Supplemental Reference Material for
"Incorporating Dual-Pol HPE and Bias HPE into Flash Flood Decision Making"
<u>**Last Updated: July 14, 2015**</u>

Note: This is a living document that will be updated frequently on the WDTD web server and within the AWIPS network at http://165.92.25.138:85/Training/HPE_Reference_Material.pdf. Please refer to the "Last Updated" date above to identify the most recent version.
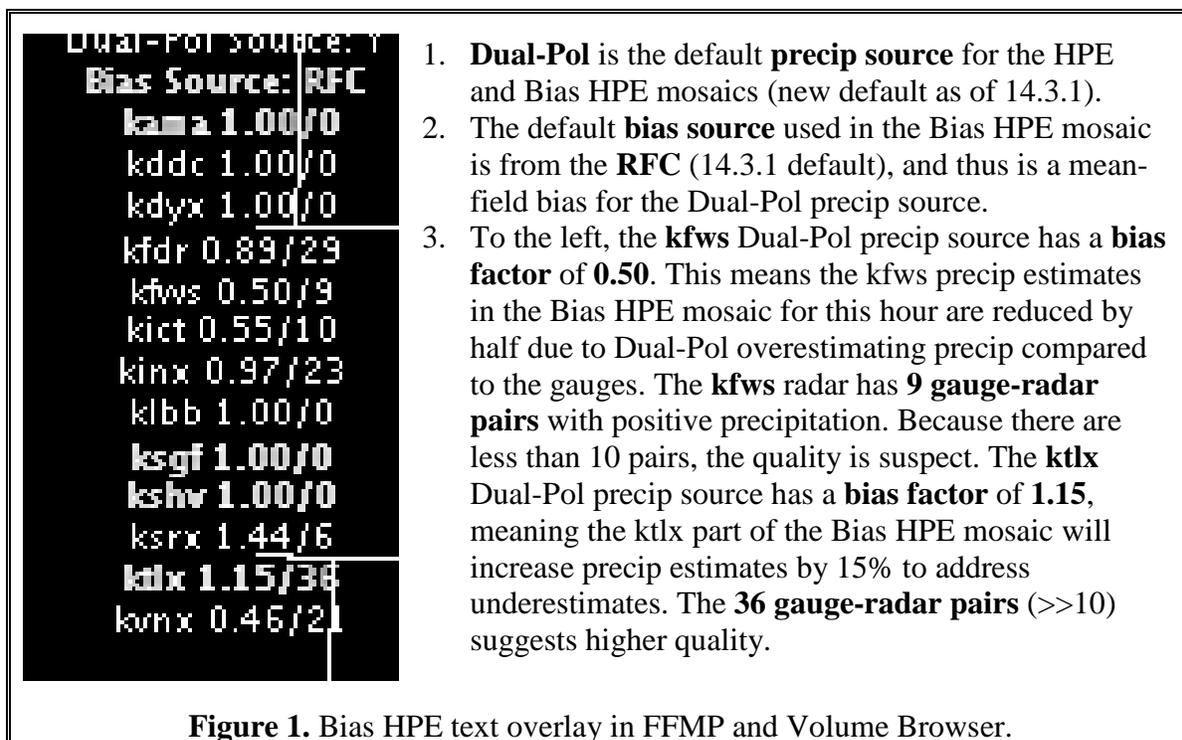
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HPE/FFMP User References

1. Important Dual-Pol HPE/Bias HPE Usage Tips
2. Loading HPE/Bias HPE in FFMP
3. Loading HPN in FFMP
4. Loading HPE/BiasHPE in the Volume Browser
5. Loading HPN Precip Rate in the Volume Browser
6. Loading HPN Storm Total Precip in the Volume Browser
7. Identifying if the Mean-Field Bias has been Applied at the RPG
8. Software Defects
9. FAQ

HPE/FFMP Focal Point References

1. Create Forced Flash Flood Guidance for FFMP
2. HPE Token for Configuring Dual-Pol or Legacy HPE Precip Sources
3. HPE Token Combinations for Configuring Bias Sources
4. Setting "misbin" to Configure Radar Used in HPE Beam Blockage Areas

HPE/FFMP User References

1) Important Dual-Pol HPE/BiasHPE Usage Tips (return to top)
   a. **How to read the new HPE/Bias HPE text overlay (Figure 1)**

1. **Dual-Pol** is the default **precip source** for the HPE and Bias HPE mosaics (new default as of 14.3.1).
2. The default **bias source** used in the Bias HPE mosaic is from the **RFC** (14.3.1 default), and thus is a mean-field bias for the Dual-Pol precip source.
3. To the left, the **kfws** Dual-Pol precip source has a **bias factor** of **0.50**. This means the kfws precip estimates in the Bias HPE mosaic for this hour are reduced by half due to Dual-Pol overestimating precip compared to the gauges. The **kfws** radar has **9 gauge-radar pairs** with positive precipitation. Because there are less than 10 pairs, the quality is suspect. The **ktlx** Dual-Pol precip source has a **bias factor** of **1.15**, meaning the ktlx part of the Bias HPE mosaic will increase precip estimates by 15% to address underestimates. The **36 gauge-radar pairs** (>>10) suggests higher quality.

Figure 1. Bias HPE text overlay in FFMP and Volume Browser.

1. **Dual-Pol Source**
   (1) **Y** : source for HPE/BiasHPE is Dual-Pol Digital Precip Rate (DPR)
   (2) **N** : source for HPE/BiasHPE is Legacy Digital Hybrid Reflectivity (DHR)
2. **Bias Source**
   (1) **RFC** : mean-field bias from RFC MPE (default as of 14.3.1)
   (2) [**WFO site ID**] : mean-field bias from local site's MPE
   (3) [**WFO site ID**] Local Bias : local bias from local site's MPE (spatially varying bias using 40-km search radius)
3. **Radar bias factors and # of gauge-radar pairs** (e.g. kfws 0.50/9)
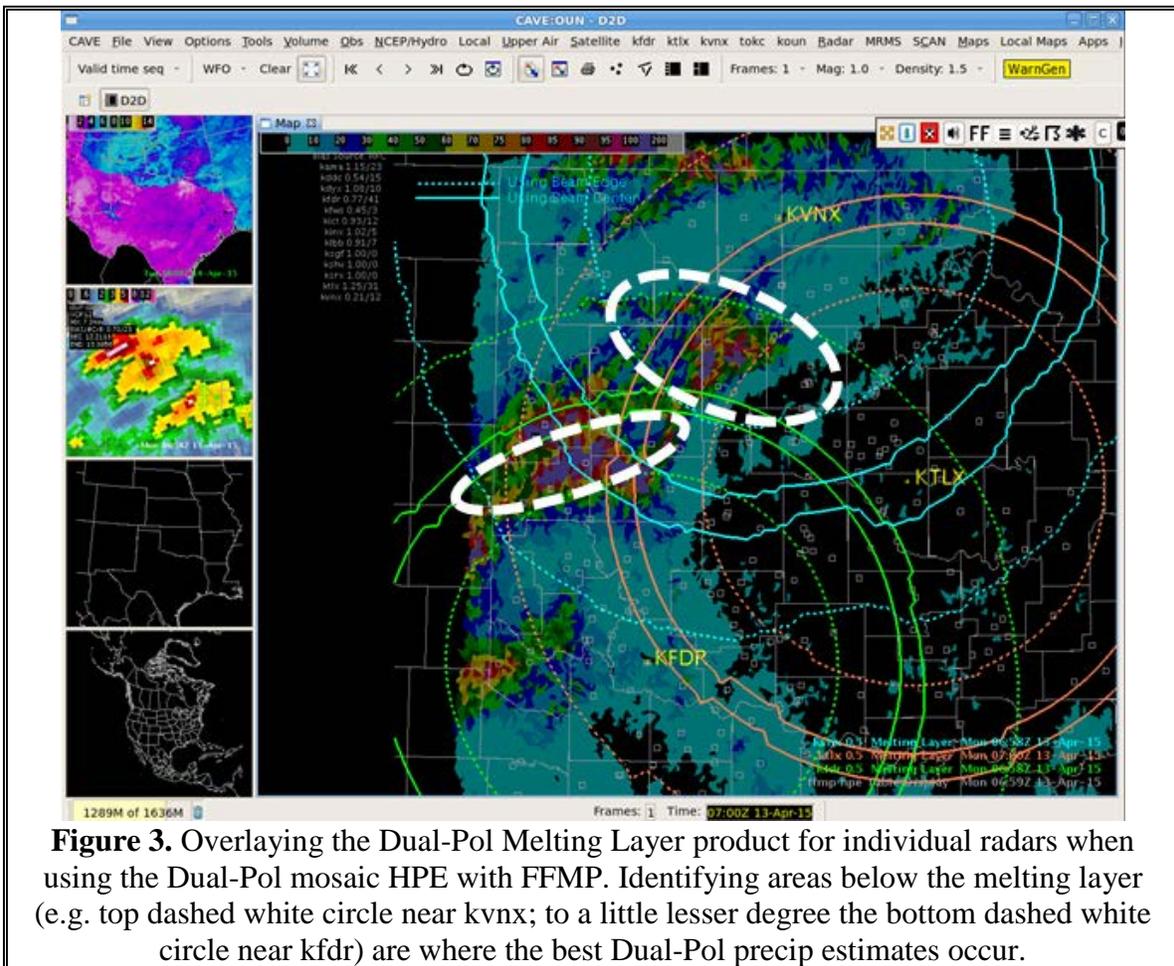   (1) [**radar**] [**precip source mean-field bias factor**] / [**# of gauge-radar pairs**]
      NOTE: The bias factors and gauge-radar pairs list will only appear if one of the two mean-field bias sources is chosen.

   b. At the **top of the current hour**, **the radar bias factors in the overlay disappear until the hourly bias update is complete ~ :25 min after the hour.** After ~ :25 min after the hour, the bias factors will appear for the current frame. If you are interested in looking at the bias factor overlay on the :00 to :25 min data, you can clear and reload the product.
   c. As of 7-13-2015 **all RFCs** have 14.3.1 or a more recent build, so the **biases** they send to the WFOs are for the **Dual-Pol product**.

d. In 14.3.1, **the Local Bias source does not work.** Therefore, do not configure HPE/Bias HPE to use this Bias Source. This problem is fixed in 14.4.1.

e. To **view the "Dual-Pol Source: Y/N" part of legend in FFMP** that is obscured by the color bar legend, you can temporarily resize CAVE by dragging the right side of the CAVE window inward. This forces the text to redraw and pop underneath the color bar. Resize CAVE to return CAVE to its normal dimensions for interrogating data.

f. If you **can't read the text legend** in the upper-left part of the D2D display due to underlying colors overwhelming the grey text, zoom out and pan to the left border with a full black background where there is no data.

g. When **choosing a precipitation source** for FFMP, consider coverage, resolution, and whether the precip source is Dual-Pol and bias-corrected (**Figure 2**). The 14.3.1 HPE mosaic based off of Dual-Pol may be a good precip source to start out with *unless* there are known issues with beam blockage, or if you have a localized event close to a single radar that might be providing higher-resolution precip estimates in time and space. In this case, single source radar data may be the optimal source. If Dual-Pol is the default for HPE and Bias HPE, then the only way to view Legacy precip estimates is with the DHR single-radar source. Only use Bias HPE when biases make sense (evaluate the biases in the text overlay in the upper left of the Bias HPE product) and you have > 10 gauge-radar pairs associated with the radar's bias factor. Whatever source you choose, it is important to routinely check your precip sources as the hourly biases can change throughout a flash flooding event.

h. Since Dual-Pol is now the default HPE/Bias HPE source, **overlay the Melting Layer** product (**Figure 3**) when looking at Dual-Pol precipitation estimates. This can help you spot potential artifacts related to the Hybrid Hydrometeor Classification (HHC) within and above the melting layer. **Anticipate precipitation estimates to change** when using Dual-Pol HPE/Bias HPE in or above the melting layer for the radars in the mosaic. Dual-Pol precip estimates are going to be best below the melting layer.

i. When using the Dual-Pol-based HPE or Bias HPE, recognize that the **instantaneous precip rates** can be much higher than the Legacy instantaneous precip rates which are usually capped off around 4"/hr with the hail cap at the RPG. Dual-Pol can suggest instantaneous precip rates much higher than 4"/hr in individual radar bins and in basin averages, but remember that these are not typically sustained for long periods of time. That is why it is very important to also view the time trend of the instantaneous precip rates, or view the precip accumulations using different durations in FFMP.

|	Maximized coverage?	Bias corrected?	Dual-Pol? (as of 14.3.1)	Resolution?
HPE mosaic	Yes	No	Yes	1 km x 1 km 5 min
Bias HPE mosaic	Yes	Yes	Yes	1 km x 1 km 5 min
Single radar DPR	No	No	Yes	0.25 km x 1 deg 3-6 min
Single radar DHR	No	No (default, but configurable at RPG)	No	1 km x 1 deg 3-6 min

**Figure 2.** Considerations when choosing a precip source.

Figure 3. Overlaying the Dual-Pol Melting Layer product for individual radars when using the Dual-Pol mosaic HPE with FFMP. Identifying areas below the melting layer (e.g. top dashed white circle near kvnx; to a little lesser degree the bottom dashed white circle near kfdr) are where the best Dual-Pol precip estimates occur.

2) Loading HPE/Bias HPE in FFMP (return to top)
    a. From the "SCAN" menu (**Figure 4**) identify the "FFMP" section, and select the FFMP Table/Basins Display menu item from the desired precip source menu (e.g. HPE, koax, etc.).

    NOTE: In 14.3.1, there is a menu labeling error once you get to the HPE/BHPE menu. The FFMP Table is described as a "DHR MOSAIC" (**Figure 5**). Beginning in 14.3.1, Dual-Pol is the default, and the menu should read "DPR MOSAIC".
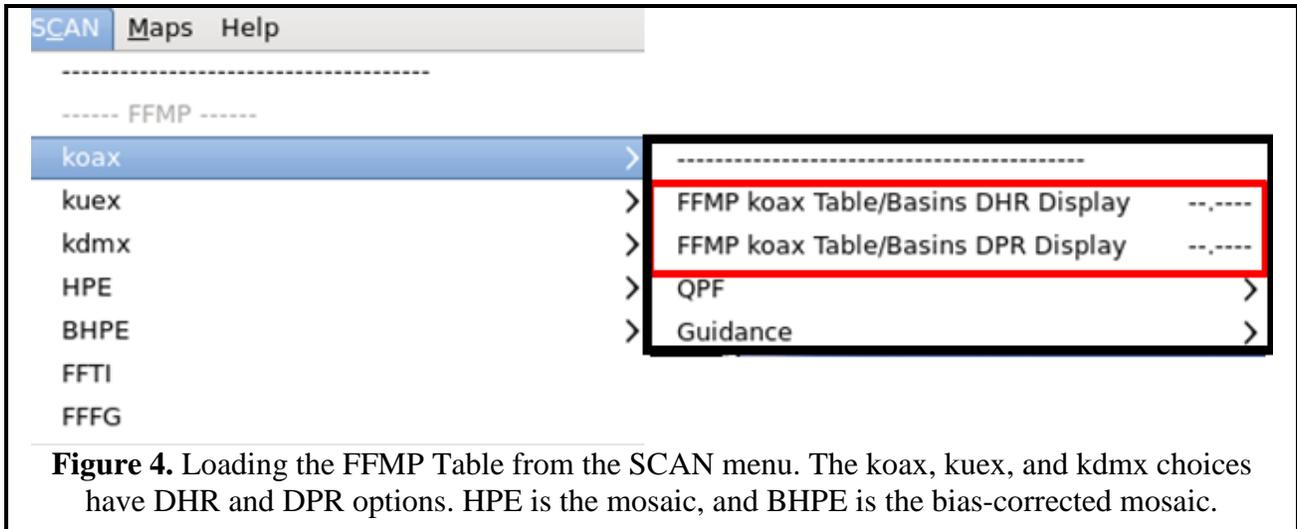
Figure 4. Loading the FFMP Table from the SCAN menu. The koax, kuex, and kdmx choices have DHR and DPR options. HPE is the mosaic, and BHPE is the bias-corrected mosaic.
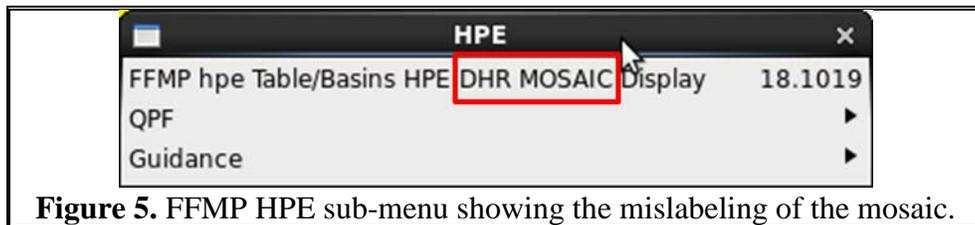
**Figure 5.** FFMP HPE sub-menu showing the mislabeling of the mosaic.

3) Loading HPN in FFMP (return to top)
    a. In the FFMP Basin Table, click the "Attributes" button to open the Attributes sub-menu (**Figure 6**, left)
    b. Checkmark "qpf" and select your QPF source (**Figure 6**, right):
        1. HPE Nowcast
        2. HPE Bias Nowcast
        3. QPFSCAN
    c. Once the QPF source is chosen, two things will happen to the FFMP table (**Figure 7**):
        1. QPF information will be in a new column
        2. Above the now yellow slider bar, it will display: "Split! XX hrs. QPE and XX hrs. QPF."
            (1) Depending on the selected duration, this line will describe how many hours of QPE data is displayed, as well as the one hour of QPF data.

(2) **Important Note**: There is a bug in FFMP where QPF is not being used in calculating Ratio and Diff in the table with HPN (see **Figure 7**). You have to manually add QPE and QPF in the columns to compare to FFG.
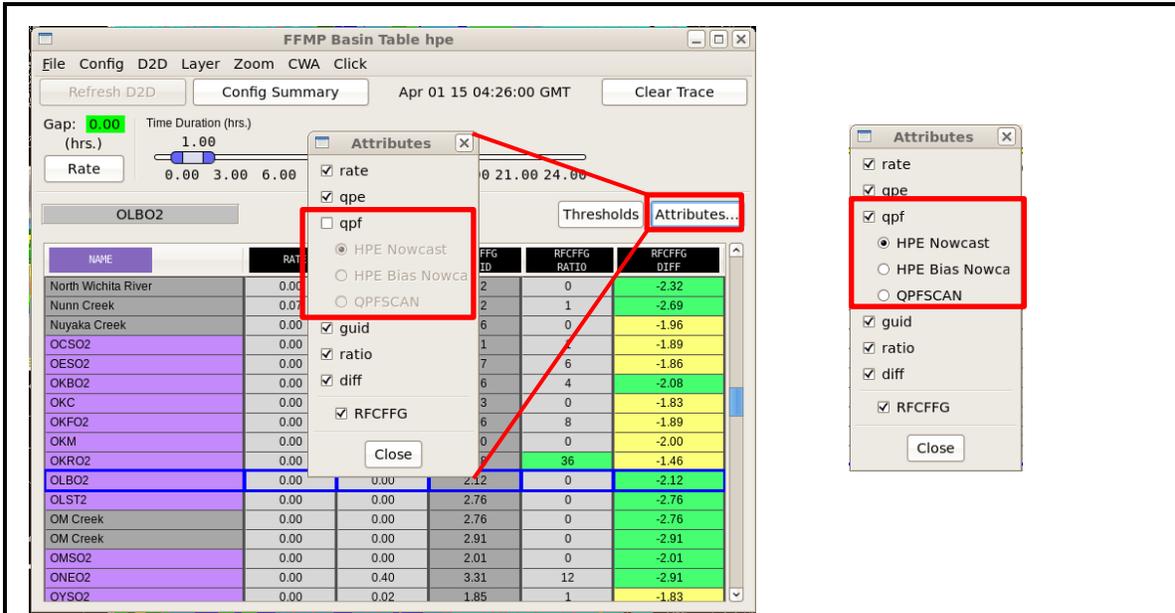

Figure 6. (left) FFMP Basin Table, showing the Attributes sub-menu with QPF not checked, (right) FFMP Attributes menu with QPF checked and set to HPE Nowcast which is HPE's 1hr QPF (the HPN).
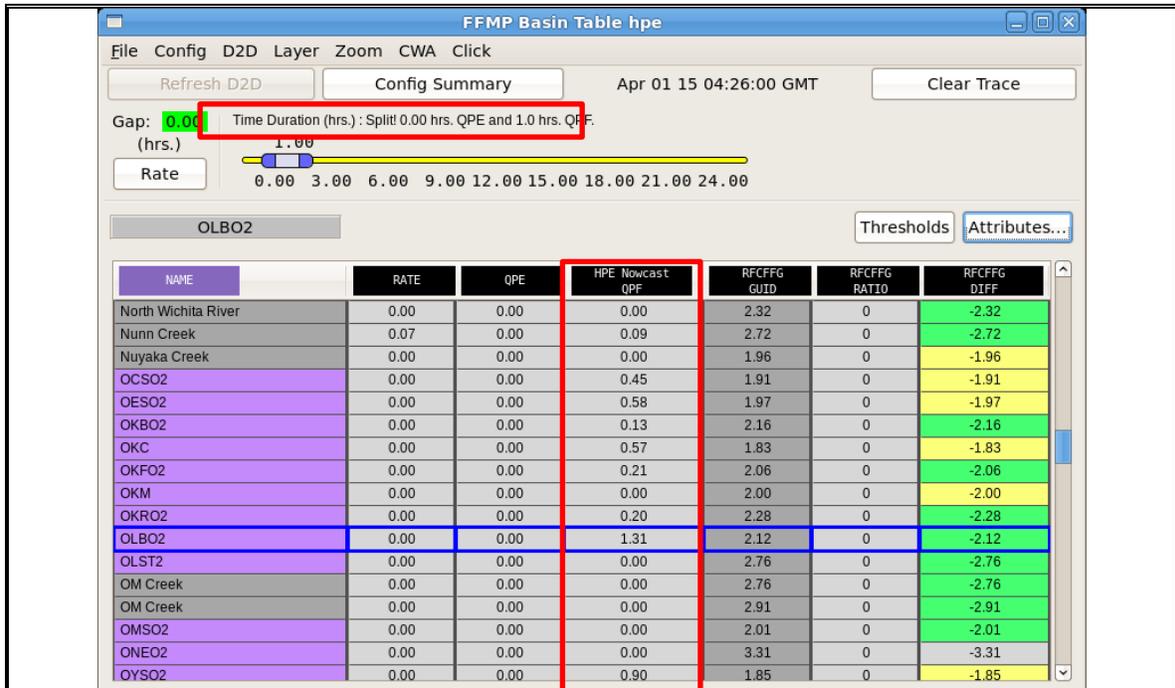
Figure 7. FFMP Basin Table after the HPN has been selected. Note the extra column of data (OLBO2 QPF was 1.31" and 1.29" ended up verifying) and the "Time Duration" QPE and QPF. Also note that ratio and diff do not use QPF data (current bug).
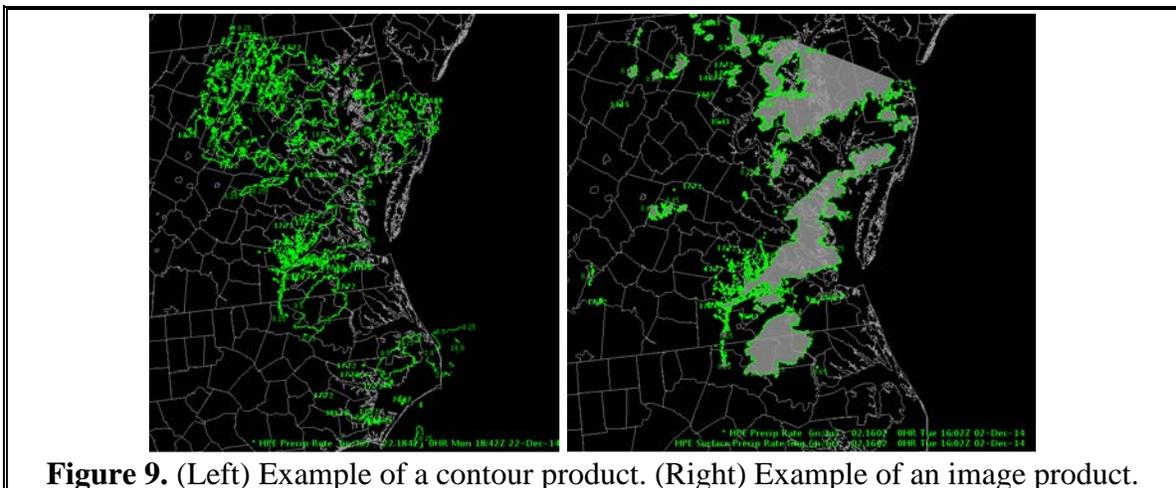
4) <u>Loading HPE/Bias HPE in the Volume Browser</u> (**Figure 8**; return to top)
- *Sources* → SfcGrid
  a. Choose "BiasHPE" and/or "HPE"
- *Fields* → Sfc/2D → Precip
  a. Choose either "Storm Tot Precip" and/or "Precip Rate"
- *Planes* → Misc → Sfc
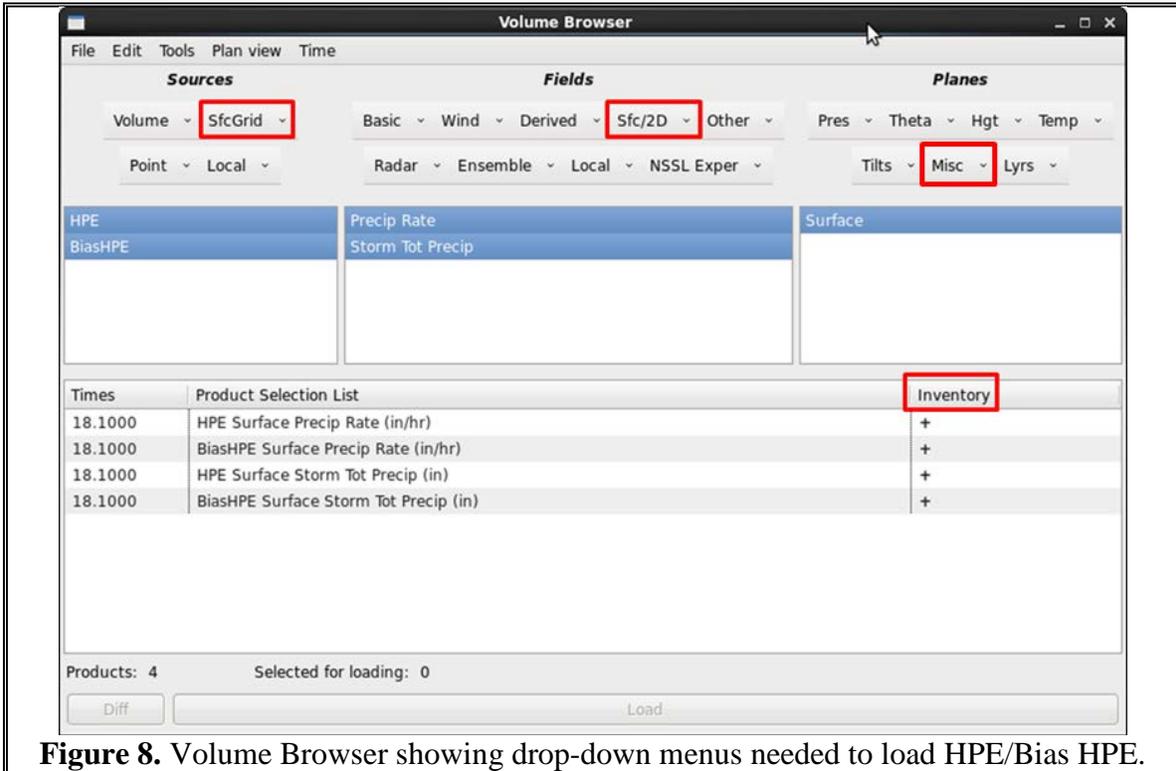
Figure 8. Volume Browser showing drop-down menus needed to load HPE/Bias HPE.

a. The HPE/Bias HPE product from the Volume Browser is a contour product, so to convert to an image for viewing/sampling, right-click the product legend on the bottom right and select "Load as Image" (**Figure 9**).


Figure 9. (Left) Example of a contour product. (Right) Example of an image product.

5) Loading the HPE-HPN Precip Rate in the Volume Browser (**Figure 10;** return to top)

Note: HPN currently does not load from the Volume Browser in AWIPS-2. Once the bug is fixed, the instructions below can be used to load it.

1. Select "No Backfill" from the Load Mode menu (see **Figure 10** below)
2. Select "5" from the Frames menu (for rates at 0min, 15min, 30min, 45min and 60min)
3. Open up the Volume Browser from the Volume menu (Volume →Browser)
4. Load the "Precip Rate" product in the Volume Browser
   a. *Sources* → SfcGrid
      o Choose "HPE" (note "BiasHPE" loads the same way)
   b. *Fields* → Sfc/2D → Precip
      o Choose "Precip Rate"
   c. *Planes* → Misc → Surface
   d. Select "HPE Surface Precip Rate (in/hr)" from the Product Selection List field
   e. Select "Load" to load the product
5. In D2D right click-and-hold on the "HPE Precip Rate (in/hr)" legend name and select "Load Product as Image"
6. Left click the "HPE Precip Rate (in/hr)" legend name to turn off the non-filled contour product and view only the image product
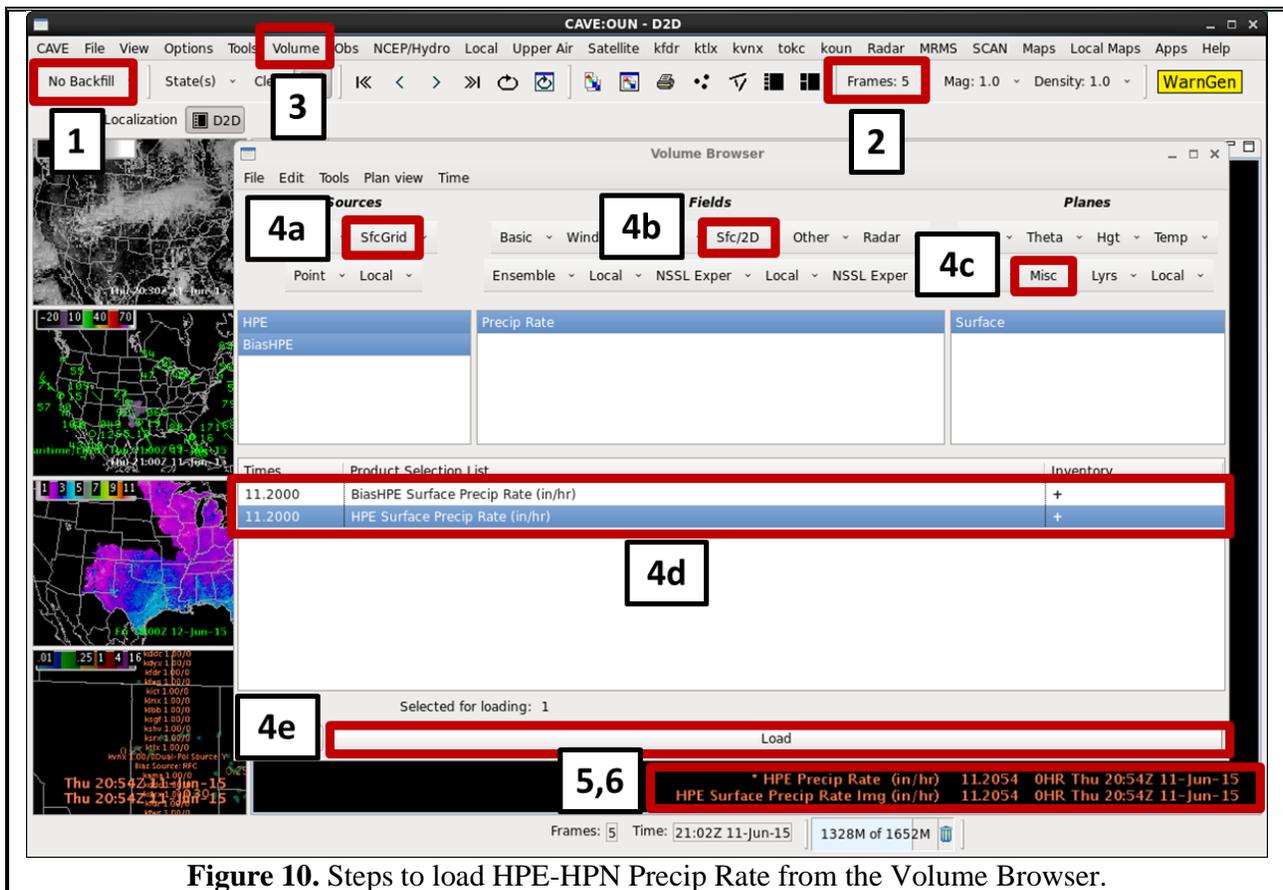

Figure 10. Steps to load HPE-HPN Precip Rate from the Volume Browser.

8

6) <u>Loading HPE-HPN Storm Total Precip Product in the Volume Browser</u> (return to top)

Note: HPN currently does not load from the Volume Browser in AWIPS-2. Once the bug is fixed, the instructions below can be used to load it.

1. Select "No Backfill" from the Load Mode menu (**Figure 11**)
2. Select "2" from the Frames menu
3. Load the Volume Browser from the Volume menu (Volume →Browser)
4. Load the "HPE Surface Storm Tot Precip (in)" product in the Volume Browser
   a. *Sources* → SfcGrid
      o Choose "HPE" (note "BiasHPE" loads the same way)
   b. *Fields* → Sfc/2D → Precip
      o Choose Storm Tot Precip
   c. *Planes* → Misc → Surface
   d. Select "HPE Surface Storm Tot Precip (in)" from the Product Selection List field
   e. Select "Load" to load the product
5. Right click-and-hold on the "HPE Storm Total Precip (in)" legend name and select "Load Product as Image"
6. Left click the "HPE Storm Total Precip (in)" legend name to turn off the non-filled contour product and view only the image product
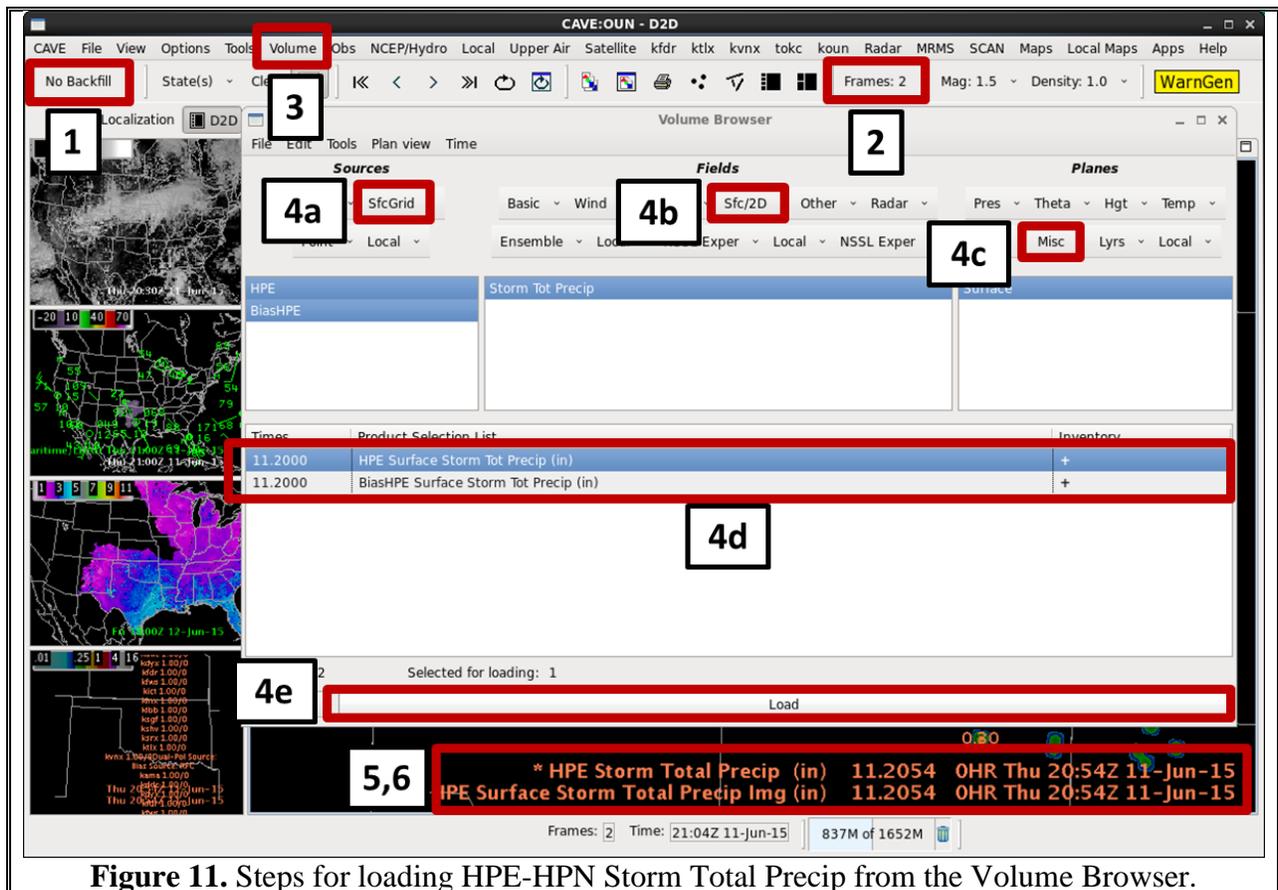

Figure 11. Steps for loading HPE-HPN Storm Total Precip from the Volume Browser.

7) Identifying if the Mean-Field Bias has been Applied at the RPG (return to top)
    a. The RPG can be configured (via the HCI) to apply a mean-field bias from MPE in the 1hr, 3hr, and storm total Legacy precipitation radar products (default is not to apply any bias in the routine radar products at the RPG).
    b. You can check if the bias has been applied at the RPG by loading the SCAN Precipitation Rate product for a particular radar if this overlay has been configured by your focal point (**Figure 12**).
    c. The legend in the upper left (**Figure 13**) will have the label: "Bias Applied Flag (T/F):"
        1. In this example, it is "False" meaning the mean-field bias is not applied at the RPG.
    d. To enable the Bias Applied Flag overlay the focal point or user can create an override:
        1. *D2D->SCAN->config->PrecipRate->SCANconfig_precipRate.xml* in localization perspective controls whether this line is turned on or off. Have focal point make a site override copy of the base file or the user can make a copy to a user override.
        2. Setting the bias flag to "True" adds it to the Precip Rate text overlay
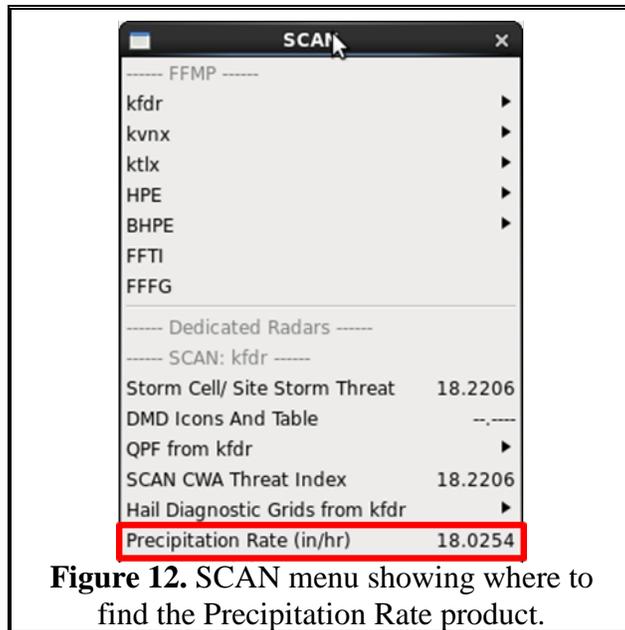
Figure 12. SCAN menu showing where to find the Precipitation Rate product.
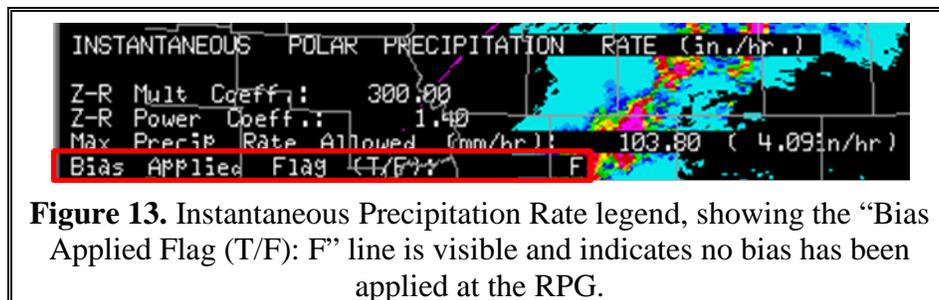
Figure 13. Instantaneous Precipitation Rate legend, showing the "Bias Applied Flag (T/F): F" line is visible and indicates no bias has been applied at the RPG.

8) <u>Software Defects</u> (return to top)
   a. HPE and Bias HPE FFMP menu labeled DHR MOSAIC when DPR is the precip source (default 14.3.1). See **Figure 5**.
      i. The HPE menu should be labeled "FFMP hpe Table/Basins HPE **DPR** MOSAIC Display"
      ii. The BHPE menu should be labeled "FFMP bhpe Table/Basins HPE Bias **DPR** MOSAIC Display"
   c. When loading HPE/Bias HPE in the 14.3.1 Volume Browser, after you "Load as Image", the text overlay in the upper-left gets duplicated (should be fixed in 14.4.1).
   d. In 14.3.1, some of the text in the upper left is hidden by the color table. Resize the CAVE by dragging the right side of the CAVE laterally inwards until the text is pushed below the color bar.
   e. When using HPN in FFMP, the ratio and diff are not using the 1hr QPF in the calculations (it only uses QPE). You can see this clearly in the FFMP table if the ratio and diff columns don't change when turning on HPN for basins where you have positive QPF. When using HPN in the FFMP table, you can really only use the QPF column to determine what the 1hr QPF will be for that basin, and you need to evaluate FFG for the basin (and different durations) separately.
   f. HPE label in upper left of the Volume Browser and FFMP D2D display is displaying bias information that is only relevant for the Bias HPE. For the HPE product, the label should read "Bias: None". The list of biases should only be displayed on the Bias HPE product. Listing biases on the HPE product could cause some to incorrectly believe that biases are being applied in the HPE product.
   g. In the first 20 min of the current hour, the radar bias factors in the HPE overlays disappear until the new biases are available at :25 min after the hour. At that point each new frame of data will have the biases listed. If you have multiple frames loaded with no biases listed for the :00 to :20 min after the hour data, clearing and reloading the data will trigger the bias overlay to display on these frames.
   h. HPN does not load in the Volume Browser due to an AWIPS-2 bug.
   i. In 14.3.1, the Site Local Bias option in MPE is broken (should be fixed in 14.4.1).

8) <u>FAQ</u> (return to top)
   a. What is the High-Resolution Precipitation Estimator (HPE)?
      • Mosaic of precip estimates from multiple radars with 1km x 1km resolution every 5 minutes, designed for use with FFMP when needing to analyze multiple radars at once.
      • Can be based on Dual-Pol Digital Precipitation Rate (DPR) OR Legacy Digital Hybrid Reflectivity, but **Dual-Pol is 14.3.1 default**.
      • No bias has been applied to the precip estimates.
   b. What is the Bias High-Resolution Precipitation Estimator (Bias HPE)?
      • Mosaic of **bias-corrected precip estimates** from multiple radars and rain gauges with 1km x 1km resolution every 5 minutes, designed for use with FFMP when needing to analyze multiple radars at once.
      • Can be based on Dual-Pol Digital Precipitation Rate (DPR) OR Legacy Digital Hybrid Reflectivity, but **Dual-Pol is 14.3.1 default**.

- Bias in Bias HPE is updated hourly at ~25 min after the hour continuously (24hrs a day), and the local hydro focal point can configure bias to come from:
  - i. Radar mean-field bias from the RFCs (14.3.1 default)
  - ii. Radar mean-field bias from the WFO
  - iii. WFO "local bias" which varies spatially as a function of distance from the rain gauges as configured in the Multi-sensor Precipitation Estimator (MPE)

c. What is the High-Resolution Precipitation Nowcaster (HPN)?
- The HPN is 4km x 4km extrapolation of either HPE or Bias HPE, created every 5 min using its own feature-tracking algorithm.
- HPN is designed to provide FFMP with 1hr QPF to generate lead time in flash flood decision making.
- Output is 15-min rain rate forecasts (at 15, 30, 45, and 60 min) and a 1-hour precip accumulation (default 1-hr forecast).
- HPN is designed to be viewable as a separate product in the Volume Browser and is displayable inside FFMP. Currently, the HPN Volume Browser display is broken in AWIPS-2. In the FFMP Basin Table, the HPN is enabled from the Attributes button (**Figure 6**), and it will create a "split window" duration with a fixed 1hr accumulation of QPF that is added to QPE to provide precipitation accumulations valid for 1hr from now (e.g. "split window" accumulations for 3hr in FFMP Table slider bar will be 2hrs QPE + 1hr QPF; see **Figure 7** for example of 0hr QPE and 1hr QPF).

d. What is the Multi-Sensor Precipitation Estimator (MPE)?
- MPE is a suite of software designed for hydro focal points to combine radar data and rain gauges to create better precipitation estimates. MPE is used at RFCs and at some WFOs to create the bias factors used in Bias HPE as well as other precipitation-related products.
- The MPE perspective is loaded from the "Open Perspectives" button in CAVE.

e. What is a mean-field bias?
- MPE calculates a single mean-field bias (e.g. 1.25) for a radar's precip source by identifying positive accumulations from the radar bins and gauges, only at the location of the gauges. The algorithm sums all gauge accumulations and divides by the radar estimates at the gauge locations. The bias factor is multiplied by the original precip accumulation in order to adjust the precipitation estimate for the current hour. The bias factor for the current hour is not applied to previous hours.
- For instances where the bias changes throughout the radar domain due to melting layer or environmental differences, the mean-field bias will not perform similarly across the domain. The local bias can perform better in these circumstances if there are sufficient gauge observations.

f. What is the site-local bias?
- Instead of creating one single bias (mean-field), a spatially varying bias field is created using all available gauges within 40 km of every fourth grid point. To create a local bias, there needs to be 10 gauge-pair observations. To achieve this threshold, the time window is expanded until this condition is met (just like the mean-field bias). The bias values are then linearly interpolated between grid points.

g. How often does the bias factor update?
- The bias factors typically update around 25 min after the hour. MPE at the RFCs or at the local WFO is set up to continuously calculate the biases and make it available to FFMP on an hourly basis.

h. What time window does MPE use to calculate the mean-field bias?
- MPE is supposed to use 10 radar-gauge pairs to calculate mean-field biases. It first looks in the current hour, and if there are not enough gauge-radar pairs of measurable precipitation, then it increases the search window using the latest 2hrs, 3hrs, 5hrs, 10hrs, 1week, 1month, 3 months, and 1142yrs (i.e. lifetime). If the gauge pairs are being reported less than 10, then this is likely broken in MPE (has been routinely observed). If it is early in an event following a long dry spell and MPE is functioning properly, then it is possible for the biases to be from a long time ago and might not be representative.

i. Why can't I see durations larger than 6hrs?
- FFMP accumulations are capped at 6hrs even though the slider bar in the FFMP table allows you to try and select something larger.

j. What is the FFMP Virtual Gauge Basin (VGB)?
- FFMP calculates precip accumulations at gauge locations in a unique way, so you can compare the point-based gauge value with a raw radar point-based value, as opposed to the areal averages applied with basin, county, or HUC-level aggregates. At every gauge location, FFMP accumulates precipitation using the nearest raw input data point. This can be the nearest low-altitude radar bin for a DHR or DPR source, or it can be the nearest gridpoint in the 1km resolution gridded HPE or Bias HPE data. The VGB location in the D2D FFMP display is annotated by white boxes at certain zoom levels, and in the FFMP table, all VGB cell names are colored purple (see SMSO2 gauge location in **Figure 14**). In the example below, the point-based VGB is 6.73", and the areal-averaged basin it resides in (XXXX highlighted with blue rectangle) is 5.12".

k. How do I compare a VGB to a gauge value in FFMP?
- When you right click on a basin name in the FFMP table, you launch a basin trend (**Figure 15**). If you check the vgb box in the Plots section in the upper right, you turn on the gauge overlay. Note the vgb label here should really be labeled gauge, because the light-blue line is actually the gauge value (reported hourly) and not the VGB precip accumulation indicated by the black line (reported every 3-5 minutes).
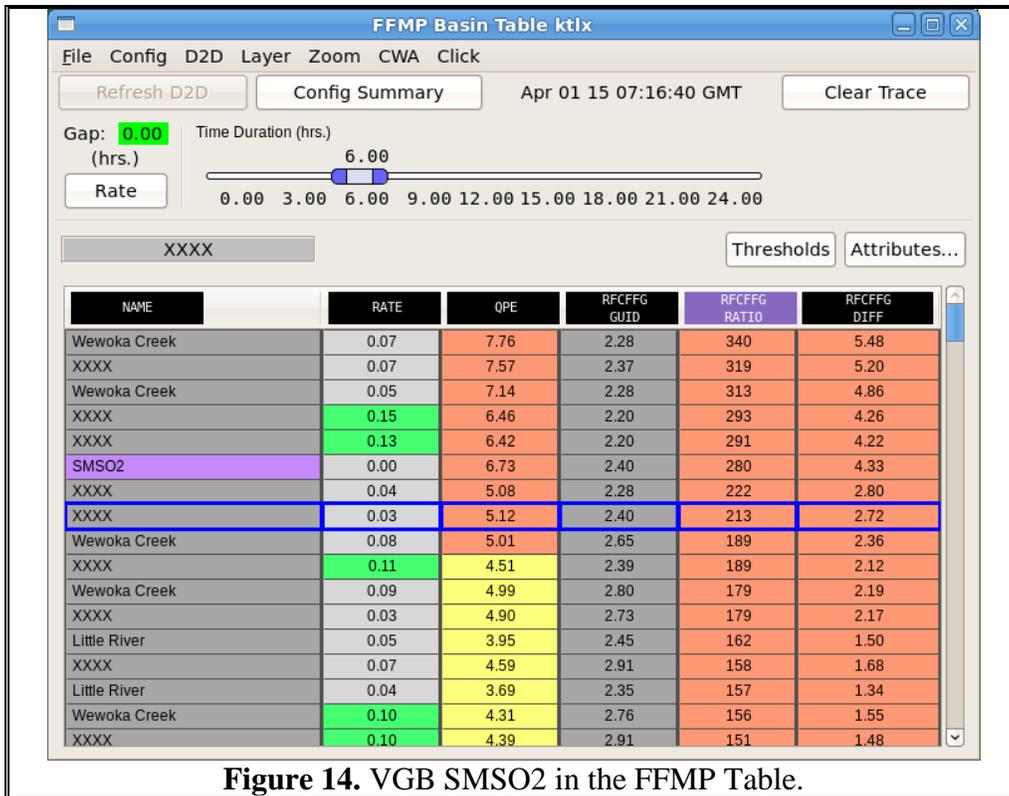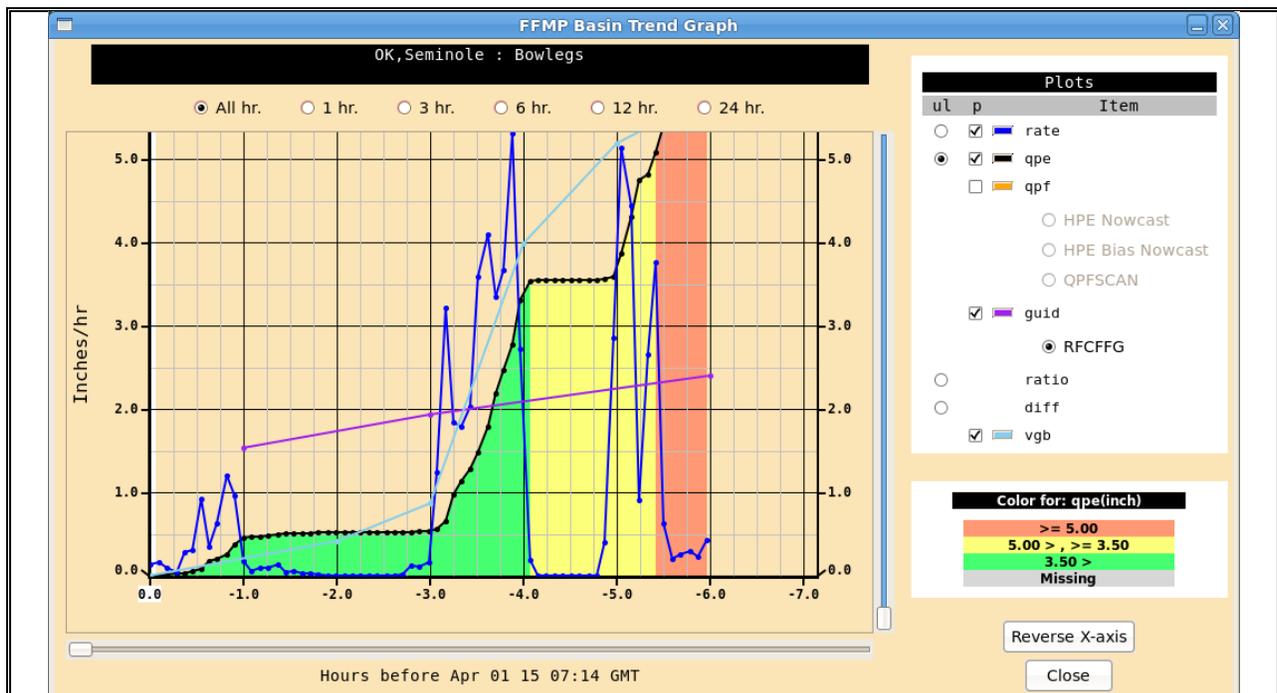
Figure 14. VGB SMSO2 in the FFMP Table.

Figure 15. VGB checkbox selected in the FFMP basin trend allows you to compare hourly gauge accumulations (light-blue line) to point-based radar precip accumulations (black line). In this example the radar-based precip estimate (black line) is less than the gauge accumulations (light-blue line) for the heavy rainfall occurring 3 to 5 hours ago. Note that there is an offset in timing between 4 and 5 hours ago that is likely due to the timing of the gauge collection.

HPE/FFMP Focal Point References

1) Create Forced Flash Flood Guidance for FFMP (return to top)
   a. Force Flash Flood Guidance in urban areas in order to effectively use FFMP. Lots of offices force 1hr FFG (e.g. 0.75", 1", or even 1.5") and 3hr FFG in basins with urban areas. The FFMP Focal Point can set this up using the FFFG tool in the SCAN menu (**Figure 16**). To identify basin IDs you need to sample the basins in D2D after loading FFMP and then match the ID to the basin list organized by county in the FFFG tool. The file can be saved, and applied for a certain amount of time specified.
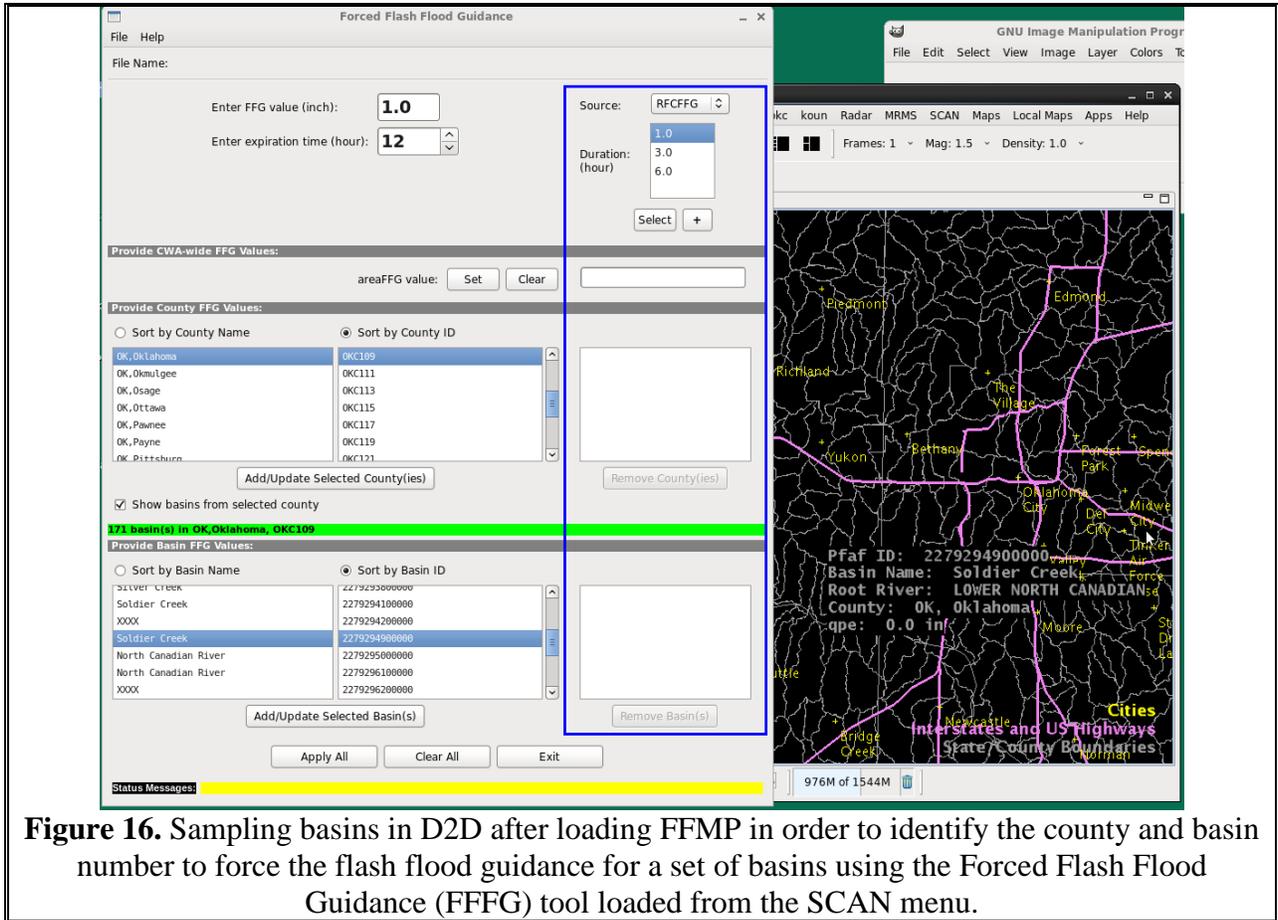
Figure 16. Sampling basins in D2D after loading FFMP in order to identify the county and basin number to force the flash flood guidance for a set of basins using the Forced Flash Flood Guidance (FFFG) tool loaded from the SCAN menu.

2) HPE Token for Configuring Dual-Pol or Legacy HPE Precip Sources (return to top)
   a. This token is configured within the *Hydro Apps->Hydro->Apps_defaults* from the localization perspective:

   > hpe_dualpol_on : yes (using Dual-Pol, default)
   > hpe_dualpol_on : no (using Legacy)

NOTE: In the rare instance that a radar does not have Dual-Pol data, HPE will use Legacy products for that radar if they are available.

3) <u>HPE Token Combinations for Configuring Bias Sources </u>(return to top)
   a. These tokens are configured within the *Hydro Apps->Hydro->Apps_defaults* from the localization perspective. The Site Local Bias (see options below) is broken in 14.3.1 and will be fixed in 14.4.1.
      i. RFC Mean-Field Bias (default settings; uses RFC MPE-generated mean-field biases)

      > hpe_use_locbias   : OFF
      > hpe_bias_source   : RFC

      ii. Site Mean-Field Bias (uses local MPE-generated mean-field biases)

      > hpe_use_locbias   : OFF
      > hpe_bias_source   : local

      iii. Site Local Bias (spatially varying bias with 40-km search radius from local MPE)

      > hpe_use_locbias   : ON   (**Note**: **broken in 14.3.1; fixed in 14.4.1**)

      <u>NOTE:</u> Setting *hpe_use_locbias* to **ON** overrides the *hpe_bias_source* token, and therefore, it does not matter how *hpe_bias_source* is configured.

4) <u>Setting "misbin" to Configure Radar Used in HPE Beam Blockage Areas </u>(return to top)
   a. These instructions are based off of Greg Hanson's (SH at WFO BTV) instructions. For questions about configuring misbin, please email Jill.Hardy@noaa.gov and Greg.Hanson@noaa.gov.
   b. By default, HPE uses the radar with the lowest beam altitude at the 0.5 degree tilt to populate a given point. In flat terrain, this is usually the closest radar. However, in complex terrain, beam blockage can sometimes result in a higher tilt being used in the precipitation algorithm (not 0.5 degrees), and a more distant radar may actually have the lower altitude grid cell. You can use MPE and misbin to force HPE to use a specific radar in areas of beam blockage.
   c. Decide if the default setting of misbin token turned off is right for you:
      i. To determine if precipitation estimates are affected by terrain or the Hybrid Scan:

      1) Review Hybrid Scan info for your primary radar. Talk to your radar focal point and maybe the ROC .
      2) Are there areas where the Hybrid Scan uses 1.5° or 2.4° in your HSA?
         a. These areas may produce poor precipitation estimates.
         b. Check adjacent radars…Can they look into your beam blocked areas at a lower elevation angle and lower altitude?
      3) Look at RADCLIM output.
         a. If it shows uniform coverage except for range degradation beyond about 100 nm, then you're OK.
         b. Wedges of degraded data that indicate blockage or overshooting due to hybrid scan are suspect.
      4) In MPE Editor, view Radar Coverage Fields (under the Basefields menu).
         a. Radar Coverage Fields show the radar that will be used if the misbin token is turned on.

          b. Do the radar coverages match your impression of which radar has the best coverage?
- ii. HPE Default setting is OK if:
  - 1) Your terrain is flat, or
  - 2) You know the 0.5° slice is used for precip estimates over your entire radar domain.
- d. (Optional) Turn on misbin token if your HSA is in complex terrain & hybrid scan uses elevations above 0.5°.
  - i. Add the following line (or modify existing setting) within the *Hydro Apps->Hydro->Apps_defaults* from the localization perspective:
    - 1) hpe_load_misbin : ON
- e. If misbin token is left off, be extremely wary of using HPE FFMP in areas of beam blockage.
  - i. Data choice will be based on altitude of the 0.5° elevation and not the actual lowest tilt of the data in the hybrid scan.
- f. If misbin token is turned on, check the Radar Coverage Field in MPE Editor.
  - i. Identify missing data areas.
    - 1) Missing data may degrade FFMP if basins are partially missing.
    - 2) Entire basin may be set to missing if no radar data is available.
  - ii. Identify areas where adjacent radars overlap the same area.
    - 1) Misbin = 1 for both radars
      - a. 0.5° rule applies for radar selection.
      - b. Make sure selected radar is using data from the lowest altitude angle available.
        - 1. Closest radar may be using 1.5° or 2.4° elevation in Hybrid scan…0.5° rule strikes again!
        - 2. Best data may be from 0.5° slice from radar farther away.
  - iii. Work with your RFC to make changes to misbin files to eliminate overlaps and use best radar data.
    - 1) Misbin files exist for each radar: misbin.aaa, misbin.bbb, misbin.ccc, etc.
    - 2) Misbin files reside in:
      /awips/hydroapps/precip_proc/local/data/app/mpe/misbin