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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Avoiding HFC growth is critical for keeping global warming below 2 during the 21st century" *by* Y. Xu et al.

Anonymous Referee #1

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This is useful paper and on balance I recommend acceptance.

On one level, the central result is easy to obtain and not surprising. Using the back of an envelope, and knowing the forcings already presented in Velders et al. (2012) and a value for the climate sensitivity, one could simply estimate the equilibrium temperature change (perhaps lack of space prevented Velders et al from taking this step); with only a slightly bigger envelope, one could estimate the transient climate change. Indeed, I would suggest that such a methodology would be more transparent, as one is never told, for example, the equilibrium climate sensitivity of the model used here, which is a significant omission. The paper also overstates the "critical" role of HFCs. Clearly if other mitigation measures fail to hit the 2 degree target, then any other mitigation measure that takes you below this threshold can be seen as "transformative". Nev-

ertheless, the work presented here is a refreshingly brief and useful reminder that all components need to be considered, if a target is to be achieved.

I also have a significant objection to the way the results are presented, although I understand there is an underlying (but unstated) political rationale for doing so. I do not think there is a compelling scientific case for grouping HFCs under SLCPs. Many of the other SLCPs are very much shorter lived, so that their distributions, given inhomogeneous emissions, are highly inhomogeneous. This is not the case for the major HFCs considered here. There is a further objection to referring to the HFCs as pollutants. Most of the other members of this somewhat arbitrary grouping are pollutants in the sense that they lead to deteriorating air quality. Of course, there are many definitional arguments here, but I think the paper could be rewritten either to just discuss the impact of HFCs without any reference to whether it is a member of an arbitrary classification of other emissions (as was done in Velders et al. 2012), or else to make it explicit that the Climate and Clean Air Coalition has made an essentially political decision to include HFCs under this SLCP banner, even though the HFCs do not impact on "clean air" in any significant way.

It would be useful if there was a reminder that the "net" climate effect of HFC reduction is important. If any replacement technologies or gases lead to less energy efficiency, then all the gains from the reduction would be lost. Just a sentence on this would suffice.

Comments

32613: Title – the "critical" in the title is hyperbole – the avoidance of HFC growth is just one alternative for avoiding the 2 degree limit, and it is not the role of this paper to profess whether it is the most sensible (in a cost effective sense) of the many options. A more neutral title "On the role of HFC growth in keeping global warming ..." or something similar, would be less emotive.

32615, 3: Ravishankara citation is inappropriate – that paper is about the very long-

lived perfluorocarbons.

32615, 6: “Are referred to as SLCPs” – they are referred to as this within the limited confines of the Climate and Clean Air Coalition, but their classification is somewhat arbitrary and politically motivated – and even then, the CCAC explicitly say “many” rather than “all” HFCs. The authors should either make clear that the classification of HFCs as SLCPs originates from the CCAC, or drop completely the attempt to somehow place HFCs in the same basket as things like black carbon. The authors might also refer to the paper by Smith et al. (doi:10.1038/nclimate1496) which arguably has a more scientifically rationale definition of short and long lived.

32616, 22: I appreciate the reasons why HFC-23 was excluded from the analysis, but this needs to be spelt out, as it is one of the more important HFCs in terms of current radiative forcing.

32617,1: There is EU regulation (842/2006) aimed at moving away from high-GWP HFCs – is the effect of this regulation (both within and beyond the EU) included in the HFC projections used here? If it is not included, the projections (and hence the potential “savings”) presented here may be an over-estimate.

32618, 1: Nowhere are we told the climate sensitivity of the RX10 model. This is important information. What assumptions are made for the geographical distribution of the HFC emissions (and how this changes with time) as this really matters for the shorter-lived HFCs, as do assumptions about the dependence of the radiative efficiency on lifetime? Are thhe gases assumed well-mixed, and if so, is that consistent with their assignation as “short lived”?

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 32613, 2012.