

Interactive comment on “A liquid nitrogen-free preconcentration unit for measurements of ambient N₂O isotopomers by QCLAS” by J. Mohn et al.

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We are grateful to Reviewer #3 for taking time to comment on the manuscript. The comments have been addressed in a point-by-point manner, as detailed below.

General

1. Comment: This paper reports a sophisticated N₂O preconcentration device which is applicable to laser spectroscopy and other concentration/isotope analytical system for trace gases. Although it is developed using not brand-new techniques, it would be useful for many scientists and therefore worth publishing. I hope the authors also present

C1360

supplemental information such as software codes together this paper or elsewhere, if they can.

Reply: The authors are willing to share additional information and anyone interested in hardware/software details should contact the corresponding author.

Detail

2. Comment: p. 3105: How did the authors remove less volatile components which could be trapped together with N₂O? I think they could be retained on the adsorbent at -50°C and interfere with quantitative trapping of N₂O or QCLAS analysis of later runs.

Reply: The authors agree that less volatile compounds could accumulate on the HayeSep D trap and thus could interfere with quantitative N₂O trapping on the long run. Reproducible starting conditions should be established during phase I (p. 3104, l. 24-27), however, to assure complete desorption the trap temperature has to be increased. The following changes were made on p. 3104, l. 26-29: ... and heated to approx. 100°C (phase I). This phase assures the absence of residual trace gases on the preconcentration trap and reproducible starting conditions.

3. Comment: p.3106, l. 25-26: What kind of correction was applied?

Reply: The spectra were baseline corrected as mentioned on p. 3106, l. 25-28.

4. Comment: p. 3114, l. 3-5 and Fig. 5: Are "preconcentrated ambient air" and "gas matrix after preconcentration" the same? If N₂O in ambient air is concentrated by the preconcentration device, it should of course contain N₂O. I am confused whether the black curve in Fig. 5a shows perfect recovery of N₂O (thus no N₂O in the residual matrix) or amount of N₂O in the ambient air is very small even if it is concentrated by the de-vice.

Reply: The authors agree that the terms "preconcentrated ambient air" and "gas matrix after preconcentration" are not correct in this context. The following changes were made on p. 3114, l. 1-5 and Fig. 5: A hypothetical absorption spectrum of spectro-

scopically interfering components was generated, based on the analyzed output concentrations and typical conditions employed for QCLAS measurements (Sect. 2.1.3). To obtain a meaningful representation, the spectrum of interfering components after preconcentration of ambient air was multiplied by a factor of 1000 (Fig. 5), . . .

Fig. 5. (a) Simulated absorption spectra of N₂O and spectroscopically interfering components after preconcentration of ambient air (magnified by a factor 1000). (b) . . .

5. Comment: p. 3122 Fig. 1: What is the function of "nafion 2"? Is it necessary?

Reply: The authors agree that the figure is not consistent with the text. In fact, nafion 2 was not used in the experiments presented in the paper as water is already removed by the first nafion drier and a chemical trap filled with Ascarite and Mg(ClO₄)₂. Figure 1 was modified accordingly.

Interactive comment on Atmos. Meas. Tech. Discuss., 2, 3099, 2009.