

Interactive comment on “Technical Note: Simultaneous measurement of sedimentary N₂ and N₂O production and new ¹⁵N isotope pairing technique” by T.-C. Hsu and S.-J. Kao

Anonymous Referee #1

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GENERAL

This manuscript presents a revised version of the IPT calculations that uses the production of both N₂ and N₂O, validates this new ITP method and gives a modified analytical method for the simultaneous measurement of N₂ and N₂O from the one sample.

The analytical method is a nice addition and publishable. The new IPT calculations are also a nice addition and publishable, but only after further validation. The manuscript also presents an excellent review and discussion of the assumptions of the ITP technique.

Only one validation experiment in the dark was done. Most of the environments where
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this technique will be applied, including the site where the authors did their validation, would contain benthic microalgae (BMA). As such, I would like to have seen a light and dark validation to make the technique more broadly applicable (see also comment on assumptions re: BMA below). More importantly, a N₂O yield of 66% is exceptionally high, and the estimate N₂O production rates didn't match the directly measured N₂O flux. Although the authors did discuss both these issues, they highlight that the technique requires more validation. It would also have been nice to have done a validation on subtidal sediment and compared to directly measured N₂ fluxes across the sediment water interface. The authors would then have validation of both the N₂O and N₂ fluxes. Due to the inclusion of N₂O perhaps the two techniques would compare better than previous comparisons between ITP and N₂:Ar that found IPT underestimated denitrification (e.g. Ferguson 2007. MEPS 350, 19; Gihring 2010. L&O 55, 740).

SPECIFIC

The whole manuscript needs to be edited for expression and grammar. I haven't made these corrections.

p. 6863. L. 19. See Dong 2006. L&O. 51, 545. Who did dual measurements of N₂ and N₂O.

p. 6864. L. 5. Need to make it clear that the did not take N₂O into account for denitrification, as some did measurement N₂O.

p. 6874. Its not clear how many times the time series was sampled- start and end point only?

p. 6876. L. 25 . see Dong 2006. L&O. 51, 545.

p. 6880. Section 4.4. Should also consider production of N₂O from co-denitrification see Spott 2011. Soil Biology and Biogeochemistry 43, 1995.

p. 6881. L.3. Welsh 2001. Marine Biology 139, 1029. found N₂O production from DNRA in the field.

p. 6885. Assumption 6. You need to consider the effect of the $^{15}\text{NO}_3$ addition on the stimulation of BMA production, which may reduce nitrification, due to competition for $^{14}\text{NO}_3$, particularly if this technique is to be used in the light, although BMA can still consume NO_3 in the dark.

Assumptions. What is the effect on N-fixation on this technique? What if the added ^{15}NO stimulated heterotrophs, sulphate reducers which can fix N?

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