OOKAMI PROJECT APPLICATION

Date: 2/22/2022

Project Title: *Pygoscelis* Penguin Response to Potential Prey Retention along the West Antarctic Peninsula

Usage:

☒ Testbed

☐ Production

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Usage Description:
The goal of this project is to determine if *Pygoscelis* penguin diets along the West Antarctic Peninsula reflect areas of high retention and use this relationship to determine if retention and other physical parameters can be used to predict where new penguin colonies may form. To measure retention and other physical parameters within penguin foraging regions, we will utilize a version of the Regional Ocean Modeling System (ROMS) developed for the West Antarctic Peninsula by Old Dominion University. Simulated particles will be seeded within the model field adjacent to penguin colonies to calculate the desired metrics. ROMS is a complex oceanographic model that requires large computing clusters, like Ookami, to run, therefore, access to Ookami is critical to the success of this project. Once the code has been ported to and optimized for Ookami, we anticipate that this project will transition from testbed to production.

Computational Resources:

Total node hours per year: Approximately 1500 (equivalent to approximately 20 runs based on the estimates below)

Size (nodes) and duration (hours) for a typical batch job: Previous simulations on the Wahab High Performance computing cluster at Old Dominion University used 384 codes to complete jobs in 75 hours. We anticipate our jobs will require 9 nodes (using 44 cores/node) to run these simulations in a similar time frame.

Disk space (home, project, scratch): This project will utilize the home and project storage locations. Previous simulations at ODU resulted in ~15 GB files and we anticipate output files from our simulations to be similar, so additional space in the PI's home directory and in the project directory may be necessary.

Personnel Resources (assistance in porting/tuning, or training for your users**):**
There is a budget of $3k in Year 1 (2022) and $4.5k in Year 2 (2023) of this project to support the personnel resources necessary for this project. We anticipate most of this need will come in 2022 in porting and tuning the source code for Ookami.

Required software:
ROMS requires the following (see https://www.myroms.org/wiki/Getting_Started):
- Subversion client to download source
- Fortran 90 or Fortran 95 compiler
- cpp program for C-preprocessing ROMS source code.
- GNU make version 3.81 or higher to compile ROMS
- Perl interpreter program
- NetCDF library, with Fortran 90 interface
- Message Passing Interface (MPI) library to run in parallel on a distributed-memory system

If your research is supported by US federal agencies:

Agency: National Science Foundation

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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