HEFS Test Manual

HEFS Release 1.0.1

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National Weather Service

Office of Hydrologic Development

Revision History

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1. Test Objective

Testers will test on a Standalone that is already configured with HEFS. Testers will verify whether the HEFS components are working as intended. The components to be tested are Data Ingest, MEFP & EnsPost Parameter Estimation (PE), MEFP forecast, EnsPost, and GraphGen.

A prerequisite of this test is installing and configuring CHPS 3.0.1 and HEFS 1.0.1 (see associated install notes), updating or re-estimating the MEFP parameters, and converting or re-estimating the EnsPost parameters.

This test manual has three testing sections to be tested by different sets of HEFS RFCs. Section 2 is a test of existing functionalities for all RFCs to test. Section 3 is a test of all the fixes which should be tested by the reporting RFCs; see the table at the beginning of the section for which RFCs are responsible for which tests and if a test procedure is provided. Section 4 is a test of the enhancements in this build and should be tested by all RFC. Some fixes and enhancements are tested as part of running the HEFS workflows and don't need any additional steps to test and therefore does not have any test procedures.

1.1. Directories of Note

The following directories will be referred to in the instructions provided below:

- <*region_dir*>: The *installation stand-alone* region home directory, typically "##rfc_sa".
- <*configuration_dir*>: The stand-alone Config directory, typically <*region_dir*>/Config.
- <*tar_root_dir*>: The directory where the release package was untarred.
- <*mefp_root_dir*>: The directory selected to hold CFSv2 location time series files and MEFP parameter files; see the *MEFP Configuration Guide: Data Ingest Components*.

1.2. Test Summary:

Each test consists of two sections: Test Prerequisites and a Test Procedure.

- **MEFP Data Ingest**
  Data ingest workflows prepare gridded forecast inputs to MEFP. This test will run the workflow for execution of the data ingest components and verify the result using the FEWS GUI.

- **MEFP PE**
  The MEFP Parameter Estimator (MEFPPE) is a FEWS explorer plug-in designed to guide the user through the process of estimating parameters for use with MEFP.This test will run the MEFPPE workflow using the FEWS GUI to estimate parameters and verify the results.

- **EnsPost PE**
  The EnsPost Parameter Estimator (EnsPostPE) is a FEWS explorer plug-in designed to guide the user through the process of estimating parameters for use with EnsPost. This test will run the EnsPostPE workflow using the FEWS GUI to estimate parameters and verify the results.

- **MEFP Forecast**
  The MEFP forecast workflow generates the forecast ensembles. This test will execute the workflow using the FEWS GUI to generate the forecast ensembles and verify the results.

- **EnsPost**
  The execution of the EnsPost workflow post processes stream flow ensembles. This test will run the workflow using the FEWS GUI to verify the installation was successful.

- **GraphGen**
  Delivered with the HEFS release of the MEFP and HEFS, EnsPost software is pre-configured Graphics Generator products designed to display MEFP Results for HEFS EnsPost Input and HEFS EnsPost Output. Using the FEWS GUI, this test will verify the installation was successful.

2. Testing Functionalities

2.1. MEFP Data Ingest

2.1.1 Test Prerequisites

CHPS is configured with the data ingest components as described in the document *MEFP Configuration Guide: Data Ingest Components*. Below is the same information from the confirmation section of the configuration guide.

This test is designed to replicate exactly how the grid files will be imported when configured to run as an automated workflow. The data represents that which is available for an MEFP run on Jan 31, 2013 at 12Z. The grids are imported by system times (T0) as follows:

- GFS: 1/31/13 00Z
- GEFS: 1/31/13 00Z
- CFSv2: 1/31/13 12Z (the data is 24-hours old: 1/30/13 12Z)

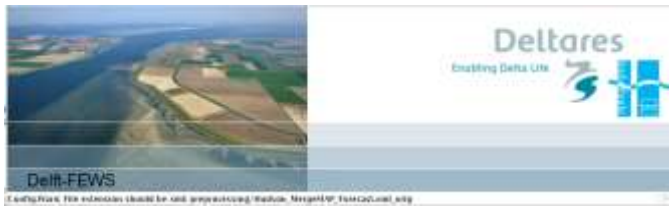
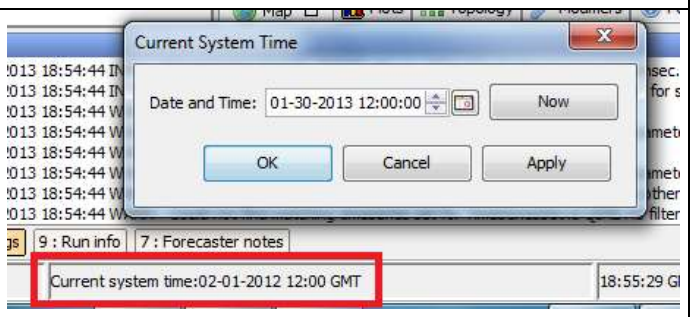
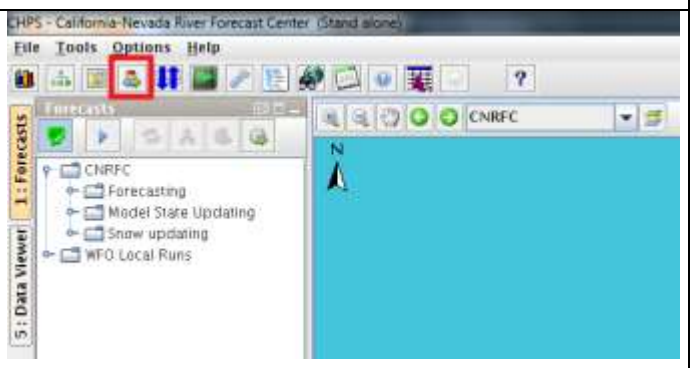
The test steps below describe how to view the gridded forecasts through the **Spatial Display Panel** of the CHPS interface.

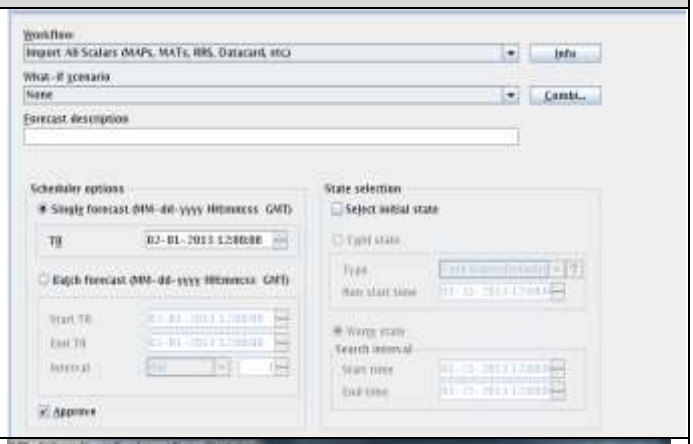
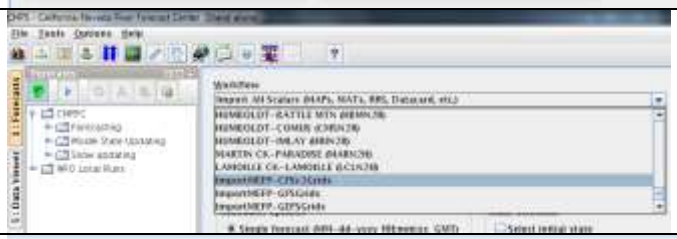
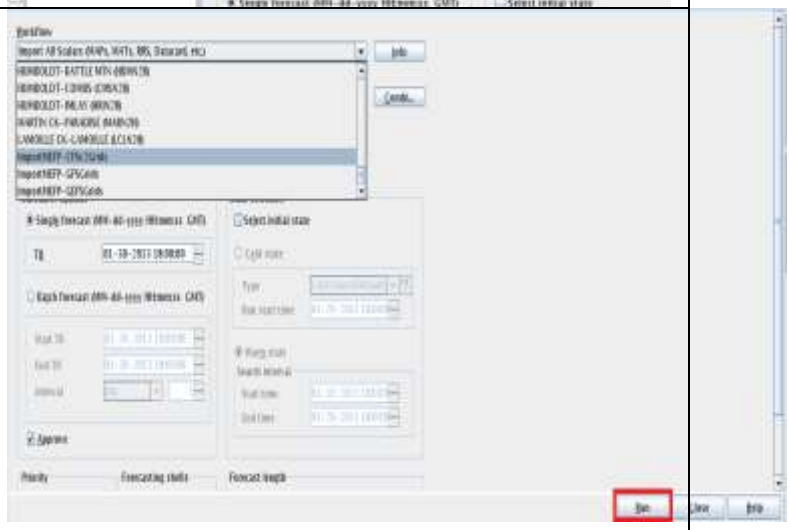
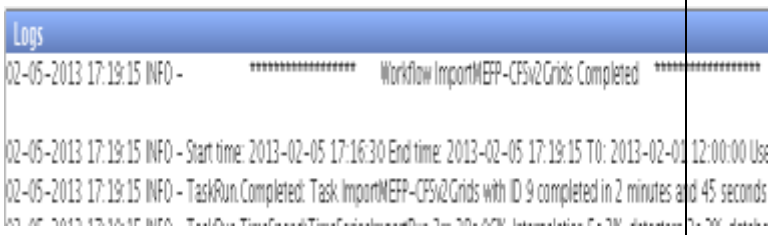
Prior to running the test, prepare the data for import as follows:

Action: Populate the <*tar_root_dir*>/dataIngest/Import directory with grid data for testing. Do the following:

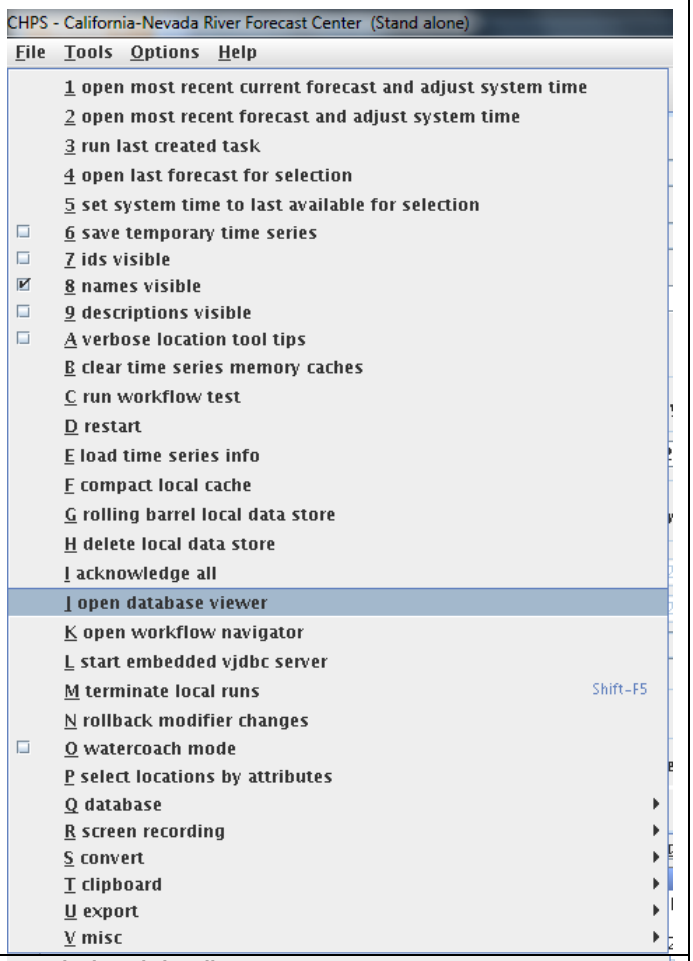
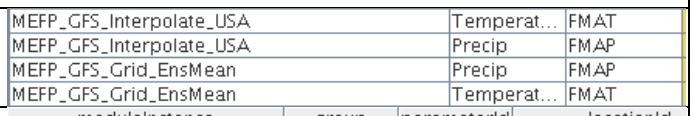
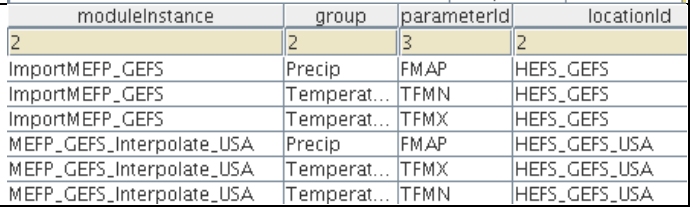
cd <*region_dir*>
tar –zxvf <*tar_root_dir*>/dataIngest/importTestData.tgz

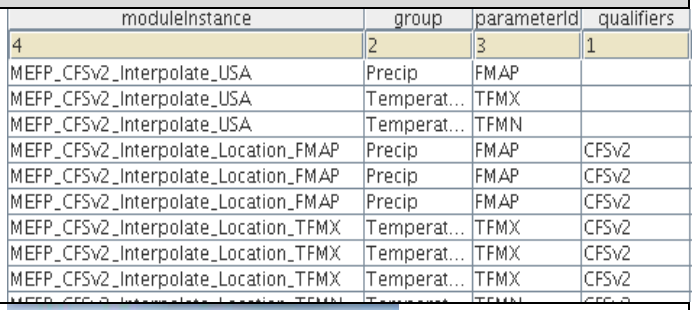
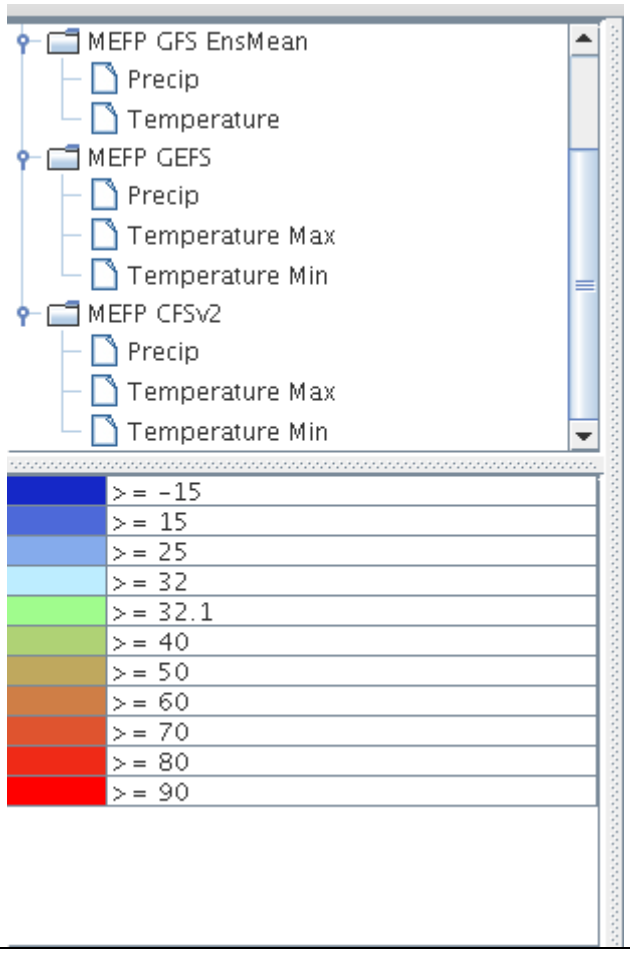
2.1.2 Test Procedure

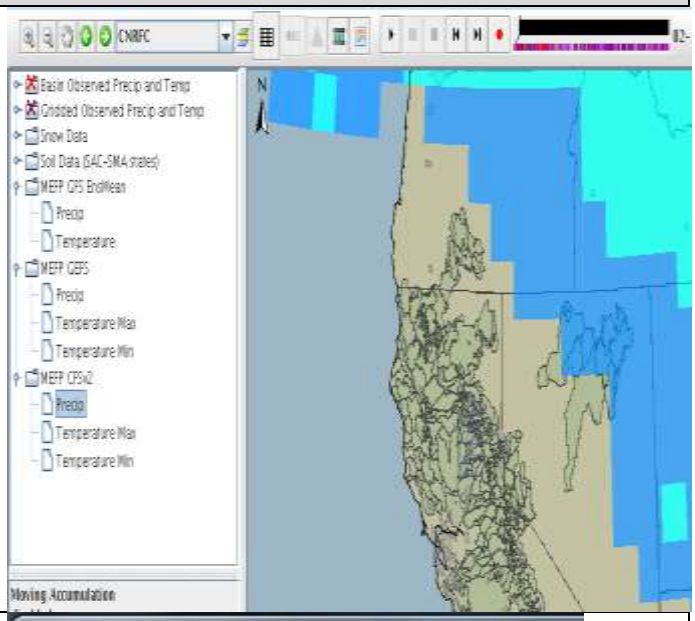
#	Action	Expected Results
1	Start FEWS using the installation standalone: ***cd*** *<region_dir>* ***cd ..*** ***./hefsPlugins/fews_hefsPlugins.sh ##rfc_sa &***	FEWS will be started. The splash screen displayed will vary by RFC. The default splash screen is:  After a short time, the CHPS interface will open.
2	Click on the **Current System Time Label** at the bottom of the CHPS interface so that the **Current System Time** dialog opens. Set the system time to 01-30-2013 12:00:00.	
3	Click on **Manual Forecast Button**.	

#	Action	Expected Results
4	The **Manual Forecast Panel** will open allowing you to select the workflow to run.	
5	In the **Workflow List**, select the ImportMEFP-CFSv2Grids workflow.	
6	Click **Run.**	
7	Wait for run to complete (up to 5 minutes)	We can see this in the Logs once run is complete: 
8	Verify that appropriate directories and files for each *installation catchment* were created under the directory *<mefp_root_dir>*/cfsv2Interpolated/archive.	If they were not created, then the module that exports the location-specific CFSv2 forecast time series file, or one of the preceding modules, failed to execute.

#	Action	Expected Results
8	Perform Step 2, again, but set the system time to be 01-31-2013 00:00:00.	
9	In the **Workflow List**, select the ImportMEFP-GFSGrids workflow.	
10	Click **Run.**	
11	Wait for run to complete (< 1 minute).	We can see this in Logs once run is complete: 17:03:39 INFO - ********** Workflow ImportMEFP-GFSGrids Completed ********** 17:03:39 INFO - Start time: 2013-02-05 17:03:25 End time: 2013-02-05 17:03:39 T0: 2013-01-30 18:00:00 User Id:shaifh 17:03:39 INFO - TaskRun.Completed: Task ImportMEFP-GFSGrids with ID 5 completed in 0 minutes and 13 seconds. 17:03:39 INFO - TaskRun.TimeSpend:TimeSeriesImportRun 12s 92% TransformationModule 0s 2% datastore 0s 4% database 0 B 17:03:39 INFO - Workflow.ActivityCompleted: 'Workflow 'ImportMEFP-GFSGrids' completed in 0 minutes and 12 seconds
12	In the **Workflow List**, select the ImportMEFP-GEFSGrids workflow.	
13	Click **Run.**	
14	Wait for run to complete (< 1 minute)	We can see this in Logs once run is complete: NFO - ********** Workflow ImportMEFP-GEFSGrids Completed ********** NFO - Start time: 2013-02-05 17:06:01 End time: 2013-02-05 17:06:14 T0: 2013-01-30 18:00:00 User Id:s NFO - TaskRun.Completed: Task ImportMEFP-GEFSGrids with ID 6 completed in 0 minutes and 13 seconds.

#	Action	Expected Results
15	Click on the **Logs Panel** (to make it active) and press the F12 key.	A menu will appear: 
16	Select "**open database viewer**" (shortcut key: **J**).	
17	In the **Database Viewer Panel** that opens, select each workflow to verify there is data in the database.	
18	You should be able to see the EnsMean has been calculated for the GFS Workflow.	 MEFP_GFS_Interpolate_USA | Temperat... | FMAT MEFP_GFS_Interpolate_USA | Precip | FMAP MEFP_GFS_Grid_EnsMean | Precip | FMAP MEFP_GFS_Grid_EnsMean | Temperat... | FMAT
19	This is what you should see in the GEFS workflow.	 moduleInstance | group | parameterId | locationId 2 | 2 | 3 | 2 ImportMEFP_GEFS | Precip | FMAP | HEFS_GEFS ImportMEFP_GEFS | Temperat... | TFMN | HEFS_GEFS ImportMEFP_GEFS | Temperat... | TFMX | HEFS_GEFS MEFP_GEFS_Interpolate_USA | Precip | FMAP | HEFS_GEFS_USA MEFP_GEFS_Interpolate_USA | Temperat... | TFMX | HEFS_GEFS_USA MEFP_GEFS_Interpolate_USA | Temperat... | TFMN | HEFS_GEFS_USA

#	Action	Expected Results
20	This is what you should see in the CFSV2 workflow.	 moduleInstance | group | parameterId | qualifiers 4 | 2 | 3 | 1 MEFP_CFSv2_Interpolate_USA | Precip | FMAP | MEFP_CFSv2_Interpolate_USA | Temperat... | TFMX | MEFP_CFSv2_Interpolate_USA | Temperat... | TFMN | MEFP_CFSv2_Interpolate_Location_FMAP | Precip | FMAP | CFSv2 MEFP_CFSv2_Interpolate_Location_FMAP | Precip | FMAP | CFSv2 MEFP_CFSv2_Interpolate_Location_FMAP | Precip | FMAP | CFSv2 MEFP_CFSv2_Interpolate_Location_TFMX | Temperat... | TFMX | CFSv2 MEFP_CFSv2_Interpolate_Location_TFMX | Temperat... | TFMX | CFSv2 MEFP_CFSv2_Interpolate_Location_TFMX | Temperat... | TFMX | CFSv2
21	Click **Spatial Button** in the toolbar of the CHPS interface.	
22	When the **Spatial Display Panel** opens, on the left, expand all three of the following: “MEFP GFS EnsMean”, “MEFP GEFS”, and “MEFP CFSv2”.	There should not be any red X’s on any of the expanded nodes (a red X indicates missing data) and the tree should appear similar to the screen shot below: 

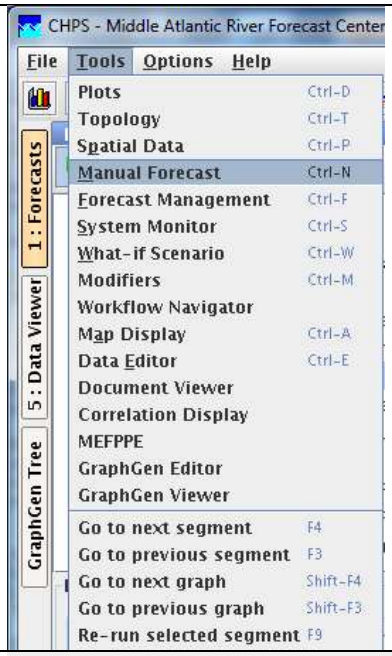
#	Action	Expected Results
23	Select each of the “Precip”, “Temperature”, and “Temperature Max/Min” nodes made visible in the last step and confirm that gridded data is displayed on the map to the right.	
24	From the **File Menu**, select “**Exit**” to close the standalone.	

2.2 MEFP PE

2.2.1 Test Prerequisites

CHPS is configured with the MEFPPE components as described in the document *MEFPPE Configuration Guide*. Below is the same information from the confirmation section of the configuration guide. The directory <*configuration_dir*>/Import/mefppe_cardfiles should already be populated with MAP and MAT datacard files.

2.2.2 Test Procedure

#	Action	Expected Results
1	Start FEWS using the installation standalone: ***cd*** *<region_dir>* ***cd ..*** ***./hefsPlugins/fews_hefsPlugins.sh ##rfc_sa &***	FEWS will be started. The splash screen displayed will vary by RFC. The default splash screen is: After a short time, the CHPS interface will open.
2	In CHPS, run the "**ImportMEFPPEHistoricalData**" workflow. Choose Tools (menu), Manual Forecast (menu option).	
3	Under Workflow (pull down menu), choose **ImportMEFPPEHistoricalData.** It may be the last Workflow.	

#	Action	Expected Results
4	Click **Run** (button). 	Output (in the CHPS log area) will have "Workflow ImportMEFPPEHistoricalData Completed", as shown in Figure 1 below. The historical MAP/MAT datacards have been imported.

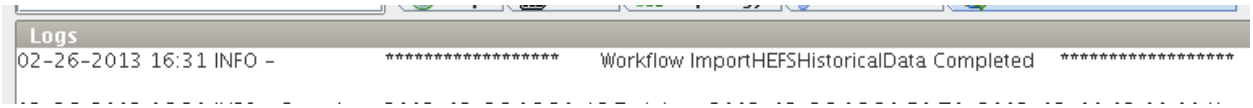
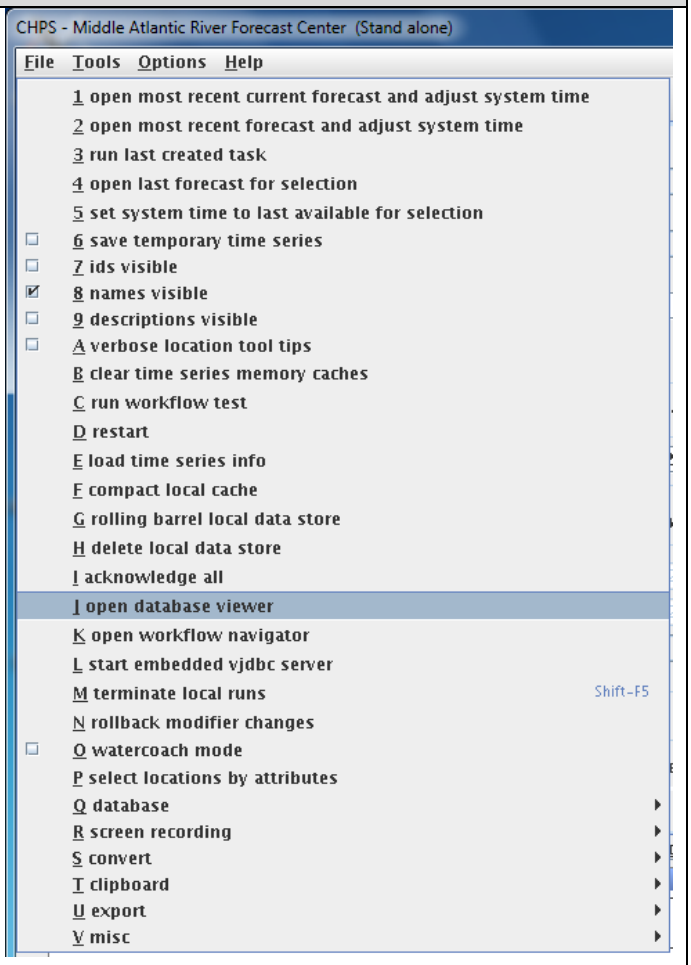
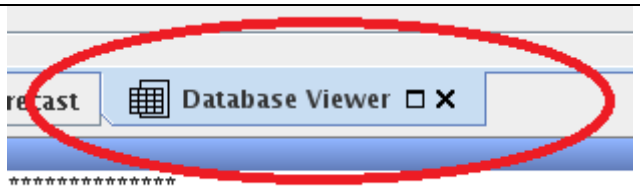
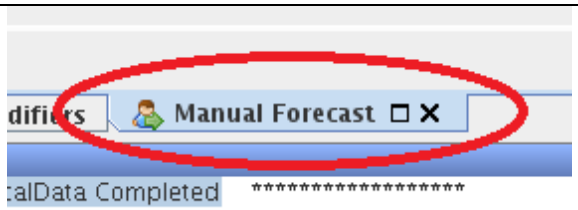
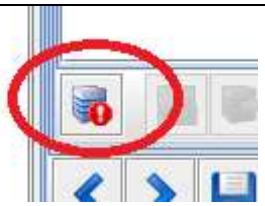
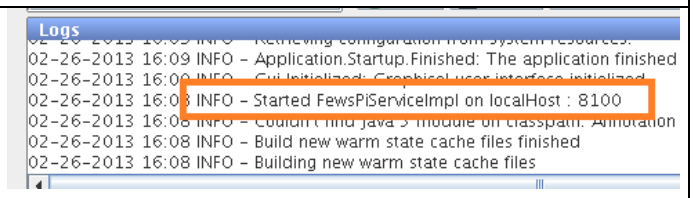
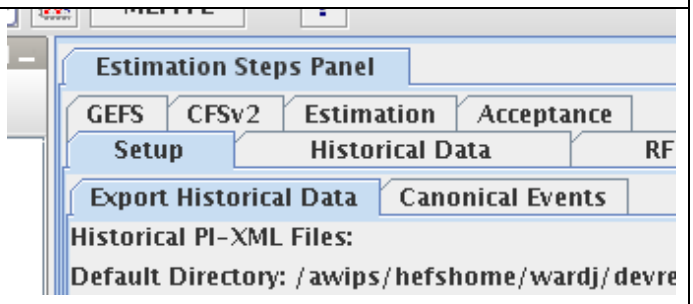
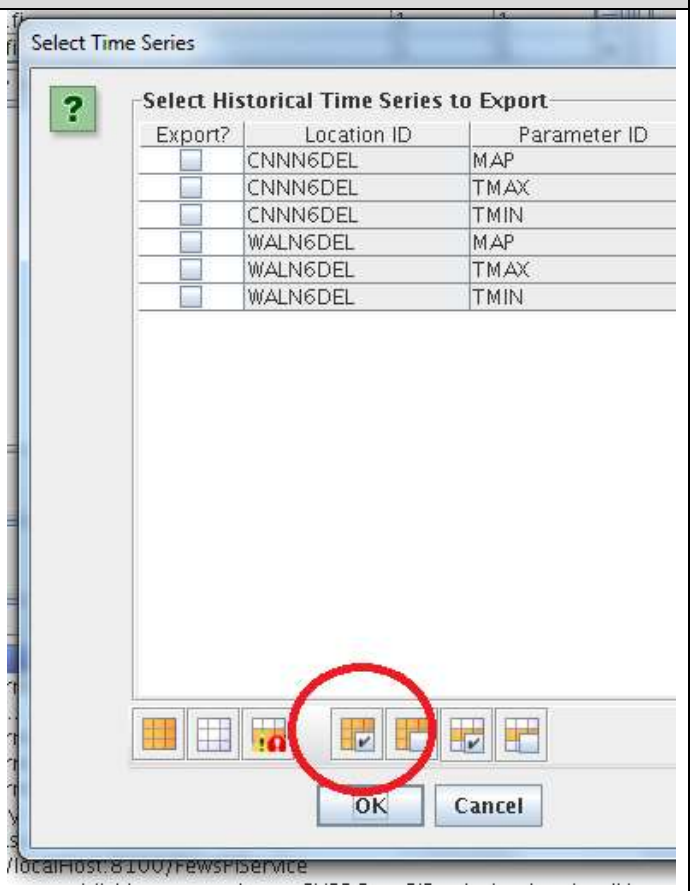


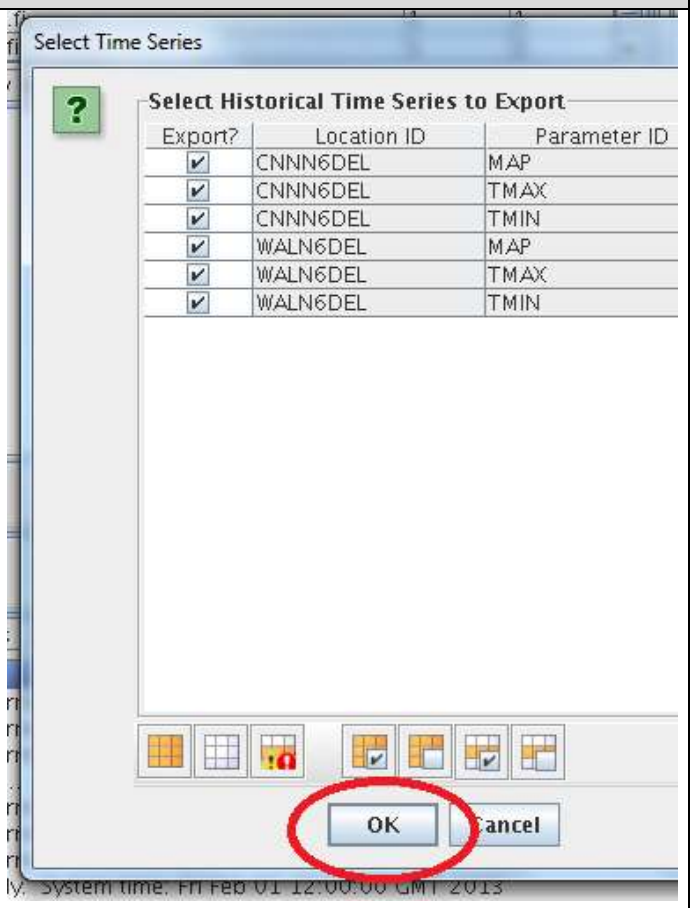
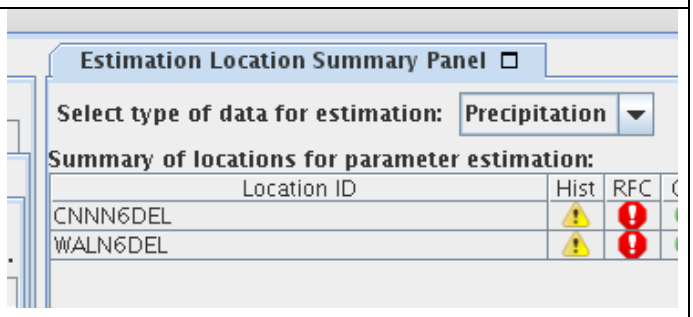
Figure 1

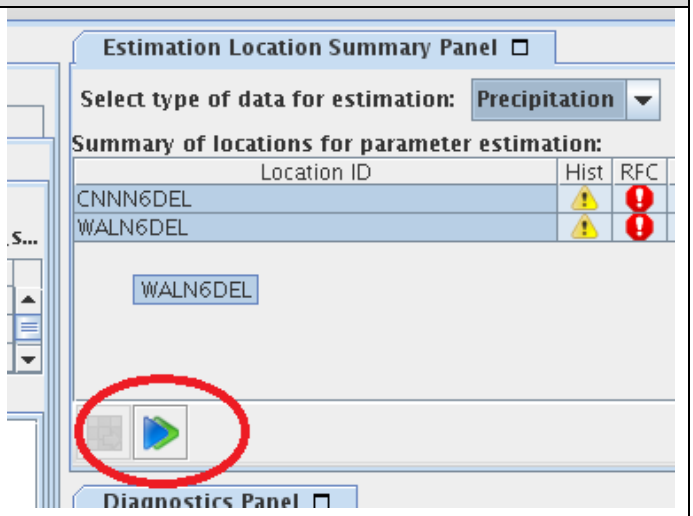
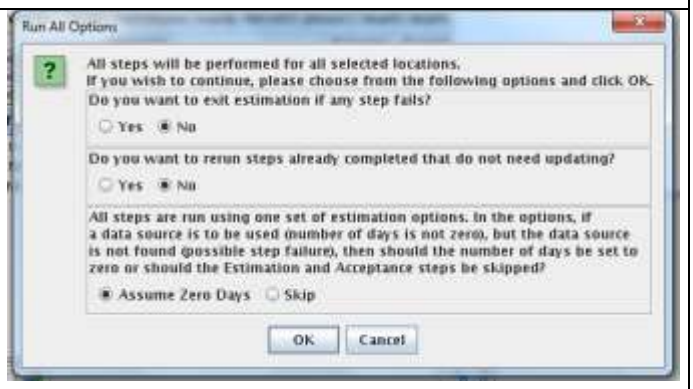
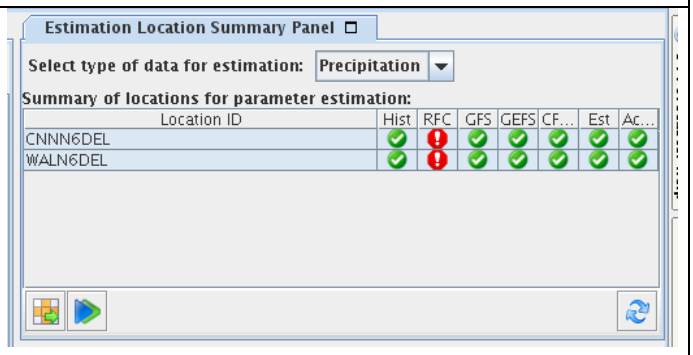
#	Action	Expected Results
5	Click in the CHPS **Logs Panel**, press the <F12 key>, and press the <**J**> key to open the **Database Viewer**.	

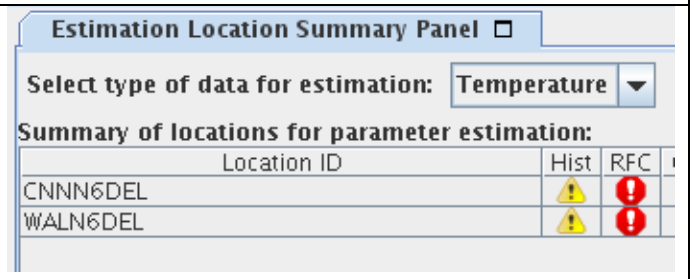
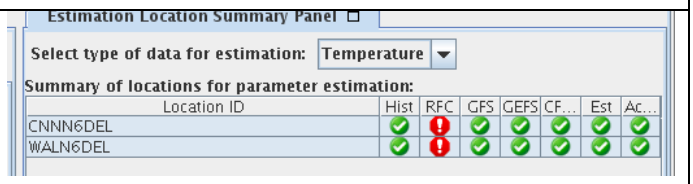
#	Action	Expected Results
6	Confirm that the imported datacard time series are present and that the imported data appears reasonable. To do so, use the standard **Database Viewer** tool to select the imported time series and view them.	
7	Close the **Database Viewer** by clicking on the X at the bottom of the panel.	
8	Close the **Manual Forecast Dialog** by clicking on the X at the bottom of the window.	
9	Start the MEFPPE by clicking on the **MEFPPE** Button in the toolbar of the CHPS interface.	
10	Unless Graphics Generator was installed in the *installation standalone*, MEFPPE will not be connected to the PI-service (see the screen capture to the right). If the MEFPPE is connected to the PI-service, skip to Step 6. The Picture on right shows the PI-service is not connected.	
11	Scroll the **Logs Panel** to find your PI-service port number, looking for a log message that starts with “Started FewsPiServiceImpl on localHost…”.	

#	Action	Expected Results
12	Click on the **Reconnect to CHPS PI-service Button**, enter your PI-service port number (in this example 8100), and click OK.	
13	When successfully connected, the **Reconnect to CHPS PI-service** Button (highlighted in the red box) will show a green checkmark and the **Export Time Series from CHPS DB** Button (highlighted in the red box) will be enabled.	
14	Select **Export Historical Data** Tab in the **Setup** Subpanel of the **Estimation Steps Panel**.	
15	Click on the **Export Time Series from CHPS DB Button**.	

#	Action	Expected Results
16	Click on the **Check All Rows for Export** Button to check all rows in the table.	

#	Action	Expected Results
17	When all of the time series are selected, click **OK**.	
18	Select "Precipitation" in the **Select type of data for estimation** Drop down menu in the **Location Summary Panel**.	

#	Action	Expected Results
19	Shift + Click to select all rows and click on the **Run All** Button.	
20	Select **OK** in the **Run All Options** window. The parameters will be estimated from the Historical, GFS, GEFS, and the CFSv2 data sources. The RFC data source is not available. (If you wish to add RFC data, see Appendix B and Appendix C below.) A progress dialog will open to display parameter estimation progress. Parameter estimation may take a few minutes.	
21	When finished, all the boxes except RFC should be checked green in the **Summary of location for parameter estimation** Table**.**	

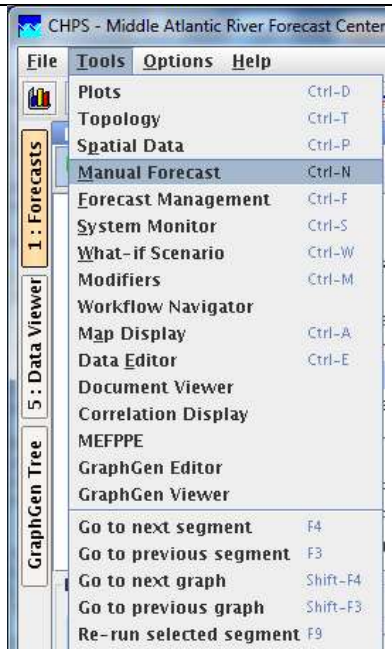
#	Action	Expected Results
22	You may see a **Perform All Errors Dialog** alerting you to missing RFC data. Click **OK**.	
23	As an additional check, the directory ***<mefp_root_dir>***/mefpParameters should contain the generated and accepted *.parameter.tgz files.	CNNN6DEL.precipitation.mefp.parameters.tgz WALN6DEL.precipitation.mefp.parameters.tgz
24	Select "Temperature" in the **Select type of data for estimation** drop down menu in the **Estimation Location Summary Panel** and perform steps 19 & 20 again.	
25	All the check boxes, except RFC, should be green.	
26	As an additional check, the directory ***<mefp_root_dir>***/mefpParameters should contain the generated and accepted *.parameter.tgz files.	CNNN6DEL.temperature.mefp.parameters.tgz WALN6DEL.temperature.mefp.parameters.tgz

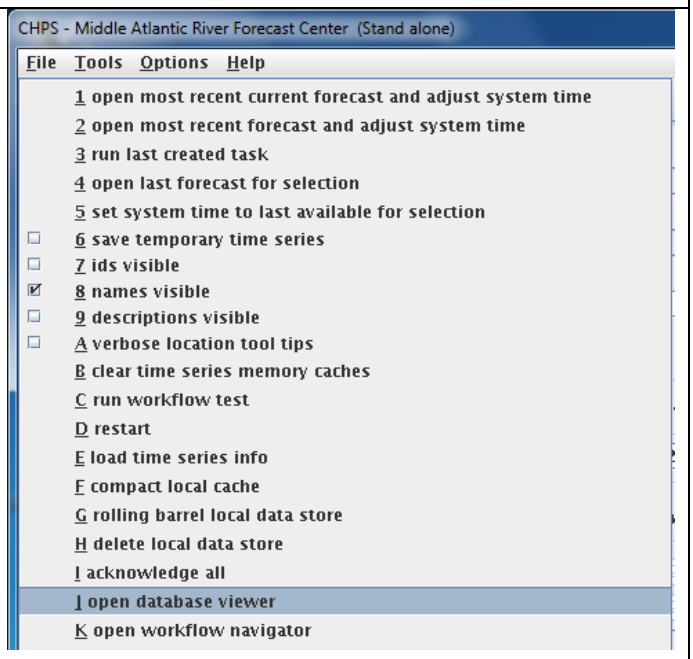
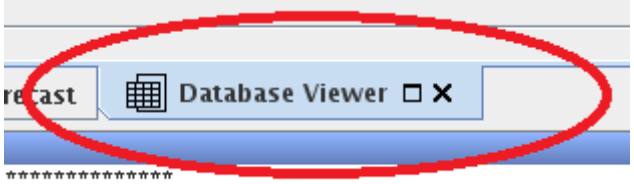
2.3 EnsPost PE

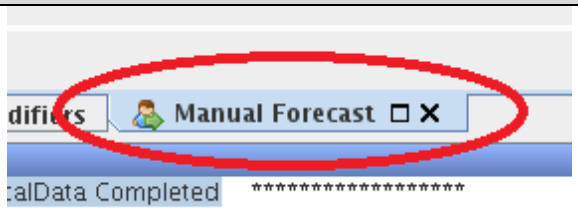
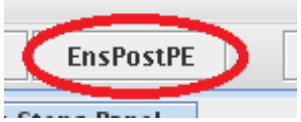
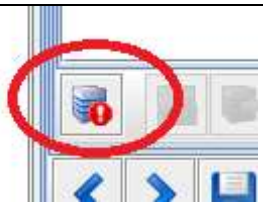
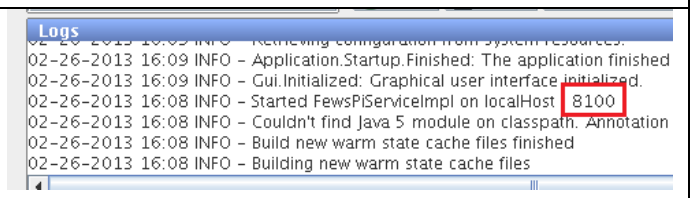
2.3.1 Test Prerequisite

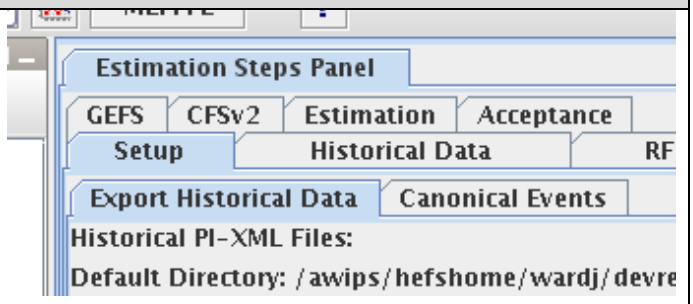
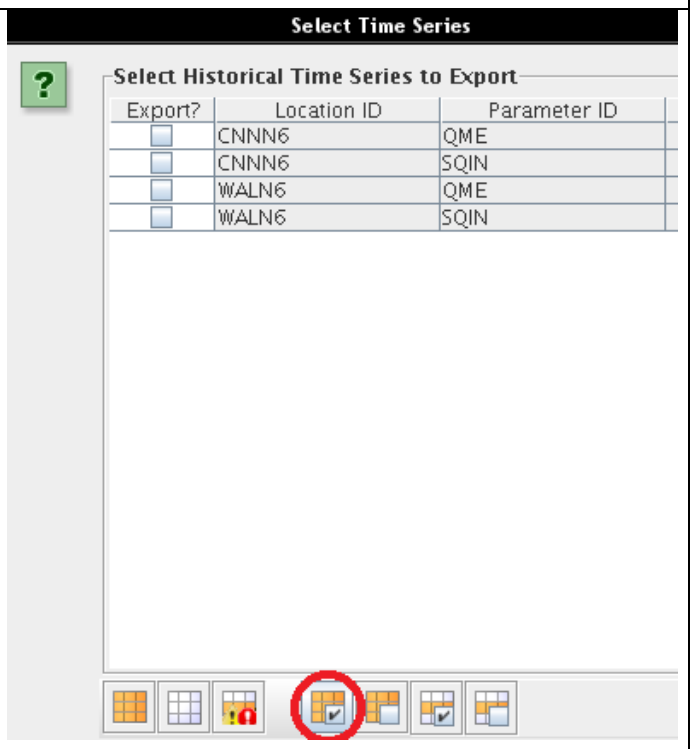
CHPS is configured with the EnsPostPE components as described in the document *EnsPostPE Configuration Guide*. Below is the same information from the confirmation section of the configuration guide. The directories should be populated with datacard files and pixml files.

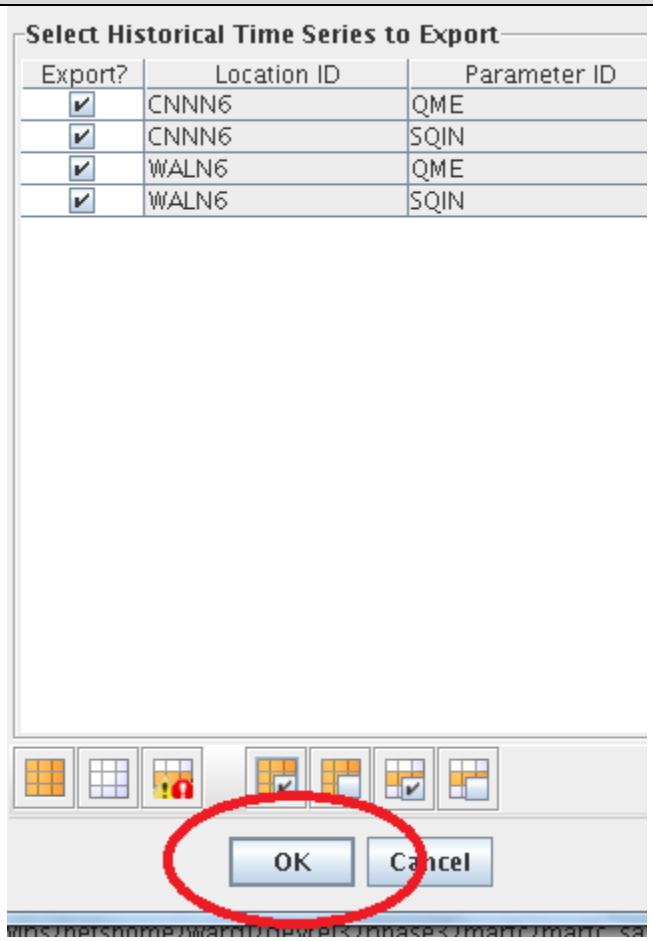
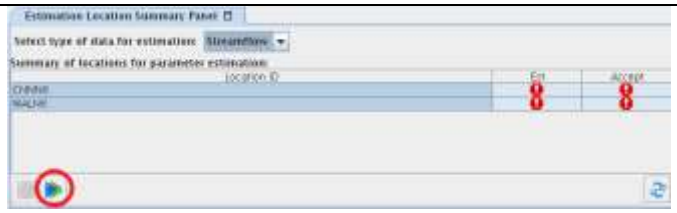
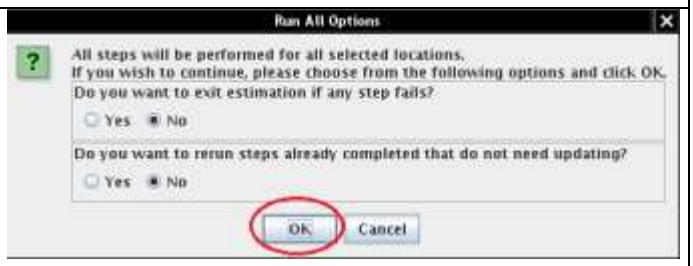
2.3.2 Test Procedure

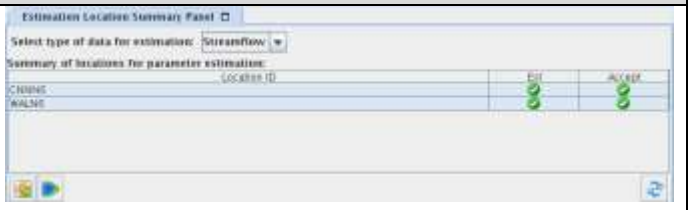
#	Action	Expected Results
1	Start FEWS using the installation standalone: ***cd*** *<region_dir>* ***cd ..*** ***./hefsPlugins/fews_hefsPlugins.sh ##rfc_sa &***	FEWS will be started. The splash screen displayed will vary by RFC. The default splash screen is: After a short time, the CHPS interface will open.
2	In CHPS run the "**ImportEnsPostPEHistoricalData**" workflow. Choose **Tools** (menu), **Manual Forecast** (menu option).	
3	Under Workflow (pull down menu), choose **ImportEnsPostPEHistoricalData.** It may be the last Workflow.	

#	Action	Expected Results
4	Click Run (button). 	Output (in the CHPS log area) will have “Workflow ImportEnsPostPEHistoricalData Completed”. The historical datacards and simulated pixml files have been imported.
5	Click in the **Logs panel**, hit the F12 key, and hit the **J** key to open the **database viewer**.	
6	The imported data should be present.	
7	Close the **Database Viewer** by clicking on the X at the bottom of the window.	

#	Action	Expected Results
8	Close the **Manual Forecast** by clicking on the X at the bottom of the window.	
9	Start the EnsPostPE by clicking on the in the toolbar of the CHPS interface. .	
10	The PI-service will be disconnected.	
11	Scroll the Logs panel to find your PI-service port number (here 8100).	
12	Click on the PI-service icon, enter your PI-service port number (8100 in this example), and click OK.	
13	When successfully connected, two database icons should be green.	

#	Action	Expected Results
14	**Select Export Historical Data** in the **Setup** subpanel of the **Estimation Steps Panel**.	
15	Click on the Export Time Series icon.	
16	Select All time series to export by pressing the "**Select All"** button?.	

#	Action	Expected Results
17	When all of the time series are selected, click OK.	
18	Shift + Click to select all Location ID rows, and then click on the Run All double arrow.	
19	Select **OK** in the **Run All Options** window.	

#	Action	Expected Results
20	When finished, all the boxes should be checked green.	
21	As an additional check, the directory **<ens_post_root_dir>**/ensPostParameters should contain the *.parameter.tgz files.	CNNN6.SQIN.enspost.parameters.tgz WALN6.SQIN.enspost.parameters.tgz

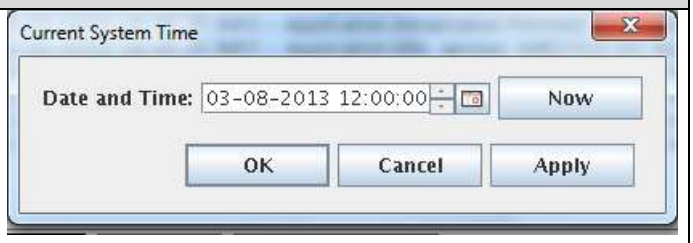
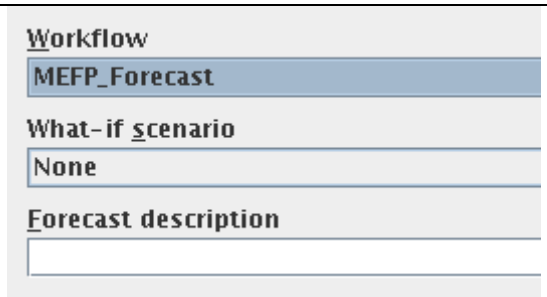
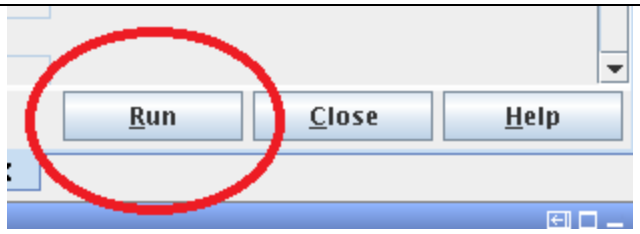
2.4 MEFP Forecast

2.4.1 Test prerequisite

CHPS is configured with the MEFP components as described in the document *MEFP Configuration Guide: Forecast*. Below is the same information from the confirmation section of the configuration guide. The data ingest components have been installed, and for a given forecast time (T0, system time), the GEFS and CFSv2 gridded forecasts must be present.

2.4.2 Test Procedure

#	Action	Expected Results
1	Start FEWS using the installation standalone: ***cd*** *<region_dir>* ***cd ..*** ***./hefsPlugins/fews_hefsPlugins.sh ##rfc_sa &***	FEWS will be started. The splash screen displayed will vary by RFC. The default splash screen is: After a short time, the CHPS interface will open.

#	Action	Expected Results
2	Only perform this step if the current system time is not correct for testing. Click on the **Current System Time** label at the bottom of the CHPS interface so that the **Current System Time** dialog opens. Set the system time appropriately and click **OK**.	
3	Click on the **Manual Forecast Button**.	
4	The **Manual Forecast Panel** will open, allowing you to select a workflow to run. In the Workflow List, select the MEFP_Forecast workflow and press the F12 key.	
5	In the **Manual Forecast Panel**, click Run.	
6	When MEFP Forecast is done, you should see "Workflow MEFP_Forecast Completed" in the logs panel: (see Figure 2 below)	

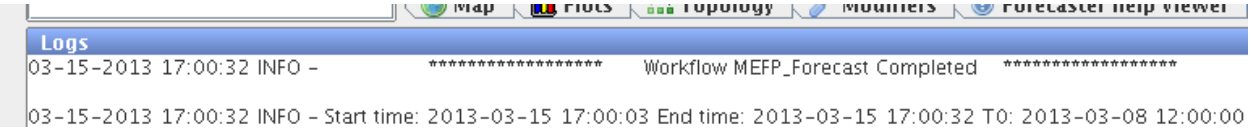


Figure 2

#	Action	Expected Results
7	To verify that ensembles were generated, click in the **Logs Panel**, hit the <F12> key, and hit the <J> key to open the **Database Viewer**.	1 open most recent current forecast 2 open most recent forecast and adj 3 run last created task 4 open last forecast for selection 5 set system time to last available f 6 save temporary time series 7 ids visible 8 names visible 9 descriptions visible A verbose location tool tips B clear time series memory caches C run workflow test D restart E load time series info F compact local cache G rolling barrel local data store H delete local data store I acknowledge all J open database viewer K open workflow navigator
8	MEFP_Forecast should be the last workflow you ran. Double click to open it. See Figure 3 below	

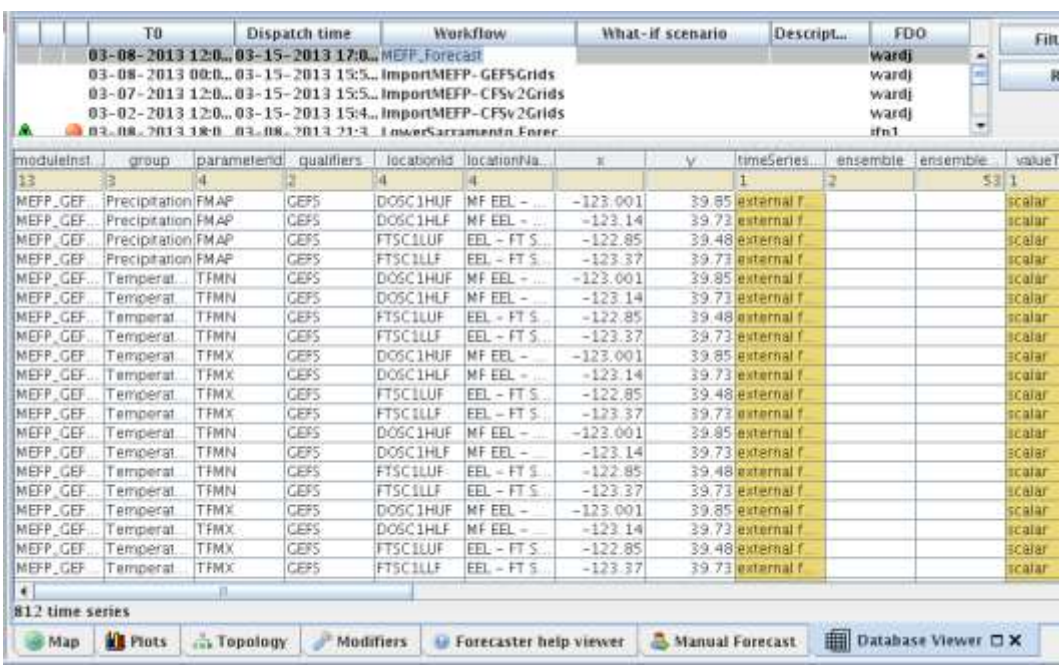
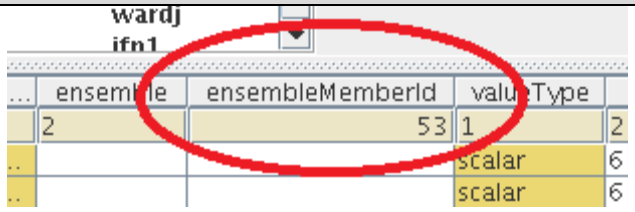
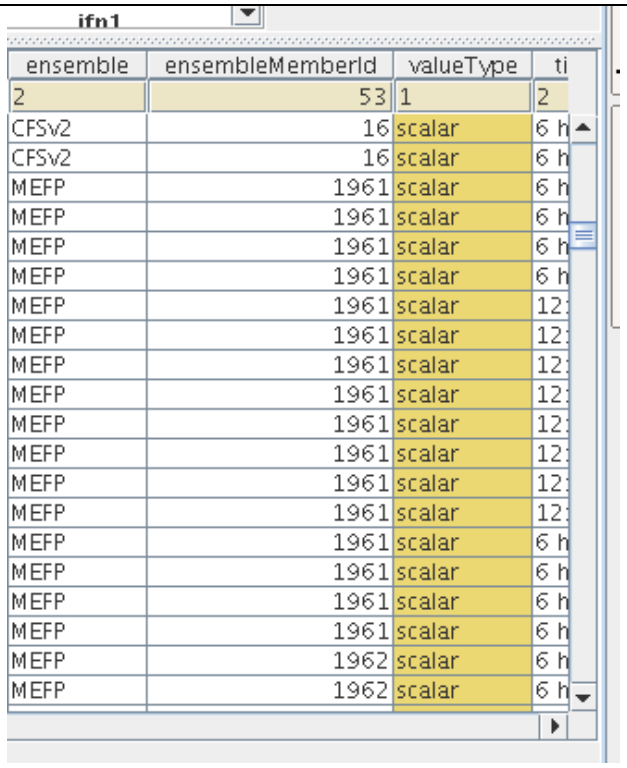
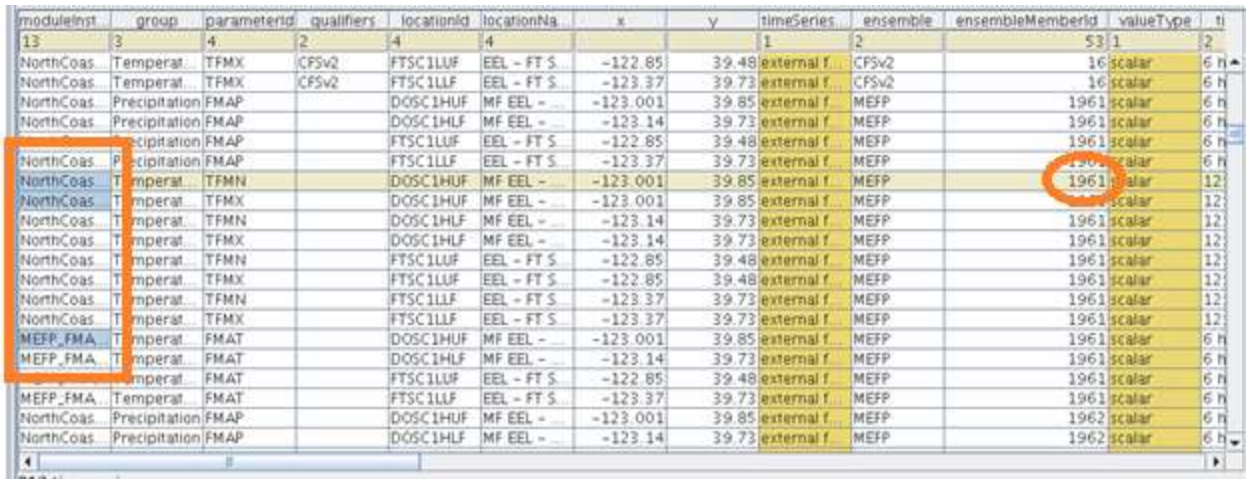


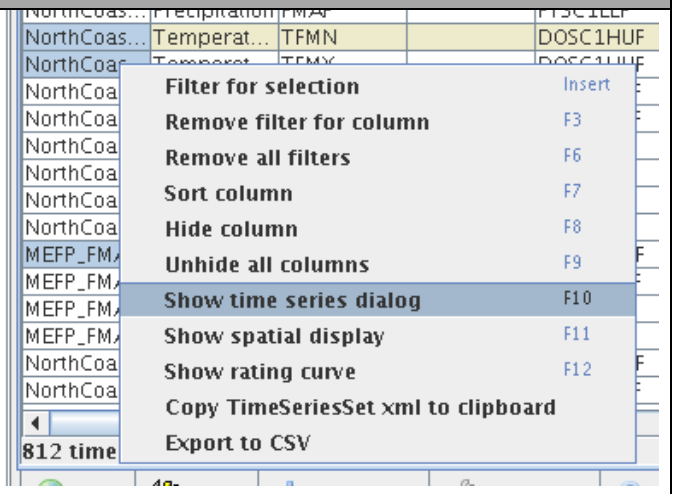
Figure 3

#	Action	Expected Results
9	Click on the "**ensembleMemberId**" column to sort by it. You may have to expand the column to see the full name.	
10	Scroll down to **ensembleMemberId** (year) 1961.	
11	Pick a **locationId**. This will vary between RFCs. In our example, locationId DOSC1HUF was chosen. <Shift> + left click to select the TFMN, TFMX, and FMAT for that location, and for one ensemble member index (1961, in Figure 4 below).	



moduleInst	group	parameterId	qualifiers	locationId	locationNa	x	y	timeSeries	ensemble	ensembleMemberId	valueType	ti
13	3	4	2	4	4			1	2	53	1	2
NorthCoas	Temperat	TFMX	CFSv2	FTSC1LUF	EEL - FT S	-122.85	39.48	external f	CFSv2	16	scalar	6 h
NorthCoas	Temperat	TFMX	CFSv2	FTSC1LLF	EEL - FT S	-123.37	39.73	external f	CFSv2	16	scalar	6 h
NorthCoas	Precipitation	FMAP		DOSC1HUF	MF EEL -	-123.001	39.85	external f	MEFP	1961	scalar	6 h
NorthCoas	Precipitation	FMAP		DOSC1HLF	MF EEL -	-123.14	39.73	external f	MEFP	1961	scalar	6 h
	ecipitation	FMAP		FTSC1LUF	EEL - FT S	-122.85	39.48	external f	MEFP	1961	scalar	6 h
NorthCoas	Precipitation	FMAP		FTSC1LLF	EEL - FT S	-123.37	39.73	external f	MEFP	1961	scalar	6 h
NorthCoas	Temperat	TFMN		DOSC1HUF	MF EEL -	-123.001	39.85	external f	MEFP	1961	alar	12
NorthCoas	Temperat	TFMX		DOSC1HUF	MF EEL -	-123.001	39.85	external f	MEFP		scalar	12
NorthCoas	Temperat	TFMN		DOSC1HLF	MF EEL -	-123.14	39.73	external f	MEFP	1961	scalar	12
NorthCoas	Temperat	TFMX		DOSC1HLF	MF EEL -	-123.14	39.73	external f	MEFP	1961	scalar	12
NorthCoas	Temperat	TFMN		FTSC1LUF	EEL - FT S	-122.85	39.48	external f	MEFP	1961	scalar	12
NorthCoas	Temperat	TFMX		FTSC1LUF	EEL - FT S	-122.85	39.48	external f	MEFP	1961	scalar	12
NorthCoas	Temperat	TFMN		FTSC1LLF	EEL - FT S	-123.37	39.73	external f	MEFP	1961	scalar	12
NorthCoas	Temperat	TFMX		FTSC1LLF	EEL - FT S	-123.37	39.73	external f	MEFP	1961	scalar	12
MEFP_FMA	Temperat	FMAT		DOSC1HUF	MF EEL -	-123.001	39.85	external f	MEFP	1961	scalar	6 h
MEFP_FMA	Temperat	FMAT		DOSC1HLF	MF EEL -	-123.14	39.73	external f	MEFP	1961	scalar	6 h
	mperat	FMAT		FTSC1LUF	EEL - FT S	-122.85	39.48	external f	MEFP	1961	scalar	6 h
MEFP_FMA	Temperat	FMAT		FTSC1LLF	EEL - FT S	-123.37	39.73	external f	MEFP	1961	scalar	6 h
NorthCoas	Precipitation	FMAP		DOSC1HUF	MF EEL -	-123.001	39.85	external f	MEFP	1962	scalar	6 h
NorthCoas	Precipitation	FMAP		DOSC1HLF	MF EEL -	-123.14	39.73	external f	MEFP	1962	scalar	6 h

Figure 4

#	Action	Expected Results
12	Right click and select "**Show time series dialog**". The **Database Viewer** will appear. TFMX is shown in red at top, TFMN is shown in blue at top, and generated FMAT is shown on the bottom. See Figure 5 below.	

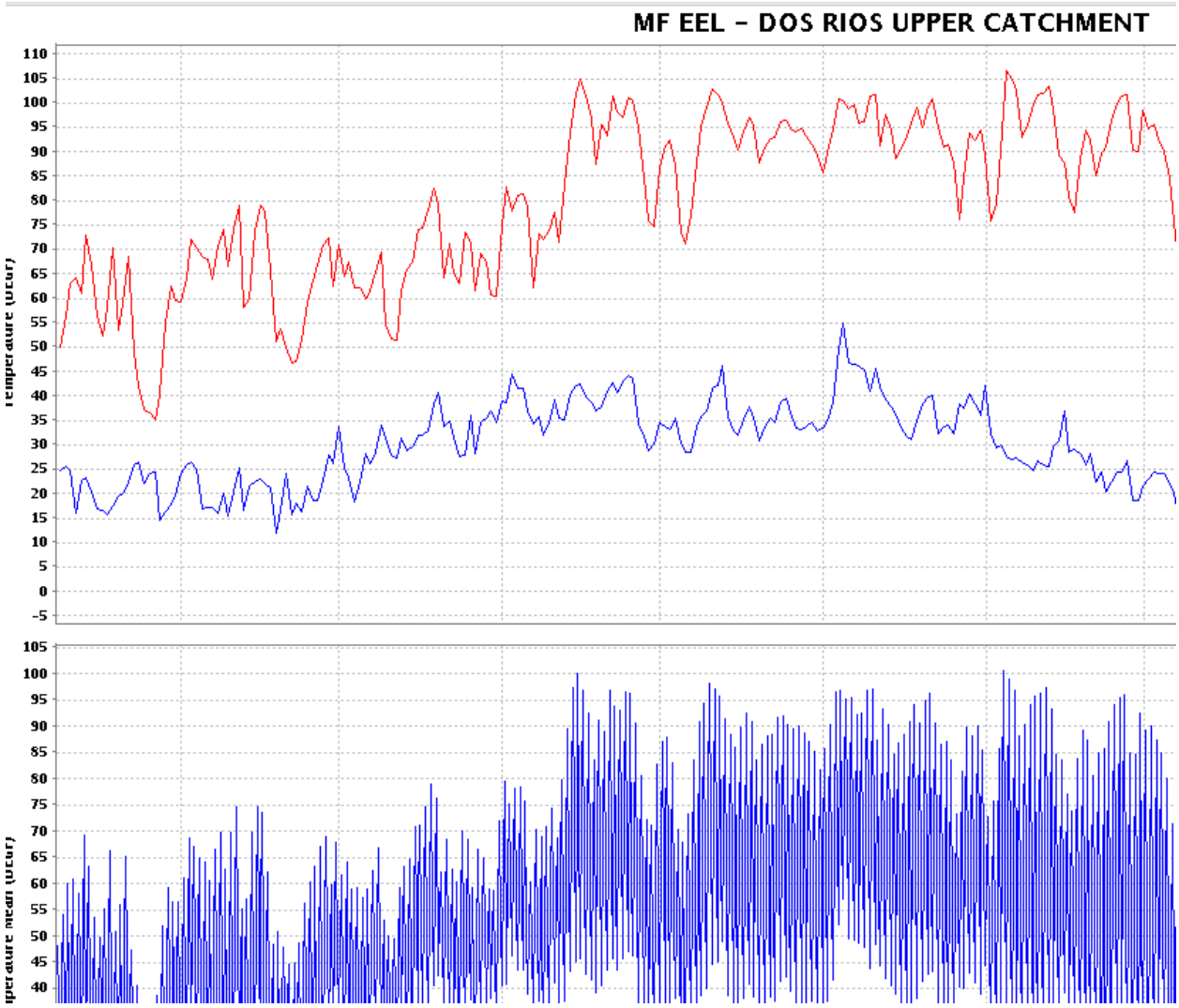


Figure 5

#	Action	Expected Results
13	For a better view, select a region of the **Database Viewer** by clicking and dragging a small rectangle from upper left to lower right. The generated FMAT should lie between the max and min temps. See Figure 6 below.	

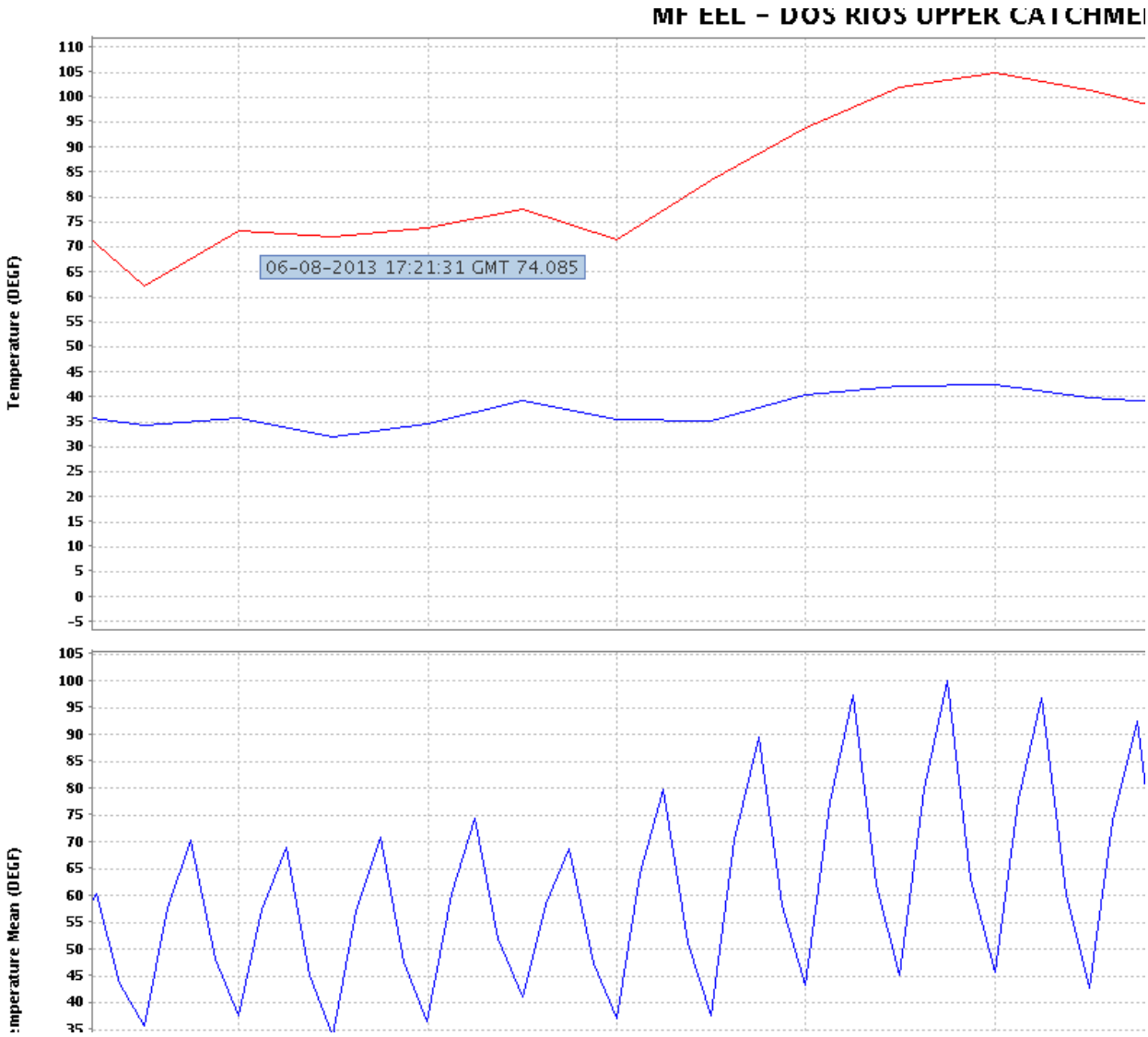

MF EEL - DOS RIOS UPPER CATCHME
Temperature (DEGF)
06-08-2013 17:21:31 GMT 74.085
Temperature Mean (DEGF)

Figure 6

2.5 EnsPost

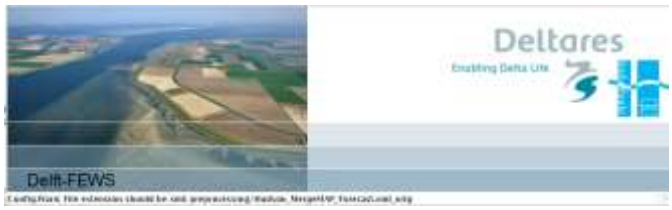
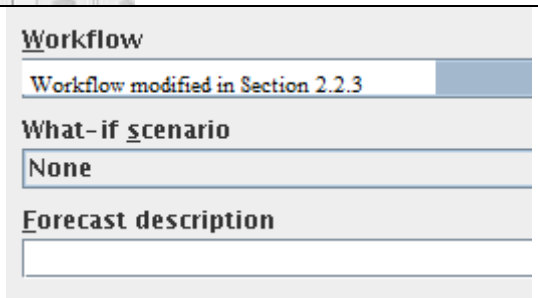
2.5.1 Test Prerequisite

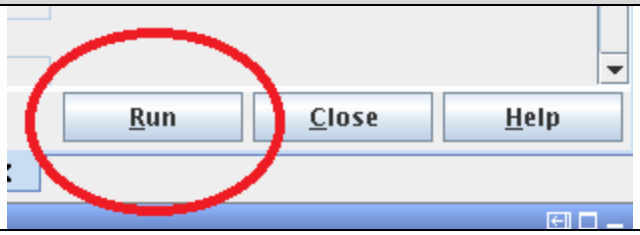
CHPS is configured with the EnsPost components as described in the document *EnsPost Configuration Guide*. Below is the same information from the confirmation section of the configuration guide. EnsPostPE is installed as described in the *EnsPostPE Configuration Guide.* The parameters .tgz file must be in the following format:

<LocationID>.<ParameterID>.enspost.parameters.tgz

Identify a workflow that generates an ensemble of stream flow forecasts. It can be an MEFP-based ensemble (see the *MEFP Configuration Guide: Forecast Components*) or an existing ESP workflow.

2.5.2 Test Procedure

#	Action	Expected Results
1	Start FEWS using the installation standalone: ***cd*** *<region_dir>* ***cd ..*** ***./hefsPlugins/fews_hefsPlugins.sh ##rfc_sa &***	FEWS will be started. The splash screen displayed will vary by RFC. The default splash screen is:  After a short time, the CHPS interface will open.
2	Click on the **Manual Forecast Button**.	
3	The **Manual Forecast Panel** will open, allowing you to select a workflow to run. In the Workflow List, select the workflow modified in the *EnsPostPE Configuration Guide*.	

#	Action	Expected Results
4	In the **Manual Forecast Panel**, click Run.	
5	Once the workflow is done.	You should see "Workflow Completed" in the logs panel. For example, "Workflow HEFS Forecast Completed"
6	Open the Database viewer in order to confirm that EnsPost successfully ran.	Select the workflow that was just completed in the database viewer, and find entries with the EnsembleID of HEFSENSPOST.

2.6 GraphGen

2.6.1 Test Prerequisite

CHPS is configured with the GraphGen components as described in the document *HEFS Graphics Generator Products Installation Guide*. Below is the same information from the confirmation section of the configuration guide. A localDataStore containing MEFP generated forecast ensembles, MEFP-based generated streamflow ensembles, and/or EnsPost post-processed streamflow ensembles.

2.6.2 Test Procedure

#	Action	Expected Results
1	Execute the workflow GraphGen_Create_HEFS_Products created in the *HEFS Graphics Generator Products Installation Guide* via the CHPS interface **Manual Forecast Panel** as normal (start CHPS, set the PI-service port number, open the panel, show all workflows, select the workflow, and click **Run**).	The HEFS product files will be created in the standard location (i.e., <*products_dir*>) specified by the baseOutputDir run file property (see *HEFS Graphics Generator Products Installation Guide*). The images will appear similar to Figures 7 - 9 shown below:

- *MEFP Results*: MEFP generated forecast ensembles of 6-hour FMAP and FMAT time series.

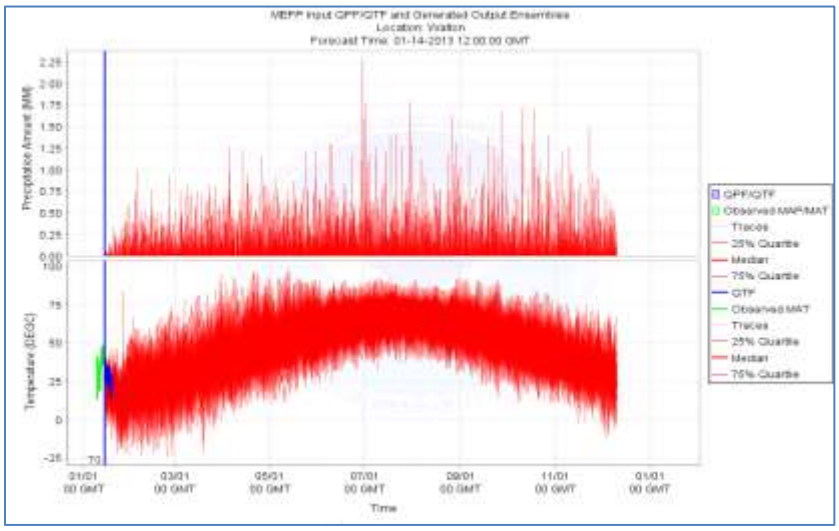


Figure 7

- *HEFS EnsPost Input*: Streamflow ensembles that are input to the HEFS EnsPost. If HEFS EnsPost is not used, the products can be used to display any streamflow ensemble.

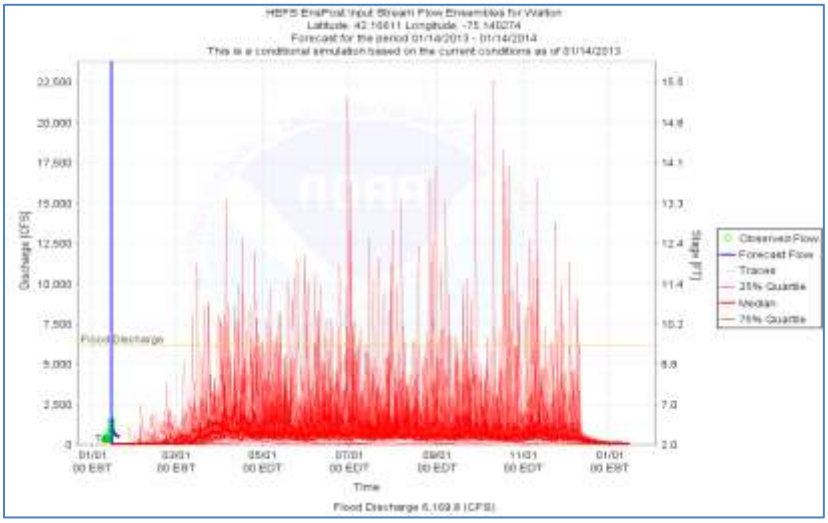


Figure 8

- *HEFS EnsPost Output*: Streamflow ensembles that are post-processed and output by the HEFS EnsPost.

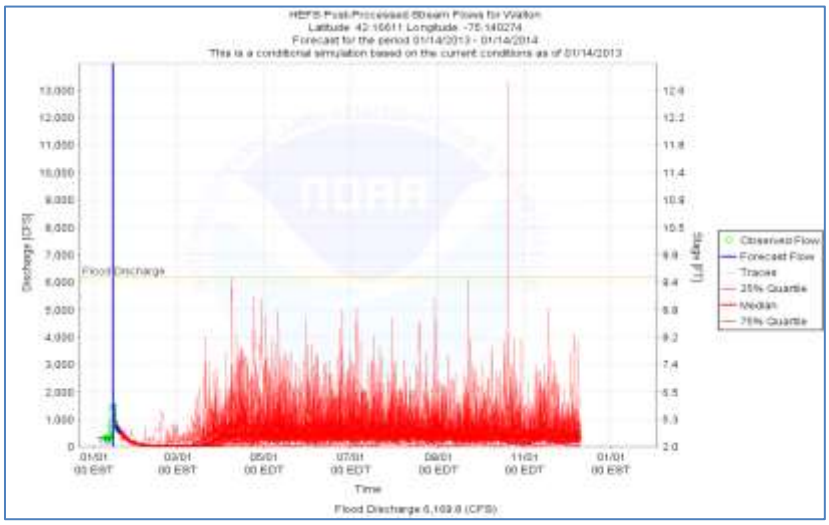


Figure 9

3 Testing Fixes

3.1 List of FogBugz tests

FogBugz ID	Tester	Test Procedure	Title
1086	CBRFC	N/A	Displaying GEFS grids for CONUS
1091	CNRFC	N/A	GDS Exception Error
1093	CNRFC	N/A	MEFPPE Explorer Plugin Error
1094	CNRFC	Yes	Model Import Time Period
1106	CNRFC	Yes	MEFPPE Parameter Estimating Error
1113	ABRFC	N/A	MEFPPE cannot read TAMN/TAMX files
1118	NERFC	N/A	Updates to non-software related files delivered with HEFS-0.3.2
1119	CBRFC	N/A	jar file missing from tarball (affects EnsPostPE and MEFPPE)
1124	CNRFC	N/A	Unable to calculate parameters
1133	ABRFC	Yes	MEFP RFC QPF seems unrealistic
1146	ABRFC	N/A	Slowness caused by adding MEFP to MergeMap
1150	CNRFC	Yes	MEFP performance issues at CNRFC
1166	MARFC	Yes	Bias in TMIN/TMAX data from 1-deg GEFS reforecasts
1186	CBRFC	Yes	MEFPPE Default Estimation parameters
1195	CNRFC	Yes	MEFP Temperature Issue

1202	ALL	Yes	Cleanup CFSv2 LaggedEnsemble.xml module files to remove WARNINGS messages
1209	OHD	N/A	Error applying EnsPost parameters

3.2 Fogbugz 1094 – Model Import Time Period

3.2.1 Description

The downloaded GEFS and CFSv2 model data does not appear to span from 1979-2010 when viewed through the MEFPPE diagnostic panel.

3.2.2 Cause

The start and end years of GFS, GEFS, CFSv2, RFC, and Climatology forcing data are different.

3.2.3 Fix

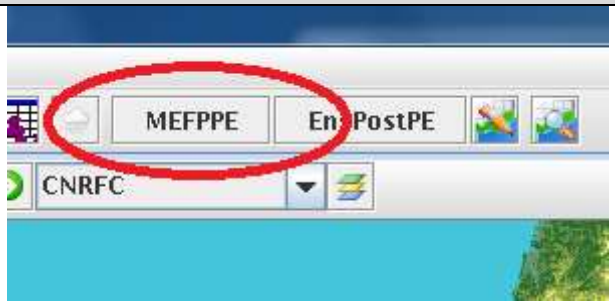
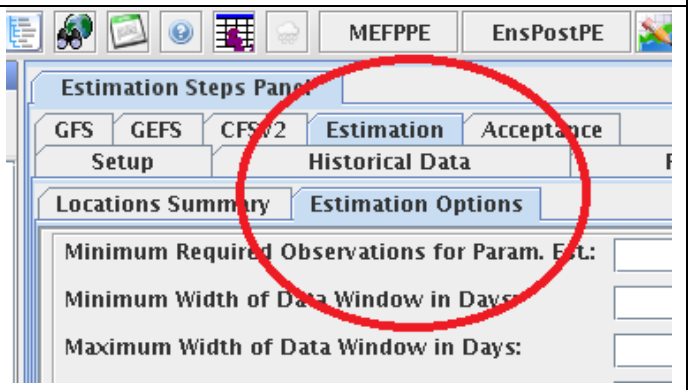
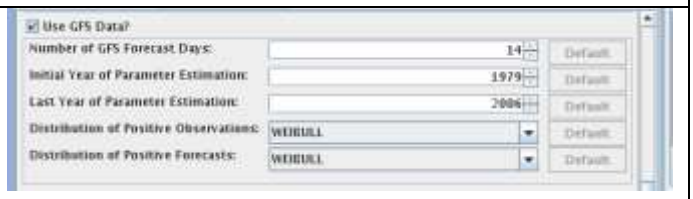
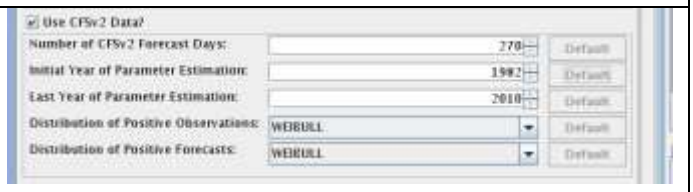
Default ranges for GFS, GEFS, CFSv2, RFC, and Climatology were updated to reflect proper ranges.

3.2.4 Notes

The proper ranges for the forcing data are reflected below:

- RFC – RFC specific
- GFS – 1979 to 2006
- GEFS – 1985 to 2012
- CFSv2 – 1982 to 2010
- Climatology – RFC specific

3.2.5 Test Procedure

#	Action	Expected Results
1	Select MEFPPE from the CHPS toolbar.	
2	Select the Estimation Options Tab in the Estimation Steps Panel.	
3	Verify all the GFS Default options.	
4	Verify all the GEFS Default options.	
5	Verify all the CFSv2 Default options.	

3.3 Fogbugz 1106 – MEFPPE Parameter Estimating Error

3.3.1 Description

An error was encountered when attempting to estimate any precipitation parameters in the Estimation Steps panel.

3.3.2 Cause

The minimum number of required observations was set at 500, but the number of CFSv2 reforecasts available was 348.

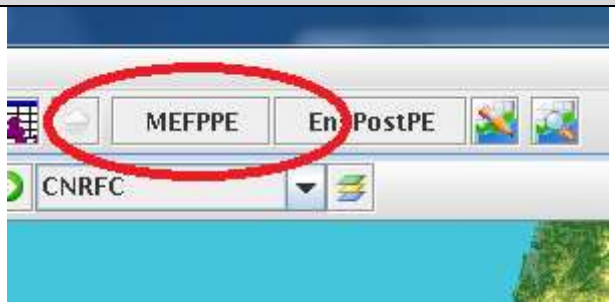
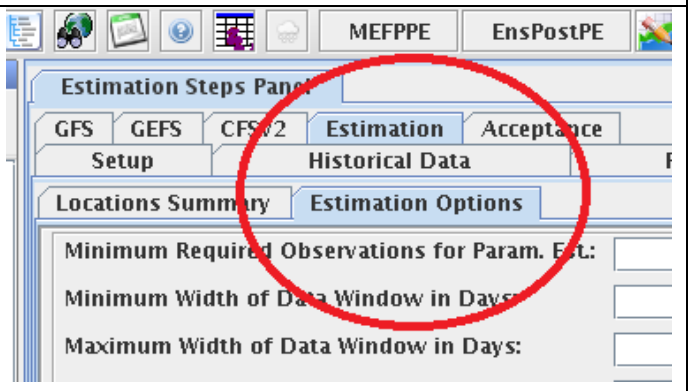
3.3.3 Fix

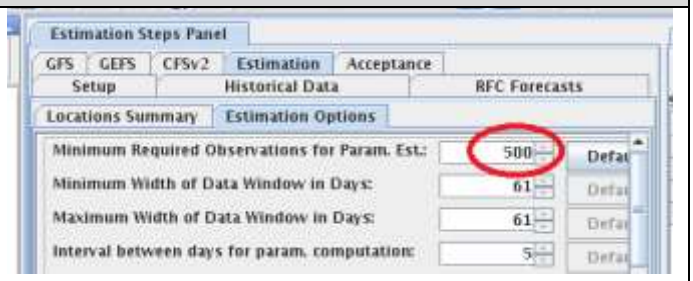
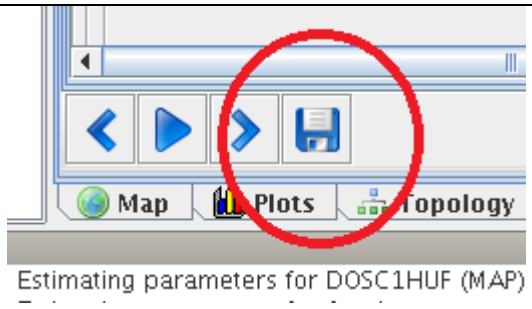
The code was changed to require a minimum of 340 observations.

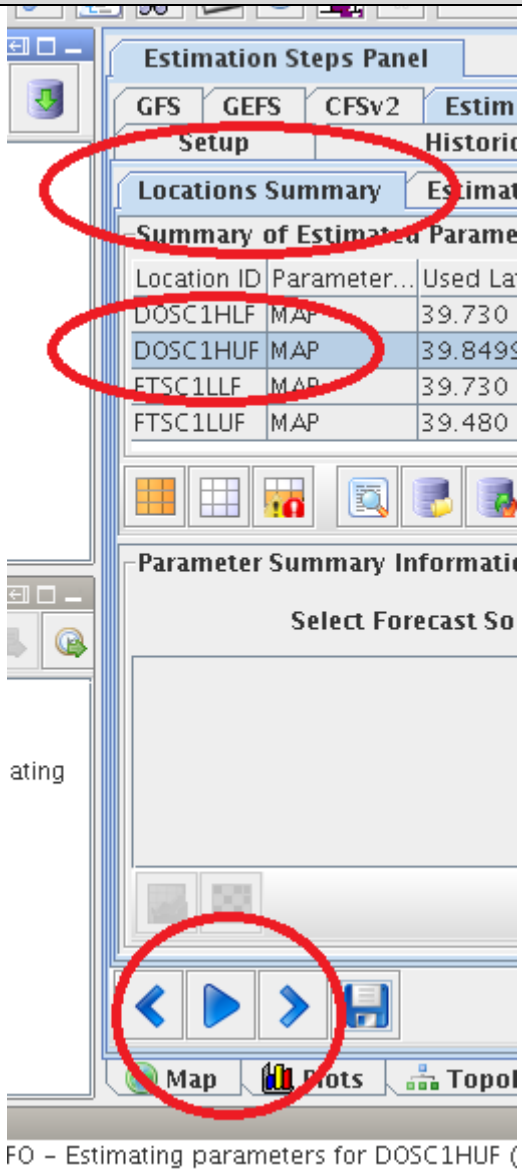
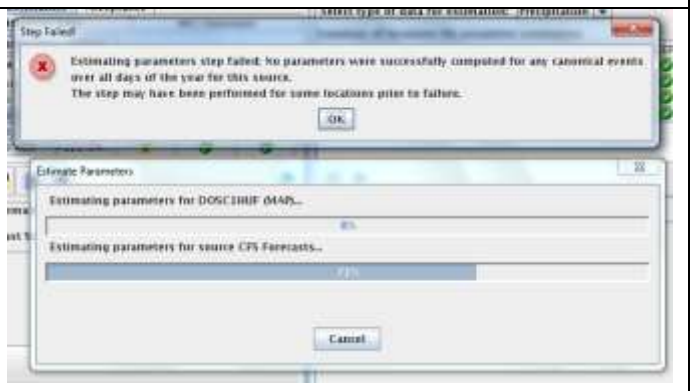
3.3.4 Notes

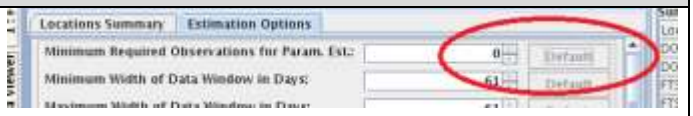
Parameter estimation for both temperature and precipitation will error out in the same manner if parameters are not estimated for any forecast sources for any reasons

3.3.5 Test Procedure

#	Action	Expected Results
1	Select MEFPPE from the CHPS toolbar.	
2	Select the Estimation Options Tab in the Estimation Steps Panel.	

#	Action	Expected Results
3	Set the Minimum Required Observations for Param Est. to 500.	
4	Save Run-time Information and select the Locations Summary Tab.	

#	Action	Expected Results
5	Select a location and Estimate Parameters.	
6	You should see a Step Failed! error box during CFSv2 parameter estimation.	

#	Action	Expected Results
7	Cancel the Estimate Parameters, return to the Estimation Options Tab, change the Minimum Required Observations for Param Est. to the Default, Save, and estimate the parameters again. You should see no error box.	

3.4 Fogbugz 1133 – MEFPPE Parameter Estimating Error

3.4.1 Description

MEFPPE could not find TMAX and TMIN files that were successfully generated.

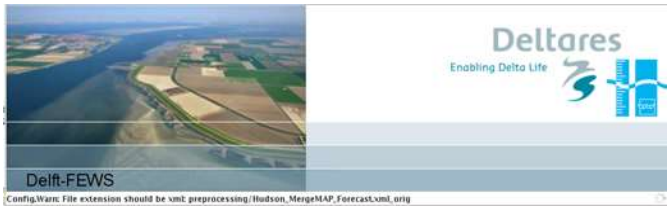
3.4.2 Cause

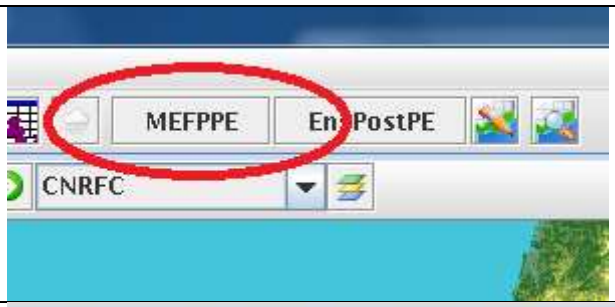
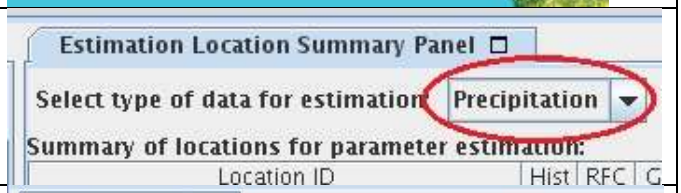
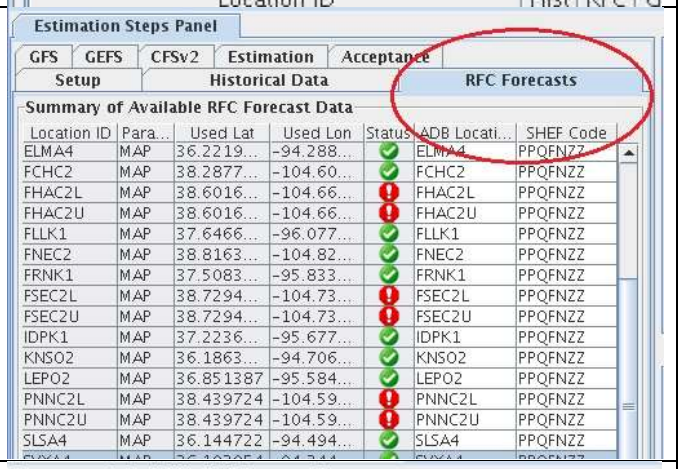
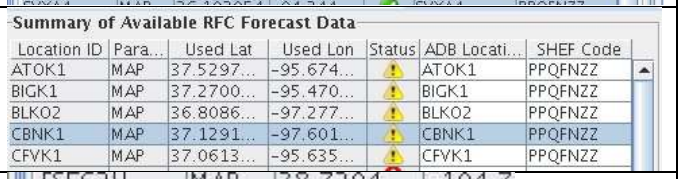
Idmapping at the PI Config file was pointing to the wrong Id map.

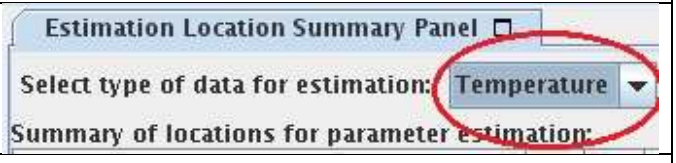
3.4.3 Fix

The existing PI configuration file was used instead of the delivered one that did not point to importdatacard for MAP unusable file in the historical directory was deleted. The code was changed to discard any time series headers pulled from the PI-service that did not have an unused time series (i.e., those that are not MAP, TMIN, or TMAX).

3.4.4 Test Procedure

#	Action	Expected Results
1	Check HEFS related configuration files under Config/WorkflowFiles/, Config/SystemCofigFiles/, Config/RegionConfigFiles/ etc, see whether HEFS has been set up permission for particular user. If yes, modify them properly.	Tester has the permission to run HEFS related workflows, and view results.
2	Start FEWS using the standalone: ./hefsPlugins/fews_hefsPlugins.sh.rboff ##rfc_sa &	After a short time, the CHPS interface will open 

3	Start MEFPPE from the CHPS toolbar	
4	Make sure the right side “Estimation Location Summary Panel” has ‘Precipitation’ data type selected	
5	Select “RFC Forecasts” tab	
6	Select the Location(s) that want to export	
7	Click the “Edit Database Connection” button	

8	"Edit Database Connection" window will pop up	
9	In the pop-up window, specify the connection parameters properly, click "Ok"	
10	Click "Prepare RFC Forecast Pairs" Button	
11	Check the newly generated RFC forecast and observation precipitation data files under $HEFSMODELSDIR/mefppeRunArea/rfcForecastData/rfc_pfcst06/ and $HEFSMODELSDIR/mefppeRunArea/rfcForecastData/rfc_pobs06/ respectively	The units field in these files have been defined as: "units = in"
12	Select data type 'Temperature' on the right side "Estimation Location Summary Panel	
13	Repeat Steps 5 ~ 10	
14	Check the newly generated RFC forecast and observation temperature data files under $HEFSMODELSDIR/mefppeRunArea/rfcForecastData/rfc_tfcst/ and $HEFSMODELSDIR/mefppeRunArea/rfcForecastData/rfc_tobs/ respectively	The units field in these files have been defined as: "units = degf"

3.5 Fogbugz 1150 – MEFP performance issues at CNRFC

3.5.1 Description

CNRFC noticed slowness when running MEFP for all 302 locations. Early signs show slowness in the MEFP_FMAT_Forecast module.

3.5.2 Cause

The configurations were not optimized.

3.5.3 Fix

The MEFP configuration files were modified to execute the MEFP_MAT_Forecast module (which converts all TFMN/TFMX data to FMAT forecast data) as an ensemble and take use of the multi-core option within FEWS.

3.5.4 Test Procedure

#	Action	Expected Results
1	Under Config/WorkflowFiles/hefs/, find the workflow file (e.g. MEFP_Preprocessing_and_Temp_Forecast.xml or MEFP_Forecast.xml) that executes the module "MEFP_FMAT_Forecast". Edit above found workflow file, add the <ensemble> attribute (highlighted green in the following example) to the section of MEFP_FMAT_Forecast module if the <ensemble> was not defined: <!-- Converts all TFMN/TFMX data to FMAT forecast data for all groups at once. --> <activity> <runIndependent>true</runIndependent> <moduleInstanceId>MEFP_FMAT_Forecast</moduleInstanceId> <ensemble> <ensembleId>MEFP</ensembleId> <runInLoop>true</runInLoop> </ensemble> </activity>	MEFP_FMAT_Forecast module is executed as ensemble
2	Check file MEFP_FMAT_Forecast.xml Under Config/ModuleConfigFiles/hefs/preprocessingMEFP/, delete all <ensembleId>MEFP</ensembleId> lines	
3	If 'runInLoopParallelProcessorCount' property has not been set to your RFC's MAXIMUM number of cores available, add the property runInLoopParallelProcessorCount=100 in 'sa_global.properties'	Will take use of all available FEWS processors.
4	Check HEFS related configuration files under Config/WorkflowFiles/, Config/SystemCofigFiles/,	Tester has the permission to run HEFS related workflows,

	Config/RegionConfigFiles/ etc, see whether HEFS has been set up permission for particular user. If yes, modify them properly.	and view results.
5	Start FEWS using the standalone: ./hefsPlugins/fews_hefsPlugins.sh.rboff ##rfc_sa &	After a short time, the CHPS interface will open
6	From CHPS "Manual Forecast", run the workflow referred in Step #1, record the run time for MEFP_FMAT_Forecast activity	It should take acceptable number of minutes
7	Save a copy of the workflow file modified in Step 1; edit this workflow file, remove the <ensemble> attribute for MEFP_FMAT_Forecast module: <!-- Converts all TFMN/TFMX data to FMAT forecast data for all groups at once. --> <activity> <runIndependent>true</runIndependent> <moduleInstanceId>MEFP_FMAT_Forecast</moduleInstanceId> </activity>	MEFP_FMAT_Forecast module will not be executed as ensemble
8	Save a copy of Config/ModuleConfigFiles/hefs/preprocessingMEFP/MEFP_FMAT_Forecast.xml as MEFP_FMAT_Forecast.xml_bckup; add the <ensembleId> attribute in file MEFP_FMAT_Forecast.xml <!-- Inputs are the TFMN and TFMX output by the MEFP Ensemble Generator. --> <variable> <variableId>input_tfmn</variableId> <timeSeriesSet> <moduleInstanceSetId>ALL_MEFP_TFMN_TFMX_Forecasts</moduleInstanceSetId> <valueType>scalar</valueType> <parameterId>TFMN</parameterId> <locationSetId>Catchments_HEFS</locationSetId> <timeSeriesType>external forecasting</timeSeriesType> <timeStep times="12:00"/> <readWriteMode>read complete forecast</readWriteMode> <ensembleId>MEFP</ensembleId> </timeSeriesSet> </variable> <variable> <variableId>input_tfmx</variableId> <timeSeriesSet>	

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        <parameterId>TFMX</parameterId>
        <locationSetId>Catchments_HEFS</locationSetId>
        <timeSeriesType>external forecasting</timeSeriesType>
        <timeStep times="12:00"/>
        <readWriteMode>read complete forecast</readWriteMode>
        <ensembleId>MEFP</ensembleId>
      </timeSeriesSet>
    </variable>

      <!-- Output is the FMAT time series. -->
      <variable>
        <variableId>output_fmat</variableId>
        <timeSeriesSet>

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            <parameterId>FMAT</parameterId>
            <locationSetId>Catchments_HEFS</locationSetId>
            <timeSeriesType>external forecasting</timeSeriesType>
            <timeStep unit="hour" multiplier="6"/>
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startOverrulable="true" end="365" endOverrulable="true"/>
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      <!-- Intermediary: 18Z time series -->

      <variable>
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startOverrulable="true" end="365" endOverrulable="true"/>
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startOverrulable="true" end="365" endOverrulable="true"/>
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      <!-- Intermediary: 0Z time series -->

      <variable>
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```
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startOverrulable="true" end="365" endOverrulable="true"/>
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    <!-- Intermediary: 6Z time series -->

    <variable>
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    <variable>
        <variableId>tfmx_6z_after</variableId>
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    <!-- Intermediary: 12Z time series -->

    <variable>
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            <qualifierId>sample12Zafter</qualifierId>
            <locationSetId>Catchments_HEFS</locationSetId>
            <timeSeriesType>temporary</timeSeriesType>
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startOverrulable="true" end="365" endOverrulable="true"/>
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            <ensembleId>MEFP</ensembleId>
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```

```
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            <timeSeriesType>temporary</timeSeriesType>
            <timeStep times="12:00"/>
            <relativeViewPeriod unit="day" start="0"
startOverrulable="true" end="365" endOverrulable="true"/>
            <readWriteMode>add originals</readWriteMode>
            <ensembleId>MEFP</ensembleId>
        </timeSeriesSet>
    </variable>

    <!-- Intermediary: Four FMAT time series computed via diurnal
computations from shifted TS. -->
```

```
    <variable>
      <variableId>output_fmat_18z</variableId>
      <timeSeriesSet>

<moduleInstanceId>MEFP_FMAT_Forecast</moduleInstanceId>
          <valueType>scalar</valueType>
          <parameterId>FMAT</parameterId>
          <qualifierId>shift18</qualifierId>
          <locationSetId>Catchments_HEFS</locationSetId>
          <timeSeriesType>temporary</timeSeriesType>
          <timeStep times="18:00"/>
          <relativeViewPeriod unit="day" start="0"
startOverrulable="true" end="365" endOverrulable="true"/>
          <readWriteMode>add originals</readWriteMode>
          <ensembleId>MEFP</ensembleId>
      </timeSeriesSet>
    </variable>
    <variable>
      <variableId>output_fmat_0z</variableId>
      <timeSeriesSet>

<moduleInstanceId>MEFP_FMAT_Forecast</moduleInstanceId>
          <valueType>scalar</valueType>
          <parameterId>FMAT</parameterId>
          <qualifierId>shift12</qualifierId>
          <locationSetId>Catchments_HEFS</locationSetId>
          <timeSeriesType>temporary</timeSeriesType>
          <timeStep times="00:00"/>
          <relativeViewPeriod unit="day" start="0"
startOverrulable="true" end="365" endOverrulable="true"/>
          <readWriteMode>add originals</readWriteMode>
          <ensembleId>MEFP</ensembleId>
      </timeSeriesSet>
    </variable>

    <variable>
      <variableId>output_fmat_6z</variableId>
      <timeSeriesSet>

<moduleInstanceId>MEFP_FMAT_Forecast</moduleInstanceId>
          <valueType>scalar</valueType>
          <parameterId>FMAT</parameterId>
          <qualifierId>shift6</qualifierId>
          <locationSetId>Catchments_HEFS</locationSetId>
          <timeSeriesType>temporary</timeSeriesType>
          <timeStep times="06:00"/>
          <relativeViewPeriod unit="day" start="0"
startOverrulable="true" end="365" endOverrulable="true"/>
          <readWriteMode>add originals</readWriteMode>
          <ensembleId>MEFP</ensembleId>
      </timeSeriesSet>
    </variable>
```

	<variable> <variableId>output_fmat_12z</variableId> <timeSeriesSet> <moduleInstanceId>MEFP_FMAT_Forecast</moduleInstanceId> <valueType>scalar</valueType> <parameterId>FMAT</parameterId> <qualifierId>shift0</qualifierId> <locationSetId>Catchments_HEFS</locationSetId> <timeSeriesType>temporary</timeSeriesType> <timeStep times="12:00"/> <relativeViewPeriod unit="day" start="0" startOverrulable="true" end="365" endOverrulable="true"/> <readWriteMode>add originals</readWriteMode> <ensembleId>MEFP</ensembleId> </timeSeriesSet> </variable> . . .	
9	In CHPS, from “File” menu, select “Reload Configuration” or F5	Modified module configuration files will be used
10	Repeat Step #6, run the workflow, record the run time for MEFP_FMAT_Forecast activity	It would take much longer time than Step #6
11	Recover the workflow file and MEFP_FMAT_Forecast.xml from the saved copy in Step #7 and Step #8	

3.6 Fogbugz 1166 – Bias in TMIN/TMAX data from 1-deg GEFS reforcasts

3.6.1 Description

TMIN and TMAX from 1-deg GEFS reforecasts for some locations in CN and MA show noticeable difference from observed values.

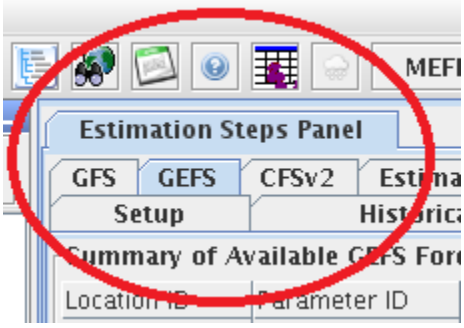
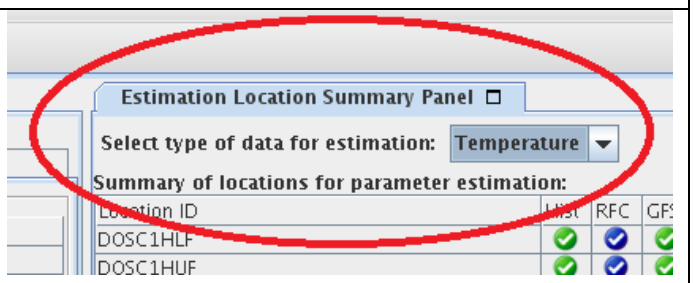
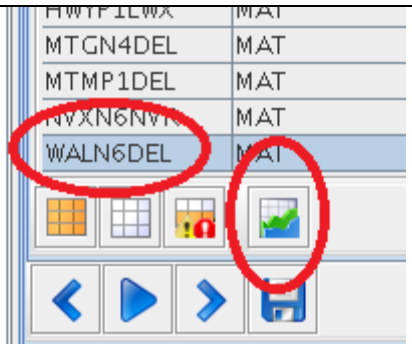
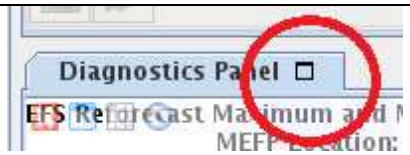
3.6.2 Cause

MEFPPE was reading the TMIN file and assigning it to TMAX; the TMAX file was read in as TMIN data.

3.6.2 Fix

The code was changed to assign the TMAX and TMIN in MEFPPE correctly.

3.6.3 Test Procedure

#	Action	Expected Results
1	Select MEFPPE from the CHPS toolbar.	
2	In the Estimation Steps Panel, select GEFS.	
3	In the Estimation Location Summary Panel, select Temperature.	
4	Select a Location and View the GEFS Archive/Reforecast Data.	
5	Enlarge the Diagnostics Panel.	
6	Select the period from Aug 1, 1985 to Aug 15, 1985. The TMIN and TMAX values should be within 10 DegC of the observed values.	

3.7 Fogbugz 1186 – MEFPPE Default Estimation parameters

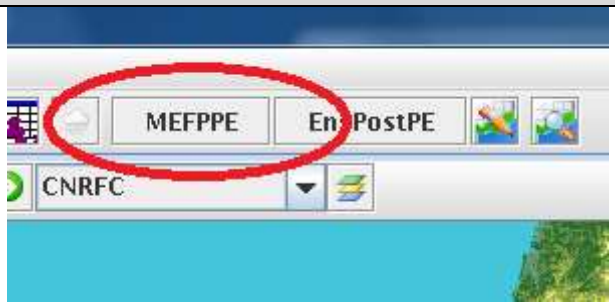
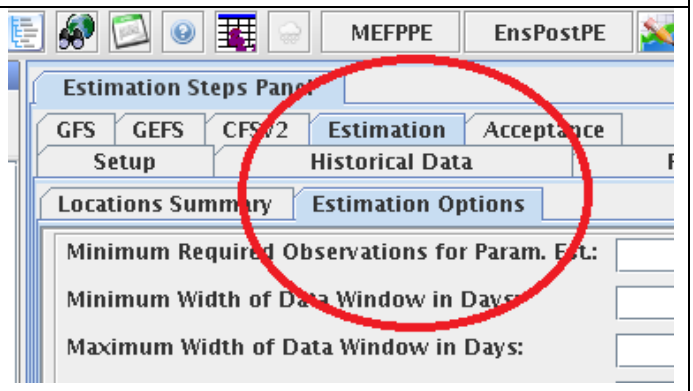
3.7.1 Description

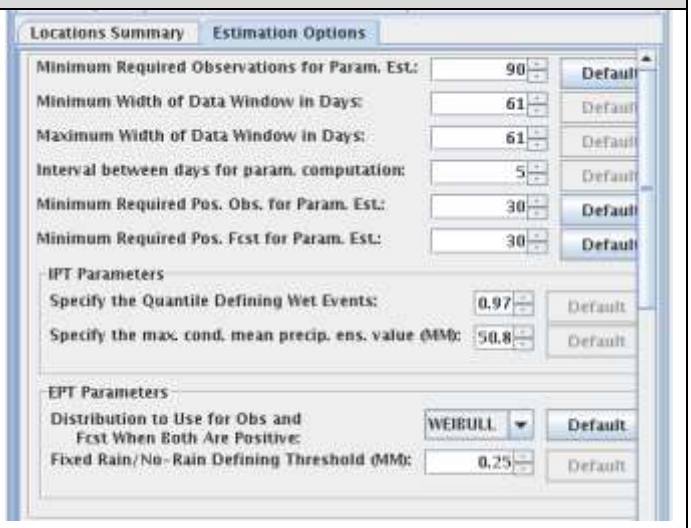
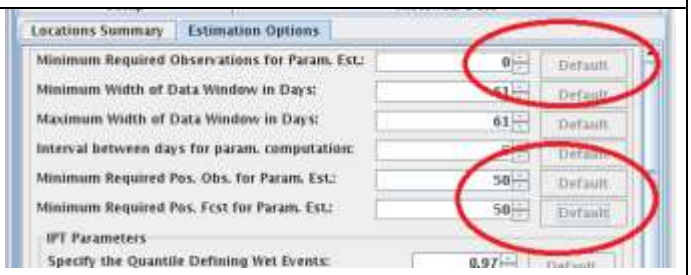
With the previous release, the only way to recover original default estimation option settings within the Estimation Options panel of the MEFPPE is to manually make the change. However, the default option settings are not made obvious in the release of MEFPPE.

3.7.2 Fix

Default options can be found in the delivered jar files (see the FogBugz for more information). However, this release includes a Default Button for each individual control option to the right of the option editing field. The button can be clicked at any time to recover the delivered default value for that option, so knowing the default options beforehand is no longer necessary.

3.7.3 Test procedure

#	Action	Expected Results
1	Select MEFPPE from the CHPS toolbar.	
2	Select the Estimation Options Tab in the Estimation Steps Panel.	

#	Action	Expected Results
3	As you move your mouse pointer over estimation option input boxes, they do not change.	
4	If the buttons are enabled, click on the Default buttons for Minimum Required Observation for Param. Est. , Minimum Required Pos. Obs. for Param. Est., and Minimum Required Pos. Fcst. for Param. Est. They should reset to default values.	

3.8 Fogbugz 1195 – MEFP Temperature Issue

3.8.1 Description

The GEFS forecast temperatures are too warm, and using new recalibrated MEFP parameters does not change the output.

3.8.2 Cause

GEFS TFMN computation in MEFP_GEFS_TFMN_6to24.xml is incorrect.

3.8.3 Fix

TMAX was changed to TMIN in the expression for calculating GEFS TFMN in MEFP_GEFS_TFMN_6to24.xml

3.8.4 Notes

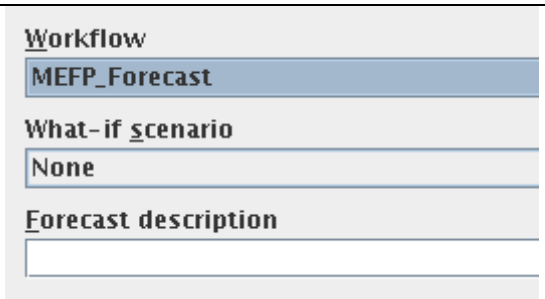
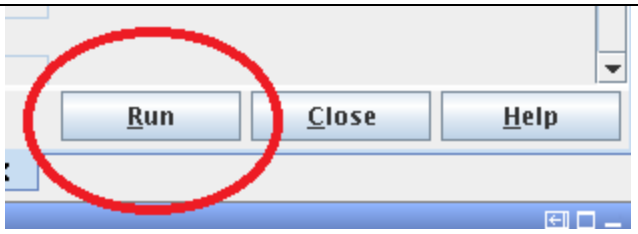
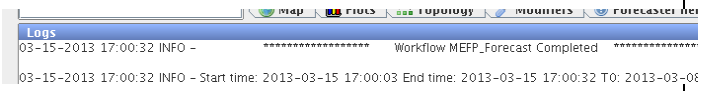
MEFP_CFSv2_TFMN_6to24.xml also changed to calculate the TMIN correctly.

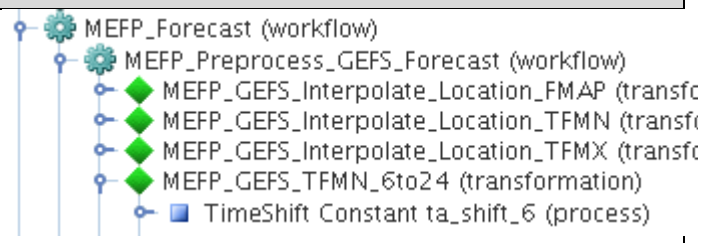
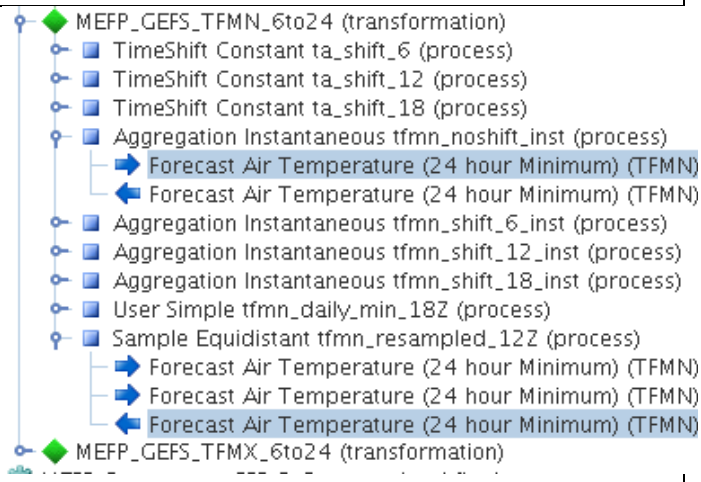
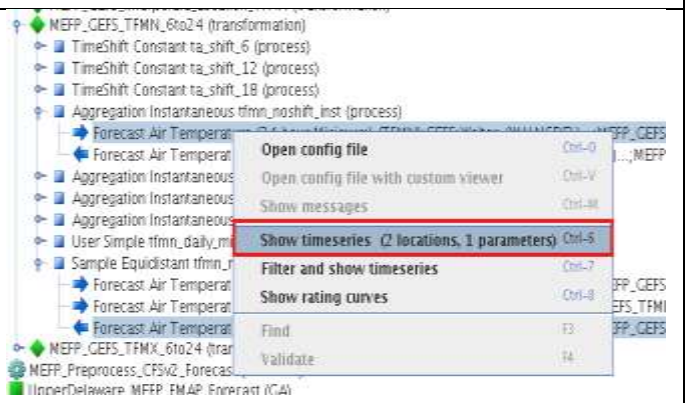
3.8.5 Test procedure

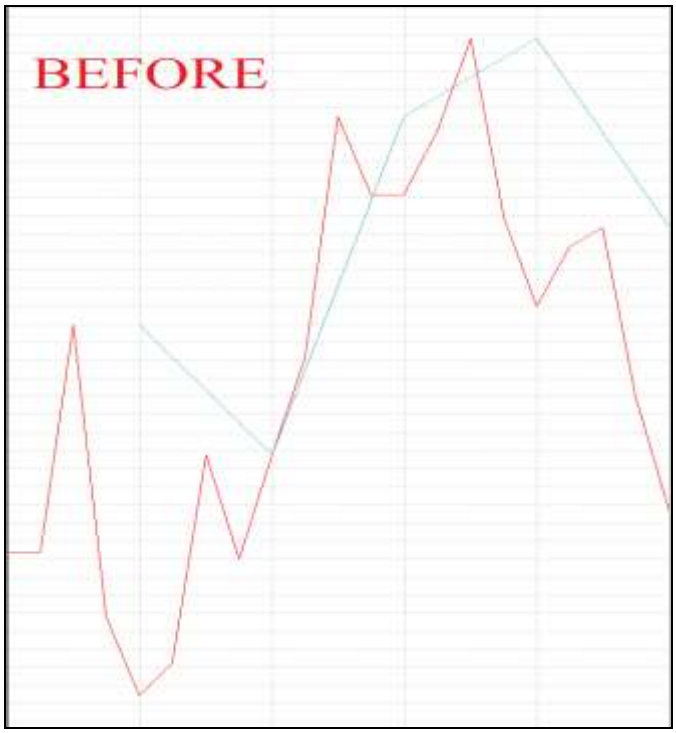
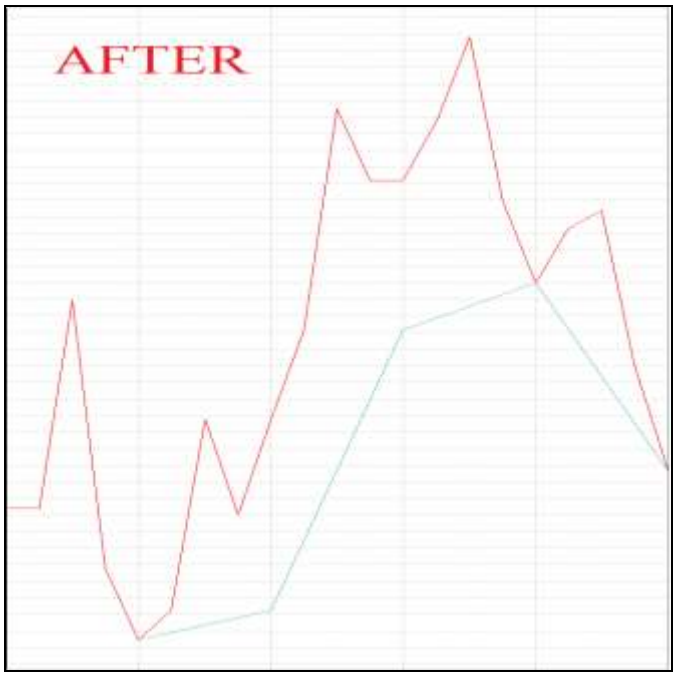
#	Action	Expected Results

1	Edit file:
	
	ModuleConfigFiles/hefs/preprocessingMEFP/
	MEFP_GEFS_TFMN_6to24.xml
		Replace:
		
		`<transformation id="tfmn_daily_max_18Z">`
		`  <user>`
		`  <simple>`
		`  <expression>max(gefs_tfmn_...)</expression>`
		`  . . .`
		`  . . .`
		
		`</transformation>`
		
		With:
		
		`<transformation id="tfmn_daily_min_18Z">`
		`  <user>`
		`  <simple>`
		`  <expression>min(gefs_tfmn_...)</expression>`
		`  . . .`
		`  . . .`
		
		`</transformation>`

2	Edit file:
	
	ModuleConfigFiles/hefs/preprocessingMEFP/
	MEFP_CFSv2_TFMN_6to24.xml
		Replace:
		
		`<transformation id="tfmn_daily_max_18Z">`
		`  <user>`
		`  <simple>`
		`  <expression>max(cfsv2_tfmn...)</expression>`
		`  . . .`
		`  . . .`
		
		`</transformation>`
		
		With:
		
		`<transformation id="tfmn_daily_min_18Z">`
		`  <user>`
		`  <simple>`
		`  <expression>min(cfsv2_tfmn...)</expression>`
		`  . . .`
		`  . . .`
		
		`</transformation>`

#	Action	Expected Results
3	Start FEWS using the installation standalone: ***cd*** *<region_dir>* ***cd ..*** ***./hefsPlugins/fews_hefsPlugins.sh ##rfc_sa &***	FEWS will be started. The splash screen displayed will vary by RFC. The default splash screen is: After a short time, the CHPS interface will open.
4	Click on the **Manual Forecast Button**.	
5	The **Manual Forecast Panel** will open, allowing you to select a workflow to run. In the Workflow List, select the MEFP_Forecast workflow.	
6	In the **Manual Forecast Panel**, click Run.	
7	When MEFP Forecast is done, you should see "Workflow MEFP_Forecast Completed" in the logs panel:	
8	To verify that ensembles were generated, click in the **Logs Panel**, hit the <F12> key, and hit the <K> key to open the **Workflow Navigator**.	

#	Action	Expected Results
9	Expand MEFP_Forecast (workflow) > MEFP_Preprocess_GEFS_Forecast (workflow) > MEFP_GEFS_TFMN_6to24 (transformation)	
10	Select the following timeseries:	
11	Right click and select **Show Timeseries**	

#	Action	Expected Results
12	Verify the result. Example shown here:	 

3.9 Fogbugz 1202 – Cleanup CFSv2 LaggedEnsemble.xml module files to remove WARNINGS messages

3.9.1 Description

Unnecessary warning messages were observed when executing the MEFP workflow.

3.9.2 Cause

A few lines in /ModuleConfigFiles/hefs/FDGroup/*MEFP_CFSv2*_LaggedEnsemble.xml were creating unnecessary warning messages.

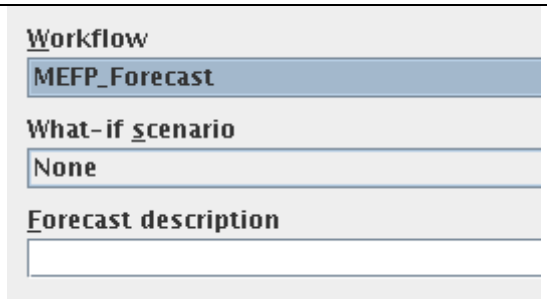
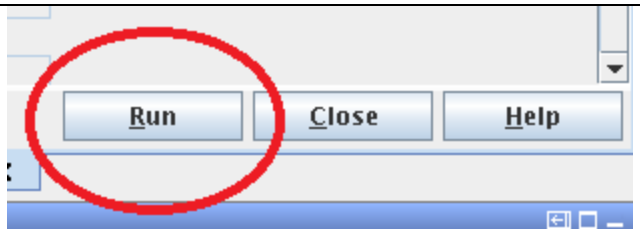
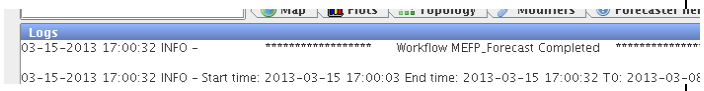
3.9.3 Fix

The problematic lines were deleted from /ModuleConfigFiles/hefs/FDGroup/*MEFP_CFSv2*_LaggedEnsemble.xml

3.9.4 Test Procedure

#	Action	Expected Results

1	The following HEFS modules
	
	ModuleConfigFiles/hefs/FGroup/*_MEFP_CFSv2_TFMN_LaggedEnsemble.xml
	
	ModuleConfigFiles/hefs/FGroup/*_MEFP_CFSv2_FMAP_LaggedEnsemble.xml
	
	ModuleConfigFiles/hefs/FGroup/*_MEFP_CFSv2_TFMX_LaggedEnsemble.xml
	
	Need the following text removed (at the top of each file). This is creating unnecessary WARNING messages.
		`<startUpActivities>`
		`  <purgeActivity>`
		`  <filter>%ROOT_DIR%/work/*</filter>`
		`  </purgeActivity>`
		`  <purgeActivity>`
		`  <filter>%ROOT_DIR%/input/*</filter>`
		`  </purgeActivity>`
		`  <purgeActivity>`
		`  <filter>%ROOT_DIR%/output/*</filter>`
		`  </purgeActivity>`
		`  <purgeActivity>`
		`  <filter>%ROOT_DIR%/run_info.xml</filter>`
		`  </purgeActivity>`
		`</startUpActivities>`

#	Action	Expected Results
2	Start FEWS using the installation standalone: ***cd*** *<region_dir>* ***cd ..*** ***./hefsPlugins/fews_hefsPlugins.sh ##rfc_sa &***	FEWS will be started. The splash screen displayed will vary by RFC. The default splash screen is: After a short time, the CHPS interface will open.
3	Click on the **Manual Forecast Button**.	
4	The **Manual Forecast Panel** will open, allowing you to select a workflow to run. In the Workflow List, select the MEFP_Forecast workflow.	
5	In the **Manual Forecast Panel**, click Run.	
6	When MEFP Forecast is done, you should see "Workflow MEFP_Forecast Completed" in the logs panel:	
7	Verify the logs. Warning message such as the example will no longer appear:	Example: WARN - Parent directory /tmp/FEWS_MARFC_UpperDelaware_MEFP_CFSv2_FMAP_LaggedEnsemble_main_3854556427735586032/output for purge activity does not exist.

4 Testing Enhancements

4.1 List of enhancement tests

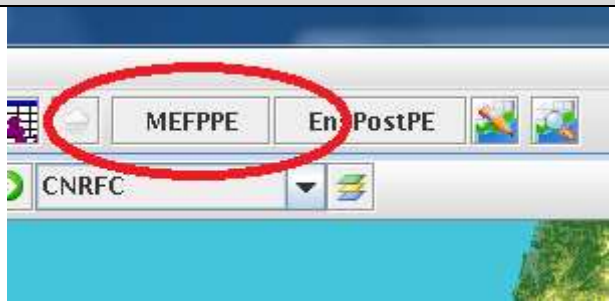
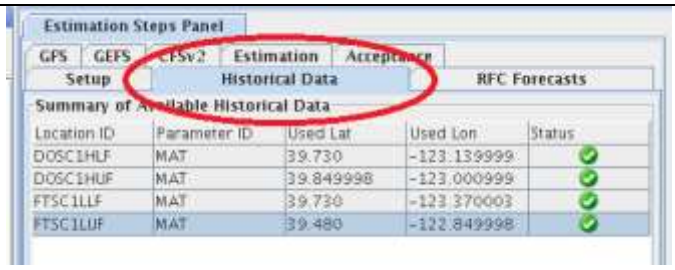
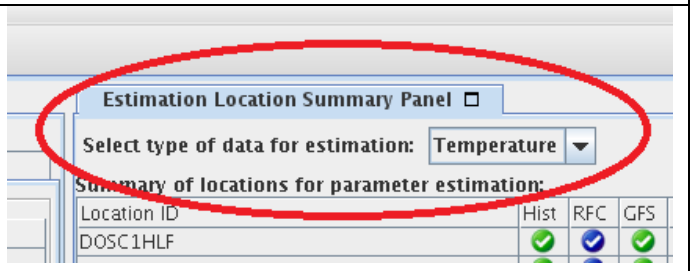
FogBugz ID	Tester	Test Procedure	Title
1157	ALL	Yes	Modify MEFPPE to allow easier detecting of "bad" historical observed data (e.g. missing values, negative precip, TMIN > TMAX)
1158	ALL	Yes	Modify MEFPPE to identify questionable MEFP parameter values (insufficient data, negative correlations)
1159	ALL	Yes	Modify ENSPOST to add an option to output daily, instead of disaggregated, post-processed flows
1191	ALL	Yes	List of EnsPost PE enhancements for HEFS 1.0.1
1200	ALL	Yes	Adding run file property to MEFP adapter for specifying member indexing year
1205	OHD	N\A	Using FEWS transformations to MERGE historical data with MEFP output
1213	OHD	N\A	List of MEFP and MEFPPE Small Enhancements for HEFS Release 1.0.1

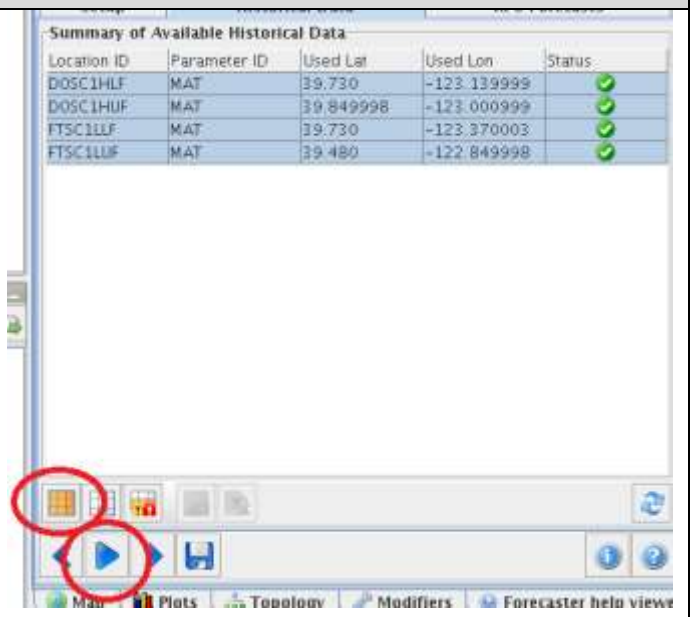
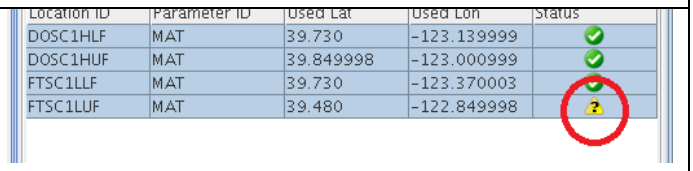
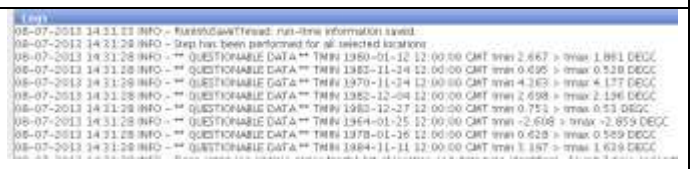
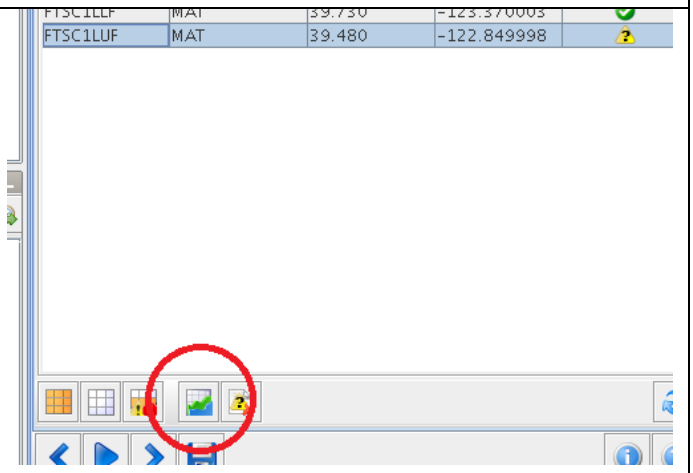
4.2 Fogbugz 1157 – Modify MEFPPE to allow easier detecting of "bad" historical observed data (e.g. missing values, negative precip, TMIN > TMAX)

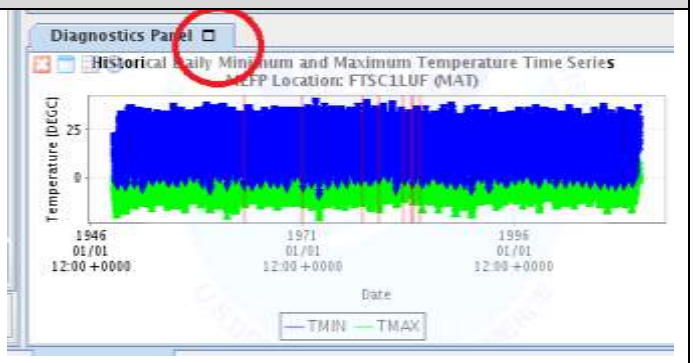
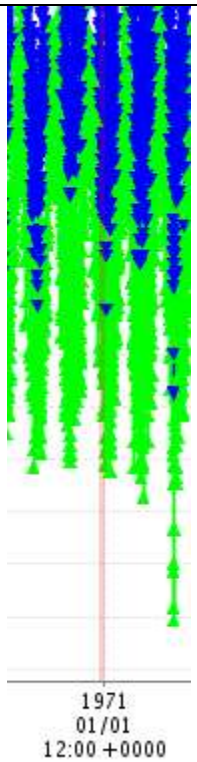
4.2.1 Description

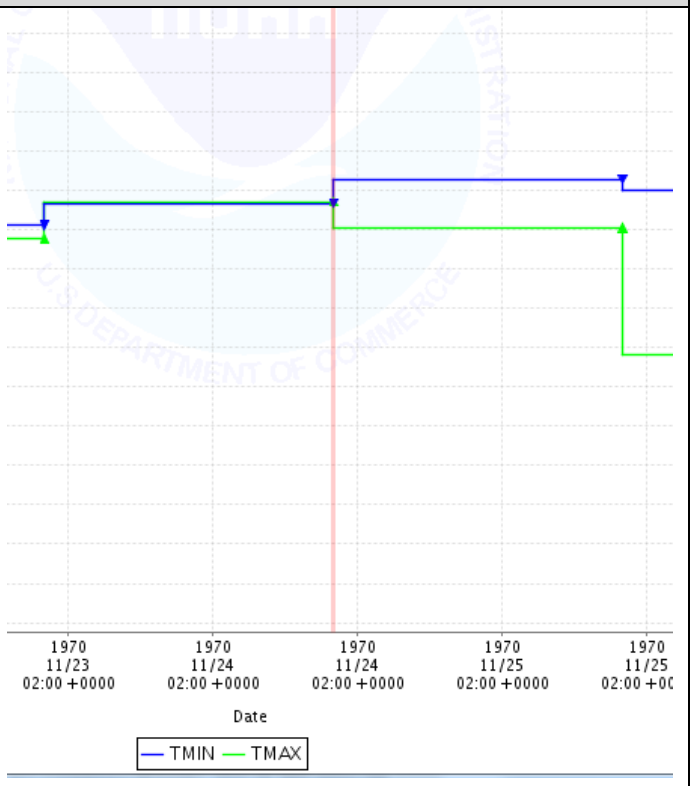
"Bad" historical observed MAP/MAT can lead to "bad" MEFP results. The Diagnostics Panel of the MEFPPE has been enhanced to display light red lines or zones on plots of time series data showing where questionable values can be found. Checks performed include missing data, gross range checks, negative precipitation data, and minimum temperature exceeding maximum temperature. Graphics Generator tools have also been enhanced to display cells with questionable data in the data table with a light red background, allow for selecting questionable cells in the data table to draw crosshairs marking the value on the plot (and vice versa), and to draw marks next to the scrollbars indicating the position of questionable data within the table. These new features apply to historical data and RFC forecast and observed data.

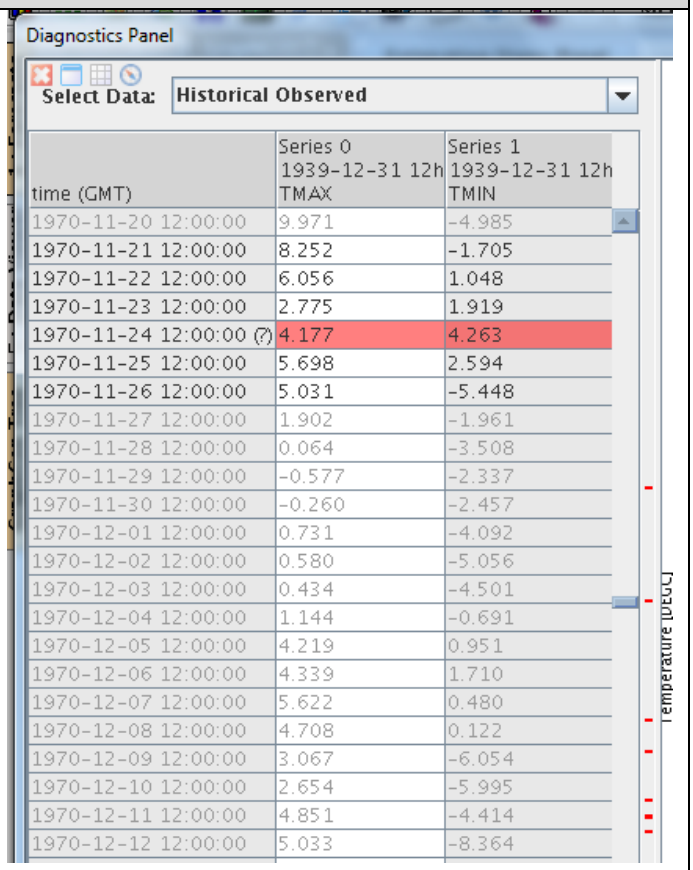
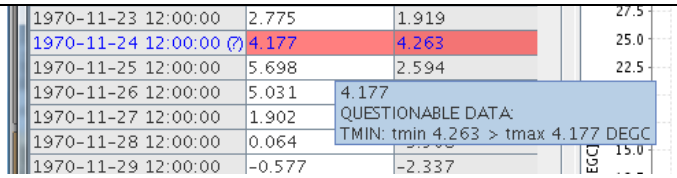
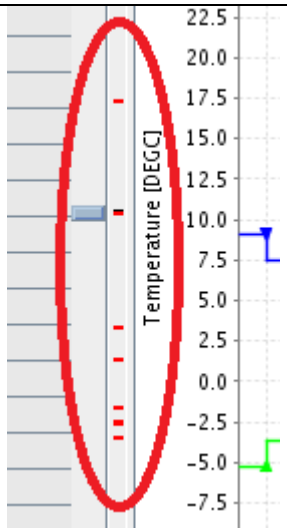
4.2.2 Test Procedure

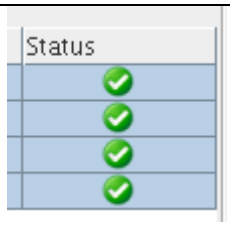
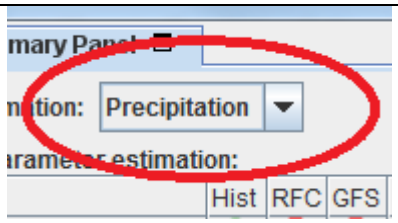
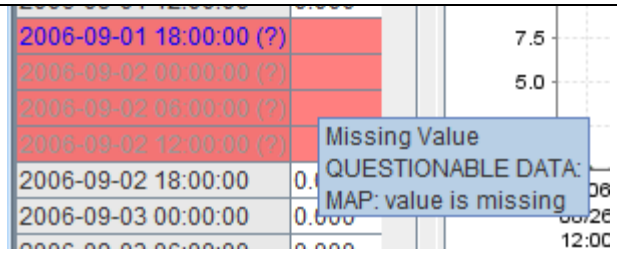
#	Action	Expected Results
1	Select MEFPPE from the CHPS toolbar.	
2	Select Historical Data in the Estimation Steps Panel.	
3	Select Temperature in the Estimation Location Summary Panel.	

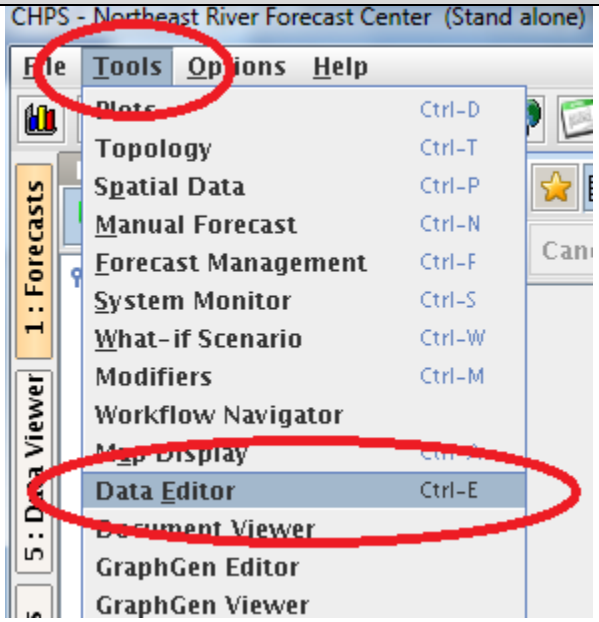
#	Action	Expected Results
4	Select All of the locations, and Prepare Historical Binary Files.	
5	Locations with questionable data are flagged.	
6	The questionable data will be Logged.	
7	Select a location with questionable data and View the Binary Historical Data.	

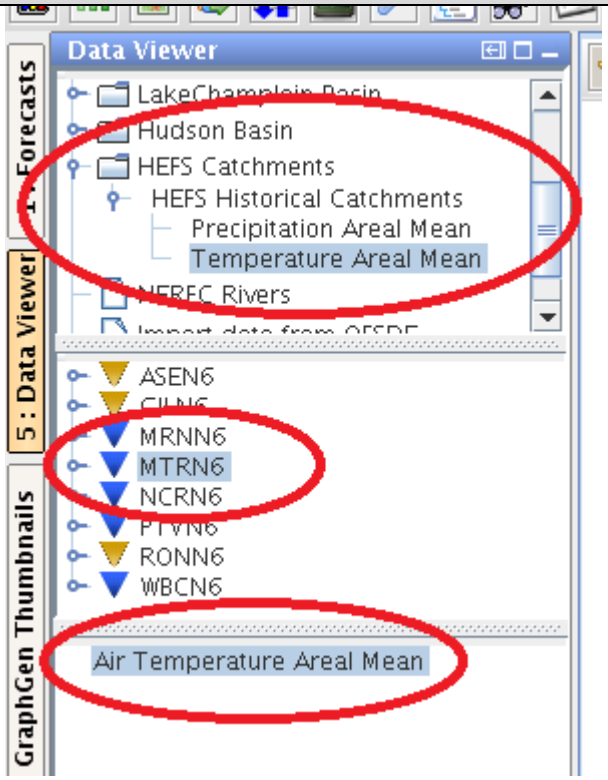
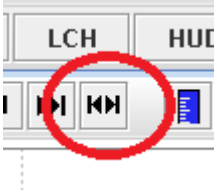
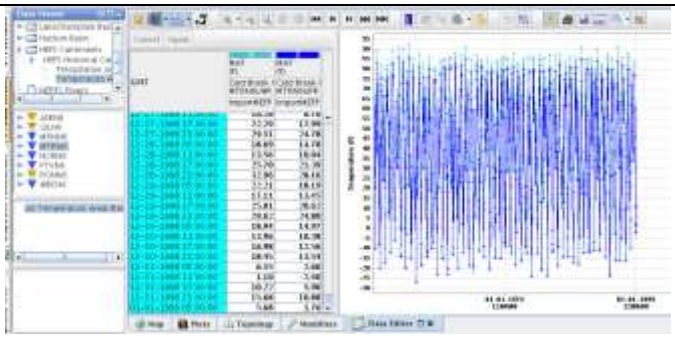
#	Action	Expected Results
8	Enlarge the Diagnostics Panel. In addition to the 24 hour TMIN and TMAX data, the 6 hour MAT will be plotted, if available.	
9	A date with questionable data is marked by a red line.	

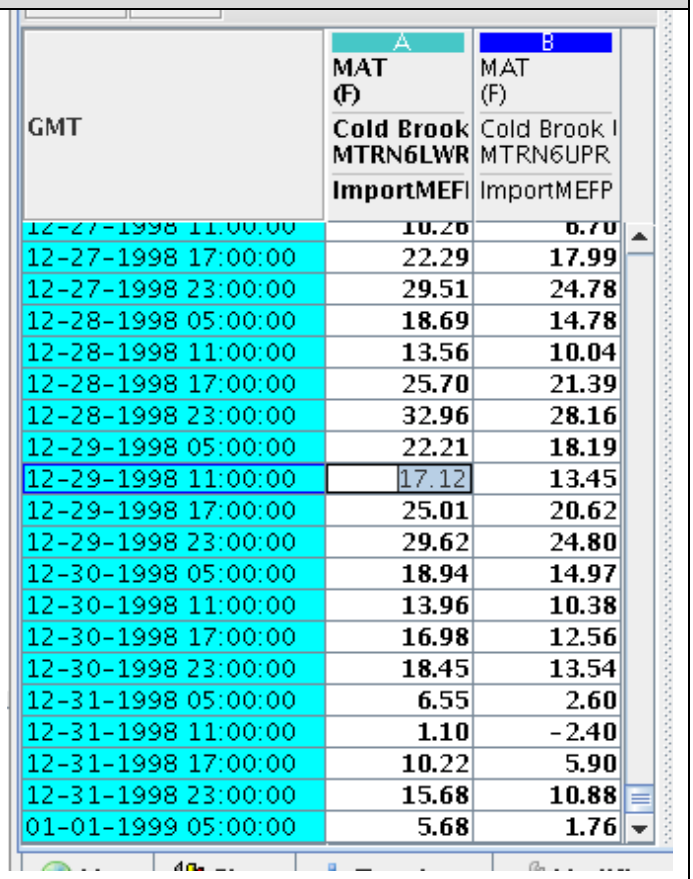
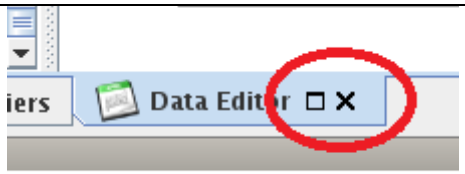
#	Action	Expected Results
10	Zoom in by drawing a rectangle around the questionable line. On 11/24/70 TMIN crossed TMAX. This was recorded in the Log as '** QUESTIONABLE DATA ** TMIN 1970-11-24 12:00:00 GMT tmin 4.263 > tmax 4.177 DEGC'.	
11	Select Data Table in the Diagnostics Panel.	

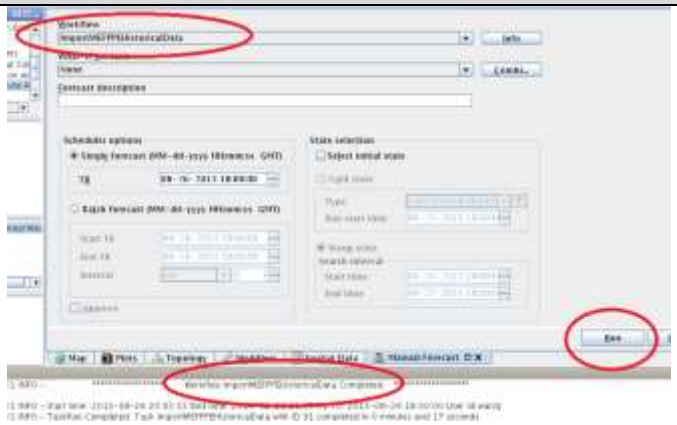
#	Action	Expected Results
12	The questionable data is highlighted in red with a question mark.	
13	If you hover your mouse over a table entry, a Tool Tip explains why it was marked as questionable.	
14	Other questionable values are marked on the side of the table. Click on a red tic to go to it.	

#	Action	Expected Results
15	The data has been marked questionable on the display. To remove the questionable marks, you can either edit and reimport the data, or select Remove in the Historical Data Summary. To edit and reimport, go to step 19. Select Remove in the Historical Data Summary. It will only change the marks on the display, not any of the underlying data.	
16	Locations with questionable data are no longer marked.	
17	Steps 3 to 16 may be repeated for Precipitation, or for the RFC Forecasts.	
18	Missing and extreme values are also marked.	

#	Action	Expected Results
19	Editing and Reimporting data. Open the FEWS Data Editor.	
20	Select the Data Viewer tab on the left hand side.	

#	Action	Expected Results
21	We will edit the Air Temperature for MTRN6. In the first pane, select HEFS Catchments; HEFS Historical Catchments; Temperature Areal Mean. In the second pane, select MTRN6. In the third pane, select Air Temperature Areal Mean.	
22	Select the Zoom Out button on the top of the Data Editor to display the entire time series.	
23	The entire time series will be displayed.	

#	Action	Expected Results
24	Select a value to edit, and enter a new value.	
25	Exit the Data Editor.	
26	You will be asked if you want to save your changes.	

#	Action	Expected Results
27	If you clicked Yes to save your changes, rerun your Import MEFP Historical Data workflow to re-import the changed data. If you changed MAP data, this should run MEFP_MAP_to_GMT. If you changed MAT data, this should run MEFP_MAT_to_TAMN_TAMX.	
28	Rerun step 4 for the locations you changed to save the MAT/TAMN, MAT/TAMX to the FEWS database. Continue with your MEFPPE processing.	

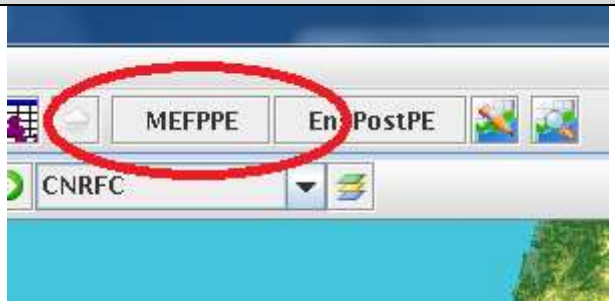
4.3 Fogbugz 1158– Modify MEFPPE to identify questionable MEFP parameter values (insufficient data, negative correlations)

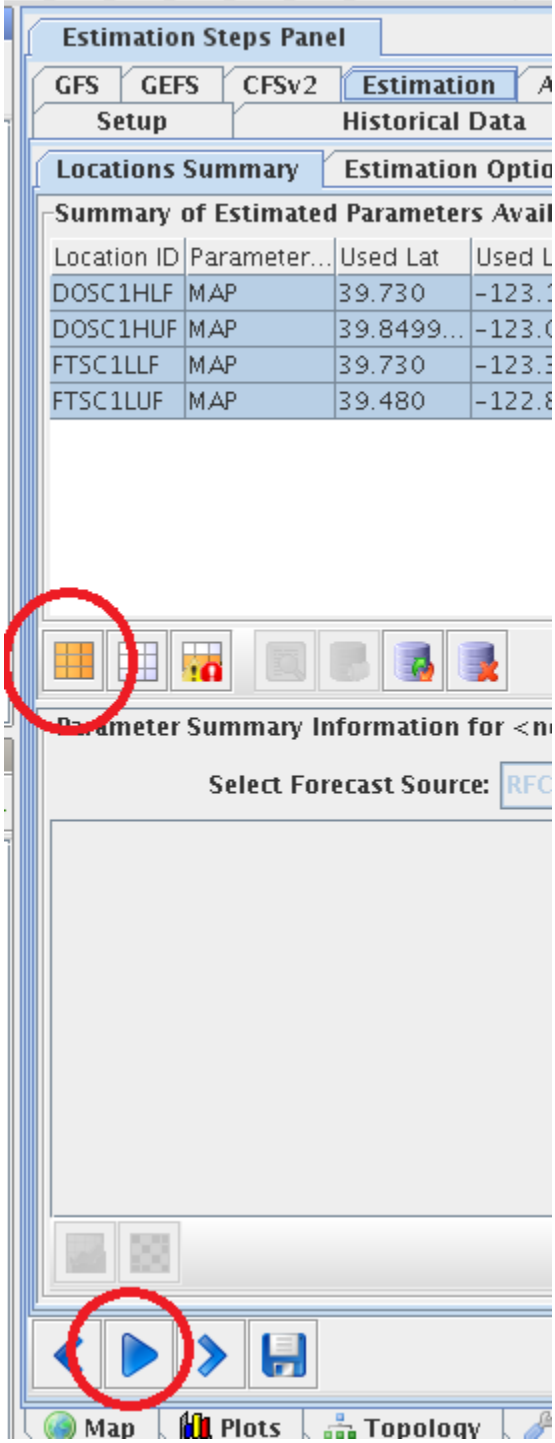
4.3.1 Description

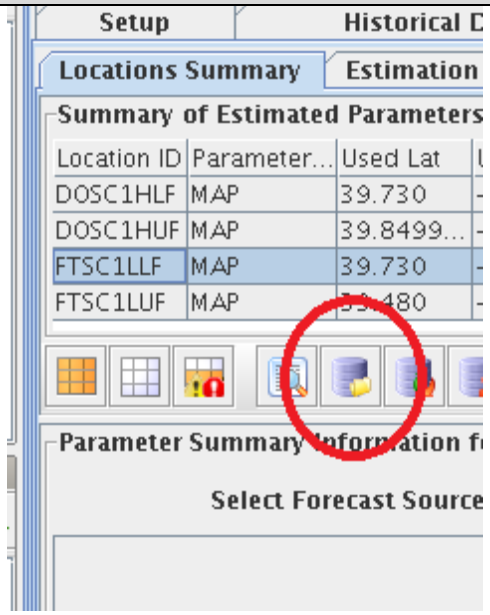
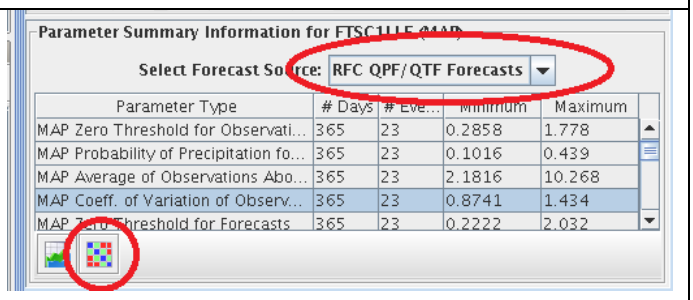
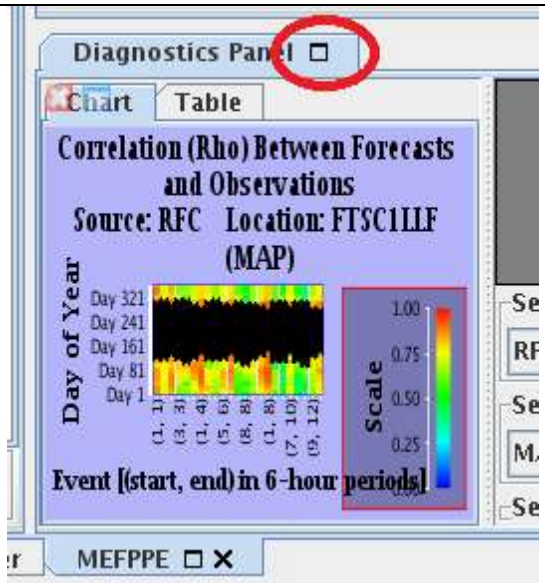
Diagnostic displays have been added for the purpose of QC'ing estimated MEFP parameters. Diagnostics include a block plot that displays parameter values according to a color scale against the canonical event and day-of-year for which the parameter was estimated. An event and day-of-the-year that yielded a questionable parameter value are marked by x's and include a tool tip (visible by leaving the mouse cursor motionless over the parameter value's block for a couple seconds) explaining why the parameter value is considered questionable. Reasons may include small sample size, missing data, and a negative correlation coefficient. A panel on the right allows for selecting the parameter to display and canonical events to include in the plot. The data can also be viewed as a table displaying the numerical values of the parameters with each cell having a background color matching the corresponding block's color in the plot.

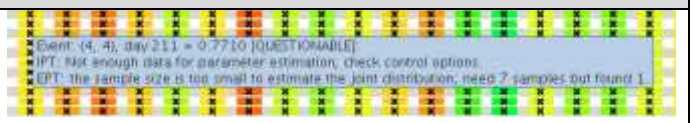
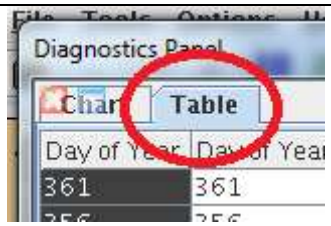
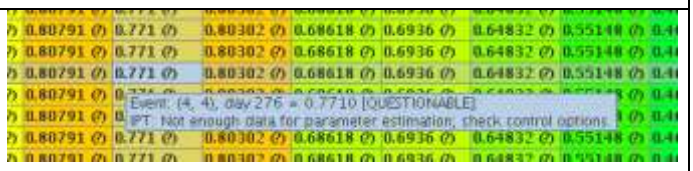
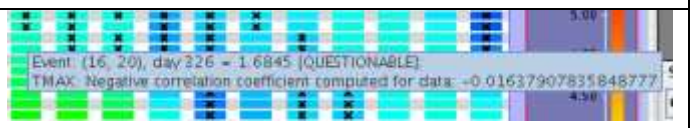
4.3.2 Test Procedure

#	Action	Expected Results

#	Action	Expected Results
1	Select MEFPPE from the CHPS toolbar.	

#	Action	Expected Results
2	In the Estimation Steps Panel, Estimation Tab, Locations Summary Tab, select all the locations and Estimate Parameters.	

#	Action	Expected Results
3	When Parameter Estimation is finished, select a Location, and Load the Selected Parameters.	
4	Select a Forecast Source of RFC QPF/QTF Forecasts and Select View Parameter Diagnostics.	
5	Enlarge the Diagnostics Panel.	

#	Action	Expected Results
6	In the Chart view, questionable parameters have an X on them. If you hover your mouse over a questionable parameter, a Tool tip will appear.	
7	Select the Table view	
8	In the Table view, questionable parameters have a ? after them. If you hover your mouse over a questionable parameter, a Tool tip will appear.	
9	Tool tips also appear for Temperature parameters.	

4.4 Fogbugz 1159 – Modify ENSPOST to add an option to output daily, instead of disaggregated, post-processed flows

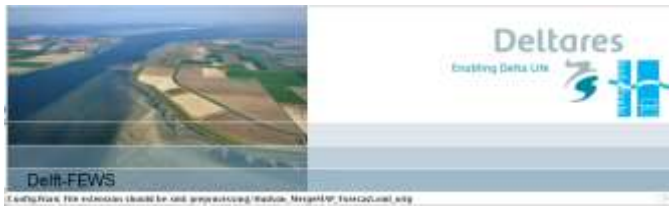
4.4.1 Description

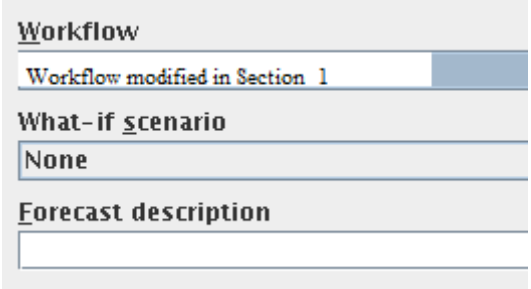
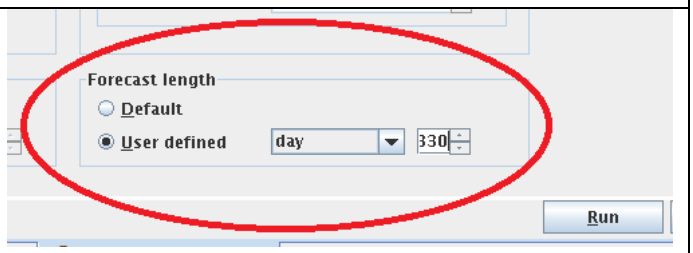
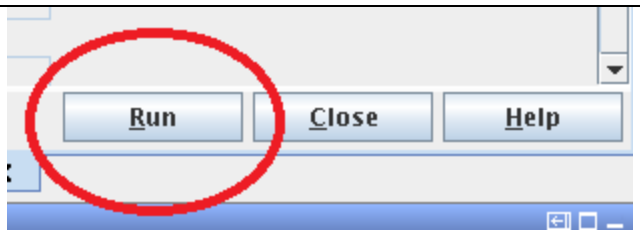
As a possible solution to FogBugz 1002, EnsPost was modified to optionally produce daily post-processed flows (i.e not disaggregated). If configured this way, the user could then use a follow-on FEWS disaggregation transformation to produce flows at the required time step.

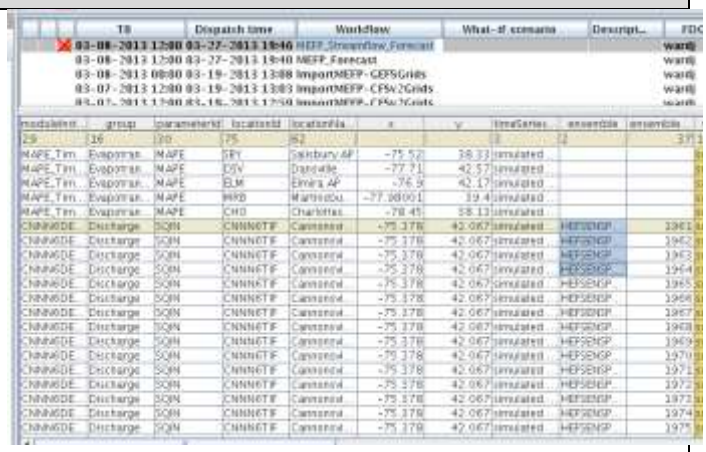
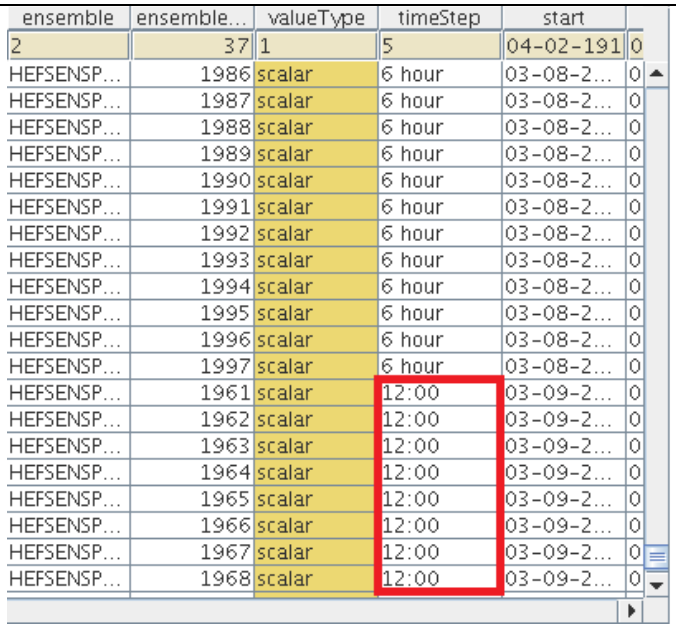
4.4.2 Fix

A new run-file property has been added called disaggOutput. When set to true, it'll disaggregate the output normally. When set to false, it will not disaggregate the output. It is an optional property, and, when it is not set by the user, the default behavior is to disaggregate the output. When set to true, a TimeStep ID of "12Z" must be set in the importActivities section of the EnsPost Module.F.

4.4.3 Test Procedure

#	Action	Expected Results
1	Edit an existing EnsPost workflow to add the highlighted variable.	<exportRunFileActivity> <exportFile>%ROOT_DIR%/run_info.xml</exportFile> <properties> ... ... <string key="disaggOutput" value="false"/> </properties> </exportRunFileActivity>
2	Modify the parameterId and the timeStep for the output	<importFile>outputs.xml</importFile> <timeSeriesSets> <timeSeriesSet> . . . <parameterId>SQME</parameterId> . . . <timeStep id="12Z"/> . . . . . . </timeSeriesSet> </timeSeriesSets>
3	Start FEWS using the installation standalone: ***cd*** *<region_dir>* ***cd ..*** ***./hefsPlugins/fews_hefsPlugins.sh ##rfc_sa &***	FEWS will be started. The splash screen displayed will vary by RFC. The default splash screen is:  After a short time, the CHPS interface will open.
4	Click on the **Manual Forecast Button**.	

#	Action	Expected Results
5	The **Manual Forecast Panel** will open, allowing you to select a workflow to run. In the Workflow List, select the workflow modified in Section 1.	
6	Set the **Forecast length** to be less than or equal to the MEFP Forecast length. The default MEFP Forecast length is 330 days.	
7	In the **Manual Forecast Panel**, click Run.	
8	When the workflow is done, you should see "Workflow <workflow modified in Section 2.2.3> Completed" in the logs panel. For example, "Workflow HEFS Forecast Completed"	

#	Action	Expected Results
9	Open the Database viewer in order to confirm that EnsPost successfully ran. Select the workflow that was just completed in the database viewer, and find four entries, with the same locationId and an ensembleId of HEFSENSPOST.	
10	Scroll over to the timeStep column to verify 24 hour time step.	

ensemble	ensemble...	valueType	timeStep	start	
2	37	1	5	04-02-191	0
HEFSENSP...	1986	scalar	6 hour	03-08-2...	0
HEFSENSP...	1987	scalar	6 hour	03-08-2...	0
HEFSENSP...	1988	scalar	6 hour	03-08-2...	0
HEFSENSP...	1989	scalar	6 hour	03-08-2...	0
HEFSENSP...	1990	scalar	6 hour	03-08-2...	0
HEFSENSP...	1991	scalar	6 hour	03-08-2...	0
HEFSENSP...	1992	scalar	6 hour	03-08-2...	0
HEFSENSP...	1993	scalar	6 hour	03-08-2...	0
HEFSENSP...	1994	scalar	6 hour	03-08-2...	0
HEFSENSP...	1995	scalar	6 hour	03-08-2...	0
HEFSENSP...	1996	scalar	6 hour	03-08-2...	0
HEFSENSP...	1997	scalar	6 hour	03-08-2...	0
HEFSENSP...	1961	scalar	12:00	03-09-2...	0
HEFSENSP...	1962	scalar	12:00	03-09-2...	0
HEFSENSP...	1963	scalar	12:00	03-09-2...	0
HEFSENSP...	1964	scalar	12:00	03-09-2...	0
HEFSENSP...	1965	scalar	12:00	03-09-2...	0
HEFSENSP...	1966	scalar	12:00	03-09-2...	0
HEFSENSP...	1967	scalar	12:00	03-09-2...	0
HEFSENSP...	1968	scalar	12:00	03-09-2...	0

4.5 Fogbugz 1191 – List of EnsPost PE enhancements for HEFS 1.0.1

4.5.1 Description

List of items proposed:

1. Add an option to choose the period of record for estimation of parameters. This option avoids the need to trim down or modify files of observed and simulated flows in case if a

subset of the entire period of the record is to be used for the calibration (the option already exists in CHPS/FEWS). It should be noted that this affects both EnsPostPE and MEFPPE.

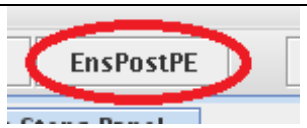
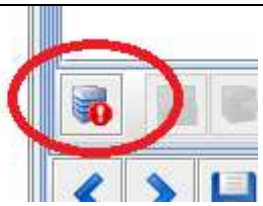
2. Added a feature to pop up a diagnostic console window which displays the seasons, months, cutoff values, and error measures at the completion of the PE run for every location that the PE is run for.

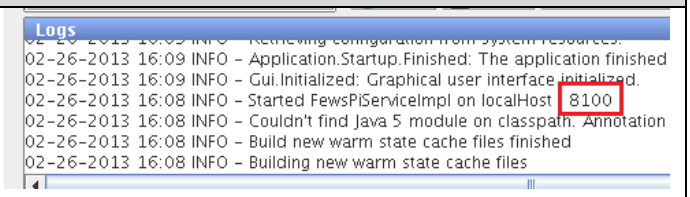
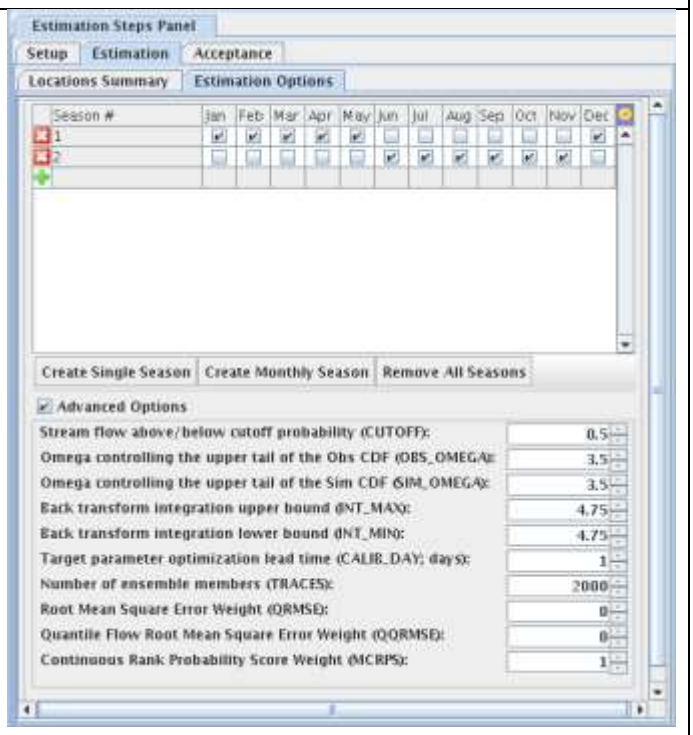
3. Add a feature to interchange y-axis units from cfs to cms for the time series plot displayed in the diagnostic panel.

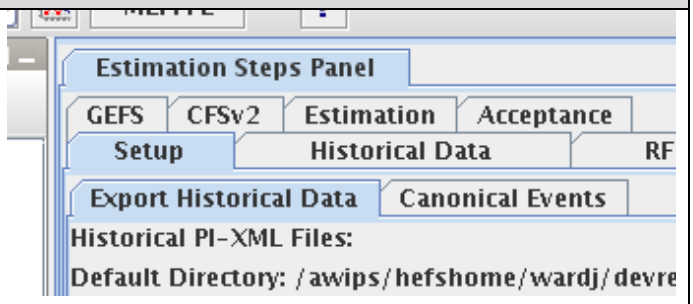
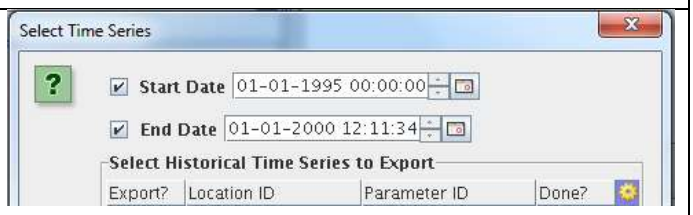
4. Modify default values of the parameters under 'advanced options' on the Estimation Options panel.

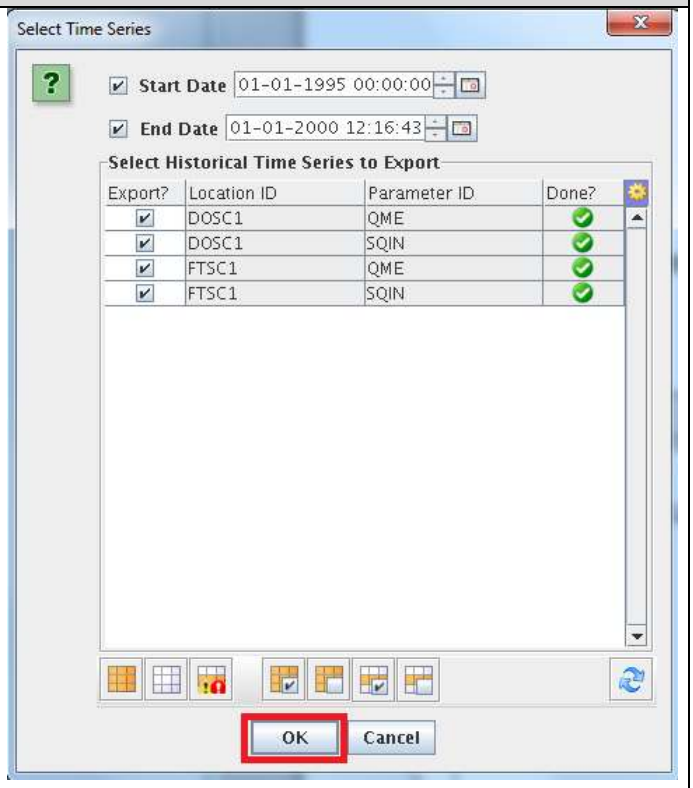
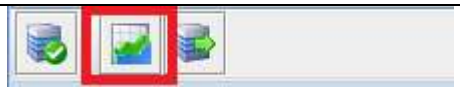
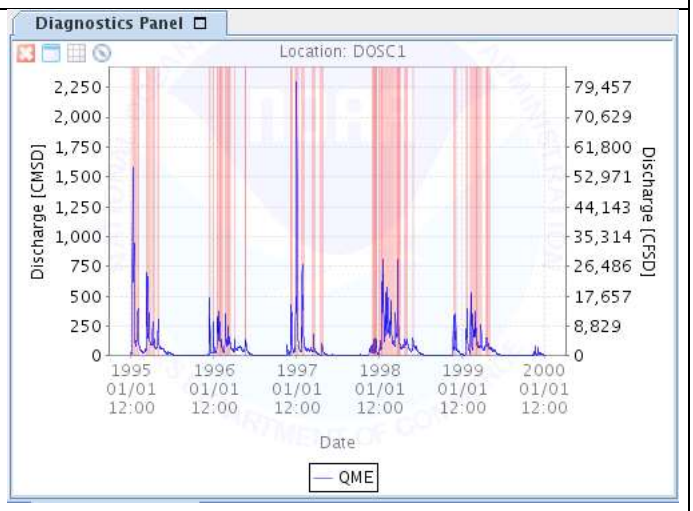
5. Fix the empirical CDF computation (i.e., as per the current scheme different probabilities are assigned to a same values, which is not possible and needs to be corrected).

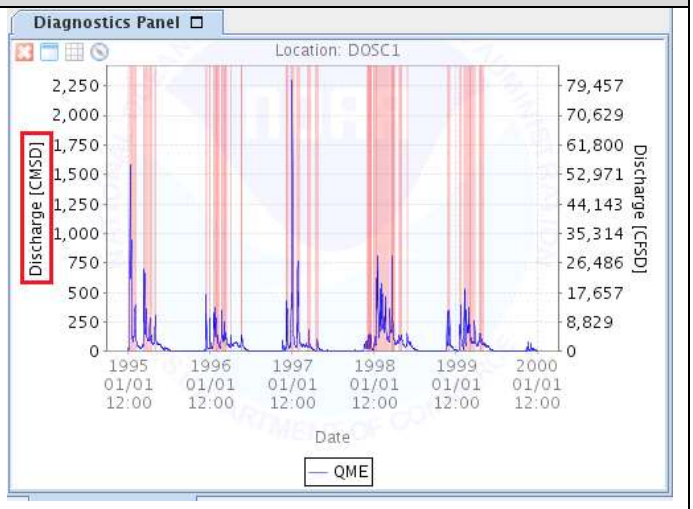
4.5.2 Test procedure

#	Action	Expected Results
1	Start FEWS using the installation standalone: ***cd*** *<region_dir>* ***cd ..*** ***./hefsPlugins/fews_hefsPlugins.sh ##rfc_sa &***	FEWS will be started. The splash screen displayed will vary by RFC. The default splash screen is: After a short time, the CHPS interface will open.
2	Start the EnsPostPE by clicking on the EnsPostPE button in the toolbar of the CHPS interface. .	
3	The PI-service will be disconnected.	

#	Action	Expected Results
4	Scroll the Logs panel to find your PI-service port number (here 8100).	
5	Click on the PI-service icon, enter your PI-service port number (8100 in this example), and click OK.	
6	When successfully connected, two database icons should be green.	
7	If launching EnsPost PE for the very first time the default value will be:	

#	Action	Expected Results
8	**Select Export Historical Data** in the **Setup** subpanel of the **Estimation Steps Panel**.	
9	Click on the Export Time Series icon.	
10	Check start and end date and set them	
11	Select All time series to export by pressing the "**Select All"** button?.	

#	Action	Expected Results
12	When all of the time series are selected, click OK.	
13	Select a location and click to view historical data.	
14	Verify results are narrowed by the time period.	

#	Action	Expected Results
15	Verify the feature to interchange y-axis units from cfs to cms for the time series plot displayed in the diagnostic panel	

4.6 Fogbugz 1200 – Adding run file property to MEFP adapter for specifying member indexing year

4.6.1 Description

A run file property was added to the MEFP adapter to allow the user to control whether hydrologic water years, calendar years, or a custom year will be used in assigning time periods to member indices.

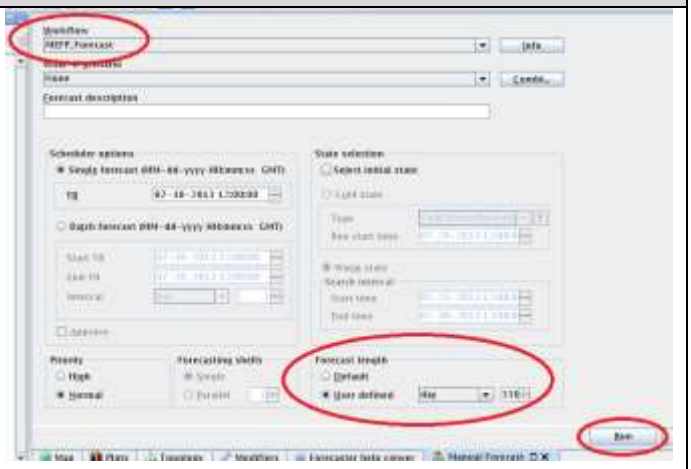
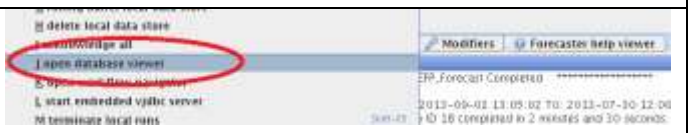
4.6.2 Fix

The memberIndexingYear property was added and it will default to 'standardHydroWaterYear'. A description has been provided in the MEFP User's Manual.

4.6.3 Test Procedure

#	Action	Expected Results

#	Action	Expected Results
1	Choose a location for which you have previously generated MEFP precipitation parameters. Our example will use the location CBNK1. Extract the historicalTimeSeries from the parameter file. This file may be located in Models/hefs/mefpRootDir/mefpParameters. tar zxvf CBNK1.precipitation.mefp.parameters.tgz historicalTimeSeries.xml. Set this file aside.	The file historicalTimeSeries.xml will appear in your local directory.
2	Edit the MEFP_Forecast ModuleConfigFile for the forecast group for this location (KEYINF). We will edit Config/ModuleConfigFiles/hefs/keyinf/KEYINF_MEFP_FMAP_Forecast.xml. In the <exportRunFileActivity> section that generates the <exportFile> run_info.xml, set (or add) the property memberIndexingYear to standardHydroWaterYear. This is the default value. The year starts on 10/1 and ends on 9/30. Set climatologyNumberOfForecastDays to 330, and useResampledClimatology to false.	<exportRunFileActivity> <exportFile>%ROOT_DIR%/run_info.xml</exportFile> <properties> … <int key="climatologyNumberOfForecastDays" value="330"/> … <string key="useResampledClimatology" value="false"/> … <string key="memberIndexingYear" value="standardHydroWaterYear"/>"/> … </properties> </exportRunFileActivity> </exportActivities>
3	Run CHPS and select Manual Forecast.	

#	Action	Expected Results
4	Run the MEFP_Forecast Workflow, setting the Forecast length the 330 days.	
5	When the Workflow completes	
6	Click in the Logs area, hit the F12 key and select J to open the database viewer.	
7	Select the latest MEFP_Forecast Workflow and a KEYINF_MEFP_FMAP_Forecast for CBNK1 that has a timespan > 300 days.	