

Interactive comment on “An improved method for retrieving nighttime aerosol optical thickness from the VIIRS Day/Night Band” by T. M. McHardy et al.

Anonymous Referee #1

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The authors present an algorithm to retrieve nighttime aerosol optical thickness (AOT) over areas where artificial light sources exist using VIIRS day/night band. The present method improves their previous work introduced in Johnson et al. (2013) in terms of retrieval accuracy at four study locations, and easier application to large scale processing without prior knowledge about aerosol optical properties. This work is scientifically significant in that it can eventually provide more complete diurnal cycle of aerosol loading over broad areas and help improve aerosol forecasting skill of numerical models.

The manuscript is well written, with a nice flow and structure. However, the short-term study period hindered to quantify quite obvious error sources, such as the moonlight and viewing geometry, due to insufficient number of data samples. The reviewer believes that the work can further be improved if the study period is extended to resolve

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this issue.

Major Comments:

1) It would be helpful to include a plot that graphically shows Eq. (6). For example, variance of the observed radiance as a function of AOT for certain variance of artificial light source and viewing geometry. This would help to understand how sensitive AOT is with respect to errors in the variance of the observed radiance.

2) The sensitivity study shown in Figs. 2-4 would benefit from a longer-term evaluation. The reviewer highly recommends to extend the study period at least at one location for more decisive conclusion about the effects of error sources.

3) The authors tested the effect of lunar fraction (Fig. 3) at Huntsville where the variance of the observed radiance showed smallest relationship with lunar fraction in Fig. 2. This is likely due to lack of lidar measurements at other locations, and including similar plots to Fig. 3 except for as a function of AERONET AOT at the other locations would be helpful.

4) It would be helpful if the authors could include analysis/make comment on the effect of lunar geometry (in addition to the lunar fraction) on the variance of observed radiance.

Minor Comments:

[Page 5160, Lines 17-18] as HSRL total-column AOT "increases"

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 5147, 2015.