



Interactive comment on “A new dataset for systematic assessments of climate change impacts as a function of global warming” by J. Heinke et al.

Anonymous Referee #1

Received and published: 17 December 2012

Overall comment:

This paper presents a new dataset of future climate scenarios, based on CMIP3 19-GCM outputs, which must be very useful for various climate-change impact assessment studies. In this study, climate scenario consists of monthly temperature, precipitation and a few more variables of land surface climate. A set of scenarios in this study means that the time-series of those land surface climate variables are prepared for several trajectories of future global mean temperature increase. The combination of the pattern-scaling method and a simple climate-carbon model MAGIC6 enables the authors to accomplish this study. Although the contents of this paper are relatively

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complicated because of the nature of this study as a technical and mathematical study, the authors have scrupulously and clearly documented necessary contents in a limited length. The data as the outputs of this study must be very useful. Thus, the reviewer basically recommends this manuscript for publication. Nevertheless, the authors are recommended to consider necessary modification to the manuscript as written below.

Specific comments:

1. The title is unclear. If the title means “a new dataset of climate change impacts”, this does not express the actual content of the manuscript because impacts are not discussed in this paper. If the title means “a new dataset for systematic assessments”, it is OK at a glance but “what kind of dataset” was not entirely shown. Needless to say, this manuscript presents a new dataset of “climate scenarios”, as written in the main body. Climate scenario consists of precipitation, temperature, and so on in this manuscript. However, the current title never says so. Please modify the title.

2. The expressions in the equations, specifically equations (1)-(7), are not well coordinated. In particular, (1)-(3) and (4)-(7) are completely different in their appearances. Because of this difference, although the concepts of the authors are understandable, it is difficult to follow actual mathematical processes. For example, let's take Equation (4). The reviewer cannot exactly understand whether T_{scen} in (4) corresponds to a specific term in Equations (1) or (2) or not. Also, it is not certain whether anomaly (T_{anom}) corresponds to “e” in Equation (2) or equals to the deviation from the pre-industrial era (or the deviation from 2009). For T_{ref} , a similar problem exists. The reviewer found in 3543 the definition of “reference time series”. But, the description on it is ambiguous. Correct understanding on it is not easy. If the reference time series correspond to data for 1961-2009, “anomaly” means the deviation from the mean of 1961-2009. Then, “anomaly” naturally includes “trajectory = mean change” as a component of anomaly. Eventually, how “trajectory” affects Equations (4)-(7) is not explicitly shown. The authors who know the entire structure may find answers to those above questions from the current manuscript only, but the reviewer cannot find adequate answers because

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mathematical expressions are not coordinated between (1)-(3) and (4)-(7). Technical terms in the main text should also be exactly correspondent to terms in those equations. Otherwise, concepts can be generally understandable but exact mathematical understanding is suppressed.

3. In Fig.4, Fig.5, and Fig.6, the reviewer would suggest the authors to add a figure of the scaling pattern as well. The reviewer means, “three panels in each Fig.4, Fig.5, Fig.6” is very helpful for understanding and capturing the result of this study. In addition, the reviewer could not understand the initial sentence of each caption for Fig.4, Fig.5, and Fig.6. The initial sentence of the caption says “Multimodel mean of. . .”. It indicates that the upper panel of Fig.4, Fig.5, Fig.6 was made from GCM outputs without the process of Fig.1. However, by reading this manuscript, the reviewer had an impression that the upper panel was made from the outputs after all the procedures in Fig. 1 were done. If the reviewer’s understanding is correct, the captions of Figs.4, 5, 6 may not be relevant.

4. The processes written in 2.3.1-2.3.4 are usually called as “bias correction”, in the field of impact assessment. The reviewer admits there is no perfect way, nor defacto standard, in carrying out bias correction. Thus, the reviewer can accept the processes adopted in this study. However, the reviewer also would like to point out there are at least several studies that already tried bias correction for precipitation and temperature. Some of recent examples are, Piani, C., G. P. Weedon, M. Best, S. M. Gomes, P. Viterbo, S. Hagemann, and J. O. Haerter, (2010), Statistical bias-correction of global simulated daily precipitation and temperature for the application of hydrological models. *Journal of Hydrology*, 395(3-4), 199-215. doi:16/j.jhydrol.2010.10.024 Watanabe, S., S. Kanae, S. SETO, P. J. .-F. Yeh, Y. Hirabayashi, and T. Oki (2012), Intercomparison of bias-correction methods for monthly temperature and precipitation simulated by multiple climate models, *J. Geophys. Res.*, doi:10.1029/2012JD018192 Some of them must have done a validation of their method against observed data. The reviewer encourages the authors to compare and discuss the method of this study and the methods in

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previous studies.

5. The dataset presented in this manuscript must have interannual variability of monthly time series. In addition, such interannual variability is not the same as the historically observed one. As was written in 2.3., future variability (for example, standard deviation of the future time series) must have been different from observed one. However, only the mean change components are shown in Fig. 4, 5, 6. Results on past and future variability corresponding to section 2.3 should be shown and should be discussed, in addition to the results on the mean. Have the authors checked whether any strange value was computed by the procedure in 2.3 in terms of interannual variability? Sometimes, such a bias correction may produce an unexpected strange value although the mean was adequately calculated.

Interactive comment on *Geosci. Model Dev. Discuss.*, 5, 3533, 2012.

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