Evaluation of The Landsat-8/Sentienl-2 Land Surface Reflectance

*Jean-Claude Roger[1,2], Eric Vermote[2], Sergii Skakun[1,2], Belen Franch[1,2], Brent Holben[3], Christopher Justice[1]

1. Department of Geographical Sciences, University of Maryland, College Park, MD, USA, 2. Terrestrial Information System Branch-Code 619, NASA/GSFC, Greenbelt, MD, USA, 3. Biospheric Science Branch-Code 618, NASA/GSFC, Greenbelt, MD, USA

The land surface reflectance is a fundamental climate data record at the basis of the derivation of other climate data records (Albedo, LAI/Fpar, Vegetation indices) and has been recognized as a key parameter in the understanding of the land-surface-climate processes. Here, we present the validation of the Land surface reflectance used for Landsat-8 and Sentinel-2 data. This methodology uses the 6SV Code and data from the AERONET network.

The first part was to define a protocol to use the AERONET data. To correctly take into account the aerosol model, we used the aerosol microphysical properties provided by the AERONET network including size-distribution ($\%C_f$, $\%C_c$, r_f, r_c, σ_r, σ_c), complex refractive indices and sphericity. Over the 670 available AERONET sites, we selected 230 sites with sufficient data. To be useful for validation, the aerosol model should be readily available anytime, which is rarely the case. We then used regressions for each microphysical parameter using the aerosol optical thickness at 440nm and the *Angström* coefficient as parameters. Comparisons with the AERONET dataset give good APU (Accuracy-Precision-Uncertainties) for each parameter.

The second part of the study relies on the theoretical land surface retrieval. We generated TOA synthetic data using aerosol models from AERONET and determined APU on the surface reflectance retrieval while applying the Landsat-8 and Sentinel-2 Atmospheric correction software. Over 250 AERONET sites, the global uncertainties are for MODIS band 1 (red) is always lower than 0.0015 (when surface reflectance is > 0.04). This very good result shows the validity of our reference. Then, we used this reference for validating the Landsat-8 and Sentinel-2 surface reflectance products. The overall accuracy clearly reaches specifications.

Finally, we will present an error budget of the surface reflectance retrieval. Indeed, to better understand how to improve the methodology, we defined an exhaustive error budget. We included all inputs i.e. sensor, calibration, aerosol properties, atmospheric conditions… This latter work provides a lot of information, such as the aerosol optical thickness obviously drives the uncertainties of the retrieval, the absorption and the volume concentration of the fine aerosol mode have an important impact as well…

Keywords: Atmospheric correction, validation, land surface reflectance

