

SatCORPS Satellite-Derived Cloud and Radiative Properties: ARM Site Coverage Updates

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NASA/Langley SatCORPS cloud and radiative property datasets are provided to ARM on an ongoing basis, covering both fixed and AMF sites. The products can be employed for a range of uses- detailing the large-scale environment surrounding ARM sites, field campaign flight planning, process-level studies, and also as model constraints. Improvements in the SatCORPS algorithms are continually being made.

Recently Delivered SatCORPS v4.2.x Data

Site	Sat	Domain	Dates
SGP	GOES-16	32°-42°N, 91°-105°W	Mar21-May22
ENA	MET-11	28°-38°N, 23°-33°W	Mar21-May22
NSA	Aqua, Terra	67°-73°N, 147°-160°W	Mar21-Jul22
HOU	GOES-16	24°-43°N, 87°-110°W	Oct21-May22
GUC	GOES-17	34°-44°N, 102°-114°W	Sep21-May22

<site>visstpx2d<sat>minnisX1.c1: Pixel-level (2-4km res) data delivered for listed domains
 <site>visstgrid<sat>minnisX1.c1: Gridded (0.5°) for all but NSA.

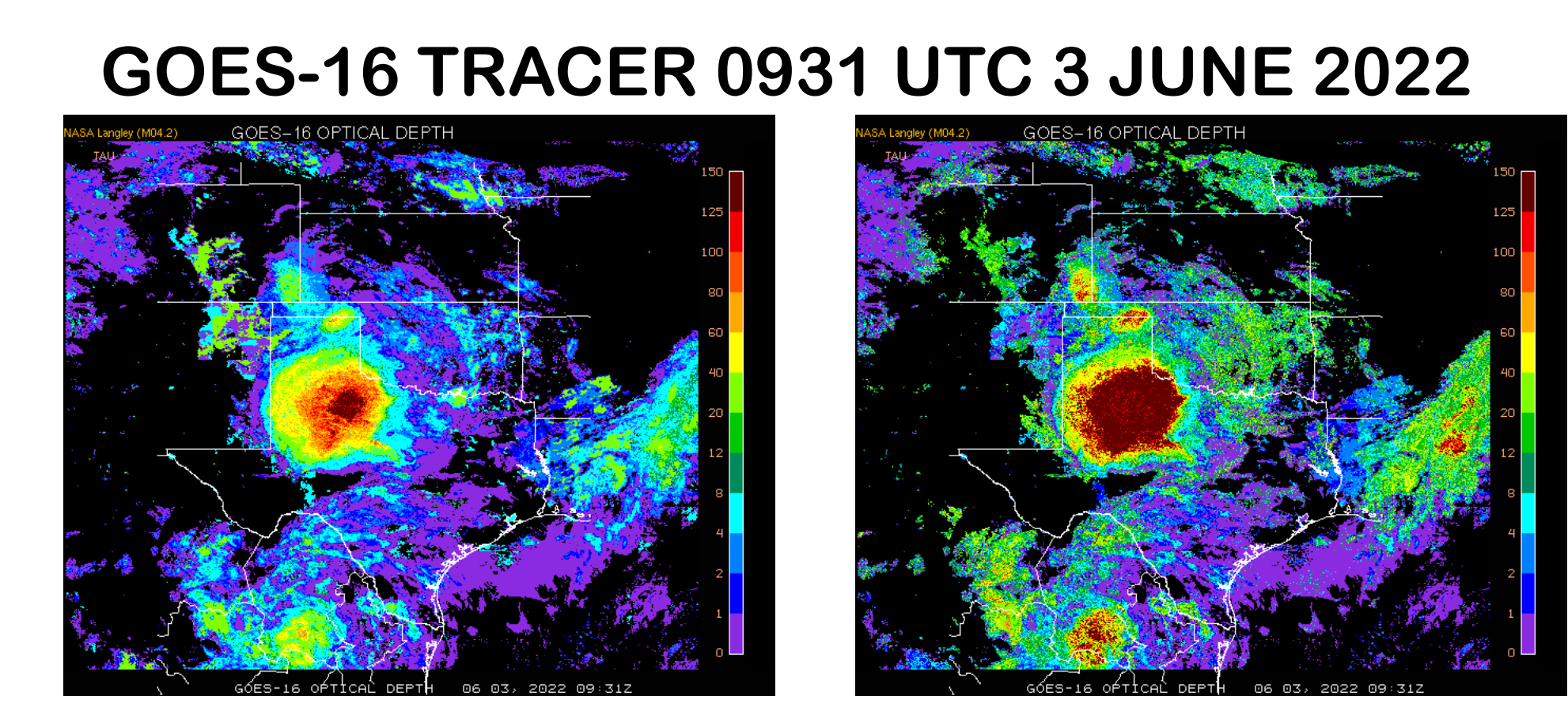
SatCORPS Website- ARM Field Campaign Support

The screenshot shows the SatCORPS website interface. The 'ARM Field Campaign Support' section is highlighted, showing links to ARM sites and campaigns. The 'ARM Field Campaign Support' section is highlighted, showing links to ARM sites and campaigns.

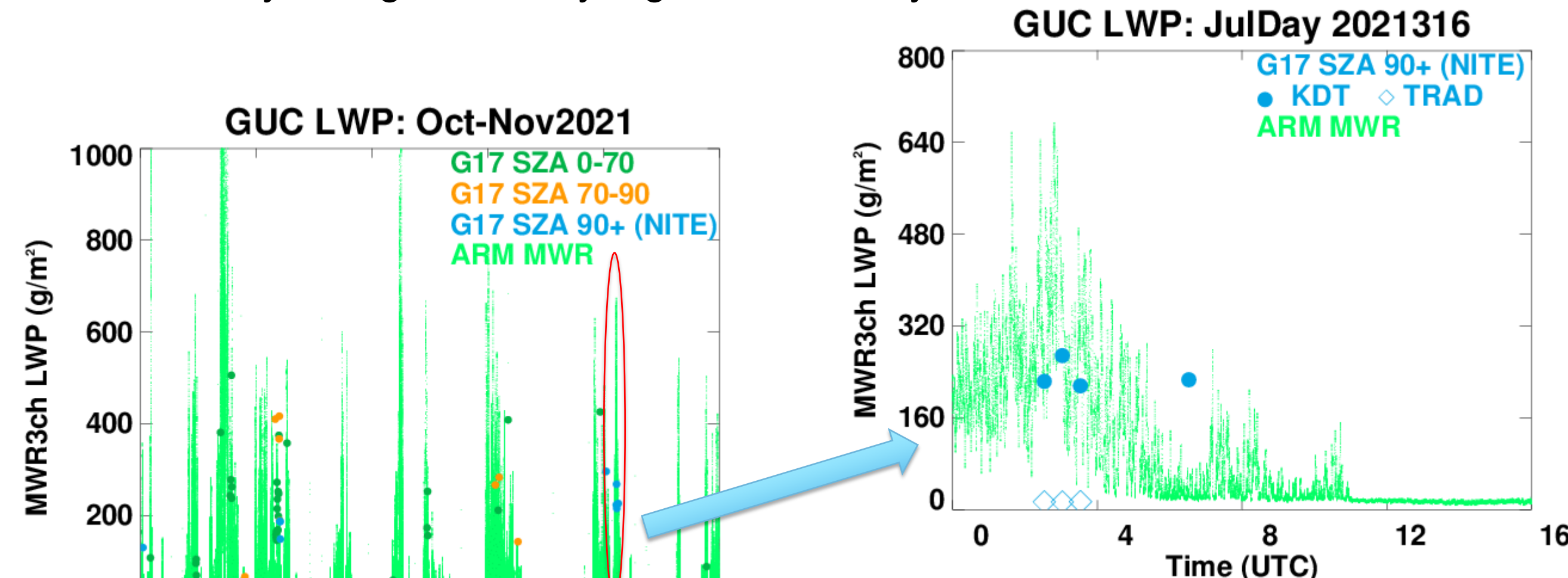
ASR button on SatCORPS site leads to ARM-site support page links
 TRACER support (shown above) included high-resolution imagery updated every 10 minutes.

<https://satcorps.larc.nasa.gov>

Machine Learning Improvements Nocturnal Cloud Properties

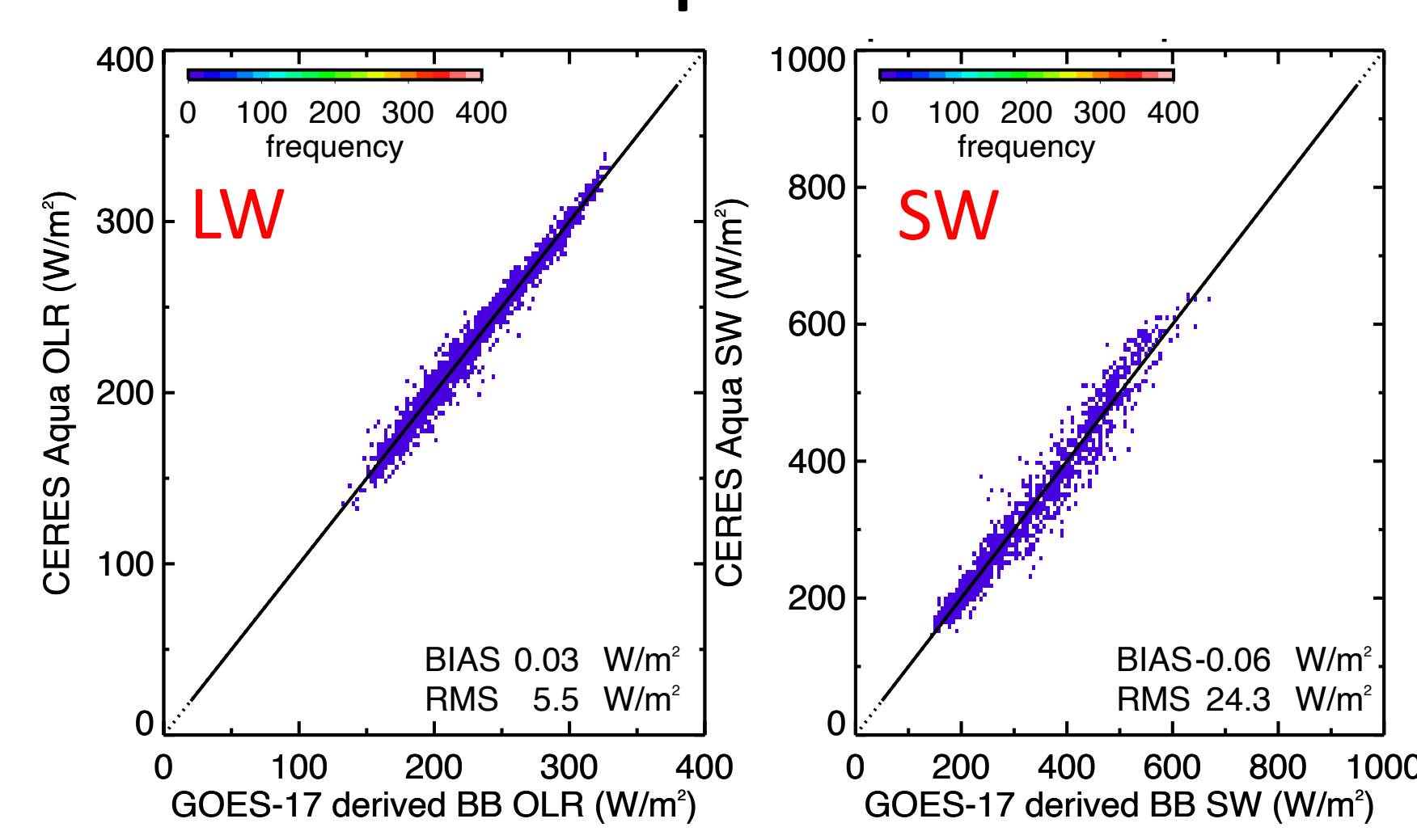


K-Nearest Neighbor Machine Learning method (KNN, right) used in concert with traditional SatCORPS (TRAD, left) relates daytime optical depth ranges to nighttime values, yielding better day-night consistency

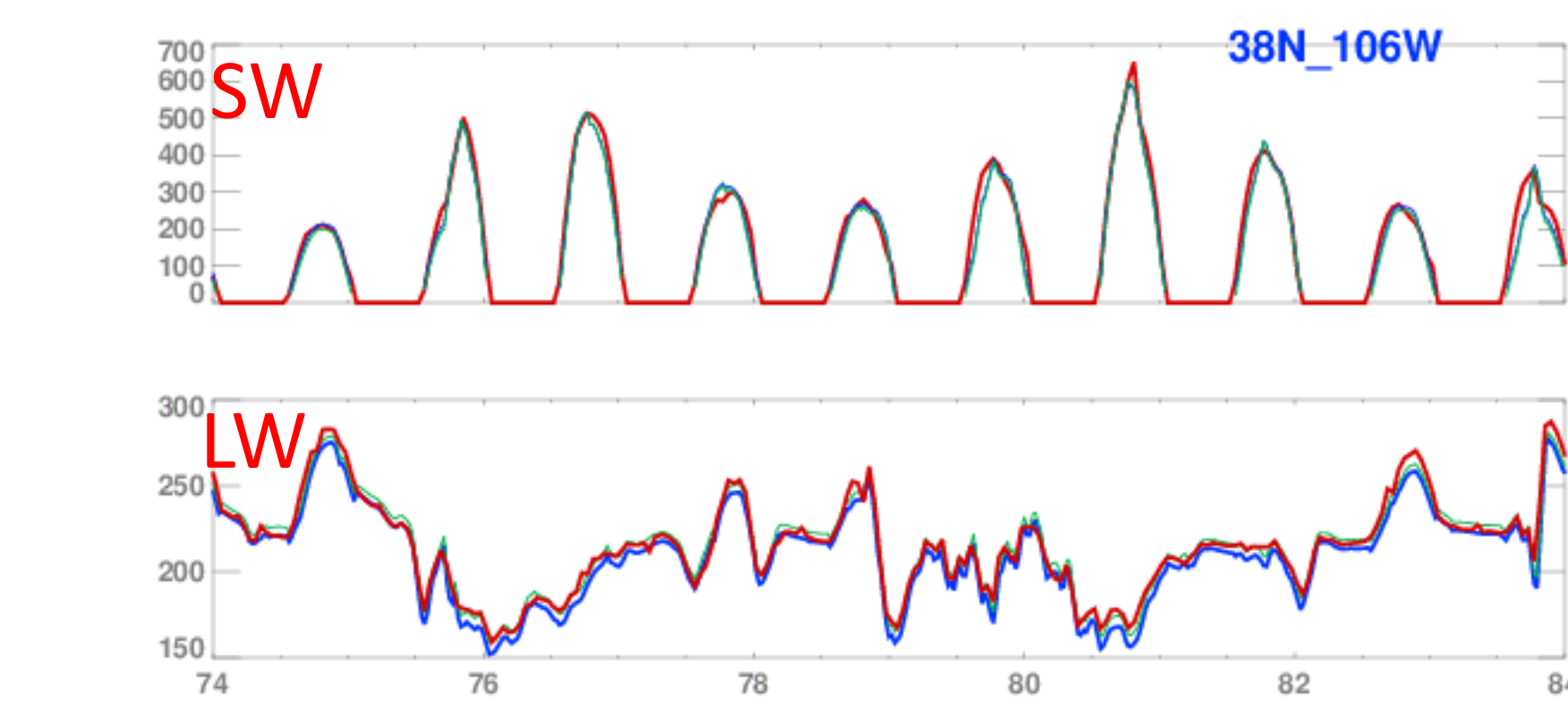


KNN-enhanced SatCORPS (circles) shows promise for improving nocturnal cloud properties, versus the traditional (TRAD, diamond) SatCORPS algorithm. 10km radius averaged KNN- SatCORPS LWP compared to MWR3c-LWP (light green, note suspect data) shows more realistic satellite derived values in 2021316 GUC site nighttime cases.

TOA Flux Comparisons with CERES



March 2022 TOA fluxes for the SAIL domain, compared with Aqua CERES SSF1deg, Recently delivered gridded v4.2.x SatCORPS broadband fluxes were normalized to Edition 4 CERES fluxes for Aqua (~13:30 LT) overpasses, reducing the bias wrt Aqua near 0.

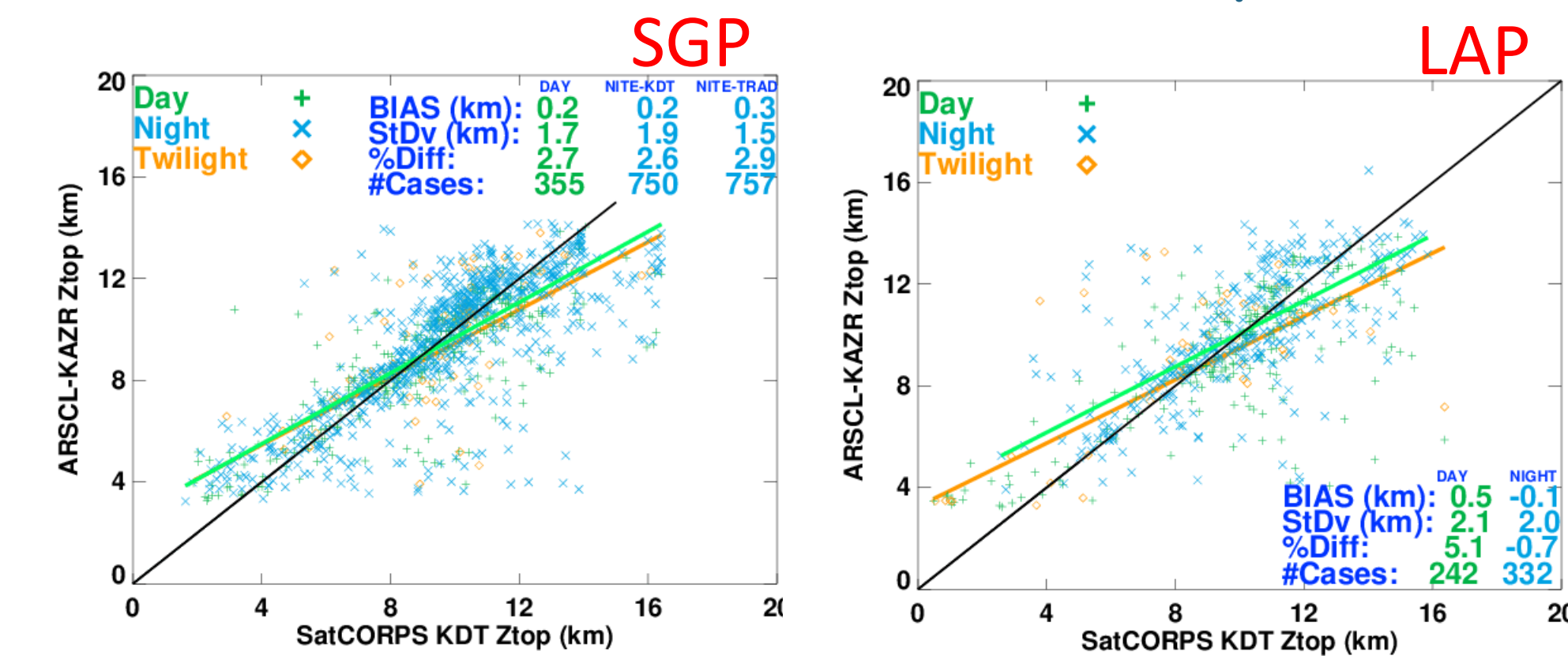


15-25 March 2022 TOA fluxes (SatCORPS normalized- green; original-blue) for the SAIL site grid box (36°N 106°W) , compared with Aqua CERES SYN1deg (red). The data matches well along the diurnal cycle.

Summary and Ongoing Work

- SatCORPS satellite cloud retrievals for recent SGP, ENA, NSA, as well as TRACER and SAIL campaigns, have been delivered to the ADC through May 2022.
- Various display tools for imagery and derived cloud properties, ground site average time series, flight track overlays, etc are available on SatCORPS website (<https://satcorps.larc.nasa.gov>)
- AMF campaign support is ongoing, including SAIL, and the recently concluded TRACER. ECAPE will be next, with SatCORPS support starting Jan 2023
- ML applications have been implemented to improve nocturnal cloud properties; other such applications are in development to improve polar nighttime cloud, and multi-layer cloud detection
- Work continues on SatCORPS Edition 5, including updating cloud algorithms for cloud mask consistency between satellites

SatCORPS vs ARM KAZR-ARSCL Ztop: Oct21-May 22, Single Layer ARM Zthk >3km



KNN-SatCORPS can also improve nocturnal cloud top height derivation. Comparing 10km radius avg KNN-SatCORPS to KAZR-ARSCL cloud top heights (single layer, >3km thick clouds) shows a slight decrease in bias for recent SGP cases (left), along with small biases seen in TRACER comparisons (right).

GOES-17 Imager (ABI) nighttime cooling problem yields degraded (10:30-16:30 GMT) IR imagery for all but 2 channels. KNN reconstructs these radiances by using information from the 2 valid IR channels. This approach allows cloud properties to be derived for the SAIL campaign (below).

