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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Airborne measurements of HCl from the marine boundary layer to thelower stratosphere over the North Pacific Ocean during INTEX-B" *by* S. Kim et al.

Anonymous Referee #2

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Kim et al present interesting airborne measurements of HCl with CIMS abourd the NASA DC-8 and comparison of the data with model calculations (RAQMS). They argue that HCl in the UTLS can be used as tracer for stratospheric air. They found appreciable levels of HCl in the marine boundary layer but typically very small HCl in the free troposphere. The paper would have benefitted from a more thorough data analysis and a clearer discussion what the scientific news are. I am not sure that we can learn much from the comparison of data with the model. I suggest to publish the paper after minor modifications as detailed below and also some improvements to the discussion have been made.

p. 3564, l. 16: In table 1 this number is 105 ppt and not 140 ppt, please clarify.

p. 3564, l. 18: Using HCl + OH as the only mechanism to produce Cl radicals will lead to an underestimate of the Cl-radical concentration. See comment below.

p. 3565, l. 6: You might want to add more recent (and poss. more comprehensive) model studies here.

p. 3565, l. 7-8: I doubt that such high levels can be associated with N_2O_5 release of chlorine. This would have to be confined to fairly small coastal regions as recently shown by Osthoff et al (2008, Nat. Geosc.). HCl levels like this are most likely due to acid displacemnet.p. 3565, l. 19 - 21: Please double check if Keene et al (1999) really refer to the data by Graedel and Keene (1995), I thought they were using new/additional data.

p. 3565, l. 26: Maybe state explicitly that CH4 is the most important sink for Cl atoms (about 50% of its loss).

p. 3570, l. 15 - 18 and in conclusions: Are the Keene et al measurements and yours for comparable regions/seasons? If not you might be looking at real atmospheric variability here.

p. 3571, discussion of figure 7b: There seems to be a lot of "structure" in the plot. Could you gain more information by, for example, color-coding the data dots by altitude?

p. 3572, l. 2-4: What about sources of HCl? Cold they be incorrect?

p. 3573, calculation of [Cl]: I think this is probably a major underestimate as you assume that HCl + OH is the only source for chlorine atoms. You are neglecting all other sea salt derived compounds like Cl_2, BrCl which according to model studies (Sander and Crutzen, 1996, von Glasow et al, 2001, Knipping and Dabdub, 2003, Pechtl and von Glasow, 2007) are major production pathways for Cl. In brief: I doubt that you can use this calculation for more than a lower limit or coastal regions with off-shore flow of poluted airmasses where acid displacement would lead to HCl being

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the most important Cl compound by far (e.g. Keene et al., 2007)

p. 3573, l. 6 - 12: What MBL depth did you assume for this caluclation?

p. 3573, l. 20-21: Note that these measurements are from VERY different locations: clean Pacific vs. pollued Mediterranean.

p. 3574, l. 1: Is Spicer et al really a relevant reference here?

References:

Spicer et al was published in 1998 not 1997 (also in text).

Tables and figures:

Table 1: please add unit to "altitude".

Figure 8: What is the difference between the open and full dots?

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Interactive Comment