



# Validation of Improved TOA Shortwave and Longwave Broadband Fluxes over the ARMTWP Domain

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## Introduction

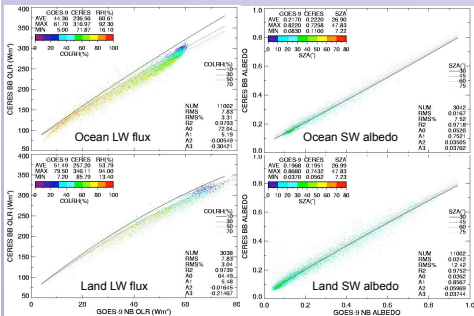
- NASA/Langley Cloud group derives cloud and radiative properties from various satellites using VISST & SIST algorithms
- TOA broadband (BB) shortwave (SW) and longwave (LW) fluxes derived from geostationary (GEO) satellite narrowband (NB) radiances using empirical fits of GEO NB vs. 2x/daily Terra CERES BB fluxes
- Previous NB-BB work concentrated on SGP, new efforts are deriving NB-BB fits over Darwin/TWP domains
  - 1° res matches of GEO data with CERES SFC (0°-17°S, 121°-140°E)
  - Specific fits: GOES-9/Terra & MTSAT/Terra
  - Fits account for diurnal, land-ocean, seasonal differences
    - Dry season, May-Oct; wet season, Nov-Apr

## Summary

- TWP Darwin region GOES- and MTSAT-derived BB LW and SW TOA fluxes have been derived:
  - GOES9: 2 sets of seasonal/land/ocean NB-BB fits per year, for period May03-Oct05
  - Separate fits for LW accounting for day/night differences
  - MTSAT: 1 preliminary set of day/night/land/ocean fits, for Oct-Dec07
- MTSAT and GOES-9-derived daytime BB LW fluxes validated with respect to Fu-Liou-derived fluxes; nighttime GOES-9 compared well with Fu-Liou RTM, MTSAT night comparison was worse
- Fairly good agreement for GOES-9-derived SW fluxes compared to Fu-Liou; some errors likely due to noisy GOES-9 visible channel data and/or lack of SZA variability in CERES
- Future work:
  - Include SZA enhancement from GERB instrument to improve derivation of SW BB flux
  - Derive NB-BB fits for all available years of SGP GOES8/10/11/12, TWP GOES9, TWP MTSAT
  - Process VISST datasets using updated NB-BB fits (<http://www-pm.larc.nasa.gov>)

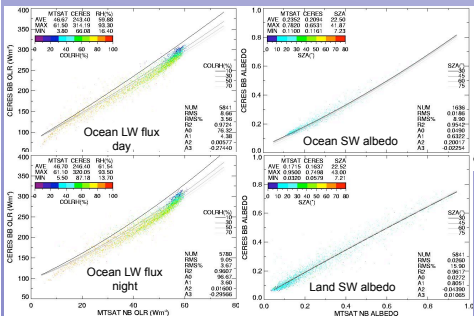
## Deriving NB-BB fits

### GOES9-CERES



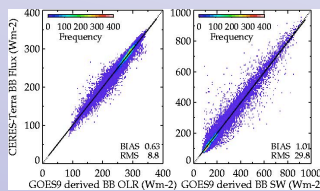
Wet season (Nov04-Apr05) daytime GOES-9 NB vs Terra CERES BB fluxes and albedos at 1° resolution. Dry and wet seasonal fits for rest of May 03 – Oct 05 period were also derived (not shown).

### MTSAT-CERES

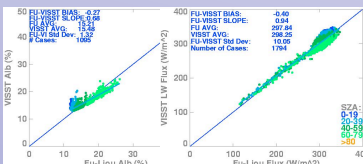


Oct-Dec07 MTSAT NB IR fluxes and VIS albedos regressed against Terra CERES BB LW fluxes and SW albedos.

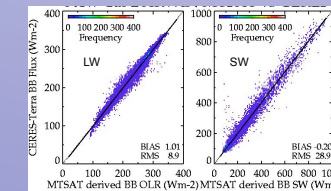
## Validation



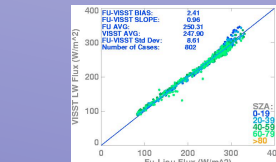
Validation of GOES9-derived BB fluxes with CERES Terra for Nov04-Oct05 data. SW scatter large due to visible channel noise, bias is small.



Daytime (SZA < 80°) May-Oct04 Fu-Liou RTM-derived CERES FSW clear sky albedo: good agreement in (left) SW clear (<5% cld frac) and (right) LW clear and cloudy conditions. Nighttime LW validation also good: bias of 0.37 Wm<sup>2</sup> and STDDEV of 10.0 (not shown).



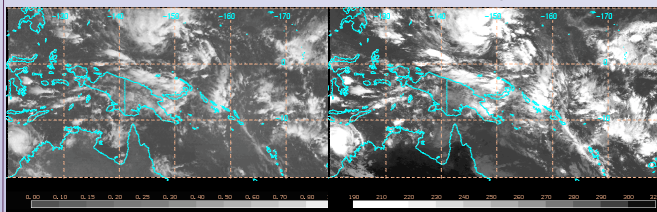
Oct-Dec07 MTSAT-derived vs Terra CERES fluxes.



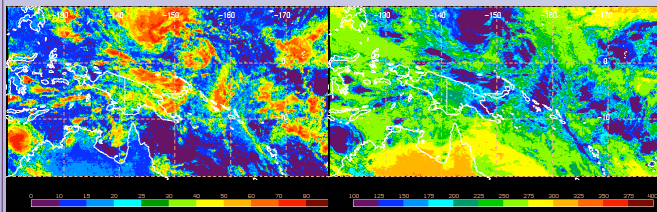
Daytime Fu-Liou derived BB LW fluxes at 13.5°S 130.5°E agree well for clear & cloudy conditions (night bias -4.3 Wm<sup>2</sup>, STDDEV 11.9; not shown).

## Results

### GOES9-derived BB Fluxes: 0025 UTC January 14, 2005

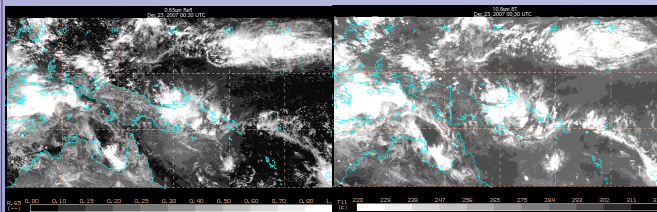


Visible Reflectance (0.65 um) IR Brightness Temp (K; 11 um)

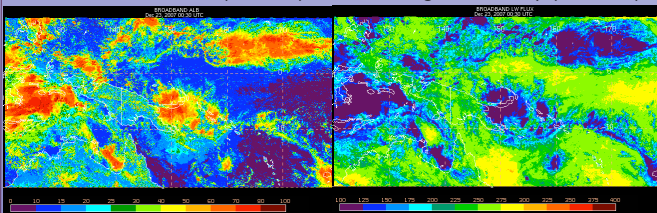


BB SW TOA Albedo (%) BB LW TOA Flux (Wm-2)

### MTSAT-derived BB Fluxes: 0030 UTC December 23, 2007



Visible Reflectance (0.65 um) IR Brightness Temp (K; 11 um)



BB SW TOA Albedo (%) BB LW TOA Flux (Wm-2)