

Interactive comment on “A laser-induced fluorescence instrument for aircraft measurements of sulfur dioxide in the upper troposphere and lower stratosphere” by Andrew W. Rollins et al.

Anonymous Referee #1

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This paper reports on the development of a new instrument for airborne SO₂ measurements. The description focusses on the technical details. All required information about the performance of the instrument is given. The authors nicely demonstrate the applicability of the instrument for airborne measurements. The paper is well-written and fits perfectly the scope of the journal.

I have only few small comments:

The description of the measurement procedure to distinguish between fluorescence and background measurements is somewhat late in the paper. I would suggest to

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mention this earlier and to refer to the procedure more often (for example: p4 l13-16: mention how much the laser is tuned for offline measurements; p9 l32/33: mention how the zero is derived).

p8 l9: I would suggest to state the correction factor for the maximum SO₂ mixing ratio that was measured to give an expression of the impact of the correction factor. Does this correction add uncertainty in the measurement?

p10 l27/28: The authors mention that they assume no water vapor dependence, because this was not observed in an other instrument. Why was this not tested in laboratory experiments? This would be an essential and feasible test of the instrument performance. Is there no quenching by water vapor expected from the quenching constant of water?

I would suggest to move the paragraph p11 l23-33 after p11 l10, because this is exactly what the reader wants to know after having read the first paragraph on that page.

p12 l23: Was the change in sensitivity observed in a random way between two consecutive calibration measurement, or was there a trend during the flight? If this was random, how do the authors know that the sensitivity did not change randomly on a shorter time scale between two calibration measurements, so that a linear interpolation may not be justified? How does this variation for flight measurements compare to variations in laboratory measurements?

Figure 10: What do the error bars include? If they only give the precision of measurements, why are they larger than the variability seen in the measurements?

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