

PERC Interactions with CCSM

A typical example of benefits from PERC collaborations with other SciDAC projects is some work done in conjunction with the “Collaborative Design and Development of the Community Climate System Model for Terascale Computers” project, often abbreviated “CCSM.” Their website is: <http://www.osti.gov/scidac/ber/projects/malone.html>.

The PERC collaboration with this project has focused on benchmarking and performance analysis. PERC researchers have worked with the CCSM researchers to package and release benchmark versions of the Community Atmospheric Model (CAM) and the Parallel Ocean Program (POP), the atmosphere and ocean components of CCSM. These codes were then used as benchmark codes for subsequent analysis.

By using tools developed within PERC and elsewhere, PERC researchers were able to collect detailed data on several performance aspects of the code. This data enabled CCSM researchers to understand the performance behavior of the CAM code, and led to a prioritization of optimization efforts within the project. Motivated by these analyses, several changes were made to the CAM code: (1) load balancing of parallel decompositions and (2) addition of OpenMP threading; and (3) improved interprocessor communication algorithms in the dynamics and the land submodels.

Together, these changes dramatically improved the code’s scalability, as can be seen in Figure 1 (next page). Note for example that the overall performance of this code at 64 processors was doubled. Even more importantly, this code can now be run on up to 256 processors without severe loss of scaling.

