

## ***Interactive comment on “Uptake of gaseous formaldehyde by soil surfaces: a combination of adsorption/desorption equilibrium and chemical reactions” by Guo Li et al.***

### **Anonymous Referee #1**

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#### Overall Assessment

The manuscript titled “Uptake of gaseous formaldehyde by soil surfaces: a combination of adsorption/desorption equilibrium and chemical reactions” by Li et al. describes (1) the use of coated-wall flow tube experiments to determine the uptake coefficients of formaldehyde on soil surfaces under atmospherically relevant conditions and (2) provide a chemically sound rationale for observed temporal, humidity, and reactivity trends. The mechanisms proposed make chemical sense and provides a better understanding of natural processes of formaldehyde adsorption, desorption, and reactions that were previously only partly understood. This is a very nice paper and techniques used in this study are sound and well-described. In order to improve the clarity of the article, a more

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comprehensive description of the statistical methods used for data analysis would be helpful, especially how many replicates were used to determine the error bars. Also, a table of the uptake coefficients would further extend the utility of the paper as it would allow others to easily use this data for modeling. Specific comments are listed below, but the figures in general could be simplified to improve readability/interpretation.

### Specific Comments

p. 7, line 29: "They both gave explanations based on the Langmuir-Hinshelwood mechanism." A brief description of the Langmuir-Hinshelwood mechanism would be helpful here for the broad readership of ACP.

p. 8, line 34: "Among the inorganic oxides, silicon oxide is most abundant followed by oxides of aluminum, calcium and iron, with their contents (wt%) being ~64%, ~13%, ~6.3% and ~5.7%, respectively." I recommend rephrasing to be more cautious with assignments. EDX data is insufficient for determining mineralogical composition. Did the authors have other data to suggest that the Si, Al, Ca and Fe are due to oxides of these elements? Some of these elements can be present as carbonates or other minerals as well.

p. 10, line 15: One monolayer at 30% RH was also reported by Donaldson et al., 2014, so there is general agreement across very different soil types.

Figure 3 would be clearer if it was a plot of uptake coefficient vs. time displaying all three experiments on the same axes.

Figure 4 might be better displayed as four separate plots instead of two compound plots as the uptake coefficient data is buried in the formaldehyde trace.

Figure 6A seems to display too much data. If the authors could make two graphs like part B, one for 0% RH and one for 40% RH, that would be easier to compare.

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