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Earth System Dynamics
Discussions

Interactive comment on "Only the instantaneous global warming potential is consistent with honest and responsible greenhouse gas accounting" *by* Peter Nightingale

Anonymous Referee #2

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I recommend that this paper is rejected.

The study is well motivated but flawed. I had expected (from the abstract) to find some coherent reason why the instantaneous GWP is superior to the normal GWP(100). However, all I find (p 3;l 18-19) is an assertion that this IS the case and then the rest of the paper follows as if that assertion is justified. In fact the abstract contains no useful information about the content of paper, but only really states the assertion.

I am no great fan of the GWP and the difficulties of using it to represent temperature change have long been known (its equivalence is formally restricted to time-integrated radiative forcing following a pulse emission). See for example Figure 3 of Fuglestvedt

et al. (Climatic Change 58, 267-331, 2003) and many of the figures and references in Myhre et al. (2013).

There is much I disagree with in this paper, but I restrict myself to those aspects that I feel justify the rejection.

The principal problem is that no account is taken of the much greater persistence time of CO2 perturbations, especially the fact that some of that CO2 is an essentially permanent addition to the atmosphere. This is acknowledged at p 2;l 28-29, but plays no subsequent part in the analysis. The only timescale used in the paper is methane's decay time.

The problem with the key figures (Figs 3 and 4) is that they just demonstrate the result of applying the assertion, rather than demonstrating that the assertion leads to a better representation of the resulting climate change than applying GWP(100), which is surely what matters. If the temperature effects (a simple physical model could be used in an illustrative context)) of using CO2-equivalents calculated using the GWP(0) was adopted, and compared with that resulting from the actual emissions (in the author's thought experiment) the temperature evolution of actual and CO2-equivalent emissions would be quite different. The impact of methane emissions from any given year would decay to near zero in a few decades, while much of its (large) equivalent in terms of CO2 using GWP(0) would remain in the atmosphere influencing climate for long periods.

The author invokes the precautionary principle but this only applies if the chosen metrics have demonstrable integrity. By placing a very large multiplier on CH4 emissions, it would encourage large cuts to methane emissions in preference to those of CO2, but the longer-term consequences of such a choice would have to be explored to assess the extent to which such a policy is precautionary or ultimately leads to a greater climate change (which could only be reversed by the negative emissions that the author (p 9;l 7) regards as "fraught with danger").

The discussion surrounding Figures 1 and 2 is confused – again we are left with an assertion that the similarity between the Figures show consistency, when such consistency can only be demonstrated by converting emissions to changes in concentrations, changes in concentrations to radiative forcings and (transient) radiative forcing to (transient) changes in temperature. To do otherwise is to ignore the physics of the climate system. In essence, the attribution statements in IPCC AR5 are tracing through those necessary links.

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