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Standards for quality assessments of remotely sensed albedo products

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Land surface albedo is important component of the Earth's energy balance, defined as the fraction of shortwave radiation absorbed by a surface, and is one many Essential Climate Variables (ECVS) that can be retrieved from space through remote sensing. To quantify the accuracy of these products, they must be validated with respect to in-situ measurements of albedo using an albedometer. Whilst accepted standards exist for the calibration of albedometers, standards for the use of in-situ measurement schemes, and therefore standards in the quality assessment of albedo products, have yet to be developed.

It is essential that we can assess the quality of remotely sensed albedo data, and to identify traceable sources of uncertainty during process of providing these data. As a result of the current lack of accepted standards for in-situ albedo retrieval and validation procedures, we are not yet able to identify and quantify traceable sources of uncertainty. Establishing standard protocols for in-situ retrievals for the validation of global albedo products would allow inter-product use and comparison, in addition to product standardization. Accordingly, this study aims to assess the quality of in-situ albedo retrieval schemes and identify sources of uncertainty, specifically in vegetation environments.

A 3D Monte Carlo Ray Tracing Model will be used to simulate albedometer instruments in complex 3D vegetation canopies. To determine sources of uncertainty, factors that influence albedo measurement uncertainty were identified and will subsequently be examined:

1. Time of day (Solar Zenith Angle)
2. Ecosytem type
3. Placement of albedometer within the ecosystem
4. Height of albedometer above the canopy
5. Clustering within the ecosystem

A variety of 3D vegetation canopies have been generated to cover the main ecosystems found globally, different seasons, and different plant distributions. Canopies generated include birchstand and pinestand forests for summer and winter, savanna, shrubland, cropland and citrus orchard. All canopies were simulated for a 100x100m area to best represent in-situ measurement conditions. Preliminary tests have been conducted, firstly, identifying the spectral range required to estimate broadband albedo (BBA) and secondly, determining the hyper-spectral intervals required to calculate BBA from spectral albedo.

Final results are expected to be able to identify for the factors aforementioned, given a specified confidence level and within 3% accuracy, when does uncertainty of in-situ measurement fall within these critera, and outside these criteria. As the uncertainty of in-situ measurements should be made on an individual basis accounting for relevant factors, this study aims to document for a specific scenario traceable uncertainty sources in in-situ albedo retrieval.