Assessment of Spatial Representativeness of 53 Fluxnet Sites Used to Validate the MODIS Albedo Product

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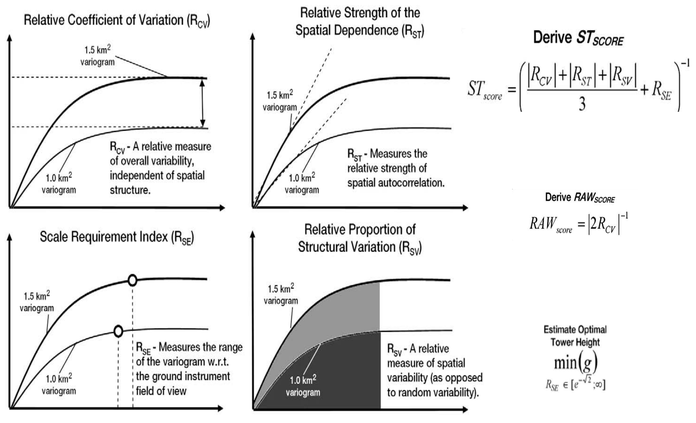
❖ Overview

Tower based albedometer measurements are routinely used in the validation of satellite global land surface albedo and reflectance anisotropy products. However the field of view of tower measurements is usually quite different from the field of view of moderate resolution satellite imagery such as obtained from NASA's MODIS. In this study, we applied a methodology developed by Román et al. (2009) based on geostatistical attributes of a variogram model to evaluate the spatial representativeness of 53 Fluxnet tower locations in order to assess whether direct comparison between tower albedometer measurements and satellite albedo retrievals would be appropriate.

Variogram functions are extracted from Landsat Enhanced Thematic Mapper Plus (ETM+) retrievals of surface reflectance using multiple spatial and temporal thresholds. The intrinsic biophysical properties of a measurement site and the surrounding landscape are brought together to produce a number of geostatistical attributes that describes the overall variability, spatial extent, strength of the spatial correlation, and spatial structure of surface albedo patterns at separate seasonal periods (mature foliage vs. dormancy) throughout the year.

Based on the International Geosphere-Biosphere Programme (IGBP) land cover classification assigned to each location, we categorized the 53 Fluxnet sites into four general landscape groups: 14 “Evergreen forest” sites; 14 “Deciduous forest” sites; 11 “Savanna/shrubland” sites; and 14 “Croplands” sites. The assessment scheme is applied to rank the spatial representativeness of the sites within each landscape category. The assessment shows the degree to which the 53 Fluxnet tower measurements are able to directly capture the intrinsic variability of the immediate landscape extending to a size of a satellite pixel.

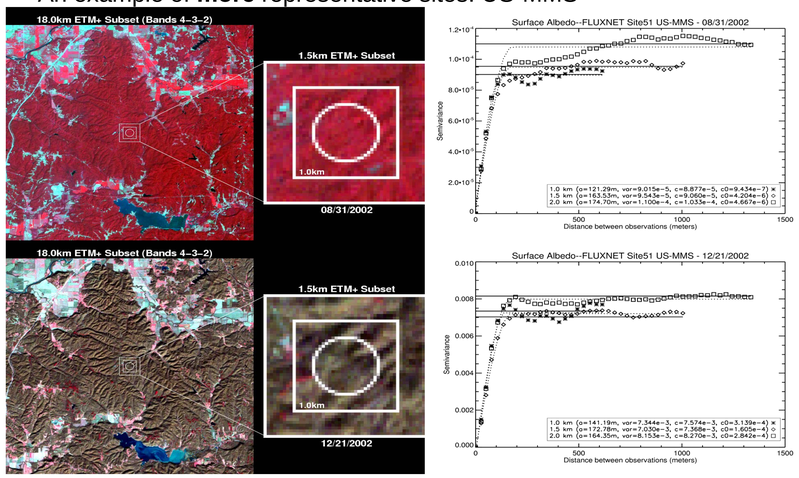
This study applies an existing methodology to a wide range of vegetated landscapes, from tropical to boreal ecosystems, with different seasonal patterns. The results are used to establish which of the 53 Fluxnet towers are best situated to serve as spatially representative validation sites for the MODIS albedo product.



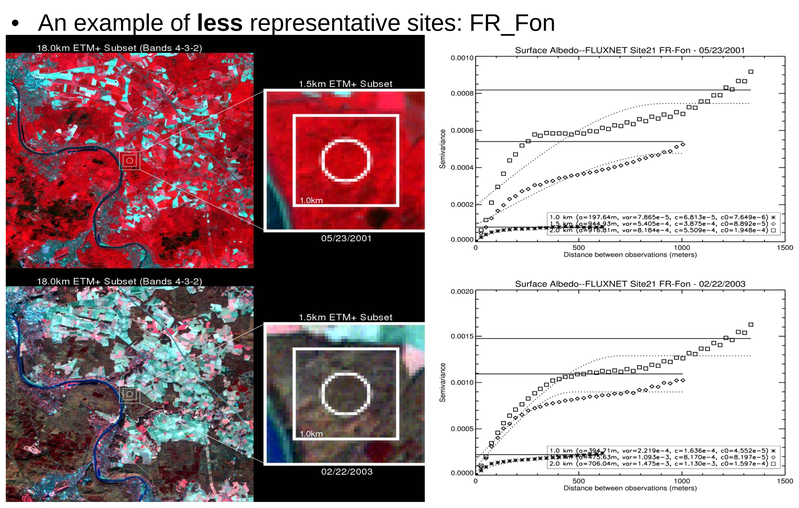
Román, M. O., C. B. Schaaf, C E. Woodcock, A. H. Strahler, et al., The MODIS (Collection V005) BRDF/albedo product: Assessment of spatial representativeness over forested landscapes, Remote Sensing of Environment, 113, 2476-2498,2009.

❖ Spatial representativeness : Mature foliage vs. Dormancy

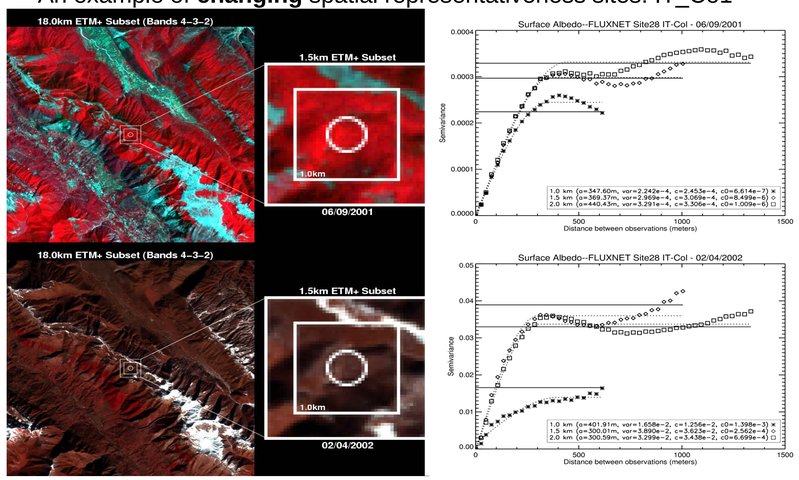
- An example of **more** representative sites: US-MMS



- An example of **less** representative sites: FR_Fon

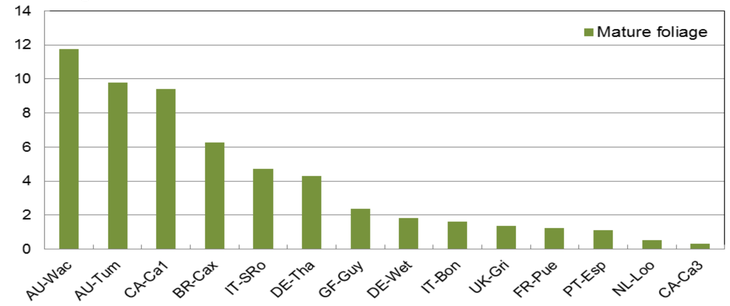


- An example of **changing** spatial representativeness sites: IT_Co1

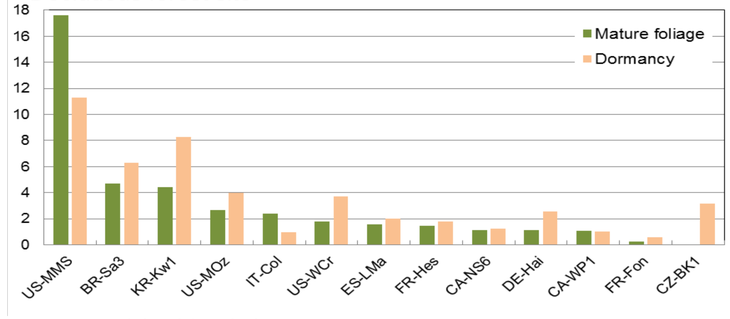


❖ Ranking of spatial representativeness

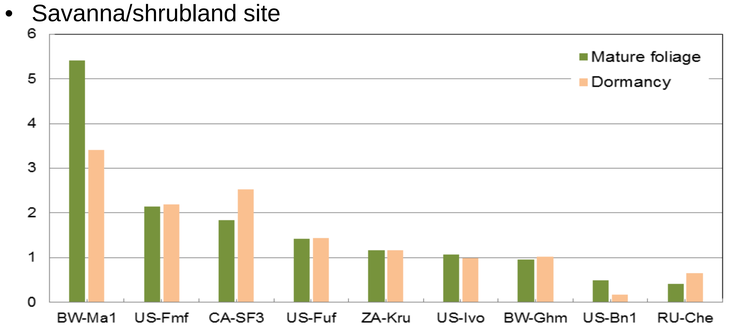
- Evergreen forest site



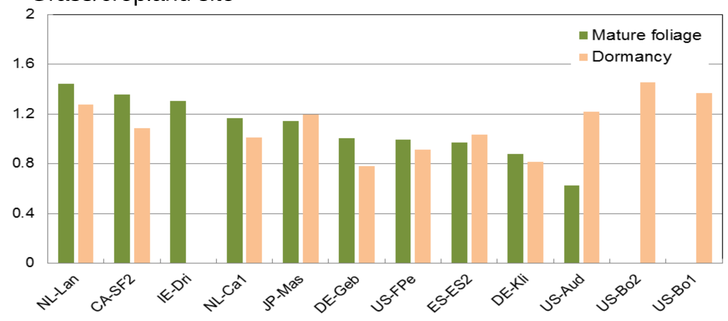
- Deciduous forest site



- Savanna/shrubland site



- Grass/cropland site



Notes: Surface reflectance composite is shown with corresponding semivariogram functions, variogram estimator (points), spherical model (dotted curves), and sample variance (solid straight lines) using regions of 1.0 km (asterisks), 1.5 km (diamonds), and 2.0 km (squares). The circle stands for the tower footprint.