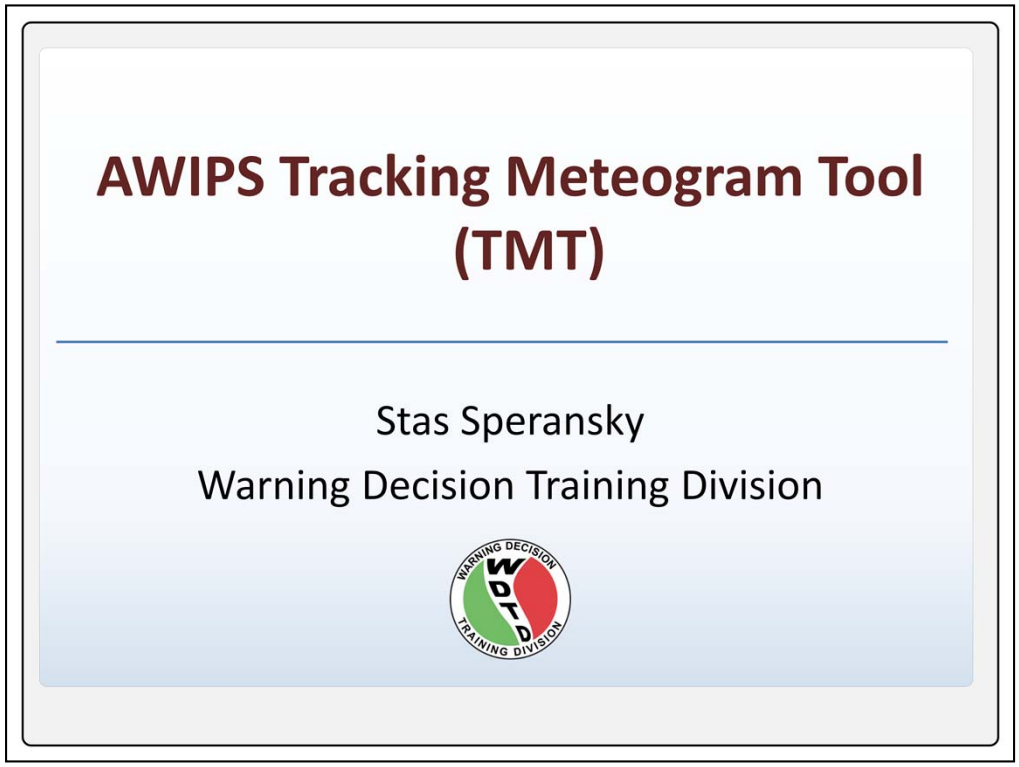
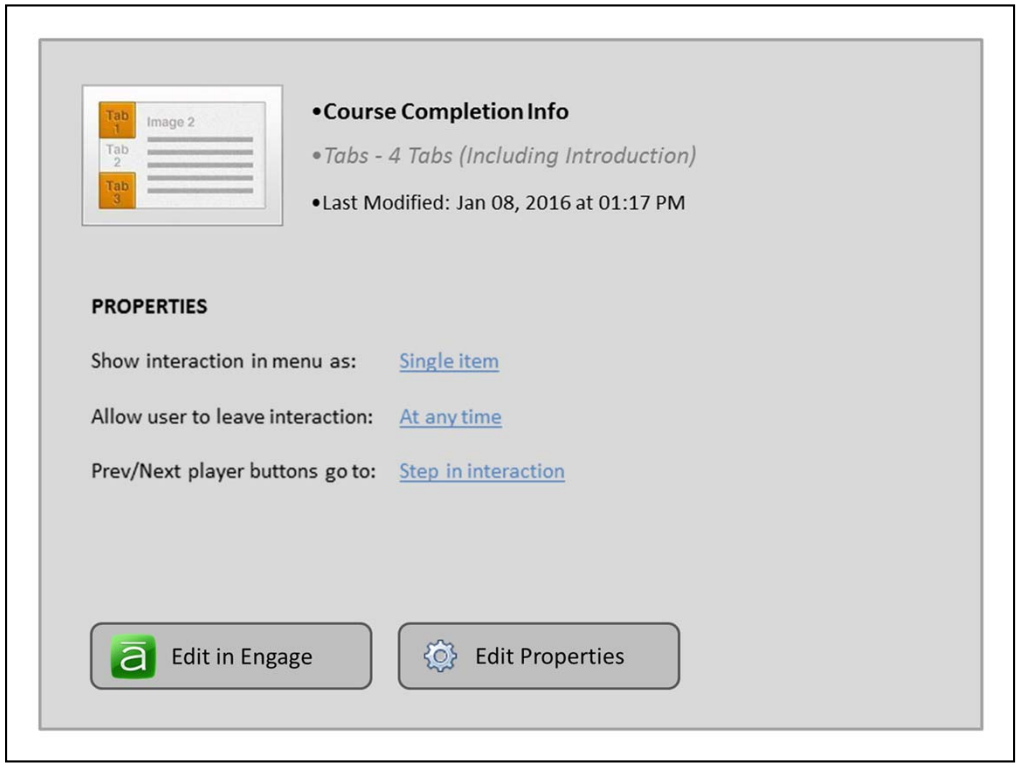
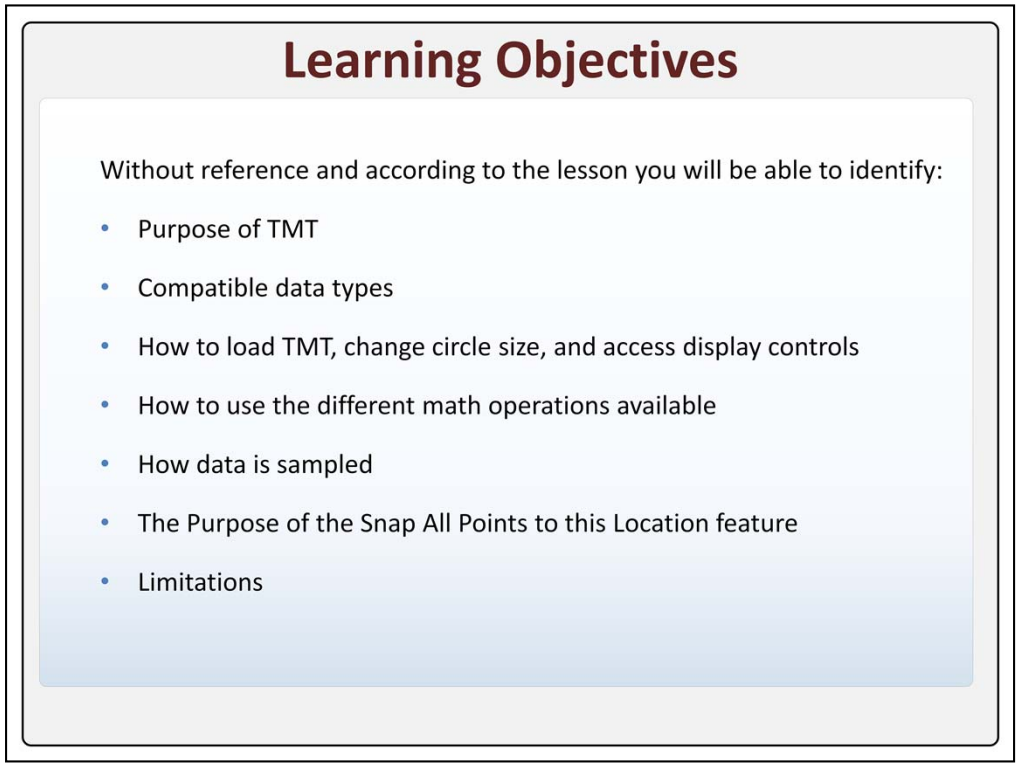


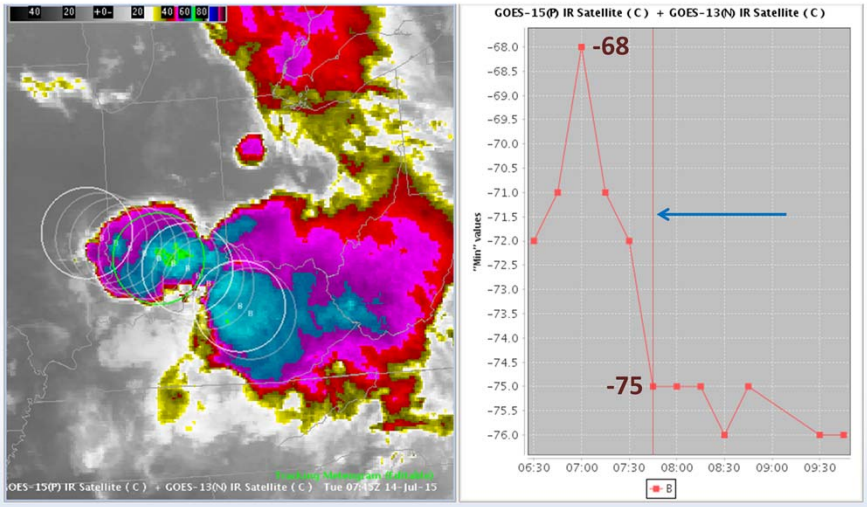
Hello everyone. Welcome to the Tracking Meteogram Tool Training. This is Stas Speransky with the Warning Decision Training Division.


Tab 1
Image 2
Tab 2
Tab 3
•Course Completion Info
•Tabs - 4 Tabs (Including Introduction)
•Last Modified: Jan 08, 2016 at 01:17 PM
PROPERTIES
Show interaction in menu as: Single item
Allow user to leave interaction: At any time
Prev/Next player buttons go to: Step in interaction
Edit in Engage
Edit Properties



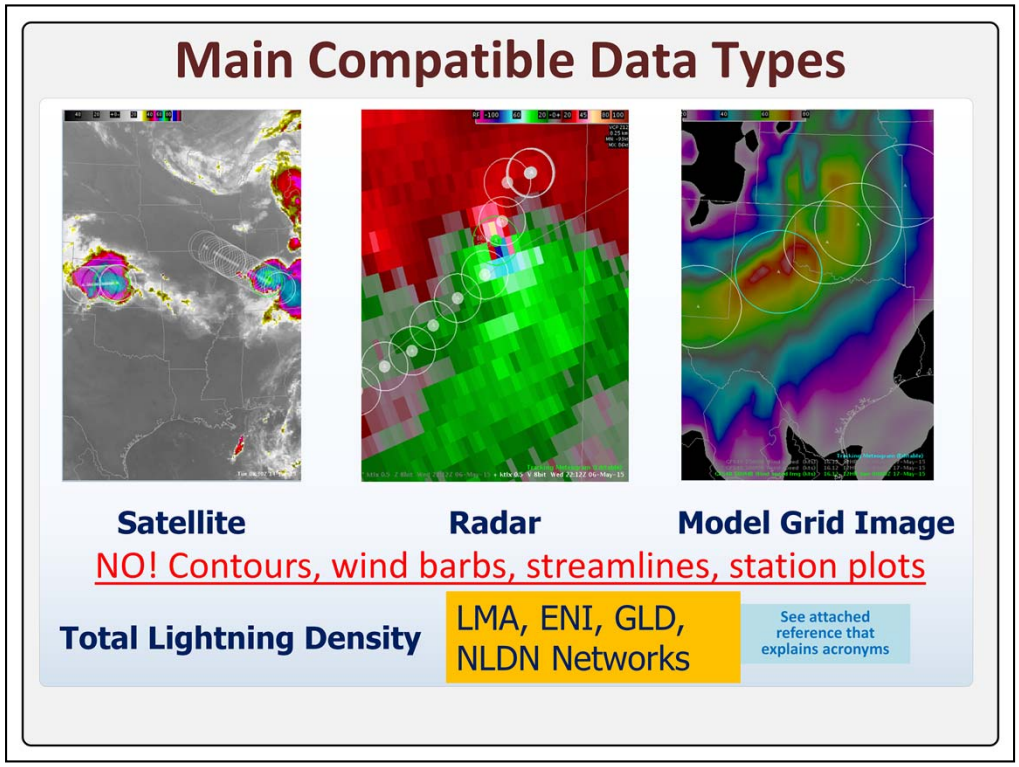
Please take a moment to review the learning objectives. Then click on the Next button to advance to the next slide.

Create Time Trend Plots with TMT

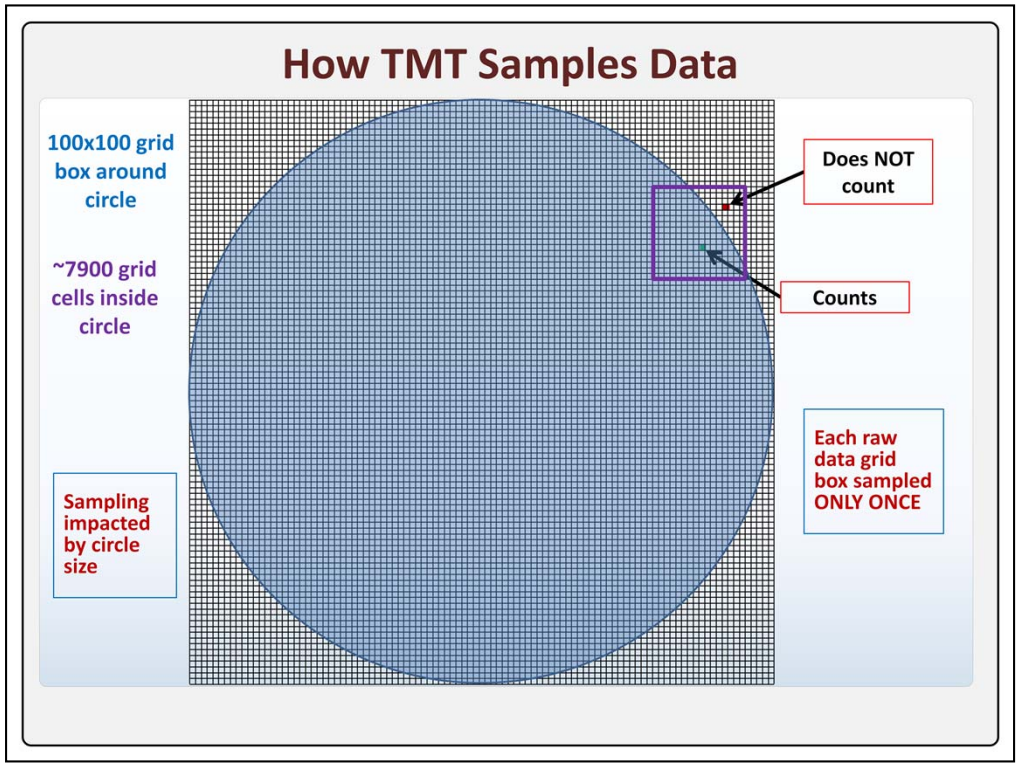


IR satellite image tracking Minimum cloud-top temperatures in a Mesoscale Convective System

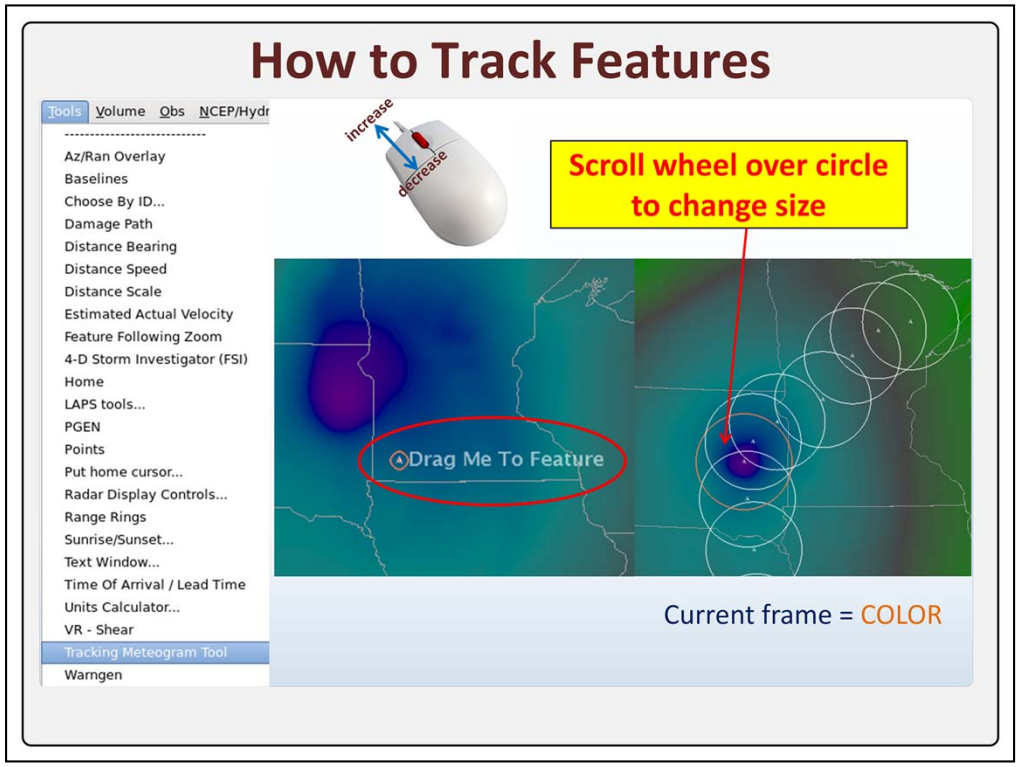
There's a Tool in AWIPS called the Tracking Meteogram. It allows the user to track meteorological features using circles on each frame of data to create time trends of the data loaded. In the example on this slide, the Tracking Meteogram is used to track the Minimum cloud top temperatures in a Mesoscale Convective System. You can see minimum cloud-top temperatures cooling from -68C to -75C as the MCS strengthens and deepens at the current time, 07:45z as indicated by the vertical red line.



Before we dive deeper into how to use the Tracking Meteogram, lets first discuss the data types that are compatible with this tool. There are 4 main compatible data types: Satellite, Radar, Model Grid Image, and Total Lightning Density. Note that data must be loaded as an IMAGE as the Tracking Meteogram is not compatible with contours, wind barbs, streamlines, or station plots.

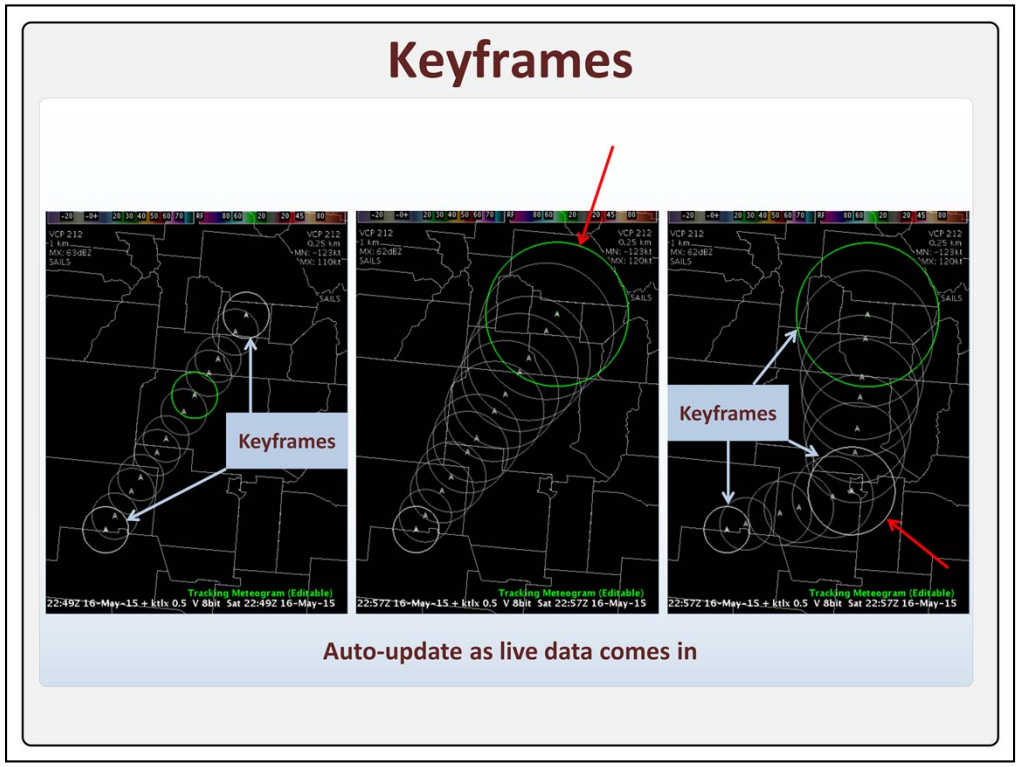


To use the TMT, the forecaster places a circle around a feature under investigation. The TMT then draws a 100x100 grid box around the circle. There are approximately 7,900 grid cell centroids inside the circle, out of 10,000 total grid cells. The Tracking Meteogram samples the raw data grid boxes of the underlying meteorological data. An example of a raw data grid box is traced in purple. Notice that there are many grid cells contained inside the purple raw data grid box (256 to be precise). If a cell centroid is inside the circle, then its value is used in the calculations, as in the green cell. Otherwise, the value is dropped, as in the red cell. The Tracking Meteogram also checks to make sure that each raw data grid box gets sampled only once. If multiple grid cells in the 100x100 grid end up sampling the sample raw data grid box, then only one of those sampled values is used in the calculations. Changing the size of the circle recalculates the values because the location of each centroid in the 100x100 grid will change relative to the meteorological data.

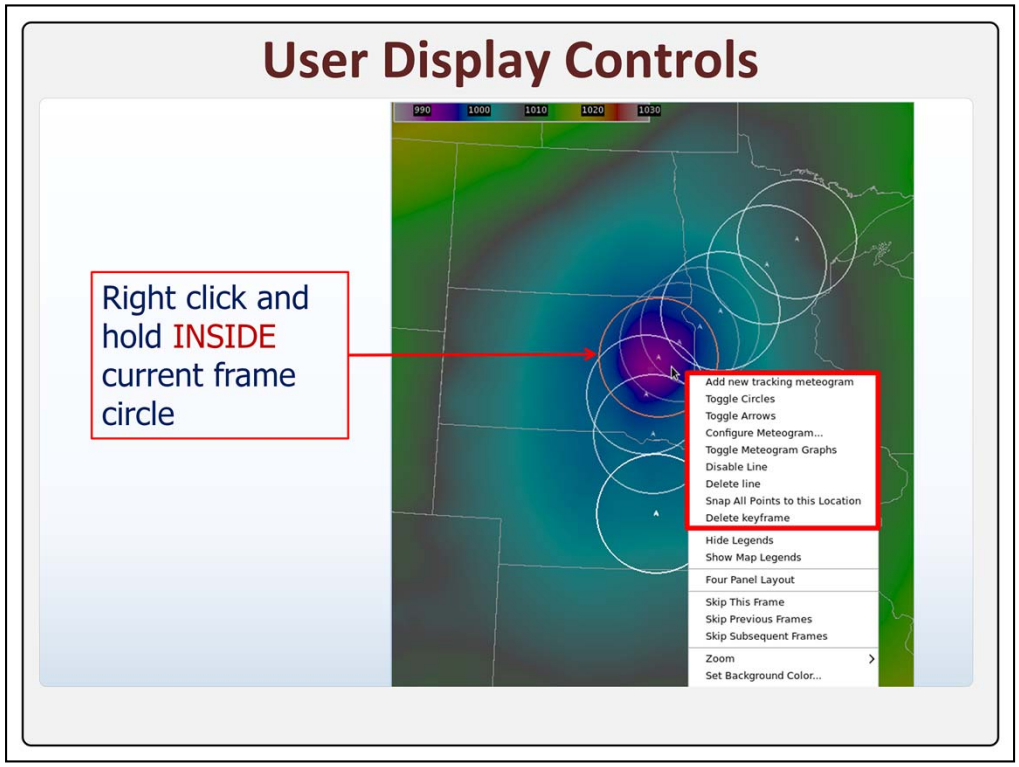


The Tracking Meteogram can be found by clicking on Tools in the D2D perspective inside CAVE. It does not matter whether you load the TMT or the data first.

To use the TMT, go ahead and load radar, satellite, or model grid image data along with the TMT. You will be prompted with a familiar “Drag Me to Feature” icon in the map editor display. After dragging the icon to the feature, many circles will appear, one for each frame of data loaded. The circle for the current frame is always highlighted with a different color and you can interact with other circles by stepping through each frame of data using the left/right arrows on your keyboard. You may change the size of the circle by hovering over it with your mouse and using the scroll wheel to increase or decrease the size of the circle.

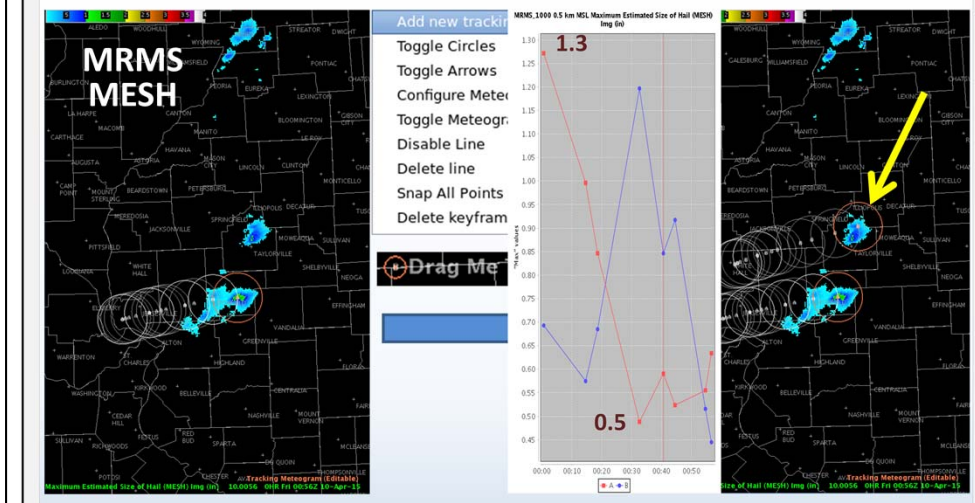


A circle that gets manipulated by the user becomes a Key frame. Circles that are Key frames can be distinguished by their thicker or bold appearance. After increasing the size of a keyframe, The Tracking Meteogram will linearly interpolate the size of the circles between Key frames. The Tracking Meteogram will also interpolate the position of the circles between Key frames. You can see a circle in the middle of the track shifted to the side, resulting in a linear interpolation between a new Key frame and each of the endpoint Key frames. As live data comes in, the Tracking Meteogram will auto-update the size and position of the new frame circle using extrapolation.



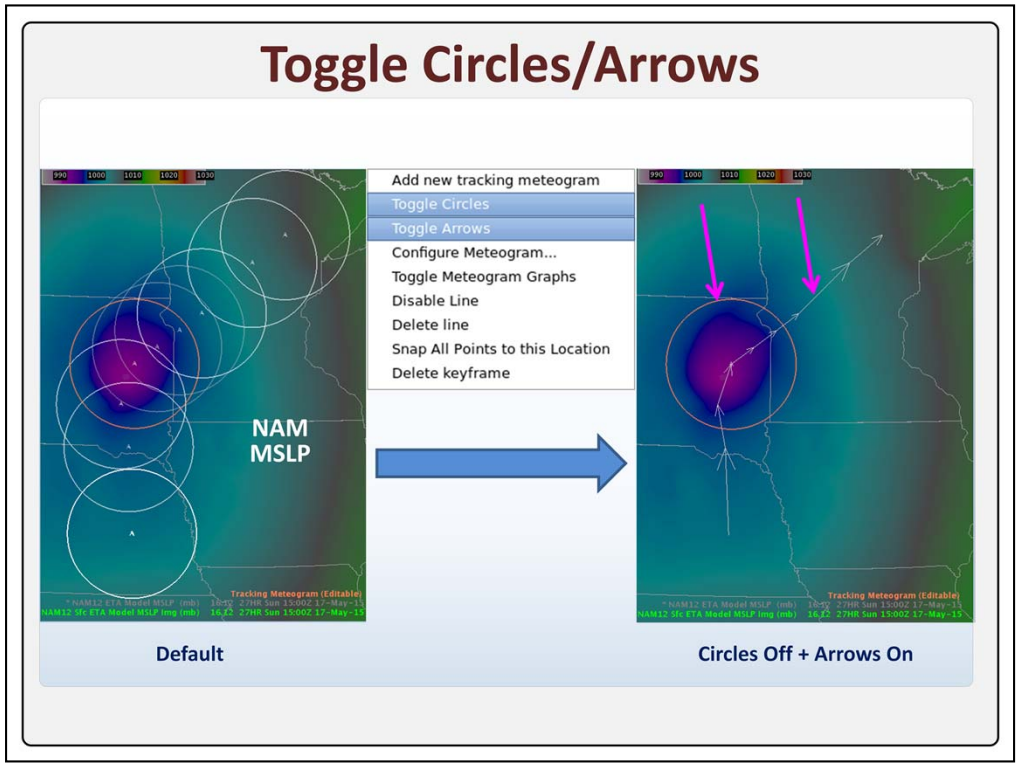
The Tracking Meteogram has 9 display options that the user can control. These options easily appear with a right click function of the mouse. However, make sure that you are right clicking INSIDE the current frame circle, which appears in color.

Add New Tracking Meteogram

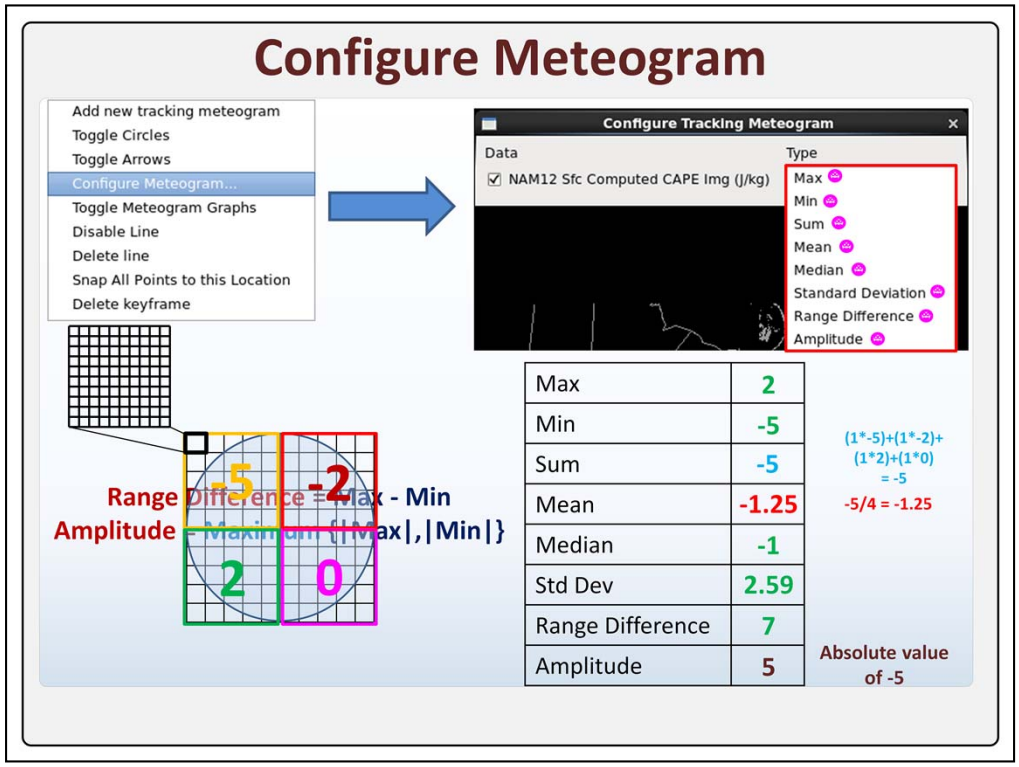


To generate multiple time trends for different areas of the display use “Add new tracking meteogram” to load an additional tracking meteogram. On the left you see a single Tracking Meteogram loaded on top of the MRMS MESH product. When you select to “Add new tracking meteogram”, you will again be prompted with the familiar “Drag Me to Feature” icon. On the right is the result of adding an additional tracking meteogram on the same display with the storm north of the first meteogram circle track.

You can add as many new meteograms as you you’d like in the same editor as well as in other CAVE windows.



Here is an example of the TMT tracking a low pressure center in the grid image. You can control the appearance of the tracking display using the Toggle Circles and Toggle Arrows. Toggle Circles hides all circles except the current frame, which is always visible. Toggle Arrows connects all the circle centers with a sequence of arrows. The image on the left is the default. The image on the right is with the circles toggled off and the arrows toggled on.

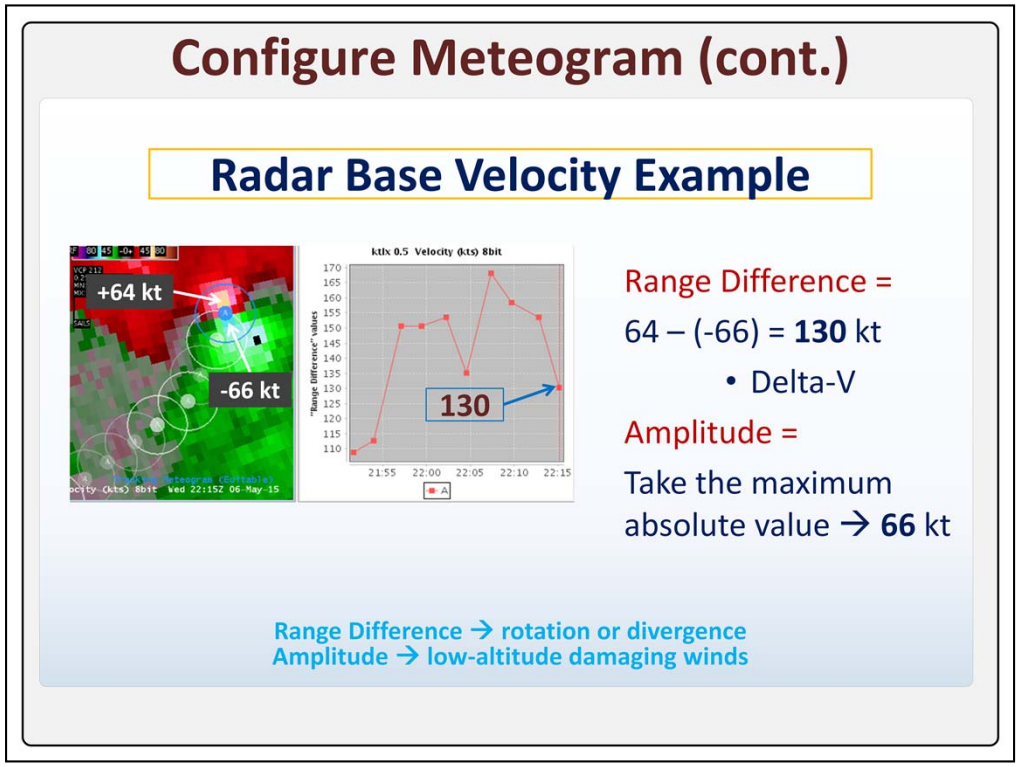


Another user option you have at your disposal is “Configure Meteogram…” This lets you select from the different math operations used to calculate values inside the circle tracks.

Max will provide the maximum value of any grid cell centroid in the circle and min will provide the minimum value of any grid cell centroid. Sum will add up all the values in the circle and provide one number. The mean provides the average value...the median provides the middle of the ordered values, and the standard deviation provides the spread of the data which is the root of the average of the squared differences from the mean. Range difference is the max minus the min. Amplitude is the maximum of the absolute values of the max and min.

Now lets take a look at a hypothetical example: Notice that we have placed a circle around 4 raw data grid boxes: orange, red, green and pink. A 100x100 grid is overlaid. Notice that each bigger cell is actually made up of 100 cells itself, as seen in the top left corner of the grid. Now assume each quadrant contains 2500 data cells, 1975 of which contain their centroid inside the circle. But remember that the Tracking Meteogram checks to make sure that each raw data grid box is only sampled one time. Thus we only have 4 data points to work with. Lets perform some calculations. The Max is 2. The Min is -5. Adding up the values of the 4 raw

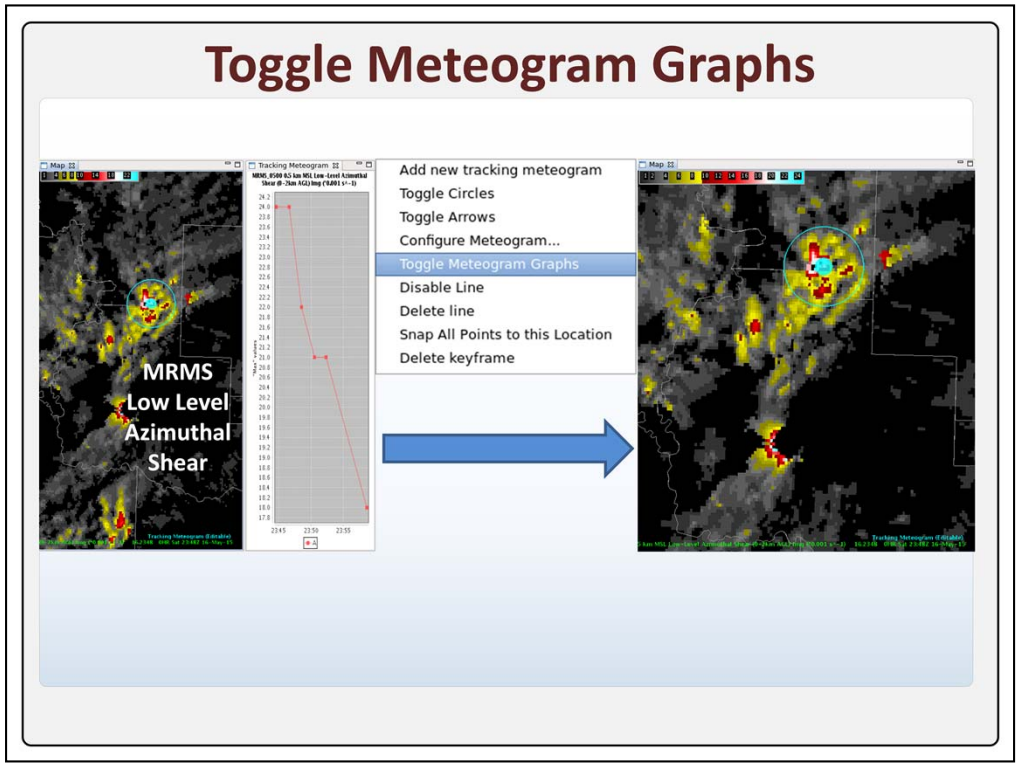
data grid boxes yields a sum of -5. Dividing the Sum of -5 by the total number of raw data grid boxes, which is 4, yields a Mean of -1.25. The Median is -1. Standard deviation is calculated to be 2.59. Range Difference is the max minus the min, so it's 7. And lastly, the Amplitude is the Maximum of the absolute values of the max and min, so its 5.



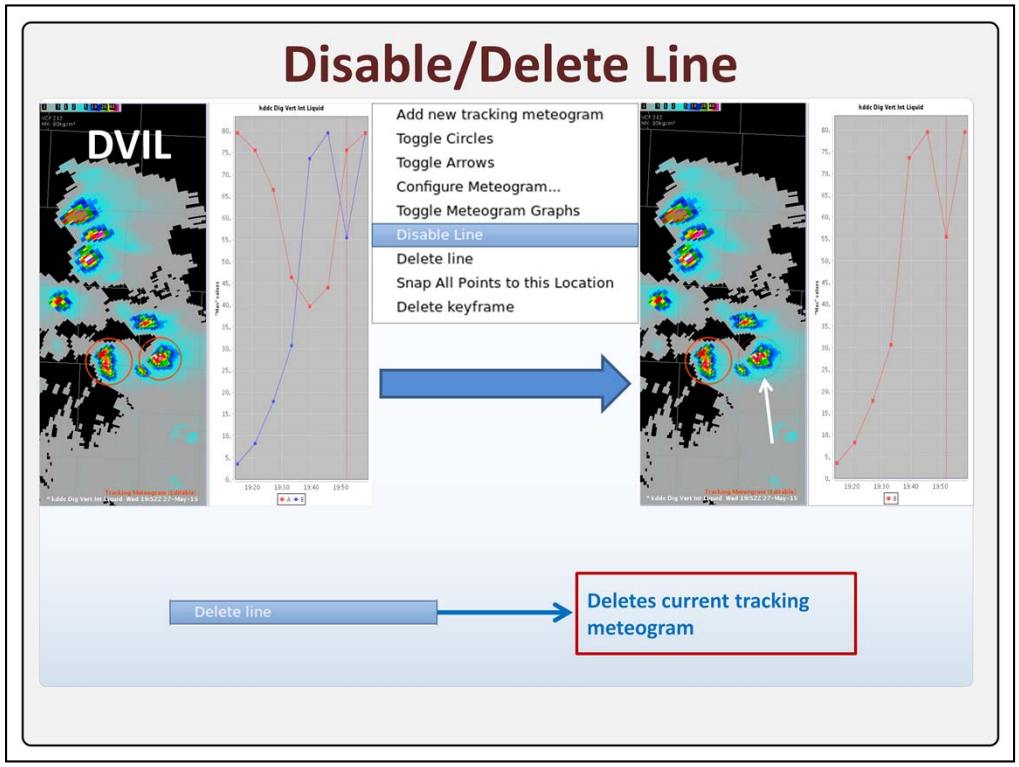
Now Lets take a look at a real life example. Here we use the Tracking Metegram to track a velocity couplet and compute the velocity (or range) difference. For example -66 and +64 kt values would give you a range difference, or Delta-V, of 130 kt.

Using the same example, 66 kt is the largest absolute value, or amplitude.

While Range Difference can be used to calculate Delta-V's of rotation or divergence, amplitude, when used on ground-relative base velocity, can be used in the detection of low-altitude damaging winds. It is important to not use the tracking meteogram with radar data when you have noisy bad velocity data with spurious maxes or mins in your circle, because the tracking meteogram will not provide you meteorologically important information in that situation.

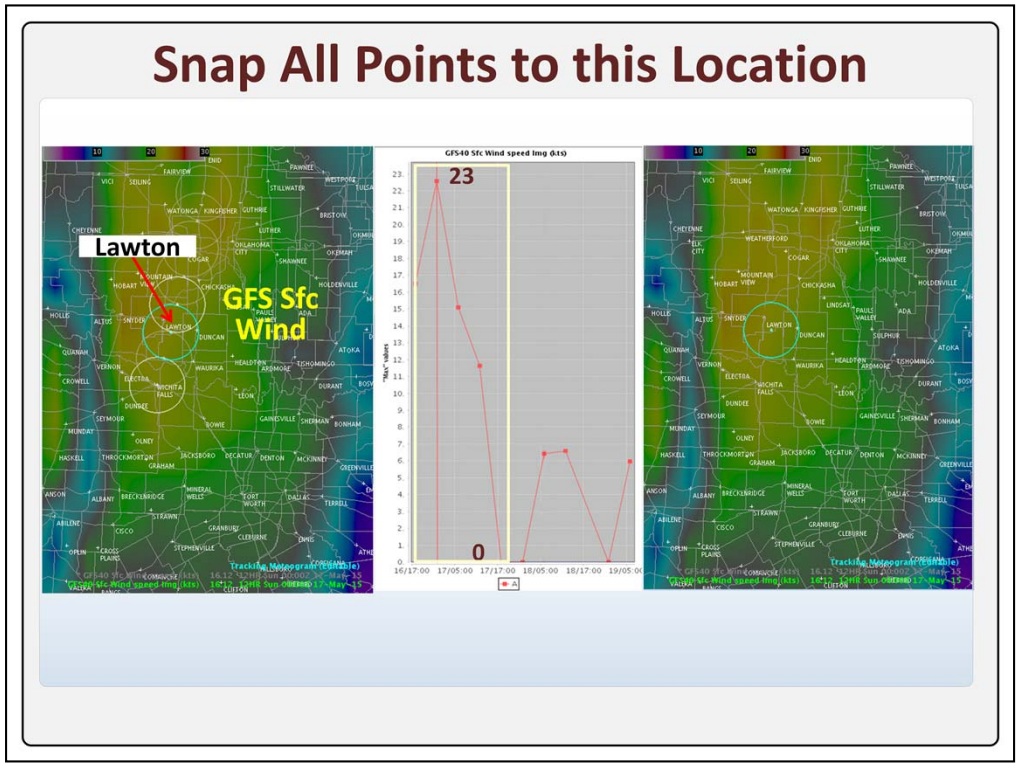


In this example you see the Tracking Meteogram loaded on top of the MRMS Low Level Azimuthal shear product. The Toggle Meteogram Graphs will effectively hide/display the time trend plot. Notice how the time trend disappears and the tracking display expands to cover the entire window on the right.

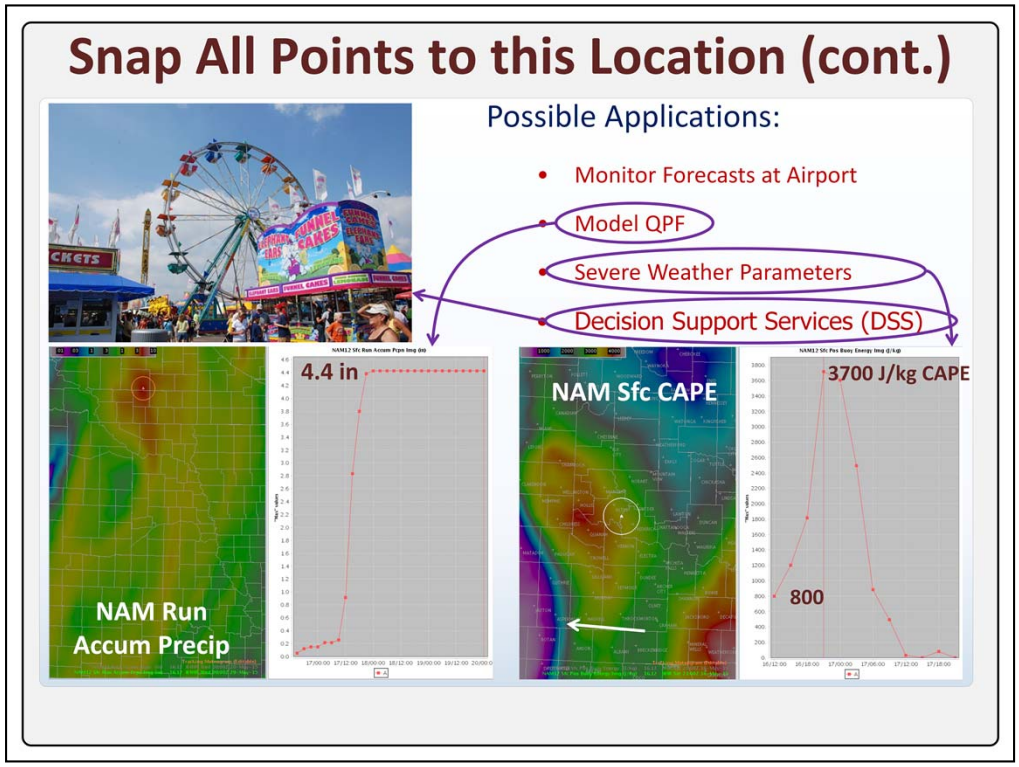


Take a look at 2 images with the Digital VIL product loaded. Image on the left has 2 different circle tracks as well as 2 time trend plots (red and blue). Image on the right only has one faded circle track and one bright circle track. The Disable Line option lets you select which time trend plot you want to remove by right clicking inside the circle track that corresponds to that time trend plot. Notice on the right, that the circle with the white arrow pointed to it becomes faded and its corresponding blue time trend plot disappears

Additionally, if you right click inside a circle track and select Delete Line, the entire tracking meteogram will be removed, including the circle track and the time trend plot.

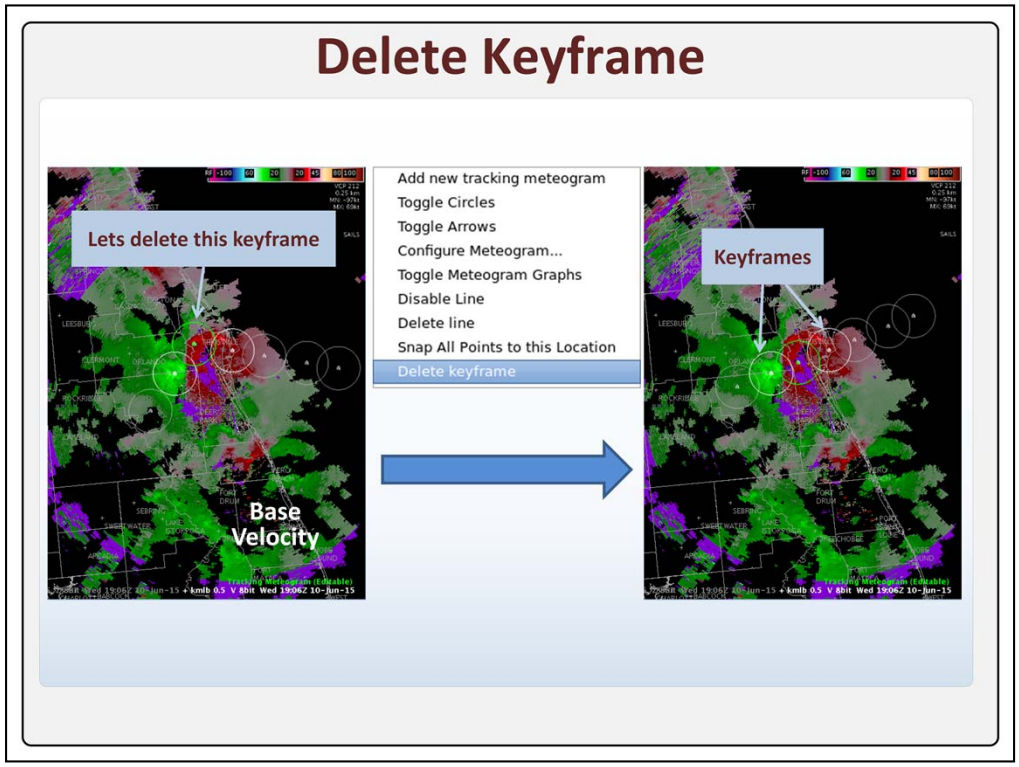


The Snap All Points to this Location option allows the user to place all circles in the same location and track trends over time in one place versus tracking a feature in time and space. Take a look at the GFS forecast trend in surface wind in Lawton, OK. We can see from the plot that the forecast winds increase to 23kts followed by a weakening trend to calm winds. On the right, you can see all the circles collapsed to a single point over Lawton.

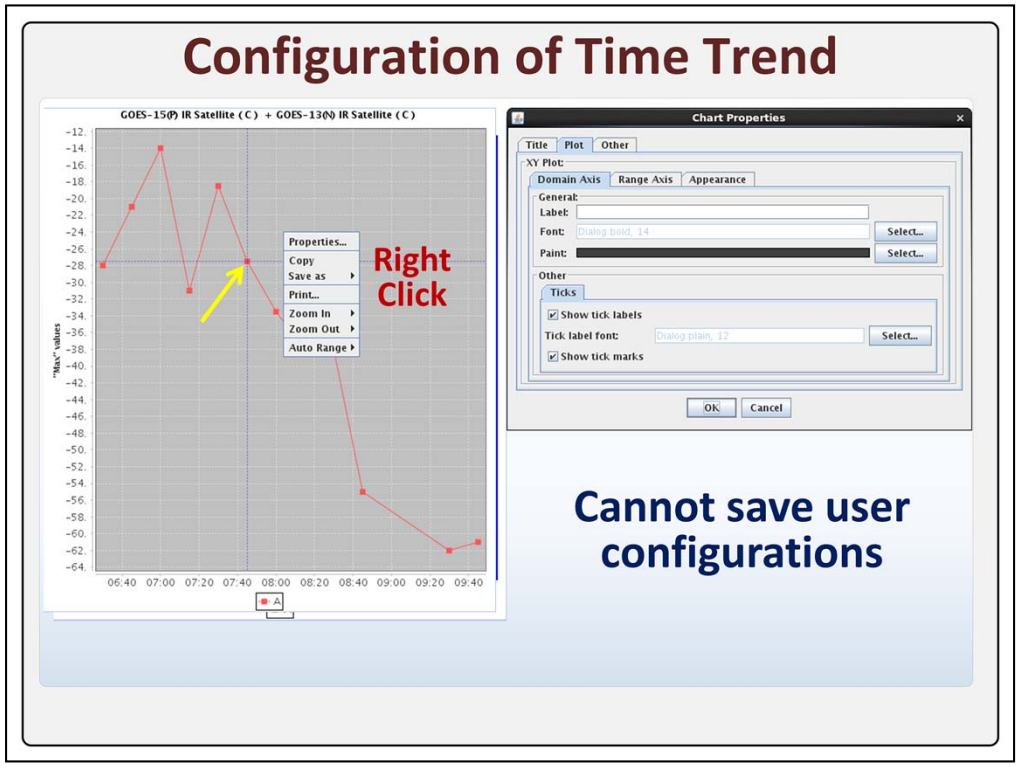


Lets discuss some possible applications using the Snap All Points to this Location option.

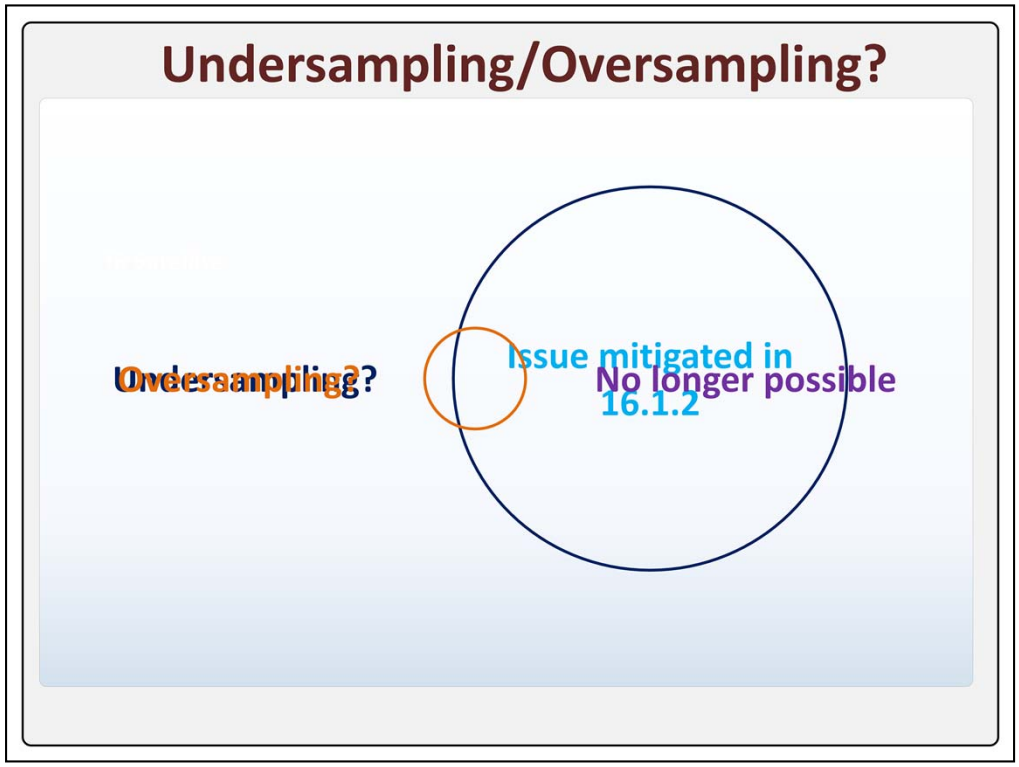
You can monitor model forecasts of different parameters around an airport like in the example on the previous slide. Lets look at some other examples. In the bottom left is a NAM run total precip accumulation using Max. Another example is the NAM max surface based CAPE which shows the maximum value rising from 800 J/kg to 3700 J/kg as the moist values ahead of the dryline approach, followed by the decrease in CAPE as the dryline moves by. Additionally, The Snap All Point to this Location option can be used as a tool in Decision Support Services to monitor model forecast parameters such as wind for outdoor events like a concert or state fair.



Deleting a Key frame places the circle in a linearly interpolated position between 2 adjacent key frames on either side.

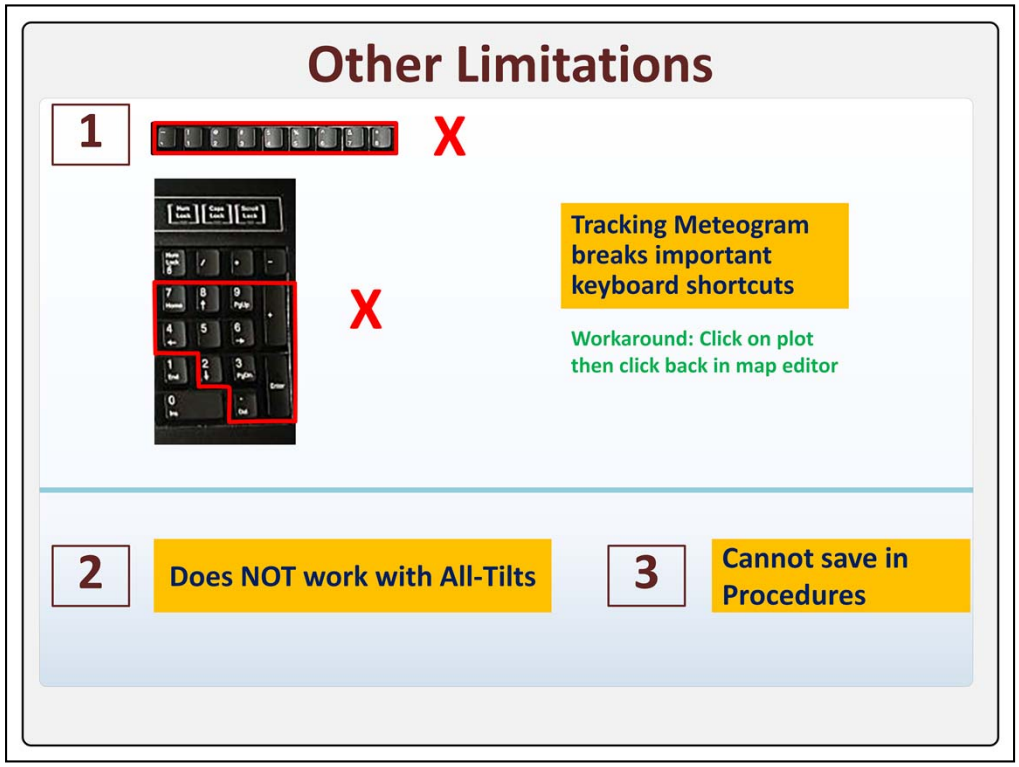


Lets discuss some configuration options to the time trend plot itself. Left clicking inside the plot will put crosshairs near the closest data point. This allows for an easy readout of data. Right clicking inside the plot brings up a pop up box that allows you to edit properties, copy the plot, save the plot, print, zoom in and out, and perform an auto range. Clicking on properties allows the user to configure the time trend plot to their liking including enlarging the font, re-naming it, and changing the background color among others. The downside is, you cannot save any of these preferences for future sessions.



Before AWIPS build 16.1.2, Undersampling and Ovesampling were critical issues that the user had to be aware of to properly use the Tracking Meteogram. The upgrade from 20x20 to 100x100 grid mitigates the Undersampling issue. You no longer have to beware of large circles not sampling peak values. As long as you can see the display pixels and they are larger than 1/100th the diameter of the meteogram circle, the circle will resolve the maxima or minima.

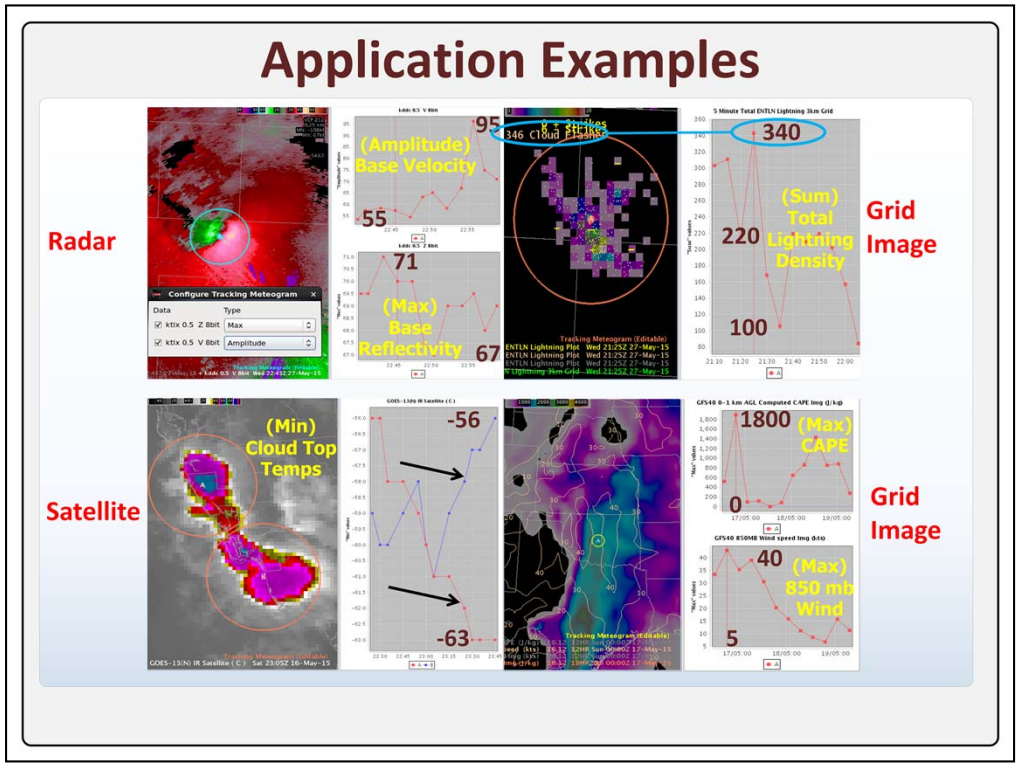
Oversampling is no longer possible for such calculations as Sum. This is because of an update to the way the data is calculated, preventing the same raw data cell from being sampled more than once, no matter how small you make the circle.



There are 3 limitations worth mentioning. First, once loaded, the Tracking Meteogram breaks the functionality of the keyboard shortcuts, except the 0 and 1 key. Therefore, the shortcuts you use to toggle between different panels or paired products with radar, satellite, and model data will not work. However, there is a workaround. Left clicking in the plot then left clicking back in the map editor will fix the toggle and other shortcuts for the remainder of your session in the current editor.

Second, the Tracking Meteogram does not work with Radar All-Tilts. Tilting up or down will not update the plots.

And third, you cannot save the tracking meteogram in procedures.



Now I'd like to present 4 more examples in addition to the ones scattered throughout this presentation. In the top left is a radar example with base Reflectivity paired with base velocity. You can compute a time trend plot of the maximum low altitude winds using the Amplitude configuration, as in the top plot. Notice how the radar derived velocity increases from 55 to 95 kt. Max reflectivity is shown in the bottom plot.

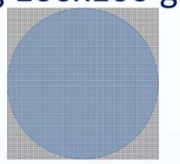
In the top right, the Tracking Meteogram is used to calculate the total lightning density using the Sum configuration. The tracking meteogram uses the flash count in each gridded data cell to sum up the total number of flashes. Note if we load the point values and zoom the editor in to about the size of the circle, then the point-based value in the upper left of the editor (346) approximately matches the value of 340 calculated by the tracking meteogram summing the flash counts in all the gridded data cells in this example. You can see lightning density spike to a max of 340 strikes inside the circle then rapidly decrease to 100 strikes in about 10 minutes before spiking back up to 220.

In the bottom, multiple Tracking Meteograms are loaded to track Cloud Top temperatures as part of sea-breeze convection in Florida using the Min configuration. You can see the blue line trend less negative, or warmer, thus the

storm is decaying. The red line trends toward more negative, or colder, thus the storm is getting stronger. The final example shows two stacked products, CAPE and 850 mb winds. Additionally the Snap All Points to this Location feature is used. Notice that the graphical result shows 2 separate line plots, the same as you would get if you paired the products instead of stacking them. Remember that to pair image products, you use the toggle image combination key. The result is image products appearing side by side in the product legend. Stacking image products is as simple as loading multiple products and having them appear one on top of the other in the product legend.

Summary

- Data created using 100x100 grid encompassing circle

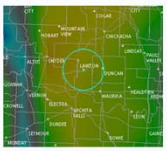


- Compatible Data Types: Radar, Satellite, Model Grid Image, Total Lightning Density
- Load from Tools Menu and right click inside circle for user display options
- Math operations inside a circle

Lets go ahead and summarize the main points. Data is created using a 100x100 grid that encompasses a tracking circle. Compatible data types include: Radar, Satellite, Model Grid Image, and Total Lightning Density. The Tracking Meteogram is loaded from the Tools menu and user display controls can be accessed by right clicking inside the current frame circle. Different Math operations are available to calculate values inside a circle.

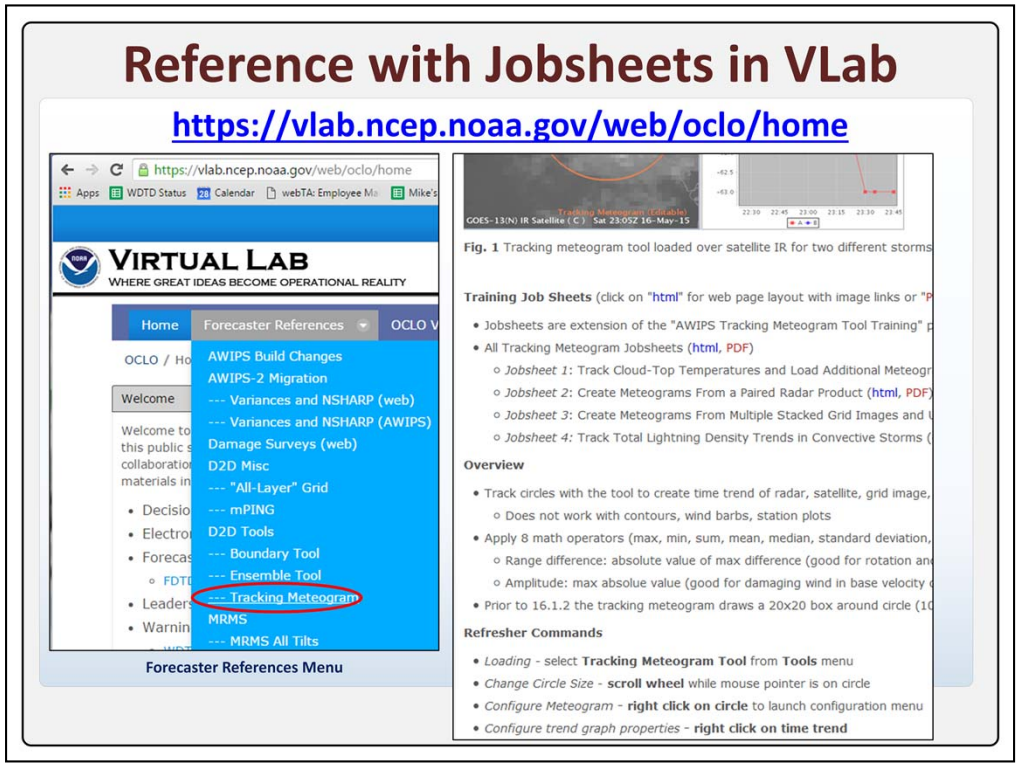
Summary (cont.)

- Track features in space as well as monitor a single location over time using “Snap All Points to this Location”

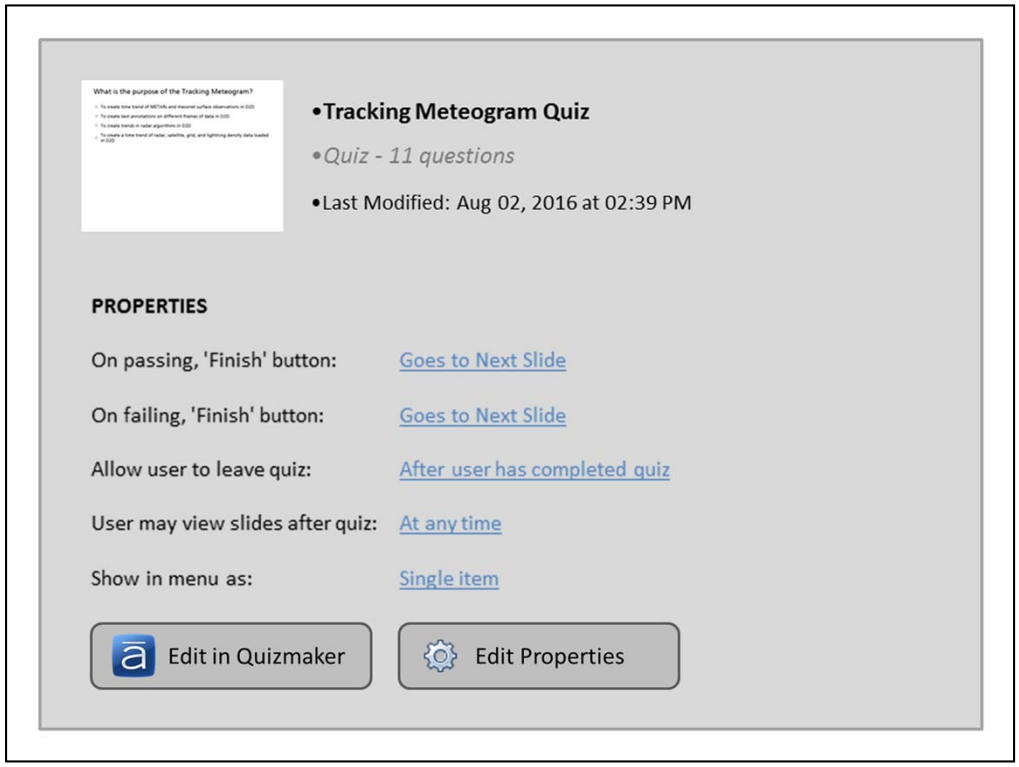


- Limitations
  - Keyboard shortcuts break after loading
    - Workaround: Click on plot then click back in map editor
  - Does not work with radar all-tilts
  - Cannot save in procedures

You can track features in space as well as monitor a single location over time using the “Snap All Point to this Location” option. There are some limitations. Keyboard shortcuts break after loading the Tracking Meteogram. That will especially impact the display of radar data. Additionally, the Tracking Meteogram does not work with Radar All Tilts. Also, you cannot save the Tracking Meteogram in procedures.



To supplement this training, We have created a reference page with jobsheets, refresher commands and more for you to access through the VLab. The reference page can be accessed using the url at the top of this page. To get to the Tracking Meteogram reference page, navigate to the Forecaster References pulldown menu at the top of the page and click on Tracking Meteogram. You will see 4 jobsheets in addition to some refresher commands and other tips about using the tool. When you are ready click on the next button to start the quiz


•Tracking Meteogram Quiz
•Quiz - 11 questions
•Last Modified: Aug 02, 2016 at 02:39 PM
PROPERTIES
On passing, 'Finish' button:
Goes to Next Slide
On failing, 'Finish' button:
Goes to Next Slide
Allow user to leave quiz:
After user has completed quiz
User may view slides after quiz:
At any time
Show in menu as:
Single item
Edit in Quizmaker
Edit Properties