

A vertical strip on the left side of the slide shows a meteorological map with various colors (blue, green, yellow) and small blue arrows indicating wind direction and speed.

# Tools

*Cindy Bruyère*

# netCDF data

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- **Advantages of using netCDF?**

- Platform-independent (*big\_endian / little\_endian*)
- A lot of software already exist which can be used to process netCDF data

- **netCDF operators**

- <http://nco.sourceforge.net/>
- <http://www.gfdl.noaa.gov/products/vis/data/netcdf/>
- Stand alone programs to, which can be used to manipulate data (*performing grid point averaging / file differencing / file 'appending'*)

# ncdump

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- reads a netCDF dataset and prints information from the dataset

# ncdump

---

- reads a netCDF dataset and prints information from the dataset

**ncdump -h *file***

*print header (inc. list of variables in the file)*



```
netcdf wrfinput_d01 {
```

```
dimensions:
```

```
    Time = UNLIMITED ; // (1 currently)
```

```
    DateStrLen = 19 ;
```

```
    west_east = 73 ;
```

```
    south_north = 60 ;
```

```
    west_east_stag = 74 ;
```

```
    bottom_top = 27 ;
```

```
    south_north_stag = 61 ;
```

```
    bottom_top_stag = 28 ;
```

```
    DIM0008 = 5 ;
```

```
    soil_layers_stag = 5 ;
```

```
variables:
```

```
    char Times(Time, DateStrLen) ;
```

```
    float LU_INDEX(Time, south_north, west_east) ;
```

```
        LU_INDEX:FieldType = 104 ;
```

```
        LU_INDEX:MemoryOrder = "XY " ;
```

```
        LU_INDEX:description = "LAND USE CATEGORY" ;
```

```
        LU_INDEX:units = "" ;
```

```
        LU_INDEX:stagger = "" ;
```

```
    float U(Time, bottom_top, south_north, west_east_stag) ;
```

```
        U:FieldType = 104 ;
```

```
        U:MemoryOrder = "XYZ" ;
```

```
        U:description = "x-wind component" ;
```

```
        U:units = "m s-1" ;
```

```
        U:stagger = "X" ;
```

// global attributes:

```
:TITLE = " OUTPUT FROM REAL_EM V2.1.2 PREPROCESSOR";  
:START_DATE = "2000-01-24_12:00:00" ;  
:SIMULATION_START_DATE = "2000-01-24_12:00:00" ;  
:WEST-EAST_GRID_DIMENSION = 74 ;  
:SOUTH-NORTH_GRID_DIMENSION = 61 ;  
:BOTTOM-TOP_GRID_DIMENSION = 28 ;  
:DX = 30000.f ;  
:DY = 30000.f ;  
:GRIDTYPE = "C" ;  
:DYN_OPT = 2 ;  
:DIFF_OPT = 0 ;  
:KM_OPT = 1 ;  
:DAMP_OPT = 0 ;  
:KHDIF = 0.f ;  
:KVDIF = 0.f ;  
:MP_PHYSICS = 3 ;  
:RA_LW_PHYSICS = 1 ;  
:RA_SW_PHYSICS = 1 ;  
:SF_SFCLAY_PHYSICS = 1 ;  
:SF_SURFACE_PHYSICS = 1 ;  
:BL_PBL_PHYSICS = 1 ;  
:CU_PHYSICS = 1 ;  
:WEST-EAST_PATCH_START_UNSTAG = 1 ;  
:WEST-EAST_PATCH_END_UNSTAG = 73 ;  
:WEST-EAST_PATCH_START_STAG = 1 ;  
:WEST-EAST_PATCH_END_STAG = 74 ;
```

# ncdump

---

- reads a netCDF dataset and prints information from the dataset

**ncdump -v VAR file**

*print data of the variable VAR*

**ncdump -v Times file**

.....  
.....  
.....  
.....

**data:**

**Times =**

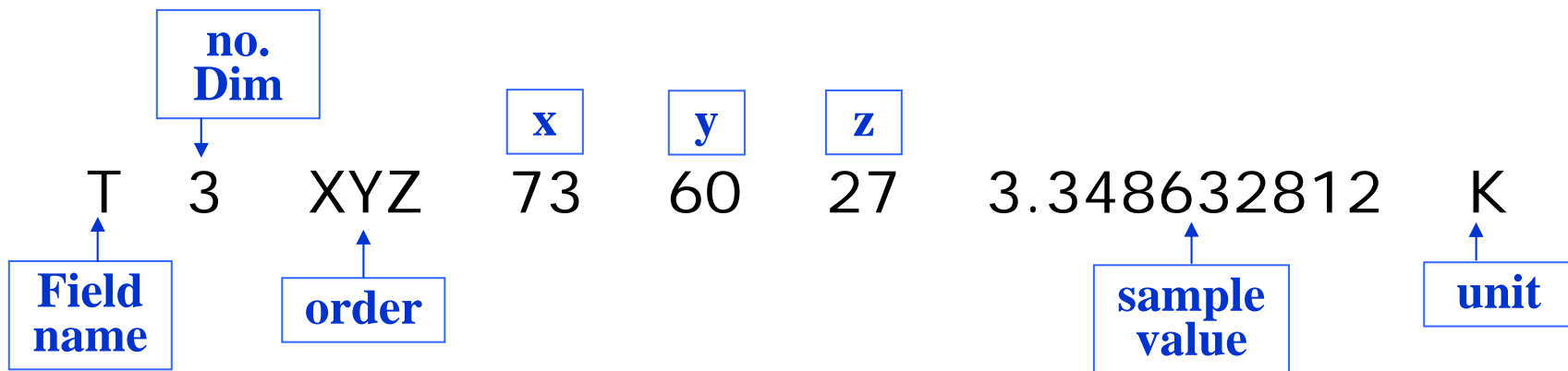
```
"2000-01-24_12:00:00",  
"2000-01-24_18:00:00",  
"2000-01-25_00:00:00",  
"2000-01-25_06:00:00" ;  
}
```



# read\_wrf\_nc

- Developed / Supported by NCAR
- FORTRAN program
  - Easy to use*
  - Easy to add your own code*

- Sample output



# read\_wrf\_nc : Options

---

- att\*** Global Attributes
  - m** Min/Max values for each field
  - M z** Min/Max values for each field  
(values for 3D fields @ **z** level)
  - s** List of available fields + a sample value
  - S x y z** List of available fields + value at point **x y z**
  - times** List of times in file
  - t t1 t2\*** Act only on **t1** to **t2** (*t2 optional*)
  - ts** Time Series (*output TIMESERIES.out*)
    - xy X Y VAR VAR ...
    - xy lat lon VAR VAR ...
  - v VAR** Basic information about field **VAR**
  - V VAR** Basic information about field **VAR**,  
and dump the full field out to the screen
  - w VAR** Write the full field out to a file **VAR.out**
- w T -t 1 : write out data for T at time 1 only**

SPECIAL option : **-EditData VAR**

# ncview

The screenshot shows the ncview software interface. The window title is "Ncview 1.93". The main display area shows a 2D contour plot with a color scale ranging from blue (low values) to red (high values). The plot shows a complex pattern with a prominent red region on the right side. The interface includes a menu bar at the top with various icons. Below the menu bar, there is a status bar that says "no variable selected". The main panel contains the following text: "Ncview 1.93a David W. Pierce 1 Feb 2006" and "\*\*\* SELECT A VARIABLE TO START \*\*\*". Below this text is a control panel with buttons for "Quit", navigation arrows, "Delay:", and "Opts". Further down are buttons for "3gauss", "Inv P", "Inv C", "Mag X1", "Linear", "Axes", "Range", "blowup", and "Print". At the bottom, there are three buttons: "(18) 1d vars", "(48) 2d vars", and "(13) 3d vars". Below these buttons is a table with columns for "Dim:", "Name:", "Min:", "Current:", "Max:", and "Units:". The table contains four rows of data:

Dim:	Name:	Min:	Current:	Max:	Units:
	Time	Min:	Current:	Max:	Units:
	bottom_top	Min:	Current:	Max:	Units:
	south_north	Min:	Current:	Max:	Units:
	west_east_st:	Min:	Current:	Max:	Units:

# other tools

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- **ncdiff**

- **ncrcat**

- Write to a new file

```
ncrcat -v RAINNC wrfout* RAINNC.nc
```

```
ncrcat -d Time,0,231 -v RAINNC wrfout*  
RAINNC.nc
```

- **ncra**

- Average and write to a new file

```
ncra -v OLR wrfout* OLR.nc
```

# GRI B data

---

- **`gribprint.exe`**
  - from “compile util” in WPS
- **`grib2ctl.pl`**
  - Create `.ctl` and `.idx` files, so one can plot GRIB files with GrADS
- **`wgrib`**
  - `wgrib -v file`
  - `wgrib -V file`
  - <http://dss.ucar.edu/docs/formats/grib/gribdoc/>

# GRI B data : wgrib

---

- s/-v*                    *short/verbose inventory*
- V*                      *diagnostic output (not inventory)*
- PDS/-PDS10*            *print PDS in hex/decimal*
- GDS/-GDS10*            *print GDS in hex/decimal*
- verf*                  *print forecast verification time*
- ncep\_opn/-ncep\_rean*    *default T62 NCEP grib table*
- 4yr*                    *print year using 4 digits*
- d [record number|all]*    *decode record number*
- p [byte position]*        *decode record at byte position*
- i*                      *decode controlled by stdin (inventory list)*
- text/-ieee/-grib/-bin*   *convert to text/ieee/grib/bin (default)*
- nh/-h*                  *output will have no headers/headers (default)*
- H*                      *output will include PDS and GDS (-bin/-ieee only)*
- append*                 *append to output file*
- o [file]*                *output file name, 'dump' is default*

# GRI B data : wgrib

---

122:3513554:D=2004123000:HGT:850  
mb:kpds=7,100,850:anl:"Geopotential height [gpm]

123:3549446:D=2004123000:TMP:850  
mb:kpds=11,100,850:anl:"Temp. [K]

125:3597364:D=2004123000:UGRD:850  
mb:kpds=33,100,850:anl:"u wind [m/s]

126:3624306:D=2004123000:VGRD:850  
mb:kpds=34,100,850:anl:"v wind [m/s]

5:152514:D=2004123000:TMP:2 m above  
gnd:kpds=11,105,2:anl:"Temp. [K]

46:1242222:D=2004123000:SPFH:2 m above  
gnd:kpds=51,105,2:anl:"Specific humidity [kg/kg]

# Vtables

GRIB1 Param	Level Type	From Level1	To Level2	REGRID Name	REGRID Units	REGRID Description
11	100	*		T	K	Temperature
33	100	*		U	m s-1	U
34	100	*		V	m s-1	V
52	100	*		RH	%	Relative Humidity
7	100	*		HGT	m	Height
11	105	2		T	K	Temperature at 2 m
52	105	2		RH	%	Relative Humidity at 2 m



# GRIB data

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- **ncl\_filedump**  
generates an ASCII representation of a supported file (netCDF, HDF, GRIB) on the standard output
- **ncl\_grib2nc**  
translates a GRIB file that NCL can read and generates a netCDF formatted file supported file (netCDF, HDF, GRIB) on the standard output
- <http://www.ncl.ucar.edu/Document/Tools>

# More tools

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- **compile util (WPS)**
  - plotfmt.exe  
*graphical interface for intermediate file*
  - plotgrids.exe  
*quick look at domains you want to create*

# Graphics

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- **ncgm2gif**

- <http://ngwww.ucar.edu/info/ncgm2gif>
- Can split into separate images
- Can create loops and movies (*not very good quality*)
- Optional libraries
  - gifmerge  
(<http://the-labs.com/GIFMerge/>)
  - gifsicle  
(<http://www.lcdf.org/~eddieltwo/gifsicle/>)

# Graphics: Magick & ctrans

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- **.pfd**

```
convert hur_track.pdf hur_track.png  
convert hur_track.pdf hur_track.gif
```

- **.ncgm**

```
ctrans -d sun hur_track.ncgm >  
hur_track.ras  
convert hur_track.ras hur_track.png
```