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Ms. Title: Atmospheric Lifetimes, Infrared Absorption Spectra, Radiative Forcings and Global Warming Potentials of NF_3 and CFC-115

In the present work, the authors report experimentally determined IR cross sections for NF_3 and CF_3CF_2Cl (CFC-115) that they were introduced in two different radiative transfer models to calculate radiative efficiencies and forcings. In this framework, they simulated species' distribution by using a 3-D model (WACCM) and they calculated the atmospheric lifetimes, for both species, by employing a whole atmosphere chemistry-climate model. Finally, they estimated the global warming potentials (GWP) for NF_3 and CFC-115 and they compared the results with WMO, IPCC and SPARC reports, as well as the measured IR cross sections with the previously determined values.

Although there are several studies in the literature that estimate NF_3 and CFC-115 GWPs, the results and the approach used in this work contribute to better understand the significance of all the parameters that affect the climate impact of those emissions and thus they are worth to be published. However, the present reviewer believes that there are some issues that the authors need to clarify before the current submission would be in a publishable form. Comments and questions are listed in detail below:

Minor issues that will help though to improve the quality of the paper are:

1. Although *rate constant* is commonly used the term is not scientifically correct and should be replaced in the whole text with *rate coefficient*, since it is not a constant and varies with temperature at least.
2. All the sentences that start with *witch* and *where* should include a comma before that, i.e., ,*which*, throughout the manuscript.

Line by line and general comments that need to be addressed:

1. Pg 1.Title: Please include the formula in the title and use the CFC-115 in parenthesis, i. e., "…of NF_3 and CF_3CF_2Cl (CFC-115)".

2. Pg 3. line 21, Introduction: Please change "*trace gas depends in part on*" with "*trace gas depends**, in part,** on*"

3. Pg 5. line 16, Introduction: "*The purpose of this work was to determine **new values**….*": It is not justified that new values are needed, especially since there are many recent studies and panels evaluations that they have taken into account all of them. It is suggested to rephrase that sentence so as to be consisted with what has been actually done in this work, which introduce some new aspects, such as clouds impact in RE, RF and GWP and more complete atmospheric models to calculate NF_3 and CFC-115 distributions and atmospheric lifetimes. IR cross-sections has been measured previously and although it is worth to assess the validity of the existing data in the literature, it is not the major issue for the occurred divergences in GWPs. The new in the present work is more the different approach that examines the impact of other processes to RE, RFs, atmospheric lifetimes and GWPs, than the need for obtaining new values. Please modify accordingly.

4. Pg 6. line 14, Experimental: Is it 40000 or 4000 cm^{-1}.

5. Pg 6. line 17, Experimental: Although the relatively high absorbance for both compounds at the atmospheric window, i.e., 800-1200 cm^{-1} assist to have high sensitivity (signal to noise ratio) and reliable cross-sections in that range, is that also the case for the lower bands at shorter wavenumbers, with 128 co-added scans at 0.1 cm^{-1} resolution? How precisely those band strengths were determined?

6. Pg 6. line 21, Experimental: At a selected wavelength or at a selected wavelength range?

7. Pg 6. line 22, Experimental: How the concentration was determined? From the mixing ratios of the manometrically prepared bulbs and the measured pressure? What are the estimated uncertainties?

8. Pg 7. line 1, Experimental: Cross section units are cm^2 $molecule^{-1}$. Please correct.

9. Pg 7. line 4, Experimental: Although it might not be the case here in and no data are depicted to evaluate it, it is not uncommon to observe divergence from Beer-Lambert law at absorbance higher than 0.6. A of 1 corresponds to 90 % loss of the IR light intensity, which is not at the safe end of the Beer-Lambert linearity range. It is important to present cross-section plots in the supplement to demonstrate the validity

of the Beer-Lambert in the hole concentration range used. What was the intercept when the experimental data were fitted with a linear function?

10. Pg 7. line 19, Atmospheric Modelling: freeware instead of **free running version** might be more appropriate.

11. Pg 8. line 1-3 and 21-23, Atmospheric Modelling: Papadimitriou *et al*. (GRL, 40, 440-445, 2013) demonstrated that Lyman-α is an important loss process for NF_3 that account for the ~5 % of its total loss, while NF_3 UV spectrum temperature dependence leads to a~20 % increase of the globally annually averaged lifetime. The authors have neglected both processes and they definitely need to include a reasonable explanation why they have either neglect them or they considered that they will be of minor importance processes. Especially, since they have included in their model processes that have significantly lower contribution to the atmospheric lifetimes, such as mesospheric metals (Na, K) chemistry. The authors need to include the results from the recent studies and to rationalize why they have excluded these two processes or to include them in their model.

12. Pg 9. line 20, Radiative Transfer Modelling: Please change NF3 to NF_3 and CFC115 to CFC-115.

13. Pg 10. line 4-6, Radiative Transfer Modelling: see comment 11.

14. Pg 10. line 23, Results: Infrared Absorption Spectra: Please change "band-integrated cross sections" to "band strengths".

15. Pg 11. line 3, Results: Infrared Absorption Spectra: What are the quoted uncertainties and how they were derived? Are the precisions from the linear fit?

16. Pg 11. line 7-9, Results: Infrared Absorption Spectra: How did the authors estimate the total uncertainties? What are the sources?

17. Pg 13., Results: Atmospheric Lifetimes: A major source for the observed discrepancies, especially between the present results and SPARC report in NF_3 results may stem from the Lyman-α and UV temperature dependence ignorance in the present study. (*see comment 11*)

18. Pg 17. Line 3, Results: Cloudiness: Please change "…efficiencies increase by." with "…efficiencies were increased by…".

19. Pg 18. Line 15, Global Warming Potentials: Please change "…is more indicative." with "…is more representative…".

21. Pg 19. Line 21, Summary and Conclusions: Please change "…in line previous" with "…in line **with** previous…".

21. Pg 19. Summary and Conclusions: It is necessary the authors to comment on the effect of Lyman-α for both compounds studied in this work and the UV temperature dependence of the NF_3 spectrum on their atmospheric lifetimes and either rationalize why they have neglected them or they should include those processes in their models.

22. Figure 2. Remove ticks from mirror axes.