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Atmospheric Measurement Techniques Discussions

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 #4

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The paper presents a method for the retrieval of aerosol optic thickness (AOT) using VIIRS day/night Band (DNB). This work is a successor of Johnson et al (2013). The retrieval of aerosol properties during night is important for the understanding of aerosol daily cycling and all aerosol effects during night, thus the paper is significant for aerosol community. The authors try to compare the new retrievals with Johnson et al (2013) using AERONET and HSRL measurements, however, due to the limited validation samples, the statistical parameters can be easily affected by any known/unknown factors. Thus I suggest that the authors extending the study period. Major comments are listed below:

(1) The key equation for this work is Eq (5) by using the "spatial derivative" of Eq (4), the authors explain that ΔIsat and ΔIa are the pixel-to-pixel changes, my understanding

is the "spatial derivative" refers to the difference between two different pixels, which makes sense to understand how to derive Eq (5) from Eq (3) and (4). However, later, the authors explain that Δ refers to the stand deviation of a block of pixels, that is a given artificial light source, the authors should explain how to derive Eq (5) from Eq (3) and (4) using stand deviation of a block of pixels;

(2) One of the key assumption to derive Eq (5) from Eq (4) is the value of D, Ip and so on are spatially invariant within an artificial light source, some references like what Johnson et al (2013) did for ignoring the rsÌĚr term or some sensitivity studies are needed to see how good this assumption is;

(3) Eq (6) is not mathematically derived from Eq (5), the correction parameter C is introduced due to additional non-mathematical reasons, thus "Solving Eq (5) for τ given Eq. (6)" is very confusing;

(4) The sensitivity study highlights the influence of satellite viewing angle. In figure 4, the authors using cosine of satellite zenith angle between 0.5-1, which actually ignoring the observation direction, however, the satellite may observe differently from east or west with the same cosine value, especially for the artificial lights, the authors should clarify this problem.

Minor suggestion:

(1) Some of the figures should be re-plotted, for instance, the colors in Figure 5 are not matched. The size of the triangles in Figure 7 is not so distinguishable.

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