Author response

The reviewer is absolutely right and we have resolved the issue in the updated version of the manuscript.

We have changed the text in the Introduction (section 1) in the following way:

" Recently, several different approaches have been introduced to address this issue. One example is the introduction of geometry-dependent surface Lambertian-equivalent reflectivity (GLER) (Vasilkov et al., 2017; Qin et al., 2019; Fasnacht et al., 2019). In the GLER approach, surface BRDF information from the MODIS surface BRDF database (Gao et al., 2005) is used to calculate Lambertian surface albedo at 466 nm for land-covered satellite footprints of the OMI instrument. For the footprints over water surfaces model calculations are used (Fasnacht et al., 2019). The result is a Lambertian surface albedo, ready to be used in a radiative transfer code with Lambertian surface reflection, calculated for the exact scattering geometry of the OMI footprint and for the specific date of the OMI footprint. The advantage is that this Lambertian surface albedo is adjusted to the geometry of the observation, whereas the surface albedo available in the typical Lambertian surface albedo climatologies is more representative for the minimum value of the surface reflectivities that were observed (see e.g. Lorente et al., 2018; Liu et al., 2020) – and therefore underestimates the surface albedo for many of the scattering geometries. The disadvantage of the GLER approach is that it, at least for land-covered scenes, depends fully on the MODIS surface BRDF database. This limits the spectral usage to the seven wavelength bands of the MODIS BRDF product for land-covered scenes. For the retrieval of NO2 and of cloud properties from the O2-O2 band, both performed in the spectral regime close to 466 nm, this is not a problem – but for many other retrievals it is.

A second example of a geometry-dependent surface LER database is the geometry-dependent effective Lambertian-equivalent reflectivity (GE_LER) database introduced in a recent paper by Loyola et al. (2020). The GE_LER approach does not depend on external data such as MODIS BRDF data and uses machine learning techniques to retrieve the surface reflectivity from level-1 data of the sensor (GOME-2, TROPOMI, or another UVN sensor). Like the GLER, the GE_LER provides daily maps of the surface properties. The GE_LER provides information for all surface types (land, ocean, snow/ice) in one database and covers the UV-VIS-NIR spectral region. "

This solves the issue in a number of ways: this section now explicitly mentions that GLER is provided also over water surfaces, it refers to the paper (by Fasnacht et al., 2019) presenting the approach for water surfaces, and the last sentence that (wrongly) claimed that GLER is not provided over the ocean has been changed to only describe the GE_LER.