



Post-processing Tools: ARWpost & VAPOR (*WRF-ARW*)

Cindy Bruyère



ARWpost

- **Converter**
 - Requires GrADS / vis5d to display data.
- **GrADS software only needed to display data.**
- **If vis5d output is required, vis5sd libraries are needed to compile the code.**
- **Generate a number of graphical plots**
 - *Horizontal, cross-section, skewT, meteogram, panel*

General

- **Download Code**

- <http://www.mmm.ucar.edu/wrf/users>

- **OnLine Tutorial**

- <http://www.mmm.ucar.edu/wrf/users/graphics/ARWpost/ARWpost.htm>

General

- **MUST have WRF compiled (*similar to WPS*)**
- **For GrADS output**
 - GrADS libraries only needed to display data
 - <http://grads.iges.org/grads/grads.html>
 - GrADS libraries are free
- **For vis5d output**
 - vis5d libraries needed for compilation
 - <http://www.ssec.wisc.edu/~billh/vis5d.html>
 - vis5d libraries are free

Configure & Compile

./configure

Make sure this is correct. If not, set environment variable NETCDF

Will use NETCDF in dir: /usr/local/netcdf-pgi

Please select from among the following supported platforms.

1. PC Linux i486 i586 i686, PGI compiler
(no vis5d)
2. PC Linux i486 i586 i686, PGI compiler
(vis5d)
3. PC Linux i486 i586 i686, Intel compiler
(no vis5d)
4. PC Linux i486 i586 i686, Intel compiler
(vis5d)

Enter selection [1-4] :

Configure & Compile

- **configure.arwp**, will be created
- If your WRF code is not compiled under **../WRFV3**, edit **configure.arwp**, and set **"WRF_DIR"** to the correct location of your WRFV3 code
- **./compile**
 - This will create **ARWpost.exe**

namelist.ARWpost

&datetime	
<i>start_date</i> <i>end_date</i>	Start & end date Format: <i>YYYY-MM-DD_HH:mm:ss</i>
<i>interval_seconds</i>	Seconds between times to process. <i>Code will skip times not required.</i> <i>Data can be in multiple files.</i>
<i>tacc</i>	If model output is not at regular intervals, use next time if within <i>tacc</i> seconds of time requested. <i>2008-04-10_12:00:00</i> <i>2008-04-10_13:00:10</i> <i>tacc=10</i>
<i>debug_level</i>	Set high for extra information

namelist.ARWpost

&io	
<i>io_form_input</i>	2=netCDF, 5=GRIB1
<i>input_root_name</i>	Path and root name of files to use as input. <i>Do not only provide directory name.</i> Can use wild characters.
<i>output_root_name</i>	Output root name. output_root_name. dat & output_root_name. ctl , OR output_root_name. v5d
<i>output_type</i>	Options are 'grads' (<i>default</i>) or 'v5d'
<i>mercator_defs</i>	Set to true if mercator plots are distorted

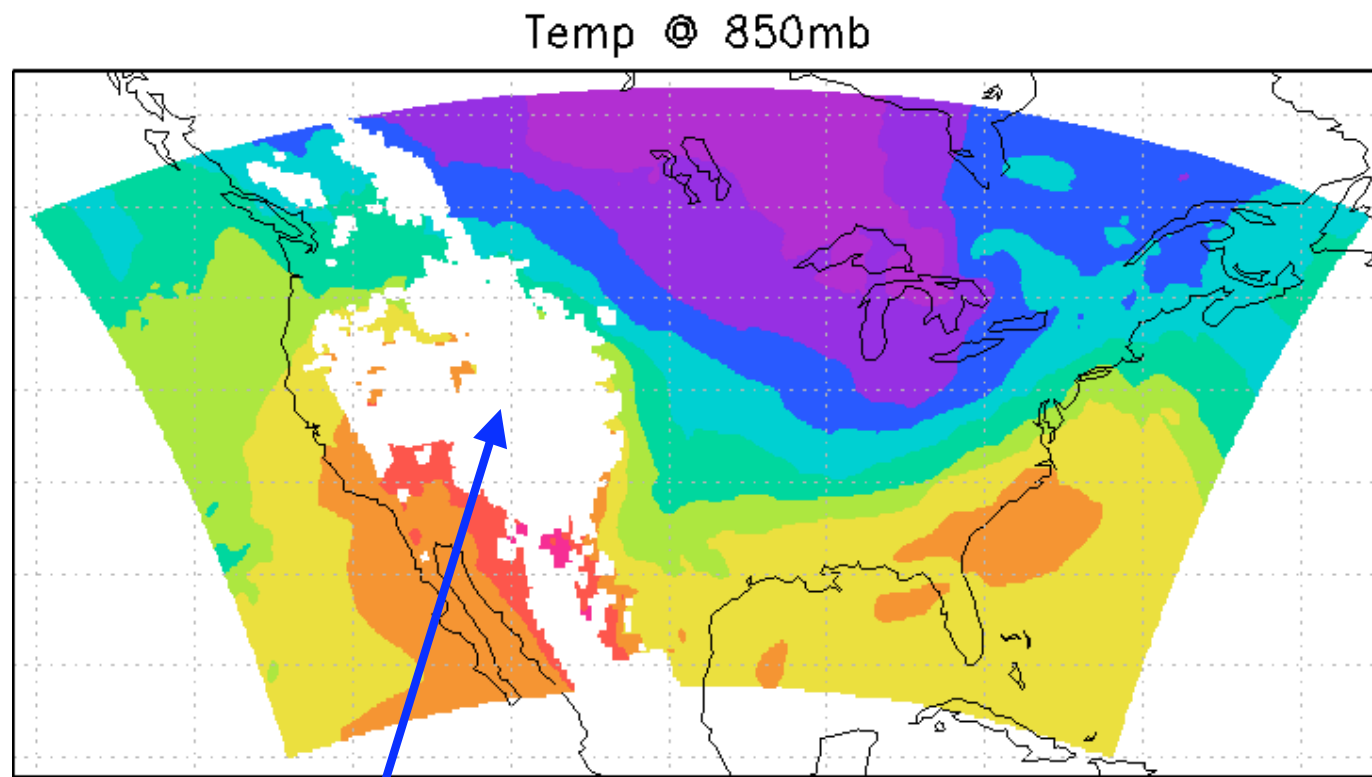
namelist.ARWpost

&io	
<i>split_output</i>	Split your GrADS output files into a number of smaller files (<i>a common .ctl file will be used for all .dat files</i>).
<i>frames_per_outfile</i>	If <i>split_output</i> is .True. , how many time periods are required per output (.dat) file.
<i>plot</i>	Which fields to process. <i>all, list, all_list</i> Order has no effect, i.e., "all_list" and "list_all" are similar. "list" - list variables in "fields"
fields	Fields to plot. Only used if list was used in the "plot" variable.
Available diagnostics: cape, cin, mcape, mcin, clfr, dbz, max_dbz, height, lcl, lfc, pressure, rh, rh2, theta ,tc, tk, td, td2, slp, umet, vmet, u10m, v10m, wdir, wspd, wd10, ws10	

namelist.ARWpost

&interp	
interp_method	0 = sigma levels, -1 = code defined "nice" height levels, 1 = user defined height or pressure levels
interp_levels	Only used if interp_method=1 Supply levels to interpolate to, in hPa (<i>pressure</i>) or km (<i>height above sea level</i>) Supply levels bottom to top NOTE: <i>NO extrapolation below ground</i>

Interpolation



NO extrapolation below ground

Run

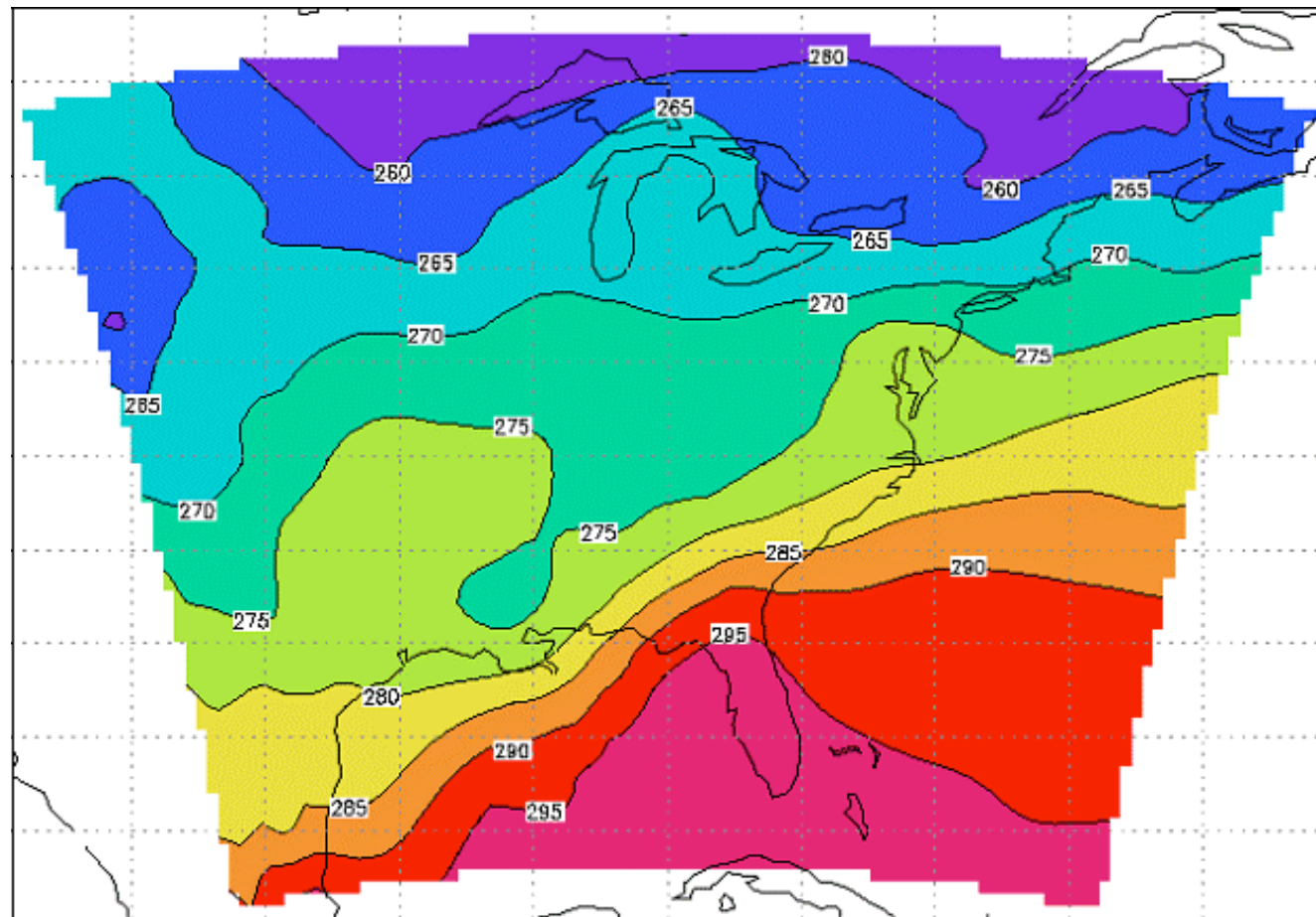
- **./ARWpost.exe**
- **Will create either,**
output_root_name.dat* & *output_root_name.ctl

OR
output_root_name.v5d

GrADS specific notes

- **To display images requires GrADS software**
freely available from
<http://grads.iges.org/grads/grads.html>
- **Documentation:**
<http://grads.iges.org/grads/gadoc/index.html>

GrADS - projections



GrADS - .ctl file

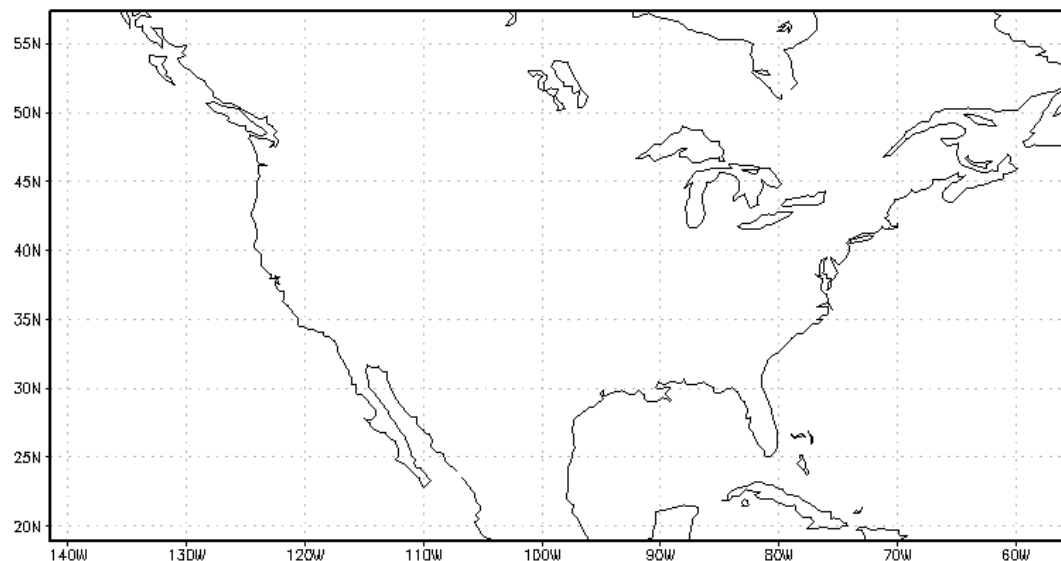
```
dset ^test.dat
options byteswapped
undef 1.e37
title OUTPUT FROM WRF V2.2 MODEL
pdef 259 163 lcc 40.000 -98.000 130.000 82.000
      60.00000 30.00000 -98.00000 22000.000 22000.000
xdef 877 linear -141.49254 0.09909910
ydef 389 linear 18.88639 0.09909910
```

options byteswapped

*Needed on some machines - if you get NaNs when you plot,
remove this line from .ctl file*

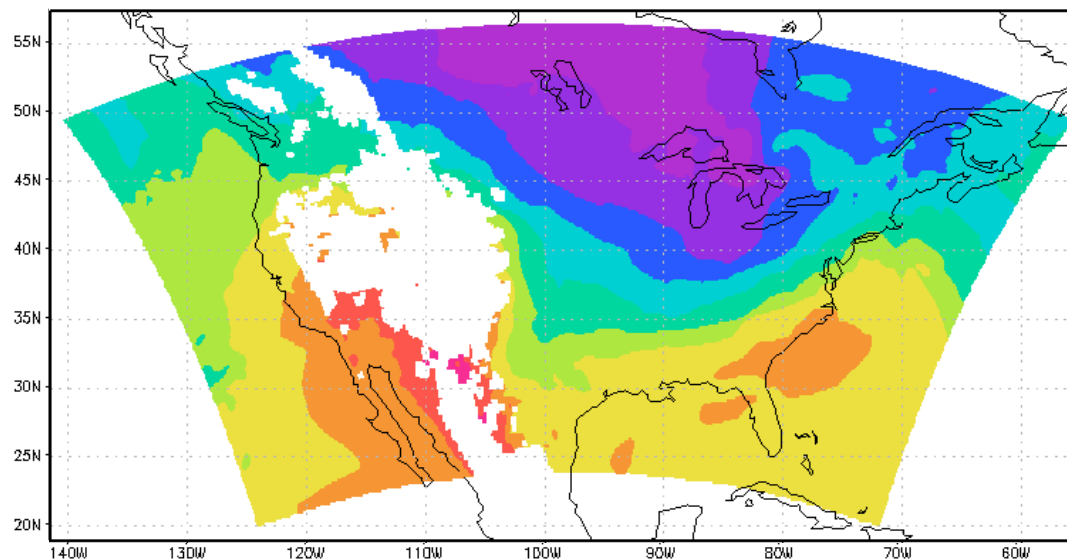
GrADS - .ctl file

```
dset ^test.dat
options byteswapped
undef 1.e37
title OUTPUT FROM WRF V2.2 MODEL
pdef 259 163 lcc 40.000 -98.000 130.000 82.000
      60.00000 30.00000 -98.00000 22000.000 22000.000
xdef 877 linear -141.49254 0.09909910
ydef 389 linear 18.88639 0.09909910
```



GrADS - .ctl file

```
dset ^test.dat
options byteswapped
undef 1.e37
title OUTPUT FROM WRF V2.2 MODEL
pdef 259 163 lcc 40.000 -98.000 130.000 82.000
60.00000 30.00000 -98.00000 22000.000 22000.000
xdef 877 linear -141.49254 0.09909910
ydef 389 linear 18.88639 0.09909910
```



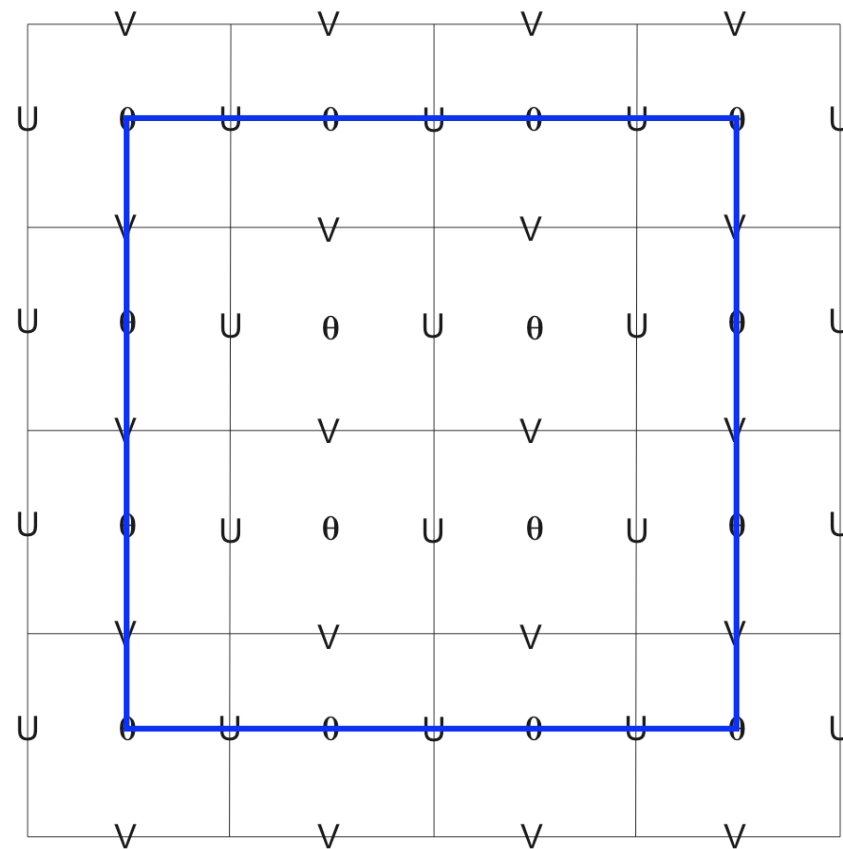


GrADS conversion - question

- **Why is a converter needed if GrADS can display netCDF files?**
 - Can only display model surface coordinates
 - Cannot interpolate to height or pressure levels
 - All diagnostics must be added via GrADS script files
 - *GRIB1 model output can also be read directly by GrADS, but above issues are still valid*
 - *For GRIB1, there is also a stagger problem*

GrADS conversion - question

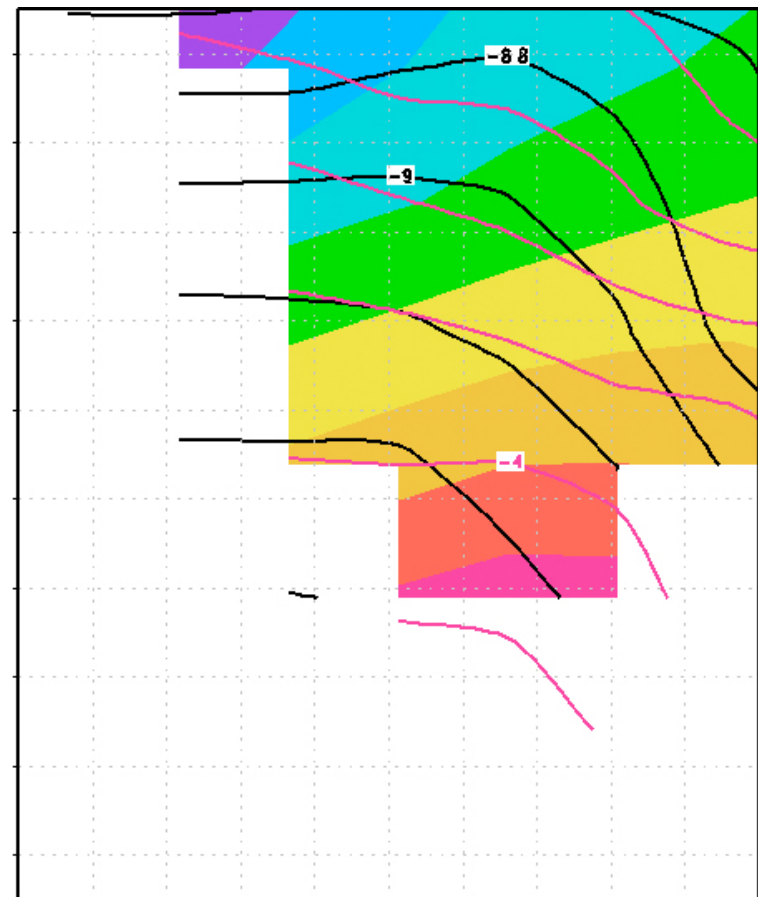
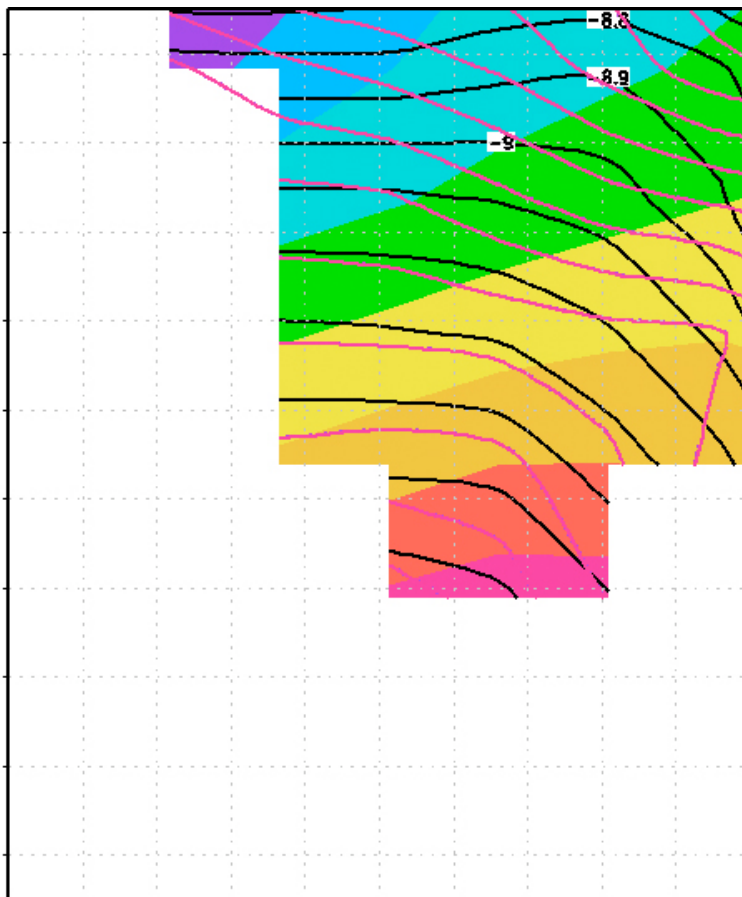
- Why is a converter needed if GrADS can display netCDF files?



**WRF
staggered
grid**

Staggering

shaded=T ; black=U ; red=V



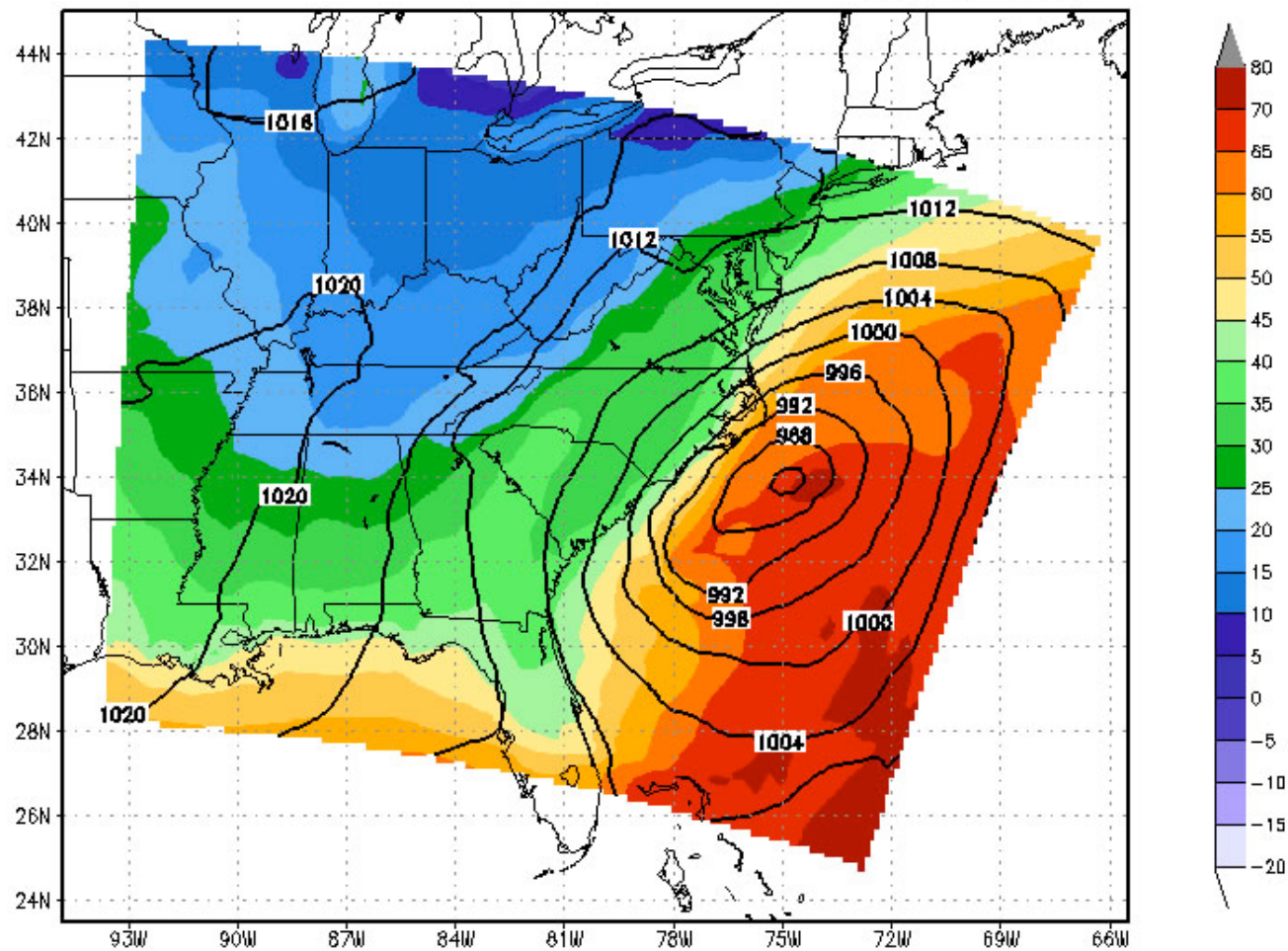


Staggering

- **Since GrADS version 1.9**
 - a new **gradsnc** interface is available
created by GrADS developers for WRF
- **To USE**
 - must create 4 .ctl files (M ; U ; V ; W)
 - must open the all at once
- **Utility**
 - ARWpost/util/WRFnc2ctl.f

Creating a Plot

Surface Temperature (F)
Sea Level Pressure (mb)



Creating a Plot

```
open em_real.ctl  
set mpdset hires  
set display color white
```

```
define tf=1.8*tc + 32  
set gxout shaded  
set z 1  
d tf  
run cbar.gs
```

```
set gxout contour  
set ccolor 1  
set cint 4  
d slvl
```

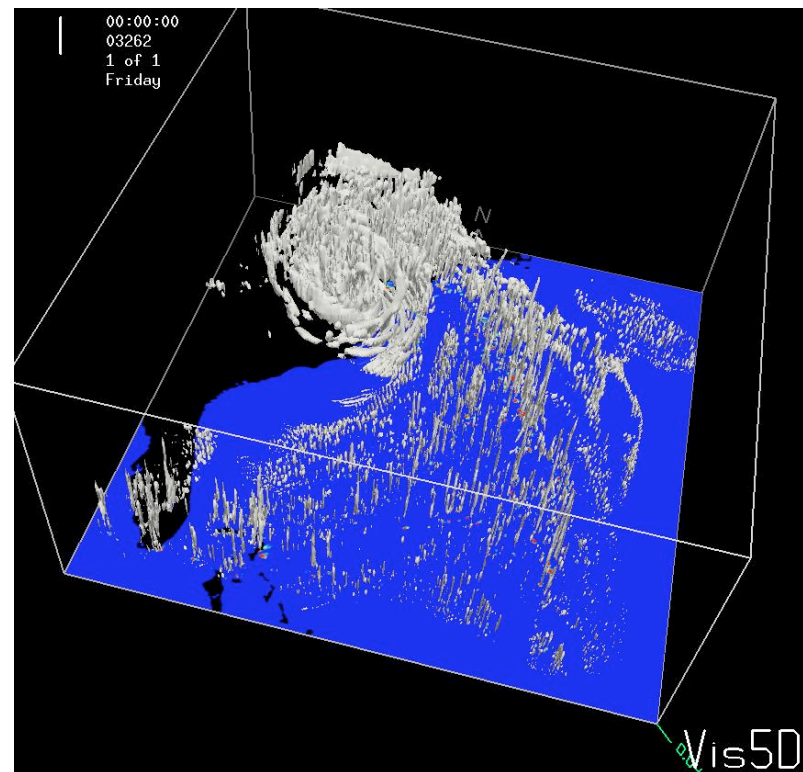


vis5d specific notes

- **vis5d is a three-dimensional visualization software**
- **vis5d is free and can be downloaded from:**
<http://www.ssec.wisc.edu/~billh/vis5d.html>
- **Run**

`vis5d output_root_name.v5d`
- **Graphical Interface**

vis5d graphical interface



VAPOR

Visualization and Analysis Platform for Oceanic, atmospheric and solar Research

Alan Norton
alan@ucar.edu
vapor@ucar.edu

National Center for Atmospheric Research

WRF in VAPOR

- Interactive 3D visualization of WRF-ARW data (*wrfout files only*)
- WRF functionality has been added in v1.2
- Available free on Linux, Windows, Mac
- Interactive rendering and animation (using GPU acceleration)
- Simple 2-step data conversion from WRF output to VAPOR
 - wrfvdfcreate & wrf2vdf
- Volume rendering
- Intuitive color/opacity editor
- Isosurface rendering

WRF in VAPOR

- Steady and unsteady flow integration
 - Interactive seed placement
 - Data probing
 - Contour plotting
 - Terrain surface image render
 - Interactive performance on terabyte datasets
-
- Downloads, documentation, examples at:
<http://www.vapor.ucar.edu>
 - <http://www.vapor.ucar.edu/doc/WRFsupport.pdf>

WRF in VAPOR

- **Steady and unsteady flow integration**
- **Interactive seed placement**
- **Data probing**
- **Contour plotting**
- **Terrain surface image render**
- **Interactive performance on terabyte datasets**

- **Downloads, documentation, examples at:**
<http://www.vapor.ucar.edu>

- **<http://www.vapor.ucar.edu/doc/WRFsupport.pdf>**

WRF in VAPOR

