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Interactive comment on "The CU Mobile Solar Occultation Flux instrument: structure functions and emission rates of NH_3, NO_2 and C_2H_6" *by* Natalie Kille et al.

K. Sun

kang.sun@cfa.harvard.edu

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This work presents mobile measurements of the column abundance of NH_3, C_2H_6, and NO_2, which are highly innovative and could have strong impact on the satellite and in-situ sensing community. Hopefully my comments can contribute to improve this manuscript.

1. Page 4, line 108-109: ACE-FTS and MIPAS are not sensitive to the lower troposphere. Nadir remote sensing of ethane is extremely challenging because 3000 cm^{-1} is right at the gap between reflected solar short-wave radiation and emitted earth long-wave radiation. Ground-based SOF is arguably the only way to

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Discussion paper

directly quantify the VCD of ethane. The author may emphasize this point here or in section 3.5.

2. Page 5, line 114-115: The authors claim that "there currently is no attempt to characterize the sub-satellite ground pixel variability of VCDs for NH_3". The large pixel-scale variability of NH_3 near CAFOs has already been demonstrated by Sun et al. "Validation of TES ammonia observations at the single pixel scale in the San Joaquin Valley during DISCOVER-AQ", DOI: 10.1002/2014JD022846. The value of this work is directly quantifying the VCD without assumptions of vertical profiles.

3. Table 6: Eddy-covariance measurements of NH_3 flux have been performed in cattle feedlots just 30 miles away from the CAFOs sampled in this study, but in colder temperature (Sun et al. "Open-path eddy covariance measurements of ammonia fluxes from a beef cattle feedlot", DOI: 10.1016/j.agrformet.2015.06.007). The flux measured in November was 20 m^2/head $\times$ 36.7 μg/m^2/s = 2.64 g/hr/head, 25% of the summer flux reported in this study. Ammonia flux has also been shown to be highly temperature dependent. It will be interesting to consider the seasonality when comparing to the inventory.

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