

Interactive comment on “A Cavity-Enhanced UV Absorption Instrument for High Precision, Fast Time Response Ozone Measurements” by Reem A. Hannun et al.

Anonymous Referee #2

Received and published: 22 September 2020

The paper offers a clear and concise description of a new, sensitive, and versatile instrument for the in situ detection of ozone via UV absorption. The small sample size/rapid flush rate and precision of the instrument enable flux measurements. Comparison/calibration with a reference standard in the laboratory, and comparisons with an established airborne instrument in the field establish its performance characteristics and accuracy. The paper is well written, reasonably comprehensive, and the instrument is a valuable addition to the suite of airborne ozone sensors.

Comments, but Mostly Questions:

1. Line 67 (also caption to Fig. 1) - is the light collimated and coupled via high-

C1

reflectivity mirrors, or do the high-reflectivity mirrors constitute the optical cavity?

2. Lines 75+ and 152+ - It is addressed, but I wonder if it is possible to be a bit more explicit here about what is measured (I_z and I ?), what is known (Rayleigh and ozone cross sections?) and what has to be empirically determined/calibrated (L_{eff} , which is set by mirror reflectivity)?

Also, how stable is mirror reflectivity over time? Do the I_z measurements at different pressures enable determination of L_{eff} in flight?

Are there other atmospheric absorbers in this region?

Does the Rayleigh scatter term depend upon the composition of the sample other than ozone, e.g., H_2O , CO , CO_2 ? Does the scrubber alter the concentrations of these species?

3. Lines 105+ - Is the cell surface treated to limit ozone loss? What material is the diffuser (FEP)? Does the particulate filter lead to ozone loss in the sample?

How do you verify the performance of the scrubber? Does its ability to fully scrub ozone depend upon flow rate, ambient pressure, ambient ozone concentrations?

4. Fig. 7 - Any thoughts on what led to the positive offset between ROZE and NO_yO_3 ? At $<1\%$ of mixing ratios at 20 ppbv it may not be worth worrying about.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2020-195, 2020.

C2