Atmos. Meas. Tech. Discuss., 7, C900–C902, 2014
www.atmos-meas-tech-discuss.net/7/C900/2014/

Atmospheric Measurement Techniques Discussions

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 #2

Received and published: 13 May 2014

The authors of this paper provide a very clear and comprehensive overview of the effects of surface reflectance anisotropy and its treatment as BRDFs for the calculation of AMFs for NO2 retrievals. They demonstrate how different degrees of neglecting the angular dependency of surface reflectivity can cause uncertainties in the NO2 retrieval and that is very valuable for all studies based satellite NO2 data. Therefore, I recommend publication after some minor additions and corrections. My main concern is that the step from AMF to NO2 values is not discussed at all. In the introduction a few studies are mentioned that estimate the amount of over or underestimation due to incorrect albedo treatment, but you are not discussing whether your study confirms

their findings or not. On p.3445 l. 12f you mention that Heckel et al. and Russel et al. "indicate that the error from surface albedo was especially large", and I think it would be an important piece of information of how large exactly and in which direction, so that during the discussion of your results you can refer to those numbers for comparison. You could also add whether the differences of 0-20% of tropospheric NO2 VCDs based on LER and BRDF determined by Zhou et al. is an over- or underdetermination. All those values, including the results by Lin et al. mentioned in the introduction should be picked up again in the discussion or concluding section for comparison. This is only possible of course when you estimate the effects of the AMF differences on the NO2 VCDS, assuming a typical set of profiles, e.g. an urban profile for the urban land cover type. Some general remarks about NO2 satellite measurements in an urban/rural/ocean/etc. environment are (or will be) overestimating/underestimating by about x% in summer/fall/winter/spring would complete your study nicely and would provide easy to use information for other validation studies.

Some minor comments:

P. 2450, l. 1f: instead of "very small" you could mention how small.

P. 3451, l. 21f and Fig. 7 and 10: If the rice paddies are filled with water in summer, why is there a difference to the water land type especially in the morning?

P. 3452, l. 9f: instead of just saying "the difference will become large" you can mention whether it leads to an over- or underestimation.

P. 3453, l. 22f: Again, as already mentioned, instead of "will cause larger errors of the AMF" you could be more specific how large this error can get and in which direction.

Fig. 8: I cannot really distinguish the different curves, since they are so close together, how about just using one local time and make the plots bigger?

Fig. 5-10: You could add a label box with the different land surface types and the corresponding colors instead of mentioning them in the caption, which would be clearer.

You could make clearer why you are focusing on the AMF calculation for geostationary observations. Of course viewing angles, measurement times and spatial resolution might be different, but your calculations can be applied to other satellite observations as well. I suggest that either you widen the scope of your study a little and mention possible effects on other satellite NO2 retrievals, and/or you clarify where your findings are specific to geostationary observations and why they cannot be applied to other retrievals.

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