

## ***Interactive comment on “CCl<sub>4</sub> distribution derived from MIPAS ESA V7 data: validation, trend and lifetime estimation” by Massimo Valeri et al.***

### **Anonymous Referee #4**

Received and published: 30 March 2017

I think that this is a useful and important paper which is well suited to publication in ACP. There has been a lot of interest in atmospheric CCl<sub>4</sub> because of an apparent ‘budget gap’. An important sink term for CCl<sub>4</sub> is atmospheric loss and to evaluate our understanding of that process profile observations into the stratosphere are required. This paper presents such data from the MIPAS instrument which has the benefit of a lot of observations to average over.

I think that the paper can be published subject to my comments below.

#### **Main points**

1) Throughout the paper could benefit from a thorough proof-reading. There are some simple spelling errors that any spell checker should find. There are also some other sentences where the English is poor. The quality does vary through the paper (e.g. the

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abstract in particular had many typos). I have mentioned some below, but in addition the paper needs careful proof reading.

2) Stratospheric trends. A number of recent papers have shown that the trends in stratospheric trace gases are affected by variability in the stratospheric circulation. This has been shown for a number of halogen source gases and the complementary degradation products such as HCl and HF. This is bound to be playing a role in the stratospheric trends shown in Figure 11 and will be at least part of the explanation of why the trend does not simply follow the tropospheric trend (with a lag). I know there is mention in the Conclusions (page 26 line 5) but more should be added near Figure 11. It is a case of adding in some mention of past work. Examples to cite are:

Harrison, J.J., M.P. Chipperfield, C.D. Boone, S.S. Dhomse, P.F. Bernath, L. Froidevaux, J. Anderson and J.M. Russell, Satellite observations of stratospheric hydrogen fluoride and comparisons with SLIMCAT calculations, *Atmos. Chem. Phys.*, 16, 10,501-10,519, doi:10.5194/acp-16-710501-2016, 2016.

Mahieu, E., M.P. Chipperfield, J. Notholt, T. Reddman, J. Anderson, P.F. Bernath, T. Blumenstock, M.T. Coffey, S. Dhomse, W. Feng, B. Franco, L. Froidevaux, D.W.T. Griffith, J. Hannigan, F. Hase, R. Hossaini, N.B. Jones, I. Morino, I. Murata, H. Nakajima, M. Palm, C. Paton-Walsh, J.M. Russell, M. Schneider, C. Servais, D. Smale and K.A. Walker, Recent northern hemisphere hydrogen chloride increase due to atmospheric circulation change, *Nature*, 515, 104-107, doi:10.1038/nature13857, 2014.

Ploeger, F., Riese, M., Haedel, F., Konopka, P., Müller, R., and Stiller, G.: Variability of stratospheric mean age of air and of the local effects of residual circulation and eddy mixing, *J. Geophys. Res.-Atmos.*, 120, 716–733, doi:10.1002/2014JD022468, 2015.

3) Figure 6 does not make sense to me. Normally the N-S IHG is presented based on an average over the two hemispheres. How is Figure 6 constructed? Is it the difference between corresponding latitudes (e.g. 80S minus 80N)? That does not make sense as the high latitudes get more and more distant from the other hemisphere so the scope for

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differences is much larger. There is also less mass at high latitudes so the differences are not so important in a budget sense. I think that this figure is flawed and should be removed.

### Minor Points

Abstract line 1. Change 'strong' to 'potent'?

Page 1. Line 4. Typo: mystery.

Page 1. Line 6. Typo: photolytic.

Page 1. Line 9. Typo: anthropogenic.

Page 1. Line 12. 'proves' is too strong. Could change to 'gives confidence in' (or similar).

Page 1. Line 16. Change scan to scans?

Page 2. Line 1. ODP is ozone \*depletion\* potential.

Page 2. Line 6. Typo: hydrofluorocarbons.

Page 3. Line 4. Typo: where.

Page 3. Line 5. Here you could cite a recent paper on modelling the CCl<sub>4</sub> budget using the latest lifetime data and limited ACE CCl<sub>4</sub> data to evaluate the model stratosphere. The availability of more stratospheric data would help constrain such model studies.

Chipperfield, M.P., Q. Liang, M. Rigby, R. Hossaini, S.A. Montzka, S. Dhomse, W. Feng, R.G. Prinn, R.F. Weiss, C.M. Harth, P.K. Salameh, J. Muhle, S. O'Doherty, D. Young, P.G. Simmonds, P.B. Krummel, P.J. Fraser, L.P. Steele, J.D. Happell, R.C. Rhew, J. Butler, S.A. Yvon-Lewis, B. Hall, D. Nance, F. Moore, B.R. Miller, J.W. Elkins, J.J. Harrison, C.D. Boone<sup>17</sup>, E.L. Atlas and E. Mahieu, Model sensitivity studies of the decrease in atmospheric carbon tetrachloride, *Atmos. Chem. Phys.*, 16, 15,741-15,754, doi:10.5194/acp-16-15741-2016, 2016

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Page 3. Line 21. 'operation' (singular).

Page 3. Line 32. Change to 'allowing the study of the evolution of atmospheric composition in great detail'.

Page 4. Table 1. Spell out MW in the caption.

Page 4. Line 12. Change to 'includes only one out of every two'.

Page 5. Figure 1 caption. Specificity 'coloured solid lines'.

Page 5. Line 4. 'Apart from the "NLGAIN"...'

Page 6. Line 7. Do these errors 'cancel out' exactly? If not you should say something like 'largely cancel out...'

Page 7. Line 2. Typos: '...type of error, therefore, has no impact on the trend calculation'.

Page 7. Line 19. 'We do not show.'

Page 7. Lines 25-29. These lines are not clear to me. I think it is the use of the word 'compatible'. You should look into rephrasing this.

Page 8. Line 5. 'continuing for inertia'. This does not make sense and needs to be rephrased.

Page 8. Line 11. 'hemispheres' (small h).

Page 8. Line 12. 'troposphere' must be a typo? At 130 hPa high latitudes will be in the stratosphere.

Page 8. Line 14. Change 'notice' to 'note'.

Page 9. Line 7. Typo: 'transport'.

Page 9. Line 8. 'justify' is the wrong word. Use 'explain'?

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Page 12. Line 7. 'Further to'. 'simultaneously'.

Page 12. Line 20. 'incompatible'.

Page 13. Figure 7 (and 8). The caption should explain the red numbers on the left panel.

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