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The Role of HFCs in Long Term Climate Change

There is ample evidence to show that emissions of HFCs have minimal (less than 1%) contribution to climate change at present [1]. Furthermore, the records show that emissions of HFCs from developed countries have slowed in recent years [2, 3]. This is partly as a consequence of legislation (such as the 2006 Regulation and Directive in the EU [1]) and partly because demand has become "saturated", for example for HFC-134a in the U.S.A. [2]

Together with methane, ozone (in the lower atmosphere), black carbon (soot) and some other atmospheric aerosols, HFCs are "Short Lived Climate Forcers (SLCFs)", which means that, although they are greenhouse gases, their environmental lifetimes are far shorter than that of CO_2, the most abundant greenhouse gas. This short term influence has led to a superficial view that reduction in SLCF emissions would have a major effect on long term climate forcing and global warming.

In a recent paper from researchers in several prestigious scientific institutes, this view has been shown to be, at best, naive [4]. They concluded that:

"... Our study demonstrates the importance of coherently considering CO_2–SLCF coevolutions. Failing to do so leads to strongly and consistently overestimating the effect of SLCF measures in climate stabilization scenarios. Our results reinforce that SLCF measures are to be considered complementary rather than a substitute for early and stringent CO_2 mitigation.
Near-term SLCF measures do not allow for more time for CO_2 mitigation"

These conclusions are illustrated in the graph from the same publication reproduced on the next page. This clearly shows the overwhelming influence of CO_2 on the development of future global temperatures and that the effect of the SLCFs, even when their emissions are severely reduced in the mitigation scenario, is actually quite small.

Conclusions such as this reinforce the need to minimise CO_2 emissions, for example by ensuring that refrigeration and thermal insulation are accomplished with the highest possible efficiency (activities in which HFCs can have a positive role in reducing an overall climate impact that includes CO_2 emissions).

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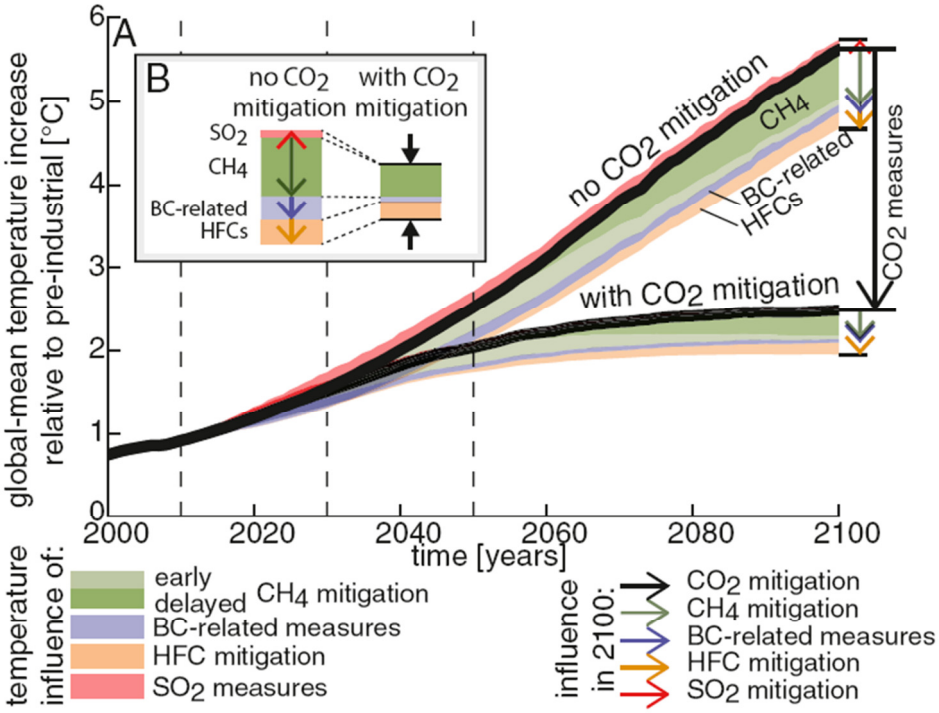

Source: *Rogelj, J. et al. (2014), Disentangling the effects of CO_2 and short-lived climate forcer mitigation, Proc. Nat. Acad. Sci. www.pnas.org/cgi/doi/10.1073/pnas.1415631111*

Influence of SLCF-CO_2 linkages under varying CO_2 mitigation.

- CO_2 paths show a world "with CO_2 mitigation" and with "no CO_2 mitigation".
- Early methane mitigation is represented by the combined light and dark green area.
- HFC mitigation is shown for the lower end of "business as usual" and the adoption of early measures.
- Black Carbon (BC)-related (and SO_2) measures show the differences between no controls and the adoption of early measures.

References

1. Fifth Assessment Report of the Intergovernmental Panel on Climate Change (www.ipcc.ch)
2. National Inventories of Greenhouse Gases submitted to the United Nations Framework Convention on Climate Change (unfccc.int)
3. European Environment Agency Technical Reports No 15/2013 and 15/2014 (www.eea.europa.eu)
4. Rogelj, J, Schaeffer M, Meinshausen M, Shindell D, Hare W, Klimont Z, Velders G, Amann M, Schellnhuber HJ. (2014), Disentangling the effects of CO2 and short-lived climate forcer mitigation, Proc. Nat. Acad. Sci. www.pnas.org/cgi/doi/10.1073/pnas.1415631111