

# McIDAS-V Tutorial

## Displaying Gridded Data

updated August 2009 (software version 1.0beta4)

McIDAS-V is a free, open source, visualization and data analysis software package that is the next generation in SSEC's 35-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, and contains "Bridge" software that enables McIDAS-X users to run their commands and tasks in the McIDAS-V environment. The functionality of SSEC's HYDRA software package is also being integrated into McIDAS-V for viewing and analyzing hyperspectral satellite data.

McIDAS-V is currently a beta version of the software, which means that the software may contain bugs and not always work as expected. If you encounter any errors, please send them to the McIDAS Help Desk at [mug@ssec.wisc.edu](mailto:mug@ssec.wisc.edu). You will be notified at the startup of McIDAS-V when new versions are available on the McIDAS-V webpage - <http://www.ssec.wisc.edu/mcidas/software/v/>. 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.

This tutorial assumes that you have McIDAS-V installed on your machine, and that you know how to start McIDAS-V. If you can not start McIDAS-V on your machine, you should follow the instructions in the document entitled *McIDAS-V Tutorial – Installation and Introduction*.

In this McIDAS-V Tutorial, each exercise will be explained using two different methods of data access: pre-loaded data bundles and real-time access to default remote servers. If you have access to your own real-time ADDE servers, you may also use those, but be aware that different server configurations may make the explanations in this document not quite applicable to all data that you may load.

### Displaying Gridded data: 2D

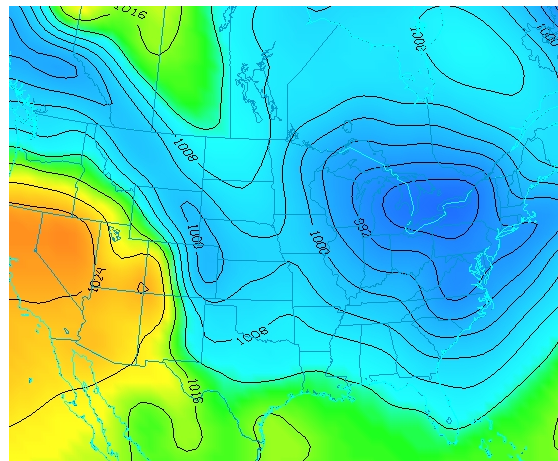
1. Load data bundle **Grid-GFS-Intro.mcvz**. If you are using real-time data, skip to step 2.
  - a. In the "Open Bundle" dialog box select the *Replace session* option and click **OK**.
2. If using real-time data, follow the steps below.
  - a. Remove all layers and data sources.
  - b. Select the *Gridded Data* -> *Remote* chooser from the *Data Sources* tab.
  - c. From the Catalog: pull down menu, select <http://motherlode.ucar.edu:8080/thredds/idv/models.xml>
  - d. Add the *NCEP Model Data* -> *Global Forecast System Model* -> *NCEP GFS CONUS 80 km* -> *Latest* source.

3. In the **Field Selector** select the *2D grid* -> *Pressure reduced to MSL @ msl* field.
  - a. Select the *Color-Shaded Plan View Display*.
  - b. In the **Times** tab, uncheck the “Use Default” box and select the first six times.
  - c. Create the Display

4. In the **Layer Controls**, turn on the option to **Shade Colors**.

5. Go back to the **Field Selector**.

- a. Change the Display type to *Contour Plan View* and overlay the same parameter.
- b. Click on the **Color Table** name (PressureMSL) to change the color table of the contours to **Solid ->Black**.



## Displaying Gridded data: 3D

1. Remove all layers. In the **Field Selector**, select the *Temperature @ isobaric* field under the 3D grid listing.
  - a. Select the *Color-Filled Contour Plan View Display* type.
  - b. In the **Times** tab select the first 6 images.
  - c. In the **Levels** tab, select 500 hPa.
  - d. Click **Create Display**.
2. Use the rotating and zooming controls to rotate the main 3D display. You can clearly see the contours are displayed at 500 hPa in the main display.
3. Keep the main display rotated so the difference in height between the map and the contours can be seen.
4. In the **Layer Controls**, use the Levels pull down menu to change the level of the contours. Note that when the level is changed, both the contours and the height of the contours change in the main display.
  - a. Change the level to 850 hPa.
  - b. Change the display units from Celsius to Fahrenheit by selecting **Edit -> Change Display Unit** from the **Layer Controls** menu.
  - c. Change the contour interval to 5 Fahrenheit by clicking on the **Change** button in the Contour section of the **Layer Controls**.

5. Reset the projection and change the level to 250 hPa. You should notice that the map does not show up on the contours.
6. Move the map above the 250 hPa contours and change the map colors to white.
  - a. In the **Layer Controls**, select “Default Background Maps” from the list of layers on the left hand side.
  - b. Change the map colors of “North & Central America”, “World Coastlines”, and “World Political Boundaries” to white.
  - c. In the Settings tab, move the Map position slider to the right to move higher into the 3D display.

## Problem Set

The previous examples were intended to give you a general knowledge of how to load and display gridded data. The problem sets below are intended to introduce you to new topics related to the data, as well as challenge your knowledge of McIDAS-V. We recommend that you attempt to complete each problem set before looking at the solutions, which are provided below the problem set.

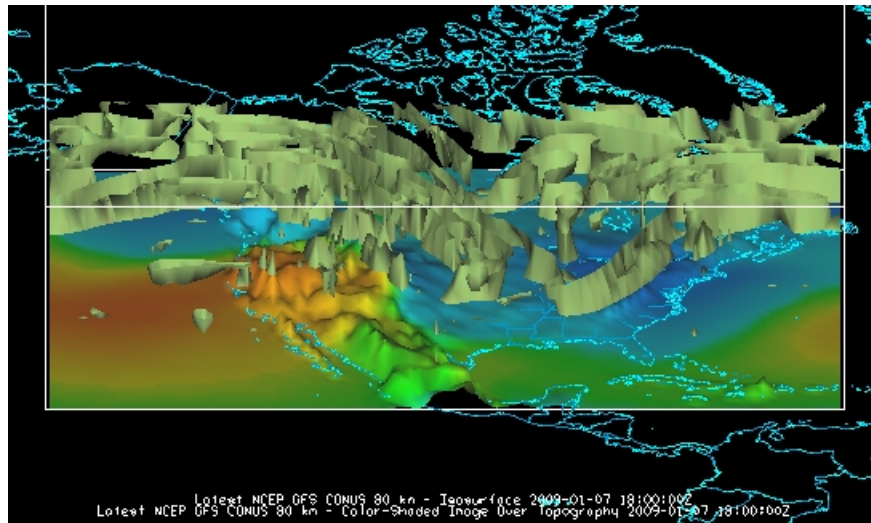
1. Create a display of 2D Pressure as a 3D Color Shaded Image over topography using the 5 most recent times. Overlay Absolute Vorticity as an isosurface. Then, remove the Absolute Vorticity layer and add a cross section of Relative Humidity. Save this as a bundle, only saving the parameters used in the displays.
2. Create a 3D globe display of jet stream winds and 2D surface pressure from grids. You may use bundle **Grid-Problem-Globe.mcvcz** or real-time data to load the grids. Note: This bundle is large, so it may take a minute to open the file.
3. Create a display showing the difference between the 0Z and 6Z 2D Pressure Reduced to MSL @ msl for a specific time. Save a JPG image of the difference. You may use bundle **Grid-Problem-Difference.mcvcz** or real-time data to load the grids.

### Problem Set #1 – Solution

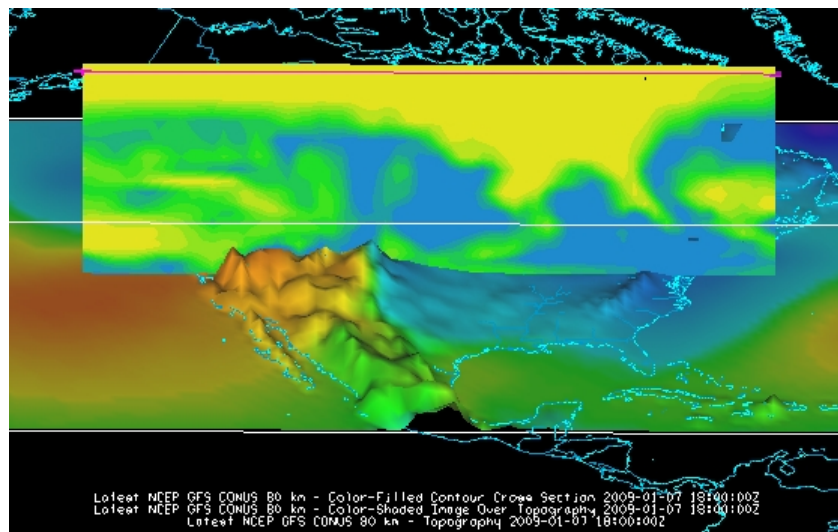
Create a display of 2D Pressure as a 3D Color Shaded Image over topography using the 5 most recent times. Overlay Absolute Vorticity as an isosurface. Then, remove the Absolute Vorticity layer and add a cross section of Relative Humidity. Save this as a bundle, only saving the parameters used in the displays.

1. Remove all layers.
2. Reset the map position to the Bottom.
3. Add the earliest 2D Pressure reduced to MSL @ msl and display it as a 3D Color-Shaded Image Over Topography. The 2D field will be displayed as a topography.
  - a. You will be prompted for the Topography field. Select the **Latest NCEP GFS CONUS 80km -> 2D grid -> 2D Geopotential height @ surface** field from the selector, the earliest time, and press **OK**.

- b. Shade the colors, and use the zooming and rotating controls to see the display in 3D.
4. Reset the display projection.
5. Display the earliest *3D Absolute Vorticity @ isobaric* as a 3D isosurface.
6. Zoom in over the US and rotate the display to see the absolute vorticity isosurface over the continental US.
7. The **Isosurface Value** in the *Layer Controls* can be used to change the value of absolute vorticity displayed.



8. Remove the absolute vorticity isosurface layer from the display.
9. Add the earliest *3D Relative Humidity at isobaric* as a *Color-Filled Contour Cross Section*. The cross section will be displayed in 3D in the main window and in 2D in the *Layer Controls* tab.
10. To reposition the cross section in the main window, *left click* on the plus or square to move the ends of the cross section, and the triangle to move the entire line.



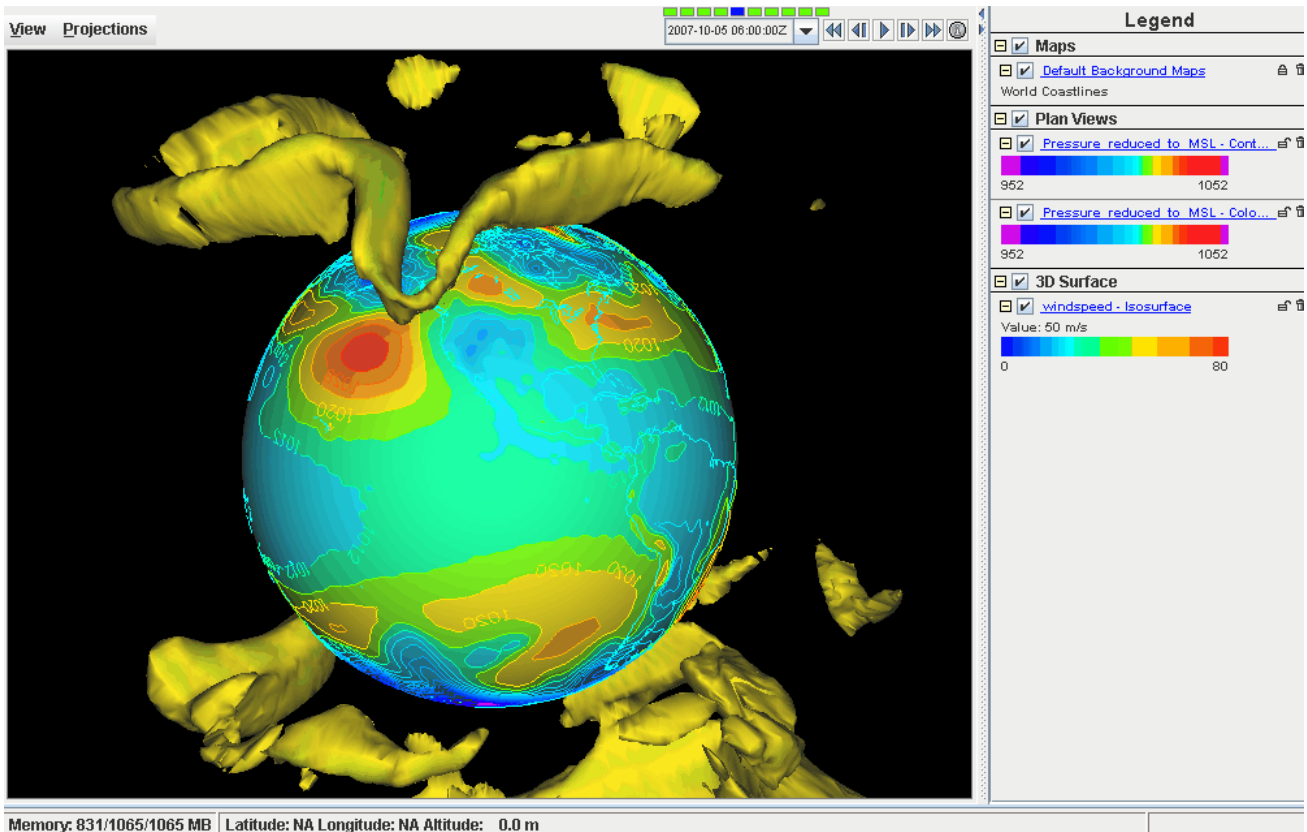
11. Select **File -> Save As...** from the main menu.
  - a. Under **Files of Type** select “Zipped McIDAS-V Bundles (\*.mcvz)”
  - b. Enter in a file name and click **Save**.
  - c. In the “Save Data” dialog box, check **Latest NCEP GFS CONUS 80 km** and click **OK**. By default, the fields used in the display are automatically checked. Click **OK**.

## Problem Set #2 – Solution

Create a 3D globe display of jet stream winds and 2D surface pressure from grids. You may use bundle **Grid-Problem-Globe.mcvz** or real-time data to load the grids. Note: This bundle is large, so it may take a minute to open the file.

1. Add a new one panel globe display tab by selecting **File -> New Display Tab -> Globe Display -> One Panel**.
2. Load bundle **Grid-Problem-Globe.mcvz**. If you are using real-time data, skip to step 3.
  - a. In the “Open Bundle” dialog box select the *Replace session* option and click **OK**. This is a large dataset, so it may take a minute to open the file.
3. If you are using real-time data, follow the steps below.
  - a. Remove all layers and data sources.
  - b. Load the latest GFS Global 1° grid (**NCEP Model Data ->Global Forecast System Model -> NCEP GFS Global 1 degree -> Latest**).
4. Display three 2D *Temperature at Surface* grids every 24 hours as a *color-filled contour plan view*.
5. Overlay it again as contours.
6. Next, display the *3D derived wind speed* grid as a 3D isosurface for the same times.
7. Use the **Layer Control** panel to change the following:
  - a. Change the **Contour intervals** for temperature to 5 K for both sets of contours.
  - b. Change the **isosurface value** to 60 m/s.
  - c. Change the default World Coastlines map color to RGB 0-153-204 and the default World Political Boundaries map color to RGB 0-255-255.
8. Start the loop and turn the **Auto rotate view** option (**View -> Viewpoint** from the main display window) on.
  - a. Use the Zooming and Panning controls to observe the data from different views.

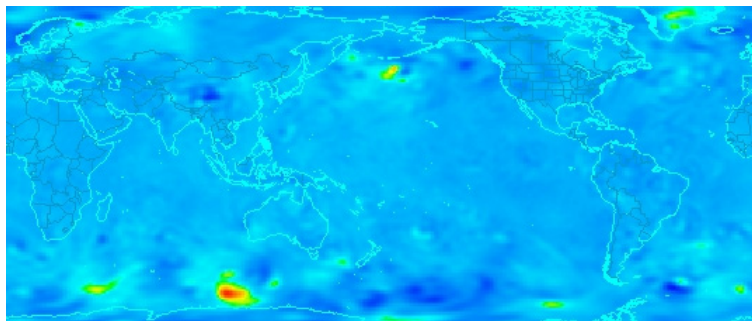
- b. Depending on preference, it might help to turn the **Auto rotate view** option off.
9. Turn the looping on and make sure the **Auto rotate view** option is on.
  10. Capture a movie of the rotating globe by selecting **View -> Capture -> Movie...**
    - a. In the movie capture box, change the **Rate:** to 0.25 seconds.
    - b. Move the main window and the movie capture box around so that they are not overlapping. (During the movie capture, if the view in the main window is obscured, the obscurities will be shown in the capture.)
    - c. Start the movie capture by clicking **Automatically**.
    - d. Once the globe has rotated a complete 360°, click **Stop**.
    - e. Click **Save Movie** to save it as a QuickTime movie.



### Problem Set #3 – Solution

Create a display showing the difference between the 0Z and 6Z 2D Pressure Reduced to MSL @ msl for a specific time. Save a JPG image of the difference. You may use bundle **Grid-Problem-Difference.mcvz** or real-time data to load the grids.

1. Close the globe display tab.
2. Load data bundle **Grid-Problem-Difference.mcvz**. If you are using real-time data, skip to step 3.
  - a. In the “Open Bundle” dialog box select the *Replace session* option and click **OK**.
3. If you are using real-time data, follow the instructions below.
  - a. Remove all layers and data sources.
  - b. Return to the *Data Sources* tab.
  - c. Load the 0Z and 6Z GFS *Global 1°* grids (*NCEP Model Data -> Global Forecast System Model -> NCEP GFS Global 1 degree -> GFS\_Global\_onedeg\_YYYYMMDD\_0000.grib2 (0600.grib2)* ) for today into the *Field Selector*.
4. Choose *Formulas* in the *Field Selector*
5. Select *Miscellaneous -> Simple Difference a-b*.
6. In the **Displays** tab select *Plan Views -> Color-Shaded Plan View* and click **Create Display**. A box will pop up prompting you for the two fields to subtract.
  - a. On the left side, select the 0Z 2D Pressure Reduced to MSL @ msl in the field and 0Z for the next day in the times.
  - b. On the right side, select the 6Z 2D Pressure Reduced to MSL @ msl in the field and 0Z for the next day in the times.
7. The resulting plot will show the difference between the two grids in Pascals.
  - a. To change to millibars, go to the *Layer Controls* tab and select *Edit -> Change Display Unit...*
  - b. Select millibars from the dropdown list and click OK. To change the range of data values with the new units, click on the default Color Table box, select Change Range, and click on Use Predefined -> From All Data. Positive values indicate the 0Z forecast predicted a higher pressure than the 6Z, and negative values indicate the opposite.



8. To save the full main display window as an image, select *View -> Capture -> Image...* from the Display menu.
  - a. Under “Capture What” change the radio button to *Full Window*.
  - b. Enter in a name, followed by the “.jpg” extension.

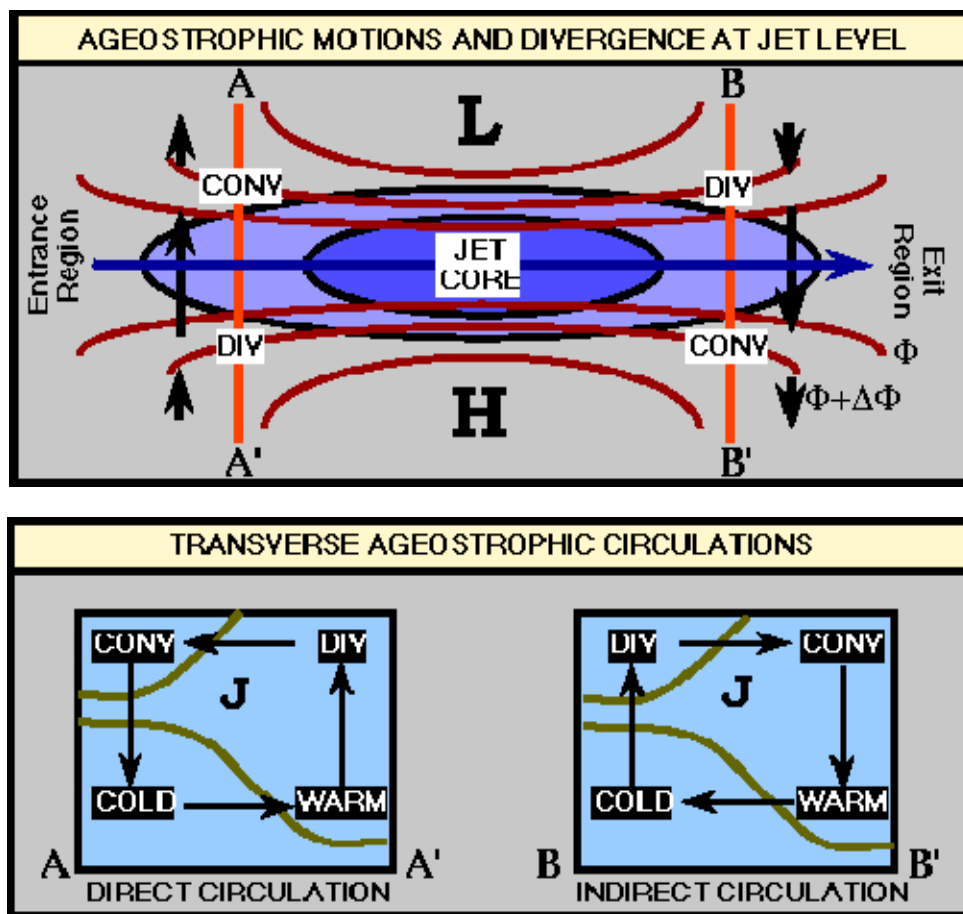
## Challenge

The bundle **Grid-Problem-Challenge.mcvz** contains 3D u and v data. Use the available data and display options to look for a jet entrance or exit region.

For a reminder of jet entrance and exit regions, see the graphic below from:

[http://www4.ncsu.edu/~nwsfo/storage/training/jets/JETS.gifs/JET\\_4Cell.A.gif](http://www4.ncsu.edu/~nwsfo/storage/training/jets/JETS.gifs/JET_4Cell.A.gif)

### THE FOUR QUADRANT STRAIGHT JET MODEL





## Zooming, Panning, and Rotating Controls

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