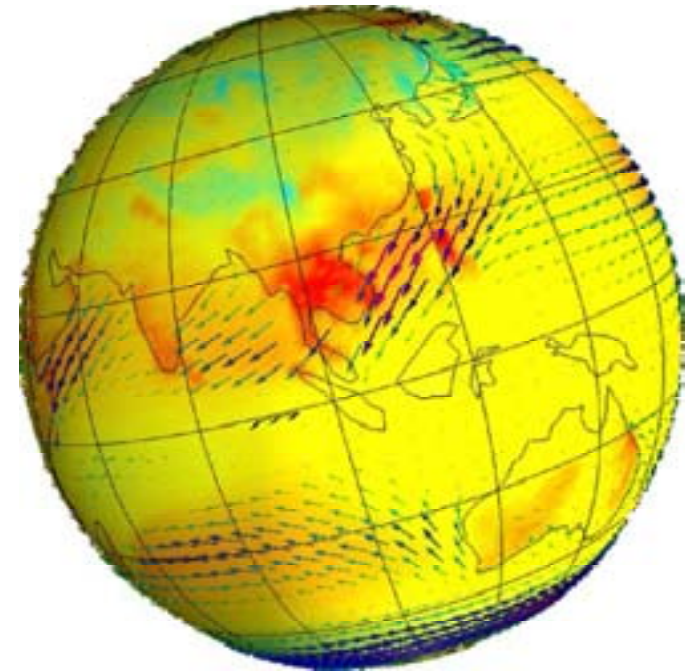# Visualizing NetCDF Data with NCVTK

A GFDL Hands-on Workshop

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Workshop Material

1. These slides:

    http://www.gfdl.noaa.gov/~rsz/ncvtkw

2. Setup environment to use ncvtk
    (for Linux workstations & Altix only):

    qlogin –pe ic.inter 1 *(optional)*

    source ~rsz/pub/ncvtk.cshrc

A Linux workstation with graphics hardware is recommended, however, use ic1 if unavailable (like today!).

Table of Contents

Preliminaries

NCVTK Overview

- Interactive tool to explore structured planetary data on a sphere.

- Comparable in performance with dedicated commercial packages such as IRIS Explorer and AVS/Express.

- Requires very small learning curve.

- Locally maintained at GFDL to ensure alignment with lab's goals.

What it isn't:

- General analysis package like MATLAB.

- File editor like the NetCDF Operators.

Assumptions about Audience

- Have access to GFDL's interactive Altix node (ic1) or a Linux workstation (preferred).

- Familiar with tools (NetCDF Operators) for subsampling, averaging, arithmetic and attribute editing.

- Aware of NetCDF conventions, such as Climate & Forecast 1.0 (CF) and CDC.

Today's Goals

We'll learn how to:

- visualize & probe structured data

- use custom colormaps

- export an image sequence quickly

- generate scripts to reproduce rich visualizations
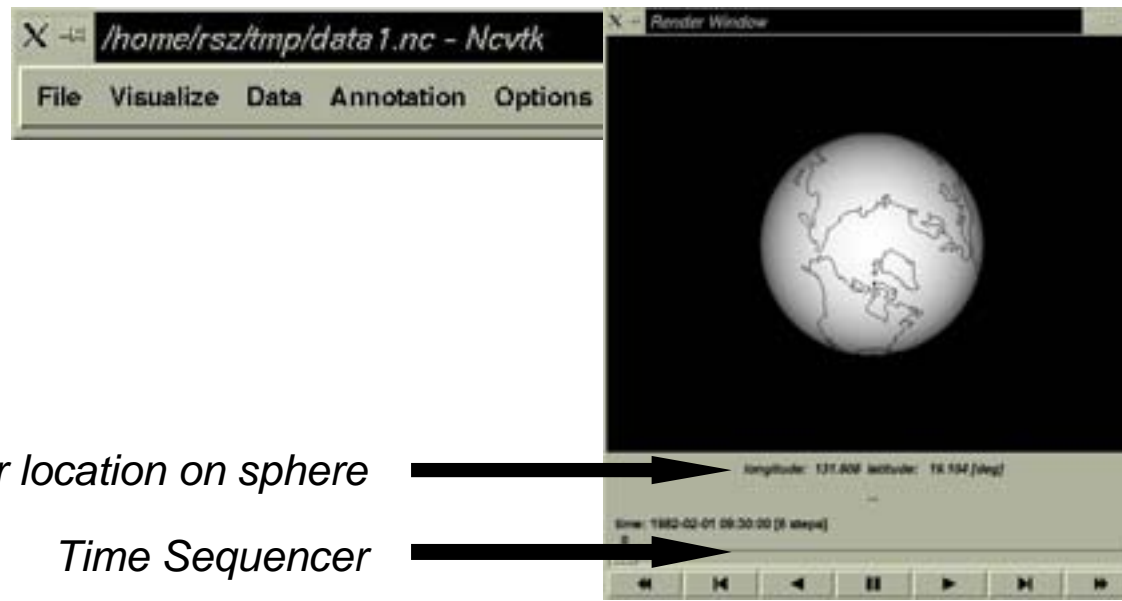
- explore additional features

Basics

Startup

Start with a sample dataset:

> ncvtk –f ~rsz/tmp/data1.nc &

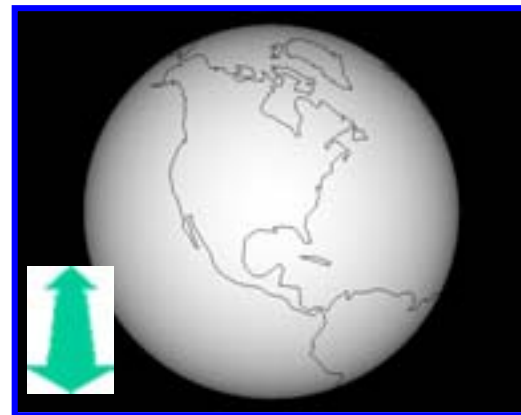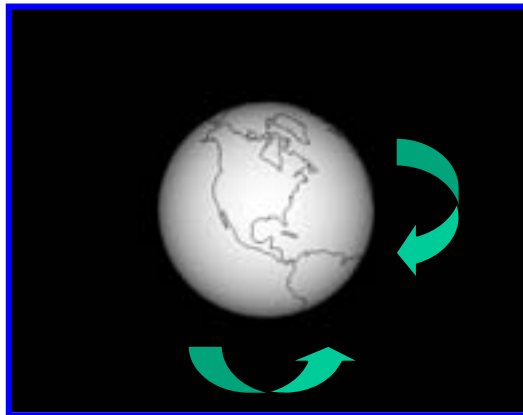The minimal ncvtk GUI will appear with current filename and time sequencer:

Cursor location on sphere

Time Sequencer

Interactivity with the Sphere
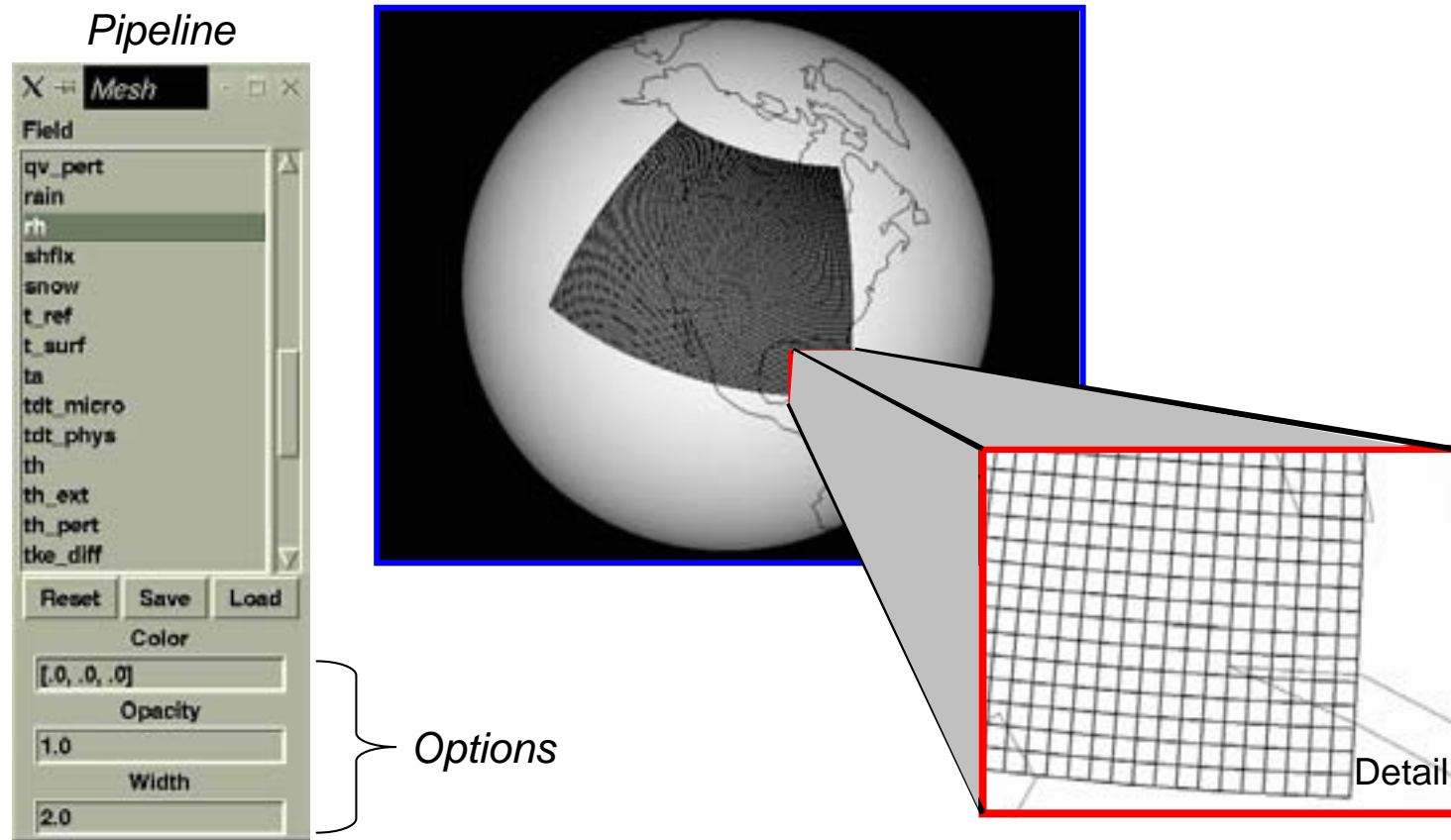
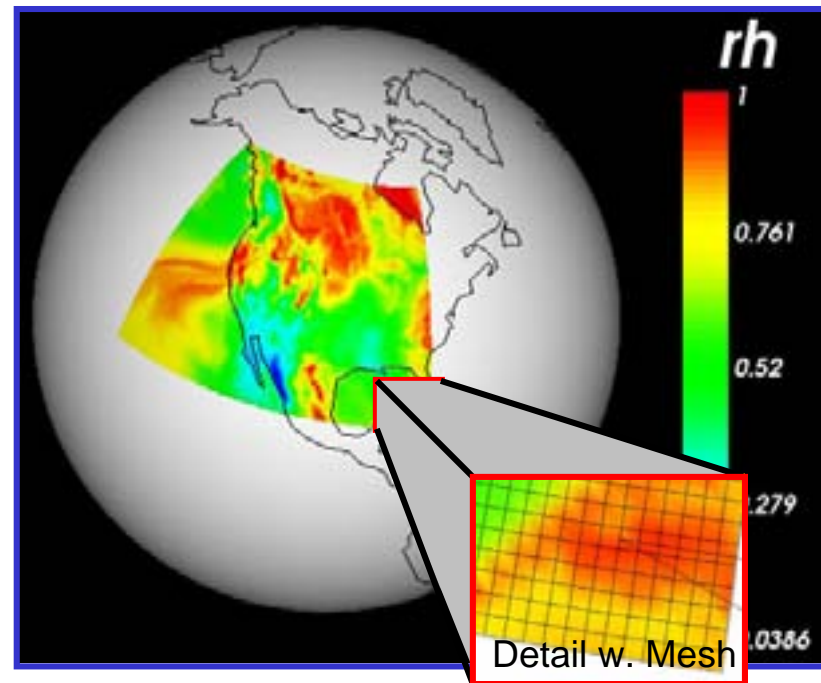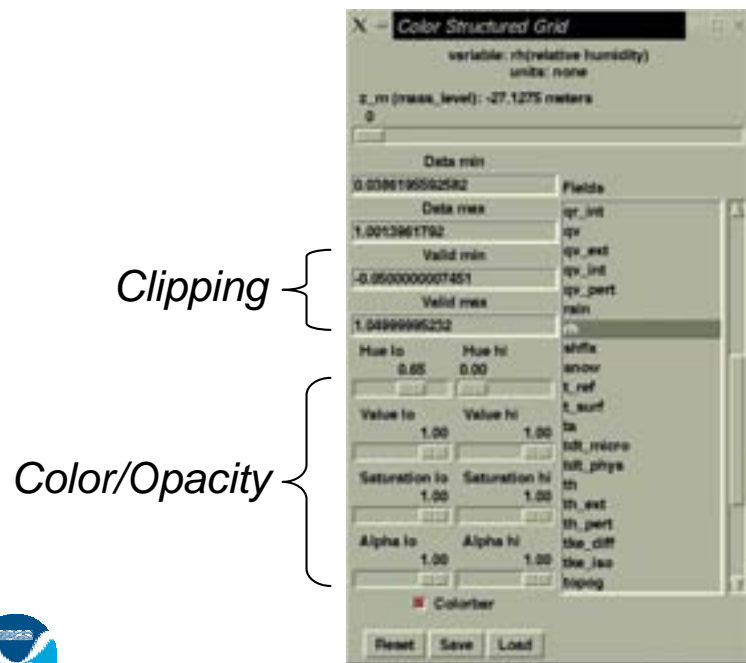With the mouse cursor in the Render Window:

Rotate

Zoom

Visualize - Mesh

- *Connects neighboring field nodes with lines.*
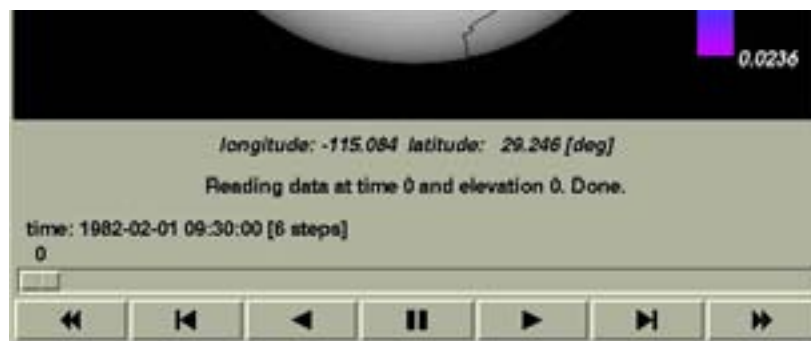

Pipeline

Options

Detail

Visualize - Color

- *Creates color-interpolated surface.*

- *Interpolates color between nodes, rather than assigning per cell (next version?).*
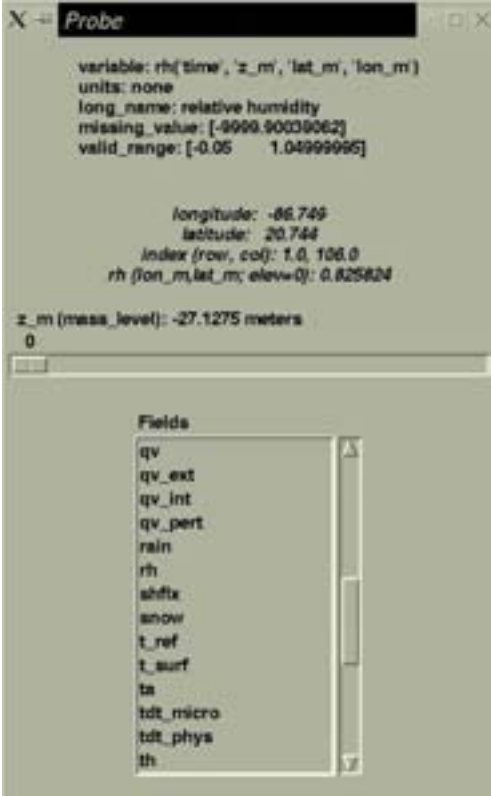
- *Uses an interactive color/opacity map.*

Clipping

Color/Opacity

Detail w. Mesh

Animation Preview

Time sequencer with looping control and slider (try it with Color S. Grid).

Probing - Point

- *Probe with mouse cursor to find field's node value and array location in the elevation slice.*

Annotation

Text

- *Add simple labels (no Greek symbol support).*
- *Centering, size, color and position definable.*

Time

- *Labels scene with current time selection (useful for exporting image sequence).*

Exporting - Images

File | Save scene as...

- *Exports the current scene as a single image (PNG or PS).*

File | Record time frames...

- *Exports the current scene for every time step.*
- *Animate with commands such as* animate, whirlgif, mkmpeg*. For details, see*

http://www.gfdl.noaa.gov/products/vis/animation

Sessions

File | Save script as...

- *Save current session as a Python script for customization or automation.*

- *Restored by directly running script with python.*
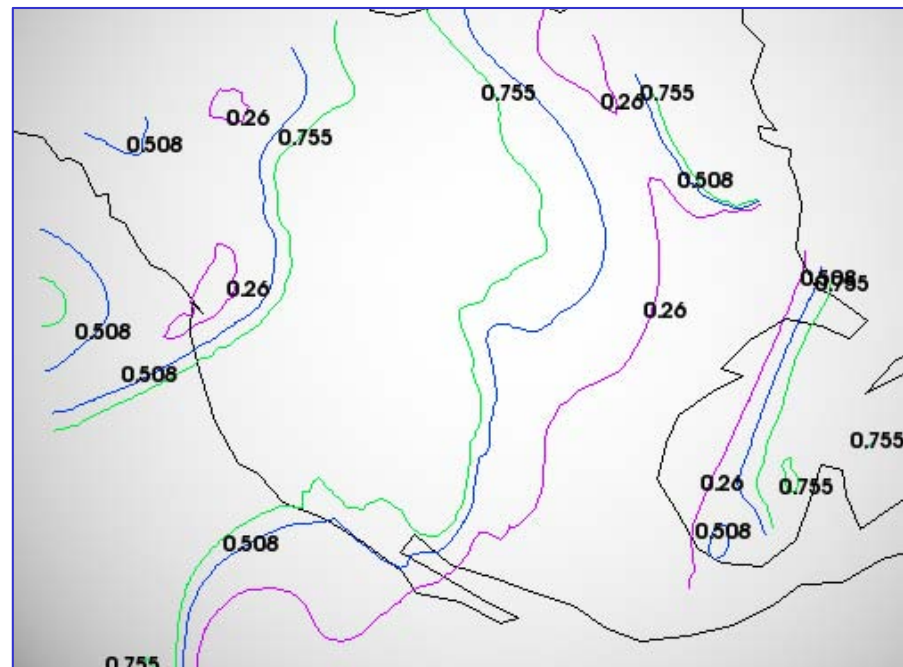
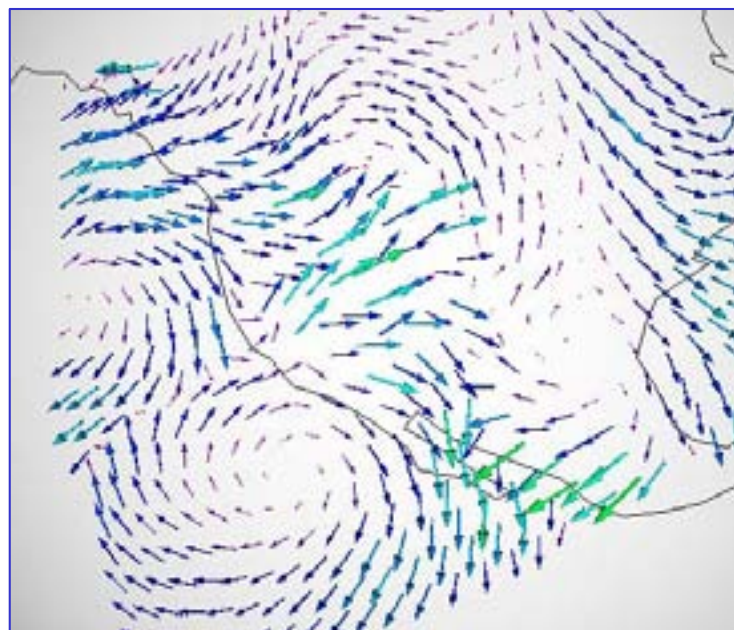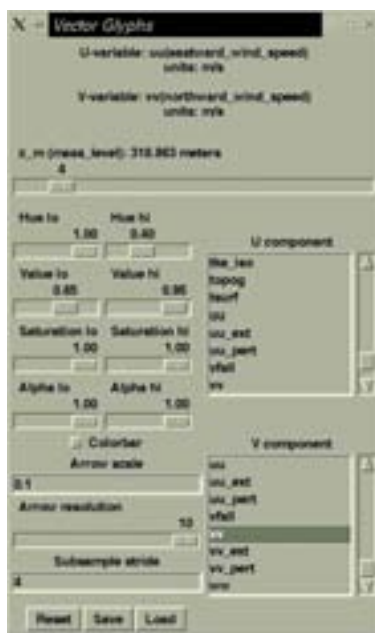> python mysession.py

Additional Features

Visualize - Contour

- *Uses colored lines.*
- *Auto-computes uniform levels or accepts custom values.*
- *Optional labels per line (they're always upright!)*

Visualize - Vector Glyph

- *Colored and scalable arrow glyphs for 1 or 2 component fields (C & D grids supported).*
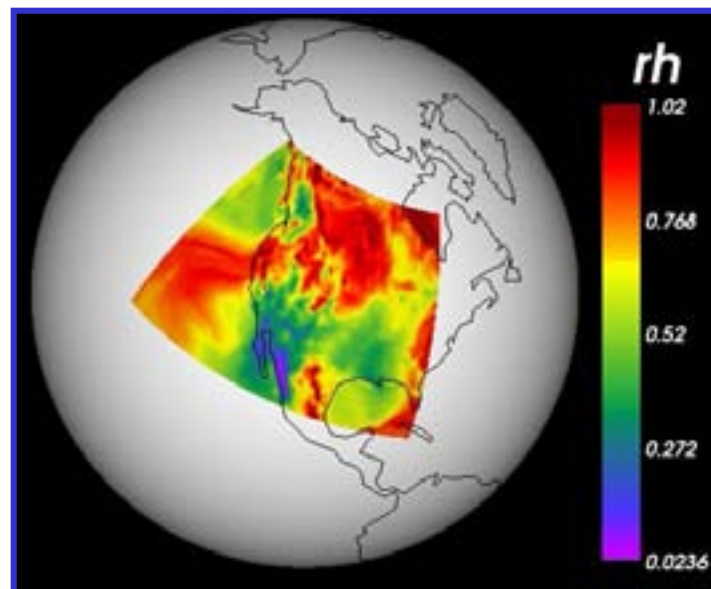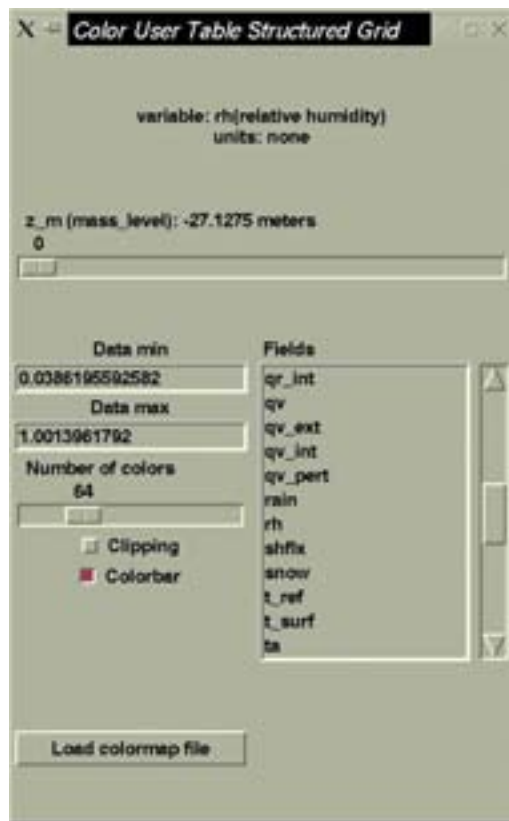
- *Use strides to prevent clutter.*

Visualize - Color (User Table)

- *Uses custom colormap files.*

File example, in percentages:

Scalar Range	Red	Green	Blue	Opacity
0.0	80.0	0.0	100.0	100.0
10.0	30.0	20.0	100.0	100.0
33.0	0.0	60.0	30.0	100.0
66.0	100.0	100.0	0.0	100.0
90.0	100.0	0.0	0.0	100.0
100.0	60.0	0.0	0.0	100.0

Options To Explore

Additional features found in the Options menu.

Background
Color

View
Lon, Lat, Zoom
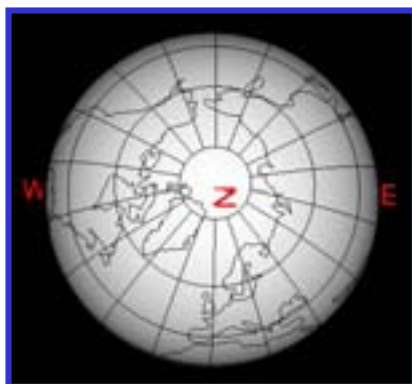
Grid
Parallels & Meridians

Sun
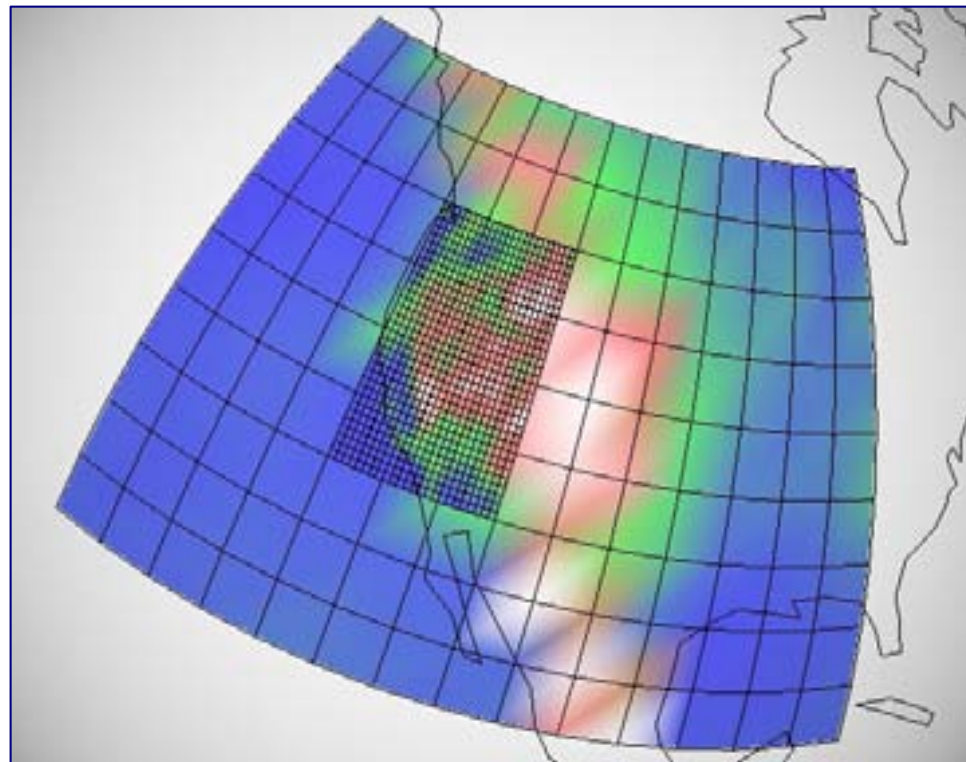*Positioned by Time*

Some Possibilities

Multiple Grids

Any number of grids can be visualized from the same file.

Two pairs of Color-Structured-Grid and Mesh

Curvilinear Grids
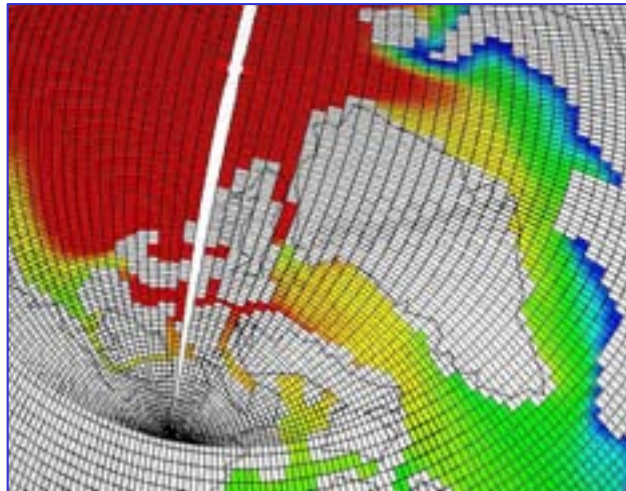
NetCDF variable attributes must conform to CF 1.0 conventions when using 2D coordinate grids.

If not, just do:

ncatted -a coordinates,var,a,c,'latgrid longrid'

CM2 tripolar example:
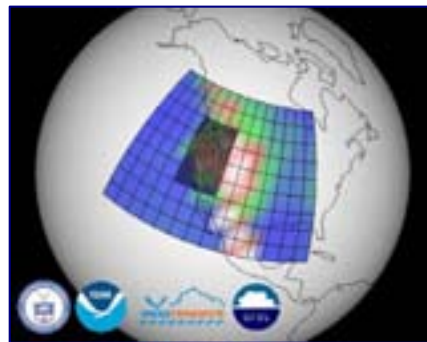
ncatted -a coordinates,ext,a,c,'geolat geolon'

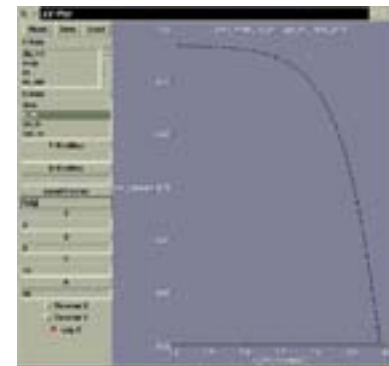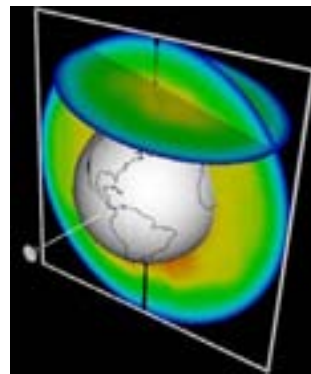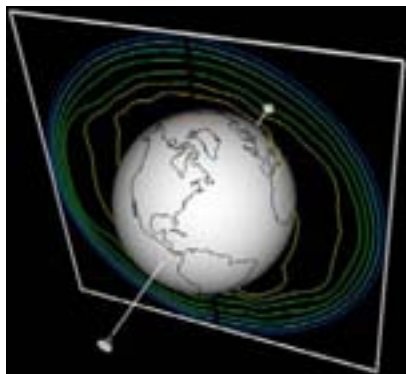*Clipped Color-Structured-Grid and Mesh*

Experimental & Candidate Pipelines

Experimental (unstable) pipelines are available from the menu,
such as Image Annotation (for logo overlays).

The future of ncvtk is driven by its users, so candidate pipelines
may be proposed at anytime.

Feedback

Follow these links for:

Project Homepage

Help

Bugs

Feature requests

Or speak with the authors at GFDL:

Jared Cohen (117B)

Alex Pletzer (129A)

Remik Ziemlinski (104A)