



**Office of Hydrologic Development  
Hydrologic Software Engineering Branch  
Bi-Monthly Activity Newsletter  
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**Software for NWS hydrology!**

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**1. HIGHLIGHTS FOR JUNE & JULY 2004**

Several HSEB developers visited RFCs in June and July. Ai Vo and Hank Herr visited LMRFC and NCRFC to discuss the new UHGCDATE mod, the new NWSRFS locking mechanism, and the latest deterministic forecast verification software. Though some technical difficulties were encountered setting up NCRFC to view the demonstrations, Ai and Hank accomplished their goals, receiving valuable feedback from both RFCs. Also, at LMRFC, they were able to observe the operational forecasting procedure used by the forecasters. Special thanks go to John Halquist at NCRFC and Bob Stucky at LMRFC for helping in coordinating the meetings. Chris Dietz, Dennis Miller, and Kelley Miles visited NERFC and co-located WFO Boston to learn about hydrologic forecasting operations, with a particular emphasis on the use of radar products. Gregg Rishel at NERFC and Dave Vallee at WFO Boston were very generous with their time, and their support was greatly appreciated. We hope to make visits with field offices a standard element of our build process.

The AWIPS WHFS/IHFS and RFC-only software continues to be involved in multiple builds. Planning is complete for OB6 activities, OB5 development is well under way, OB4 is finalized, the OB3.1 and 3.3 patch releases are ongoing, while OB3 deployment and support continues. For OB3, the most noteworthy changes are numerous enhancements to the Multi-Sensor Precipitation Estimator (MPE) component of HydroView, the addition of a pre-defined request for the Point Display Control function

in HydroView, and RiverPro enhancements in support of requested CNRFC enhancements. Details on OB4 features are summarized later.

Finally, on the WSR-88D side, HSEB wrapped up a 3-month field evaluation for the Range Correction Algorithm (RCA). Feedback from forecasters was generally positive, and analysis of data gathered for the evaluation helped highlight some algorithmic changes that were needed.

On the AWIPS systems front, several major decisions have recently been made. The PostgreSQL DBMS has been selected as the next Relational Database Engine for AWIPS, and will replace Informix as the HP-UX DS machines are retired and replaced by the Linux DX machines. Here is the PostgreSQL web site for those who would like to find out more about this DBMS, <http://www.postgresql.org>. There is an interesting FAQ in the Docs section (where, for example, you can learn that PostgreSQL is pronounced *Post-Gres-Q-L*). The AWIPS program office is finalizing the PostgreSQL deployment schedule. Tentative plans are for a significant portion, if not all, of the OHD software to use PostgreSQL in AWIPS Release OB6. These plans are quite involved so as to accommodate the many dependent activities, including the field conversion of local applications which use the existing Informix database.

To support field development activities, a web site has been established by the HSEB which provides helpful information on PostgreSQL development:  
<http://www.nws.noaa.gov/ohd/hrl/hseb/postgresql/index.htm>

Also, as previously mentioned, the Red Hat Enterprise Linux Workstation Basic version 3 has been selected as the operating

system for AWIPS Release OB6. Other major AWIPS system architecture changes are also planned in the OB5/6/7 time frame. The most noteworthy of these changes from an application development standpoint are the selection of PostgreSQL and Red Hat Enterprise V3.

On a final note HSEB had two major personnel changes this period. On July 16 Mr. Martin Bennertz joined us as a senior software engineer contractor from RSIS to replace Monica Toth who left in April. Martin joins Edwin's AHPS Group and will also be supporting Donna Page's RFC Development Management (RDM) work. At the moment Martin is becoming familiar with all of the RFC Archive Server software, working with Donna and Julie Meyer of MBRFC, and plans to put it under configuration management control using the NESDIS "CasaNOSA" collaborative project development tool on the Internet. This good news was tempered with the bad news (for HSEB) of losing Ms. Mary Mullusky on July 23. She has taken a new position working for Tom Graziano in OCWWS/HSD as the Flash Flood Program Manager and will also be leading ensemble forecasting policy work for HSD. This is a wonderful promotion for Mary and we wish her all success. Lucky for us we will still be working with her on NWS hydrology issues here in the same building.

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## **2. DETAILS OF TASKS**

### **2.1 NEXRAD SOFTWARE DEVELOPMENT**

Visit our web page: <http://www.nws.noaa.gov/oh/hrl/hseb/nexrad.htm>

#### **2.1.1 RPG BUILD 5**

##### ***Enhanced Pre-Processor (EPRE)***

In June we provided assistance to the OOS/ROC/Programs Branch concerning low radar precipitation estimates at the Philadelphia WFO. We also helped the OS&T/SEC/Development Branch with their investigation into operational behavior of the Radar Echo Classifier (REC) software algorithm; output from the REC algorithm is ingested by EPRE.

#### **2.1.2 RPG BUILD 8**

##### ***Range Correction Algorithm (RCA)/Convective Stratiform Separation Algorithm (CSSA)***

The field evaluation of the RCA/CSSA concluded on June 11. WFOs participating in the evaluation of this new science were Charleston, WV, Minneapolis, MN, Norman, OK, Pittsburgh, PA, Pleasant Hill, MO, and Portland, OR. ABRFC and MBRFC were also invited to participate. A 'wrap-up' teleconference call was held on June 10 to summarize our findings. Field reaction to the new science was positive overall, although we experienced some problems with weather (lack of precipitation) and data feed availability/stability at one or two sites. By analysing data from the field evaluation, RCA/CSSA source scientists were able to fine-tune the science and develop operational guidance.

In mid-July HSEB and OCWWS/HSD finalized the Concept of Operations (Conops) document, which provides operational scenarios introducing RCA/CSSA into forecast operations at WFOs and RFCs.

The OOS/ROC/Applications Branch in Norman, OK continued with an Independent Validation & Verification (IV&V) of the CSSA science. Their report has been delayed due to the need to support higher priority operational issues, and is now expected sometime in August.

We continued to improve the cpu efficiency of the RCA/CSSA prototype software during June and July. However, OOS/ROC announced on June 30 that further significant timing improvements must be made in order to meet ROC resource budget requirements. HSEB

will no longer be able to meet the software delivery deadline for RPG Build 8 (operational deployment Fall 2005). A new project plan will be developed in August.

On July 23 the Hydrologic Science and Modeling Branch (HSMB) presented the RCA/CSSA to the NEXRAD Technical Advisory Committee (TAC). A final report is expected in early August. The role of the TAC is to provide recommendations to the NEXRAD Program Management Committee (PMC) concerning implementation of algorithms into the WSR-88D.

### **2.1.3 DOCUMENTATION**

During June and July, we worked on updates to the Federal Meteorological Handbook No. 11 - Doppler Radar Meteorological Observations (WSR-88D), otherwise referred to as FMH-11, to incorporate recent changes to the RPG precipitation processing software. Our updates were delivered on July 7 for incorporation into a final version of the document which is expected to be published by OOS/ROC sometime later this year. We are now in the process of generating documentation for existing radar precipitation product formats and content. Current Interface Control Documents (ICDs) which are published on the ROC website (downloads available at [http://www.roc.noaa.gov/ssb/cm/icd\\_downloads.asp](http://www.roc.noaa.gov/ssb/cm/icd_downloads.asp)) have proved to be difficult to interpret and are incomplete in some instances. By popular request, our group is now developing detailed descriptions of the following radar products sent from the RPG to AWIPS and other external systems (in order of priority): Hourly Digital Precip Array (DPA), Digital Hybrid Scan Reflectivity (DHR), One Hour Precip (OHP), Storm Total Precip (STP), Digital Storm Total Precip (DSP), Hybrid Scan Reflectivity (HSR), Three Hour Precip (THP), User Selectable Precip (USP), and Supplemental Precip Data (SPD). In June and July we worked on the DPA (which is now near completion), DHR, and OHP.

### **2.1.4 OTHER NEXRAD DEVELOPMENT NEWS**

Three members of our group (Chris Dietz, Dennis Miller, Kelley Miles) traveled to the Northeast RFC (NERFC) and WFO Boston on June 21-22. The goal was to learn about hydrologic forecasting operations, with a particular emphasis on the use of radar products. It also served as a valuable introduction to NWS forecasting operations for our newest group member Kelley. Staff at the RFC and WFO were extremely generous with their time, and we learned a great deal from them. Our group is seeking to develop closer relationships with end users of our software products, as a step towards the ultimate goal of improving quality and usefulness of delivered capabilities.

In support of the OHD Science Infusion and Software Engineering Process Group (SISEPG), Kelley Miles has been experimenting with using the NESDIS "CasaNOSA" collaborative project development tool for configuration management (CM) of NEXRAD PPS software baselines. He is piloting the use of the Subversion ( <http://subversion.tigris.org/> ) CM tool component of CasaNOSA to see if the combination of CasaNOSA and Subversion can possibly meet our internal needs for software CM as well as expand our CM environment to include collaborative development outside OHD. We hope to use Kelley's experience to evaluate the use of these tools for AWIPS/AHPS software development too.

Our summer student, Jeremy Su, completed documentation for the RadClim system of scripts/software. The AWIPS software development group will begin incorporating RadClim into the AWIPS baseline. Jeremy's last day was July 23.

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## **2.2 AWIPS RELEASE OB3.x**

### **2.2.1 RFS**

OB3 has been superseded by OB4 (available to the RFCs), although AWIPS is now delivering OB3.

### **2.2.2 WHFS/IHFS DATABASE**

Please visit the OCWWS/HSD web page for the WHFS software at: <http://www.nws.noaa.gov/om/whfs/> This web page contains the OB3 Release Notes, which detail the numerous changes, large and small, made for OB3.

AWIPS Patch Release OB3.1 was also completed to support Initial Operational Test and Evaluation (IOT&E) of the VTEC functions in RiverPro. Included in the 3.1 release is the ability to specify probability attributes when retrieving forecast data for inclusion in a generated product.

AWIPS Patch Release OB3.3 includes significant new features to support RiverPro VTEC features, and will be used to support VTEC OT&E to be conducted this summer. Any changes resulting from this OT&E will be incorporated in the OB4.1 release, with VTEC scheduled for formal "turn on" in February 2005. The RiverPro OB3.3 version will also include some changes in support of NWS Instruction 10-922 policy changes, with the remaining changes to be incorporated into RiverPro OB4.1. NWSI 10-922 provides a detailed specification of WFO hydrologic product content and format; the companion NWSI 10-923 includes detailed examples of the products described in 10-922. All WFOs and RFCs are required to install Release OB3.3, although RFCs are not required to perform certain Riverpro configuration items. WFOs are required to configure RiverPro to support the new RiverPro Service Backup feature implemented in OB3.3. Also, some of the OB3.3 changes to support pending 10-922 changes require WFO configuration changes.

### **2.2.3 PRECIPITATION PROCESSING SOFTWARE**

A major collection of enhancements, and some bug fixes, have been incorporated into the MPE component of HydroView. In addition, a new quality control feature was added that makes use of lightning data and which performs spatial consistency checks on gage data. All these changes are detailed in the WHFS web page.

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## 2.3 AWIPS RELEASE OB4.X

### 2.3.1 RFS

Development for the RFS OB4 delivery is complete and this build is now in the maintenance phase. Please see the HSD support page for the status of bug reports.

[http://www.nws.noaa.gov/om/water/RFC\\_support/hseb\\_buglist.shtml](http://www.nws.noaa.gov/om/water/RFC_support/hseb_buglist.shtml)

We have made four interim releases for the OB4-R25 software.

- 1) Corrected the ingest pairs portion of the new verify software suite, so the TS code in existing pair files is interpreted correctly. Bug R25-11.
- 2) Corrected the dates on the espadp CARD file display . Bug R25-8.
- 3) Corrected the National Statistics output from the new verification software. Bug 25-23.
- 4) Corrected problems with pointers being out of bounds so stations could not be re-defined with PPINIT. Bug R25-6
- 5) Made more corrections to the PPINIT HRAP calculations. Bug R25-20

Please contact the HSD support team if you have questions about these two interim releases.

[Contact HSD Support Team](#)

### 2.3.2 WHFS/IHFS DATABASE

The final submission of the WHFS/IHFS OB4 software to the AWIPS Contractor was recently completed. Because of issues external to the OHD software, the full deployment of OB4 has been delayed, and is scheduled to commence in mid-September 2004. The OB4 release notes document is complete and will soon be posted on the WHFS web page. The highlights of the Release OB4 changes include:

- Added the Sacramento rainfall-runoff model into Site-Specific, with supporting RFC-WFO communications functions, and an improved user interface.
- Removed the old DamCatalog tables in the IHFS\_DB in lieu of the newer database used by the browser based application; this frees up database space.
- Established consistent service backup controls in the WHFS software that are based on the HSA definitions, instead of county based assignments.
- Completed many minor enhancements and bug fixes.

As part of the OB4.1 Patch release, the RiverPro application will contain numerous enhancements to support the WFO product formatting policy changes as specified in NWSI 10-922.

### 2.3.3 PRECIPITATION PROCESSING SOFTWARE

The highlights of the Release OB4 changes include:

- Updated the DPA product decoder to handle new data and associated format changes in RPG Build 5 (EPRE) products while also handling Build 4 products properly.
  - Added two new MPE fields generated by the MPE FieldGenerator application and usable in the interactive HydroView/MPE application: local bias adjusted multi-sensor precipitation field and bias adjusted satellite precipitation field.
  - Removed obsolete Stage 2/3 IHFS\_DB tables and software.
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## 2.4 AWIPS RELEASE OB5

### 2.4.1 RFS

For this build the major development tasks are integrating the new UHGCDATE mod, developing an initial NDFD-to-NWSRFS pre-processor, upgrading the NWSRFS fs5file locking process, and adding new features to the RES-J operation.

We finished coding and testing the UHGCDATE mod software. The requirement for the UHGCDATE mod also had been updated. We have sent a version of UHGCDATE software along with the requirement to NCRFC and LMRFC for further testing.

We have received review comment on the requirements for the NDFD pre-processor from Tom Adams. He pointed out to us that the requirement for picking out a single point value from the grid, which we did not plan to complete in this build, was critical to the western region RFCs. Unfortunately, that requirement made the project too large for the available FY2004 AHPS resources for this task. We have several questions about the way we should extract single grid values, starting with the scientific validity of extracting a single grid cell from the NDFD grids and assigning this value to the entire basin on through how the information about the grid cells to extract should be stored. With FY2005 AHPS resources we will work with the interested RFCs to develop and validate precise requirements for this phase of the development. RFCs should also be aware we are passing a requirement to OCWS/HSD for a more robust method for RFCs to download the NDFD grids. The only method currently available is to pull them off the Internet outside the AWIPS Firewall. We believe that this method is unacceptable for basic system operations. We plan to work with OCWS/HSD and AWIPS to provide NDFD grids inside the AWIPS Firewall and sectored for RFC coverage areas. Until we achieve this better AWIPS system solution, we will not be able to provide the mechanism to retrieve NDFD grids for processing.

We have developed the code for allowing multiple concurrent locks in the RFS databases -- we think that is the good news! Unfortunately, as we test and evaluate the new lock process, it does not look promising for us to be able to develop a finer locking mechanism within the current structure of the fs5files. We need to move to a relational

database where we can lock by rows to enable ourselves to run multiple forecast groups and the like. At least that is how it looks to us now.

Many thanks to Reggina Garza of SERFC for her excellent testing of the new RES-J features.

#### **2.4.2 WHFS/IHFS DATABASE**

Initial delivery of OB5 software is scheduled for August 2004, with AWIPS Systems Integration Testing (SIT) commencing December 6, 2004, and full deployment beginning April 12, 2005.

The following is scheduled for OB5:

- The existing browser-based Dam Catalog application will be replaced/upgraded with the DamCREST (Dambreak Catalog Reviewer and ESTimation Tool) application. The DamCREST implementation provides a much easier interface, with particular attention paid to getting catalogued results displayed quickly and to facilitating the entry of model input data and subsequent model execution. A new catalog database is not provided with DamCREST; it will use a slightly changed version of the existing database. Field sites will not have their dam catalog data disturbed. There is a recognized problem with the accuracy of the data and break scenarios already provided in the catalog due to the limited data which led to assumptions made in the Simplified DamBreak model runs used to populate the catalog. The OHD/HL/HSMB is investigating methods to improve the input data. The HSEB would like to thank the HSMB for doing a significant amount of development work on the new DamCREST application.
- Assorted enhancements for the SiteSpecific application. Some of these are already completed. We strongly encourage offices to provide feedback on the OB4 SiteSpecific application.
- Enhancements to the TimeSeries application, including some requests from the Western Region.
- The Point Data Display feature currently in HydroView/MPE will be implemented within the D2D application. This will allow overlay of point data from the IHFS database onto D2D. This work is being performed by OST/MDL with significant assistance from OHD/HL/HSEB.
- Work is under way to perform the transition of the OHD HSEB software from using an Informix DBMS on HP-UX servers to using a PostgreSQL DBMS on Linux workstations. This is the beginning of our OB6 work.

#### **2.4.3 PRECIPITATION PROCESSING**

- An overhaul in the way that gage precipitation estimates are handled in the WHFS will ensure that all software has consistent algorithms for deriving precipitation accumulations and will improve the speed of the precipitation data processing. This will affect the Shefdecode, RiverPro, HydroView/MPE, PrecipPreProcessor (siipp), and OFS Data

Entry (ofsde) applications. Gage data was formerly stored in the Precip and CurPrecip tables, with the CurPrecip table containing the same data types as the Precip table, but for a much shorter duration (e.g., the last 3.5 days). This redundant storage method was adopted to provide performance improvements when reading the data (from the CurPrecip table). These "raw" data will now be stored in four new IHFS\_DB tables: 1) "raw" PC data; 2) "raw" top-of-the-hour hourly PP data; 3) non-top-of-the-hour or non-hourly PP data; and 4) other precip data such as precip type reports. The two new raw tables will be used to maintain two additional new tables - one for hourly PC and one for hourly PP data - which have data stored in 24 hourly slots for each day (similar to methods used in CBRFC's fastetc database). This is expected to improve performance when reading hourly data. To aid in transition of local applications, a configuration option will exist in OB5 to allow the population of the old Precip and CurPrecip tables in addition to the new tables. However, this should be used very carefully as it will cause double storage of precip data. In a later build the Precip and CurPrecip tables will be removed.

-- Improvements are being considered for the MPE component in HydroView to improve the management of user polygon edits in gridded precipitation fields.

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## **2.5 DEVELOPMENT SUPPORT ACTIVITIES**

### **2.5.1 New OHD Software Architecture**

Here is an interesting page which you should check out:

[http://www.nws.noaa.gov/oh/hrl/hseb/hseb\\_pdf\\_links.htm](http://www.nws.noaa.gov/oh/hrl/hseb/hseb_pdf_links.htm)

As is to be expected with a project like this, each step takes longer than it should. We have been working to define the development steps for an actual test of our architectural ideas. However, this involves using expertise from two different contractors (RTi for the RFS expertise and Apex Digital Systems for the architectural expertise) and defining the roles and responsibilities of each party is very important and very difficult. We expect to be testing an actual running Data Service with the NWSRFS RRS pre-processor this fall. Our intention is to test the capability of running from the NWSRFS fs5files and then with a MAGIC change in a configuration file read from a real PostgreSQL database. We have been defining and negotiating this next architecture task with the contractors and we expect it to commence in early August.

### **2.5.2 OHD starting to use XML**

In late July we started a new contractor task with Apex Digital Systems to start pulling together the hydrologic community in the use of XML for exchanging hydrologic data. The task order goal is the development of a well accepted (in the hydro community) XML schema for hydrologic forecasting. The purpose of the first phase of the task is to

coordinate OHD's XML development with other NWS offices and NWS cooperators, and to develop, document and publish an initial XML schema for hydrologic forecasting.

### **2.5.3 Development Environment**

We continue to try to move toward establishing a more collaborative software development environment by experimenting with collaborative project tools and configuration management tools (see section 2.1.4 above). The goal is to establish a software development environment that can be conveniently shared with developers not sitting here with us in Silver Spring.

The OHD SISEPG has been working on developing improved software engineering process document templates and establishing more official OHD coding standards for the various software languages.

### **2.5.4 Really Great Reservoir Workshop**

During the week of June 28 Kuang Hsu and Mary Mullusky led the Reservoir Workshop at the ABRFC.

### **2.5.5 Beta Testing**

The OB4 Site Specific application, with the Sacramento rainfall-runoff model is in ongoing beta testing at MBRFC and SERFC/SJU.

The VTEC (Valid Time Event Coding) features of RiverPro are being tested as part of a formal Operational Test and Evaluation (OT&E) at selected sites from August 30 - October 8. VTEC will be implemented in February 2005 and represents a major change in the way hazard products are issued by the NWS.

The OB5 DamCREST application is being beta tested at Dodge City WFO and ABRFC.

Testing of modifications of RiverPro made to support CNRFC-WFO operations is ongoing. These features are provided in OB3.

### **2.5.6 Personnel Changes**

Mr. Martin Bennertz (RSIS) joined Edwin's AHPS Group on July 16 (see Highlights at the top).

Ms. Mary Mullusky (Gov't) left Edwin's AHPS Group on July 23 to take a new position with OCWS/HSD (see Highlights at the top).

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