

# ***Interactive comment on “Statistical estimation of global surface temperature response to forcing under the assumption of temporal scaling” by Eirik Myrsvoll-Nilsen et al.***

## **Anonymous Referee #1**

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### General comments

The paper describes a new stochastic model the response of global mean surface temperature to radiative forcing which assumes a scale-invariant response function instead of a combination of exponential functions. The model is fitted to temperature and radiative forcing data from the GISS-E2-R, and further used to forecast temperature for different CO<sub>2</sub> forcing scenarios and to estimate the transient climate response (TCR). The results of the scale-invariant model are compared with the ones resulting from an exponential response function. The paper seems in my opinion scientifically sound and the results are interesting from the applications point of view. It's not clear to me,

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however, whether the comparison is performed with a 1-box energy model or with a combination of  $m$  exponential functions (and in that case what is the size of  $m$ ).

#### Specific comments

- Please clarify the meaning of "emergent" (emergent symmetry, pg 3, line 58; emergent property, pg 3, line 76).
- Maybe provide a reference for the Goddard Institute for Space Studies (GISS) E2 model (page 4, line 85).
- Fig 8: maybe explain why both the scale-invariant and exponential curves are unable to capture the histogram mode.
- Fig. 8, caption: maybe remove the "dashed" in the description of the vertical lines (for the mean of the exponential response function).

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