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Atmospheric Chemistry and Physics Discussions

Interactive comment on "CCl_4 distribution derived from MIPAS ESA V7 data: validation, trend and lifetime estimation" *by* Massimo Valeri et al.

Anonymous Referee #3

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Review of

CCl4 distribution derived from MIPAS ESA V7 data: validation, trend and lifetime estimation

Valeri et al

Overview

The paper presents the results of an analysis of the new MIPAS CCl4 product from the ESA processor. While opportunities for validation are limited the authors do exploit one of the strengths of MIPAS, which is a 10-year globally sampled dataset to draw conclusions on interhemispheric variation and trends. On the whole, the paper is a clearly-written and convincing and I have no major criticisms.

General comments

a) While there is a convincing trend (matching the ground stations) it would have been useful to apply the same trend analysis to a different molecule retrieved with the same algorithm (eg N2O?) which has no expected trend. This would help quantify the contribution of any calibration drift.

b) Of all the time-series fit parameters, it would have been helpful to indicate which ones were actually significant: the trend, constant and annual cycles are obvious from Fig 10 but what effect do the other terms have? Were they really needed?

c) Comparison with ground stations: is the assumption here that the CCl4 profile is expected to be constant with altitude all the way through the troposphere? It would have been helpful to show at least a modelled CCl4 profile to support this. However, the fact that the MIPAS data have a seasonal cycle while the ground station data do not suggests that these must be different air masses, in which case there is presumably also some age difference between the air sampled by MIPAS and the surface air which could explain some of the bias.

d) Given the data available, it is possible to calculate a *total* atmospheric content of CCl4, at least the partial column above some pressure surface, and provide the trend of this with time. This would be a much easier quantity for simple comparison with models or other satellite instruments without having to match details of pressure levels or latitude bands, also for stratospheric chlorine budgets.

Minor comments

P2 L5: It is not clear from the text whether CCl4 is an entirely anthropogenic gas or whether there is also some (small?) natural source.

P4 L19: If you mention 'oversampling the limb' you should explain what the size of the field-of-view is.

P4 L21: 8 rows for the FR AK, but only 7 for OR.

P7 Much of the text here us unnecessary as it is already in the Fig 3 caption.

P9 Presumably the effect is larger in the antarctic due to the stronger, more stable polar vortex?

P10 L6: Since the ocean is the major surface sink, and there is more ocean in the southern hemisphere, wouldn't an IHG be expected even in the absence of continued emissions?

P11 L5/Fig 6: since Fig 6 is effectively an annual average its difficult to argue which components are persistent and which are seasonal. Perhaps there's an alternative way of plotting the data to highlight the seasonal differences (eg shift the s.hemisphere data by 6 months before subtracting?)

P11 L14: I can understand why balloon instruments might have better signal/noise than satellite instruments since they can effectively take many scans of the same atmosphere, but I don't understand what is instrinsic to the balloon measurement that gives it high vertical resolution compared to satellites. Indeed the 1.5km spacing of MIPAS-B seems comparable to MIPAS.

P15 L12: Given that CCl4 is a relatively long-lived gas with no diurnal variation, and that both MIPAS and ACE-FTS obtain relatively uniform sampling in longitude, I wonder why you didn't simply compare zonal means of both datasets (interpolating MIPAS to the approrpriate latitude for ACE-FTS each day) rather than look for profile-by-profile coincidences which could contain a latitude bias or end up just selecting MIPAS ascending or descending node observations (with the associated GRAD error).

P15 L15: Again much of the text repeats what is in the figure caption, although it takes a while before explaining what I really wanted to know, which is the distinction between 'standard deviation of the mean' and 'standard deviation of the differences'. The former is just the latter divided by root(N), is that right?

P17 Eq(1): I agree with the approach but the term 'offset parameters' confused me -

offset relative to what? Perhaps just 'constant parameters'.

Typographic/grammatical comments

P1 L1: no need for capital C in 'Carbon tetrachloride'

P1 L12: 20-50 rather than 20/50 if this indicates a range of latitudes rather than a particular pair of latitudes P3 L9: Similarly.

P2 L33: Suggest 'limits' rather than 'edges'.

P3 L14: 'where' rather than 'were'

P15 L6: Suggest 'extends' rather than 'goes'

Fig 5: some vertical lines at the year boundaries would be helpful.

Fig 6: 'degN' for the latitude axis should presumably just be 'deg' here.

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