

Interactive comment on “The Oceanographic Multipurpose Software Environment” by Inti Pelupessy et al.

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General comments

This manuscript by Pelupessy and colleagues introduces a new software tool that facilitates the integration of existing ocean modelling softwares into a modular and coupled simulation system and that facilitates the deployment of these coupled systems on different compute platforms. This software tool, called “OMUSE” builds on an existing set of tools that are used in astronomy (“AMUSE”), but adds to this wrapping codes for selected ocean models and a python user interface.

The manuscript is within the scope of Geoscientific Model Development. The work referred is highly relevant for the geoscientific research community. It is one of several current innovative efforts to facilitate collaboration between different ocean models; its

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particular strengths are the modular design and the focus on usability.

The paper is overall well written, but suffers from jargon, some inconsistencies, carelessness in definitions, insufficient documentation for reproduction, all of which are detailed below, and which necessitate a thorough revision. Figures are appropriate and of good quality, but those containing code examples should be moved to an appendix.

There could be more specific comparisons with alternative approaches that would help the reader to make choices regarding the use of this or an alternative modeling environment. Also, the software must be deposited in a public and permanent repository and be marked with a persistent identifier such as a DOI.

I recommend that this paper is published pending these revisions.

Specific comments

Title The (revised) title and the text refer to OMUSE as a *framework*. This is, unfortunately, a term that is not clearly defined and that is overused these days. It would better be avoided or clearly stated what its meaning is in the current context. I suggest to refer to OMUSE as a “toolset for coupling”.

Title and Abstract I would find it useful to see the complete meaning of OMUSE as “Oceanographic Multipurpose Software Environment” reflected in the title. It is confusing to have it referred to as a “framework” vs. “software environment” and “multipurpose” vs. multimodel in the first line of the text and the title, respectively.

Abstract I don’t see how OMUSE facilitates the design of coupled models. It certainly helps to implement the coupling. Reword more precisely what OMUSE does.

121f¹ Give full names and references at first occurrence of model acronyms. You might also consider to refer to a table where the models are listed with their institution

¹Line numbers refer to the revised version that is available as a supplement to RC1 author comment

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and reference.

- I 23f** These models are only a subset of the CMIP5 models, they don't constitute it.
- I 33** Many would not term SWAN a "coastal ocean model", it is a coastal wave model. Throughout the text, you could give the reader better structure for your coupling applications between (1) different ocean models (e.g. global to coastal), (2) ocean - wave coupling, and (3) data assimilation.
- I 42ff** There are many ways how couplings can be implemented, and many categories that describe the coupling type. Most often, the term "tight" versus "loose" coupling are used; in your case, the differentiation is between "monolithic" and "modular" coupling (and there are a lot of in-betweens). Refer to Valcke (2012) for categories. AGRIF is one tool to facilitate exchange of information that is on different grids. It may be helpful in both monolithic or modular approaches so it is not a useful category here. Then, of course, it is typically not sufficient (but already beyond many existing solutions) to couple just two different models (you propose coastal and open ocean) to tackle the coastal research problems you describe earlier.
- I 57ff** This sentence is only understandable to coupling experts. Please reword in more simple terms and explain jargon.
- I 68** Why do you restrict your work to the ocean modeling community? I believe your approach would be valuable for the entire Earth System modeling community and you should confidently state this, even though the applications presented are from the ocean domain.
- Figs 2,3,4,6** The code examples (provided in Figs 2,3,4,6) are not relevant to understanding the text and should be moved to an appendix. As they are, they are not easily understood and distract from the text.

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- I 107ff** contains again too much jargon and should be rewritten for a broader audience. The possibility of running multiple instances of the same program, and even multiple instances that are compiled differently could be highlighted more, as this approach is an outstanding characteristic of OMUSE.
- I 118** "as the master script". You have not defined what this is.
- Section 2.1 overall** It would be helpful to have references and acronym lists and definitions (such as the table recommended before) for the technical terms MPI, OpenMPI, OpenMP, MPI-2. The (sometimes subtle) differences between these technologies are very likely unclear to much of the readership and must be explained as far as this distinction is relevant to the purpose of this paper. What about vendor-specific MPI implementations?
- I 181ff** Is there any use of the "particle" set in your applications? All ocean applications are defined on structured or unstructured grids ("meshes"). The "particle" concept seems useful for Lagrangian tracer studies and for observation data; I don't see any of your applications making use of it (or is the eddy tracker one of these?)
- I 732ff** As the need for coupling models is increasing and tackled by several new frameworks or toolkits/software environments please justify just how easy it would be to create more interoperability. Why an entirely new approach in OMUSE? Both ESMF (Hill et al. 2004) and CSMDS (Peckham 2013) et al. contain python interfaces; both support C and Fortran, and CSDMS many more language implementations. You already justify this a little with your state model and OO approach. But would it be not more helpful to provide BMI to ADCIRC/POP/SWAN ... (actually, SWAN already has one) such that these models can be used both in OMUSE and CSDMS? And to elaborate on existing BMI within OMUSE by wrapping the original BMI in your high-level OO?

General discussion I also think that you should contrast your work more to the most

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recent efforts done in other coupling frameworks/software environments, such as the work in the GMD special issue by Balaji, or Cossarini's BFM coupler (also GMD), to name just a few. The purpose of this comparison would also be to highlight your own strengths and to give the reader more information on when not to choose your software but rather a different one.

I 770f this is wrong. GPL does not refer to private use in any way. Please convey the important terms of the GPL correctly. I would also find it helpful to include in the discussion a paragraph on your choice of license, i.e. GPL, as this choice imposes severe limitations (strong copyleft) on the distribution of coupled models.

I 773f It was not possible to download ADCIRC without registration; this should be stated (SWAN, POP worked). Also, with a serious attempt to build AMUSE and OMUSE according to the instructions provided, I was not able to achieve a successful build (though all requirements were met). While this may be a particular problem on my side (OSX + gfortran system, error in the python build script), it is not acceptable for what you call "production ready" software to not point the user to help/bug database/contact person. There is an "issue tracker" on the project site, but this seems to be inactive (only four issues, more than 8 months old).

I 774f Instructions on how to contribute are missing, particularly a contributor license agreement.

General code availability It is not clear what OMUSE v1.0 refers to. Please push your software to a permanent repository and obtain a DOI for the published version (e.g. Zenodo). Bitbucket is a private company and cannot guarantee availability.

Technical comments

I 16,291 Don't use "relatively" if no relation is provided.

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I 16f Repetitious use of "also"

I 36f "relax" is jargon for physical modelers; try to address a general readership.

I 43 Spelling of "AGRIF", correct is AGRIF.

I 68 Spelling "seperate", correct to "separate"

I 118f 118 relation of "its" and "it" unclear.

I 138 misuse of "reckon"

I 378 add "Eq." before (3)

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