

## ***Interactive comment on “Intercomparison of fast response commercial gas analysers for nitrous oxide flux measurements under field conditions” by Ü. Rannik et al.***

**Ü. Rannik et al.**

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Received and published: 31 October 2014

We thank the referee for encouraging and positive comments. We believe the scientific community benefits from this evaluation of the instrumentation and methodology of calculation of nitrous oxide fluxes, which despite of recent advances of the instrumentation, are frequently still on the detection limit of the systems and therefore further development is needed.

Below the referee's specific comments follow. We hope that our response satisfactorily addresses the raised matters.

Sincerely,

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Üllar Rannik

P11753 Could the authors add some information (one sentence) about the calibration of all instruments, not only for the IRGA and pulsed QCL?

In the beginning of the campaign the instruments CS-TDL and AR-CW-QCL were calibrated. The factory calibration of LGR-CW-QCL was checked but no deviation was observed within the uncertainty range of the calibration gases.

No calibration was performed during the campaign for the Continuous Wave analysers. These analysers are very stable according to manufacturers' and also according to the current study. The concentrations measured by these two instruments were very consistent throughout the campaign and the slope (sensitivity) of the 30 min average concentration comparison did not deviate from unity by more than 5%. Also the absolute levels of the concentrations detected by these two instruments were very close.

The operating parameters of CS-TDL, such as laser current and laser, housing and detector temperatures were checked and adjusted once a week and after power failures. In addition, the shape and intensity of the absorption line were checked at the same time. These checks were assumed to guarantee calibration stability of the instrument to a reasonable degree. Nevertheless, the instrument is known for low frequency signal variation dominated by offset drifts (fringe effect), therefore accurate measurement of absolute concentration by this instrument over a long period of time cannot be expected.

As stated in the MS, AR-P-QCL was calibrated every 2-3 weeks during summer with two standard gases 299 and 342 ppb. The calibration slope did not change by more than 7.6% throughout the campaign and maximum 6.1% between consecutive calibrations. Thus 6.1% can be considered as the maximum flux error arising from calibration accuracy of this instrument. Nevertheless, the correlation of the 30 min average concentration measured by this instrument as compared to AR-CW-QCL was not as good as among two Continuous Wave analysers letting to conclude that the instrument was

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not able to measure the absolute concentrations as accurately.

P11759 L11 “the” is missing before method

Inserted.

P11759 L16-20 the sentence is not entirely clear. “higher values” refers to what?

The average higher value refers to 0.15 s obtained from CO<sub>2</sub> signal analysis over several other periods than the high flux period. The sentence was clarified as following:

The N<sub>2</sub>O signal was synchronised with CO<sub>2</sub> by using the lag determined for CO<sub>2</sub> and theoretically N<sub>2</sub>O response time does not differ from that of CO<sub>2</sub> under turbulent tube flow regime, hence we choose the constant value 0.15 sec for co-spectral corrections throughout the campaign for this instrument.

P11760 L8 “the” before expression

Inserted.

P11760 L18 I guess this is for H<sub>2</sub>O: could you repeat it in the text?

Yes for H<sub>2</sub>O, repeated for clarity.

P11760 L19 lines (plural)

Corrected.

P11760 L24 delete “frequency”

Deleted.

P11760 L26 add “the” before sampling.

Added.

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Interactive comment on Biogeosciences Discuss., 11, 11747, 2014.