

## ***Interactive comment on “The CU Mobile Solar Occultation Flux instrument: structure functions and emission rates of NH<sub>3</sub>, NO<sub>2</sub> and C<sub>2</sub>H<sub>6</sub>” by Natalie Kille et al.***

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### General comments:

This manuscript presents a general description of the University of Colorado mobile Solar Occultation Flux instrument consisting of a digital mobile solar tracker coupled to a Fourier Transform Spectrometer (FTS) and a UV-Visible Spectrometer (UV-Vis). The paper describes the characterization of the instrument with respect to the ILS. These spectrometers are used to measure the absorption of NH<sub>3</sub>, NO<sub>2</sub> and C<sub>2</sub>H<sub>6</sub> along the solar beam from a ground-based moving laboratory. Furthermore it demonstrates the first application of the instruments to characterize structure functions and quantify emission fluxes of NH<sub>3</sub>, NO<sub>2</sub> and C<sub>2</sub>H<sub>6</sub>. Collocated measurements next to a

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high resolution FTS at the National Center for Atmospheric Research were performed to check the precision and accuracy of NH<sub>3</sub> and C<sub>2</sub>H<sub>6</sub> for the low resolution FTS instrument. The manuscript gives an overview of the assessment of errors and biases in the vertical column density (VCD) of NH<sub>3</sub>, NO<sub>2</sub> and C<sub>2</sub>H<sub>6</sub>. The paper gives innovative measurement techniques which will be an added value to the satellite and in-situ community. Therefore I recommend it for the AMT publication with some minor additions as outlined below in the specific and technical comments.

### Specific comments:

I would appreciate if you could give the precision and accuracy of the NO<sub>2</sub> measurements with the UV-Vis spectrometer even though in section 2.1 and 2.3 you have made reference to the comparison paper made by Baidar et al., 2016.

A Stirling cooled detector has been used for the experiment; do you see any vibration related problems in your results? Perhaps a comment on this would be helpful for the reader in section 2.2

Page 13 Line 358: I suppose the error in the wind calculation cannot be divided by the sqrt of the number of days.

### Technical comments:

Page 3 Line 74: I would include the formula for acetaldehyde here.

Page 4 Line 110: I would include the full name of SCIAMACHY here.

Page 4 Line 111: for NO<sub>2</sub>

Page 5 Line 117: May be “Experimental setup” or “Experimental design” is better suited?

Page 5 Line 121: please mention the resolution of the FTIR here.

Page 5 Line 128: The instrumentation was mounted inside a trailer with the solar

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tracker placed on top of the trailer.

Page 5 Line 139: ... and N<sub>2</sub>O lines at UV-Vis wavelengths.

Page 6 Line 146: “to change the optical path difference” – this sentence is not so clear?

Page 6 Line 148: what is the temperature of the detector?

Page 6 Line 160: “The MCT spectra were background corrected” this sentence is repeated – see two lines above.

Page 6 Line 166: ... and water vapor taken from NCEP

Page 8 Line 197: Prior to field deployment, collocated measurements were performed with the mobile laboratory at the National Center for Atmospheric Research (NCAR) in Boulder, CO with a high resolution ...

Page 10 Line 267: ... variability is 50 % of the maximum value ...

Page 10 Line 273: I suggest giving a plot reference here.

Page 11 Line 298: While driving around a source area

Page 15 Line 391: ... a source point that is at a distance ...

Page 21 Line 583: The list of acronyms is not complete: for example you may add RD, NEI,

Page 38 Figure 1: I suggest labeling the components in the UV-Vis spectrometer and the mirror in the FTS spectrometer.

Page 41 Figure 4: Labelling of the X and Y axis are missing.

Page 43 Figure 6: Labelling of the X and Y axis are missing.

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