

Interactive comment on “Dynamics of nitrogen oxides and ozone above and within a mixed hardwood forest in Northern Michigan” by B. Seok et al.

Anonymous Referee #1

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This study describes a study of vertical profiles of ozone and NO_x sampled through an inlet manifold with ports at six different heights over the course of several months at a remote site in northern Michigan. The different inlets were sampled sequentially with standard instrumentation. In part the profiles were used to investigate a consistent observation of early-morning NO_x increase. To understand the dynamics of this variation, a vertical canopy exchange model was used to test the sensitivity of ground-level NO_x to various mechanisms that could account for this consistent morning spike. The model results suggest that soil NO_x emissions are not sufficient to account for the observations but that some local phenomena associated with foliar NO_x exchange could contribute to this behavior. There are many things unknown about this exchange that

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warrant further investigation.

Detailed comments 32519 L.25 While it is true that NO_x is a large fraction of NO_y in urban areas, this sampling site is far from urban. How can the authors justify using the catalytic channel of the TEI instrument as a measure of NO_x? Wouldn't it be some fraction of total NO_y? 32520 L.8 It would be clearer if the 5% accuracy error is specified as analytical accuracy and not overall measurement uncertainty. Does this value hold for both NO and “NO_x”? 32521 Bias in sampling line: how important was NO_x photochemistry inside of the PFA tubing? The lower inlets that were coiled inside the building experienced less sunlight. How does this bias correction factor into overall uncertainty of the measurement? 32522 L.22 The dynamical behavior of gases through the canopy are going to be influenced by in-canopy turbulence and air movement. How do the authors justify using above-canopy processes such as boundary layer dynamics and cloud formation to simulate in-canopy behavior, i.e. assuming that canopy acts as a uniform source of soil or foliar emissions. Can the importance of canopy-scale movement be addressed? 32523 L.20 The Zhou et al. reference is different from the one listed in Table 1. 32526 L.22 Is the buildup of BVOC inside the canopy an observation or an inference? It is discussed here as though it is commonly seen in this forest. 32526 L.26 Is there evidence of a canopy layer in this forest even in the winter? 32528 L.25 Does the “spatial and temporal evolution” refer to vertical motion or also some measure of horizontal composition? 32528 L.27 typo “suggests” 32528 L.28 It appears the authors are inferring process from correlation. I think they might want to be a bit more circumspect 32530 L.16 I'm not sure I follow the logic that the lack of large-scale sources of NO_x in the region, the morning peak cannot be local. This is an important assertion but it's not clear that it follows from the data. 32530 L.25 I wonder if the treatment of timing for the NO_x peak is oversimplified. Figure 4 shows that the NO_x begins to increase before sunrise on most days. 32533 L.0 Is the disagreement of model and observations related to the fact that the authors are not measuring NO_x per se, but a fraction of NO_y? 32534 L.27 While it appears that soil NO_x emissions have little influence in the model, it's not clear how to understand the spatial variation in this

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value given that Nave et al. reports a value 10x lower than the one used by Alaghmand et al.

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