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Interactive comment on "Influence of meteorology and anthropogenic pollution on chemical flux divergence of the NO-NO2$-O_3$ triad above and within a natural grassland canopy" *by* D. Plake et al.

Anonymous Referee #1

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Plake et al present the results of a short campaign to observe concentration profiles of NO, NO2 and O3 within and above a grass canopy. The data set is interesting and relevant and fills a gap in understanding an important land class for which we have relatively less information about exchange of reactive trace gases. Besides noting that grasslands are a globally important surface type it may be worth mentioning that they are in particular very abundant adjacent to major sources of NOx emission. Roads are lined by grass and not by forest.

Overall, this is a well-executed measurement campaign and good presentation of the

data. There are some places where minor additions to clarify missing details would be improve the manuscript and some additional points to consider in the data interpretation.

Page 10742 It would help to say just a little more about the main instrument methods here. Consider adding a few sentences that summarize the most important features of the primary measurements and refer to prior papers for the details. The measurement time scales are especially important for the analysis in this paper so there should be some mention about integration times for the various analyzers. It would only add a little text to list the main features of the measurements. Refer to prior papers for the details of how they were done.

Page 10743 Equation 2 that defines the chemical time scale needs to be explained a little better. A sentence identifying what the underlying assumptions and basis for the time constant would be helpful here. The Lenschow reference does not provide sufficient explanation for the calculation of time scale in equation 2. Furthermore, readers may be left to wonder whether it is valid to consider only the NO-NO2-O3 triad, of if the level of peroxy radicals that recycle NO should be considered in calculating the time scales.

Page 10745, line 14 The discussion about high vs low NOx levels and correspondence with wind speeds ought to be more explicit about the role of emissions. Earlier section indicates the site is 9km SW of city center. High NOx from the NE then probably comes from local emissions and it would be a coincidence that wind speeds differ in that sector. Also, it is a little confusing to be identifying the cases as high and low NOx when actually the basis for separation is wind direction and wind speed.

Page: 10, line 1 Can you clarify what fraction of the data were actually analyzed. Are the conclusions based only on the 20 clearly high or low NOx days and the remaining 18 days of data just ignored, or are those still used in some way? Are these data used in the plotted values that are identified as "all data"?

Line 8 If wind speed is criteria for identifying the cases then of course the mean wind speeds for the two cases are different. Overall the data binning needs to be presented more clearly

Page: 10753 Discussion of chemical time scales should make some mention at the outset that influence of RO2 is unknown. This point is acknowledged later in the section but it should come sooner and include an effort to quantify its influence, perhaps by estimating its magnitude relative to reaction with O3 based on literature values. Is it reasonable to ignore the contribution of peroxides to the NOx chemical lifetime?

Page: 10754, line 28 At a site that is clearly influenced by local anthropogenic emissions the contribution from anthropogenic VOC that are emitted together with NOx should be noted. It is not enough to just note that biogenic VOC concentrations are small.

Page: 10757, line 15 In the absence of significant soil NO sources I don't think it is justified to make conclusions about what the strength of NOx canopy reduction would be. The influence of soil NO emission on the vertical profile of O3 and other oxidants needs to be evaluated in order to show that the reaction time scale is not changed. I agree that conversion to NO2 and plant uptake could take place as long as there is adequate penetration of O3, but what happens if the NO efflux overwhelms transport of O3 into the canopy layer and most of the NO oxidation occurs above the canopy? The conclusion is careful to note that this work cannot provide improved estimates of canopy retention for grasslands because the site did not have enough soil NO emission. I agree that is valid to point out the potential importance, and the need to do similar measurement where NO emissions from soil are higher.

Interactive comment on Biogeosciences Discuss., 11, 10737, 2014.