Thank you very much for the kind words and constructive review. Below we address the open issues. We have formatted our responses in blue text to better distinguish them from the comments. The formatted PDF response file is provided as a Supplemental File, and plain text is provided here.

Yours sincerely,

Tony Wong and Alexander Bakker (on behalf of the author team)

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General comment

The manuscript, "BRICK v0.1, a simple, accessible, and transparent model framework for climate and regional sea-level projections, describes and open-source, modular modeling framework to investigate change in global and regional sea level. The authors details the modeling framework well all with conveying the value of this type of modeling. I suggest publication with a few minor comments to be addressed below.

Reply

Thank you very much. We address the suggestions below

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Comment #1

My main concern is that the model is contained in a zip file. This made it difficult to look at the structure and code without downloading the whole package. For maximum visibility and reproducibility it would be great to publish this model on github or bitbucket. This would allow for easy code review, version control, and issue tracking etc.

Reply

Thank you for pointing this out – it is exactly our intent *not* to distribute the model widely using a zip file or tarball. Indeed, this would go against our stated interest in reproducibility, longevity, and transparency. Our codes are maintained on Github, and we only put a preliminary version out to accompany the GMD Discussions manuscript as a zip file. In our updated manuscript, Code and Data Availability section, we point to a Github site where the codes will be maintained for the long term:

"All BRICK v0.2 code is available at https://github.com/scrim-network/BRICK under the GNU general public open source license. Large parameter files as well as model codes forked from the repository to reproduce this work (including the sea level projections) may be found at https://download.scrim.psu.edu/Wong_etal_BRICK/."

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Comment #2

It would be useful to the reader to make it clear upfront that you are coupling multiple, already published, models together.

Reply

You are, of course, correct. In the abstract we now have:
"Here, we introduce a simple model framework (largely building on existing models) for projections of …"

And in the introduction: "In this model framework, we present a set of existing, well-tested, and easy-to-couple simple models for…"

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Comment #3

A description of the inputs and outputs along with the spatial and temporal scales and rough run times would be useful. For example, does the model take in an emission pathway? Concentrations? Only CO2?

Reply

All of the component-models are zero-dimensional, with the following exceptions. The ocean-model is a 3-layer 1D model. The Antarctic ice sheet model (DAIS) considers a two-dimensional axisymmetric geometry. These exceptions are noted in the original manuscript, Page 10 Line 7 (DAIS) and Page 7 Line 4 (ocean). In Section 2.2.4 in the original manuscript, we give rough estimates of the run times (order of thousandths of a second per 1850-present hindcast simulation).

At page 7 line 25 in the original manuscript, we point out that the sea-level rise model uses a one-year time step: "The differential equations for the GIC, GIS, AIS, and TE contributions to global mean sea level (below) are integrated in BRICK using first-order numerical integration schemes with a one-year time step." The annual time scale can be easily adjusted.

In the revised manuscript, we have added text to make clear that the climate component uses a one-year time step as well, and state the required forcing is a radiative forcing time series: "We use a one-year time step for the DOECLIM model, and the required input to drive the model is the radiative forcing time series (W m^{-2})."

For projections, this uses Representative Concentration Pathways (as seen in the presentation of the results) and for the hindcasts, we use the same data as Urban and Keller (2010) and Urban et al. (2014).

The other component models are driven by global temperature and the Antarctic ice sheet contribution and the local sea-levels also require sea-level contributions from all sea-level components.

We have revised the text within Sections 3.1 and 3.2 to make these details more clear:

"DOECLIM is a zero-dimensional energy balance model coupled to a three-layer, one-dimensional diffusive ocean model."

"We adopt a simple zero-dimensional sub-model for the contribution to global sea-level rise from Glaciers and Ice Caps (GIC) from Wigley and Raper (2005)."

"BRICK uses the mechanistically-motivated, zero-dimensional SIMPLE (Simple Ice-sheet Model for Projecting Large Ensembles) model as the parameterization for the Greenland ice sheet (GIS) contribution to global mean sea level change (Bakker et al., 2016a)."

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Comment #4

Does the user have to calibrate the model? Or does the model come already calibrated?

Reply

We will provide the larger calibrated parameter sets at a download server if users wish to use the sea-level projections showcased in the revised manuscript; we have run a larger ensemble since the initial submission, but the resulting conclusions have not changed. We hope that these projections, along with the "BRICK_LSL.R" script to fingerprint to local sea level at a user-defined latitude and longitude, will be useful for readers to incorporate numerous uncertainties in sea level projections into their own work. Thus, the model may be used already calibrated, but the model's accessibility enables easy experiments with alternative calibration schemes. Additionally, we have added a "Code Example" for using our sea-level projections and fingerprinting to yield local sea-level projections in a new README.md file, available from the Github repository.

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Small points

pg1 ln17 'easier to reproduce' Easier than what? -> change in "*easy*"

Reply

Corrected in the revised Abstract.

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Section 2.2.2 - are there instructions on how to incorporate new datasets?

Reply

We aim for a transparent easy to access framework. To test this, we need feedback from users and we will try (maybe with the help of other users) to incorporate this feedback. We have added a note about this to the "README_calibration" file in the "calibration" directory:

"Additional observational datasets for calibration may be introduced by making the following modifications.
In the calibration directory:
(1) [submodel]_readData.R – read the dataset, match the model and observational data indices (using "compute_indices" function)
(2) BRICK_calib_driver.R – add to the obs.all, obs.err.all, midx.all, oidx.all, ind.norm.data lists (these tell the BRICK_assimLikelihood.R routines how to compare the model and data)
(3) BRICK_assimLikelihood.R – calculate a likelihood function value for these data and add to "log.lik" routine. Note that simply adding the log-likelihood from the new dataset assumes independence between residuals from one dataset to the next.
In the data directory:
(1) Add the dataset, and make sure to point to this in [submodel]_readData.R"

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pg7 ln14 – what data is used for this comparison?

pg7 ln14-21 – I suggest expanding this paragraph a bit more.

Reply

In the original manuscript, we mention these data sets at Page 7 Line 17: "We add the heteroscedastic observational error estimates from Morice et al. (2012) and Gouretski and Koltermann (2007)"

We have expanded this to specify that the data are temperature and ocean heat uptake in the revised text, as suggested:
"We add the heteroscedastic observational error estimates for global mean surface temperature from Morice et al. (2012) and for ocean heat uptake from Gouretski and Koltermann (2007)"

This type of calibration approach has been used previously, and we point to those studies for further details at the end of the paragraph in question:
"This type of calibration approach for DOECLIM has been implemented previously in the literature (Urban and Keller, 2010; Urban et al., 2014), and we direct the interested reader to these studies for further details."

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pg9 ln31 - are the projections in the manuscript all relative to this mean?

Reply

Yes, that is correct.

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Figure 2 – the coloring on my end was hard to see.

Reply

We appreciate this opportunity to improve the clarity of our figures, and have revised the color schemes for both Figure 2 and Figure 3.