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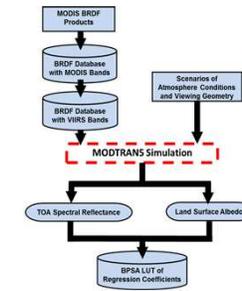
Overview

- Surface albedo is the ratio between outgoing and incoming shortwave radiation at the Earth surface. It is an essential component of the Earth's surface radiation budget.
- Surface albedo EDR is combination of land surface albedo (LSA), ocean surface albedo (OSA) and sea-ice surface albedo (SSA).
- Two algorithms (Dark Pixel Sub-Algorithm (DPSA) and Bright Pixel Sub-Algorithm (BPSA)) were originally designed for LSA. Currently, only BPSA is used to generate LSA products.
- BPSA is a direct estimation method, which directly estimate broadband albedo from VIIRS TOA radiances.

Major Refinement to the BPSA algorithm

A new LUT of LSA BPSA regression coefficients was developed:

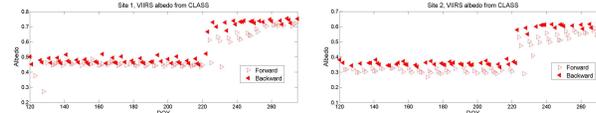
- Using updated spectral response function;
- Considering multiple aerosol types;
- Including surface BRDF in radiative transfer simulation;
- Developing surface-specific LUTs.



A brief flowchart showing how the BPSA LUT of regression coefficients is generated

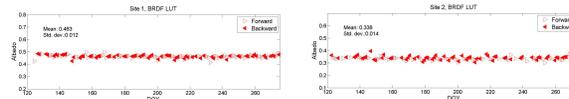
Temporal stability of LSA retrievals

The LSA retrievals in the summer of 2012 over two Libya desert sites are used to illustrate the issue of temporal variability of LSA.

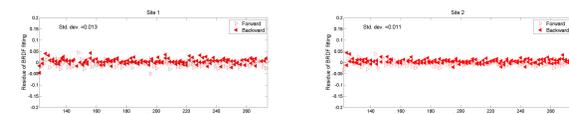


Time series of beta release data. "Forward" means pixels with relative azimuth angle >90° and "backward" means those with relative azimuth angle <90°.

New albedo estimated with the BRDF LUT has improved in temporal stability



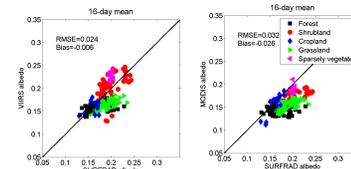
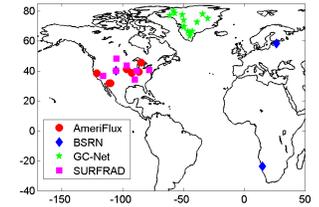
Compare residual variations with those from alternative methods



Residue of BRDF fitting, calculated as the difference between MODIS surface reflectance and BRDF predicted from MODIS BRDF. The narrow-to-broadband conversion coefficients are used to covert spectral residues to the broadband residue.

Validation against in situ measurements

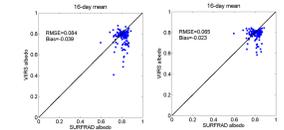
- Spatial representativeness of station measurements are evaluated by examining the high resolution satellite imagery of the sites.
- Quality control of field data is applied.



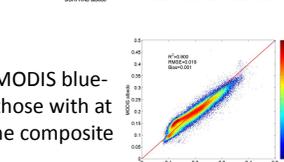
- 16-day mean was calculated to compare with MODIS data
- VIIRS data have smaller bias and RMSE, well below the product threshold.

Validation results of 16-day mean snow-free albedo from VIIRS and MODIS.

- VIIRS generally has improved results for snow albedo.
- Retrieval accuracy is strongly dependent on quality of cloud detection.
- Temporal filtering can improve retrieval quality and data continuity.

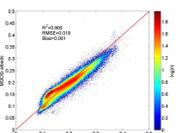


Validation results of snow albedo using GC-Net measurements

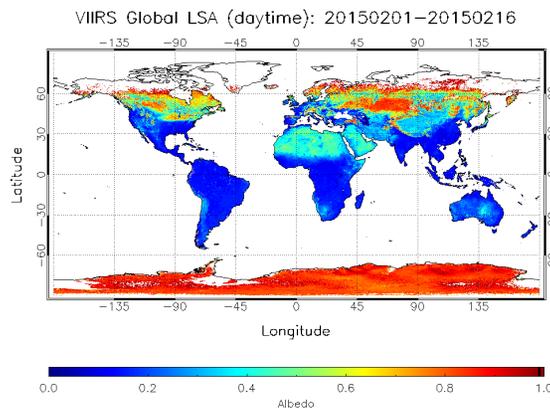


Comparison with MODIS

Comparing 16-day mean VIIRS albedo MODIS blue-sky albedo (Right). Data are limited to those with at least 8 clear-day observations during the composite period of 16 days.



Example of VIIRS LSA maps



A global map of land surface albedo composite with VIIRS products of Feb 1-16, 2015

Publication

Wang, D., S. Liang, T. He, and Y. Yu (2013), Direct estimation of land surface albedo from VIIRS data: Algorithm improvement and preliminary validation, J. Geophys. Res. Atmos., 118, 12,577–12,586, doi:10.1002/2013JD020417

Summary

- Validation results demonstrate the VIIRS BPSA algorithm can reliably retrieve LSA over both dark and bright surfaces.
- Continuous efforts have been put to improve the BPSA LSA algorithm.
- A long-term monitoring tool is under development to provide rea-time validation results of VIIRS LSA.