

Interactive comment on “Attribution in the presence of a long-memory climate response” by K. Rypdal

dr. Rypdal

kristoffer.rypdal@uit.no

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Thanks for an informative and constructive review.

1. Unfortunately, I was not aware of the very comprehensive paper by Canty et al., and it certainly needs to be cited and commented.

2. My formulation “little physical justification” (of delays) was referring to the cited papers by Lean and Rind, and Foster and Rahmstorf, and my concern was mainly the long delay of a decade for the response to anthropogenic forcing. I am not aware of physical justifications of this delay in the mainstream literature. The delays of 1-6 months of response to solar, volcanic and ENSO is not a concern in my paper because I analyse annual time series. The reason for using annual series is that I am concerned

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with effects of long-memory response, and introducing higher resolution and delays of a few months as free parameters will increase the chance of overfitting. In my paper the long delay in the response to anthropogenic forcing is incorporated in the long-memory response.

3. I will cite Canty et al. on this point of the short-time temperature response around volcanic eruptions.

4. It also seems resonable to cite Canty et al. on the need to introduce AMV as a predictor in the regression model.

5. I think I have to choose my wording more carefully. Climate forcing is a problematic concept, since it depends on what one defines as the “system” that is subject to external forcing. As a physicist/applied mathematician who has entered climate science via a non-standard route, I tend to think about ENSO and AMV as internal modes, and not as forcings. But realise that it may be reasonable to think of the Earth surface/mixed layer as the system, and that this system can be forced by modes involving energy exchange between the surface/mixed layer and atmospheric systems (ENSO) and between the surface/mixed layer and the deep ocean (AMV via AMOC). In that case my remarks become rather irrelevant. However, from a mathematics/statistics point of view it may be in place with a reminder that high explained variance associated with a certain predictor variable does not necessaril imply a causal link, and in particular not that the predictor is forcing the reponse variable.

6. It is nice that others reach similar conclusions about the hiatus.

I will certainly discuss Canty et al. also in the concluding section.

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