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Atmospheric Measurement Techniques Discussions

Interactive comment on "A cavity ring down/cavity enhanced absorption device for measurement of ambient NO_3 and N_2O_5" *by* G. Schuster et al.

Anonymous Referee #2

Received and published: 25 September 2008

Referee comment on: A cavity ring down / cavity enhanced absorption device for measurement of ambient NO3 and N2O5

General comments:

This paper describes a newly built instrument for the optical detection of NO3, with additional capability to heat the inlet so existing N2O5 will dissociate to NO3 and thus can be measured as well. The instrument uses two optical techniques, Cavity Ring Down (CRD) and Cavity enhanced absorption (CEA). First measurements from ambient air and an environmental chamber are described.

The paper addresses issues regarding the NO3 and N2O5 assessment in an instrumental device. The optical detection concepts itself are not new and widely used for

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trace gas detection; however, there are few instruments capable of using two techniques at the same time. Of special interest is (preliminary) data from an intercomparison campaign, whose final results will be published elsewhere. Findings are mostly related to the instrument sensitivity, its calibration and N2O5 and NO3 handling issues. The description of the instrument and its critical parts should allow for its reproduction, and the measurements are described clearly. The authors refer to related work when using formulas and results. In summary I recommend the paper for publication with only minor issues.

Specific comments:

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. 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.

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.

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

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

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be used in the future to improve throughput, which asks for the question how much throughput the presently used irises allow for.

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 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

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)

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