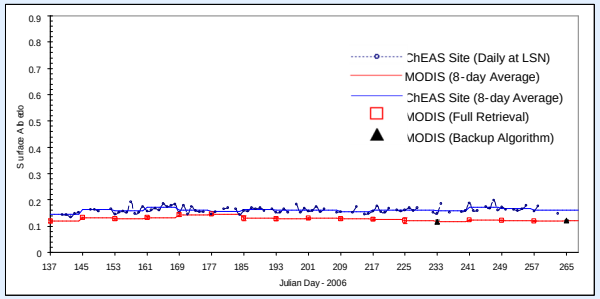
Validation of Daily Global Land Surface Albedo and Anisotropy Products from VIIRS

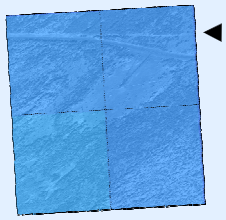
Miguel O. Román[1], Crystal C. Schaaf[1], Jicheng Liu[1], Yanmin Shuai[1], Alan H. Strahler[1], Odele Coddington[2], and Charles K. Gatebe[3]
[1]Department of Geography and Center for Remote Sensing, Boston University, Boston, MA,
[2]Laboratory of Atmospheric and Space Physics, University of Colorado, Boulder, CO,
[3]Goddard Earth Sciences and Technology Center, University of Maryland Baltimore County, Baltimore, MD

A roadmap is presented for the validation of the proposed VIIRS daily albedo and anisotropy products by characterizing the surface anisotropy and capturing the daily temporal and spatial variations of surface albedos observed by measurements taken at multiple scales of resolution using field instruments, aircraft, and satellites. Future earth observation platforms will provide continuity to time-critical surface albedo products (at overpass time). This specification represents a temporal improvement beyond that currently provided by EOS era algorithms and is driven by consideration of the surface energy budget variations possible from rapidly changing surface covers, e.g. burning, clearing, tilling, harvesting, and flooding. One of the primary challenges of this strategy is to meet the temporal demands while still providing consistent high quality, high resolution, global surface albedo datasets over a sufficient period to constitute stable Earth Science Data Records (ESDRs), and Climate Data Records (CDRs) for the modeling and climate diagnostics communities.

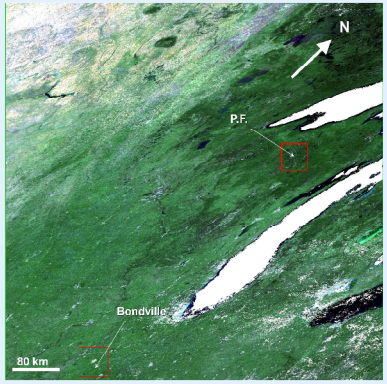
MODIS Surface Albedo vs. ChEAS Park Falls, WI



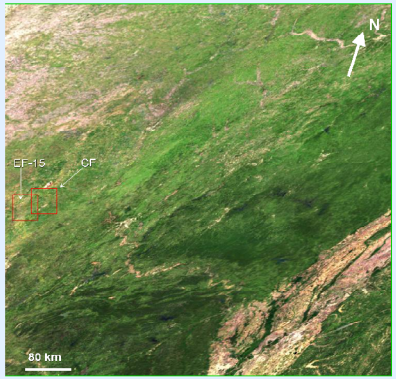
Time series of surface albedo at local solar noon for the Ameriflux-ChEAS station at Park Falls, WI (2006 summer season.)



◀ MODIS WSA 500-m over reprojected Quickbird 0.6m Pan

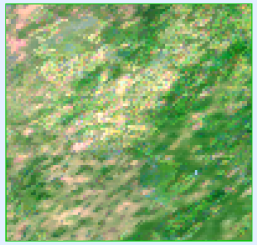


White-Sky Albedo from the MODIS 500-m product, a true-color image in sinusoidal projection, nominal date 8/13/2005.



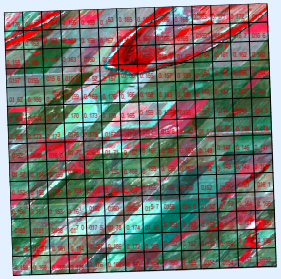
White Sky Albedo from the MODIS 1km product, MCD43B3, a true-color image in sinusoidal projection, nominal date 5/9/2003

▲ 500m Park Falls, WI, 8/13/2005



▲ 500m ARM Southern Great Plains (SGP) Site.

Upscaling at ChEAS-WLEF 396m tall tower (Park Falls, WI)

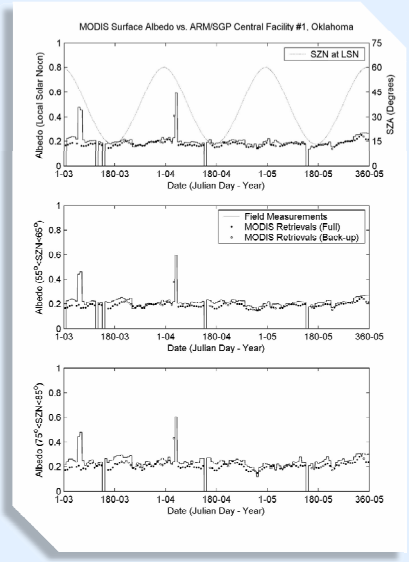


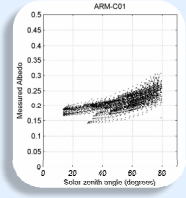
ASTER scene (5/23/06) at the ARM-C01 station. This 7km x 7km subset was superimposed against a MODIS ASCII subset using blue-sky albedos at 500m resolution.

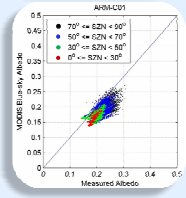
http://www-modis.bu.edu/brdf/

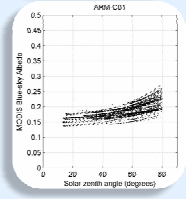
To assess the quality of these projected daily albedos, hourly measurements of surface albedos can be reconstructed from the Moderate Resolution Imaging Spectroradiometer (MODIS) BRDF/Albedo satellite product. These are compared with instantaneous ground data from field stations in the US. Qualitative intercomparisons between high-spatial resolution scenes derived from ASTER (15-m) and IKONOS (4-m), Quickbird (0.6m) sensors, and MODIS BRDF/albedo measurements (at 500-m) provide assessments of subpixel heterogeneity.

MODIS Surface Albedo vs. ARM-SGP (C01)









This validation scheme not only relies on well calibrated global BSRN (Baseline Surface Radiation Network) and the US Surfrad (Surface Radiation Network) field data, but also includes aircraft-derived surface albedos as derived from the Solar Spectral Flux Radiometer (SSFR) measurements of upward and downward irradiance, and Cloud Absorption Radiometer (CAR) measurements of the bidirectional reflectance distribution function of various surface types.