Response to Referee 2

Anonymous Referee #2

The authors describe a spectroscopic technique (DOAS) for measuring emissions of NOx and SO2 using a mobile monitoring platform. Compared to satellite-based techniques, the method used here has advantages including higher spatial resolution and the possibility of making multiple measurements per day. The mobile DOAS technique is used to measure NOx and SO2 emissions from industrial sources in Sarnia, which is in southwestern Ontario close to the US border. An interesting feature of this work is the use of a NOx analyzer which provided measured NOx/NO2 ratios, facilitating the estimation of NOx emissions from NO2 column measurements.
The authors should address the following questions before the manuscript is published in ACP.

Response: We thank Reviewer # 2 for their time.

Line 332: The Leighton ratio is calculated using measured NO and NO_2 concentrations, but the NO_2 measurement is likely to be biased high because of other nitrogen containing pollutants such as peroxyacetyl nitrate, other organic nitrates, and nitrogen containing acids that are included in the total NOx (and therefore also in the inferred NO2) concentration measurements. The authors conclude Leighton ratios provide evidence of peroxy radical-related deviations from the photo-stationary state relationship relating O3, NO, and and NO2 concentrations. Uncertainties in the NO2 measurement (calculated as NOx-NO) may also be a factor to consider.

Response – You are correct. We did not address this for the Leighton ratio, although we did address the potential bias in the NOx/NO2 ratio from these errors. We have now addressed the potential bias in ϕ but it does not change the interpretation. Clarifying text:

Section 3.3: *Even if we consider a potential bias of + 20% in the NO_2 measurements by the NO_x analyzer for reasons outlined in Section 3.2 (highly unlikely in a fresh NO_x plume), a + 20% bias in the Leighton ratio would still give (ϕ = 1.4-1.9).*

Footnote in Table 3: ***Note that Leighton ratios,** ϕ *, could be biased high by as much as +20% from the the NO_2 component of NO_y measured by the NO_x analyzer, but likely much lower due to it being a fresh urban/industrial NO_x plume.*

Lines 423 and Line 570: fix "Canada and Canada" reference formatting errors

Response - Fixed, should be ECCC.

Line 656: please add a URL for this reference.

Response - Fixed.

Additional references:

Davis, Z. Y. W., Frieβ, U., Strawbridge, K. B., Aggarwaal, M., Baray, S., Schnitzler, E. G., Lobo, A., Fioletov, V. E., Abboud, I., McLinden, C. A., Whiteway, J., Willis, M. D., Lee, A. K. Y., Brook, J., Olfert, J., O'Brien, J., Staebler, R., Osthoff, H. D., Mihele, C., and McLaren, R.: Validation of MAX-DOAS retrievals of aerosol extinction, SO_2 and NO_2 through comparison with lidar, sun photometer, Active-DOAS and aircraft measurements in the Athabasca Oil Sands Region, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2019-296, in review, 2019.