Interactive comment on “Application of thermal dissociation-laser induced fluorescence (TD-LIF) to measurement of HNO₃, Σalkylnitrates, Σperoxy nitrates, and NO₂ fluxes using eddy covariance” by D. K. Farmer et al.

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We thank Drs. Neftel, Amman and Spirig for their insightful comments, and for continuing the discussion we raise in the paper regarding our summer flux observations at Blodgett Forest. The data presented were intended merely to provide enticing examples of the potential of this instrument to make new contributions. A complete discussion of our proposed mechanism for HNO₃ production in the canopy required a separate manuscript. The basic idea is that the upward HNO₃ fluxes are not driven by NOₓ emissions into a constant field of OH, but rather that OH is higher within the canopy than above, driving HNO₃ production and thus an HNO₃ gradient causing an
upward flux. We do not attribute the HNO$_3$ fluxes to conversion of soil NO to HNO$_3$. As we mention in this paper, and will discuss in forthcoming papers, we suggest that soil emissions of NO react with O$_3$ to produce NO$_2$, and thus influence the emission of that species. Neftel and colleagues are correct in their calculation that the available time is too short for the emitted NO$_2$ to produce the HNO$_3$ gradient responsible for the entire flux. Thus we argue that there is no reason to expect the ratio of NO$_2$ to HNO$_3$ fluxes to be any particular value as the mechanisms controlling these fluxes are different. Namely, the NO$_2$ flux is likely driven by soil NO emissions reacting with O$_3$, while the HNO$_3$ flux is driven primarily by an OH gradient and the competing processes of deposition.

Regarding the more technical comments, we will clarify the wording of our lagtime calculation in a revised manuscript, as our calculation method matches Referee 1’s suggestion. We agree with Dr. Neftel that spectral analysis may be used to think about fluxes, and have been considering how to use the observed ogives to provide information on the processes involved. We are preparing a manuscript on this topic, and welcome Dr. Neftel’s ideas and discussion on this matter.

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