

Interactive comment on “Estimation of nocturnal CO₂ and N₂O soil emissions using changes in surface boundary layer mass storage” by Richard H. Grant and Rex A. Omonode

Anonymous Referee #1

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Observations of turbulence and gas concentrations over a flat, agricultural terrain are analysed in this manuscript and show that gas accumulation in the nocturnal boundary layer can provide reasonable estimates of CO₂ and N₂O emissions. The site, meteorological conditions, and measurement installations were ideal for this approach. The results clearly show potential and limitations of the technique. In this sense, the study makes a useful contribution to the journal.

The only major addition I would like to propose is a broader discussion of the technique in the context of other techniques used to estimate gas exchange between land and atmosphere. In particular, I would like to see a comparison with the eddy covariance

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and the radon mass balance techniques (e.g. Biraud et al., 2002, Tellus, 54B, 41-60) in terms of their precision and the scale of the observed ‘footprint’.

Minor issues

Title: instead “. . .using changes. . .” perhaps “. . .from changes. . .”?

Page 2, line 12: “. . .mass accumulations are reported for CO₂, CH₄, N₂O, and H₂. . .” Since H₂ is consumed by soil microorganisms, I would expect H₂ concentrations to decrease in the nocturnal boundary layer, not to accumulate.

Methods: Please show coordinates of the experimental field, or at least tell the reader in which country, near which town, it is located.

Page 3, line 30: “measured”, not “measure”

Precision of reported fluxes, e.g., page 7, line 15, and Table 4: How meaningful is it to report the value of a mean flux to the second digit after the decimal point, when the standard deviation is larger than the mean itself?

Mass accumulations, first paragraph: Were the comparable fluxes cited here done in a similar climatic region, with similar land management (e.g. N fertilisation)?

Page 8, line 29: The first sentence in this line states a trivial fact and can be deleted.

Page 9, Discussion of lower N₂O accumulation compared to chamber fluxes: Another possible explanation is that chamber fluxes were measured during the day, when soils tend to be warmer than during the night. Other parameters being equal, N₂O flux from soil increases substantially with soil temperature.

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