



SatCORPS Satellite-Derived Cloud and Radiation Properties Derived for ARM Domains



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Introduction

The NASA Langley SatCORPS (Satellite Cloud Observations and Radiative Property retrieval System) team routinely produces large-scale satellite-derived cloud and radiation parameters covering ARM fixed and Mobile Facility sites. Near-real-time datasets are made available to support field campaigns and upon request. The products enhance the sites' localized ground-based measurements, providing wide areal context and information (such as BB TOA Fluxes) needed to support cloud modeling, radiative closure studies and other efforts. Results are compared with ARM ground-based measurements and other data to evaluate consistency.

NASA Langley ASR/ARM Support webpage

<http://satcorps.larc.nasa.gov> and [click on ASR link](#)

Site-specific links for 3 fixed ARM sites, current AMFs, and past campaigns provide easy access to SatCORPS-derived pixel level and gridded data products and imagery

Pixel, gridded data are also available from the ARM archive

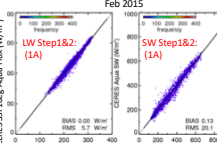
The screenshot shows the NASA Langley ASR/ARM Support webpage interface. It includes a top navigation bar with 'Home', 'Products', 'Support', and 'About' tabs. Below this, there are several sections: 'SatCORPS Group' with links for 'Cloud Products', 'Quality Inquiry', 'Field Experiments', and 'Submissions'; 'ASR - NASA Langley' with 'ASR Official Home' and 'ASR Office Home'; 'ASR & Field Experiments' listing various campaigns like 'ARM-ARCS', 'BORGARCS', 'MARCUS', 'MIRRE', 'CALIPSO DISCOVERY', 'ARM-AMAZON', 'ARM-AMAZON2', 'ARM-AMAZON3', 'ARM-AMAZON4', 'ARM-AMAZON5', 'ARM-AMAZON6', 'ARM-AMAZON7', 'ARM-AMAZON8', 'ARM-AMAZON9', 'ARM-AMAZON10', 'ARM-AMAZON11', 'ARM-AMAZON12', 'ARM-AMAZON13', 'ARM-AMAZON14', 'ARM-AMAZON15', 'ARM-AMAZON16', 'ARM-AMAZON17', 'ARM-AMAZON18', 'ARM-AMAZON19', 'ARM-AMAZON20'; and 'Recently Delivered Datasets' with a table listing domain, coverage, satellite, and delivery date.

DOMAIN	Coverage	Satellite	Delivered to ARM Archive
SGP	32°-42°N, 91°-105°W	GOES-13	Thru Dec17
ENA	37°-42°N, 26°-31°W	MET-10	Thru Dec17
NSA	68°-73°N, 147°-160°W	NOAA-19	2010-2016*
MICRE	52°-57°N, 156°-161°W	HIM-8	May16-Jan18
MARCUS	20°-65°N, 125°-180°W	HIM-8	TBD
LASIC	5°-20°S, 0°-15°W	MET-10	Jun16-Oct17
AWARE McMur	75°-81°S, 164°-170°E	NOAA-19	Jan-Dec16*
AWARE Waiw	77°-83°S, 109°-115°W	NOAA-19	Nov15-Jan16
BAECC	57°-65°N, 21°-28°E	NOAA-19	Feb-Sep14

Improved Diurnal TOA Fluxes

Step 1: Apply standard NB-BB coeffs to pixel-level imager data
Step 2: Normalize pixel-level fluxes to Ed4 CERES hourly
A) Aqua SSW1deg (SW or LW) or B) SYN1deg (SW) flux product

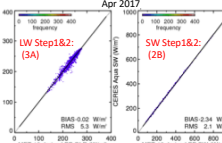
SGP Reprocess: 2004-2015



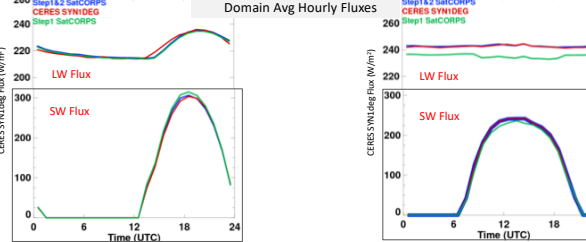
ENR Reprocess: Sep13-2017

Sources for NB-BB fits (used in Step 1)
(1) GOES/CERES Terra NB-BB fits (Khayyer et al. 2012)
(2) AVHRR-CERES Aqua NB-BB fits (Minnis et al. 2016)
(3*) MODIS-CERES Aqua 2channel (WV & IR) NB-BB fits (after Doelling et al. 2016)

ENR Reprocess: Sep13-2017

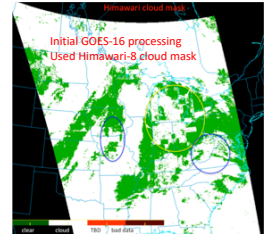


GEO Fluxes vs Ed4 CERES SYN1deg

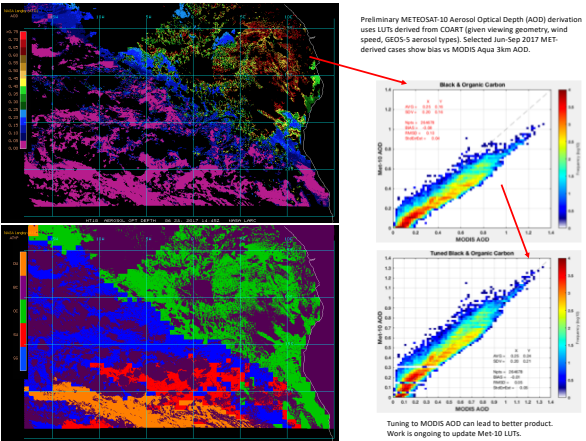


Cloud Mask

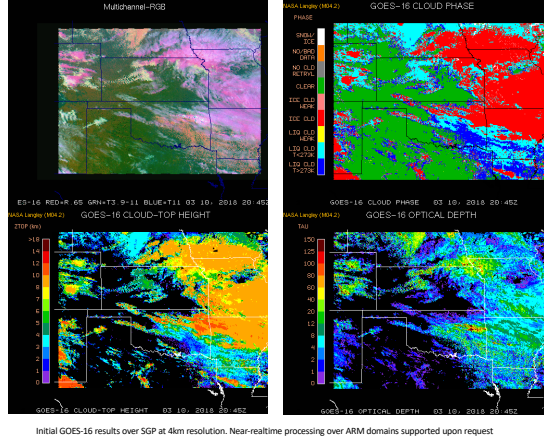
- Updated visible calibration
- METEOSAT-10 cloud mask improvement (increased aerosol sensitivity)
- TOA clear-sky temperature improvements, yielding better retrievals
- Improved phase detection in GOES, METEOSAT
- Greater inter-satellite consistency



GEOSTATIONARY SATELLITE AEROSOLS (LASIC AMF)



New Satellite Capability: GOES-16 (SGP)



Summary

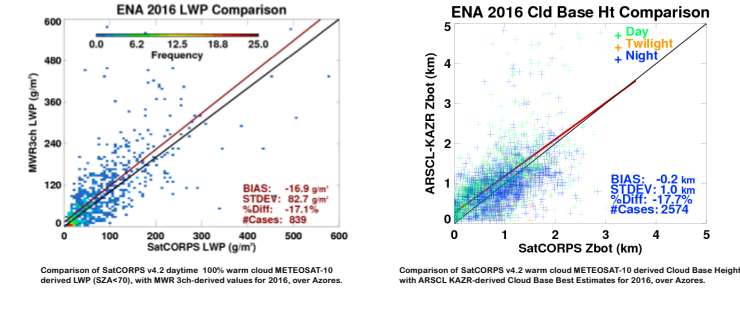
Satellite-derived cloud and radiation parameters: ARM fixed sites, AMF campaigns

- ARM SGP, ENA, NSA, AMF campaign support: MICRE, MARCUS (current); ACE-ENA, LASIC (recent)
- Typical data processing and delivery within 1-3 month (some latency required to incorporate CERES observations)
- Real-time cloud product imagery always available, R/T data products upon request
- Pixel-level, gridded datasets available from NASA Langley website and ARM archive (missing periods being filled in)
- Single grid (10/20 km) centered on ground/sites also available
- Recent additions to ARM archive:
 - o Near-real-time ENA & LASIC (METEOSAT-10), MICRE (Himawari-8), SGP (GOES-13)
 - o NOAA-19 AVHRR (Minnis, Bedka et al 2016), subsetted for BAECC, AWARE, NSA (2010-2016)
- MODIS-derived cloud/radiation retrievals over polar sites available upon request
- Recently reprocessed SatCORPS v4.2 datasets: SGP (2004-15), GO-AMAZON (2014-2015), ENA (Sep13-17)
 - o will be finalized/delivered soon; more in progress

Cloud retrieval, aerosol retrieval & TOA flux algorithm improvements ongoing

- GOES-16 operational for SGP; SatCORPS products reasonable but work in progress to address striping, calibration problems
- Flux Improvements: TOA Narrowband to Broadband normalized to CERES (removes diurnal bias)
 - o LW Flux (2 channel NB-BB LW fit (6.7 & 11 um) normalized to CERES - similar to Doelling et al 2016
 - o SW Flux diurnally normalized to Ed 4 CERES SYN1deg product - Applied to ENA reprocesses, in process of evaluation/realization
- New surface skin temperature retrieval (VZA correction, Scarino et al. 2017) and clear-sky info implemented for GOES-16

Validation with ARM



References

- (1) Doelling et al. 2016, Advances in Geostationary-Derived Longwave Fluxes for the CERES Synoptic (SYN1deg) Product, *J. Atmos. Oceanic Technol.*
- (2) Khayyer et al. 2012, Improved TOA Broadband Shortwave and Longwave Fluxes Derived for ARM Domains, *ASR Proceedings*
- (3) Minnis, Bedka et al. 2016, A consistent long-term cloud and clear-sky radiation property dataset from the Advanced Very High Resolution Radiometer (AVHRR), *ATD*
- (4) Scarino et al. 2017, Global clear-sky surface skin temperature from multiple satellites using a single-channel algorithm with angular anisotropy corrections, *Atmos. Meas. Tech.*

Acknowledgment

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Feedback and requests from users are welcome
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