

## ***Interactive comment on “OceanMesh2D 1.0: MATLAB-based software for two-dimensional unstructured mesh generation in coastal ocean modeling” by Keith J. Roberts et al.***

### **Anonymous Referee #1**

Received and published: 22 November 2018

The paper discusses a software suite useful to Ocean and Coastal modellers. The software aims to facilitate the generation of high-quality meshes for Ocean and Coastal modelling. Given the threats posed by climate change and the vulnerability of coastal areas, this reviewer acknowledges the potential impact of OceanMesh2D, and the paper. The particular traits and aims of the package, namely automated geospatial processing and generation of high-quality meshes could make this paper a welcome contribution. However, many important issues have led this reviewer to propose significant changes to the manuscript. Broadly, two issues led to this decision: Structural and contextual

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Structurally, the paper will benefit from extensive modifications. In particular, the manuscript would benefit from presenting the test cases graphically. The three areas summarised by table 2 could be introduced more effectively through a figure with multiple panels showing the regions, in cartographic form and at various scales. The figure should also indicate data sources in different colours. Such a figure should be placed early in the paper to make it more appealing, and its discussion can be placed in a separate small section, outlining the cases, their location and reasons for selection. The figure would directly showcase the capabilities of OceanMesh2D, regarding handling multiple data sources. Also, the figure will be an "anchor point" facilitating later discussions. Table 2 could thus only summarise the meshing parameters, Mesh quality and Iterations, making it smaller, easier to typeset, more digestible to the reader, and could be placed later in the paper.

The description of the software modules would also benefit from restructuring. Section 2 could be renamed "Architecture overview", as the term framework has a different meaning in computer science. While conceding that this reviewer is now focusing on semantics, an architecture overview section will enhance the broader description of the software modules and show how their design and mutual interaction was conceived to address the specific problems outlined in earlier sections. The details of specific classes should be placed in a section named "Component design" where each class is presented in a separate subsection. Note, currently the msh class is described in section 2, while all other classes are described in a separate section each.

The authors could consider placing section 5.2 in "Architecture overview" or "Component design" as it repeats points made in those sections. In general, the authors are encouraged to revise the manuscript and avoid making the same arguments multiple times. Also, the meshgen class should be presented first, rather than last. The meshgen class is the core of the package. Therefore, it seems appropriate to describe it first, followed by the description of other classes. Thus the need for sections to refer to later sections is eliminated. The only exception to this is section 5.2, as discussed

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above. Two further points relevant to the meshgen class description are: i) The way Algorithm 2 is presented could leave readers uninterested, as it clouds the algorithm's aim with data assignment and other operators. The pseudo-algorithm presentation is better suited to the User Manual. A figure with multiple panels and a more straightforward representation of the algorithm will be more effective at making the same point. ii) In page 27 the description of various methods (or are those functions?) is also poorly presented. The identifiers of the methods could be listed in a table, while a couple of figures could showcase the problematic cases that are targeted by the functions. It seems substantial effort has been invested into developing the methods outlined in page 27, and the present description will leave readers uninterested.

Far more important than the above structural problems, the paper makes statements on reproducibility that are not supported. Reproducibility is conflated with automation and replication. In the article, reproducibility seems to be defined as the ability to produce a given output, with given inputs exactly. However, the output of mesh-generation algorithms can vary, due to differences between various platforms. Seeding point coordinates with a random number generator is one such example. Unless the authors have built a system that eliminates such variations, claiming this type of reproducibility is invalid.

Also, the term reproducibility is today explored within the context of provenance and attribution, aiming to accurately define the processes and inputs leading to specific outputs, while disseminating outputs, processes and citing data, collectively termed Research Data Management (RDM). The software presented in the paper makes no explicit effort to distribute, trace provenance and make attributions. While a script will inherently contain information on the mesh generation process, such pointers are weak as they do not adequately describe the environment or other inputs and processes. Also, the authors state that the distribution of the script file with other supplementary data helps establish reproducibility (line 5 page 5). However, one of the main obstacles targeted by RDM practices is the distribution of such complementary data through per-

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sistent and open platforms. If the authors are suggesting that Revision Control Systems (RCS) could be used to address reproducibility, then that is an effect of RCS, rather than the software described in the paper. Besides, even with an RCS reproducibility in the context of RDM is not immediately achieved, often requiring more steps. For example pointing to very large datasets that are impossible to distribute, due to size or licence restrictions.

It seems that the concept of reproducibility has been added to the manuscript as an afterthought, with citations peppered in the text, making the same point in multiple locations. However, this is not the best feature of the presented software, is not a novel idea and does not address well-known issues in RDM: The 2011 paper by Roger D. Peng (doi:10.1126/science.1213847) outlines the basic concepts of RDM as well as obstacles to the consistent use of RDM in academic research. In that article, three steps are proposed as an incremental approach to RDM. To their credit, the authors have provided the source code under a permissive licence on an appropriate repository. Steps two and three are characterised as more difficult in the article, but since 2011 various open, citable repository services have been launched, where uploading code and data in citable forms is possible. Zenodo and Figshare are popular examples. The 2012 report by the Royal Society (<https://royalsociety.org/topics-policy/projects/science-public-enterprise/report/>) reiterates and expands many of the points made in Peng 2011. Section 4.3 will be of interest to the authors. In particular, the sections on Provenance and Citation in Appendix 2 are the basis for many of the reviewer comments. Since 2012, attempts at automating RDM procedures have appeared: In the context of mesh generation in geophysical domains, the articles by Jacobs et al. (2015, <https://arxiv.org/abs/1509.04729>) and Avdis et al. (2018, <https://doi.org/10.1016/j.renene.2017.09.058>) present RDM approaches integrated into GIS and mesh generation and will be of interest to the authors.

Please see specific comments in the text. I have used Okular (<https://okular.kde.org/>) to embed the comments in a copy of the pdf. The authors are encouraged to scrutinise

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the paper for grammatical corrections. There are plenty of corrections to be made (not all are pointed out), unfortunately distracting the review process from its purpose and adding a reason to opt for major corrections.

Please also note the supplement to this comment:

<https://www.geosci-model-dev-discuss.net/gmd-2018-203/gmd-2018-203-RC1-supplement.pdf>

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Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2018-203>, 2018.

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