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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Diurnal fluxes of HONO above a crop rotation" *by* Sebastian Laufs et al.

Anonymous Referee #1

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This is an interesting manuscript; it presents some valuable information and discussion on HONO sources over an agricultural field site. It is suitable for publication in ACP. Here are my general comments and questions:

It is surprising that microbial nitrite formation in the soil is only a minor contribution to the overall HONO emission from the ground; it is expected to be a major one over actively farmed and heavily fertilized areas such as the study site. Were soil acidity/alkalinity and nitrite content measured during the campaign? Soil (and the ground surface) acidity/alkalinity is one of the most important factors controlling the direction and the rate of HONO exchange between the air and the soil (and the surface).

The authors should assess and discuss the contribution from ground emission to the overall HONO budget in the atmospheric surface boundary layer. Based on my very rough calculation, this contribution is ∼30% at the noontime, assuming [HONO] ∼ 200 pptV, J(HONO) ∼ 1.1×10-3 s-1 (∼15 min photolysis lifetime), F(HONO) ∼ 5×1013

molec m-2 s-1, and a surface mixed layer height of ∼30 m. The vertical mixing is enhanced by surface heating during the day in summer, and HONO emitted from the ground surface may be transported up to several hundreds of meters above the ground level within its photolysis lifetime.

The measurement data of each campaign were lumped into 24 1-hr diurnal averages and then the fluxes were calculated. The authors argue that this averaging process reduced the errors of measurements for each parameter. However, a lot of detailed and valuable information was lost. If the data were averaged for each 1-hr interval, not lumped over the whole campaign, the authors may not need to filter out those "high-noise" data points and may be able to see real changes in HONO exchange direction and magnitude with many environmental factors during different events (e.g., rainy vs sunny, clean periods vs pollution episodes, . . .).

Specific comments:

P13, L475: "nigh-time" should be "nighttime".

Figs. 3 and 4, HONO gradient: HONO concentrations were measured at two heights; which one is shown in the figures? One important parameter in HONO flux calculation is the difference in HONO concentrations at the two heights (Δ[HONO]). Please plot the concentrations at both heights or the Δ[HONO]. The precision of F(HONO) is directly dependent on how significant the difference between the two concentrations; the difference between two similar numbers would result in a small number with a large relative uncertainty (i.e., σ(gradient) » Δ[HONO]). Readers need the information to assess the accuracy of the calculated F(HONO).

Fig. 6: Several high F(HONO) data points for the morning hours should probably removed, since they may be caused by the release of trapped nitrite in dew (p 14, L 500-503). The removal of these odd data points seems to significantly improve the correlation between F(HONO) and T(soil). Would the improved F(HONO) - T(soil) correlation suggest that soil emission (from microbial nitrite formation) may be more

important after all?

Fig. 6 caption: check the equation; a left bracket is missing.

Supplemental, L7-10: Why both equations (S1) and (S2) are under “unstable conditions”? One should be for stable and the other for unstable conditions. Please cite the reference for each condition.

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