

# Expanding GeoCAT's Visualization Capabilities

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## Background

- In 2019, NCAR announced the transition from NCL to Python
  - ◆ GeoCAT team works to make this transition as smooth as possible
- Three components of GeoCAT:
  - ◆ GeoCAT-Comp recreates NCL computational routines
  - ◆ GeoCAT-Viz is an aid for creating NCL-style plots
  - ◆ GeoCAT-Examples is a gallery of recreated NCL example plots in Python



GeoCAT-Comp Github



GeoCAT-Viz documentation



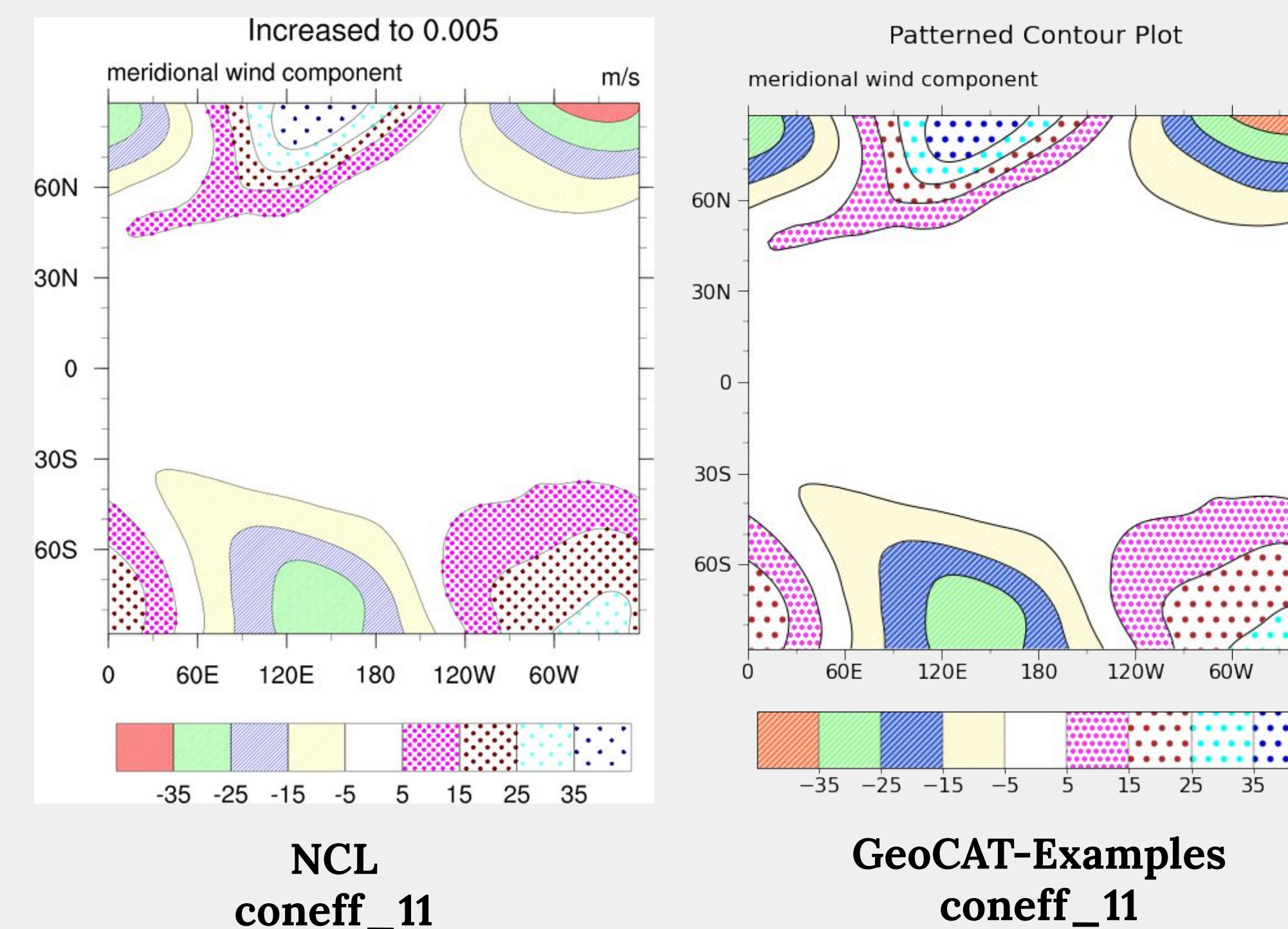
GeoCAT-Examples Gallery

## Issues with NCL to Python Transition

Python has some style differences, but creates publication quality plots just as well as NCL.

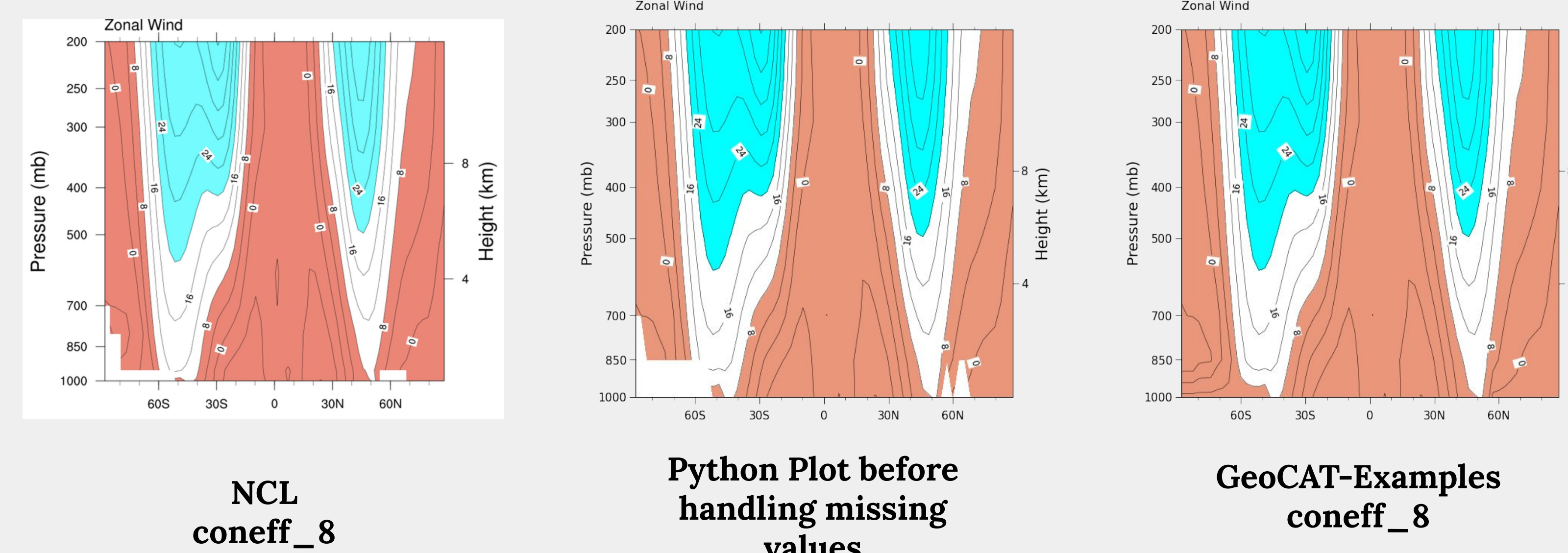
### Hatch-marks in Python vs NCL

- In Python, hatch mark density cannot be fine-tuned as much as in NCL
- Hatch colors for the contour plot and the colorbar must be set separately in Python



### Interpolation in Python vs NCL

NCL interpolates values differently than Python, which affects how data is displayed.



### Using GeoCAT-Viz Contour class

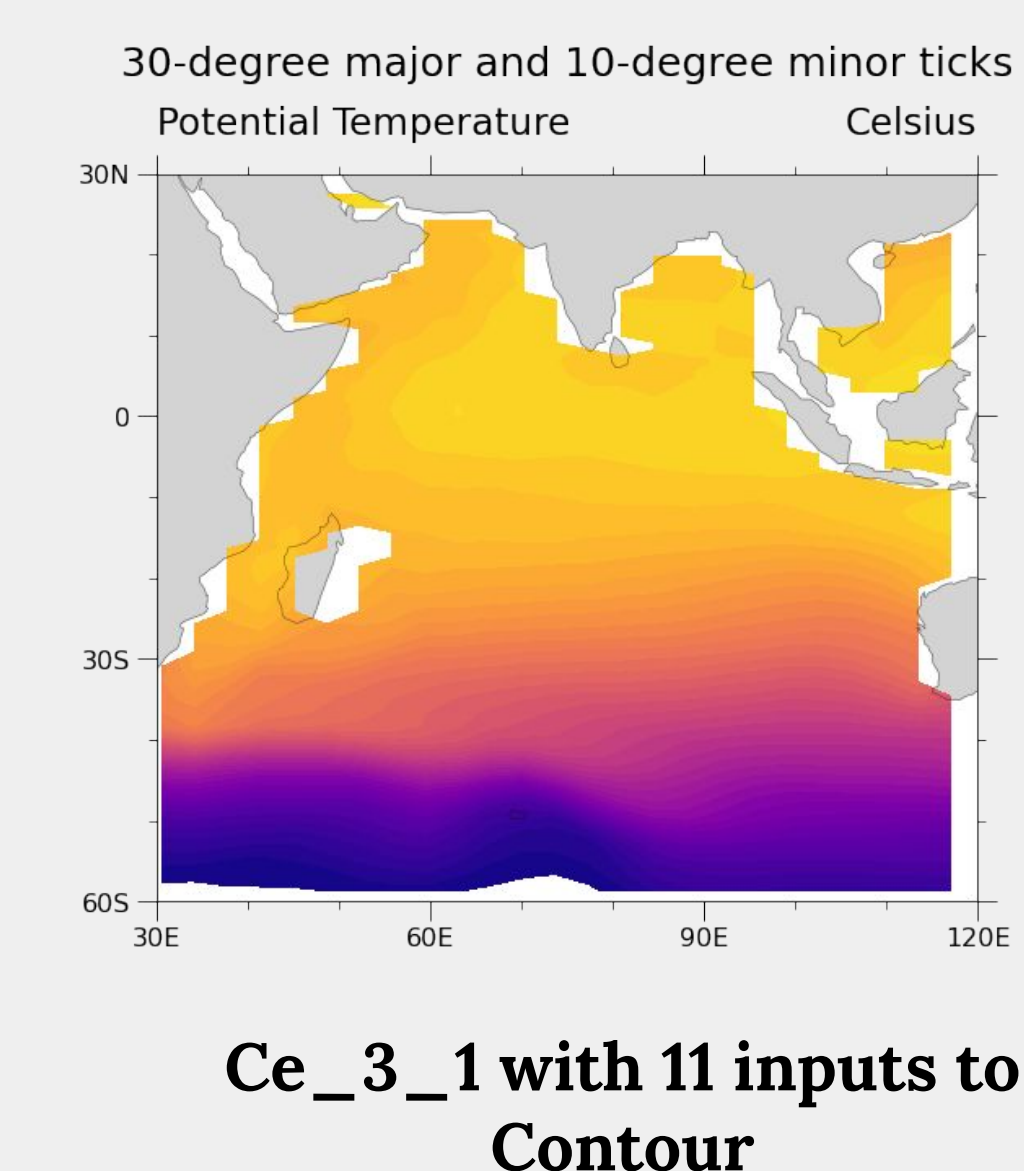
The GeoCAT-Viz Contour class is an experimental tool for creating NCL-style contour plots.

#### Pros

- Create a finished contour plot with one function call

#### Cons

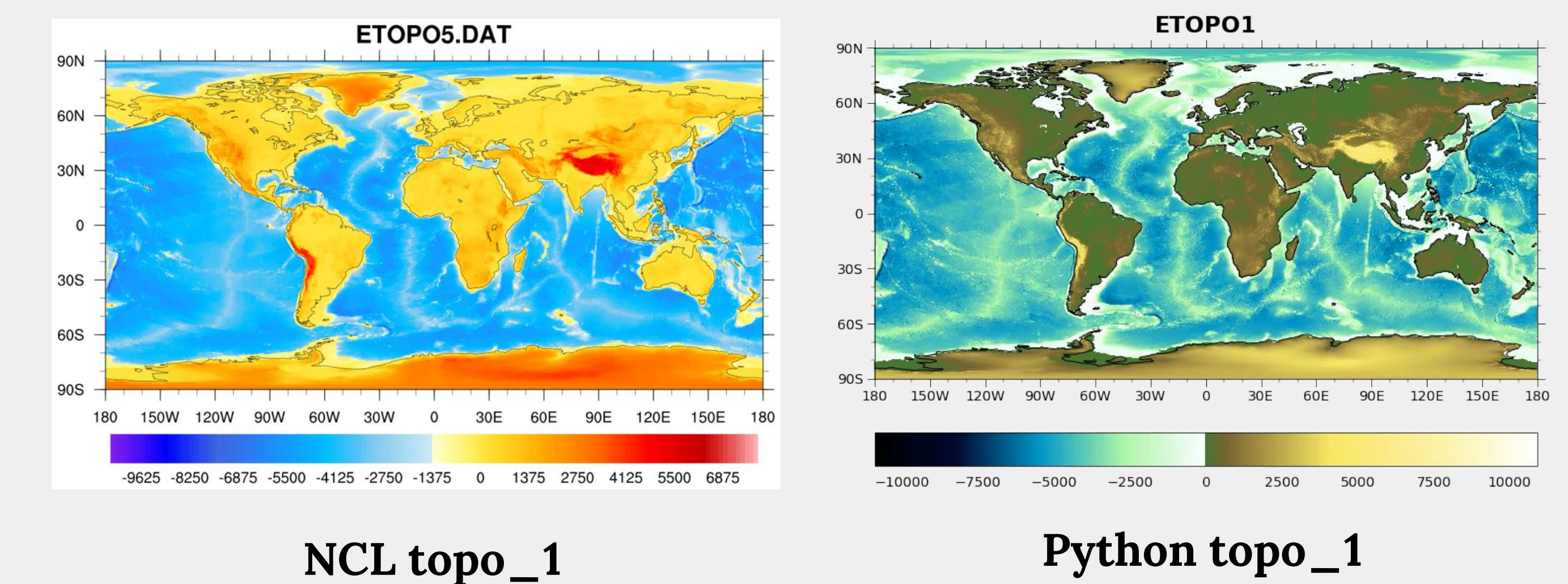
- Hard to fully customize plot
- Lots of inputs



## Creating Topographic Maps

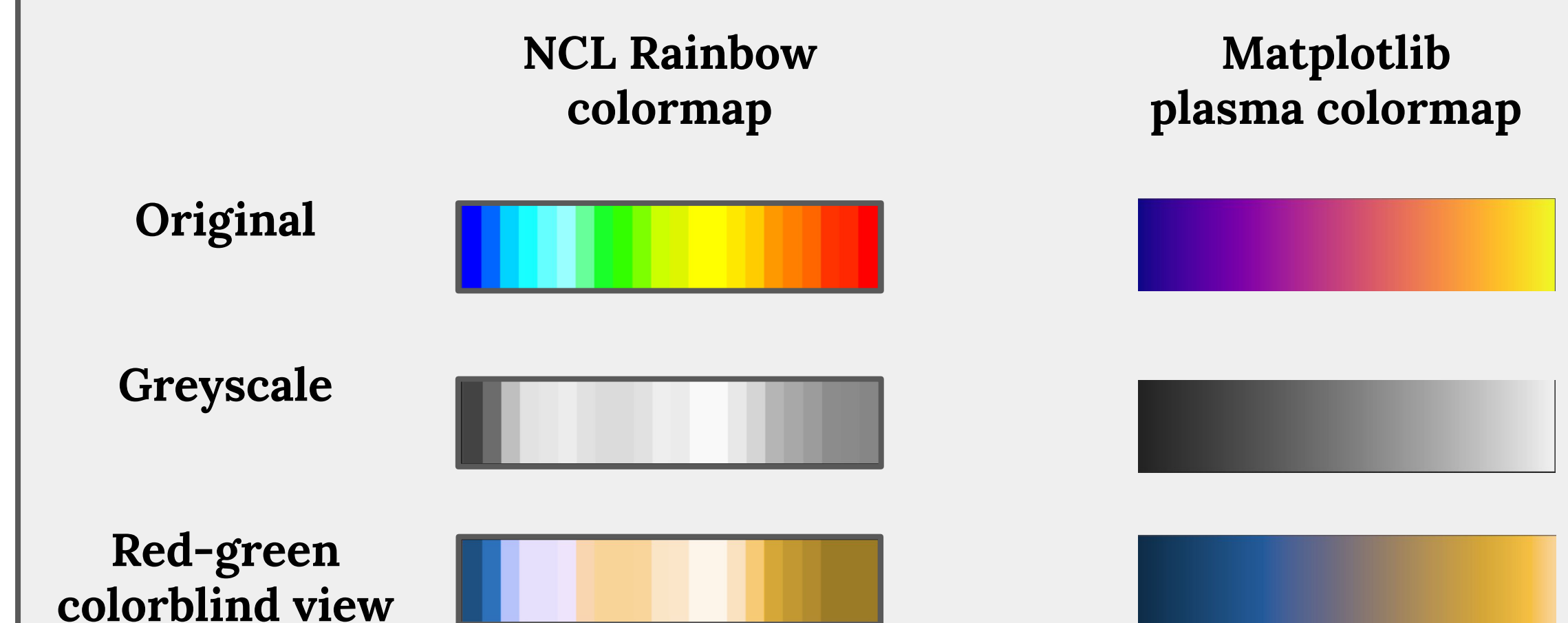
- Difficulties:
  - NCL uses old and deprecated dataset
  - Working with large dataset
    - Download time
    - Plotting time
- Solutions
  - Use ETOPO1 global elevation dataset
    - Higher resolution
    - Gridded format easier to work with
  - Use imshow() to speed up plotting

Name	Last modified	Size
Parent Directory	-	-
ETOPOS.DAT	2004-02-06 14:46	18M
ETOPOS.DOS	2005-05-27 16:48	18M
ETOPOS.txt	2005-06-03 15:06	5.3K
settopo.exe	2004-02-06 14:46	42K



## Improving Colormap Usage

NCL's rainbow colormap is not accessible to people with visual impairments, and is not ideal for black and white versions of the plot. Newer GeoCAT-examples utilize Matplotlib's perceptually uniform sequential colormaps to avoid these issues.



Learn more about colormaps:  
<https://matplotlib.org/stable/tutorials/colors/colormaps.html>

## Why Python?

- Popular in the scientific community
- Good documentation and support for beginners
- Free and open-source
- Packages such as matplotlib, xarray, and cartopy make it easy to handle and visualize data



## Future Work

- Develop computational routines for interpolation in GeoCAT-Comp
- Continue refining GeoCAT-Viz wrapper functions
- Add remaining NCL examples to the examples gallery