

Interactive comment on “The importance of surface reflectance anisotropy for cloud and NO₂ retrievals from GOME-2 and OMI” by Alba Lorente et al.

Anonymous Referee #2

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This is an outstanding publication making a significant contribution to the still very sparse literature on surface BRDF effects on cloud and trace gas retrievals. It convincingly demonstrates the need to consider BRDF effects in future retrievals. In particular, the manuscript demonstrates (I think for the first time) the great relevance of BRDF effects for cloud retrievals in the O2-A band.

The manuscript was a pleasure to read. It is very well written (moreover with essentially no typos) and structured, the analyzes are carefully designed, and the individual parts of the manuscript are nicely linked together.

I thus highly recommend publication and have only a few very small comments:

1. Almost all analyses are made for a domain over the Amazon forest. This choice is never motivated. In terms of NO₂, this is not the most relevant region I can think of. 2. Because of the focus on this forested region, the analyzed BRDF effects may be larger than over other regions of the globe with less dense and tall vegetation. This should be better emphasized in the paper (e.g. in the abstract). In the discussions and conclusions section on page 23, line 3, for example, it is mentioned that surface albedo is underestimated by as much as a factor 2 over "vegetated" scences, but "vegetated" in this case actually means forested. Results would likely be quite different over other vegetated surfaces like grass- or croplands. 3. GOME-2 and OMI have different equator crossing times (GOME-2 has a morning, OMI and after-noon orbit), an information that seems missing in the manuscript but is relevant for the interpretation of the results. Because GOME-2 is further away from noon, I would expect BRDF effects to be larger for GOME-2 than for OMI. 4. The study emphasizes the importance of satellite missions that can provide surface BRDFs like MODIS. Since the MODIS missions have surpassed their designed lifetime already by far, the community should think about alternatives for the post-MODIS period. Can the Sentinels fill this gap? Maybe this would be worth a sentence in the discussions section.

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