Community Tools for the Analysis and Visualization of Geoscientific Data
Mary Haley, NCAR

We present a variety of open-source and parallel tools for the analysis and visualization of geoscientific data. The NCAR Command Language (NCL) is scripting language that provides 1) robust file input and output for a number of commonly used scientific data formats, including NetCDF, HDF/HDF-EOS, shapefiles, and GRIB 1/2, 2) hundreds of computational functions, many of which are specific to climate sciences, and 3) publication quality and custom-tailored 2D visualizations. PyNIO and PyNGL are Python modules that provide the same file I/O and visualization capabilities as NCL, enabling NCL's software components to be exposed to a wider and more mainstream user base. ParVis is a 3-year joint project headed by Argonne National Laboratory in conjunction with other DOE labs and NCAR, to develop a suite of parallel tools for handling ultra-large climate datasets. ParVis consists of two main components: ParGal, a parallelized computational library that will vastly improve the speed of climate data analysis, and ParNCL, a parallelized version of NCL.

These tools are well supported and under continuous development, driven by a large and active international community. The large volume of data currently produced by climate models is overwhelming the current, decades-old visualization workflow, requiring the application of parallel methods and tools to address these issues. This work is being done with a high level of focus on the needs of the Community Earth System Model community.

These tools play an essential role in the post-processing infrastructure of a growing number of high-volume providers of atmospheric, ocean, and climate data. They are used by thousands of users from over 140 countries at foreign and domestic universities, national labs, supercomputing centers, government and military sites, weather forecast offices, research companies, and commercial entities. The prominent users include climate modelers, but other disciplines are also represented including atmospheric research, weather forecasting, microbiology, hydrology, physics, astronomy, and social sciences.

We will present an overview of these tools, show representative code samples, display a variety of scientific visualizations, and discuss future plans.