AOS 452 Lab 12 Handout
Vis5D II – Advanced Topics

<u>Other Control Panel Buttons</u>
We've already seen how to use some of the buttons on the control panel. Here's a brief description of some others:

NEW VAR.. – Invokes external analysis functions, or clones fields
TOPO – Toggles display of the Earth's surface
BOX – Toggles display of the 3D box
CLOCK – Toggles display of the clock
SAVE.. – Save Vis5D settings (or when right-clicked, saves the current Vis5D file)
RESTORE – Restore settings previously SAVEd
GRID #'s – Toggles between latitude/longitude/height and raw grid numbers
CONT #'s – Toggles display of contour labels
PERSPEC – Toggles between perspective and orthogonal viewing projections
SCRIPT.. – Runs Vis5D scripts (Not described in lab)
INTERP.. – Starts interactive interpreter (Not described in lab)
UVW VARS.. – Tells Vis5D which variables to use for wind vectors/trajectories (not described)
LEGENDS – Toggles display of color bar (when applicable)
IMPORT – Imports datasets into Vis5D (Not described in lab)
DISPLAY – Manipulate display windows (Not described in lab)

Creating More Vis5D Plots - Let's explore some more advanced Vis5D features.

A) New Variable
The NEW VAR.. button also lets you create rudimentary diagnostics. For example, if your Vis5D file contained U and V, but not speed, you could click "Make type-in expression…" and then enter speed=SQRT(U**2+V**2) in the next window. For more advanced diagnostics, you could write your own functions in Fortran, but that's beyond the scope of this lab!

To preserve a computed diagnostic into the Vis5D file, right-click SAVE to save the new Vis5D file.

B) Trajectories
The history of different air parcels can be found by using the Trajectory mode. Eight different sets of trajectories can be created. You have the option of making the trajectory a line or ribbon of varying length. Trajectories can be one color or a color that varies based on the value of some field (e.g., temperature).
1) Begin with a horizontal plot of 2-km potential temperature (theta) contoured every 4 K. Then, as an example, step through your Vis5D file and identify a

region of high baroclinicity (i.e. a frontal region). We will plot trajectories near the front.

2) Enter Trajectory mode.
3) Move the cursor to the white cross in the display window. Click and hold the right mouse button and drag the cross somewhere near your front. If you wish to move the cross in the vertical direction, switch to the SOUTH view and complete the click, hold, and drag procedure. Note that the exact location of the cross is given in the upper-right corner.
4) In the trajectory control panel near the bottom of the screen, set the length to 4.
5) Press the middle mouse button to set a trajectory through that point. A thin line representing the trajectory will appear on the screen.
6) Use the STEP button to see the flow associated with the air parcel. After stepping through several frames (view from the side as well to see vertical motions in the trajectory), delete the trajectory by clicking the Delete Set button in the trajectory control panel.
7) Now click on the Ribbon button in the panel near the bottom of the screen. Instead of lines, trajectories will be represented as ribbons.
8) Right-click on Set 1 in the Trajectory control panel. A window will appear where you can adjust the color of the trajectory. Select pres on the left side of the window. The color of the trajectory now will correspond to the value of the pressure. Click CLOSE to close the window.
9) Go back to the frame you started at.
10) Set a few trajectories in and around the temperature gradient. When you are finished setting trajectories, animate the display. You should find the colors of the trajectories changing according to the pressure of the air parcel. Look at the trajectories from the SOUTH and WEST views.

Note that you can create a set of trajectories all going through the same point, but at different time steps, by middle-clicking while Vis5D is animating.

C) Probing the Data

Probe mode allows you to inspect individual data values at various locations in the 3D grid.

1) Select Probe mode, but don't delete your trajectories.
2) Click and hold the right mouse button with the cursor on the white cross, and then drag the cross over the plot. Note how the variables change when you move the cursor.
3) To move the cursor in the horizontal, use the TOP view. To move the cursor in the vertical, use the SOUTH or WEST view.

You can probe your trajectories by right-clicking on the trajectory after you've selected Probe mode. Once you animate, the probe will follow the *first* trajectory you created. Experiment with this. Is theta conserved? Try to find trajectories that conserve theta (within 2 K or so) and trajectories that don't (differences greater than

10 K over the life of the air parcel). Why do you think theta was conserved in some trajectories but not others?

You cannot use Probe mode to follow trajectories other than the first in their set. However, if you create different sets of trajectories, you can move the probe to another set by making sure only that set is displayed. (Use the left mouse button to toggle the display of various trajectory sets.)

D) Vertical Soundings
Although the Sounding mode of Vis5D can make rudimentary soundings, they look pretty ugly. I strongly recommend using gdprof or snprof instead.

E) Multiple Isosurfaces
With Vis5D it is possible to create more than one isosurface of the same field, but first you have to clone it. To do so, click on NEW VAR.. in the main control panel. As an example, click theta in the "Select variable to clone:" section. You'll see theta' appear at the bottom of the main control panel, and you can now select both theta and theta' to plot two isosurfaces of temperature.

F) Clipping Planes
Clipping mode allows you to move the clipping planes. Each plane defines regions where plots will or will not appear. On the interior side of each plane, plots will appear, but on the exterior side, plots will be clipped. The clipping planes can be used to peer inside an isosurface, as an example.

Try using the clipping planes to look inside a jet core.

Contour Options
Line types & limits
Entering a negative contour (slice) interval makes Vis5D use dashes for negative values of a contour, but solid lines for positive values. You can also specify minimum and maximum contours. As an example, let's say you wanted to plot the 1.5-km temperature (close to 850 mb), with dashed contours for values below freezing, –10°C as your minimum contour, and 10°C as your maximum contour. Then in the "T Hor. Slice Interval" box you would type -2 (-10,10) followed by <Enter>. (This sample may not work for all Vis5D files, since some have T stored in Kelvin)

Surface values
Vis5D can automatically interpolate the values of any field to the surface. To see these values, click the SFC button. Try this with temperatures (T), and then rotate the box to see how the contours are laid on the topography. This works for wind vectors as well.

Contour fill opacity

You can change the contour fill opacity by holding down <Shift> while pressing <Down arrow> (for more transparency) or <Up arrow> (for more transparency). The mouse cursor must be in the black color intensity box for this to work.

Command Line Options

When starting Vis5D, you may specify a number of options. As an example, you could type:
vis5d –circle /raid6/class/fall11/mbreeden/452labs_f15/00_LATEST_GFSpac_00.v5d &
to have a circle drawn around the clock. Here are some potentially useful options to add instead of -circle:
  -barbs — Wind barbs instead of vectors
  -box x y z — Lets you specify data box aspect ratio. Default is 2 2 1.
  -circle — Display circular clock
  -date — More understandable date format
  -hirestopo — Use higher-resolution topography

Have fun!