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Interactive comment on “Effect of surface BRDF of various land cover types on the geostationary observations of tropospheric NO₂” by K. Noguchi et al.

Anonymous Referee #1

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This paper addresses an assumption in NO₂ column retrieval from UV/Vis spectroscopy from space—that of Lambertian surface reflectivity, compared with full BRDF implementation. The paper describes the error associated with neglecting BRDF clearly, identifying the magnitude over different land types, variation within the same land type with season and examining the role of aerosol. It is well thought out and I recommend publication in AMT after attention to the relatively minor issues noted below:

1. The authors' conclude that the next step is to validate satellite measurements of BRDF and confirm that the use of a full BRDF improves the accuracy of NO₂ column

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measurements by comparison with in-situ measurements. Some comments on the recommended strategy for accurate retrievals in advance of that research would be useful.

2. The text directs the reader to compare the difference in AMFs in Fig. 10 with those of Fig. 7 to understand the effect of aerosols on the impact of BRDF vs. BRF. Since Figs. 7 and 10 may not be typeset near each other in the final paper, including AOD = 0.2 and AOD = 1.0 in the same figure might make the point clearer, especially since the difference appears to be one of magnitude, not shape. As both forest types, crops, and urban AMFs have very similar shapes in each subfigure, perhaps it would be more informative to the reader to choose one of these as a representative case, and plot both the AOD = 0.2 and AOD = 1.0 AMF differences on the same axes.

3. On p. 3445 (lines 20-25), it is not clear from this sentence what Lin. et. al. compared. (What is “no consideration” of BRDF – does that mean LER was used?) Is the decrease in NO₂ observed a further deviation from an accurate measurement, or is this not known? 4. On pp. 3446 (line 26)-3447 (line 3), fiso is mentioned twice when describing what the different coefficients correspond to. I suspect this is a typo. 5. The first two paragraphs of the Results section clearly describe the application of different land cover thresholds to determine the appropriate value. A minor suggestion: the sentence “For a sensitivity study, we changed the threshold to be 90 %, 95 % and 100 %...” could be rephrased to make this application clearer sooner: e.g. “As a sensitivity study, the values of fiso, fvol, and fgeo were compared for different values of the land cover threshold (90%, 95%, and 100%). Different values were used for crop land cover type (60%...), owing to. . .”

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 3443, 2014.

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