Expanding and Strengthening the Transition from NCL to Python Visualizations

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GeoCAT-Examples
GeoCAT-Viz
GeoCAT-Examples and GeoCAT-Examples support the transition of scientific visualizations from NCL to Python ecosystem.

Transition from NCL to Python Visualizations

Why Convert from NCL to Python?
- Python is widely used by the scientific community, allowing for community input
- Packages like Matplotlib and Cartopy can replicate NCL functionalities almost exactly and allow even more use cases and functionality
- Python is relatively easy to understand, even for novice programmers

NCL has stylistic quirks that are not automatically set in Matplotlib
- Left and right sublabels are not built-in features in Matplotlib; instead, they must be manually placed and sized. Since this is common in many figures, a utility function was included in GeoCAT-Viz to easily add them.
- Minor ticks, usually about two for every major tick, are a common feature in NCL plots. Again, since this is a common feature in NCL plots that is not embedded in Matplotlib plots, a utility function was made in GeoCAT-Viz.

Repetitive use of utility functions to recreate NCL plots is inconvenient and creates long scripts

GeoCAT Aiding the Transition

GeoCAT-Examples
A Collection of Scripts for Reproducing NCL Plots
- Contains a large variety of examples
- Styles, formatting, etc. can be copied into other scripts
- Provides a starting point for replicating NCL plots

GeoCAT-Viz
A Collection of Functions to Create NCL-Like Visualizations in Python
- Contains a library of utility functions
- Wraps around Matplotlib for alignment
- Wraps around cartopy for alignment

NCL Plot and Contour Classes
- Contains basic style and functionalities that are essential across all plots
- Reproduces NCL styles, such as contour line labels

GeoCAT-Comp function interp_hybrid_to_pressure (esccr in NCL) interpolates dataset to user-specified pressure levels

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Examples of Scientific Visualization with Python Ecosystem

GeoCAT-Examples Recreated Plot
GeoCAT-Viz Recreated Plot

Transition to NCL Plot and Contour Classes
- When replicating plots in Python, it was apparent that basic utility functions were needed to reduce the amount of replicated code between each of the examples
- However, as more complex examples were made, multiple utility functions were needed for each example
- On average, plots took about 200 lines of code to recreate about 30 lines of NCL.

Utility functions in GeoCAT-Viz are called to manipulate tick marks, formats, font sizes, tick label formats, etc.

Figure readability and functionality remains when utilizing the Contour class with less code

Adding more inputs dramatically increases the similarity of the plot without significant additions to code length

Matplotlib functionalities like GridSpec, Subplot, Inset_axes, axes location are used to configure the positioning of multiple plotting components

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