

Earth Syst. Dynam. Discuss., author comment AC1
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Reply on CC1

Mikhail Verbitsky and Michael Mann

Author comment on "ESD Ideas: A Global Warming Scaling Law" by Mikhail Verbitsky and Michael Mann, Earth Syst. Dynam. Discuss., <https://doi.org/10.5194/esd-2021-87-AC1>, 2021

Dear Dr. Rosen,

Thank you for your comment. I think the book of G. I. Barenblatt (Barenblatt, G. I.: Scaling. Cambridge University Press, Cambridge, 2003) provides a very good introduction into dimensional analysis that may be helpful to you.

<https://www.cambridge.org/core/books/scaling/E08325F4C8A14AAD4742E39FE5D0A6B3>

I think Introduction and Chapters 1-4 will be sufficient.

You are raising a very good question regarding the physical content of the equation (1), and I do not want to be brief in answering your question. I would like to start with the quote from the book I just recommended: "Applied mathematics is the **art** of constructing mathematical models in nature, engineering, and society" (page xi). Why art? Because every model is a simplification or idealization of a phenomenon (otherwise a model would be as difficult for interpretation as the nature itself), and therefore it is a decision of a researcher what factors of a phenomenon are of critical importance and what factors can be neglected, a decision that like any artistic action cannot be formalized but is based on researchers' experience and best judgement. We call equation (1) a hypothesis, a hypothesis that suggests that the **internal dynamics of the climate systems is largely governed by magnitudes of its positive and negative feedbacks**. This is the physical content of the equation (1). Then, using dimensional requirements, we proceed to the scaling law. Thus the idea of the paper is as following: If the climate system is indeed governed by the magnitudes of its feedbacks, it should follow these laws. To challenge our scaling law, one needs to present an argument why our hypothesis is not valid.

Thank you again for your question. I am sure that our conversation will help other readers as well.

Respectfully,

Mikhail Verbitsky