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Earth System
Dynamics
Discussions

Interactive comment on "Probabilistic projection of sea-level change along the world's coastlines" *by* M. Perrette et al.

Anonymous Referee #1

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I don't really know what to make of this paper—I'm not sure it's science, as it isn't clear to me how one would test it except by waiting until 2100. That puts it into the category of an engineering study—do empirical regressions, generate some small ensembles, build the bridge, and ask whether it will fall down?

More specifically, it is really a study of the scatter in predictions by a class of models: the title of "probabilistic projection.." is misleading, because a true probabilistic projection would include the prior probability distribution of the models—something that isn't even mentioned. So for example, what is the probability the Rahmstorf model is skillful? It ignores entirely the known physics of continental glaciers. Since some of the Antarctic ice is nearly 1 million years old, surely there would have to be terms reflecting the lag times between temperature changes 1 million years ago (and everything

in between) and modern melt rates. Thus one might argue that the probability of it being correct is nil! A true probabilistic prediction would have the posterior probabilities depend upon the model priors. They say P. 364 that they are spanning the range of possibilities—but how is that known? It seems to be only the range of the given models. What is the probability they really do span the possibilities?

Perhaps the authors can deal with this: (1) How does one falsify the conclusions of this study without waiting 90 years? (2) If they cannot or won't assign prior probabilities to the models, they can reformulate the paper as a study of empirical ensembles run on various classes of model. But I wouldn't want to do an expected cost calculation based upon the results.

Other issues: The published heat uptake calculations are taken at face-value. But as the authors note, they are mostly based upon the upper 700m, and with most of the data from the northern hemisphere. Shouldn't a probabilistic calculation account for the likely errors in these estimates? At least discuss it. It's argued that the model-data discrepancy is due to the models using the whole water column. Does that not mean there has been no net heating below 700m? Is that probable?

Do Pfeffer et al. state that their ranges should be interpreted as uniform probabilities? An unusual result.

Coastal changes are surely going to be influenced very strongly by regional wind variations (thought to produce much of the present regional variations). Isn't the wind field something that needs to be discussed? Predictability of the wind field? Is this effect negligible?

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