

Reviewer Comments

Documenting numerical experiments in support of CMIP6

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Introduction:

This paper addresses an essential aspect of the use of models in scientific investigation, namely the ability to describe model workflow and experiments. This is essential for the integrity of the scientific method, the ability to design controlled experiments, and the framing of the sources of uncertainty in the experiments.

The paper addresses an effort to provide an approach across the “community,” which has individuals, many levels of organization, different cultural approaches to the execution of scientific investigation, and a wide variety of disciplines and purposes.

The paper represents astoundingly difficult tasks and those tasks are likely to never be wholly complete or satisfactory. It is a task that requires sustained attention, and likely, the incorporation of concepts, if not experts, from outside of the traditional “climate modeling” community.

My recommendation is to publish the paper, essentially, as is. I am hopeful that authors will consider some of my remarks in a modified framing of the paper.

What I feel is more important than this paper or my review is a community discussion on the community approach to climate modeling and its future. It is the ability to perform this problem of documentation at scale that warrants this discussion. Is this the right way to be consolidating our resources?

Reviewer’s Background

I am more of a model user than a model developer. Recently, my focus has been on the use of the CMIP models by those interested in adaptation. I have been, in the past, involved in efforts to develop improved metadata and documentation for climate models. I have worked on controlled vocabularies, and use them in my personal organization of resources. I have general experience in the focus of this paper, and a long-time participation in the climate modeling community.

Reviewer’s Comments

I have read the paper, looked at some of the references, and spent some time at <https://search.es-doc.org/>. Without my experience over the years, I would have difficulty entering the paper. I would appreciate more attention in the introduction about the general problems of translation and interpretation across different disciplines. There are words such as “forcing” and “scenario,” which are treated as if their definitions are known and widely accepted. In the lectures I give, to scientists and model simulation users, I am always asked the question, “what do you mean by ‘forcing.’” I am, presently, reviewing a very long paper defining the different uses that climate scientists attribute to scenario.

There are some very basic needs of scholarship and language that need to be recognized, for example, the need for glossaries. In every end-user design review of software systems and information services, in which I have participated, a major design gap has been glossaries. Some attention needs to be paid to these more fundamental issues of communication, rather than jumping straight into controlled vocabularies. Why the tactic of controlled vocabularies? Are there other approaches to bring order to this complex task?

Philosophically, it is perhaps worth stepping back, and looking at the nature of the problem. The community of scientists is growing, the complexity of the models is increasing, our observations of the climate are revealing many new processes that need to be considered, and the potential end user community is exploding. Hence, the idea of highly structured, stable controlled vocabulary is, perhaps, not well posed. Hence, does it make sense to consider something that is more dynamic, where there is the emergence of standards and definition?

The effort, as I read here, reminds me of a linguistic class where we discussed the efforts of the French Academy to define the French language. Language is dynamic, especially in a situation where everything is in flux, including those interested in using the language. This begs the question, do you need some expertise from other fields, such as linguists, or perhaps library science? Do you need an approach more like the Dublin Core (<https://dublincore.org/>) which looks at improving practice and, in my likely superficial interpretation, at the level of categorization that is perhaps possible and meaningful at any given time?

The paper is quite careful in defining a narrow scope of the purpose of CMIP experiments and the target audience. There is no mention of the practitioner interested in adaptation. In my opinion and experience, CMIP plays a bit of a shell game. Formally, CMIP limits its purpose to the scientific community. But it is well known that CMIP has far broader users, and there are those who proffer CMIP’s broader applications. Minimally, it is worth recognizing this community and managing the expectations that will be offered by ES-DOC and its controlled vocabulary. It seems to me that this community is, ultimately, more important than the science community, and an effort is needed for translation to that community, or perhaps, we need to recognize that there is a different type of modeling approach. Followed by defining CMIP more narrowly than at present and tightly focused on its scientific mission.

If I were to approach this problem, I would seriously consider a more community based, community engaging process. I know there have been efforts in community capturing of

documentation and experience (e.g. <https://journals.ametsoc.org/doi/full/10.1175/BAMS-D-14-00189.1> (CHARMe)). I realize these approaches are problematic. But the problems of compliance and participation that you realized in ES-DOC and CMIP5, are not likely to go away. There is probably some “governed” space between an expert designed controlled vocabulary and reliance on the community that might offer the ability of accurate information and more completely addressing the problem of providing information for a/the “community.”

Finally, I admire and congratulate the progress and successes realized in the ES-DOC effort. I, particularly, like the statements in the paper of what was learned in the CMIP5 activity and the efforts to improve it. As I opened, this is fundamental to the scientific integrity of our field. It needs more support, but it is not the type of activity that excites most program officers who I know. In the end, I don’t think the effort can keep up with the growing complexity, and perhaps, is there a better way?