

BBHRP Breakout Schedule

1:00-1:15 Nazim Ali Bharmal, Comparisons of measured and calculated divergence over Niamey

1:15-1:30 Zheng Liu, Heating rates from CloudSat/ARM

1:30-1:45 Mandana Khaiyer, Improvement of Broadband Shortwave and Longwave Fluxes over ARM Domains

1:45-2:00 Leslie Moy, Clear and All Sky TOA OLR Comparisons between RTM Calculations and CERES Observations

2:00-2:15 Lazaros Oreopoulos, Comparison of radiative transfer codes via BBHRP

2:15-2:30 Sally McFarlane, BBHRP Testbed for Cloud Retrieval Evaluation

2:30-2:45 Jennifer Comstock, Intercomparison of CLOWD retrieval methods using BBHRP

3:00-3:30 break

3:30-3:45 Matt Shupe, An Evaluation of Cloud Microphysics and Radiation Calculations at the NSA

3:45-4:00 Eli Mlawer, Overview of BBHRP Cloud Retrieval Comparisons at SGP

4:00-5:00 Discussion of BBHRP Cloud Retrieval Evaluation

Objectives of the Broadband Heating Rate Profile Project

- ❖ Compute **heating rate profiles** at all ACRFs based on in-situ measurements
- ❖ Evaluate new data sources using **radiative closure analysis**
 - emphasis on evaluation of cloud retrieval algorithms
- ❖ Generate **dataset** of measured and modeled radiation using ‘baseline’ cloud retrieval

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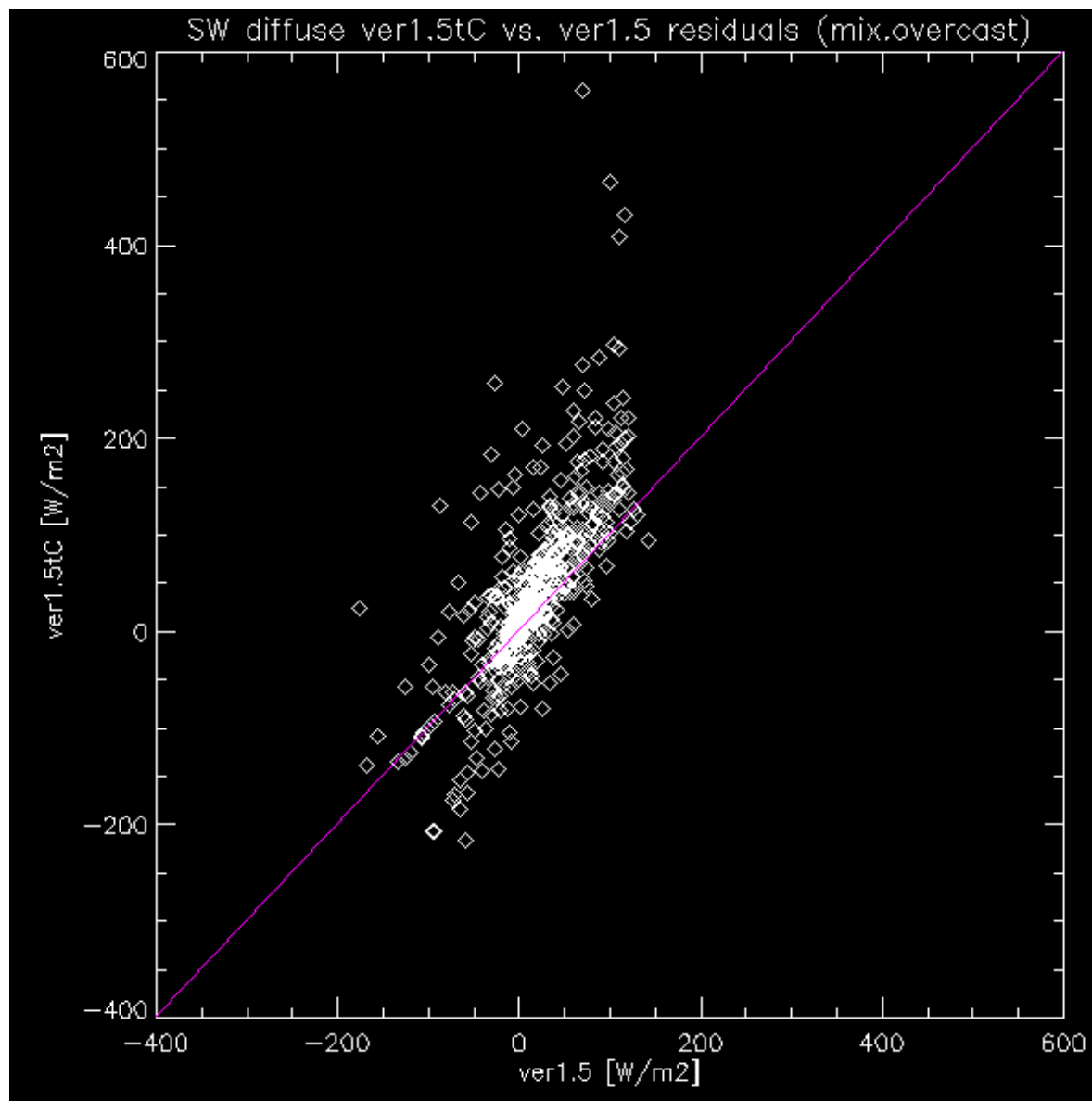
Recent Developments

- ❖ Release of new PI product for SGP (ver 1.5)
 - 1-min ICA calculations averaged over 30 min.
 - Extensive improvements to I/O netcdfs
- ❖ Evaluation of numerous cloud retrievals at SGP (thanks M. Dunn)
- ❖ Evaluation of Shupe-Turner retrieval at NSA
- ❖ Discovery of issues with GOES TOA flux values

Planned Developments

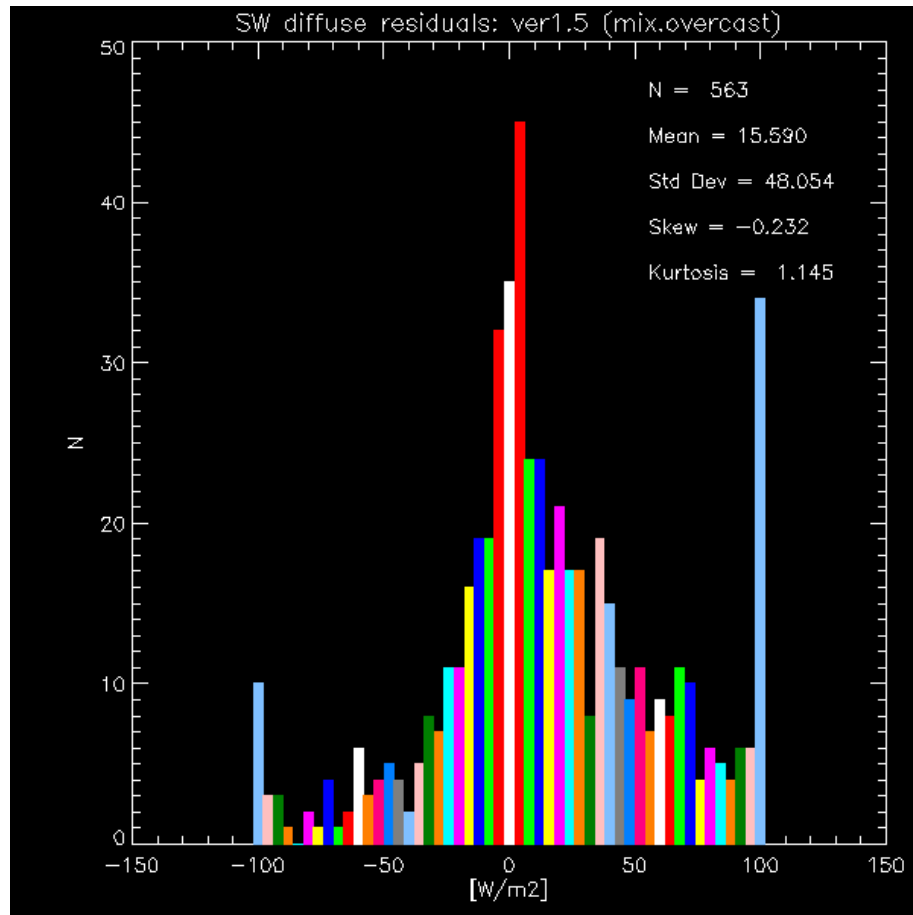
- ❖ Release of PI product for NSA
 - Microbase or Shupe-Turner?
- ❖ Release of 'testbed' to allow easy input of retrieved cloud properties into BBHRP
- ❖ Intercomparison at PYE of CLOWD retrieval methods
- ❖ Development continues at TWP (including TWP-ICE)

LWP Comparison: Microbase (x) vs. No_MWR (y)

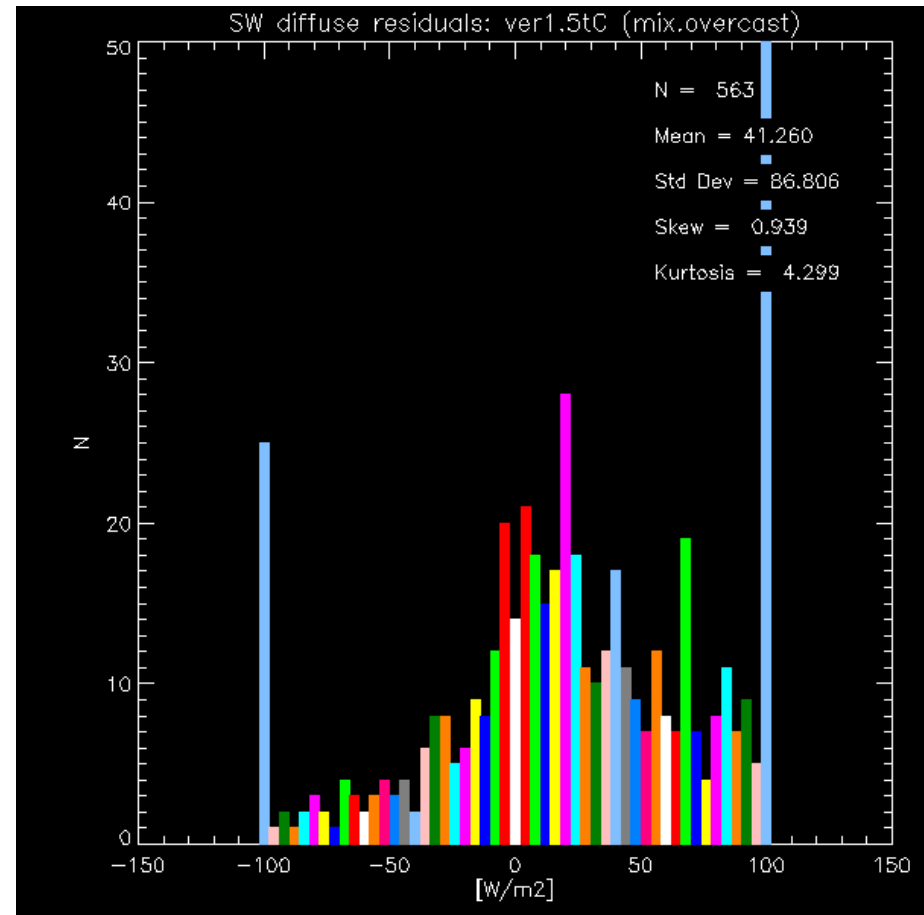


Mixed-
phase

SW Diffuse Residuals - Mixed-phase

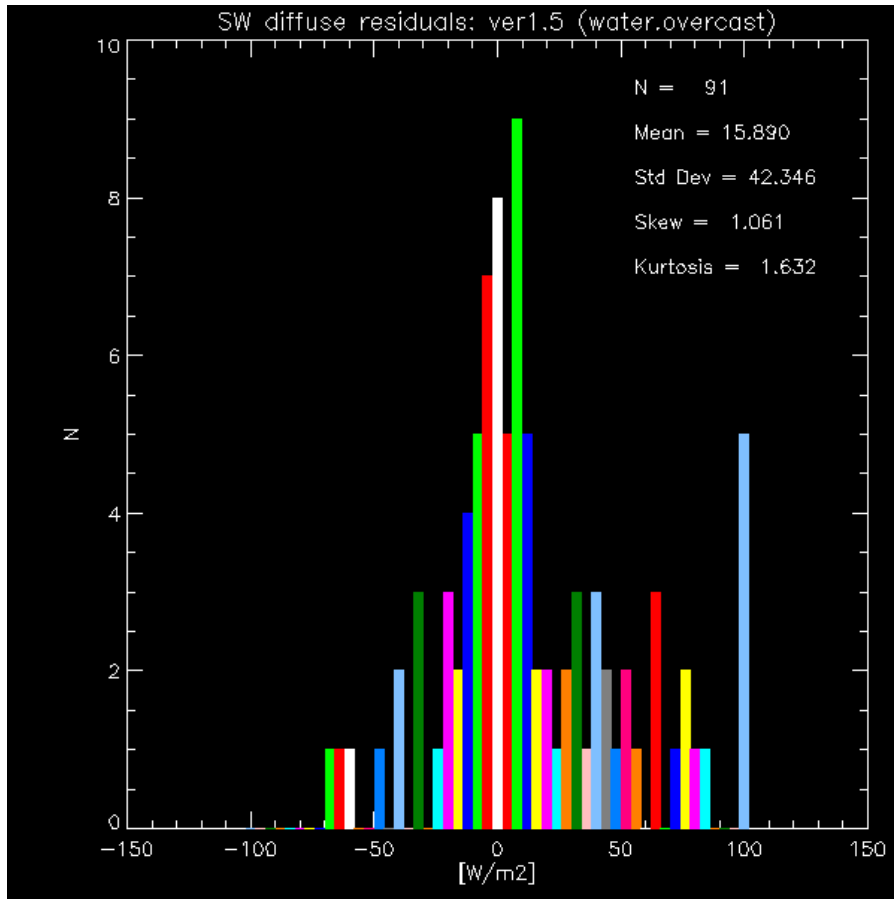


Microbase: 15.6, 48.0

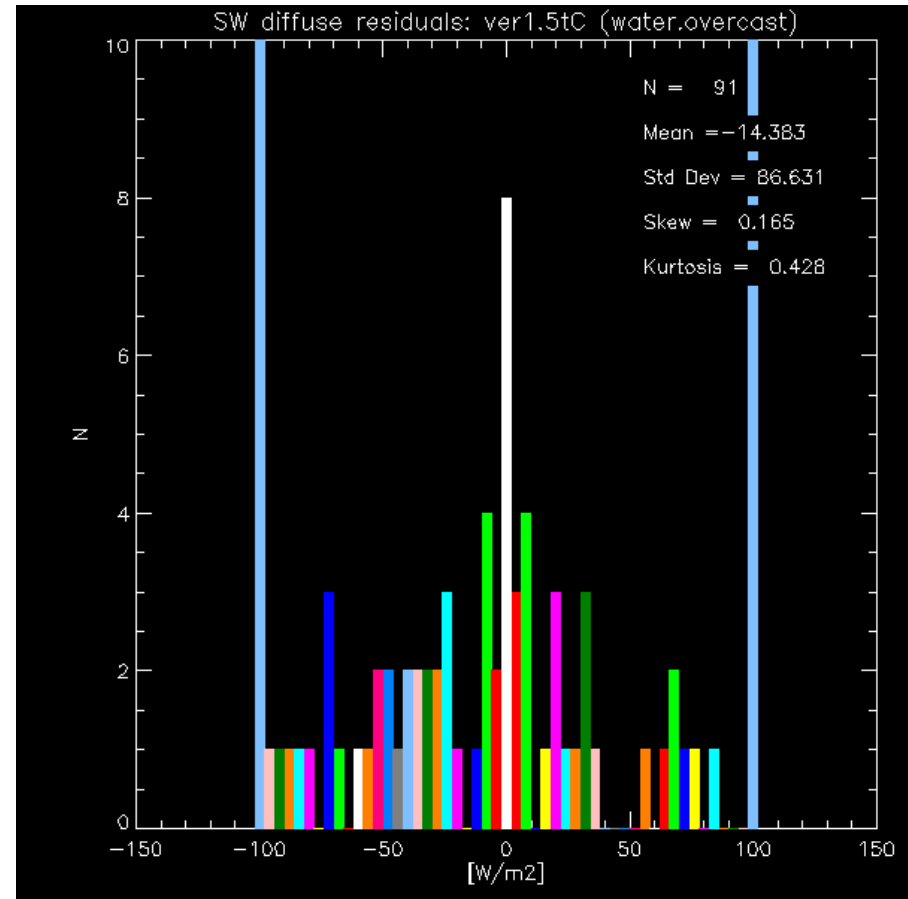


Microbase (no MWR LWP): 41.3, 86.8

SW Diffuse Residuals - Liquid clouds

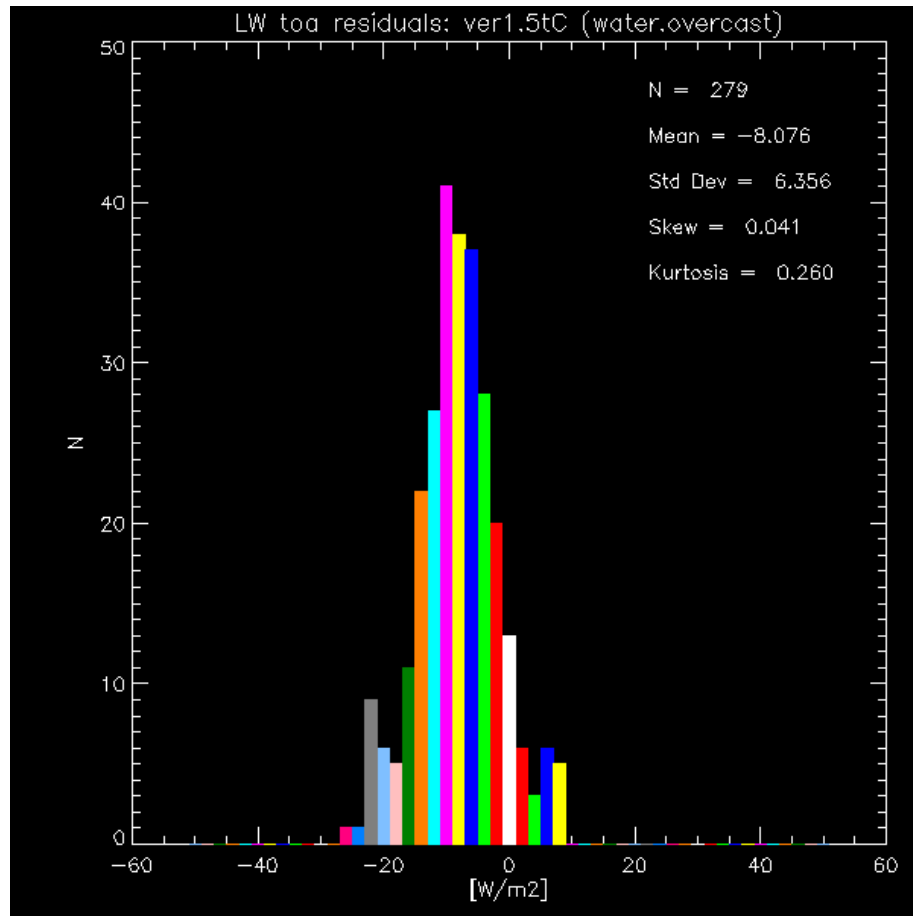


Microbase: 15.9, 42.3

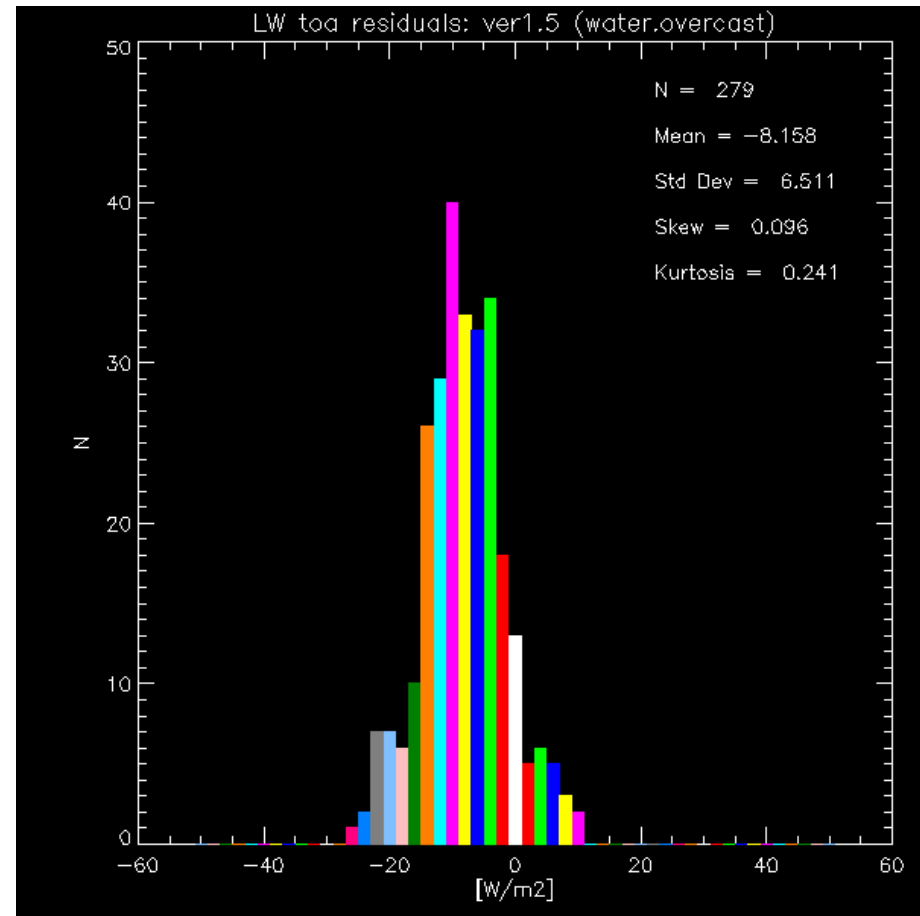


Microbase (no MWR LWP): -14.8, 86.6

LW Residuals - Liquid clouds



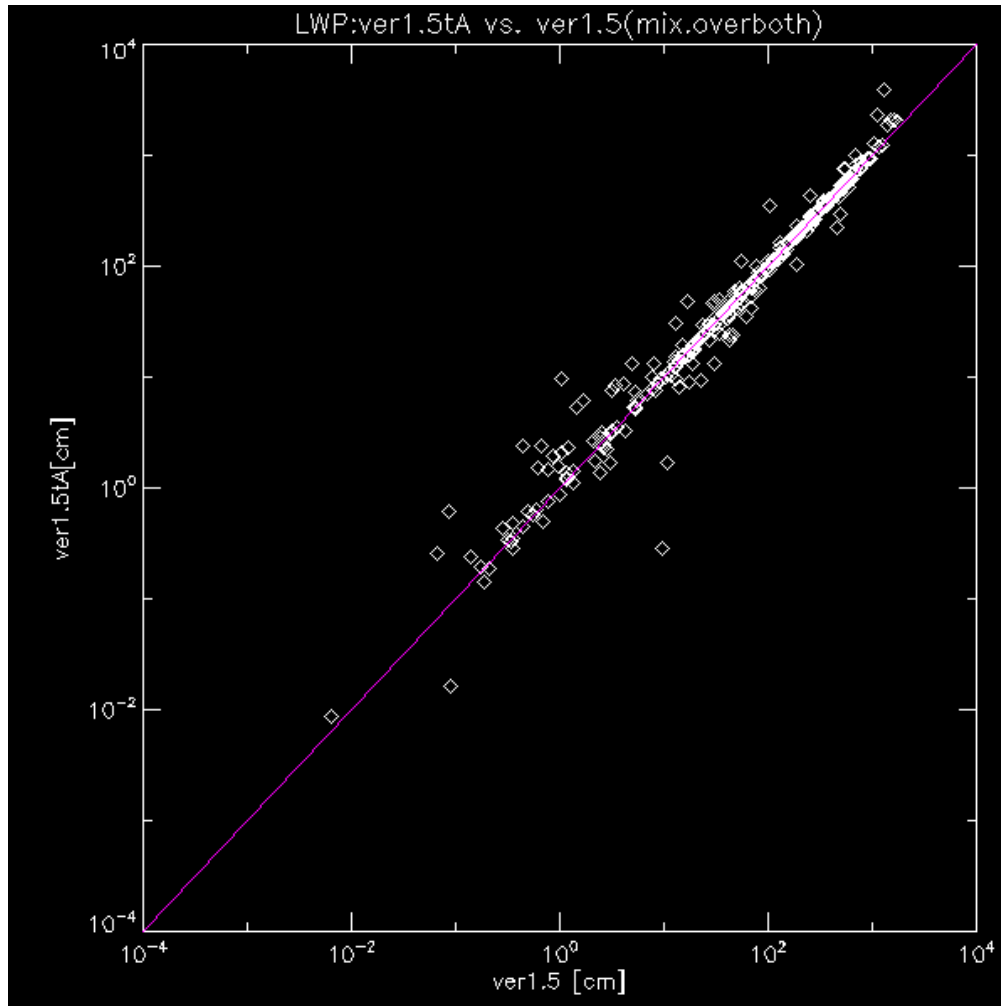
Microbase: -8.1, 6.3



Microbase (no MWR LWP): -8.2, 6.5

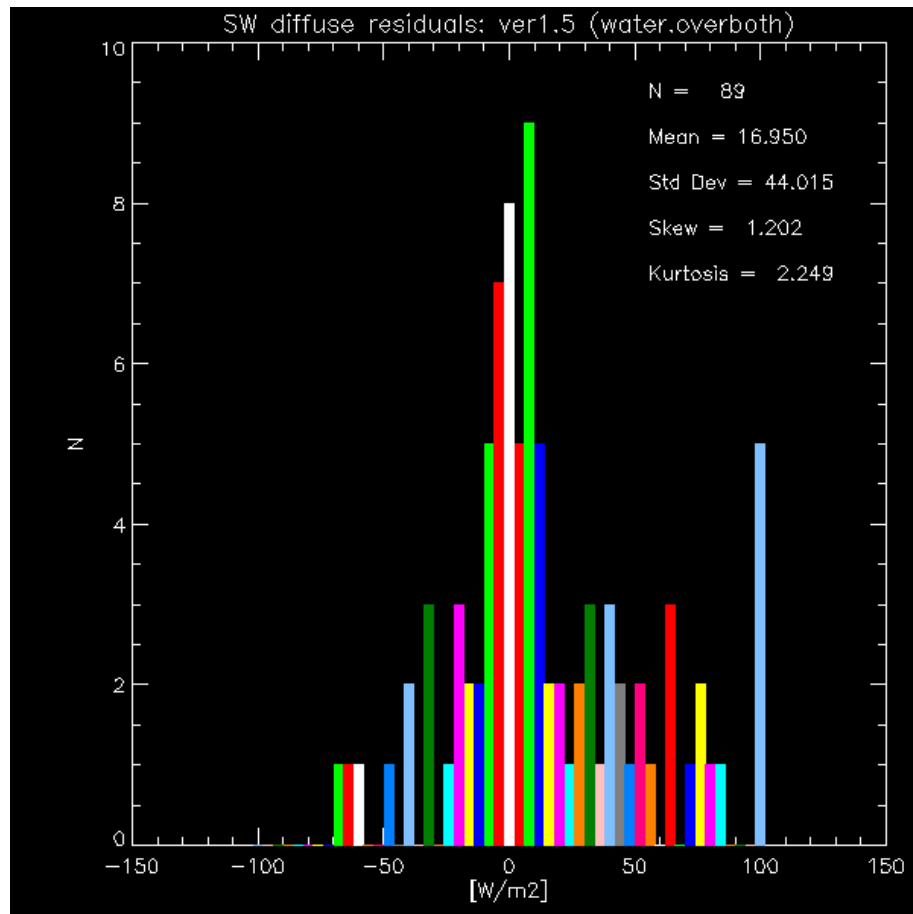
Frisch et al. retrieval

- MWR LWP
- liquid number density from ratio of integrated radar reflectivity and LWP
- lognormal distribution is then used to compute $LWC(z)$ and r_{eff} .

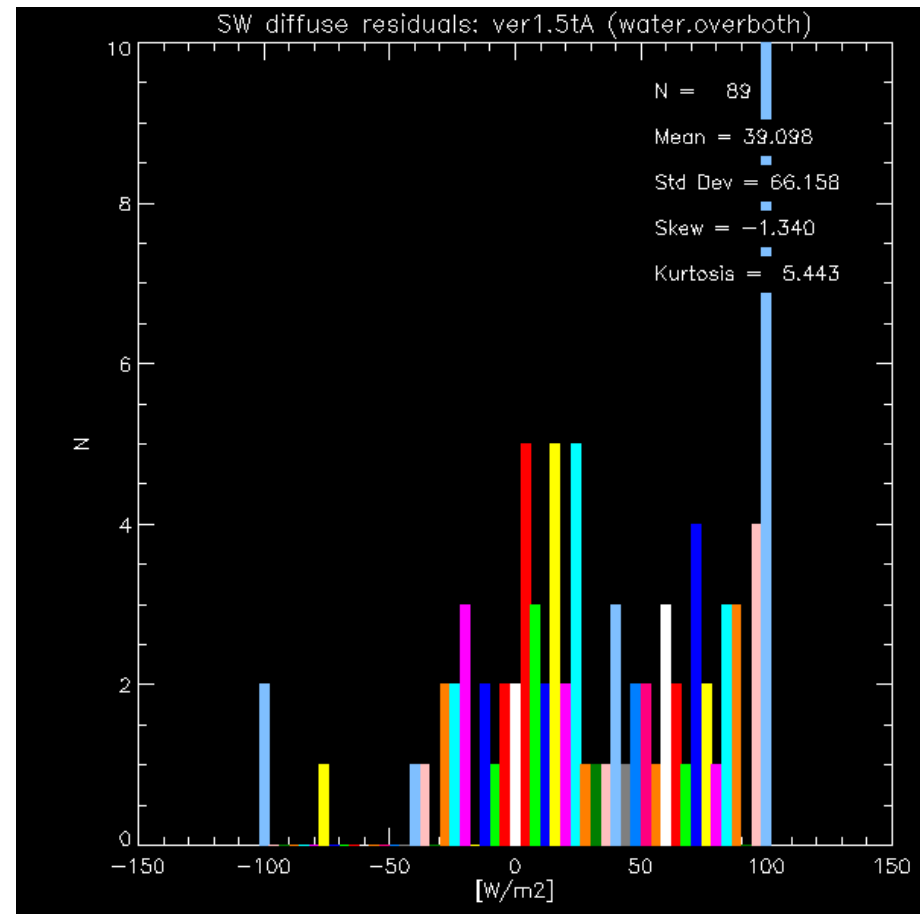


Same LWPs as
Microbase,
higher r_{eff}
values

SW Diffuse Residuals - Liquid clouds

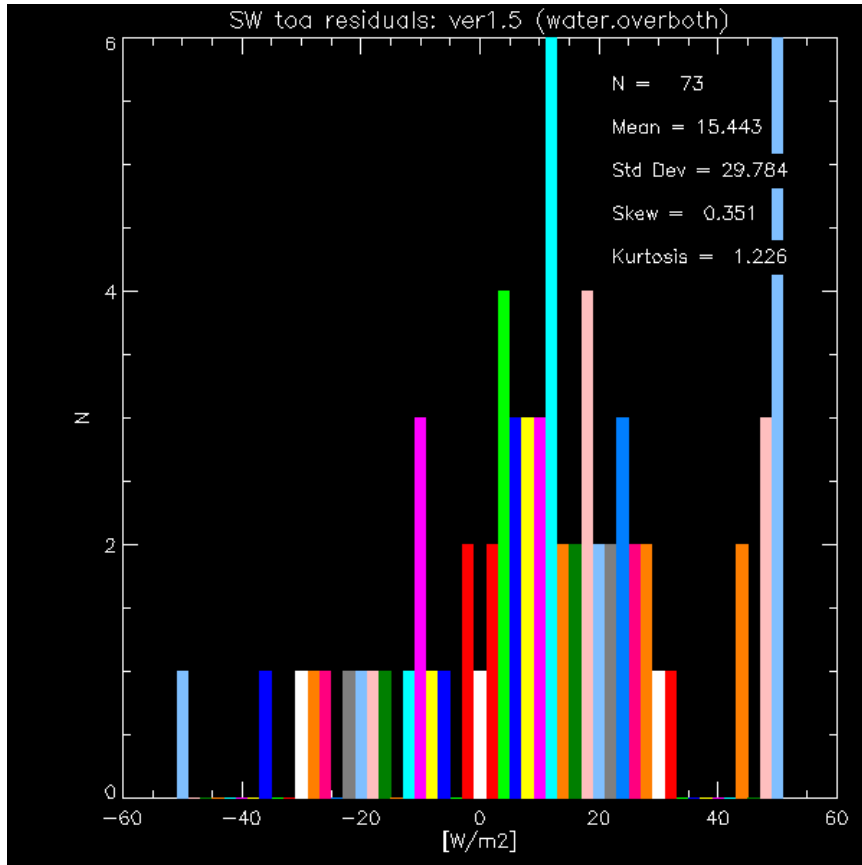


Microbase: 17.0, 44.0

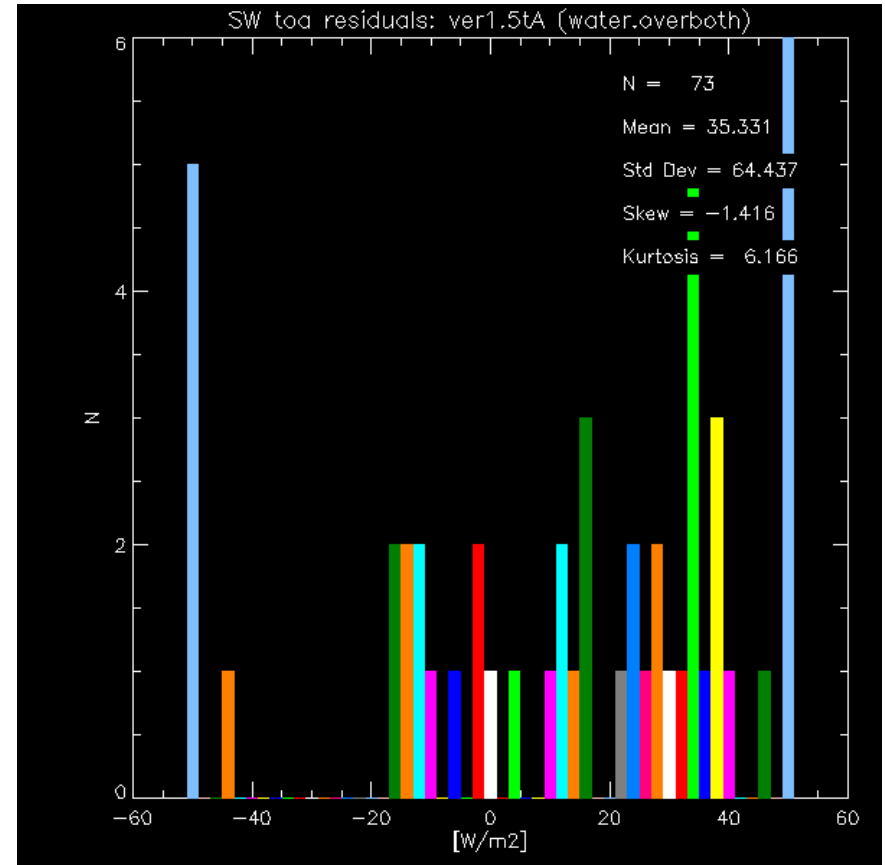


Frisch: 39.1, 66.2

SW TOA Residuals - Liquid clouds

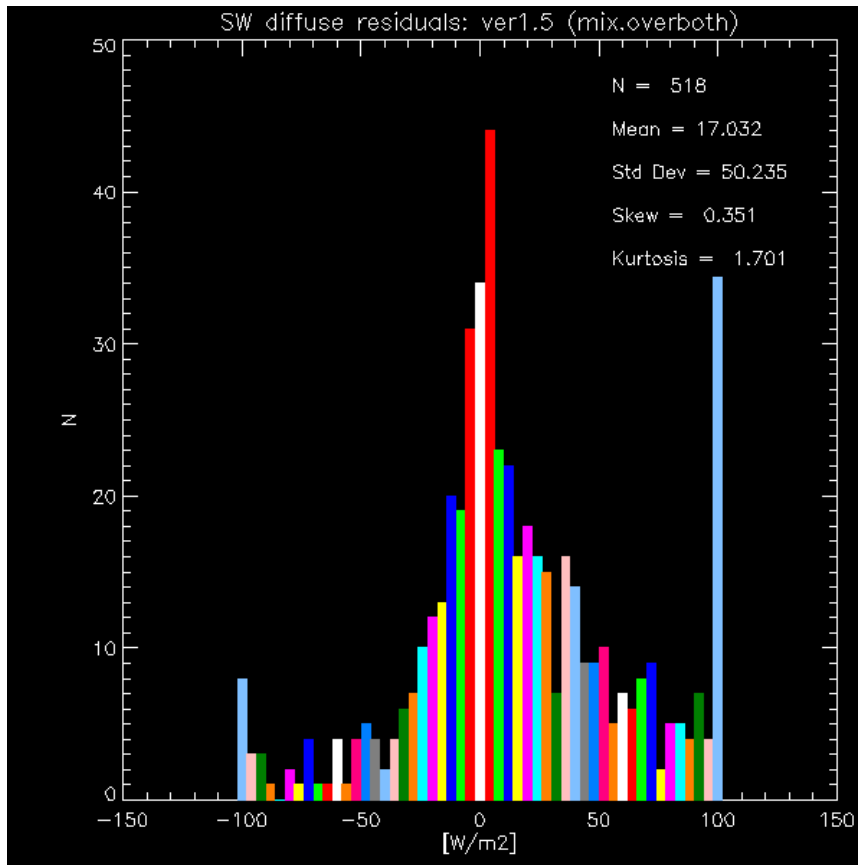


Microbase: 15.4, 29.8

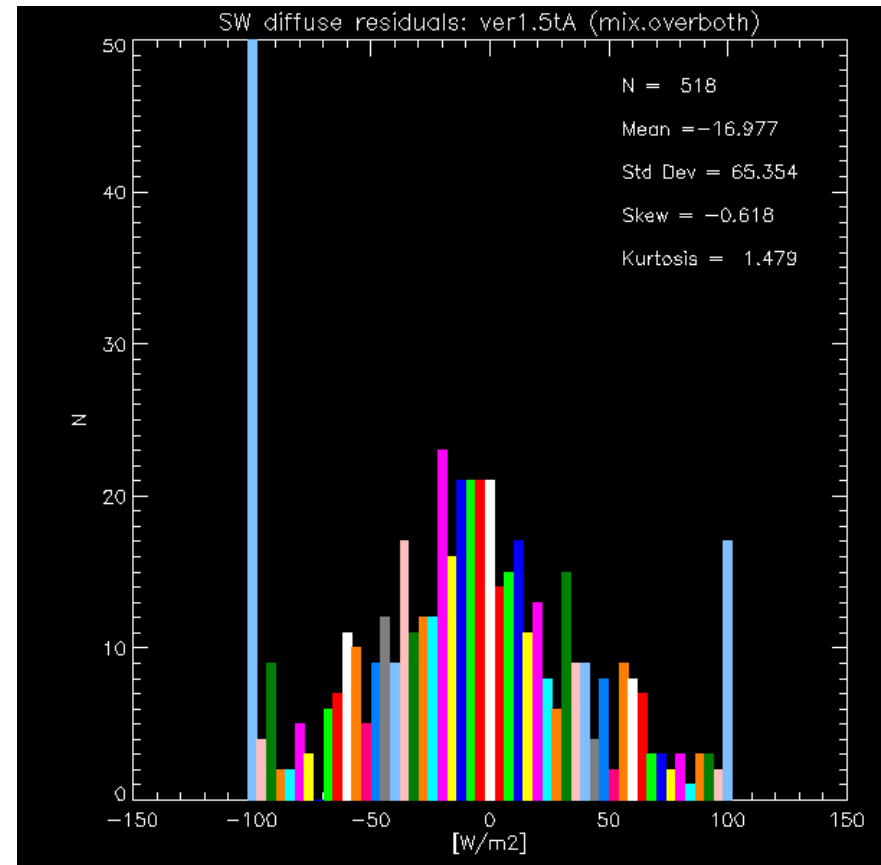


Frisch: 35.3, 64.4

SW Diffuse Residuals - Mixed-phase clouds

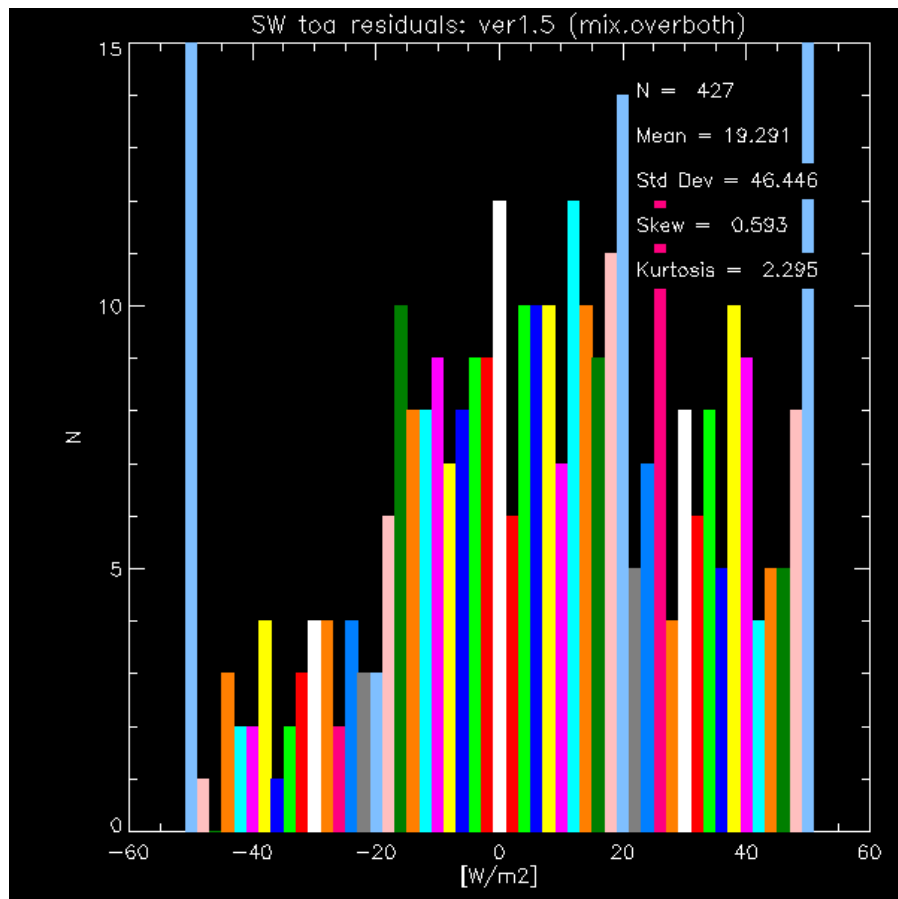


Microbase: 17.0, 50.2

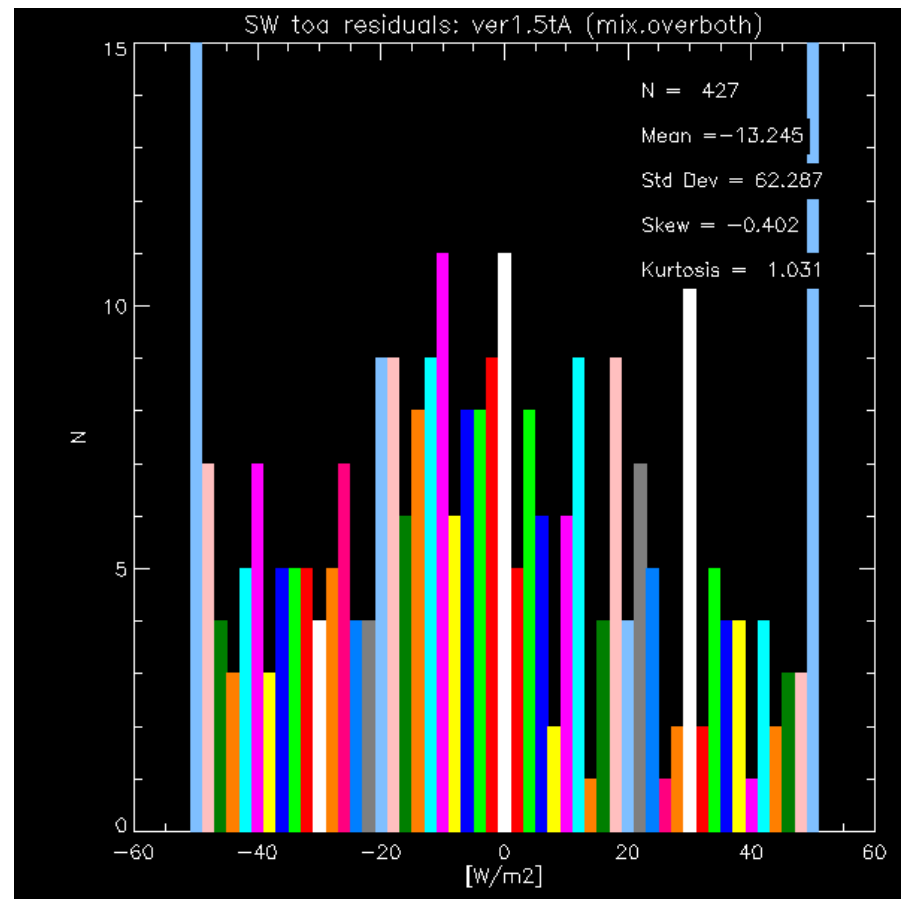


Frisch: -17.0, 65.4

SW TOA Residuals - Mixed-phase clouds

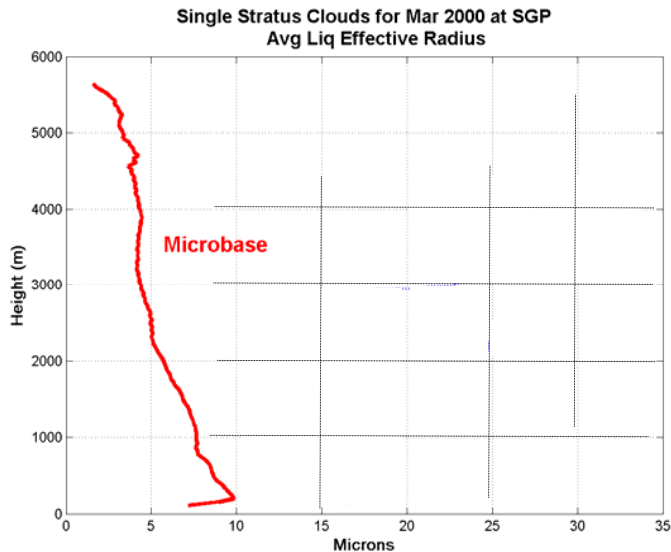


Microbase: 19.3, 46.4



Frisch: -13.2, 62.3

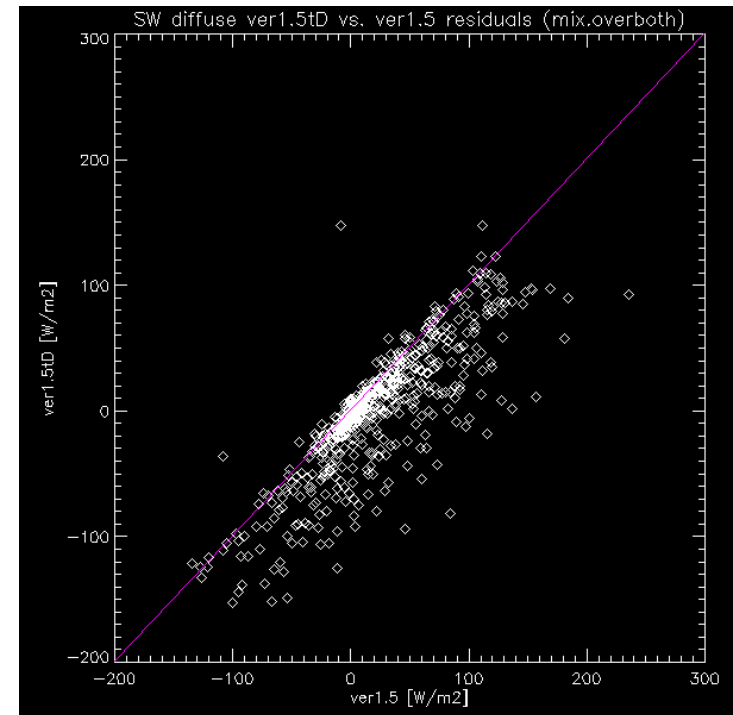
Evaluating Simple Reasonable Assumptions



Microbase - assumes that the liquid number density (N_d) is $200/\text{cm}^3$ to determine the r_{eff} from each layer's LWC.

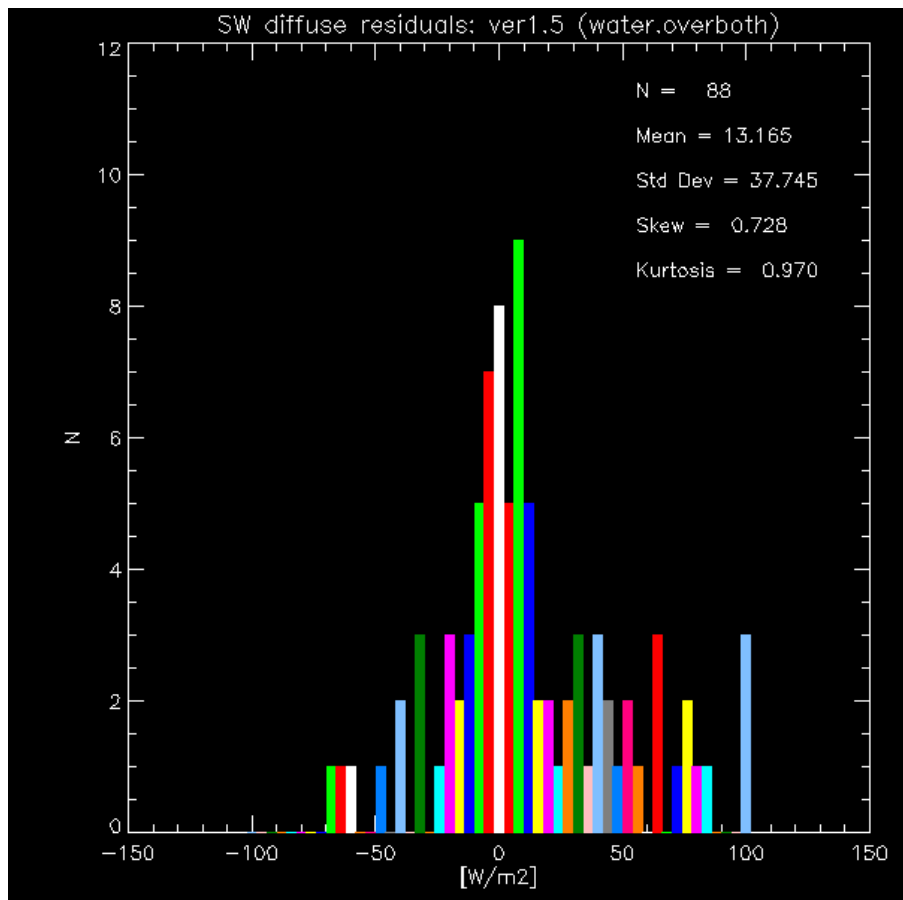
Sengupta et al. - suggested using a fixed value of $r_{\text{eff}}=7.5 \mu\text{m}$ (i.e. a varying N_d in each layer).

BBHRP run - Retrieval 'Sengupta' consists of Microbase layer LWPs and $r_{\text{eff}}=7.5 \mu\text{m}$.

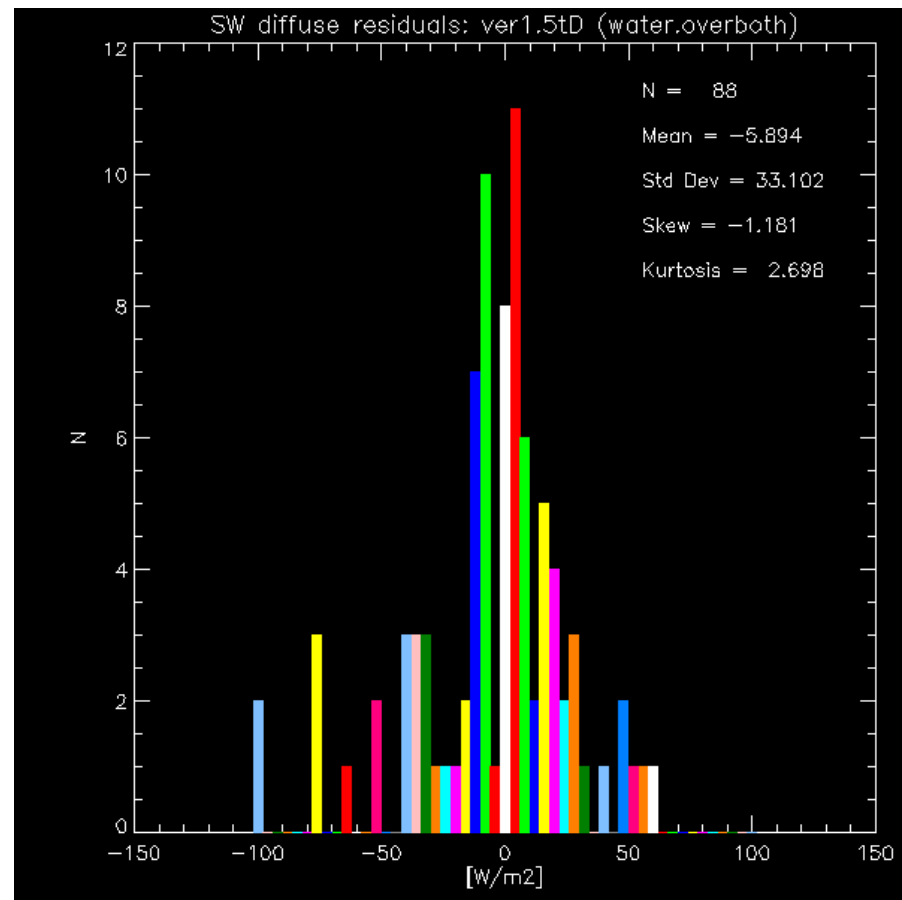


SW diffuse

SW Diffuse Residuals - Water clouds

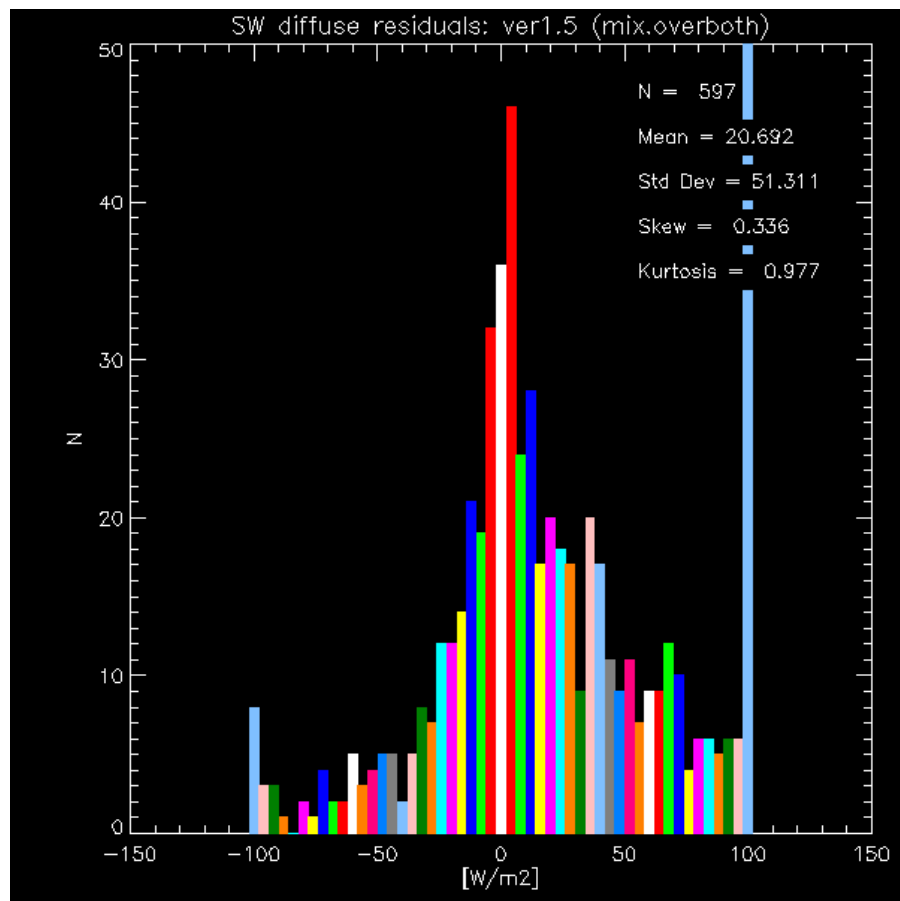


Microbase: 13.2, 37.7

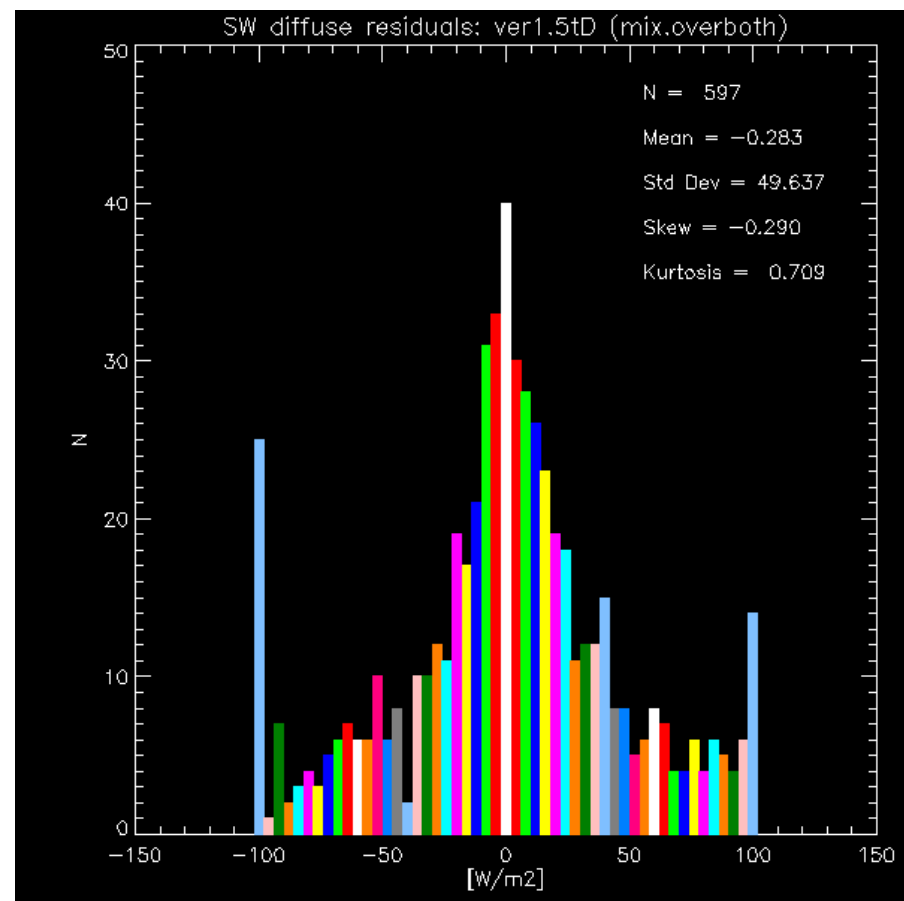


'Sengupta': -5.9, 33.1

SW Diffuse Residuals - Mixed-phase clouds

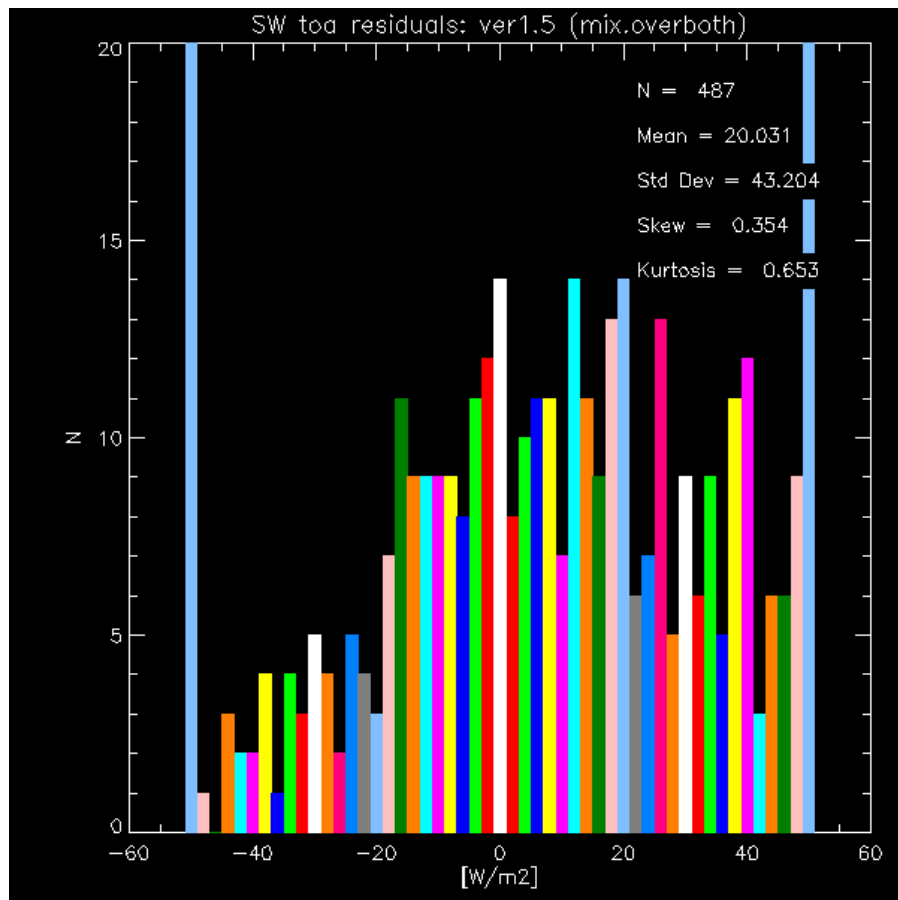


Microbase: 20.7, 51.3

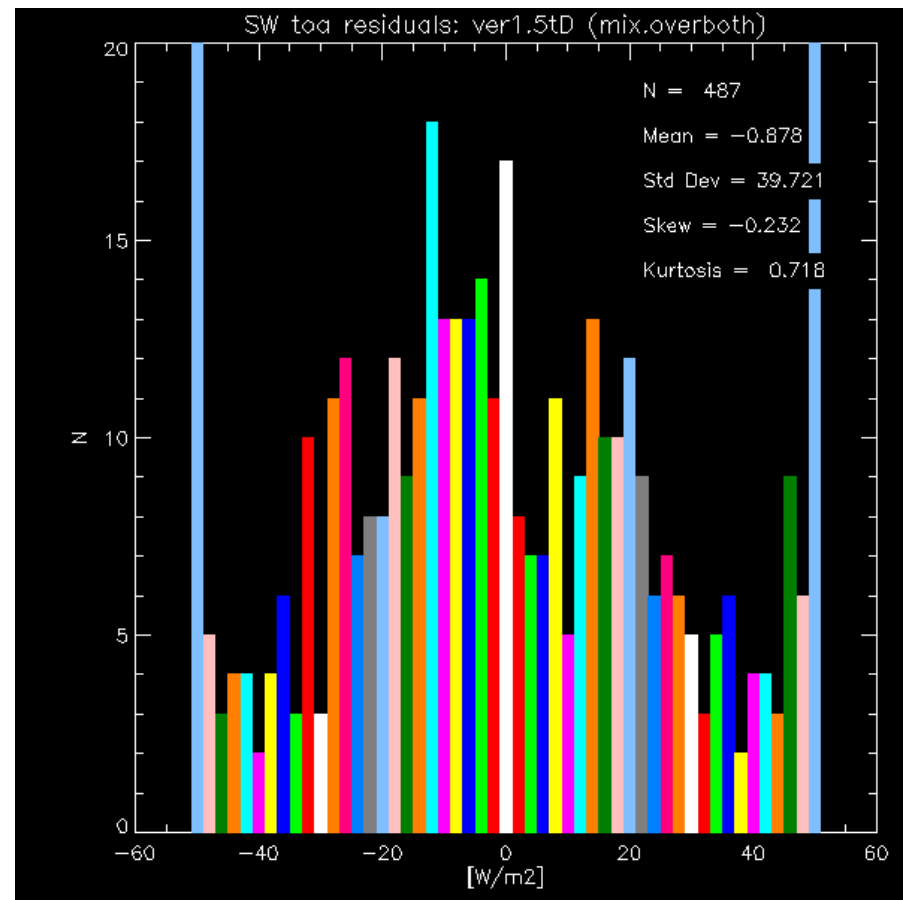


'Sengupta': -0.3, 49.6

SW TOA Residuals - Mixed-phase clouds

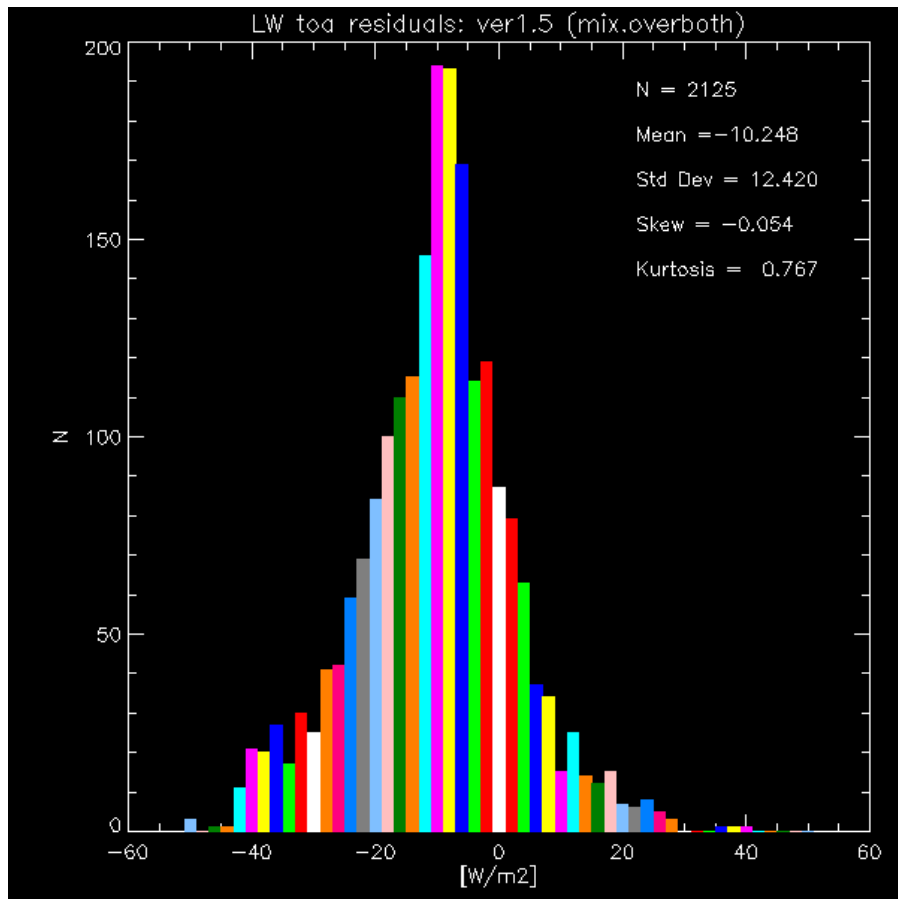


Microbase: 20.0, 43.2

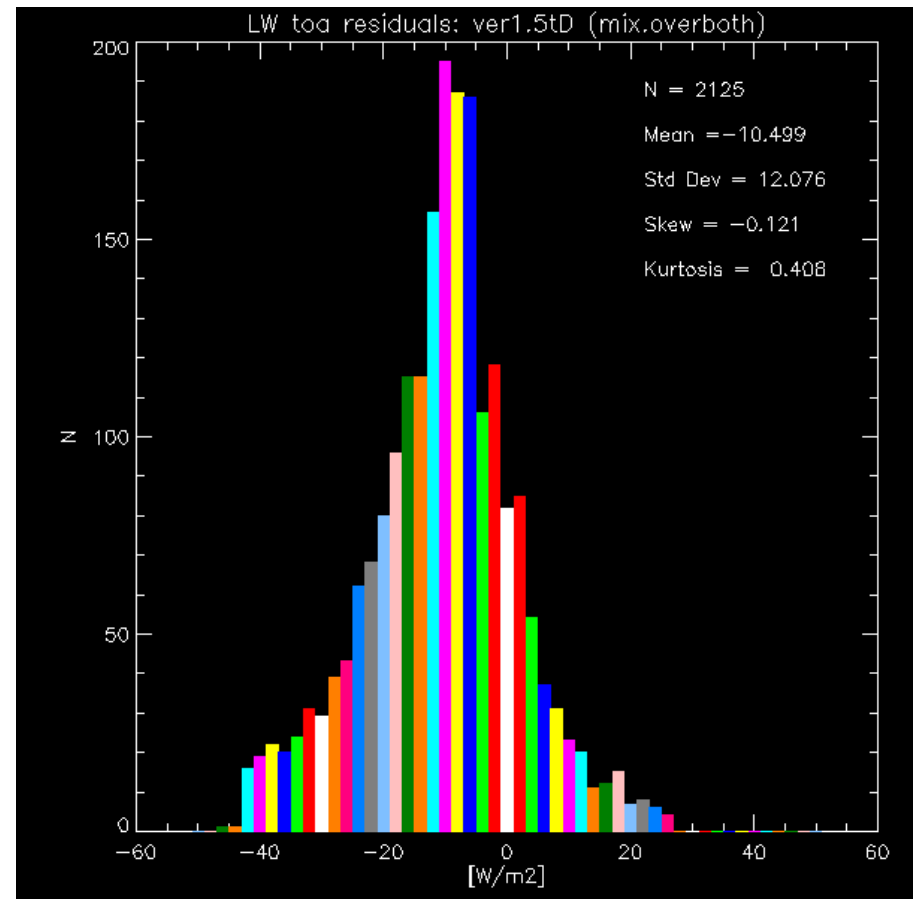


'Sengupta': -0.9, 39.7

LW TOA Residuals - Mixed-phase clouds



Microbase: -10.3, 12.4

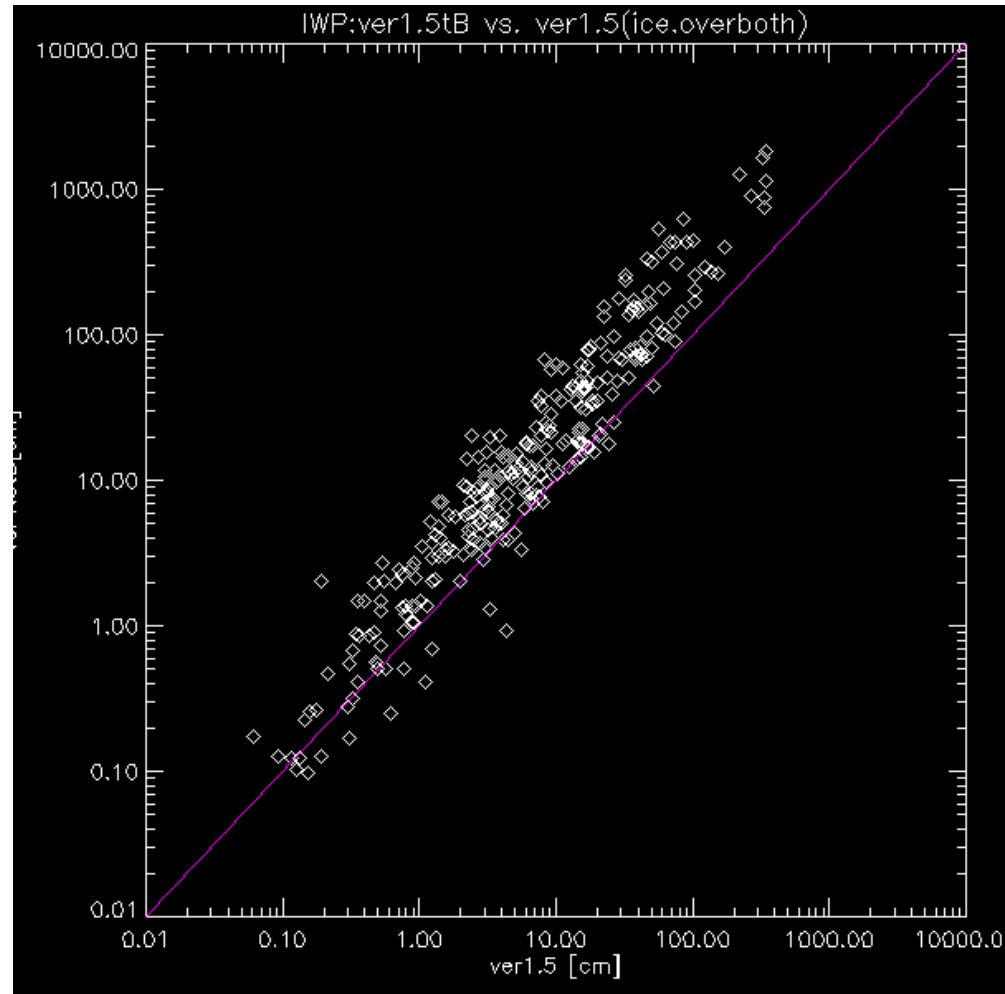


'Sengupta': -10.5, 12.1

First Results from a More Sophisticated Retrieval

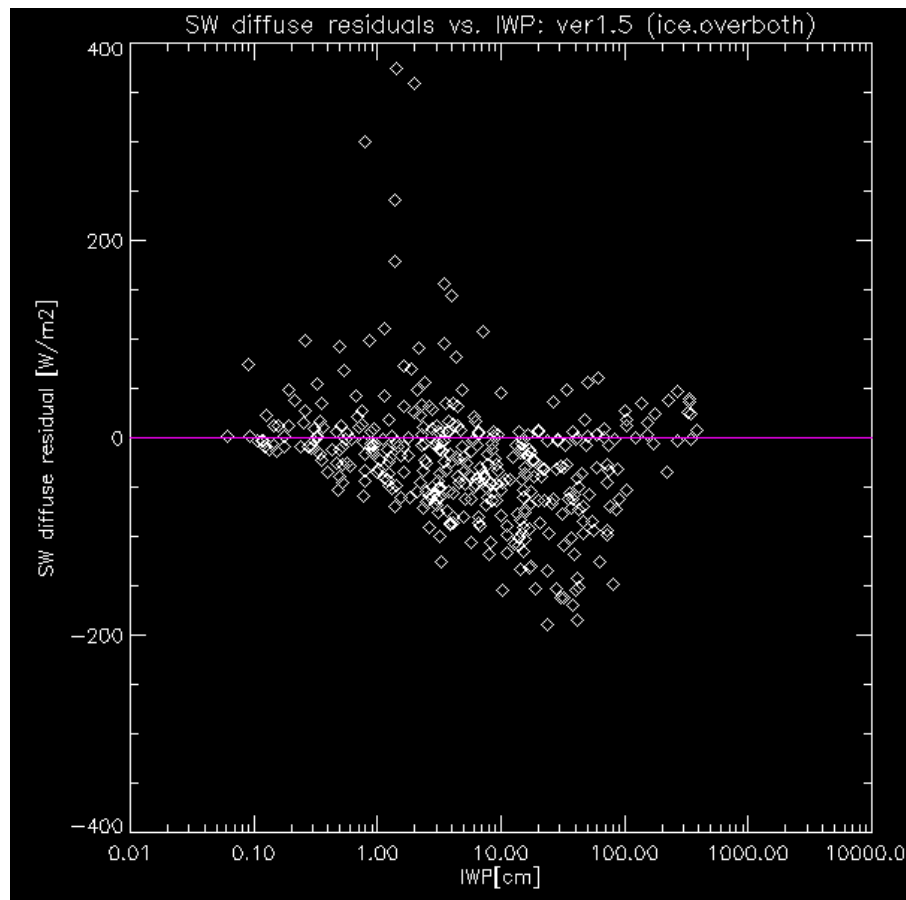
Marchand et al. (2007) combines:

- radar-reflectivity-only retrieval
- radar-reflectivity-and-Doppler-velocity retrieval
- radar-reflectivity-microwave-radiometer retrieval
- lidar-only based retrieval

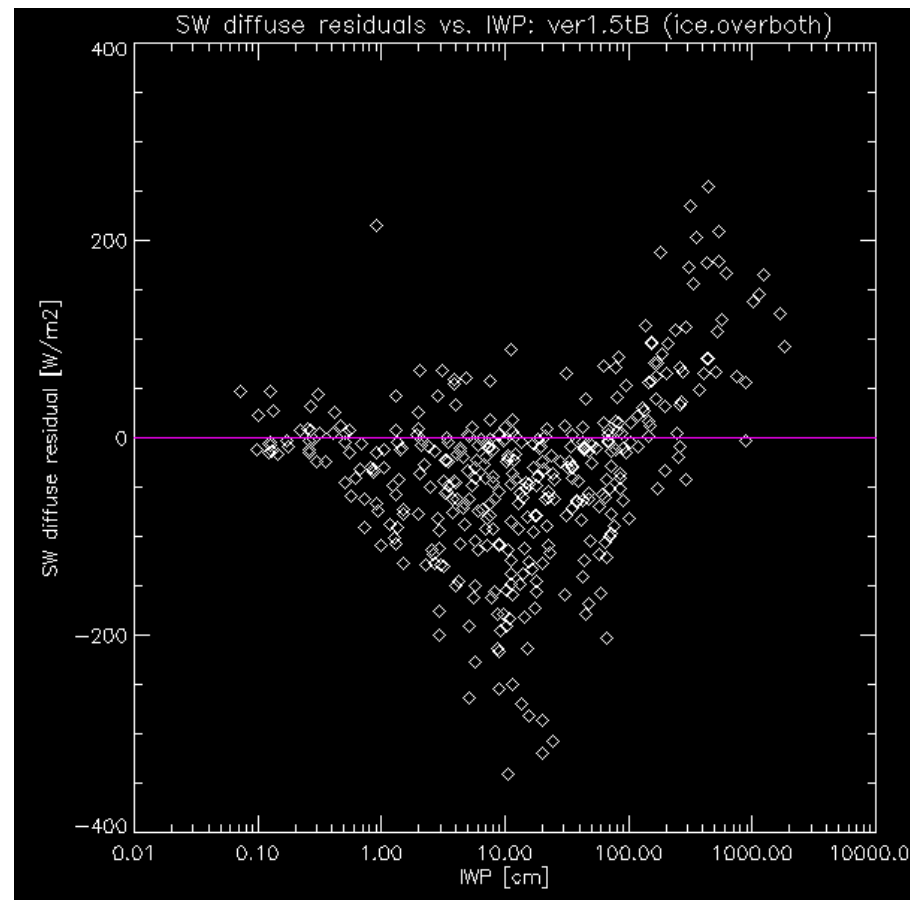


IWP

SW Diffuse Residuals - Ice clouds

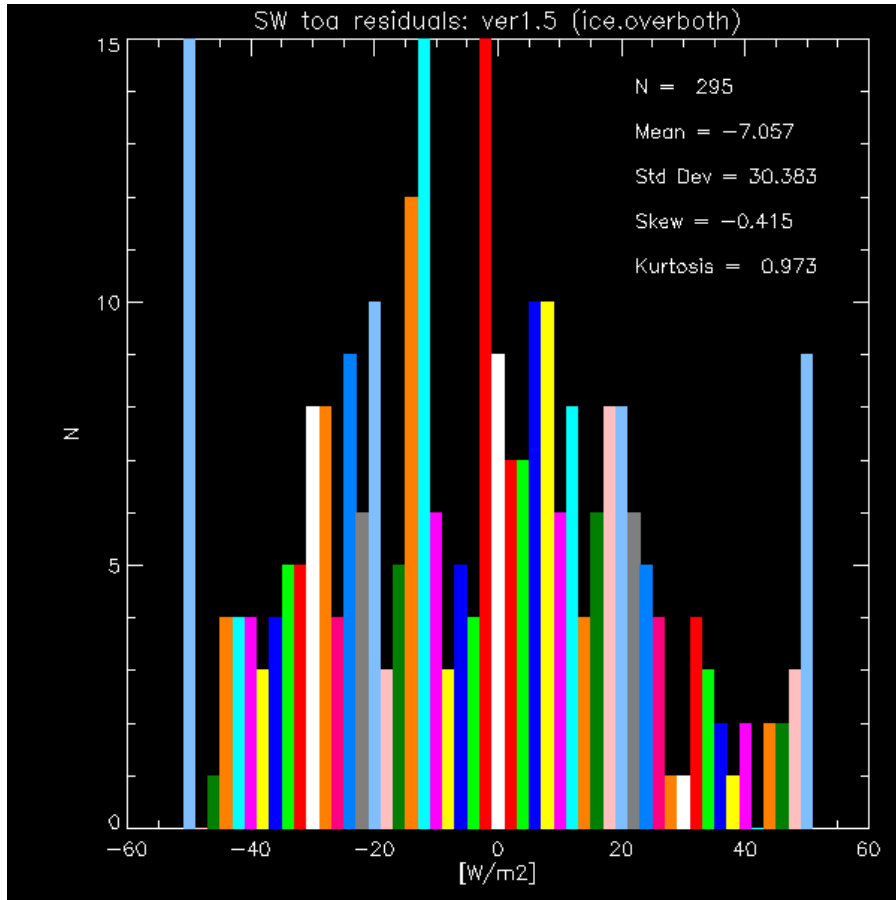


Microbase: -22.9,63.9

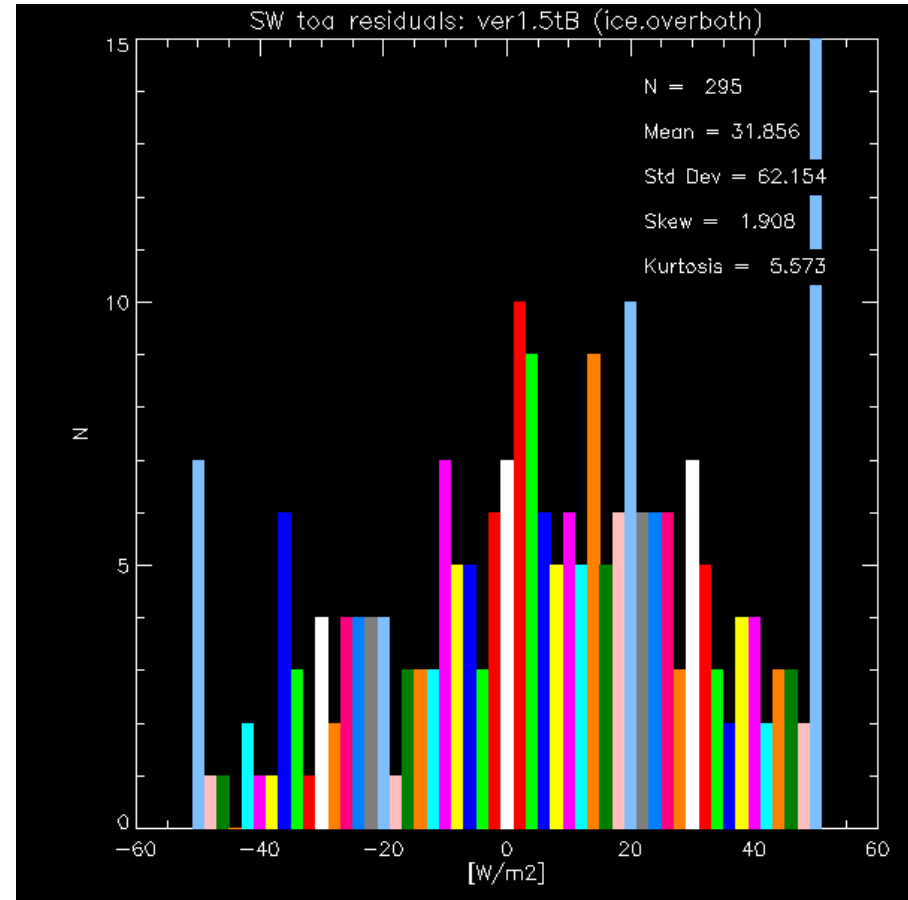


Marchand: -34.2,88.3

SW TOA Residuals - Ice clouds

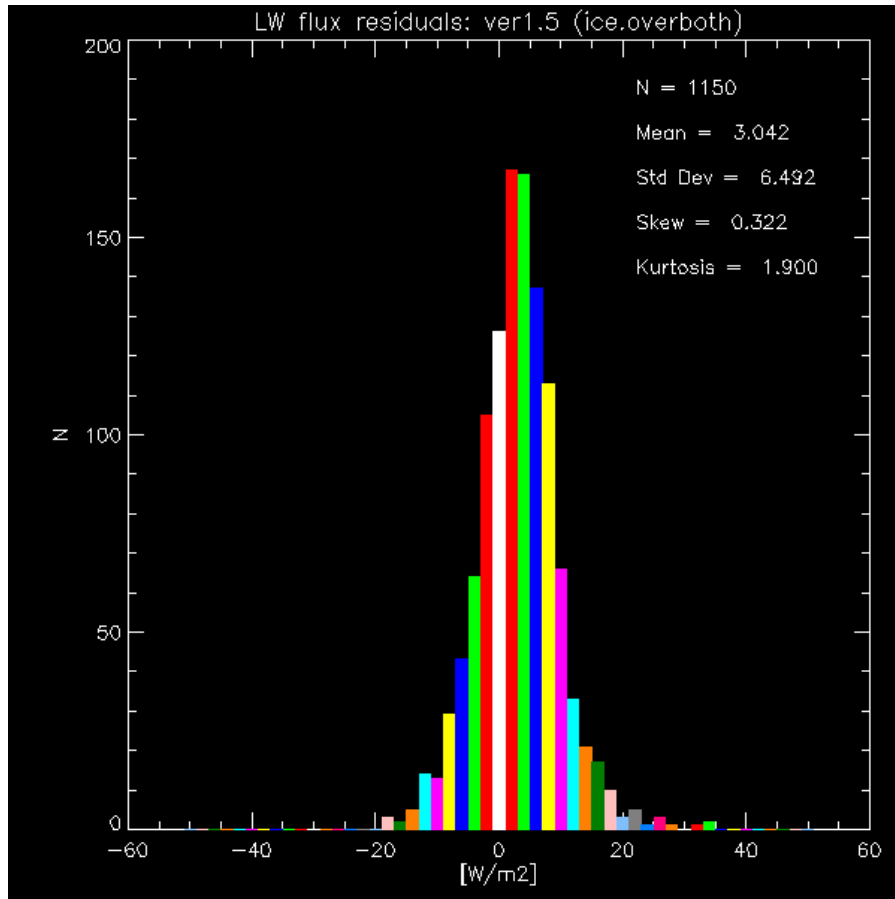


Microbase: -7.1,30.4

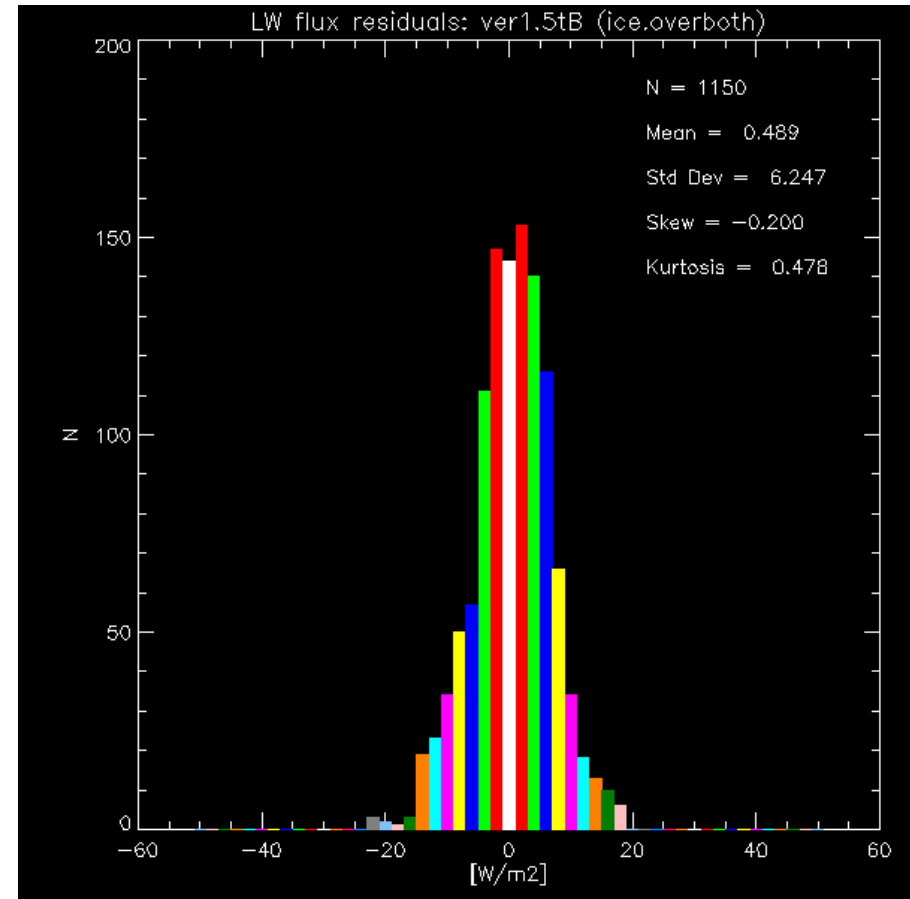


Marchand: 31.9,62.2

LW Surface Residuals - Ice clouds

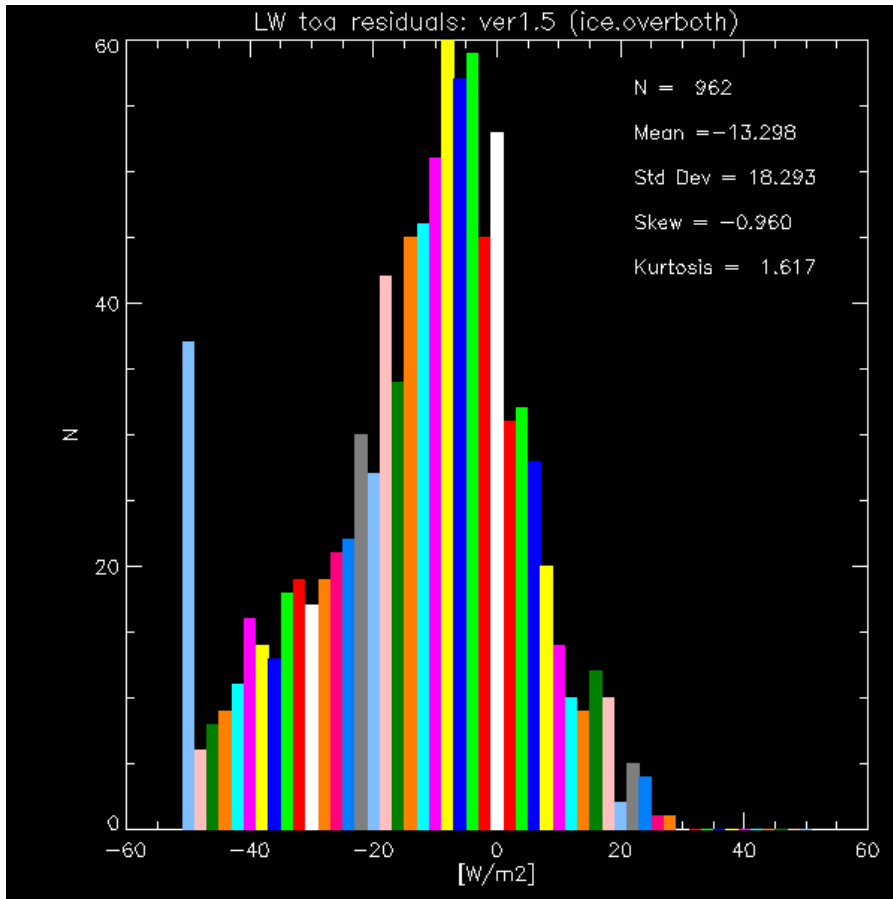


Microbase: 3.0,6.5

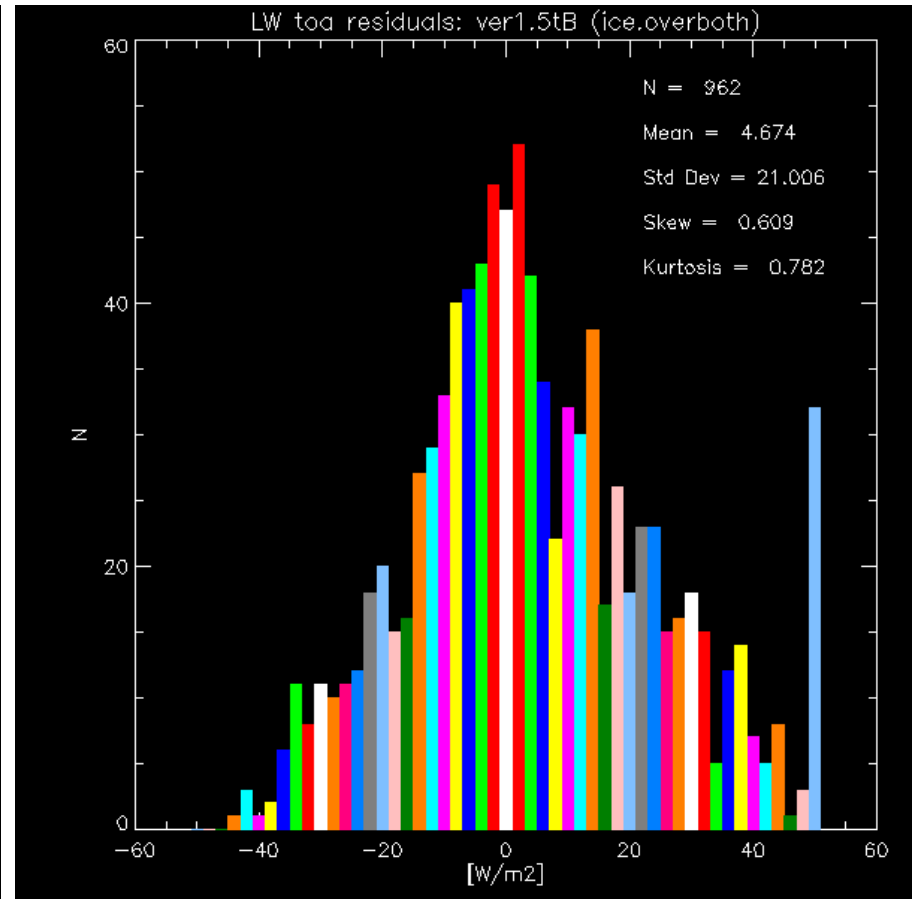


Marchand: 0.4,6.3

LW Residuals - Ice clouds



Microbase: -13.3,18.3



Marchand: 4.7,21.0