2016 MUG Meeting McIDAS-V Demonstration Outline

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Note: The data files referenced in this document can be found at:
ftp://ftp.ssec.wisc.edu/pub/mug/mug_meeting/2016/presentations/2016_McIDAS-V_demo.zip

1. Start with a very brief introduction to McIDAS-V for those not familiar with it.
    a. Show the Main Display window and the Data Explorer window
    b. Explain general workflow of the Data Explorer
    c. Do a quick example of loading/displaying most recent adde.ucar.edu/RTIMAGES/GE-IR data.
    d. Remove all layers and data sources.

2. 'show variables' button in the Field Selector:
    a. Load the OT_ABI-L2-MCMIPC-M3_G16_s20143091756512_ e20143091756512_c20143091800094.nc file.
    b. This is an older simulated ABI Level 2 file that demonstrates the problem that can exist if only the long_name attribute of each variable is written in the Field Selector. All of the similar variables for each band (e.g. 'Cloud and Moisture Imagery'/'CMI') are the same so you can't tell which band you are selecting unless you hover over the field.
    c. The default is to show the description (long_name attribute) of each variable. Click the 'show variables' button to switch from showing the long_name attribute to the variable name, also known as the shortname macro in McIDAS-V.
    d. Right click on data source and go to Properties. In the Properties window, go to the Metadata tab and scroll up to the top. Notice variables CMI01 and CMI02 have the same long_name attribute.
    e. This can be used for any NetCDF or grib file, local or remote.
    f. We will see some more ABI examples later.

3. New Flow Displays display types and controls:
    a. Load the latest NCEP > GFS > GFS One Degree – Global > Forecast data source
    b. Note that the "show variables" button is there. This is remote grib2 data (as can be seen by looking at the metadata of the data source).
    c. Expand the 2D > Momentum field and select the 'Momentum > Derived > Flow Vectors' field. Expand the Flow Displays display types. There are 4 new display types, the ones ending with "Colored by Speed" and "Colored by Another Parameter".
    d. Display some data
        i. Select the Flow Displays > Vector Colored by Speed display type
        ii. In the Region tab, choose "Select a Region" and draw a box over the USA
        iii. In the Times tab, choose "Use Selected", right click in the Times panel and choose Select Range > First 10.
        iv. Click Create Display

e. Investigate display and controls
    i. To save screen real estate, undock the controls. From the Layer Controls, choose View > Undock from Data Explorer
    ii. Display centered over USA with wind vectors colored by wind speed (in m/s). Color scale is in the Legend for a reference.
    iii. From the Layer Controls, change to Streamlines. Adjust the Density slider to show how more lines can be added/removed from the display.
    iv. Change to "Trajectories". This is new in 1.6.
        1. Play through loop to see default display. Trajectory length is 4, meaning 4 timesteps are included in each trajectory. Change this to 8. Play through loop to show how trajectories are now longer.
        2. Add an arrow head to the trajectories by clicking the 'Arrow' option.
        3. Change the "Trajectory Form" to "Ribbon". Play through loop to see how trajectory lines are thicker, like a ribbon…
        4. Change the "Trajectory Form" to "Cylinder" to see how you now have tubes for your trajectories. Tube structure can be seen better if the display is rotated.
        5. Change the "Trajectory Form" to "Deform Ribbon". Display is now closer to ribbon, but ribbon becomes narrower when there's little v-component of the wind (wind is east-west oriented).
        6. Change "Trajectory Form" back to "Line". Things to mention:
            a. One benefit of these newer trajectories compared to the others demonstrated at the last MUG meeting is that they are a lot smoother. The other trajectories have sharp turns/angles at each change of animation time.
            b. These new trajectories make it easier to display trajectories over the entire domain of the data.
            c. The older trajectories have nice features too, such as the ability to draw your Trajectory Initial Area, set the length offset by number of hours instead of timesteps, and the ability to draw back trajectories.
            d. In the future, we hope to merge these two trajectory controls into one, keeping the good things about each of the current controls.
    v. Change "Show" to "Curly Vectors". This is similar to a regular vector display, with the exception that the vector contains multiple timesteps. By default, each trajectory has a length of 2, or the last 2 timesteps are included in each trajectory. Change the trajectory length to 4.
    vi. The rest of the display options are pretty self-explanatory.
f. Remove the layer from the display. Return to the Field Selector and display Vector Colored by Another Parameter.
    i. Keep everything else as-is, just change the display type and click Create Display.

ii. In the Field Selector window that appears, choose the color-by field. Select 2D > Temperature > Temperature @ Sigma level. Keep the subset tabs (Times, Region, Data Sampling) as-is (the values will come from the Field Selector tab of the Data Explorer) and click OK.
iii. Controls are the same as they were for Vector Colored by Speed, just now we are coloring the vectors by temperature instead of speed.

g. Remove the layer from the display. Return to the Field Selector and display Wind Barb Colored by Speed.
   i. Keep everything else as-is, just change the display type and click Create Display.
   ii. If necessary, change the Wind Barb size to make them reasonably-sized. The controls are the same as the other display types.

4. New 3D Flow Displays
   a. Choose the 3D > Momentum > Derived > 3D Flow Vectors field.
   b. Expand the 3D Flow Displays display types. All of these are new except for 3D Vector Cross Section.
   c. 3D Volume Vector Colored By Speed
      i. Choose the 3D Volume Vector Colored By Speed display type, verify that the first 10 times are selected and that the Region is over the USA. Click Create Display.
      ii. This will load in/display vectors from the majority of the x/y/z data points in the grid and display them all at once, so you see a volume of vectors.
      iii. Rotate the display so you can see the 3D display.
      iv. The display defaults to showing vectors. Adjust the Layer Controls to make it easier to see what's going on.
         1. Float the controls.
         2. Set the vector size to ~ 7
         3. Change the XY Skip to 3
            * Note that the Z Skip defaults to 1, so we are already showing only every other Z level.
      v. Change the "Show" option to "Trajectories".
      vi. Change "Trajectory Start Level" to 20000 (200 hPa).
      vii. Change the "Trajectory Form" to "Cylinder" to see the 3D tubes.
   d. Return to the Field Selector for a description of the other display types… no need to demo all of them.

5. Julian dates with archive servers
   a. Remove all layers and data sources.
   b. Create a new one-paneled map display and remove all previously-existing tabs.
   c. From the Satellite > Imagery chooser, choose geoarc.ssec.wisc.edu/AGOES14, Connect, and choose the OTHER Image Type.

d. We are interested in 2016-04-18. In the past, you would have to use the calendar widget or type "APR 18, 2016". Now, you can enter the Julian date, such as "2016109". There are several valid formats, and the text will change to green as you type if you are at a valid format. If the text is red, then it isn't valid.

6. List All Images button
    a. From the Absolute tab in the Times panel of the Data Sources tab of the Data Explorer, there are two buttons below the times. "List All Images" and a button with the date.
    b. In the past, all of the times in the dataset would list, which can take some time to load. It was a user request to list only the last 100 images since the user might just want to know if a sensor is in rapid scan mode (which we are here).
    c. Verify that only 100 times are listed by clicking on a time and pressing Ctrl+A to highlight all of them. The tab will tell you how many times are selected.
    d. Click the "List All Images" button to have McIDAS-V go back to the server and list out all of the times in the OTHER dataset for the selected day. Once this completes, verify that there are now 648 times and the times go back to the beginning of the day.
    e. From the Absolute times tab, select the last 5 times by right clicking in the Times panel and choose Count > 5. Click Add Source.
    f. Display the 10.7um Temperature field.
    g. Change to the Satellite > Longwave Infrared Deep Convection display type.
    h. Change the enhancement range to 300 to 200.
    i. Add a color scale to the top of the image.
    j. Capture a movie of the loop. Try doing this w/ Ctrl+M.
    k. Save a movie with the "Use 'global' GIF color palette" enabled and disabled. Play the movies.
        i. When enabled, the color palette will be taken from all frames in the animation, so there won't be any variation in the color scale in each frame in the movie.
        ii. When disabled, the color palette will be taken from each individual frame, so the color scale in each frame of the movie will vary.
        iii. There's a limitation of 256 colors in a GIF which is why this comes into play.

7. Simulated ABI data via ADDE
    a. Through the Satellite > Imagery chooser, select pappy.ssec.wisc.edu/TESTSET/ABINCNS.
    b. Choose 2016-08-02 18:07:16Z through 18:32:16Z (5 oldest times) and click Add Source.
    c. Choose 0.86 > Brightness. In the Advanced tab, hit button to get full resolution. In the Region subset tab, choose area over Wisconsin/Midwest. Click Create Display.
    d. Play through loop and probe to see data values.
    e. Note that the DOE4 L1b and L2 files can also be read through the General>Files/Directory. This was covered more in the McIDAS-V ABI training.

8. Scripting
    a. New describe() function:

i. Copy/paste text of describe_script.py into Jython Shell
ii. Note the syntax highlighting where comments are green, strings are pink, etc.
iii. Run the script
iv. Now, run: describe(data)
    1. This outputs statistical analysis about the data object returned from loadADDEImage
v. Close the window created by the script

b. New metadata returned from grids:
    i. Copy/paste text of grid_metadata.py into Jython Shell
    ii. Run the script
c. Open the Jython Library window and show syntax highlighting in the system libraries (e.g. System > Grid Diagnostics)

9. Display Hurricane Hermine Suomi NPP data
    a. Display the day/night band data
        i. From the Under Development -> Imagery – Suomi NPP chooser, navigate to the HurricaneHermine directory. Select both of the GDNBO-SVDNB granules and click Add Source. These are pre-aggregated granules from CLASS with the data (SVDNB) and geolocation (GDNBO) packaged in the same file.
        ii. Select the 'VIIRS-DNB-SDR_All/Radiance' field. Subset an area in the southeast USA including Florida. Click Create Display.
        iii. Zoom in over the southeast USA. Change range to -1E-10 to 1E-8.
            1. Note the city lights. Over SC/GA/FL you can't see much. There was a new moon at the time so no light for the DNB sensor to pick up off the clouds. That's why we have IR data available!
    b. Overlay SVI05 (11.45um IR 375 meter resolution data).
        i. From the Under Development -> Imagery – Suomi NPP chooser, navigate to the HurricaneHermine directory. Select both of the GIMGO-SVI05 granules and click Add Source. These are pre-aggregated granules from CLASS with the data (SVI05) and geolocation (GIMGO – not terrain-corrected) packaged in the same file.
        ii. Choose the swathToGrid formula (from the VIIRS Formulas plugin) and click Evaluate. Enter a resolution of 375 meters.
        iii. Choose the 'VIIRS-I5-SDR_All/BrightnessTemperature' field. Subset roughly the same region as done with the DNB data over the southeast USA. Click OK.
    c. Adjust the display so both layers are visible.
        i. Change the enhancement of the IR layer to 'Satellite > GOES-IR > GOES IR'.
        ii. Set the range to 180 – 320.
        iii. Edit the enhancement. Remove the 272.1 breakpoint and add a new breakpoint at 250.
        iv. Change the transparency of the 300 breakpoint to 100%. Interpolate the transparency between 300 and 250.

v. Look back at the display to see both layers at once

10. Mention but don't demonstrate
    a. New scripting function called importEnhancement()
    b. Added the ability to import CMAP AWIPS enhancements
    c. With Suomi NPP data, we now have the ability to subset a region across missing scanlines for SDR and EDR granules. In the past, you would be limited to displaying on just one side of the missing scanline.
    d. Java version was updated from 1.7 to 1.8.
    e. For users who write scripts that point towards servers/datasets that require accounting information this accounting no longer needs to be specified in the script. This makes it easy to pass scripts around to colleagues without having to remember to remove your accounting information before doing so.