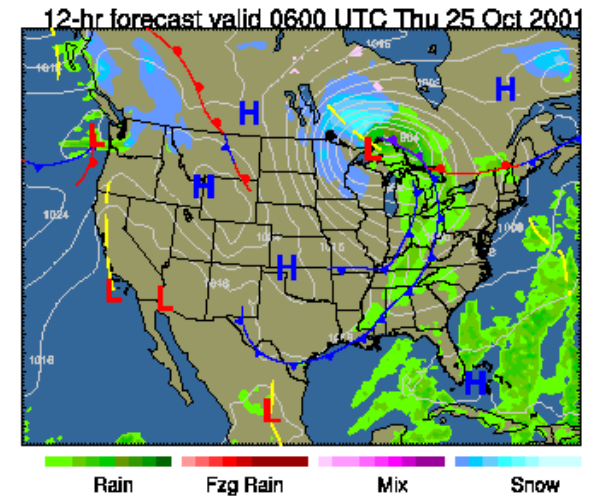
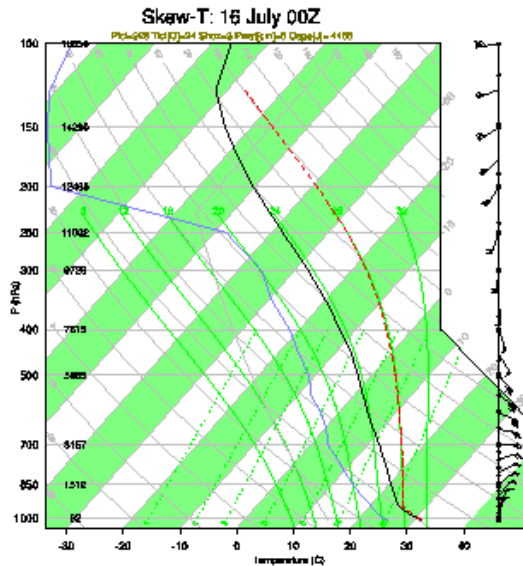
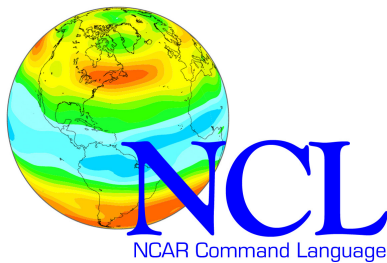


# Introduction to NCL

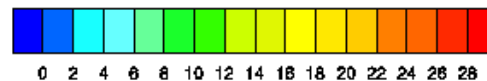
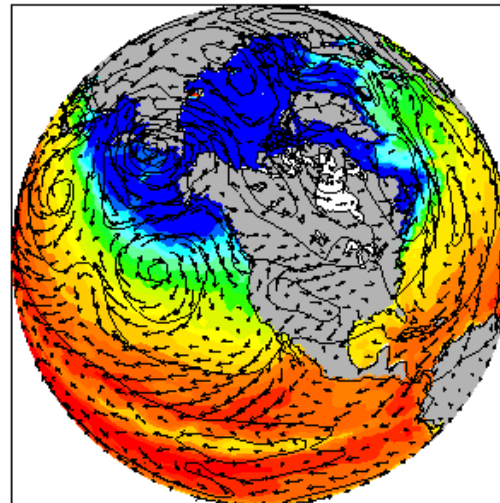
[part 2 of 3]

Dennis Shea

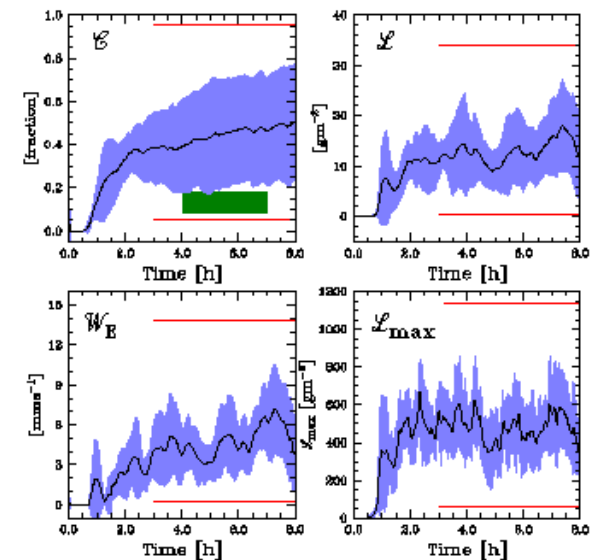


## Orthographic Projection

PSL (hPa) SST (C) Wind (m/s)



## Simulations of Tradewind Cumuli Ensemble Means



# Introduction: Key Points

## Printing & Debugging

- Still the best for **debugging**; (NCL **no** built-in debugger)

## Documentation

- Online; Manuals; Numerous downloadable examples

## Support

- Email; Large user base which can offer some assistance

# printing

- **printVarSummary**
  - gives gross overview of a variable
- **print**
  - includes same info as **printVarSummary**
  - prints each value
- **write\_matrix**
  - print to standard out or a file
  - format control of numerical output
  - can write to file also

# printVarSummary

- **Print overview of variable contents**
  - type
  - dimension information
  - coordinate information (if present)
  - attributes (if present)
- **printVarSummary** (u)

Variable: u

**Type:** double

Total Size: 1179648 bytes

147456 values

**Number of Dimensions:** 4

Dimensions / Sizes: [time | 1] x [lev | 18] x [lat | 64] x [lon | 128]

**Coordinates:**

time: [4046..4046]

lev: [4.809 .. 992.5282]

lat: [-87.86379 .. 87.86379]

lon: [ 0. 0 .. 357.1875]

**Number of Attributes:** 2

long\_name: zonal wind component

units: m/s

# print (1 of 3)

- **Prints out all variable information including**
  - All meta data, values
  - T(lat,lon): `print (T)`

```
Variable: T
Type: float
Total Size: 32768 bytes
           8192 values
Number of Dimensions: 2
           Dimensions / Sizes: [lat | 64] x [lon | 128]
Coordinates:
           lat: [-87.86379 .. 87.86379]
           lon: [ 0. 0 .. 357.1875]
Number of Attributes: 2
           long_name: Temperature
           units:      degC
(0,0) -31.7
(0,1) -31.4
(0,2) -32.3
(0,3) -33.4
(0,4) -31.3 etc. [entire T array will be printed]
```

## print (2 of 3)

- **can be used to print a subset of array**
  - meta data, values
  - T(lat,lon): `print( T(:,103) )` or `print( T(:,{110}) )`

Variable: T (subsection)

Type: float

Total Size: 256 bytes

64 values

**Number of Dimensions: 1**

Dimensions / Sizes: [lat | 64]

Coordinates:

lat: [-87.86379 .. 87.86379]

**Number of Attributes: 3**

long\_name: Temperature

units: degC

**lon: 109.6875 [ added ]**

(0) -40.7

(1) -33.0

(2) -25.1

(3) -20.0

(4) -15.3 etc.

# print (3 of 3)

- **print** with **embedded strings**

- no meta data
- **print** ( "T: min="+**min**(T)+" max="+**max**(T) )

```
(0) T: min=-53.8125 max=25.9736
```

- **sprintf** and **sprinti** **provide formatting**

- often used in graphic labels
- **print** ( "min(T) = "+ **sprintf**("%5.2f ", **min**(T)) )

```
(0) min(T) = -53.81
```

- **sprinti** can **left fill with zeros** (ex: let n=3)

- fnam = "h" + **sprinti** ("%0.5i", n) + ".nc"
- **print**("file name = "+fnam)

```
(0) file name = h00003.nc
```

# write\_matrix(x[\*][\*], fmt, opt)

- **pretty-print 2D array (table) to standard out**
  - integer, float, double
  - user format control (fmt)
  - T(N,M), N=7, M=5: `write_matrix (T, “5f7.2”, False)`

4.35	4.39	0.27	-3.35	-6.90
4.36	4.66	3.77	-1.66	4.06
9.73	-5.84	0.89	8.46	10.39
4.91	4.59	-3.09	7.55	4.56
17	3.68	5.08	0.14	-5.63
-0.63	-4.12	-2.51	1.76	-1.43
-4.29	0.07	5.85	0.87	8.65

- **can also create an ASCII (text) file**

```
opt      = True
opt@fout = “foo.ascii”      ; file name
write_matrix (T, “5f7.2”, opt)
```



# Debugging, Error Messages, Help

- NCL does **not** have a built-in debugger
  - use **print** / **printVarSummary** ; examine output!
    - `nmsg = num( ismissing(x) )` ; count # `_FillValue`
    - `print("x: min="+min(x) +" max="+max(x) )`

- Error messages; **Warning** or **Fatal**
  - Look at message; often describes problem/issue  
eg: **A = B**  
**Fatal: *left and right side have different sizes***  
  
**printVarSummary(A)** ; look at array size  
**printVarSummary(B)**  
**A = B** ; **fatal** statement

# NCL Documentation

- **Documentation & Examples**
  - <http://www.ncl.ucar.edu/>
    - **Functions**: alphabetical, categorical
    - **Examples**: many downloadable scripts/figures
  - **Downloadable** reference manuals [pdf], FAQ
    - <http://www.ncl.ucar.edu/Document/Manuals/>
    - [Mini-Language.pdf](#) , Reference Manual, Graphics Tutorial

# NCL Support

- **Support:** [ncl-talk@ucar.edu](mailto:ncl-talk@ucar.edu)
  - **required** to subscribe
  - [http://www.ncl.ucar.edu/Support/email\\_lists.shtml](http://www.ncl.ucar.edu/Support/email_lists.shtml)
  - **two Modes:** (a) email-by-email, (b) digest
  - 2013: 98% of posted questions answered
- **Posting Guidelines**
  - include enough info to facilitate answering
  - do **\*not\*** attach large files: **ftp, www, dropbox**
  - do **\*not\*** 'dump' a messy script to ncl-talk
    - Nobody is paid to answer ncl-talk postings
    - **Our time is valuable too!**