

***Interactive comment on “Global carbon tetrachloride distributions obtained from the Atmospheric Chemistry Experiment (ACE)” by N. D. C. Allen et al.***

**Anonymous Referee #1**

Received and published: 14 July 2009

Review of ‘Global carbon tetrachloride distributions obtained from the Atmospheric Chemistry Experiment (ACE)’ by Allen et al.

Comment: This is a fairly short paper that describes the distribution of carbon tetrachloride within the upper troposphere and stratosphere as observed by the ACE satellite instrument. Generally the paper is well written but I think a little more attention needs to be paid to (a) the ACE and MkIV balloon comparisons and (b) the derivation of the carbon tetrachloride lifetime. Once these issues and the minor items below are corrected the manuscript should be worthy of publication in ACP mostly since the carbon tetrachloride distributions are the first observed by satellite.

C2825

**Specific Issues:**

Abstract: Make it clearer that the ACE carbon tetrachloride distributions are within the upper troposphere and stratosphere. In addition, briefly state the results of the satellite and model comparison.

Page 13300 Line 25: How much does carbon tetrachloride contribute to the global chlorine budget (include a percentage estimate and a reference)?

Page 13301 Lines 7: Please provide the basic reactions of carbon tetrachloride within the troposphere/stratosphere.

Page 13301 Lines 9-11: This sentence is not very clear. Do you mean the cumulative loss into the oceans? Also, the lifetime of carbon tetrachloride was reduced to 26 years; reduced from what? Please clarify.

Page 13302 Line 1: What measurement technique was used to make the first atmospheric observations?

Page 13304 Line 9: Grammar. I’m sure a comma should be inserted after the Nassar et al. (2005) reference.

Page 13306 Lines 19-20: Style, for example: ‘...cloud tops to the balloon (35-40 km)...’ - am I to believe a balloon is as big as 40 km? Please rephrase this sentence to make it clearer.

Page 13307 Line 4: There is no mention of the location to which Figure 6 refers.

Page 13307 Lines 14-15: Apart, from Fairbanks the ACE and MkIV profiles agree fairly well in the troposphere. Please mention this.

Comment: With reference to the balloon comparisons, I think it would be beneficial to also compare ACE monthly or seasonal averages with the MkIV data rather than just averages over the entire 2004-07 ACE dataset. For example, compare ACE observations averaged over Sept 2004-07 with the balloon flights at Ft. Sumner or ACE

C2826

observations averaged over March-April-May 2004-07 at Esrange.

Page 13307 Line 23: The global atmospheric lifetime of carbon tetrachloride is given as 26 years, is the tropospheric lifetime the same?

Page 13308 last paragraph: Whilst the fall in carbon tetrachloride mixing ratios with altitude is the about same between the model data and ACE observations there is a clear offset between them, both in the stratosphere and troposphere, which is not discussed. Is this offset attributed to the carbon tetrachloride surface observations which are used to constrain the models? Are the models lacking any carbon tetrachloride sources or sinks, or chlorine photochemistry? More discussion is required here.

Page 13309 Line 19: Please define 'OCS' as carbonyl sulphide.

Page 13309 Equation 1: Please add that the VMRs are representative of concentrations in the troposphere not stratosphere. I also think a slightly more detailed analysis is required here, for example: (a) What tropospheric mixing ratio of carbon tetrachloride was used in the calculation of its stratospheric lifetime? What uncertainty was assigned to this value? (b) Does the curvature in Figure 10 arise from observations within different latitude bands? (c) How does the carbon tetrachloride lifetime vary with latitude? (d) How does the carbon tetrachloride lifetime change if newer estimates of CFC-11 and CFC-12 lifetimes are used (e.g., WMO 2006 report)?

Page 13310 Line 7: Please fully reference any previous estimates of the carbon tetrachloride lifetime.

Page 13310 Line 10: What were the estimates of the carbon tetrachloride lifetime from the GMI and AER-2D models?

Summary and Conclusions: The authors have shown some nice carbon tetrachloride retrievals from the ACE satellite but it is unclear to me what the 'take home message' of the paper is. For example, how do the ACE retrievals improve our understanding of carbon tetrachloride and chlorine chemistry within the atmosphere? Are there any

C2827

plans to assimilate the ACE observations into one of the chemistry-transport models? I think the 'take home message' needs to be more clearly stated in this section (and abstract accordingly).

Figures:

Figure 2: State where the average tropopause height is determined from.

Figure 4: The orange line for 45-60 S did not clearly print (after using two different printers). Please consider using a different colour.

Figures 5-7: Please remove the plot-titles from these figures as it is misleading (the ACE observations are not made from a balloon platform).

Typographic Issues:

Page 13300 Line 10 and elsewhere: 'equator' should be capitalized.

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Interactive comment on *Atmos. Chem. Phys. Discuss.*, 9, 13299, 2009.

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