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Interactive comment on "Nine time steps: ultra-fast statistical consistency testing of the Community Earth System Model (pyCECT v3.0)" *by* Daniel J. Milroy et al.

Anonymous Referee #1

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The article by Milroy et al. is about a methodology to verify that a given Earth System Model produces (or not) statistically undistinguishable climates when, for instance, it is used on two different computers, or with different compilation options. In general, their methodology applies to cases when Bit For Bit verification is not possible because the rounding differences or treatment of the operations causes very small differences at the first time step that then grow due to the inherent chaotic nature of the model. Their approach is pretty unexpected in my point of view since I would personally rely on very long climate simulations to address the same problem. But their methodology is really convincing and the results they obtain prove that their approach is relevant. Each step of the methodology is both well described and robust, and I agree with the

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interpretation of the results (smartly limited to the actual implications of the results and applicability of the methodology). Overall the scientific quality of the paper is really good and it is well written. With only one two minor comments, I highly recommend the publication of this article that perfectly fits within the scope of GMD and hope that pyCECT will be adapted and used in many climate modeling centers in the future.

Minor comments: Page 4 line 3-10: the description of the PCA decomposition in section 2.1 would deserve more detail (step by step as in Milroy et al. 2016) to be more quickly understandable.

page 4, line 24: replace ‘studies’ with ‘study’

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