

## ***Interactive comment on “Tropospheric sources and sinks of gas-phase acids in the Colorado Front Range” by James M. Mattila et al.***

### **Anonymous Referee #1**

Received and published: 12 June 2018

#### General Comments

Mattila et al. present measurements of gas phase acids from the BAO tall tower in Erie, Colorado. The novelty of this paper are the vertical profiles presented. The dataset and resulting manuscript are very brief but add in a substantial way to the existing literature on alkanolic acids. I think the paper should be published following the authors attention to the comments below:

1) The authors suggest that the strong gradient in formic acid could be sustained by O<sub>3</sub> deposition to the surface. Is this possible? Using an upper limit for O<sub>3</sub> deposition velocity and unit yield for formic acid production, is the surface flux large enough to sustain the concentrations seen here?

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2) The vertical profiles show a strong inflection point at 75m. It is not clear what is driving this. The authors should include some discussion of vertical mixing in this region that could lead to this. Further, I was very surprised that the vertical profiles look almost identical (if normalized to concentration at 250m) over the course of the day. It would be helpful for the authors to provide some discussion of why the profiles are so similar in morning, at noon, and at night.

3) It would be extremely helpful to also include paired vertical profiles for T, CO, NO<sub>x</sub>, O<sub>3</sub>, and H<sub>2</sub>O to assess the extent of vertical mixing during these profiles. I recognize that these measurements are discussed in McDuffie (2016), but it would be very nice to include the vertical profiles here as a reference panel in Fig. 3 for the profiles used in this study.

4) There is no discussion of the inlet used or inlet characterization in the manuscript. This should be included. What is the inlet transmission efficiency for these molecules and how was this corrected for? I also do not see a discussion in the supplement. In addition, how substantial is the water dependence in sensitivity and how was this accounted for? Is there enough of a gradient in H<sub>2</sub>O to make this important for the interpretation of the vertical profiles? There is mention of hysteresis that could be related to inlet transmission in section 3. This should be elaborated on.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-326>, 2018.

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