Documentation for the Parallel Ocean Program

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LONG-TERM GOALS

The Parallel Ocean Program (POP) is currently being evaluated by the Navy for the purpose of becoming the ocean component of a fully coupled global ocean-atmosphere-sea ice forecasting system. In order to make the transition to this model easier, we have created documentation for POP that includes an extremely detailed explanation of the numerics of the code.

OBJECTIVES

Our primary objective is to create a reference manual for POP that is detailed and thorough, yet straightforward to read and understand. This is necessary for creating an infrastructure for the model to be used in data assimilation and forecasting, as well as for providing users with guidance when it is necessary to modify the code.

APPROACH

Although POP is closely related to several other z-level coordinate primitive equation ocean models that are descendants of the original Bryan-Cox model (*e. g.,* Bryan, 1969), many aspects of the original numerical formulation have been improved. However, these improvements have not always been well documented in the kind of detail necessary for developing the infrastructure needed for the model to be used in conjunction with a data assimilation scheme, or for providing guidance with code modification.

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14. ABSTRACT
The Parallel Ocean Program (POP) is currently being evaluated by the Navy for the purpose of becoming the ocean component of a fully coupled global ocean-atmosphere-sea ice forecasting system. In order to make the transition to this model easier, we have created documentation for POP that includes an extremely detailed explanation of the numerics of the code.

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To remedy this, we have gathered together most of the developers and experienced users of POP (mostly at LANL) and written a detailed reference manual.

WORK COMPLETED

Gathering the pertinent information for the manual and writing it in a unified and well thought out manner required quite a bit of time. While some content was fairly easily copied from existing manuscripts, a large majority had to be created from scratch. In particular, many of the newest features in the code (implemented in the last few years) were not documented anywhere. Examples include partial bottom cells and the variable thickness surface layer formulation. We were able to gather most of the necessary content and now have a preliminary draft of the reference manual available for Navy users. To get a copy, please send email to the PI (maltrud@lanl.gov). In the near future, the manual will be available on the POP web site (http://climate.acl.lanl.gov/models/pop).

RESULTS

Since the reference manual is only now becoming available, no results can be cited as being directly related to this effort. However, as some Navy research institutions transition to using POP more, we expect the manual to have a positive influence on productivity by reducing the amount of time taken to understand how the code works, thus making code modifications a much more efficient process, resulting in goals being reached more quickly and/or accurately.

IMPACT/APPLICATIONS

Having a useful manual will help the user make the correct implementation choices the first time through when it is necessary to modify the code for a specific purpose. For example, adding new physics parameterizations requires knowledge of the spatial discretization scheme as well as familiarity with the overall code structure and how code modifications will affect the model as a whole. A thorough working knowledge of POP gained from the use of the manual will help save significant time in testing and debugging new code.

TRANSITIONS

This reference manual was developed specifically with Navy users in mind, specifically those at Naval Research Laboratory (NRL) and Fleet Numerical Meteorology and Oceanography Center (FNMOC) in Monterey. We will now make the POP manual available to the users at these institutions and will continue updating and modifying the content based on feedback from them.

RELATED PROJECTS

The project most closely related to this work is “A 1/8th Degree Global Ocean Simulation Using the Parallel Ocean Program” (Maltrud et al., ONR award number #N0001400F0364) which involves running a fully global POP simulation with 1/10th degree resolution. The results from this simulation will be made available to NRL and FNMOC for use in ocean forecasting studies.

REFERENCES

Bryan, K., A numerical method for the study of the circulation of the world ocean. *Journal of Computational Physics*, 4, 347-376, 1969.

PUBLICATIONS

None.