

## ***Interactive comment on “Emission of nitrous acid from soil and biological soil crusts represents a dominant source of HONO in the remote atmosphere in Cyprus” by Hannah Meusel et al.***

### **Anonymous Referee #1**

Received and published: 9 June 2017

In this manuscript, the authors presented laboratory-determined emission rates of HONO and NO from soil and biological soil crust samples collected from arid and semi-arid environments in Cyprus, and extrapolated the results to the ambient conditions. The data and results presented are useful and are suitable for publication in Atmospheric Chemistry and Physics. However, the authors need to address the following comments before I could recommend the acceptance of this manuscript for publication:

General comments:

I am concerned about the validity of extrapolating the laboratory results to the ambi-

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ent conditions in this study. The soil and biological soil crust samples were stored at room temperature for up to 15 weeks before some of the experiments were conducted. The samples might be deteriorated during the storage, and by the time of experiments in the laboratory, their chemical (nitrite) and biological (chlorophyll and microbial population) characteristics might be quite different from those under ambient condition. Furthermore, the laboratory experimental conditions were very different from those of the ambient, e.g., air and soil temperature, humidity, and their daily cycles. And finally, while the soil was always a HONO source in the laboratory dynamic chamber since dry zero air was flowing over the soil sample, it could be a net sink for HONO in the air under ambient conditions, for example, during the morning hours when RH is high and a significant level of HONO is present.

While there is no doubt that HONO emission from soils could be an important source of atmospheric HONO under certain conditions, the results from this study should be considered as qualitative, and the actual contribution need to be verified and determined by field studies including flux measurements under ambient conditions. Two recent such measurements suggest that soil emission was not be a significant HONO source in boreal forest (Oswald et al., 2015) and at agricultural field site (Laufs et al., 2017).

I would suggest the authors to add a figure to show diurnal plots of surface temperature and RH (from Figures 2C and 2D), extrapolated HONO and NO emission rates (from Figures 3 and 5, and RH information), and HONO and NO concentrations measured during the CYPHEX field study. Comparison of the diurnal variation patterns of extrapolated HONO flux and ambient HONO concentration should provide us with some insight into the potential importance of soil HONO emission as a HONO source over the day.

Specific comments: Page 4, section 2.4 Trace gas exchange measurements: how was a sample placed into the chamber and what was the thickness the sample. The information would help readers in understanding the data presented.

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Page 7, section 3.3 NO and HONO flux measurements: Is the unit of  $\text{ng m}^{-2} \text{s}^{-1}$  based on the area that a sample (25-35 g) occupied in the field? Or is it based on the area of the sample occupied in the flow chamber? The authors need to explain how these parameters were derived from laboratory results, even if the method has been discussed in previous papers by the authors.

Figure 5: Would the flux behavior be the same if the experiment is done reversely, i.e., flowing humid air over dry soil. This information may be important to understand if soil HONO emission is important HONO source in the evening and night.

References Oswald, R., et al., A comparison of HONO budgets for two measurement heights at a field station within the boreal forest in Finland. *Atmos. Chem. Phys.*, 15, 799-813, 2015. Laufs, S., et al., Diurnal fluxes of HONO above a crop rotation, *Atmos. Chem. Phys. Discuss.*, <https://doi.org/10.5194/acp-2016-1030>, in press, 2017.

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Interactive comment on *Atmos. Chem. Phys. Discuss.*, <https://doi.org/10.5194/acp-2017-356>, 2017.