



Satellite-Derived Cloud and Radiation Retrievals over Various ARM Domains

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Motivation

ASR provides ground-based cloud and radiative measurements at various climatically representative sites providing a variety of measurements 24/7, but over localized regions. Satellites can provide cloud property information over larger scale regions, and add the capability of derived TOA Broadband LW and SW fluxes. Derived cloud and radiation properties covering large regions are especially useful for cloud modeling endeavors, and TOA-derived BB fluxes are helpful in radiative closure studies.

Objective

NASA/Langley Cloud group provides large-scale satellite-derived cloud and radiative parameters for ARM fixed and Mobile Facility sites. Results compared with ARM ground-based instruments to ensure consistency with ARM ground-based measurements.

Data and Methodology

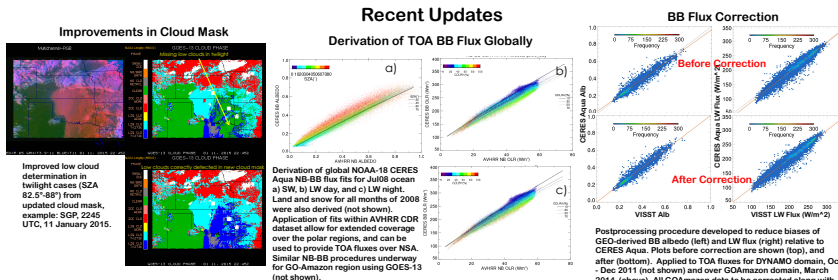
- Cloud and radiative parameters derived from geostationary (GEO) and low-Earth orbiting satellites (LEO)
 - Calibrate all satellites against common reference (Aqua MODIS Channel 1)
 - Applied to GOES, MSG, MTSAT, AVHRR, MODIS, Suomi NPP
 - NEW LEO: NOAA satellites (30 year AVHRR CDR underway)
 - Will be used to provide satellite retrievals over NSA and other ARM sites
- Cloud retrieval algorithms used: VISST/SIST/SINT (Minnis et al, 2011)
 - Recently updated algorithm (consistent with CERES Edition 4); improvements include:
 - Reduced false cloud detection over desert & ocean, improved low cloud determination in twilight for GEO
- Multilayer retrieval algorithm MCAT (Chang et al 2010)
- Derive TOA BB SW and LW fluxes based on narrowband (NB)-to-broadband (BB) matching with CERES
 - Match/regress avg calibrated 0.65- μm albedos A_{bb} and 10- μm fluxes M_{bb} with CERES SFC
 - Land/Ocean, Day/Night fits based on NB-BB matches within +/- 15 minutes
 - Applications ongoing with GEO; newly applied to LEO satellites
 - NOAA-18 AVHRR matched with CERES
 - Land/Ocean/Snow monthly global fits
 - Can also correct GEO-derived BB fluxes post-processing, by deriving BB correction based on CERES Aqua
 - Currently being applied to DYNAMO 2011-2012; also recent GO-Amazon and Azores
- Maintain ASR-focused webpage for access to all ASR/ARM-related satellite-derived datasets:
 - www-pm.larc.nasa.gov/cgi-bin/site/showdoc?docid=4&cmd=field-experiment-homepage&exp=ARM

Links to pages provide information for fixed ARM sites, and AMF deployment sites; site-specific pages provide easy access to VISST-derived data and imagery of the ARM site.

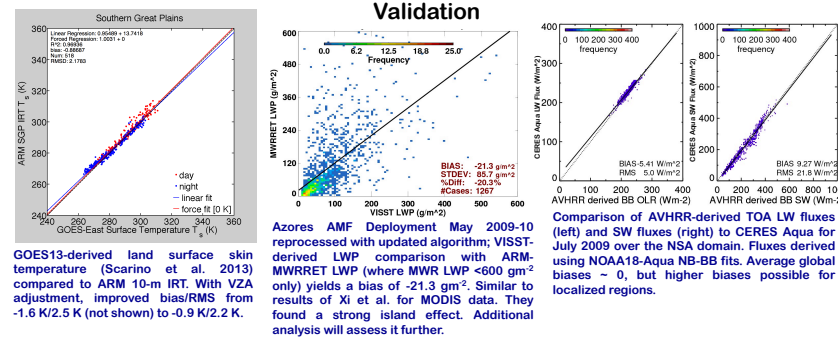
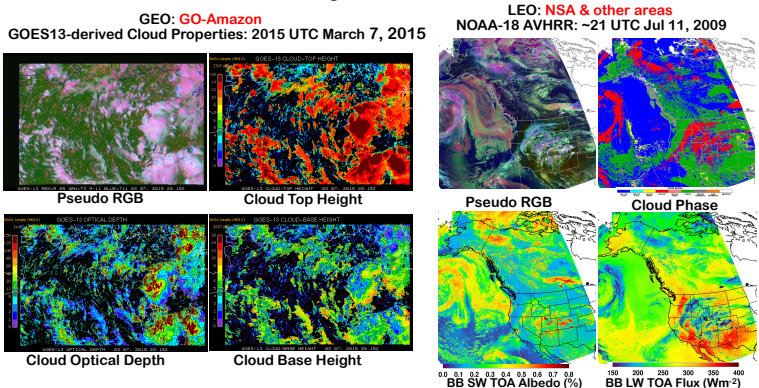
The screenshot shows the ARM website interface with a search bar and navigation menu. The main content area displays 'ARM AMF Support: GO-Amazon' with a satellite image of the Amazon region. Below the image are sections for 'ARM AMF Support: GO-Amazon' and 'ARM AMF Support: Eastern North Atlantic'. The 'ARM AMF Support: GO-Amazon' section includes a table with columns for 'Cloud Amount', 'Cloud Top Height', and 'Cloud Phase'. The 'ARM AMF Support: Eastern North Atlantic' section includes a table with columns for 'Cloud Amount', 'Cloud Top Height', and 'Cloud Phase'. The website also features a 'References' section with links to various publications.

Datasets also available from ARM archive. New datasets currently being made available:

- MAGIC
- GO-Amazon
- Eastern North Atlantic
- Efforts to fill time gaps and revisions of some data ongoing



New Coverage of ARM Domains



Summary

- Cloud & radiative parameters derived from satellite imager data for ARM fixed sites & AMF campaigns
 - Real-time imagery, pixel-level, gridded, 10km/20km average ground site data available from NASA Langley website
 - Pixel data also available from ARM archive
 - Data for missing times being added when new algorithms completed
 - Newest domains: MAGIC, ENA Azores, GO-Amazon
- Cloud retrieval & flux estimation algorithm improvements implemented
 - ARM datasets to be reprocessed going forward
- Validation with ARM ground-based measurements and other datasets ongoing
- Feedback and requests from users are always welcome

References

- Minnis, P., S. Sun-Mack, D. F. Young, et al. 2011: CERES Edition-2 cloud property retrievals using TRMM VIRS and Terra and Aqua MODIS data. Part I: Algorithms. *IEEE Trans. Geosci. Remote Sens.* **49**, 11, 4374-4400.
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- Xi, B., X. Dong, P. Minnis, & S. Sun-Mack. 2014: Validation of CERES-MODIS Edition 4 marine boundary layer cloud properties using DOE ARM AMF measurements at the Azores. *J. Geophys. Res.* **119**, doi: 10.1002/2014JD021813.

Acknowledgment

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