Office of Hydrologic Development
Hydrologic Software Engineering Branch
Quarterly Activity Newsletter
October 2009

Software for NWS Hydrology!

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1.   HIGHLIGHTS OF July, August and September 2009

Just last month, in September, Mr. Lee Cajina was promoted to Project Area Leader to fill the position vacated by Mark Glaudemans on May 9. Lee brings excellent credentials from the past couple of years of leading the team of developers who migrated the NWSRFS model operations into CHPS. We are quickly integrating Lee into the HSEB management team and re-aligning project assignments among the five PALs. We hope to fill Lee's vacant position in the next few months.

AWIPS baseline software development efforts were minimal for this quarter. For OB9.2, we completed significant changes to the MPE/Daily QC which were made available to River Forecast Centers (RFCs) through an AWIPS Test Authorization Note (ATAN) and will be part of the OB9.2 baseline. The changes include enabling ingest from NSSL's experimental system, the National Mosaic and Multi-sensor Quantitative Precipitation Estimation (NMQ), and adding functionality to provide gridded forcings to the Community Hydrologic Prediction System (CHPS).

Almost all of our support of AWIPS has been in providing considerable support to the AWIPS II (a.k.a. AWIPS migration) evaluation activities. Besides being part of various coordination tasks, we have worked to install the latest Task Order 11 software and begun evaluating it. We also provided significant input to NWS efforts to collect, evaluate, and develop AWIPS software testing documents.

For Next Generation Radar (NEXRAD), HSEB is integrating testing the dual polarization (or dual pol) Quantitative Precipitation Estimation (QPE) algorithm and associated products operational software. This past quarter, the ROC radar test bed began providing live dual pol data for testing. This software and the dual polarization initial operating capability are targeted for operational deployment in NEXRAD Radar Product Generator (RPG) Build 12. Deployment of the initial dual pol operating capability and Build 12 is scheduled to start in 2010.

CHPS "buddy" visits were completed in July. The third CHPS Acceleration Team (CAT) Implementation Workshop was hosted by ABRFC at the end of September, followed immediately by the first Preparation Workshop for the CAT-II also in Tulsa. Another quarterly

Software Acceptance Test (SAT) was successfully conducted in September; and migration and testing of the legacy models for BOC II was completed.

2. NEXRAD SOFTWARE DEVELOPMENT

NEXRAD release Build 11.1 deployment is nearly complete. One major enhancement in Build 11 was the addition of the Clutter Mitigation Decision (CMD) which reduces clutter in reflectivity and, hence, precipitation products, although HSEB did not help implement that software. Build 11.1 fixes an issue with the CMD.

2.1   Dual Polarization

HSEB is testing the software for the dual pol QPE algorithm and products which they delivered to the Radar Operations Center (ROC) early in 2009. This software and other dual pol algorithms and products implemented by ROC and OST and the operational dual pol hardware capability will be part of NEXRAD Build 12.

For the dual pol enhancement, the Radar Product Generator (RPG) software, including new algorithms and products, are being implemented by the ROC, OST, and OHD. The Radar Data Acquisition (RDA) software and hardware changes for the dual polarization enhancement are being done by a contractor, Level III Communications.

This past quarter, the ROC test bed WSR-88D was upgraded with dual pol, and OHD, OST, and ROC started real-time testing of the dual pol software. Following an extended Beta Test period, deployment of Build 12 and the dual pol enhancement begins in late 2010 and lasts into 2012. The long integration and testing period is due to the complexity and magnitude of the dual pol enhancement. The long deployment period is because a major hardware change is part of the enhancement.

3. AWIPS RELEASE OB9

The OB9.2 release will contain fixes for several bugs and the MPE/Daily QC changes for NMQ and CHPS. The previously planned maintenance release OB9.3 has been eliminated.

3.1   WHFS Improvements

Information on the WHFS, data ingest, and precipitation processing (e.g., MPE) applications are accessible on the NWS Office of Climate, Water and Weather Services Hydrologic Services Division (OCWWS/HSD) support web page at: https://ocwws.weather.gov/intranet/whfs/.

No significant work has been done on WHFS in the last quarter.

3.2   Precipitation Processing Improvements

We made critical changes to MPE/Daily QC related to NMQ and CHPS and provided these changes to RFCs via an ATAN. With OB9.2, those changes will be included in the AWIPS baseline. The MPE/Daily QC changes are described below in more detail. The changes related to CHPS are described in the CHPS section.

For 1-hr MPE precip processing, new options were added to read, process, and display NMQ-based grids. NMQ is an experimental system developed and maintained by NSSL; for more information see http://nmq.ou.edu/. The new options include the ability to read and display the raw radar-only NMQ grid and to use the raw grid to generate a local-bias corrected grid. The local-bias corrected grid can be used to generate a multi-sensor grid using the same algorithm used to generate the other multi-sensor grids within MPE. For Satellite-Radar-Gage (SRG) fields, a check was added so that if a top-of-the-hour satellite product is missing, MPE will look for a 15 minute after-the-hour product.

For 6-hr and 24-hr MPE/Daily QC precip processing, new options to generate netCDF format files and GRIB1 format files were added. The netCDF format files can be read by GFE. Also, the ability for the forecaster to edit a time distributed 6hr precip value was added.

3.3   AWIPS System Changes

An upgrade to the RedHat Enterprise Linux operating system from RHEL 4 to RHEL 5 was made as maintenance release, OB9.1. The latest AWIPS schedule shows the general release date of 11/9/09 for OB9.2. The previously planned maintenance release OB9.3 has been eliminated.

3.4   Field Tests

The following evaluations at certain offices are ongoing:

- Multiple RFCs continue to use a post-OB9 version of MPE which supports the NSSL NMQ radar-based QPE product and derived products.
- Selected RFCs continue to evaluate the Daily QC features in the post-OB9 version of MPE.
- CAT RFCs are configuring CHPS for operational testing expected to start this fall.
- CAT RFCs are using a post-OB9 version of MPE to provide gridded forcings for CHPS. (This version is the same as what will be deployed in OB9.2.)

4.   DEVELOPMENT SUPPORT ACTIVITIES

4.1   New RFC Software Architecture: CHPS

Visit the CHPS web site at http://www.nws.noaa.gov/ohd/hrl/chps/index.html. The "News & Activities" section contains reports from these HSEB quarterly newsletters. The CHPS page can also be accessed from the main OHD page (http://www.nws.noaa.gov/ohd/).

4.1.1 CHPS Implementation

CHPS Acceleration Team (CAT)

"Buddy" visits for the CAT-II RFCs were completed in July. These 1.5-day visits provided a high-level yet comprehensive and consistent introduction to a wide variety of aspects of the project. Each CAT-II RFC has been paired with one of the four CAT RFCs to facilitate their learning process. The goal is to provide a support system which will minimize any given RFC's dependence on Deltares.

During the Software Acceptance Test (SAT) at OHD on September 21-23, forecasters from NWRFC, NERFC, CNRFC, and ABRFC conducted further tests of the new Interactive Forecast Displays (IFD). Work on the IFD continues, with the majority of all changes expected in the November release (scheduled for SAT the week of December 7). During the SAT, OHD hosted a visit from Dr. Jack Hayes, Director NWS.

The third CAT Implementation Workshop was held at ABRFC in Tulsa, OK during 28 - 30 September. The CAT RFCs have begun their respective analyses of data forcings, and have drafted initial plans for parallel operations which they subsequently shared with the CAT-II RFCs.

CHPS Acceleration Team-II (CAT-II)

Immediately following the CAT Implementation Workshop, the CAT-II attended their first Preparation Workshop in Tulsa. Most of the presentation and discussion sessions were led by the CAT members, with additional presentations by Deltares. Some top concerns from the workshop included operational support, training, and parallel operations.

CHPS Software Development

HSEB developers finished migration and testing of the legacy models required for BOC II. These models are planned to be formally tested in December. HSEB developers also worked with Deltares developers to improve the performance of CHPS model runs, especially for ensembles. The improvements were formally tested during the September SAT in Silver Spring.

During this quarter, HSEB hosted CHPS formal testing sessions in September. These tests demonstrated that the CHPS BOC I models produced equivalent results as the NWSRFS counterparts. At the conclusion of the September tests, OHD CHPS Release 2.0.1 was disseminated to the CAT RFCs for their use in starting CHPS parallel execution.

HSEB folks have also been supporting the CAT RFC migration efforts in conjunction with HSD and Deltares. We investigate each operational support problem which might be related to a

problem with the legacy models. When a software problem is identified and corrected the fixed software is packaged and released through the HSD and Deltares.

Deltares held several IFD joint design meetings with some of the CAT forecasters. The focus of the design is to maximize forecaster efficiency (minimize mouse and button clicks) when navigating the user interface, while providing access to all functionality. Some AWIPS-like use of screen "real estate" has been included in the design. In mid-June Deltares delivered to the CAT representatives a demonstration version of the CHPS IFD for evaluation and testing.

CHPS Forcings

Progress towards generating gridded forcings for use in CHPS continued. A listserver was set up to allow for the exchange of emails between members. The minutes from the CHPS Forcings Teleconferences are posted to the listserver.

OHD completed upgrades to MPE/DailyQC to generate grids in netCDF and GRIB1 formats. The netCDF format grid can be ingested by GFE for further processing. The GRIB1 format file can be sent directly to CHPS. The NC2GRIB application was completed which is used to transform netCDF format files (output from GFE or MPE/DailyQC) into GRIB1 format. This application offers a second pathway for generating grids to be ingested by CHPS. OHD worked with NWRFC and Deltares personnel to successfully test ingest of GRIB1 format grids into CHPS.

HSEB developers completed changes to MPE/DailyQC aimed at AWIPS Release OB9.2 and are currently providing support for OB9.2 testing. In addition, developers are working on a few further enhancements which have been identified as being necessary for smooth operations in CHPS. These enhancements will be completed and tested under an ATAN at the CAT RFCs after OB9.2 has been deployed.

4.1.2 HEC-RAS for CHPS

Deltares conducted tests of the HEC-RAS during SAT on September 21-23; most tests passed but HEC has been asked to implement one more fix before HEC-RAS will be considered fully ready for operational use with CHPS.

NWRFC has successfully calibrated segments for the Lower Columbia River and expects to receive assistance from Deltares to develop the first FEWS configuration. The CAT-II RFCs are steadily implementing HEC-RAS in their own areas.

4.1.3 HEC-ResSim for CHPS

Deltares conducted tests of the HEC-ResSim during SAT on September 21-23; all tests passed. However OHD is waiting for a revised version of HEC's software which correctly handles warm states; formal testing for this version is expected to occur in December. At the present time CNRFC executes HEC-ResSim from NWSRFS; they will be the first RFC to run it within CHPS. Other RFCs are considering implementing HEC-ResSim in the future.

4.1.4 Experimental Ensemble Forecast System (XEFS) and Hydrologic Ensemble Forecast Service (HEFS)

The XEFS includes experimental non-baseline versions of new ensemble-related software interfaced to CHPS and FEWS through model adapters. Any new baseline ensemble-related software will become part of the HEFS which is intended to be the operational name to follow XEFS.

XEFS components will first be available in October and November 2009. These components are a new Ensemble Pre-processor (EPP3), Ensemble Post-processor (EnsPost), Ensemble Verification System (EVS), and Hydrologic Model Output Statistics (HMOS). Each of these components will be available to RFCs with CHPS for field testing following a month of beta testing. In addition, each of these components will undergo a second phase where the prototype is re-factored into baseline CHPS software.

The Graphics Generator is the first real piece of the HEFS that has not gone through a prototype phase. The Graphics Generator is a GUI where users can change the look of graphics or displays and an engine to create special graphics not available through the standard CHPS GUI, the IFD. The Graphics Generator will be implemented in phases with approximately 6 months between phases. For phase 1 of the Graphics Generator, by the end of November, we will implement the same functionality as the existing Ensemble Streamflow Prediction Analysis and Display Program (ESPADP). During the past quarter, we completed most of the coding and have very recently provided an early demo version to RFC members of the steering team. For phase 2 of the Graphics Generator, the functionality will be extended to deterministic displays.

To help make XEFS easier to use and move toward operations, OHD will be setting up a one-stop web page to provide the needed software (models and adapters) and documentation (installation and configuration notes and users guides).

4.2 AWIPS II

In February, Raytheon announced the functionality for Task Order 11 (TO11) would be delivered to the NWS in a series of six monthly slices beginning in April. The first three slices were delivered and HSEB personnel tested these slices in the March through June period. Late in June, Raytheon announced a change in plans under which a slice 3.1 which contained fixes to some previously reported Test Trouble Reports (TTRs) would be delivered in July and the functionality for the next two slices would be delivered in August.

In early July, HSEB received the slice 3.1 software and began testing it. HSEB received the combined slice 4/5 software, which included MPE functionality, very late in August and have tested that software throughout September. During the past quarter, HSEB wrote 78 TTRs to identify missing or defective functionality in Slices 3, 3.1, and 4/5.

In August, Paul Tilles participated in a Technical Interchange Meeting (TIM) with Raytheon/Omaha developers at their Omaha development site.

The Systems Engineering Center (SEC) within the NWS OS&T is managing the testing and evaluation of this and all AWIPS II task orders. OHD is providing considerable support for the TO11 test and evaluation. In addition to conducting testing, OHD is also working with SEC personnel to identify and resolve "gaps" in the test cases for hydro applications. WFOs and RFCs are encouraged to obtain, install, and evaluate TO11 software.

During the summer AWIPS announced a revised schedule for the completion of the AWIPS II migration and deployment to the field. TO11 is to be completed and delivered to the Government in mid-March 2010. Following that there will be 6 months (March – September 2010) of system OT&E followed by 4 months (September 2010 – January 2011) of field OT&E followed by general deployment starting in January 2011.

5. HYDROMETEOROLOGICAL AUTOMATED DATA SYSTEM (HADS)

Visit our web page at: http://www.nws.noaa.gov/ohd/hads/.

5.1   HADS Systems and Software

During the past three months there were no significant changes to the HADS software that generates and delivers SHEF encoded data products.

However, due to the expanded use of gage correction values, an enhancement to the public HADS web pages was implemented that altered the display of Data Collection Platform (DCP) meta-data.

Historically most adjustments to observed water level data values were depicted in the field entitled "Base Elevation", but with the significant growth in the use of gage correction values it became apparent that our services needed to be improved in order to add clarity to the use of gage adjustment values. Therefore Base Elevation values and Gage Correction values have been separated. The change was put in place to clearly identify each. The Base Elevation field is used solely to present values, generally permanent in nature, that adjust the observed value due to a defined Sea Level elevation or a defined Datum. The Gage Correction field is now used to depict a gage correction value, expected to be temporary, and likely to be altered as conditions warrant.

Another enhancement to HADS web services was enacted in order to present, in near real-time, the USGS and Corp of Engineers data locations that are subject to draw-down adjustments. The web page at http://amazon.nws.noaa.gov/cgi-bin/hads/listGageCorrectionsWeb.pl presents the data points at which known draw-down adjustments are in place. Sites are added to, or removed from this database table as details are received from the gage operator.

5.2   HADS Data Network

There are now 13,972 data locations defined for HADS processing, an increase of 104 data points since July 1st. The number of data values delivered to NWS operations is now averaging 2.65 million each day.

As mentioned in the previous Newsletter, the 14 prototype Modernized Historical Climate Network (HCN-M) sites in Alabama have been re-programmed in order to provide much more timely temperature and incremental precipitation data. These data are recorded at five-minute intervals and are now transmitted less than five minutes after the most recent observation is recorded. The HCN-M program is now activating a number of sites in the Southwest region of the U.S. with these same observational parameters. As the HADS program becomes aware of these new DCPs, and as NWSLI assignments are created for them, they will be added to HADS processing and their observations will be delivered as SHEF encoded data records.