Interactive comment on “Demonstration of an off-axis parabolic receiver for near-range retrieval of lidar ozone profiles” by Betsy M. Farris et al.

Anonymous Referee #1

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General Comments: The manuscript describes a substantial improvement in the return of the Langley ozone lidar system. The manuscript discusses the improvement of the LMOL data retrieval in the lowest 1km by using an OAP (off axis parabolic) reflector. The article describes the technical make-up and design change to the system to incorporate the OAP then justifies the changes by showing robust results from the OWLETS (southeast VA) campaign. The lidar showed higher ozone on average than ozonesondes, but lower than the insitu measurements provided by a UAV holding a POM.

The low level return is an important improvement in the information gathered by the system. The vertical transport and evolution of ozone in the lowest levels of the atmosphere is most pertinent to the evolution of surface concentrations, which most directly impact human health, monitoring, and ultimately policy. While the overall evolution of the boundary layer provides important information to the evolution of surface ozone the ability to properly resolve the near-surface layer is imperative for fine scale dynamics which transpire near the ground. This manuscript provides a technically driven discussion on the set-up of the near-field retrieval, and then displays its practicality in an operational environment, demonstrating the usefulness of the improvement. The manuscript itself seems well written, quite technical for those unfamiliar with the intricacies of the lidar design, but otherwise well structured with good flow with only minor science questions/suggestions and a few technical corrections.

Sciences Questions/Suggestions: Page 2 line 24: “(F#=1)” Does this mean the f-number of the OAP is 1? The notation caught me a bit off-guard as f-number hadn’t been discussed prior to this.

Page 4 line 5: Where does the background value come from?

Page 4 line 9: How do you know pressure and temperature at altitude? Do you use a rawinsonde?

Page 5, lines 8-15: This section shows the capability of the OAP and ozone lidar well. However, there are a lot of assumptions, so the interpretation should be handled with care. Overall questions and suggestions in this section do not change the conclusion that the new OAP adds incredible value to the lidar, but that additional instrumentation complimenting the lidar can add huge explanatory value to the ozone observed.

line 8: It is not entirely clear on the figure how the boundary layer collapses. Are you referring to a collapsing of ozone to the surface or collapsing in total depth? If the former, is that collapse hidden behind the UAV observations rectangles near the surface and ozone has mixed down from 400m to the surface around 20UTC? From the surface observations at the bottom of the figure, it looks like ozone has increased by 18UTC thus more likely the collapse refers the PBL total depth decreasing, to the drop in ozone concentrations above 500m, and the enhancement in ozone centered...