

Interactive comment on “Implications of constant CFC-11 concentrations for the future ozone layer” by M. Dameris et al.

Anonymous Referee #2

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This paper details the effect of a very specific future scenario of CFC-11 on ozone recovery. It is a response to the recent measurements showing the CFC-11 values are not dropping as quickly as predicted by compliance to the Montreal Protocol and thus implying illegal emissions. It outlines this one simple scenario in sufficient detail and the paper is well written. However, it is severely lacking in answering the questions necessary to understand the effect of the newly discovered emissions (see below for details). Thus, I cannot recommend publication of this paper in anything like its present form. I suggest the authors rethink the scope of the problem and expand their study considerably.

General Comments

The recent paper of Montzka et al. 2018 makes a strong case that there are illegal
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emissions of CFC-11 presently occurring and that these have been occurring since 2012 and even perhaps earlier. This brings up many questions for future ozone recovery including (but not limited to): Have the emissions to date affected future ozone recovery; How much more would continuation of the present emissions to various end dates affect ozone recovery; What if the emission increased, what would that do to future recovery; What if there are banks of CFC-11 (and perhaps CFC-12) associated with the illegal emission; etc. The present paper does not address these questions in any detail. Instead it only addresses one simple scenario: if the mixing ratio of CFC-11 stays constant through 2050, what is the effect on ozone. This assumes that the emission rate of CFC-11 stays at a constant level slightly higher than any inferred emission estimated in Montzka et al. and that this emission stays constant for the next 3 decades. Ignoring that this scenario is unlikely to occur given the international response to this issue, the real problem with the paper is that so little of the problem space is explored. I see limited value in modeling one (unlikely) scenario in detail and ignoring all other possibilities.

I can only assume this choice was made because it is easy to implement in their model and it only took one new run. Unfortunately, the only question answered is that if a larger emission than inferred in Montzka et al. is continued for three decades it will have a negative effect on ozone recovery. This will surprise no one and in fact it can be predicted by computing the perturbation of EESC in 2050 by changing the CFC-11 mixing ratio between the ref value to the new value. This is a “back of the envelope” calculation. I expect much more of the problem space explored in a paper addressing the effect of illegal emissions of CFC-11 on ozone recovery and with a chemistry-climate model to use. As stated above, I recommend that the author team rethink the issues the Montzka et al. paper uncovered and take a real stab at helping answering them. It is necessary to frame the problem in terms of various possibilities for the emissions (and bank changes) and then from there predict mixing ratio scenarios and finally model time series. Only then can the reader understand the scope of the problem and the possible effects on future ozone.

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