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Atmospheric Measurement Techniques Discussions

Interactive comment on "The importance of surface reflectance anisotropy for cloud and NO_2 retrievals from GOME-2 and OMI" *by* Alba Lorente et al.

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1. The paper misrepresents the GLER product (Vasilkov et al, 2017) as GLER climatology (line 15, page 3). GLER is not a climatology, but a bidirectional (sun-view geometry dependent) LER product at a scale of satellite pixel (OMI is used as an example). GLER is derived using real OMI pixel geometry and MODIS high-resolution BRDF product over land averaged over an OMI field of view (FOV) and the Cox-Munk slope distribution over ocean with a contribution of water-leaving radiance. This is the kind of product the authors recommended for TROPOMI in the conclusion section.

2. The authors implemented MODIS BRDF model into the RT DAK and use it for

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Discussion paper

UV/Vis wavelengths of OMI and GOME-2 (section 3.2, see line 30, page 11). It is not clear if DAK is a scalar or vector RT model in terms of atmospheric RT simulation. But the models that DAK is compared to for evaluation include a scalar model (LIDORT) and a model (SCIATRAN) that has both modes (scalar or vector), and which mode is used is not clear either.

However, as indicated in Vasilkov et al, 2017, our experience with VLIDORT has shown that ignoring polarization for UV wavelengths would result up to 10% error in TOA radiance simulations.

3. The operational MODIS product (MCD43A1) is used in this paper for surface BRDF characterization (line 15, page 11). However, as we know, operational MODIS BRDF product usually has up to 20% gaps globally due to cloudiness. That's why we use gap-filled MODIS product (MCD43GF) in our GLER product.

4. This paper only covers BRDF effects on NO2 and cloud products (FRESCO and OMCLDO2) over land, and ocean is not mentioned at all. But ocean reflection is non-Lambertian either. A good example is the sunglint effect caused by Fresnel reflection, which creates strong forward reflection as significant as the so-called hot-spot effect in the backward scattering direction over land as discussed in this paper. To characterize the surface BRDF effect globally, one has to consider both land and ocean.

5. It is mentioned in couple of places (line 5, page 1; line 11, page 21) that rugged terrain causes strong backscattering reflection. However, not only rugged terrain, any rough surfaces like vegetation and soils produce strong backscattering, even the terrain is flat.

6. The discontinuity of the green curve at nadir in Fig.9b indicates something is not correct in the simulations, which needs more explanation.

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