

Interactive comment on “A cavity ring down/cavity enhanced absorption device for measurement of ambient NO₃ and N₂O₅” by G. Schuster et al.

G. Schuster et al.

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We thank this referee for his / her review. Our replies and indications of changes to be made to a revised manuscript are listed below.

Comment 1 The abstract clearly describes the instrument features and refers to the general aim of building an inexpensive and compact instrument. There are references in the paper to different detection methods (DOAS, ESR and other absorption measurement techniques), but not to their specific advantages and disadvantages. It is stated the "most of the available instruments" require expensive and/or bulky components, making them unsuitable for certain space/weight constraints. The paper does mention the instrument weight of 40kg and a cost of 20kEuro, but is not directly compared to other available instruments.

Reply Perhaps this statement was too provocative ? The size and weight of instruments similar in principal but operated but different groups varies greatly and detailed information about weight, size and power consumption are not generally accessible. In a revised manuscript, the statement that most of the available instruments require expensive and/or bulky components will be removed.

Comment Also, from the instrument design it follows that a vacuum pump is necessary at two points, and a rather high flow of about 13 std.l. has to be maintained, which would indicate that a powerful pump must be used.

Reply As the device operates close to atmospheric pressure small diaphragm pumps are sufficient to maintain the required flows. We omitted to mention this in the manuscript but will do so in the revised version.

Comment A clarification of the above issue, maybe also with a photo including rough dimensions, and more detailed information about the other instruments would improve the discussion about the instrument's performance.

Reply Photos of complex devices are rarely useful. As we reply to reviewer 1, we shall provide the rough dimensions and footprint of the instrument. We would prefer not to make a detailed comparison of the advantages and disadvantages of all the operational NO₃ / N₂O₅ devices; we do not see this as the task of this manuscript which aims to describe our new instrument for the first time. We shall however provide an overview of the detection limits reported by several groups working with NO₃ detectors (see also comment by J. Orphal).

Comment 2 Since the paper specifically addresses a newly built instrument, its most important parameters (sensitivity, time resolution, errors) should be mentioned in the abstract.

Reply OK, this will be done in the revised manuscript.

Comment 3 An interesting part of the optical setup is the use of a fabry-perot laser

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diode. It is mentioned in the paper that the diode has to be shielded from back reflections, even though the coupling to the cavity is off-axis. It is mentioned that an optical isolator will be used in the future to improve throughput, which asks for the question how much throughput the presently used irises allow for.

Reply Despite working off-axis, the protection against back reflections is necessary during laser adjustment. Initial tests with a home built optical isolator suggest that a gain of more than a factor of three in throughput will be achieved. We shall mention this in the revised manuscript.

Comment page 96, fig.4: In the upper panel, a NO₃ increase can be seen, while the lower panel does not show that. A comment if this is expected would be appreciated

Reply These data were taken at different times as indicated on the x-axis. Between 10:40 and 10:50 the NO₃ concentration in the SAPHIR chamber was clearly increasing, whereas between 11:40 and 11:50 any change in NO₃ is simply not discernible above the noise.

Comment Minor corrections:

page 68, line 21: [...] concentrations of NO₃... page 83, line 5: "reject" must be removed page 84, line 9: the "comma" must be removed page 84, line 15: the ")" must be removed page 93, fig.1: The "P" should be explained (possibly a pressure transducer) page 98, fig.6: [...] (open circles on the 21st, solid circles ...), add a comma here page 102, fig.10: I believe that the state is called "Hessia" or "Hesse" (Hessen is the german word)

Reply Typographical errors will be removed in the revised manuscript.

Interactive comment on Atmos. Meas. Tech. Discuss., 1, 67, 2008.

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