



Parallel Analysis Tools for Ultra-Large Climate Data Sets

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While climate models have used parallelism for several years, the post-processing tools are still mostly single-threaded applications and many are closed source. These tools are becoming a bottleneck in the production of new climate knowledge when they confront terabyte-sized output from high-resolution climate models. The ParVis project is using and creating Free and Open Source tools that bring data and task parallelism to climate model analysis to enable analysis of large climate data sets. ParVis is using the Swift task-parallel language to implement a diagnostic suite that generates over 600 plots of atmospheric quantities. ParVis has also created a Parallel Gridded Analysis Library (ParGAL) which implements many common climate analysis operations in a data-parallel fashion using the Message Passing Interface. ParGAL has in turn been built on sophisticated packages for describing grids in parallel (the Mesh Oriented database (MOAB), performing vector operations on arbitrary grids (Intrepid) and reading data in parallel (PnetCDF). ParGAL is being used to implement a parallel version of the NCAR Command Language (NCL) called ParNCL. ParNCL/ParCAL not only speeds up analysis of large datasets but also allows operations to be performed on native grids, eliminating the need to transform data to latitude-longitude grids. All of the tools ParVis is creating are available as free and open source software.