

OOKAMI PROJECT APPLICATION

Date: 10/17/2022

Project Title: Porting and Tuning of System for Atmospheric Modeling with Multigrid Acceleration

Usage:

Testbed

Production

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Usage Description:

The project will aim to port the global System for Atmospheric Modeling (gSAM) on Ookami and fine-tune its performance for A64FX processors. gSAM is a cloud-resolving model written in Fortran 90 and MPI. It has been applied to simulate the evolution of clouds over the whole globe with resolution of a few kilometers, and also to various smaller convection problems, and has been used by scientists in their research at a wide variety of institutions. gSAM uses a geometric multigrid solver at each step. The special focus of this project will be on the performance optimization of the multigrid Poisson/Helmholts solver and improving its robustness and efficiency for nonuniform grids.

Computational Resources:

Total node hours per year: ~1000 node hours

Size (nodes) and duration (hours) for a typical batch job: 10 nodes for 1 hour

Disk space (home, project, scratch):

- Home: 20GB for analysis, visualization, and batch scripts
- Project: 5 TB for important results

- Scratch: 20 TB for the code and output data

Personnel Resources (assistance in porting/tuning, or training for your users):

Chengpeng Sun will work on the porting and tuning. Online training resources should be sufficient.

Required software:

- MPI
- Fortran compilers
- LAPACK
- NetCDF

If your research is supported by US federal agencies:

Agency: National Science Foundation

Grant number(s): AGS 2218827

Production projects:

Production projects should provide an additional 1-2 pages of documentation about how
(a) the code has been tuned to perform well on A64FX (ideally including benchmark data comparing performance with other architectures such as x86 or GPUs)

(b) it can make effective use of the key A64FX architectural features (notably SVE, the high-bandwidth memory, and NUMA characteristics)

(c) it can accomplish the scientific objectives within the available 32 Gbyte memory per node