

Interactive comment on “On determining the Point of no Return in Climate Change” by Brenda C. van Zalinge et al.

Brenda C. van Zalinge et al.

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We thank the reviewer for the detailed report and the very useful comments on the manuscript. A point-by-point reply follows below, where we refer to each section of the report.

4. Recommendation

Reply:

The aim of the paper is to introduce a novel methodology, combining stochastic viability theory, linear response theory and economic modeling to address the concept of the point of no return π_t . Indeed, the models employed (even the PLASIM), the mitigation

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scenarios and the cost function are highly idealized. However, they are used here to illustrate the methodology and not to provide a realistic estimate of π_t . Although this was mentioned in the original manuscript (in the discussion), we agree that we should provide a much more critical discussion and we will do so in the revised paper. Determining the point of no return in a realistic setting is the next step on which we are currently working and is basically a new paper.

2.4 The model for and analysis of the cost function

Reply:

Also based on the recommendation of reviewer #1, the original section 4.3 will be deleted in the revised paper. Instead we will mention the possibility of determining optimal mitigation scenarios in the revised discussion.

2.3 The energy balance model

Reply:

This model is indeed constructed to illustrate the methodology in the presence of a saddle-node bifurcation. We think that it serves this purpose, without claiming to be realistic here (which is questionable anyway with these type of models). In the revised version, this will be explicitly mentioned.

2.2 Science-fiction scenarios

Reply:

We agree but this is an additional detail which is not needed to illustrate the concept

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of the point of no return and the methodology to determine it. However, in the revised section 4.2, we will discuss the effect of the value of the e-folding time scale (for the PLASIM) on the results.

2.1 How to use simplified models

Reply:

Our opinion is that models should always be targeted to the question which is asked. Idealized models can be used when answering questions on mechanisms and illustrating methodology, but it is questionable whether such simplified models can determine relations between relevant observables (here radiative forcing and the global mean temperature). Anyway, our motivation here is to use these models only to illustrate the methodology and concepts and in that respect this is justified.

1. General comments

Reply:

The only remaining issue is the fact that the point of no return can indeed occur before the climate becomes non-viable due to the delay of the carbon cycle response. We will address this issue in the revised discussion.

3. Some minor points

Reply:

Page 6, lines 163–167: Suggestion will be followed and the value of σ^2 will be mentioned.

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Figure 3: More information will be provided to explain the results of this figure.

Page 10, lines 261–263: We will add a paragraph to explain this difference.

Page 15, line 384: We were not aware of the Rypdal (2015) paper where this suggestion is made. We will compare this approach with the one based on linear response theory and add the results in the revised paper.

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