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Geoscientific
Model Development
Discussions

Interactive comment on "Automated continuous verification and validation for numerical simulation" *by* P. E. Farrell et al.

P. E. Farrell et al.

david.ham@imperial.ac.uk

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We would like to thank the reviewer for his comments. In particular they focussed our attention on what exactly the paper is claiming and we will clarify this in the revised manuscript.

Since both reviewers raised questions on the topic of the verification of GCMs, we refer the reader to our response to the first reviewer in which the scope of the paper is addressed in depth.

In summary, we have concluded that the automated system we describe is a system for *verification* but not for *validation*.

The concerns of reviewer 2 centre on GCMs. In addition to the points made in our

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response to reviewer 1, there are particular responses germane to the additional issues raised here. Although this is a paper about verification of geoscientific models in general and not specifically about GCMs, we agree with the reviewer that they are an important class of models. We feel there are three distinct questions the reviewer is asking, which we address as follows:

- Should the paper include a discussion of the validation of Fluidity-ICOM as a GCM?

  As we note in our other response, Fluidity-ICOM is a flow solver with particular capabilities in the study of ocean processes. We did not, however, claim that the current version of Fluidity-ICOM has the large-scale capabilities of the well-known community OGCMs. As noted above, we also now feel that the system we have described is an automated verification system. This renders discussions of validation moot.

- Is continuous verification already widespread?

  As we noted in our response to reviewer 1, we will include a review of some of the GCMs in our revised paper and in this particular field, some models do already employ some form of ongoing verification, but for others there is no evidence readily available that they do. More generally, we are confident that ongoing verification is not the norm in the small-scale software development projects which typify most academic geoscientific model development.

- Can GCMs be verified with MMS?

  This is an interesting and substantive question which we cannot comprehensively answer but the reviewer is right that it is remiss of us to neglect. We feel that there is some merit in the argument of Oreskes et al. (1994) that complex geoscientific models such as GCMs may be formally unverifiable simply because they do not constitute closed mathematical systems. We argue that MMS is a very effective

GMDD
3, C860–C862, 2011

way of generating tests for systems of PDEs but we fully concede that there is a lot more to a GCM than the PDE solver (the dynamical core). Nonetheless, components of GCMs including the dynamical core but also some parameterisations when considered as stand-alone components or in some cases when coupled to the core do constitute well-posed systems of PDEs for which MMS is an applicable technique. We concede that the situation is, however, more nuanced than our original manuscript makes clear and we will include this discussion in our revised paper to make this clear.

References

Oreskes, N., Shrader-Frechette, K., and Belitz, K.: Verification, Validation, and Confirmation of Numerical Models in the Earth Sciences, Science, 263, 641–646, doi:10.1126/science.263.5147.641, 1994.

Interactive comment on Geosci. Model Dev. Discuss., 3, 1587, 2010.