McIDAS-V Tutorial
Displaying NASA SPoRT NUCAPS Gridded Data
created November 2023 (software version 1.9)

McIDAS-V is a free, open source, visualization and data analysis software package that is the next generation in SSEC's 50-year history of sophisticated McIDAS software packages. McIDAS-V displays weather satellite (including hyperspectral) and other geophysical data in 2- and 3-dimensions. McIDAS-V can also analyze and manipulate the data with its powerful mathematical functions. McIDAS-V is built on SSEC's VisAD and Unidata's IDV libraries. The functionality of SSEC's HYDRA software package is also being integrated into McIDAS-V for viewing and analyzing hyperspectral satellite data.

More training materials are available on the McIDAS-V webpage and in the Getting Started chapter of the McIDAS-V User's Guide, which is available from the Help menu within McIDAS-V. You will be notified at the startup of McIDAS-V when new versions are available on the McIDAS-V webpage - https://www.ssec.wisc.edu/mcidas/software/v/.

If you encounter an error or would like to request an enhancement, please post it to the McIDAS-V Support Forums - http://www.ssec.wisc.edu/mcidas/forums/. The forums also provide the opportunity to share information with other users.

Terminology

There are two windows displayed when McIDAS-V first starts, the **McIDAS-V Main Display** (hereafter **Main Display**) and the **McIDAS-V Data Explorer** (hereafter **Data Explorer**).

The **Data Explorer** contains three tabs that appear in bold italics throughout this document: ***Data Sources***, ***Field Selector***, and ***Layer Controls***. Data is selected in the ***Data Sources*** tab, loaded into the ***Field Selector***, displayed in the **Main Display**, and output is formatted in the ***Layer Controls***.

Menu trees will be listed as a series (e.g. ***Edit -> Remove -> All Layers and Data Sources***).

Mouse clicks will be listed as combinations (e.g. *Shift+Left Click+Drag*).

Introduction

The data for this tutorial can be downloaded at:
https://bin.ssec.wisc.edu/pub/mug/mcidas-v/training/data/NUCAPS.zip

McIDAS-V can be downloaded from the Download McIDAS-V webpage:
https://www.ssec.wisc.edu/mcidas/software/v/download/

If McIDAS-V is already installed, please continue to step 1 on page 6.

See the main McIDAS-V page (https://www.ssec.wisc.edu/mcidas/software/v/) for more information about McIDAS-V including:

- Sample capabilities
- System requirements
- Documentation – User's Guide and additional tutorials
- McIDAS-V support forum
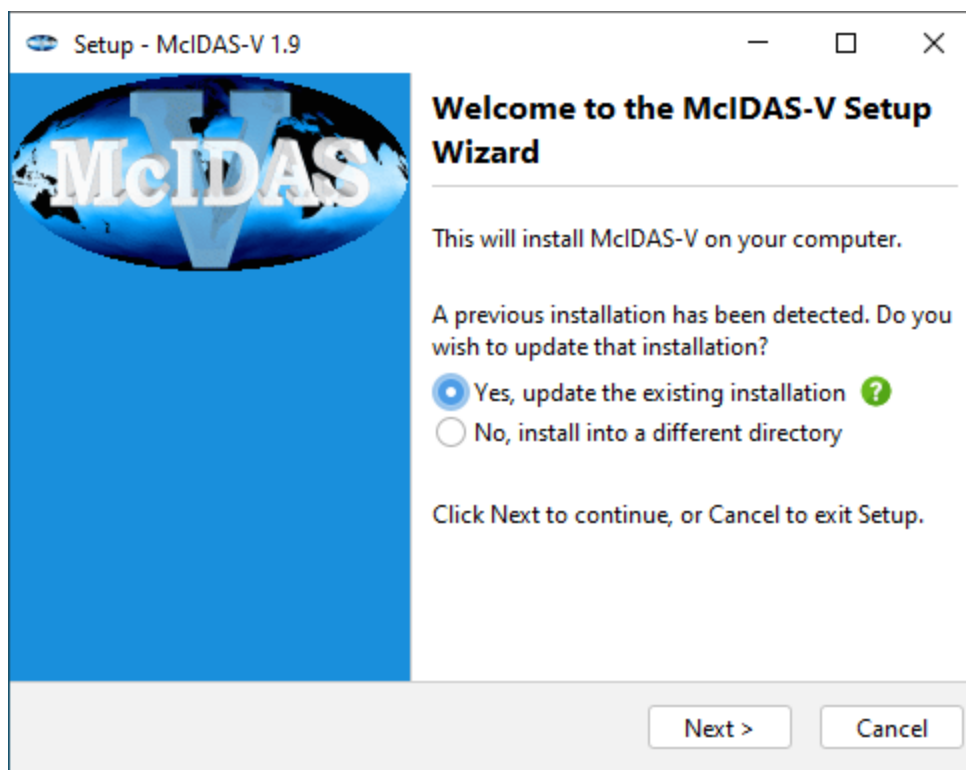
Installation of McIDAS-V

The installation of McIDAS-V is a simple three-step procedure (download, install, and run).

1. Download the appropriate package for your operating system from the McIDAS-V webpage. This file is only the installer and can be placed anywhere on your machine. When you run the installer in the next step, you can then indicate where you want McIDAS-V to be installed. The system requirements for McIDAS-V are also listed on the McIDAS-V webpage.

2. Install McIDAS-V by starting the installer by following the instructions appropriate for your operating system:

> Mac OS X   mount the .dmg and double-click the installer

> Windows   double-click the downloaded **.exe** file

> All other platforms open a terminal window and run **sh ./<installer>.sh**

A GUI will walk you through the installation steps and allow you to create a program group and/or desktop icon.

3. Run McIDAS-V by following the instructions appropriate for your operating system:

Mac OS X   *Double-click* on the McIDAS-V shortcut icon that was created in /Applications.

Windows   *Double-click* on the McIDAS-V shortcut icon that was created on the Desktop.

All others   At the UNIX prompt from the directory where McIDAS-V was installed,

                  run the command: **runMcV**

Note: By default, McIDAS-V uses 80% of the available memory on your machine. The maximum amount of memory is determined by the operating system. To manually change the amount of memory used by McIDAS-V, edit the **Maximum Heap Size** in the **Advanced** tab of the Preferences by selecting *Edit -> Preferences...* from the main menu. The new amount of memory will be saved and used in subsequent sessions. For 32 bit operating systems, it is recommended to set this to no more than 1250 MB. The maximum value for 32 bit operating systems is 1536 MB. Exit McIDAS-V and start a new session to use this new memory setting.

Welcome Window

Upon initial startup, the **Welcome to McIDAS-V** window will be displayed.

Please be sure to read this **IMPORTANT NOTICE**. Because McIDAS-V utilizes the latest developments in Java 3D programming and video driver updates, it is often necessary to update video drivers to solve some seemingly unrelated performance problems. Do not assume that because you have a new machine, you have the latest drivers. We have found brand new machines with drivers that are more than five years old!

After reading the notice in the Welcome window, click **Quit** to close the window, or click **Start McIDAS-V** to close the window and start McIDAS-V. Once McIDAS-V has been started, this window will not appear again.

Introduction to McIDAS-V windows

There are two main windows in the McIDAS-V application - the **Data Explorer** window and the **Main Display** window. Other windows may appear when needed.

Data Explorer (shown on the left)

The **Data Explorer** window is central to McIDAS-V. It is used to choose data sources and parameters to display, the kinds of displays to make, and times of data to display. The first time McIDAS-V starts up, the **Data Explorer** defaults to the *Satellite -> Imagery* chooser. This chooser, along with several others, uses ADDE (Abstract Data Distribution Environment) servers to access data. McIDAS-V comes with a pre-configured list of several available free servers which contain real-time and archived atmospheric datasets.

Main Display (shown on the right)

The **Main Display** window includes the McIDAS-V display panels, legend, time animation controls, viewpoint controls for 3D displays, icons to zoom and pan, menus to control views and projections, and the main McIDAS-V menu. Navigating to *Help -> User's Guide* in the Main Toolbar brings up the McIDAS-V User's Guide, which has both a table of contents and a search function.

Common Usage Scenario

To create displays of data with McIDAS-V, a common usage scenario is:

- Choosing the source of data (local files, remote servers, etc.)
- Selecting parameters and display type
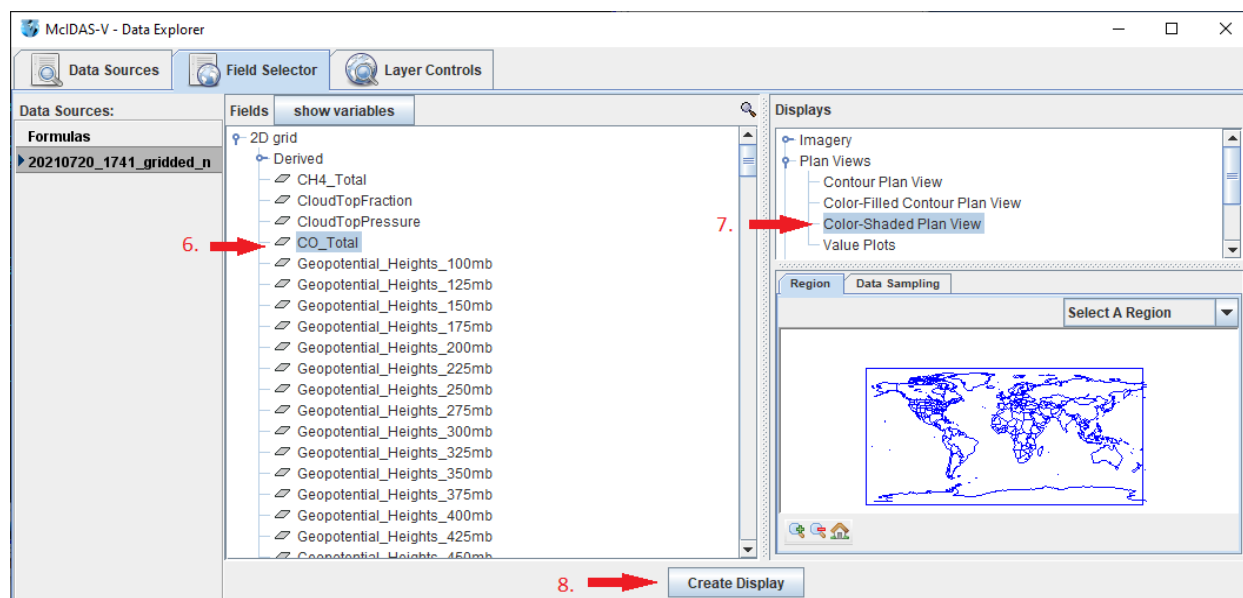- Creating the display
- Controlling the display
- Creating a bundle

Create a Data Source of a Single Time of Sea Surface Temperature Data

1. From the *Data Sources* tab of the **Data Explorer**, navigate to the *General->Files/Directories* chooser.

2. Using the *Data Type* dropdown menu, select *Grid files (netCDF/GRIB/OPeNDAP/GEMPAK)*.

3. Using the *Look In* menu, select the directory containing the files downloaded from ftp.

4. Select the *20210720_1741_gridded_nucaps_noaa20_conus.nc* file.

5. Click **Add Source**.
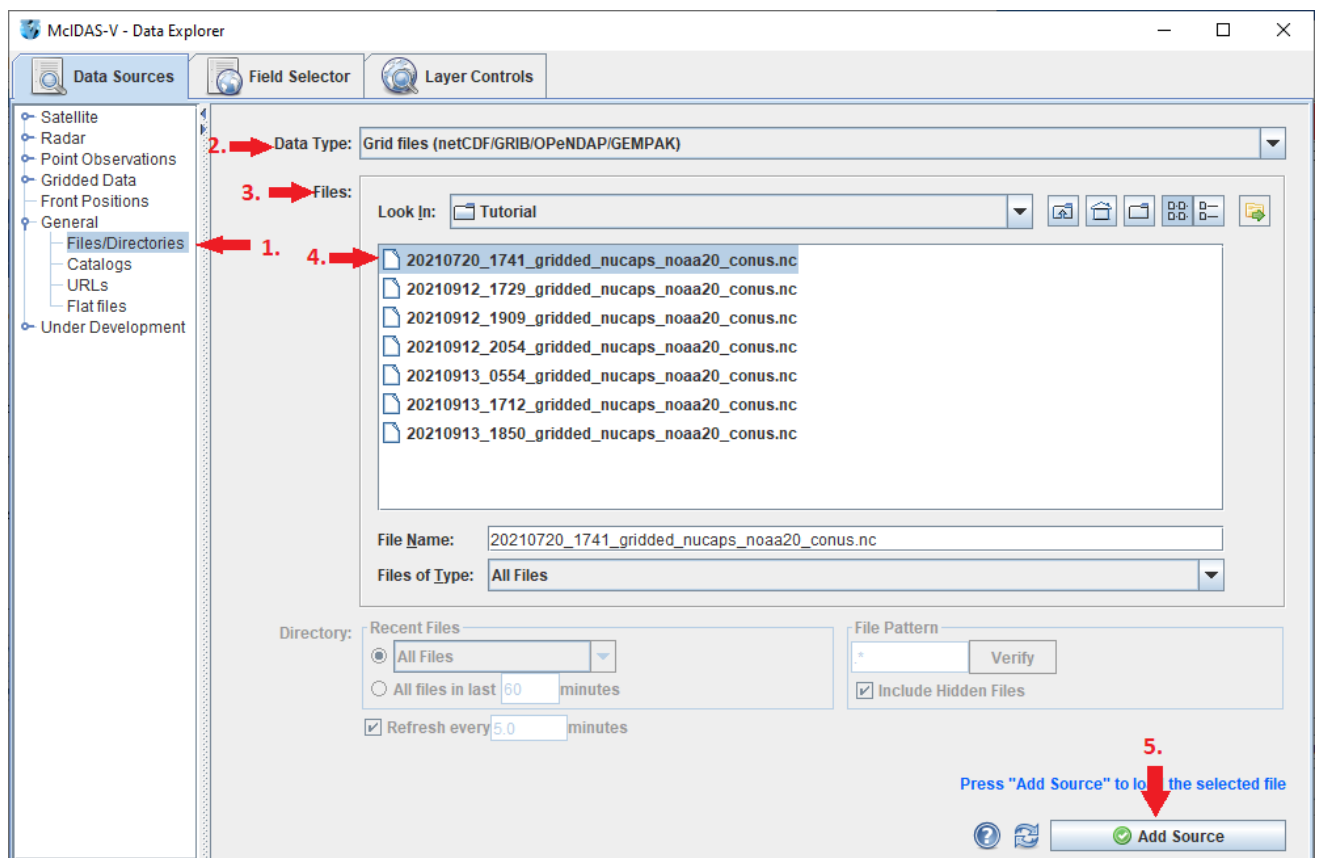

Create a Display of Total Carbon Monoxide

6. From the **Fields** panel of the *Field Selector*, select the *2D grid -> CO_Total* field.

7. From the **Displays** panel of the *Field Selector*, select the *Plan Views -> Color-Shaded Plan View* display type.

8. Click **Create Display**.

Investigate the Display

9. The display of the *CO_Total* data appears in the **Main Display**. Practice navigating around in the display and probing the data.

    a. Hold down the middle mouse button to probe the data. This will give a carbon monoxide output in units of 10e18 molecules/cm^2 as well as latitude and longitude values at the bottom of the display.

    b. Zoom in on the display by scrolling down with the mouse wheel. Zoom out of the display by scrolling up with the mouse wheel.

    c. Zoom in on the display by using *Shift+Left-Click+Drag* to draw a bounding box.

    d. Translate the display by using *Ctrl+Right-Click+Drag*. This moves the display left and right without any rotation.

    e. Rotate the display with *Right-Click+Drag*.
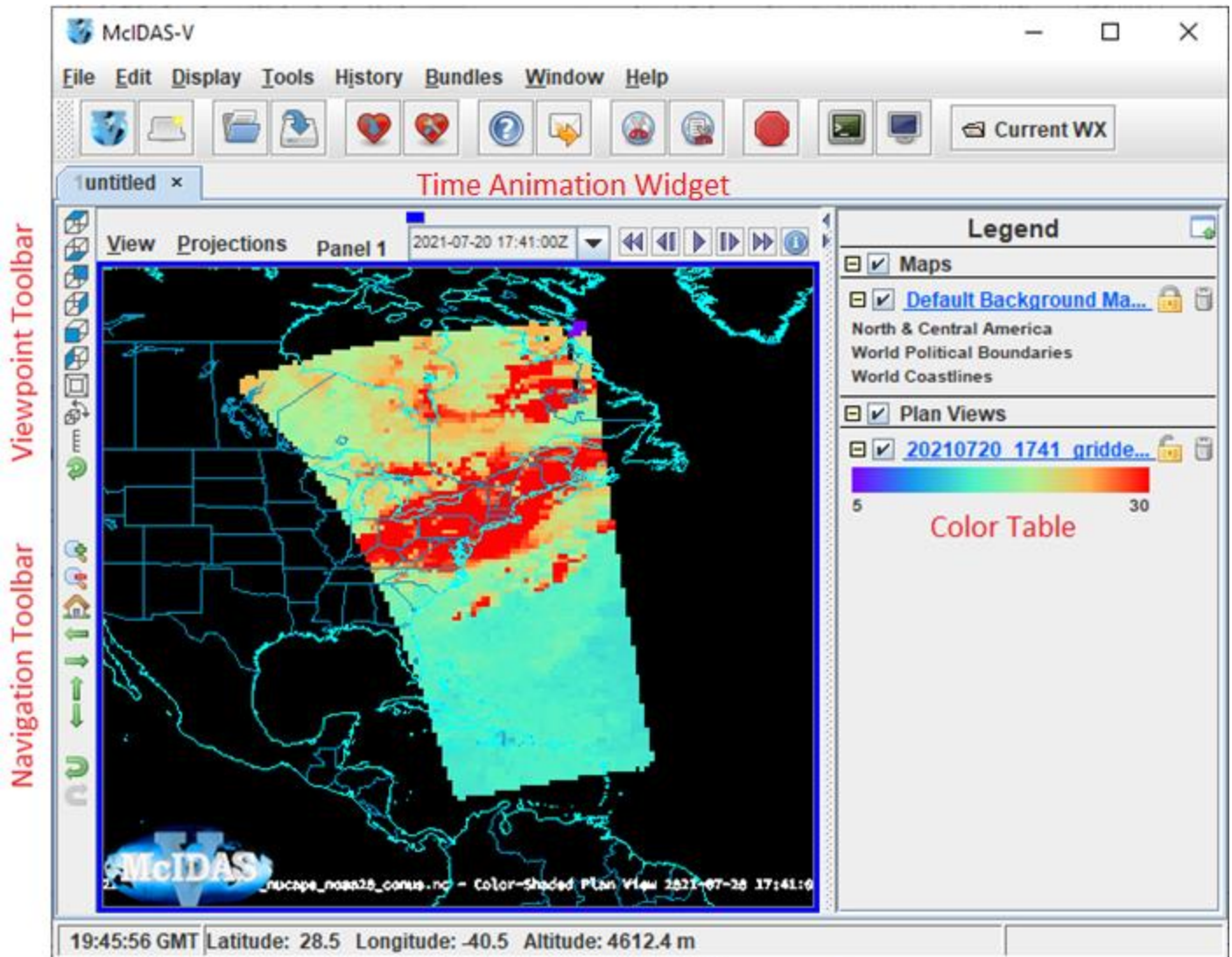
Add a Color Scale to the Display

10. *Right-Click* on the blue "20210720_1741_gridded_nucaps*" legend label in the **Legend** of the **Main Display** and select *Edit -> Properties* to open the **Properties** window for the layer.

11. From the Properties window, navigate to the *Color Scale* tab and set the following:

     a. **Visible:** check
     b. **Position:** Top
     c. **Labels -> Visible:** check
     d. **Labels -> Show Unit:** uncheck
     e. **Labels -> Font:** Arial, Bold, 26
     f. **Labels -> Color:** White
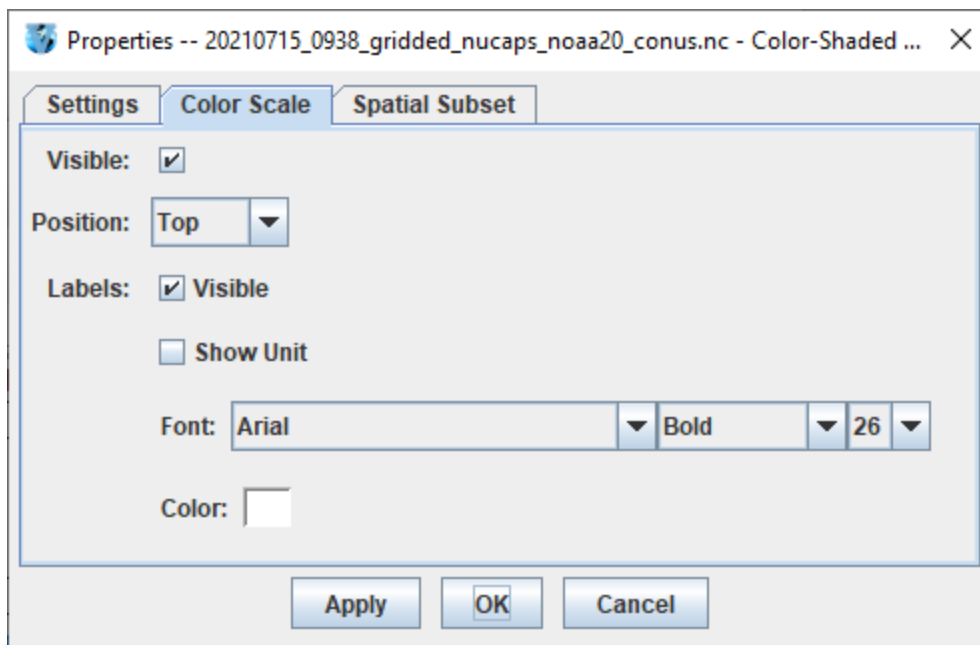
12. Click **Apply** and then **OK** in the **Properties** window to add the color scale to the **Main Display**.

Expand the Enhancement Range

13. McIDAS-V defaults to an enhancement range of 5 to 30. While this range generally captures most values in a given scene, fires in the western United States and Canada produced a large amount of carbon monoxide over the eastern United States on this day. Because of this, much of the display is solid red, meaning the value at those locations is greater than or equal to 30. *Right-Click* on the color scale in the **Legend** and select *Change Range*.

14. In the **Change Range** window, change the max value from *30* to *40* and click **OK**.

15. Investigate the display and observe that it is now easier to determine where the highest concentrations of CO exist.

Capture an Image of the Display

16. From the **Main Display** window, select *View -> Capture -> Image*.

17. From the **Save** window, navigate to a directory to save the image to.

18. In the *File Name* field, enter a name, such as: *NUCAPS_CO.jpg*

19. Click **Save**.

20. From a file explorer window outside of McIDAS-V, navigate to the directory the image was saved to and view it.

Create a Data Source Containing Multiple Times of Data

21. Remove all layers and data sources from the previous display by selecting *Edit -> Remove -> All Layers and Data Sources* from the **Main Display** window. Click *Remove all layers and data* in the window that appears.

22. From the *Data Sources* tab of the **Data Explorer**, navigate to the *General->Files/Directories* chooser.

23. Using the *Data Type* dropdown menu, select *Aggregate Grids by Time*.

24. Using the *Look In* menu, select the directory containing the files downloaded from ftp.

25. Use *Shift+Left-Click* to select all of the files with data from September 2021 (202109*.nc).

26. Click **Add Source**.
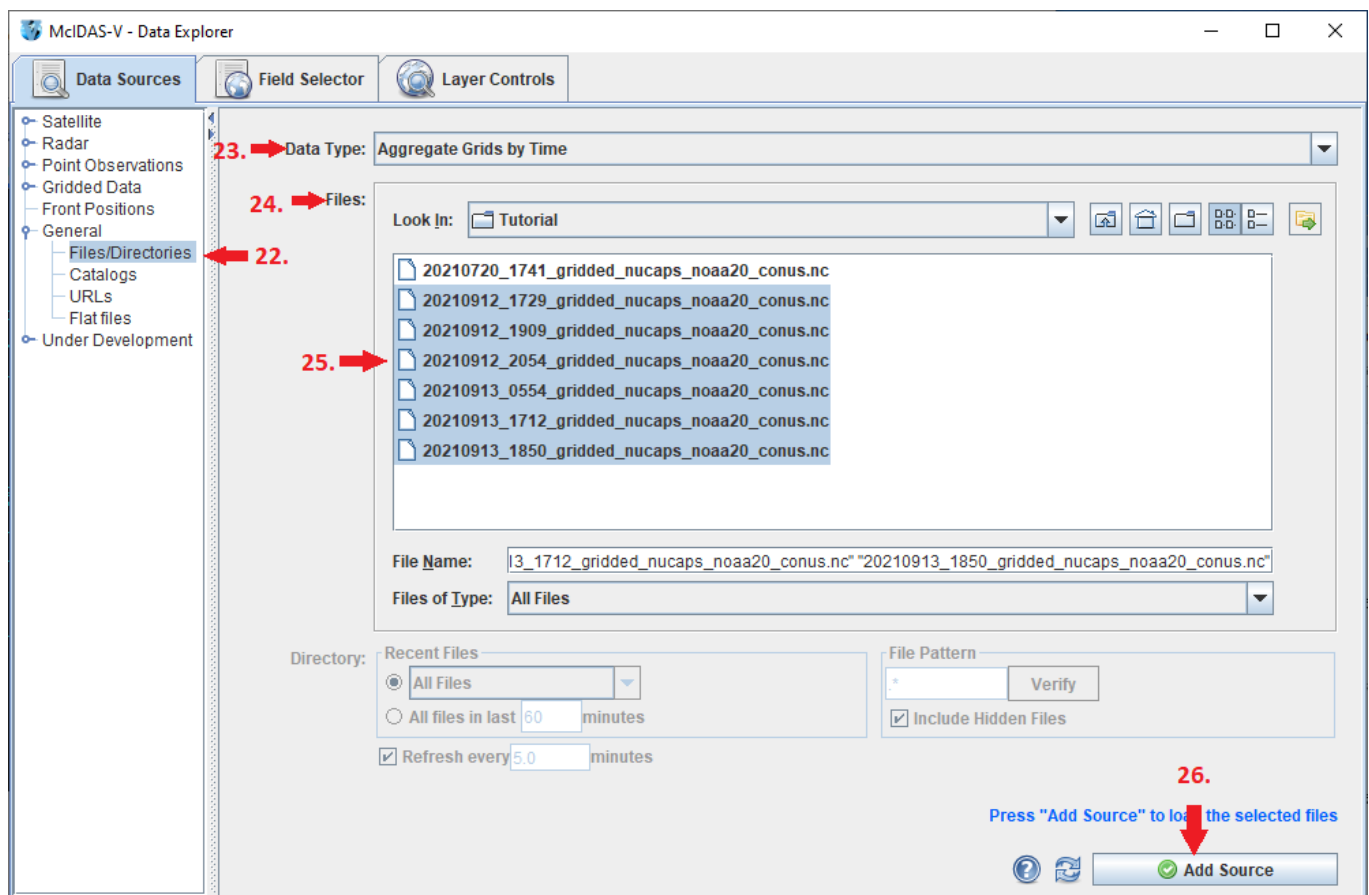
Display a Loop of 2 Meter Relative Humidity Data

27. From the **Fields** panel of the *Field Selector*, select the *2D grid -> RelHum_2m* field.

28. From the **Displays** panel of the *Field Selector*, select the *Plan Views -> Color-Shaded Plan View* display type.

29. Click **Create Display**.
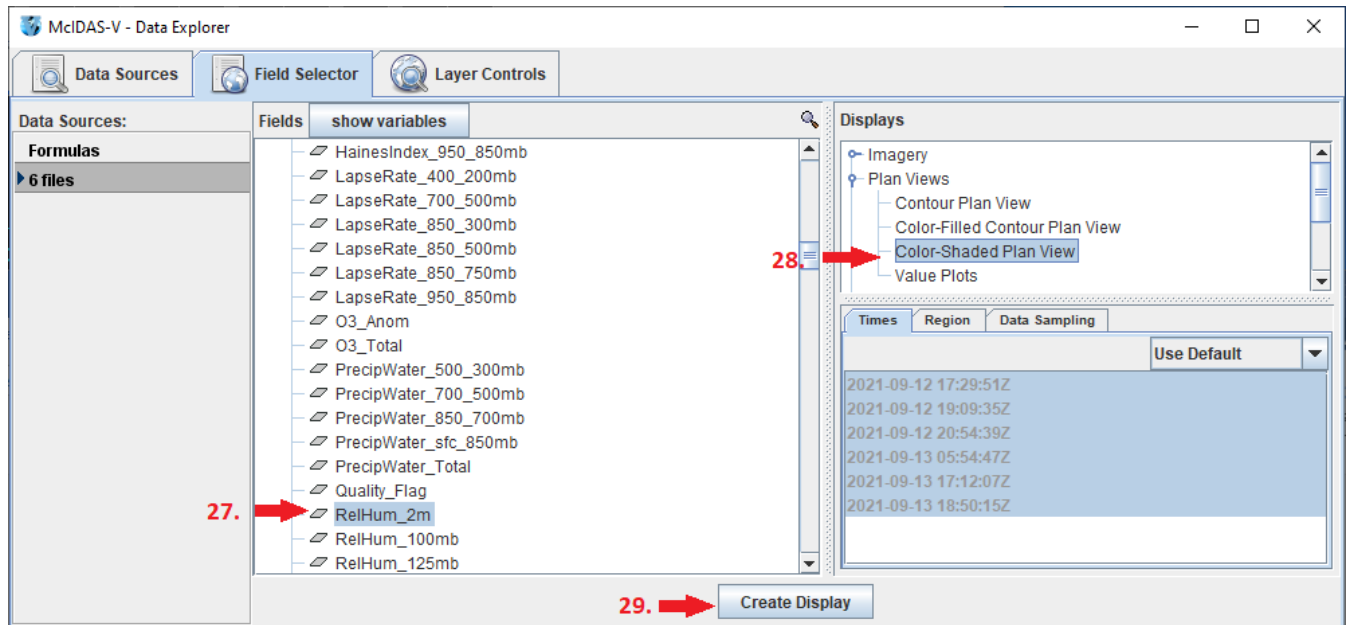
Display a Loop of 2 Meter Relative Humidity Data and Save a Movie

30. Use *Shift+Left-Click+Drag* to zoom in over the United States.

31. Use the **Time Animation Widget** at the top of the display to step through the individual timesteps and play a loop of the data.

32. From the **Main Display** window, select *View -> Capture -> Movie*.

33. In the **Movie Capture** window, verify that *Current View* is selected under **What to capture**. This tells McIDAS-V to capture an animation of the current active panel. The other options under **What to capture** allow for capturing animations of multiple panels, the entire **Main Display**, as well as the everything currently on the screen.

34. In the **Movie Capture** window, click the *Time Animation* button. At this point, the **Main Display** window will come to the front and the animation will play. Ensure that no windows overlap the **Main Display** window while the animation is capturing.

35. In the **Save** window, navigate to the directory where the data files were copied to at the beginning of the tutorial. Enter a filename, such as "*RH_Loop*". Under *Files of Type*, select *MPEG-4 files (*.mp4)* and click **Save**.
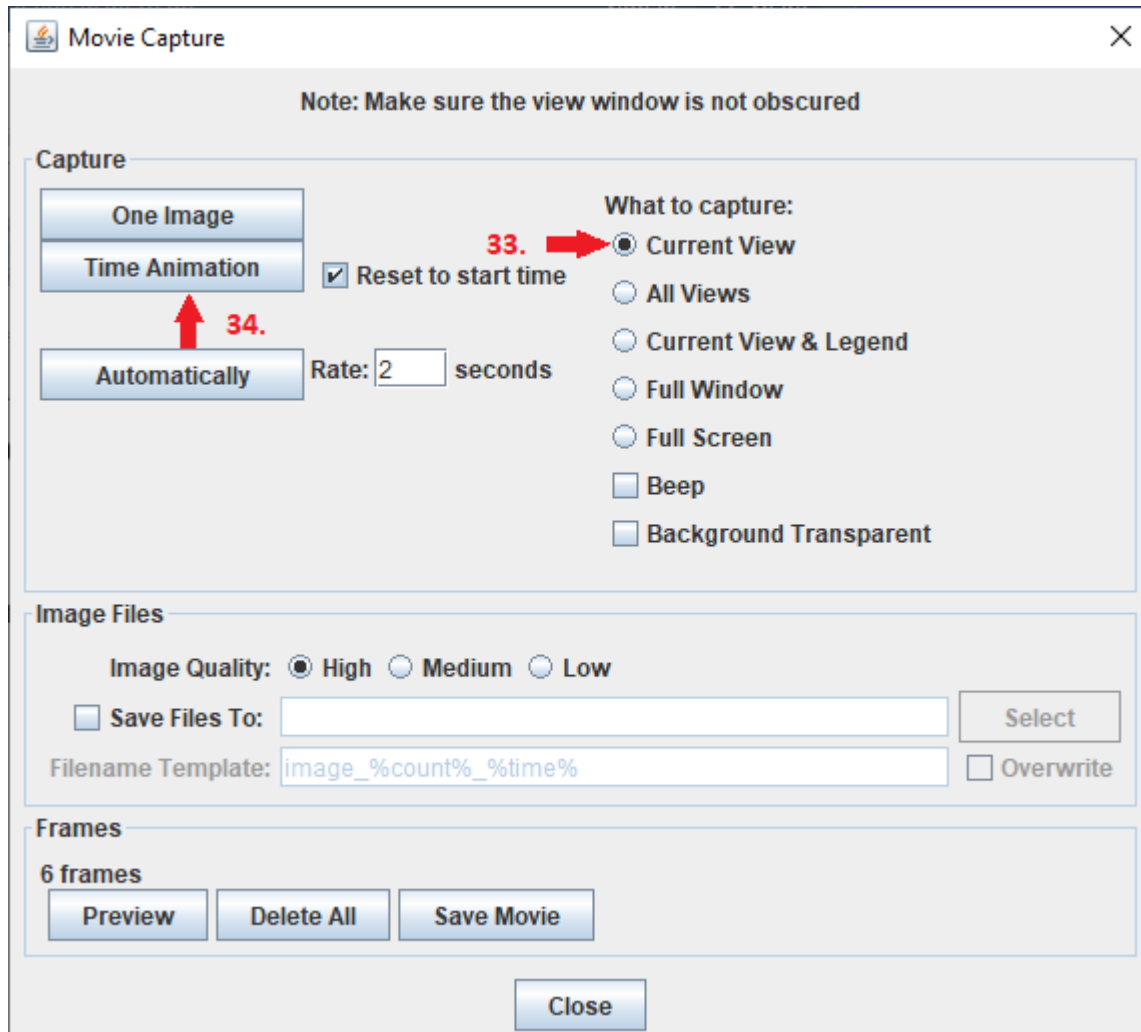
36. Outside of McIDAS-V, use a file explorer window to navigate to the directory the animation was saved to and view it. Close the **Movie Capture** window.

Display a Single Time of Remote Data

37. Remove all layers and data sources from the previous display by selecting *Edit -> Remove -> All Layers and Data Sources* from the **Main Display** window.

38. From the *Data Sources* tab of the **Data Explorer**, navigate to the *General->Catalogs* chooser.

39. In the *Catalog* text box, enter the following URL and press *Enter*:
    https://renucaps.ssec.wisc.edu/thredds/catalog.xml

40. The listing of files under *Browse* is divided into four geographical categories: *Alaska*, *Caribbean*, *CONUS*, and *Northern Hemisphere*. Select the top (most recent) file under *SPoRT NUCAPS CONUS* and click **Add Source**.

41. In the **Fields** panel of the *Field Selector*, expand *2D grid*, and select any field of interest.

42. In the **Displays** panel of the *Field Selector*, verify that *Imagery->Image Display* is selected.

43. Click **Create Display**.
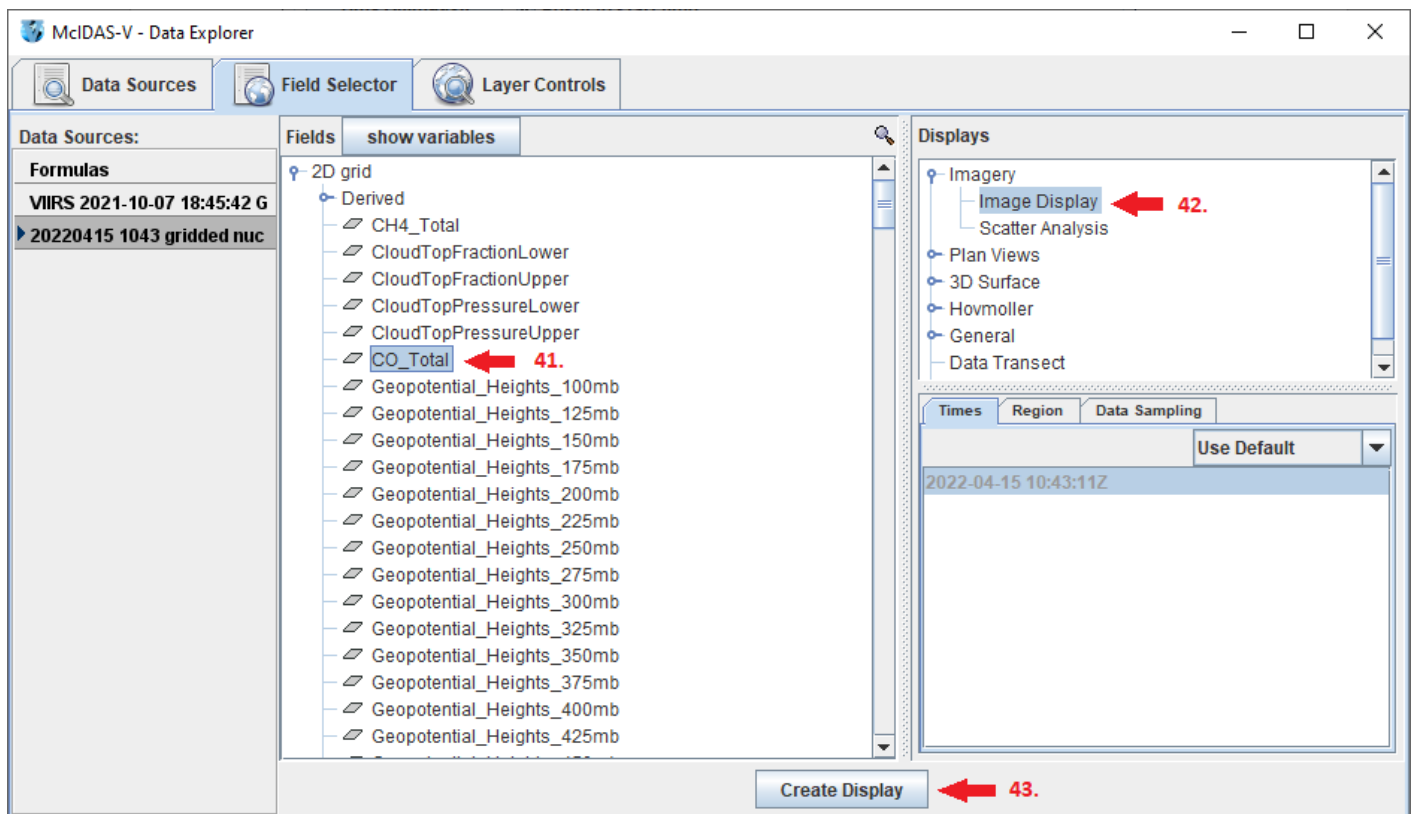
Display a Loop of Remote Data

44. Remove all layers and data sources from the previous display by selecting *Edit -> Remove -> All Layers and Data Sources* from the **Main Display** window.

45. From the *Data Sources* tab of the **Data Explorer**, navigate to the *General->Catalogs* chooser.

46. In the *Data Source Type* dropdown menu, select *Aggregate Grids By Time*.

47. Use *Shift+Left-Click* to select the top ten files under *SPoRT NUCAPS CONUS*.

48. Click **Add Source**.
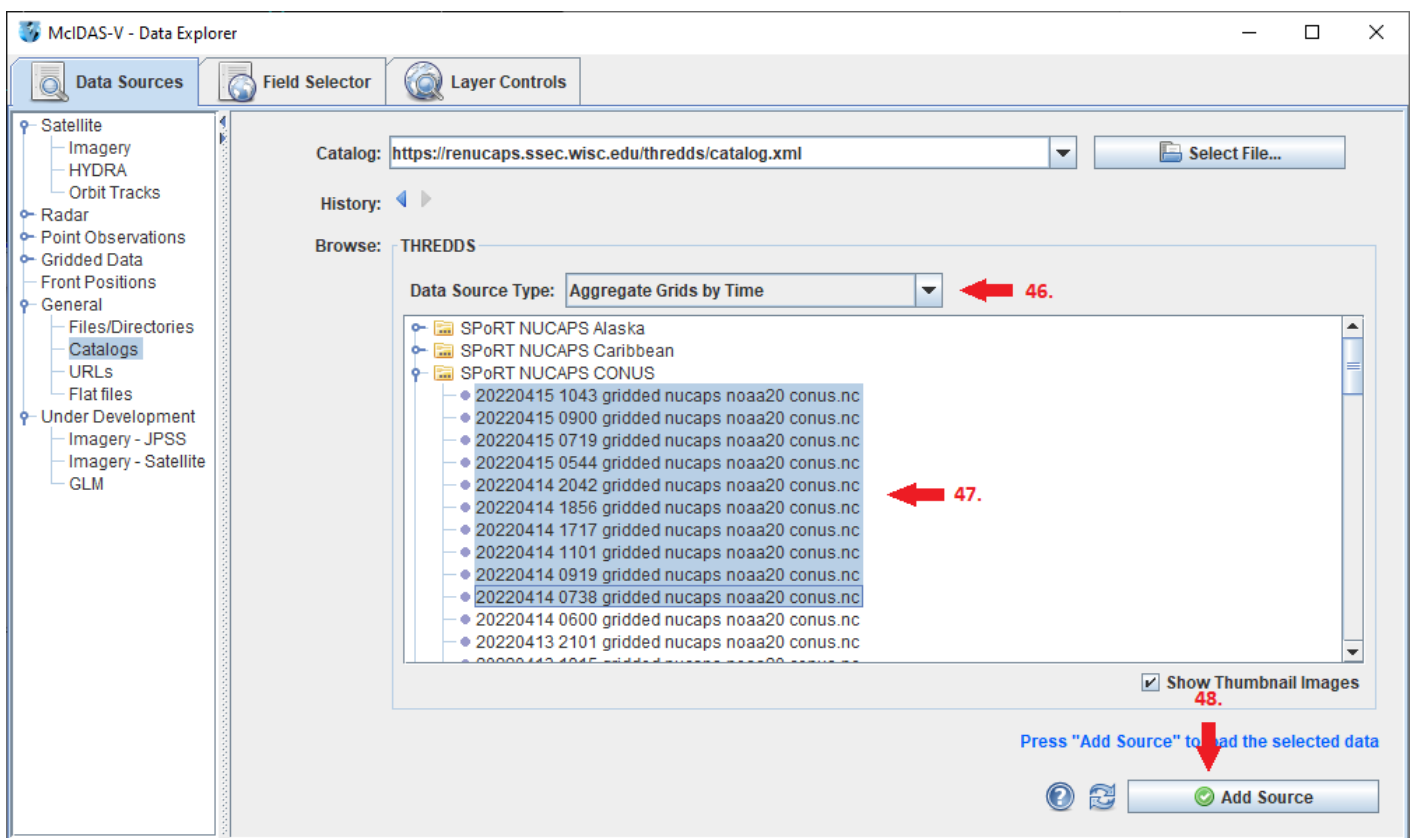
49. In the **Fields** panel of the *Field Selector*, expand *2D grid*, and select any field of interest.

50. In the **Displays** panel of the *Field Selector*, verify that *Imagery->Image Display* is selected.

51. Click **Create Display**.
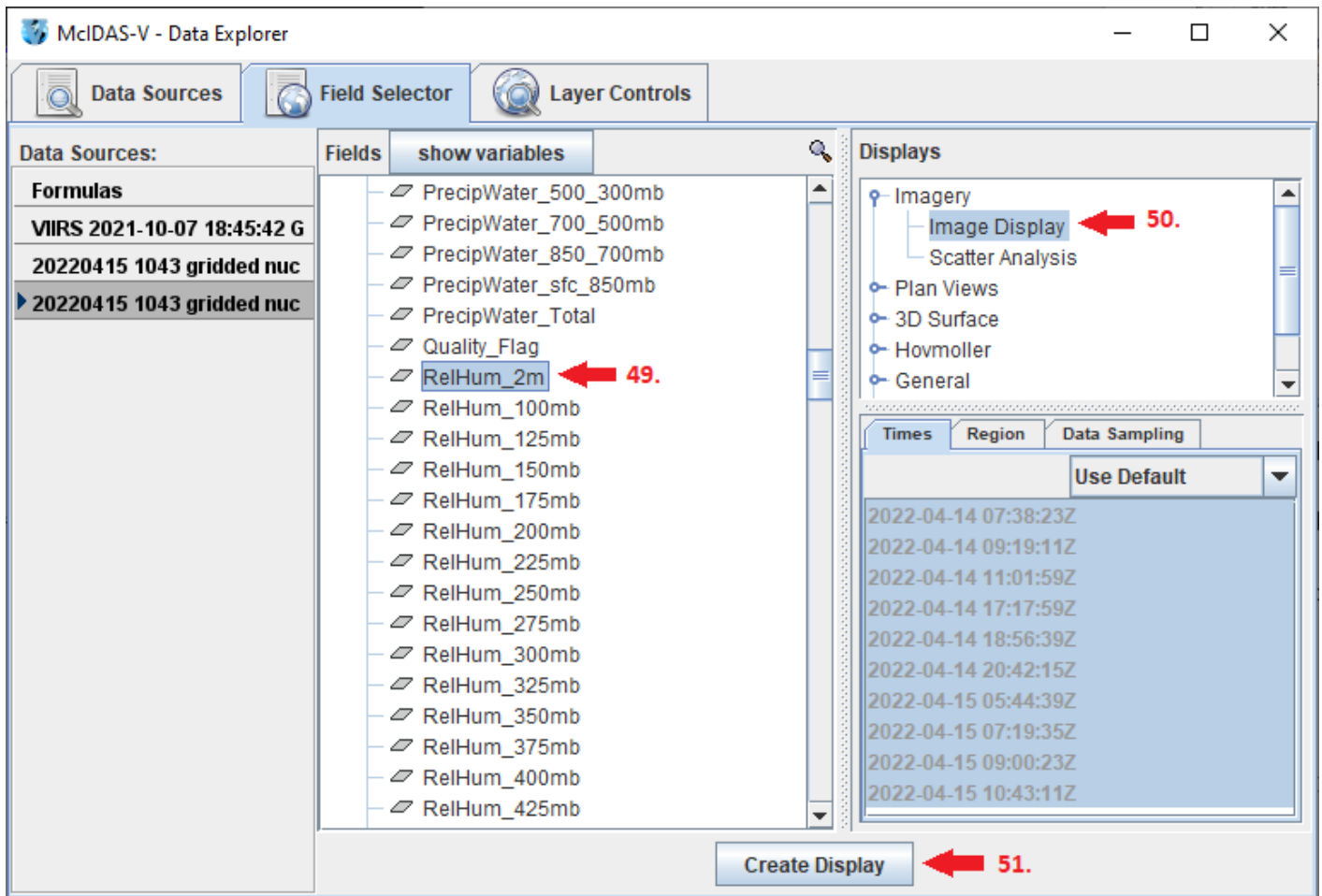
52. In the **Main Display** window, use *Shift+Left-Click+Drag* to zoom in over the United States domain.

53. Use the **Time Animation Widget** at the top of the **Main Display** window to loop through the time series.

Zooming, Panning, and Rotating Controls

Zooming	Panning	Rotating
	Mouse	
Shift-Left Drag: Select a region by pressing the *Shift* key and dragging the left mouse button. **Shift-Right Drag:** Hold *Shift* key and drag the right mouse button. Moving up zooms in, moving down zooms out.	**Control-Right Mouse Drag:** Hold *Control* key and drag right mouse to pan.	**Right Mouse Drag**: Drag right mouse to rotate
	Scroll Wheel	
Scroll Wheel-Up: Zoom Out. **Scroll Wheel-Down:** Zoom In.		**Control-Scroll Wheel-Up/Down:** Rotate Clockwise/Counterclockwise. **Shift-Scroll Whell-Up/Down:** Rotate forward/backward clockwise
	Arrow Keys	
Shift-Up: Zoom In. **Shift-Down:** Zoom Out.	**Control-Up arrow:** Pan Down. **Control-Down arrow:** Pan Up. **Control-Right arrow:** Pan Left. **Control-Left arrow:** Pan Right.	**Left/Right arrow:** Rotate around vertical axis. **Up/Down arrow:** Rotate around horizontal axis. **Shift-Left/Right arrow:** Rotate Clockwise/Counterclockwise