

Reply to the reviewer #1

Reviewer's comment is typed in blue, authors' response is typed in black, and the change in the revised text is highlighted with red.

The manuscript describes a new and very sophisticated method for measuring N₂O from a broad range of concentrations with very high precision. The manuscript is well written, the method is sound and useful, therefore I suggest to accept the manuscript for publication. However, there are some minor issues the authors should address before final publication:

We thank the reviewer for his/her careful reading and constructive comments. We have revised the manuscript according to his/her suggestions.

1. When describing the setup in the text, the authors should refer to the abbreviations used in Fig. 1 (e.g. p3, lines 15 you should detail that the “multi-position six-port valve” is SV1 in the Figure, and accordingly with all elements throughout the text)

Relevant sentences in sections 2.1-2.4 have been revised as suggested.

2. P3, line 20: to me (a non-native speaker) ss is more common than SUS for stainless steel
Corrected.

3. P4, line 2: if I understand this correctly, EITHER V1 and V2 OR V3 and V4 are closed.

We have revised the sentence as follows:

When the pressure agrees with the pre-calculated value within $\pm 5\%$, either V1 or V3 (when sample is analyzed, Fig. 1) or V2 (when standard gas is analyzed) and V4 are closed, the pressure is recorded, and the injected sample amount is calculated.

4. P4, line9: please which concentration trap you refer to here (is it T1?)

Yes, the sentence has been revised.

5. P4, line 13: I might have missed something, but do you detail how/how often the molecular sieves and charcoal are renewed/cleaned?

We have not yet renewed the purification column since its installation in 2015, but it can be cleaned by heating with a flexible heater when system blank of CO₂ or N₂O increases to a significant level.

6. P4. Line 15: V15 is open already at this moment

No, V15 is closed until this moment (see Fig. 2). By the way, we made a minor correction to the sentence related to the switching of SV2 (P4, Line 11-12) :

First, the concentration trap is purged with ultra-pure He (> 99.9999%, Japan Air Gases Ltd., Tokyo, Japan) at 100 cm³ min⁻¹ for >10 s by switching SV2 to the “inject” position.

7. P6, line 27: should turbular be replaced by turbulent?

Corrected.

8. Figure 3: Please use kPa (not Torr) for all pressure readings

Corrected.

9. Figure 3: Please specify what “n meas” and “n meas1” is exactly

“n_{meas1}” is found to be unnecessary and deleted. We have added explanations for “n_{meas}”, “n_{meas(j)}”, v_s , $P_{\text{calc}(i)}$, and $PG2_{\text{calc}(i)}$ in the figure caption.

10. Figure 3: Please use different abbreviation/symbol for Volume and Valve. Using V for both is very confusing. Please also make sure that this (new) denomination is consistently used throughout the manuscript

Symbols for volume have been replaced with "v".