

Interactive comment on “Caution with Spectroscopic NO₂ Reference Cells (Cuvettes)” by Ulrich Platt and Jonas Kuhn

Anonymous Referee #1

Received and published: 6 June 2019

This manuscript describes the limitations of the use of NO₂ cuvettes for quantitative measurements. In the draft, the impacts of chemical processes occur in a NO₂ cuvette are assessed via analytical calculations alongside box model simulations. Generally, the manuscript is well written and presents an interesting topic. I recommend a publication after the authors need to address the following questions/comments.

Comments:

1. Line 40-43 (page 1): The bullet points should follow the sequence of the draft.
2. Line 12-20 (page 1): Why the case related to NO₂ is preferred? The selection needs some motivation.
3. Lines 11-16 (page 2): The use of anti-reflective coatings for windows of a cell is very

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common. What will happen in the case of coated surfaces?

4. Line 29 (page 3): The statement “NO₂ is a quite reactive gas” needs a justification (How?) or a reference.
5. Line 33 (page 3): I think the use of terminology should be ‘accuracy’ instead of ‘precision’. Since the contributions from further reactions will also be a part of accuracy.
6. Line 9 (page 4): To validate the statement “However, this is a slow process”, the reaction rate coefficient is required.
7. Line 22 (page 4): ‘k₆’ unit is missing.
8. Lines 7-40 (page 5): What will be the impact/importance of the reaction ‘R5’ on the NO₂ concentration?
9. Line 11 (page 11): How is it possible only for traces of water (but no other trace gases) to enter the cell? I think this line should be modified.
10. Line 21 (page 11): The value of ‘k₂₀’ is missing.
11. Line 31 (page 11): The assumption “all H₂O is ultimately converted to HNO₃” needs a reference.
12. Line 35 (page 11): What is and why ‘laboratory air’? Why not oxygen or synthetic-air? I think lines 34-37 need a realistic starting assumption.
13. Page 12: A separate column in ‘Table 1’ for references (instead of the superscript in column 1) will ease the reading process.
14. Page 14-15-16: The sub-panels of Fig. 4, Fig. 5, Fig. 6, and Fig. 7 should be labelled with the relevant pressure values. In Fig. 5, the scale for N₂O₄ (the top right and left panel) should be separate. For example, it can be done by plotting a separate y-axis (only for N₂O₄) on the right side.
15. Line 4 (Page 17): Duplicate pressure value needs to be removed.

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16. Line 5-6 (Page 17): The statement ‘initial O₂ was assumed’ contradicts ‘Line 22 (Page 17) and Line 1 (Page 18)’. Which one is true?

17. Line 2-5 (Page 18): The statement “there are no fundamental differences in the NO₂ time series between the simple model and the full model” is not understandable (what is referred?). A table, for the final NO₂ concentration at a fixed time interval (@ 300 s), would be helpful to summarize the comparison (simple vs full model).

18. Line 29 (Page 18): The wavelength for the photolysis (threshold) of NO₂ to NO conversion is required.

Interactive comment on *Atmos. Meas. Tech. Discuss.*, doi:10.5194/amt-2019-130, 2019.

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