating the importance of the aircraft data to the RR.

Verification over Alaska continues. We saw some very large errors in 925mb wind forecasts at Anchorage during a strong low-level easterly flow situation with a deep low pressure in the Gulf of Alaska. The next paragraph may provide a partial explanation.

Using less smooth terrain (implemented in Feb) improved the response to surface data, since the GSI observational error of METAR stations is related to the difference between the station elevation and the model elevation at the station location. However we recently found that there is an inconsistency in the terrain file we have been using for the mass points and that used for the velocity points in the WRF model. Experiments will soon be conducted to determine damage caused by this oversight.

The frequent prediction of insufficiently cold temperature found in onshore flow events in NW Alaska in Jan-early March was found to be related to our oversimplified treatment of ice in the RUC Land-Surface Model (LSM). Tanya Smirnova began a major modification to the RUC LSM in February, and this was implemented in the primary RR cycle in late April; see further discussion under Task 8). Earlier tests of this modification for several days in our RR cold start runs had indicated overall improvement in 2-m temperature forecasts along the NW Alaska coast.

NCEP

09.5.4.2 1 Nov 2008 (GSD, NCEP)
Continue to solicit input from Inflight Icing, Turbulence, National Ceiling/Visibility, and Convective Weather RTs and NWS forecasters in Alaska and Puerto Rico, as well as AWRP RTs, on performance of pre-implementation Rapid Refresh. Arrange to have GSD RR grids available to examine and solicit feedback on RR performance.

(ESRL/GSD)
GSD continues to make many different types of RR files available to users (AWR RTs, NWS). We are currently producing 4 flavors of RR files (native level, pressure level, surface field, and precip fields) for each of 3 grids (full RR, Alaska 249, CONUS) and in grib1 and grib2 formats. George Trojan at Alaska Region NWS has ported RR grids to the AWIPS workstation and forecasters at ANC and FAI and the AAWU have now had a few months to evaluate them. We reported on the major concerns expressed by the Alaska forecasters in the FY09Q2 report.

PPT presentations (from the Alaskan Weather Symposium from 10-12 March in Fairbanks, AK). Summarizing the most recent Rapid Refresh verification can be viewed at:
http://ruc.noaa.gov/pdf/RR-AK-Wx-Symp-Mar09-pt1.pdf and
http://ruc.noaa.gov/pdf/RR-AK-Wx-Symp-Mar09-pt2.pdf

As a result of discussions with Alaska forecasters late last year, NASA Langley initiated an effort to produce GOES-based cloud products over most of the Rapid Refresh domain (more under 09.5.15). ESRL and NASA Langley are working to set up the real-time feed for this data, which is expected around mid-June (ESRL heavy job-load for IT services).

Various AWRP RTs at NCAR have also been accessing the RR grids and are evaluating the performance of their algorithms on this data. The Icing RT makes revealing displays comparing the hydrometeor fields from the RR vs. RUC.

09.5.4.3 30 May 2009 (GSD, NCEP, NCAR)
Updated report on status of tactical planning for making RR-WRF ARW model code for 2012 in compliance with Earth System Modeling Framework (ESMF) in agreement with the Sept 2007 Rapid Refresh MOU between NCEP and GSD.

09.5.4.4 30 Sept 2009 (GSD, NCEP)
Complete pre-JIF evaluation of Rapid Refresh in accordance with NCEP pre-implementation checklist for major implementations. Respond to evaluation questions, present information on Rapid Refresh pre-implementation testing and evaluation results in various forums, as required.

09.5.4 30 Sept 2009 **(previously extended to Q2 FY10 @ Jan09 AWRP meeting – DiMego and Benjamin)** (GSD and NCEP)
Pending EMC, and NCEP Center initial recommendations, Job Implementation Forms (JIFs) are filed to submit Rapid Refresh software to NCO.

Deliverables

09.5.4.E1 20 Dec 2008 (GSD)
Report on Rapid Refresh testing at annual NCEP Production Suite Review meeting.

A presentation summarizing the RR testing and refinement was given by Steve Weygandt at the NCEP Annual Product Review (see PPT slides for RUC/RR presentation under **http://www.emc.ncep.noaa.gov/annualreviews/2008Review/index.html**

09.5.4.E2 1 September 2009 (GSD, NCEP)
Complete documentation (in Technical Procedures Bulletin-like document) of Rapid Refresh system.

09.5.4.E3 30 September 2009 **(previously extended to Q2 FY10 @ Jan09 AWRP meeting – DiMego and Benjamin)** (GSD, NCEP)
Pending EMC, and NCEP Center initial recommendations, Job Implementation Forms (JIFs) are filed to submit Rapid Refresh software to NCO.

Task 09.5.5 Develop, test, and implement improvements to the operational 3DVARs for Rapid Refresh and North American Mesoscale runs.

NCEP
Wan-Shu Wu reports that preparations are underway for two impact studies to quantify the influence of the changes in background errors and the influence of using the QUIKSCAT data in the NDAS.

Dave Parrish reports that an interface was constructed and testing completed to allow the use and updating of the NEMS/ESMF version of NMMB in the GSI. He has also made progress on the strong constraint.

Shun Liu developed a set of codes to compare the estimated mixing-layer height from radar with other observations. With help from Matt Pyle, Shun Liu modified the HiRes forecast system so that the system can run in near-real-time or do a retrospective case study. The WRF-launcher's verification has been modified to verify the HiRes forecast in retrospective case study mode. A precipitation case on April 12 2009 was used to test various options for assimilating radial velocity. Test results are encouraging. After assimilating radial velocity, the forecast composite reflectivity pattern is obviously better than the current HiRes parallel's forecast. However, it still must be determined how to thin data or form super-obs, how to decide the optimal background error de-correlation length, and how to set the parameters for strong constraints.

Manuel Pondeca is exploring using the eigenvectors of an ensemble covariance matrix, and more

generally the EOFs of a time-history of ensembles, to construct background error covariances for the GSI. Manuel Pondeca has also begun to test a 2.5km-resolution CONUS RTMA system which will replace the current 5km system. A new Hawaii NDFD grid is also being prepared.

GSD
Dezso Devenyi continued his work on a set of modifications to map the surface observations from the actual terrain to the model terrain (using a local lapse rate from the background field). By providing for a more accurate innovation, an improved fit to the surface observation should be obtained. Without this change, surface observations for which there is a significant height difference between the actual and the model would just be down-weighted, resulting in a less close analysis fit to these observations. Results indicate a better background fit to the observations, following the modifications, but the analysis fit is not reduced. Dezso also evaluated the impact of scatterometer winds for a single case study. Ming Hu continues to work on 1) tracking down the build-up of errors along the boundaries and resultant crash of the RR every few days, and 2) evaluating the 1QFY09 version of GSI. In addition, Ming and Curtis Alexander have assembled a new hourly retrospective capability for the Rapid Refresh.

09.5.5 30 May 2009 (CAPS and GSD)
Testing and refinement to the radial velocity analysis component of the GSI for Rapid Refresh configuration together with the cloud analysis.

Dezso Devenyi and Steve Weygandt worked with Dennis Keyser at NCEP to begin obtaining level 2.5 radial velocity files from NCEP and begin evaluation of them within the GSI for Rapid Refresh.

Subtasks

09.5.5.1 31 December 2008 (NCEP and GSD)
Report on testing of 2DVAR GSI assimilation of high spatial and temporal mesonet surface data using analysis grids with 5-km or finer resolution.

A time-of-the-day dependent bias-correction scheme for the RTMA first guess was successfully tested in the parallel version of the RTMA used for development work. A First Guess at the Appropriate Time (FGAT) capability was also implemented in the parallel RTMA and its performance is being evaluated. As is consistent with the use of FGAT, the observation time window was increased for all observation types, resulting in a three to four-fold increase in the number of assimilated observations. (Pondeca)

09.5.5.2 31 December 2008 (NCEP)
Establish hourly cycled NAM assimilation system on NOAA R&D computer at NCEP (machine called “haze”) using GSI and WRF-NMM to be adapted to ARW-based RR by GSD.

The cycled assimilation system with the digital filter is functional. (Wu)

09.5.5.3 31 January 2009 (CAPS and GSD)
Testing of and refinement to the radial velocity analysis component of GSI for Rapid Refresh configuration, together with the cloud analysis.

Testing and evaluation for tropical cyclone case ongoing using RUC background fields.

09.5.5.4 28 February 2009 (GSD)
Report on preliminary statistical evaluation of Rapid Refresh forecasts initialized with the GSI, including examination of upper-level winds, surface fields, and precipitation.

Extensive evaluation of the RR in late February (in advance of our trip to Alaska to discuss RR with Alaska NWS folks) indicated satisfactory results in most verification statistics.

Details are included in the following PPTs, presented at the Alaska Weather Symposium: PPT

presentations (from the Alaskan Weather Symposium from 10-12 March in Fairbanks, AK), summarizing the most recent Rapid Refresh verification can be viewed at:
http://ruc.noaa.gov/pdf/RR-AK-Wx-Symp-Mar09-pt1.pdf and
http://ruc.noaa.gov/pdf/RR-AK-Wx-Symp-Mar09-pt2.pdf

Beginning in mid-late March, performance of the RR worsened, particularly for winds and temperature near the tropopause. Investigation is underway, but likely candidates are 1) the fact that we had turned off aircraft data as part of our investigation of the lateral boundary related crashes and they were not turned back on until 13 April, and 2) the increased number of missed runs and breaks in the cycle caused by the excessive load on the ESRL supercomputer. (In order to improve reliability of the primary RR cycle, we temporarily turned off the devRR cycle in late March, as noted above.) After we resumed using the aircraft data in the GSI, verification improved back to the levels of February and early March, particularly for winds near the tropopause, indicating the importance of the aircraft data to the RR.

09.5.5.5 Based on case-study testing and refinement of the research quality code, deliver an 'experimental' code for an upgrade package (e.g. strong constraint, improved satellite channel bias correction, improved use of WSR-88D radial wind and/or satellite radiances and/or retuned co variances) to the GSI for FY2009 change package to the NAM. (31 Jul 09)
(Pondeca, Yanqiu Zhu, Parrish)

Deliverables

09.5.5.E1 31 March 2009 **EMC** (Rogers, Wu, Parrish, Pondeca, Liu)
Subject to NCEP Director approval, implement upgrades (e.g., partial cycling, TAMDAR) to GSI used in NAM/NDAS.

CURRENT EFFORTS:

The NAM/NDAS upgrade was implemented in December 2008 just prior to the NCO moratorium. Work was begun and completed this quarter with NCO/PMB to transition NAM GSI codes and scripts to the new computer. During the validation of the GSI on the new CCS supercomputer, an MPI_IO BUFR read problem occurred but the GSI code continued to run without generating any error message. A code check was implemented in GSI to alert users when the problem occurs. (Wu)

PLANNED EFFORTS:

Preparations are underway for a possible late 2009 regional GSI minor upgrade. Continue checking the new TLNMC code. Run assimilation tests with the low-res WRF-NMM Testbed comparing the no constraint, existing TLNMC, and new TLNMC. (Wu, Parrish)

PROBLEMS / ISSUES ENCOUNTERED OR ANTICIPATED: None.

INTERFACE WITH OTHER ORGANIZATIONS: NCO

UPDATES TO SCHEDULE: Completed December 2008.

09.5.5.E2 30 September 2009 **(previously extended to Q2 FY10 @ Jan09 AWRP meeting – DiMego and Benjamin)** (GSD, NCEP)
Pending EMC, and NCEP Center initial recommendations, Job Implementation Forms (JIFs) are filed to submit GSI code as part of Rapid Refresh software to NCO.

09.5.5.E3 30 September 2009 (CAPS and GSD)
Finalize enhancement package for radial velocity data analysis to begin testing at GSD toward future implementation for Rapid Refresh.

09.5.5.E4 30 August 2009 (GSD, NCEP)
Complete report on Rapid Refresh performance, including that from the GSI component of the RR, in comparison with the operational RUC.

<u>Task 09.5.8</u> Improve physics in the WRF model, especially that bearing on prediction of aircraft icing.

Subtasks

09.5.8.1 31 July 2009 (GSD)
Complete systematic GSD evaluation of physics performance in GSD 1-hour RR cycles for initial RR implementation.

Several times during January and February our Alaska verification revealed onshore flow in northwest Alaska as being too warm. We found this to be an issue common among models, not allowing sufficient surface radiative cooling when there is snow on ice. During February and March, Tanya Smirnova looked into what would be required to modify the RUC LSM to treat ice as a land surface, including the accumulation and ablation of snow on the ice and vertical heat diffusion within the ice, as well as cycling of snow and ice temperature, and also with temperature and snow-cover dependence for albedo (smaller albedo for temperatures approaching and above freezing when ponding on the ice may be present). We hypothesized that this enhancement would permit more realistic buildup and maintenance of cold air over the ice surface in winter through greater negative surface heat flux to the atmosphere. Tanya modified the RUC LSM accordingly and subsequent tests with this new version of the RUC LSM in the cold start RR indicated that, indeed, 2-m temperature forecasts along the northwest coast of Alaska were improved. Tanya has also made a number of other improvements to the RUC LSM. These include removal of a singularity that occasionally manifested itself as anomalously cold surface temperatures with very thin snow cover, loosening of the constraints on melting rate when air temperature is above freezing, and general code cleanup. These changes were introduced into the RR1h cycles in late April and are being evaluated further.

09.5.8.3 30 July 2009 (NCAR)
Research and testing on addition of the new explicit aerosol variable(s) in initiating cloud water and ice. Computer storage and run time considerations will be considered as a constraint on the development. (NCAR task)

Trude included a module into WRF to account for emission of dust from the ground based on wind and soil data. This module will also account for settling of emitted dust. The module is based on the GOCART modules that are in WRF-Chem. However, the GOCART WRFChem-Wversion has a few size bins included, while we attempt to include as few as possible new variables. Thus changes must be made for how size distributions are accounted for in our version.

Trude Eidheimer is analyzing simulations she conducted last month with various ice nucleation schemes implemented in the Thompson microphysics for an Ice In Cloud – Layer (ICE-L) experiment case (November 16, 2007).

09.5.8.5 1 December 2008 (DTC, GSD)
Report on FY07-funded GSD-DTC RR retrospective testing of the impact of different thickness of vertical model layers close to the surface and, as appropriate, other physics.
A draft report has been written by the DTC and GSD has provided comments on this draft.

09.5.8.6 1 August 2009 (GSD)
Begin to explore possibilities for enhancing treatment of sea ice and tundra (including spring-time pooling) in Rapid Refresh domain toward FY11 Rapid Refresh upgrade.

Preparations are being made to make available for evaluation for forecasters at Environment Canada's Arctic Weather Center at Edmonton the real-time RR1-h cycle running at GSD.

Deliverables

09.5.8.E2 30 Sept 2009 (GSD, NCEP)
Pending EMC, and NCEP Center initial recommendations, Job Implementation Forms (JIFs) are filed to submit upgraded WRF model physics code as part of Rapid Refresh software to NCO.

09.5.8.3 Jul '09: Report on research and testing on addition of the new explicit aerosol variable(s) in initiating cloud water and ice. Computer storage and run time considerations will be considered as a constraint on the development. (NCAR task)

09.5.8.5 Dec '09: Report on FY07-funded ESRL-NCAR RR retrospective testing of the impact of different thickness of vertical model layers close to the surface and, as appropriate, other physics. (Joint NCAR and ESRL task)

09.5.8E2 Sep '09: Provide an improved microphysics scheme to ESRL for evaluation toward FY11 Rapid Refresh upgrade. (NCAR)

09.5.8E3 Aug '09: Complete FY09 physics improvement for icing, C&V, turbulence and convective forecasts. (NCAR)

Task 09.5.15 Develop improved methods of cloud and moisture analysis for use in the WRF Modeling System.

Subtasks

09.5.15.2 5 Jan 2009 (GSD and CAPS)
Continue testing and evaluation of the generalized cloud/hydrometeor assimilation (including GOES cloud-top data and METAR cloud/visibility/weather data) within a cycled GSI on the full Rapid Refresh domain.

GSD
Work by GSD continues on refining the GSI cloud analysis for Rapid Refresh. Extensive report on this task last month (quarter, nothing additional this month).

09.5.15.3 30 Jan 2009 (GSD)
Develop and evaluate performance of diabatic digital filter initialization (DDFI) in the 13-km RR WRF model including assimilation of radar reflectivity data

GSD

09.5.15.4 30 May 2009 (GSD and CAPS)

Request in February from Stan Benjamin and Ming Xue: DEFER due date from 30 March to 30 May. Assumed approved.

Further refine the generalized cloud analysis for the target RR resolution, model physics scheme and use of additional data. Perform forecast test evaluations to document the impact of the cloud analysis refinements.

09.5.15.6 30 Mar 2009 (GSD)
Include radar reflectivity-based latent heating within diabatic digital filter initialization (DDFI) in the RR

WRF model

We have the DDFI-based radar assimilation coded and running our real-time RR cycle. We have been evaluating difference between the RR cycles with and without the radar assimilation and comparing them with similar differences in the RUC. Based on recent qualitative assessment, the signal from the DDFI radar assimilation in the RR looks similar to that from the RUC radar assimilation, with the exception that the RR produces larger areas of heavy convective precipitation (though this may be linked more to the model than the implementation of the radar assimilation procedure

Deliverables

09.5.15.E2 30 Sept 2009 (GSD)
Complete testing of GSI generalized cloud analysis for Rapid Refresh and deliver code to NCEP as part of Rapid Refresh package delivered to EMC, pending availability of NCEP testing capability.

Task 09.5.6 Develop, test, and evaluate the performance of the nonhydrostatic WRF modeling system.

NCAR/MMM

CURRENT EFFORTS:

PLANNED EFFORTS

PROBLEMS/ISSUES/SCHEDULE CHANGES:

Subtasks

09.5.6.3 1 September 2009 (NCEP)
Maintain and further develop WRF Post-processing system including necessary RR capabilities and updates to all documentation, in response to community requirements.

GSD – Some improvements in WRF-Post described under 09.5.4, yet to be submitted to NCEP (Huiya Chuang). SVN repository set up for all ESRL changes to WRF-post.

09.5.6.4 30 June 2009 (NCAR/MMM)
Deliver a WRF Users' Workshop and a WRF tutorial for the user community.

CURRENT EFFORTS:

PLANNED EFFORTS:

UPDATES TO SCHEDULE: NONE

09.5.6.5 30 Sept 2009 (NCAR/MMM)
NCAR released WRF Version 3.1 in April 2009. Preliminary work involved completing testing and certification of the code for release.
Both WRF 3.1 and WRF-Var 3.1 were provided. Release features have been summarized in previous reports and are described at http://www.mmm.ucar.edu/wrf/users/wrfv3.1/updates-3.1.html .

Jimy Dudhia of NCAR worked on resolving issues in surface analysis nudging and the QNSE PBL in preparation of the WRF V3.1 release. He also incorporated the sea-ice physics for the polar modification package.

Some post-release bug-fixes have been made. Dudhia addressed cleaning up the arrays needed by Ferrier microphysics to memory and disk space in running WRF. There were minor fixes for the RUC (Smirnova) LSM related to the accumulation budget for snow melt and to allow use of a time-varying background albedo. Dudhia also received and verified changes to the Lin microphysics scheme from Peter Blossey (Univ. of Washington) and prepared them for implementation in the WRF repository. These are minor fixes to the evaporation calculation.

CURRENT EFFORTS:

PLANNED EFFORTS:

UPDATES TO SCHEDULE: NONE

Deliverables

09.5.6. E1 30 June 2009 (NCAR/MMM)
Deliver a WRF Users' Workshop and a WRF tutorial for the user community

09.5.6.E2 30 September 2009 (NCAR/MMM)
Incorporate physics improvements from the user community, GSD, and NCEP into the WRF software infrastructure for use in the Rapid Refresh model. Perform code testing to permit implementation into WRF repository. In collaboration with GSD, assist in the evaluation of those physics schemes for the RR that may be tested using the ARW.

Task 09.5.24 Test WRF Rapid Refresh model at 3-km resolution toward High-Resolution Rapid Refresh

GSD

GSD has focused on case study evaluation and verification of the new larger-domain HRRR in April and early May. Some excellent case studies have occurred, including the central US squall line case on 13 May with unusual (but well-forecast by HRRR) convective mode. Without question, much better forecasts are now regularly available from Iowa-Illinois into the Chicago area, and from Missouri toward St. Louis with the larger HRRR domain.

GSD has conducted a series of tests with different WRF namelist parameters for diffusion, advection, and forward differencing options, as suggested by Lou Wicker at NSSL after Stan Benjamin's visit to NSSL/SPC in April. One set of changes for diffusion was implemented immediately into the real-time HRRR runs in late April, and other changes are possible.

In addition to Stan's visit to Norman in April for only 1.5 days, Steve Weygandt and John Brown visited SPC/NSSL for a full week each to participate in the Spring Forecast Experiment for convective weather forecasting. The HRRR is now an important participant among the experimental NWP products being evaluated in this Experiment.

GSD has developed a prototype time-lagged ensemble-based convective probability forecast product from the HRRR and NCAR has preliminary results from a statistical assessment of HRRR time-lagged forecasts. As of early May, a HRRR Convective Probability Forecast (HCPF) product is being created and verified in real-time.

The HRRR products now available have been expanded after changes to WRFpost and HRRR ncl scripts for graphical products. This is now the list of products available hourly for the full HRRR domain, and each of 4 regional quadrants (NW, SW, NE, SE). See http://ruc.noaa.gov/rr/hrrrlargeq1/

1 km agl reflectivity
reflectivity
max reflectivity
surface CAPE
surface CIN
most unstable CAPE
LCL
0-1 km shear
0-6 km shear
max updraft helicity
storm motion
max vert int graupel
10m wind
max 10m wind
skin temp
2m temp
2m temp - skin temp
2m dew point
precipitable water
1h acc precip
total acc precip
snow water equiv
precip type
850mb temp
850mb wind
850mb rh
850-500mb mean rh
700mb temp
700mb vvel
mean vvel
max updraft
max downdraft
500mb temp
500mb vort
250mb wind
visibility
cloud top height
ceiling

Subtasks

09.5.24.1 15 Feb 2009 (GSD, NCAR/RAL, NCAR/MMM, CAPS, MIT/LL)

Design the assimilation/modeling configuration for the HRRR during the 2009 summer convection forecasting (CoSPA) exercise.

GSD

As reported last month, as of 25 March, the 2009 HRRR expanded domain is up and running in real-time on the ESRL supercomputers (under reservations) and producing 12-h forecasts every hour with about a 2-h latency.

09.5.24.2 15 Aug 2009 (NCAR/MMM)
Evaluate techniques for convection-permitting (e.g., 3-km) forecasting by the ARW core in the HRRR configuration.

CURRENT EFFORTS:

In this quarter NCAR/MMM and GSD scientists developed the plan for this work, the evaluation of convection-permitting forecasts. The strategy, **implemented in early May**, is to exploit the 3-km real-time NWP to be conducted this spring at NCAR in support of the SPC's Spring Forecast Experiment. NCAR will be running the ARW at 3 km twice-daily **using 13-km RUC DFI grids** (as used in the ESRL HRRR) for initial conditions. Two to three forecasts/cases will be chosen, based on GSD input, for close evaluation. GSD personnel will review the forecasts daily, and candidates for further study will be noted. The cases are being analyzed jointly by NCAR/MMM and GSD.

PLANNED EFFORTS:

NCAR will produce 3-km ARW forecasts this Spring based on 13-km RUC DFI initialization. In collaboration with GSD, cases will be selected for review. The evaluations will take place over the next two quarters.

UPDATES TO SCHEDULE: None.

09.5.24.3 15 Sept 2009 (NCAR/MMM, GSD)
Collaborate on analysis of convection-permitting tests using HRRR cases. Draft and deliver summary of results.

Coordinated evaluation of specific case studies is ongoing with monthly meetings between GSD and NCAR. Sensitivities to grid resolution, model numerics, and microphysics have been examined. Other experiments have illustrated the benefit of using the RUC initial fields (with the DFI-based radar assimilation).

09.5.24.4 30 Sept 2009 (GSD, NCAR/RAL)
Complete 2009 HRRR summer exercise using modeling and assimilation modifications determined in 2008 exercise. Collaborate on analysis of HRRR tests and deliver summary of results.

A significant effort to make the HRRR production and file delivery system robust has been completed, including placing HRRR within the jet reservation system, adding new post-process variables, calibrating the number of cores to optimize the run time and working with user communities to achieve timely and reliable transfer of various output files. Additional work is ongoing to evaluate real-time HRRR runs, identify strengths and weaknesses, and resolve issues. One issue that we have identified is the presence of streamers in the vorticity field entering from the upstream boundary. These may be related to inconsistencies in the WPS interpolation from the external model grid. We are actively investigating this problem.

Deliverables

09.5.24.E1 30 August 2009 (NCAR/MMM)
Submit report on evaluation of HRRR-ARW forecasts.

CURRENT EFFORTS:

The planning for the approach to the evaluation was completed.

PLANNED EFFORTS:

NCAR will draft the report in the third and fourth quarters as the evaluation is done.

UPDATES TO SCHEDULE: None

09.5.24.E2 30 August 2009 (NOAA/ESRL/GSD)
Complete FY09 test in Northeast Corridor U.S. domain with 3-km High-Resolution Rapid Refresh running every 1 h.

- Conduct real-time summer 2009 HRRR forecasts using 3-km WRF initialized with radar-enhanced Rapid Refresh over Northeast US Corridor domain
- Coordinate with other AWRP users and other collaborators
- Provide project management
- Lead writing of report on summer 2009 HRRR experiments

09.5.24.E2 30 September 2009 (NCAR/RAP and NCAR/MMM)
Collaborate with GSD on analysis of 2009 results. Draft and deliver summary of results.
Evaluate techniques for convection-resolving (e.g., 3-km) forecasting by the Rapid Refresh (ARW core). Perform and evaluate HRRR convection-resolving forecasts on test cases using Rapid Refresh grids from GSD to identify strengths and weakness of model at high resolution. Perform 2009 experiments to re-evaluate effects of transition from 13-km parameterized convection to 3-km resolved convection in 0-3h forecasts and in lateral boundary conditions from the RUC or Rapid Refresh using the Grell-Devenyi parameterization.

Task 09.5.19 Develop ability to assimilate WSR-88D radial velocity and reflectivity data through GSI and Rapid Refresh toward High-Resolution Rapid Refresh.

GSI
See report last month…
We are continuing to examine how the convergence / divergence fields initialized in the HRRR (from the RUC radar reflectivity assimilation) evolve down-scale during the first 1-3 hours of the HRRR model run to yield 3-km-scale convective systems.

Subtasks

09.5.19.1 30 October 2008 (GSD, NCAR/RAL, CAPS)
Select initial case studies from summer 2008 for 3-km HRRR data assimilation case studies.

GSD
A set of 8 summer 2008 cases has been selected for coordinated GSD, NCAR, and MIT/LL evaluation. These include 20, 27 July; 2, 8, 13, 15 Aug; 6 Sep. We are also looking at some other cases for specific HRRR analysis including 31 July, 13 Sept. and 5 Sept.

09.5.19.2 31 August 2009 (GSD, NCAR-RAL)
Run case studies from early 2009 using 3-km HRRR on GSD jet computer using different RR-based initial conditions

- Radar-DFI enhanced RR
- Radar-DFI RR using unsmoothed latent heating
- Test of 3-km radar-enhanced diabatic digital filter initialization (DDFI)

GSD has been providing, to NCAR, RUC lateral boundary and radar-enhanced initial condition (history file dump directly after the RUC diabatic DFI-based radar assimilation) files for experimental re-runs of selected test cases from the 2007 convective season. Initial work has focused on 5 Sept.

09.5.19.3 30 Sept 2009 (CAPS)
Complete new 3-km GSI data assimilation experiments toward improved assimilation of radial wind.
Earlier experiments at CAPS using RUC analysis background showed positive impacts of radar data for tropical storm Erin (2007) case based on subjective and quantitative evaluation against radar data. For

the quantitative evaluations, Yi Yang continued verification against NCEP Stage II precipitation data by using MET (Meteorological Evaluation Toolkit). The verification has been performed for the 12-h accumulated precipitation valid at 1800 UTC 19 August over the Oklahoma domain. The forecast accuracy (ACC), frequency bias (FBIAS), probability of detecting Yes (PODY), false-alarm rate (FAR), Critical Success Index (CSI, also known as the Threat Score TS), Gilbert Skill Score (GSS, also known as the Equitable Threat Score ETS), and the Heidke Skill Score (HSS) computed from the simulated 12-h accumulated precipitation for all the experiments with different use of radar data, at a threshold of 50 mm are given in Figure 1. For all the experiments, the ACC scores are similar. It indicates that all experiments can predict the general precipitation reasonably well. The rainfall above 50 mm is forecast too frequently (see FBIAS score) by the experiments that assimilate reflectivity data (Exp-RF and Exp-ALL). All experiments with radar data (Exp-RF, Exp-VR and Exp-ALL) get higher PODY scores and smaller FAR than Exp-CNL without radar data. Although, Exp-VR has the lowest hit rate (PODY) among the three experiments assimilating radar data, it also has the lowest false alarm rate (FAR). The results show that the assimilation of radar observations lead to general improvement in heavy rainfall forecast. CSI is the ratio of the number of times the event was correctly forecasted to occur to the number of times it was either forecast or occurred. It can be seen that the assimilation of radar data has a positive impact on the heavy rain forecast. Note that the FBIAS measures the ability of the model to predict the frequency of the event (i.e., occurrence of model precipitation above the given threshold), whatever the forecast accuracy. It doesn't take into account the location error, while GSS and HSS measure the ability to predict precipitation above a given threshold at a specific location. A perfect prediction has GSS and HSS scores equal to 1, and a random prediction has a score of 0. The tendencies of the two scores are similar. It can be seen that the experiments that assimilate radar data have higher GSS and HSS scores than the experiment without radar data therefore radar data assimilation improves that precipitation location forecast also. The majority of the scores show that Exp-ALL that assimilates both radial velocity and reflectivity data gives the best prediction of 12-h accumulated precipitation.

MET version 2.0 has been installed successfully on local and external Supercomputers used by the CAPS team. The new version of MET adds a new package called wavelet stat which decomposes the forecast and observation fields into the sum of spatial components on different scales by using spatial filters. This may provide useful insight into model performance at different scales. Also, treating the reflectivity as precipitation data in MET, a interface for reflectivity has been written for MET. Generally, the verification scores of reflectivity and accumulated precipitation are similar. Meanwhile, using NAM as a background and assimilating radar reflectivity and radial velocity data, different two-hour-long assimilation windows from 00 UTC to 06 UTC were examined (See Fig. 2). The CSI (also known as TS) and GSS (also known as ETS) scores for assimilation windows from 00 UTC to 02 UTC and from 02 UTC to 04 UTC are similar, but the latter shows higher scores on average and better scores after 12 UTC. The assimilation window from 04 UTC to 06 UTC gave the lowest score (See Fig. 3). The score results are consistent with subjective evolution shown in Fig. 2.

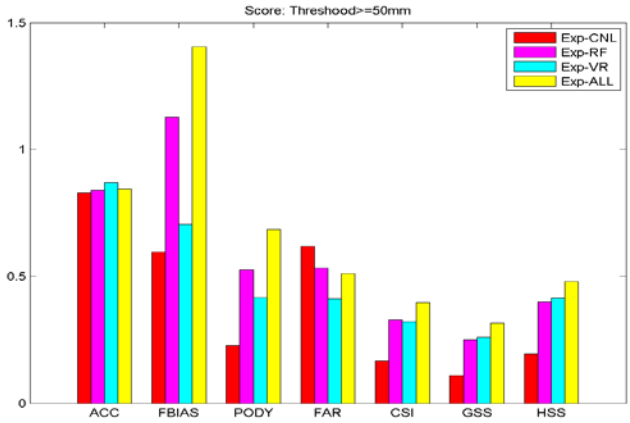

Figure 1 The ACC, FBIAS, PODY, FAR, CSI, GSS and HSS scores computed from the simulated 12-h accumulated precipitation valid at 1800 UTC 19 August for all the experiments with a threshold of 50mm.

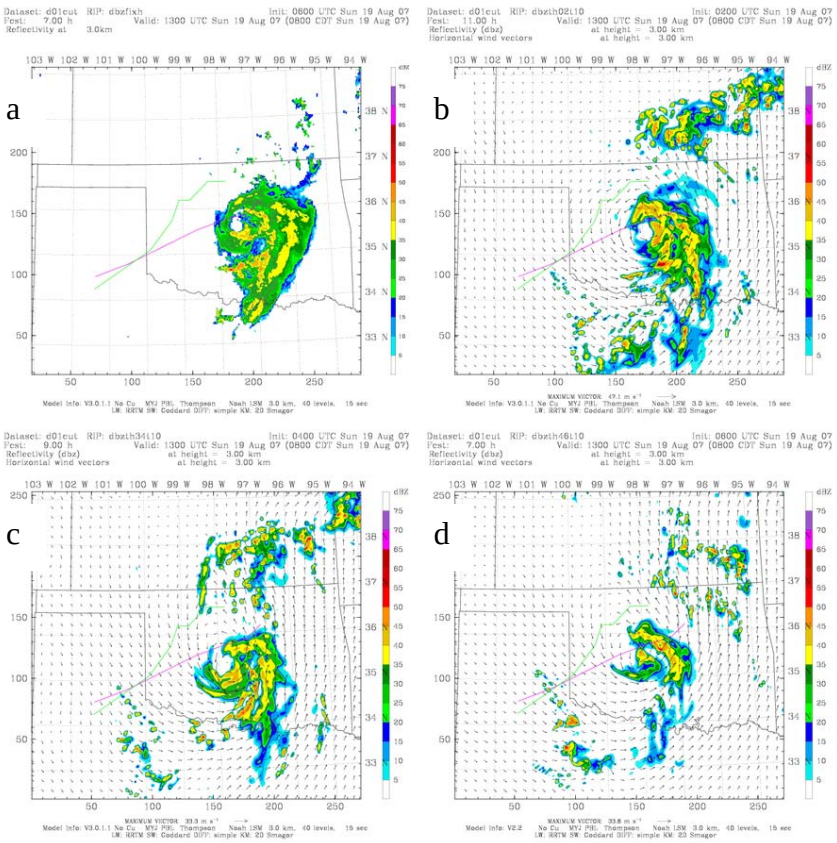

Fig. 2. (a) Observed radar reflectivity at 13 UTC, Aug 19, 2007, and forecast reflectivity and wind fields valid at the same time, assimilating radar data at 10 minute intervals for a two hour period, from (b) 00 UTC to 02 UTC (c) 02 UTC to 04 UTC, and (d) 04 UTC to 06 UTC. The results show significant difference in the forecast quality when radar data are assimilated at the different stage of the over-land intensification of Erin. Between 00 and 02 UTC, Erin was weak and not well organized. The vortex was most intense around 09 UTC.

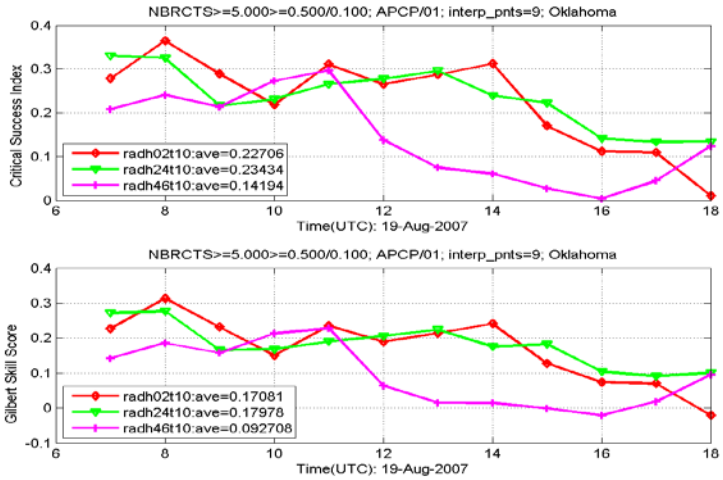

Fig. 3. The CSI and GSS scores of hourly precipitation for three experiments with data assimilation windows from 00 UTC to 02 UTC (red), from 02 UTC to 04 UTC (green), and from 04 UTC to 06 UTC (magenta).

09.5.19.4 30 Sept 2009 (GSD)
Develop and test improved DFI assimilation of radar reflectivity at 3-km using observation-based specification of latent heating within WRF-DFI developed by GSD and NCAR in FY08.

Deliverables
09.5.19.E1 30 Sept 2009 (GSD, CAPS, NCAR/RAL)
Complete improved version of 13km/3km radar assimilation techniques for demonstration in FY09 exercises.

Task 09.5.20 Develop ensemble-based probabilistic products for aviation users.

GSD
Curtis Alexander and Doug Koch developed code to create and verify real-time HRRR Convective Probability Forecasts (HCPF). Steve Weygandt supplied RCPF code to Binbin Zhou, who is utilizing time-lagged RUC ensemble members and other model grids to create a prototype Ver Short Range Ensemble Forecast (VSREF).

NCEP
Jun Du reports that the parallel SREF system (running on the new P6 computer since February) has had its complete set of RFCs submitted to NCO for Quarter 4 implementation. Aviation related fields of cloud base, PBL height, Composite Radar Reflectivity and Echo Top height have been refined or added and tested, and are now produced from most or all 21 members of the parallel SREF system (reflectivity & echo top can only be produced from WRF & RSM members at this time).

BinBin Zhou worked on VSREF products based on the RUC and NAM forecasts, using the SREF ensemble product generator. The first-cut products include cloud base/top, visibility and reflectivity. Other products such as icing, turbulence and convection etc., will be considered in the next step. The preliminary products can be viewed at the following website, which is now open for comments http://www.emc.ncep.noaa.gov/mmb/SREF_avia/FCST/VSREF/web_site/html/vsref.html.

Subtasks

09.5.20.1 Complete 'research quality' version of upgrade to SREF (e.g. higher resolution, more WRF members and more physics diversity) for consideration in November 2010 SREF upgrade package. (31 Jan 09)

NCEP started transitioning code to a new supercomputer system in January. The transition of the operational SREF system was completed by March. The parallel SREF system with hourly output aiming toward aviation forecasts has been established and is running on the new computer. This parallel system will replace the current operational system within a week of Production running on Stratus (next quarter). In February, the evaluation of this parallel system was started. Work on adding radar reflectivity and echo top to the parallel SREF is underway now at the request of Aviation Weather Center and FAA's Danny Sims. A problem in calculating ceiling probability was also identified and fixed in the SREF ensemble product generator code. (Du)

09.5.20.2 15 February 2009 (NCEP)
NCEP visits AWC to conduct continued training and education on SREF applications, receive feedback on existing guidance, and to acquire new requirements (fully depending on FAA funding).

09.5.20.3 Develop & deliver a new fog algorithm used in SREF product for aviation. (30 Apr 09)

A new fog algorithm was designed and developed in FY2007 and presented at Fog Remote Sensing and Modeling (FRAM) Workshop at Dalhousie University, Halifax, Nova Scotia, Canada 21-22 May 2008. This algorithm was incorporated into the special ensembles NCEP ran in support of the Beijing Olympic

Games in August 2008. A paper about the verification of a fog prediction method using part of the NCEP SREF system was written by Binbin Zhou and Jun Du and is under internal review prior to submission to Weather and Forecasting. (Zhou)

09.5.20.4 31 August 2009 (NCEP)
Based on case-study testing and refinement of the research-quality code, deliver the upgrade SREF codes to NCO for November 2010 SREF upgrade package.

09.5.20.5 31 March 2009 (GSD and NCEP)
Develop a preliminary procedure appropriate for aviation users from Very Short-Range Ensemble Forecast (VSREF) system using high-resolution RR and NAM existing runs.

GSD has identified a new scientist to work on the VSREF project with NCEP – more on this topic by next month's report.

09.5.20.6 1 July 2009 (GSD and NCEP)
Further calibrate probabilities and potential echo-top (improve statistical reliability) ensemble cumulus information.

Deliverables

09.5.20.E1 31 August 2009 EMC (Du, Zhou)

Demonstrate products from experimental VSREF probabilistic forecasts updated hourly.

CURRENT EFFORTS:

A new method called the "neighborhood approach" was chosen to create a probabilistic forecast based a single deterministic forecast. The method could be useful in high-resolution mesoscale runs. Although initial coding work has been started to test this new method, using hi-res window runs for the future Very Short-Range Ensemble Forecast (VSREF) system, it was temporarily stopped in favor of other higher priority work related to the parallel and operational SREF systems. (Du)

Work has started on the verification of ceiling/visibility/flight restrictions over Hawaii where IC4D techniques are being tested (following a similar exercise in NWS' Alaska Region). NCEP is helping MDL to pre-process SREF's aviation product GRIB files. The pre-processing procedure includes splitting current probability files into single threshold files. For example, an original ceiling probability file includes 5 thresholds like < 1000, 2000, 3000, 4000, 5000 m. MDL has no tool to decode the multiple-threshold probability file, so code is being developed for MDL to split the file into 5 small files, each with a single ceiling threshold, and then archive them. The split code is just finished and the split files have been reviewed and accepted by MDL. (Zhou)

PLANNED EFFORTS:

Further tune the convective parameterization scheme and run more case studies. Construct initial VSREF system using the highly adaptable ensemble product generator. Wait for MDL evaluation results and make improvements based on their feedback. (Du, Zhou)

PROBLEMS / ISSUES ENCOUNTERED OR ANTICIPATED:

No ceiling/cloud amount is available from ARW SREF members, and no reflectivity is available from the Eta members and some RSM members.

INTERFACE WITH OTHER ORGANIZATIONS: AWS, GSD
UPDATES TO SCHEDULE: None.