

Proposed Solar Diffuse Reference Standard: Instrument Group and Methodology

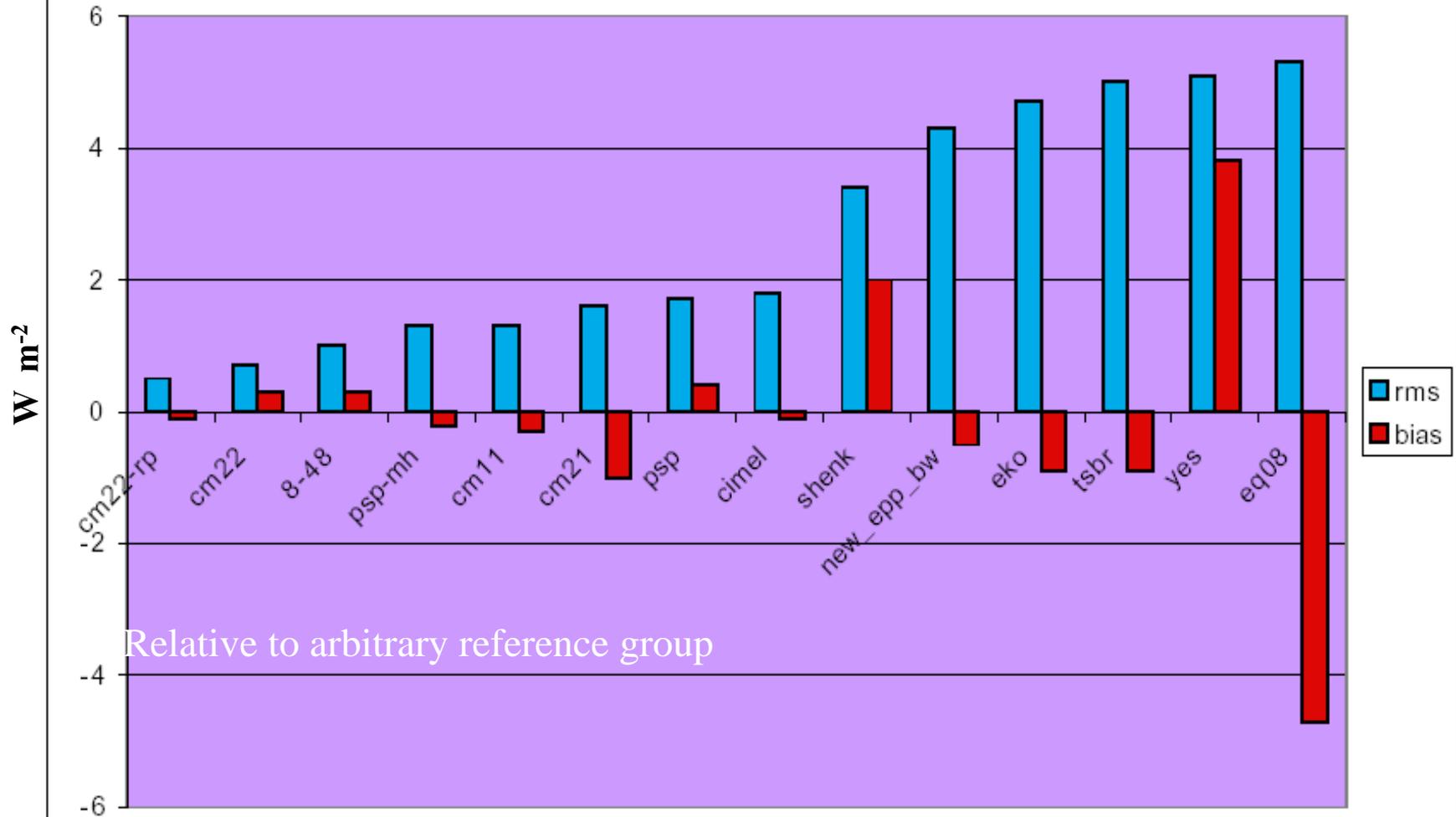
Joe Michalsky

Presented by Ells Dutton

From Michalsky et al., *JGR* Sept. 2007

Solar-Diffuse Radiometer Intercomparison - I

BSRN-ARM/SUNY-A/CMDL + SGP 2001

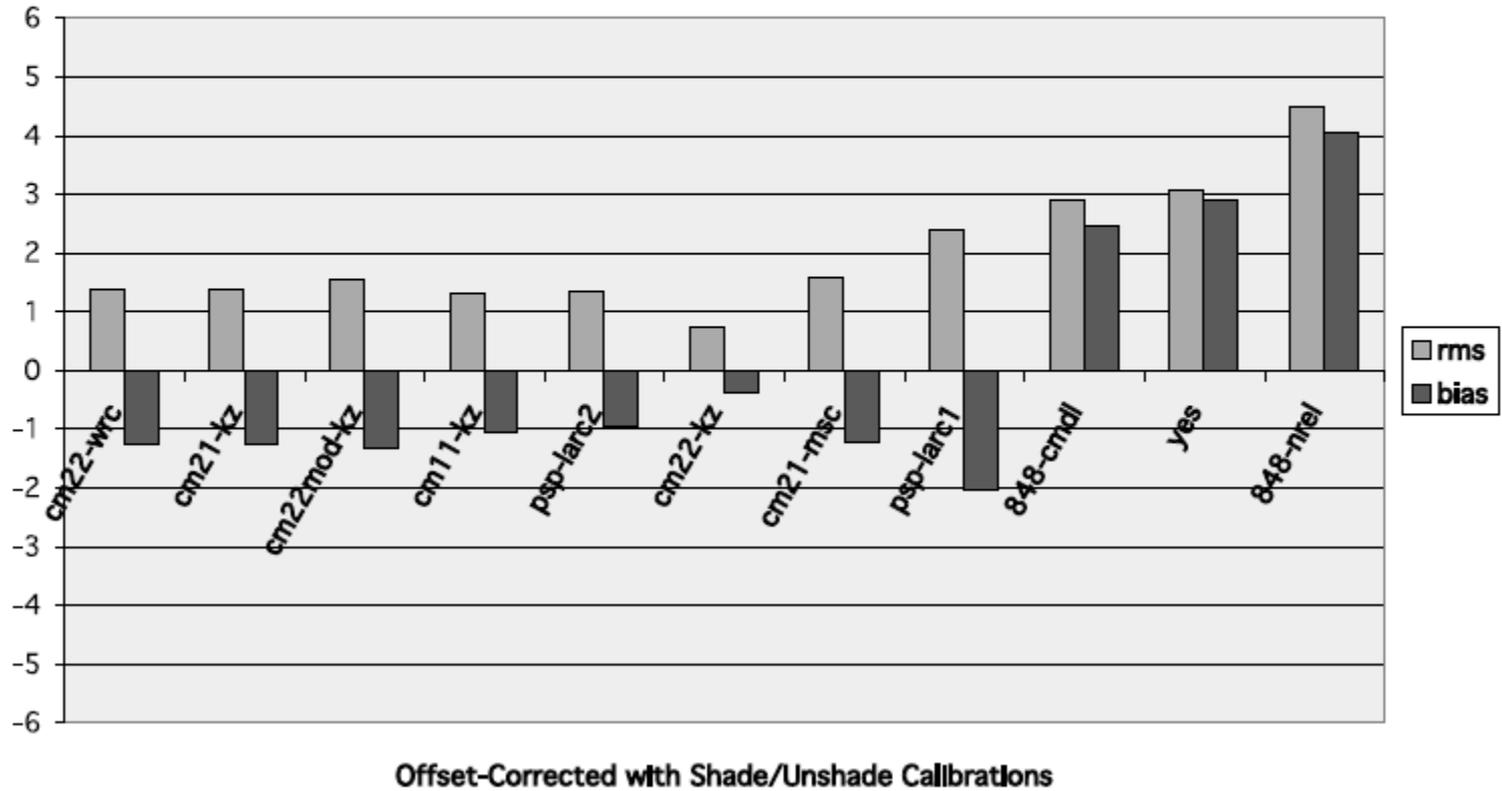


Michalsky, et al., 2003

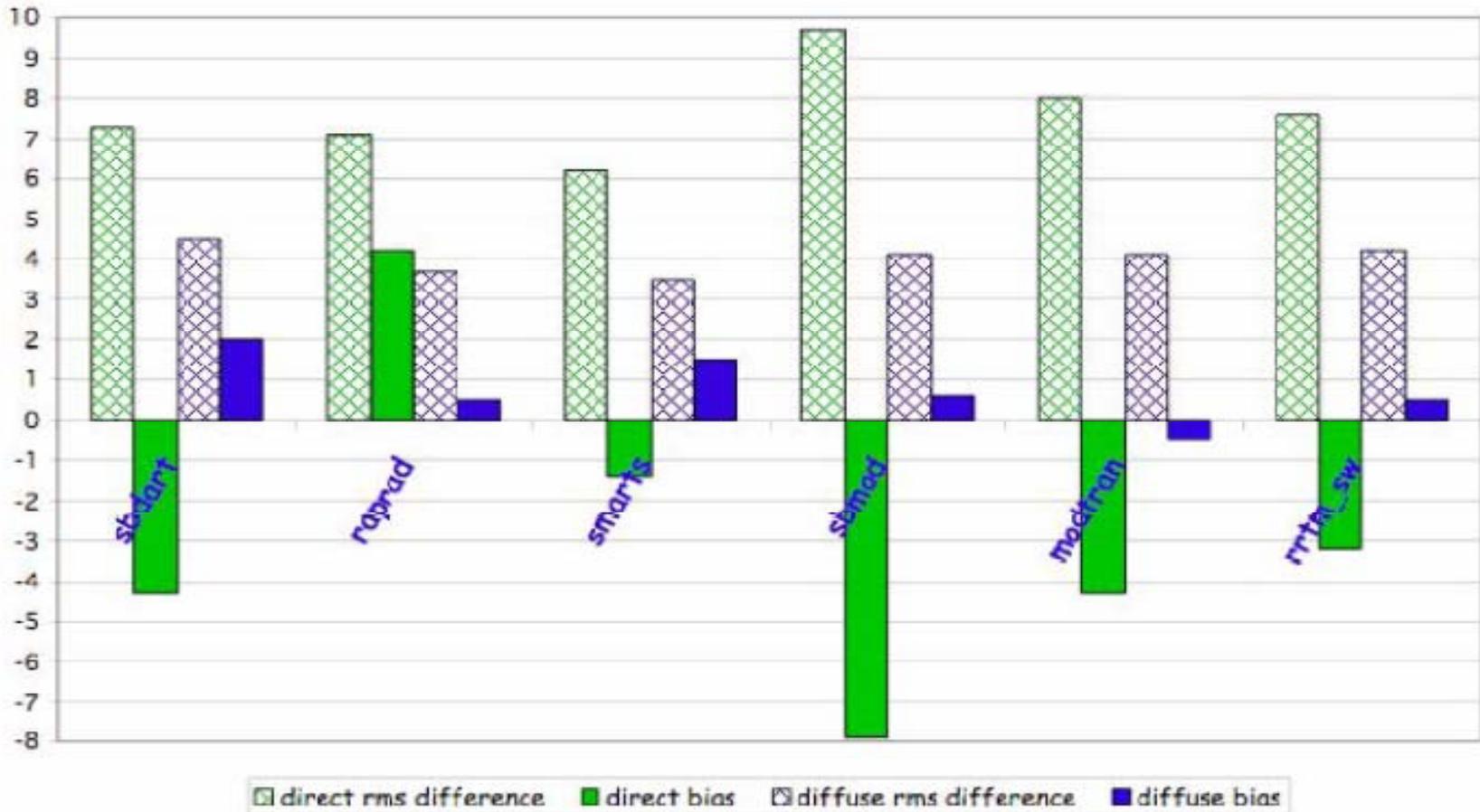
ARM Radiative Processes
WG Mtg.
17-19 Sept 2007
Madison, Wisc.

Diffuse radiometer comparison II

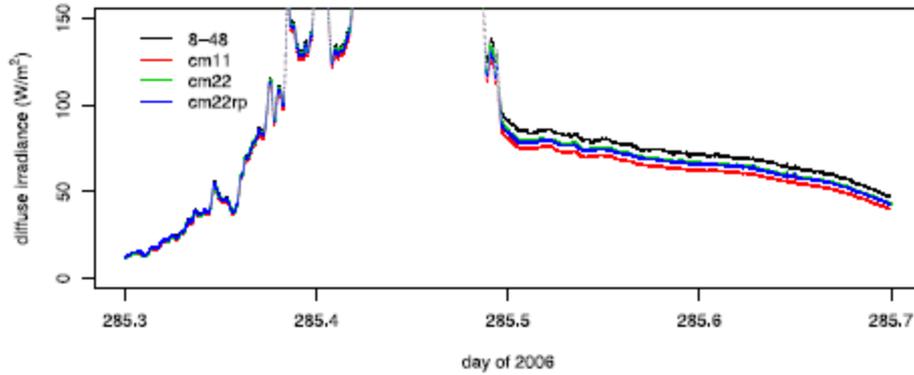
Diffuse Radiometer Performance Relative to Mean of Stable Eleven (Wm^{-2})



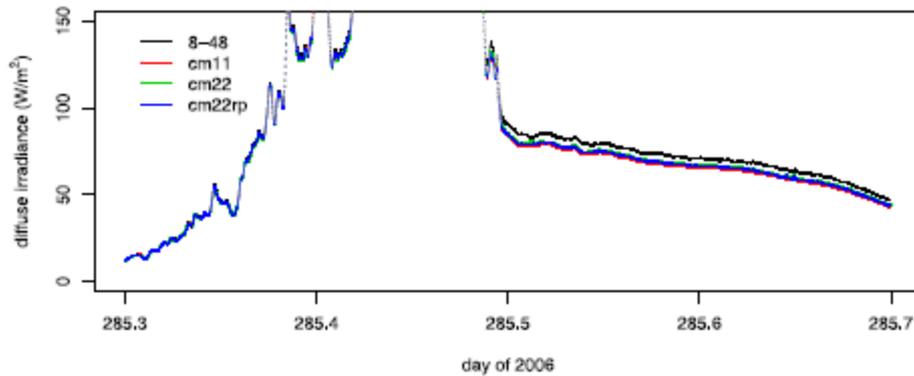
(Model - Measured) Dir. Normal (Avg = 761.5 W/m²); Diff. Horizontal (Avg = 108.6 W/m²)



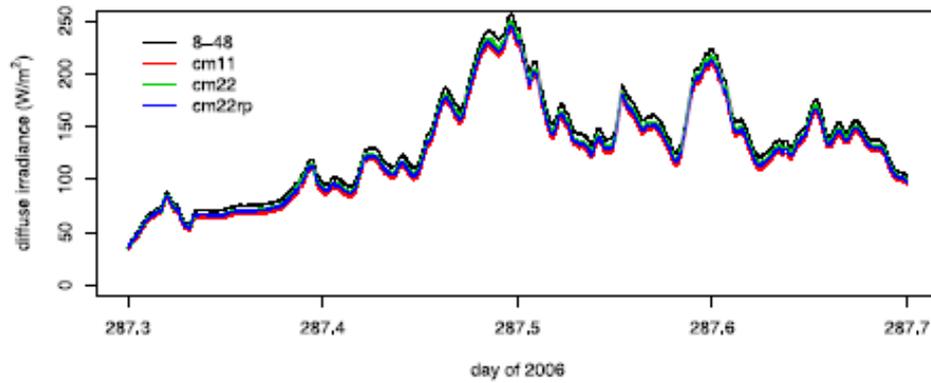
Candidate Group



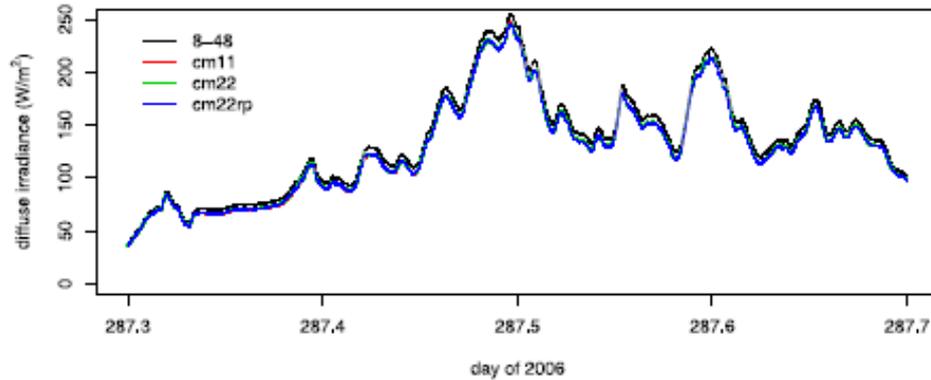
Supplied calibration



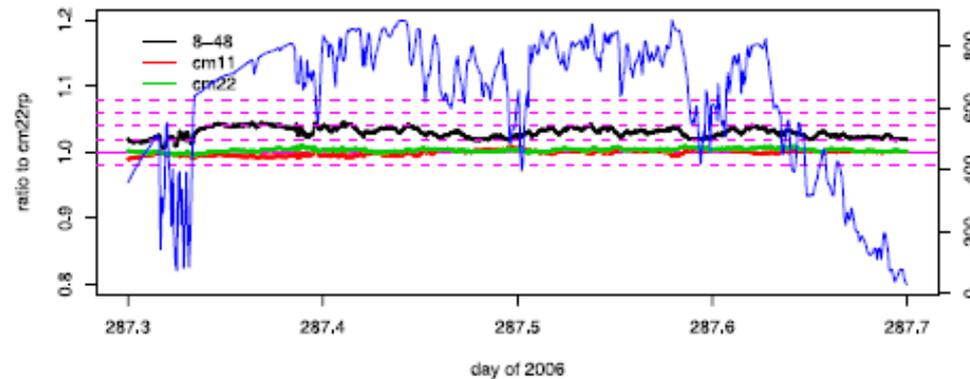
Common shade/unshade cal.



Supplied calibrations

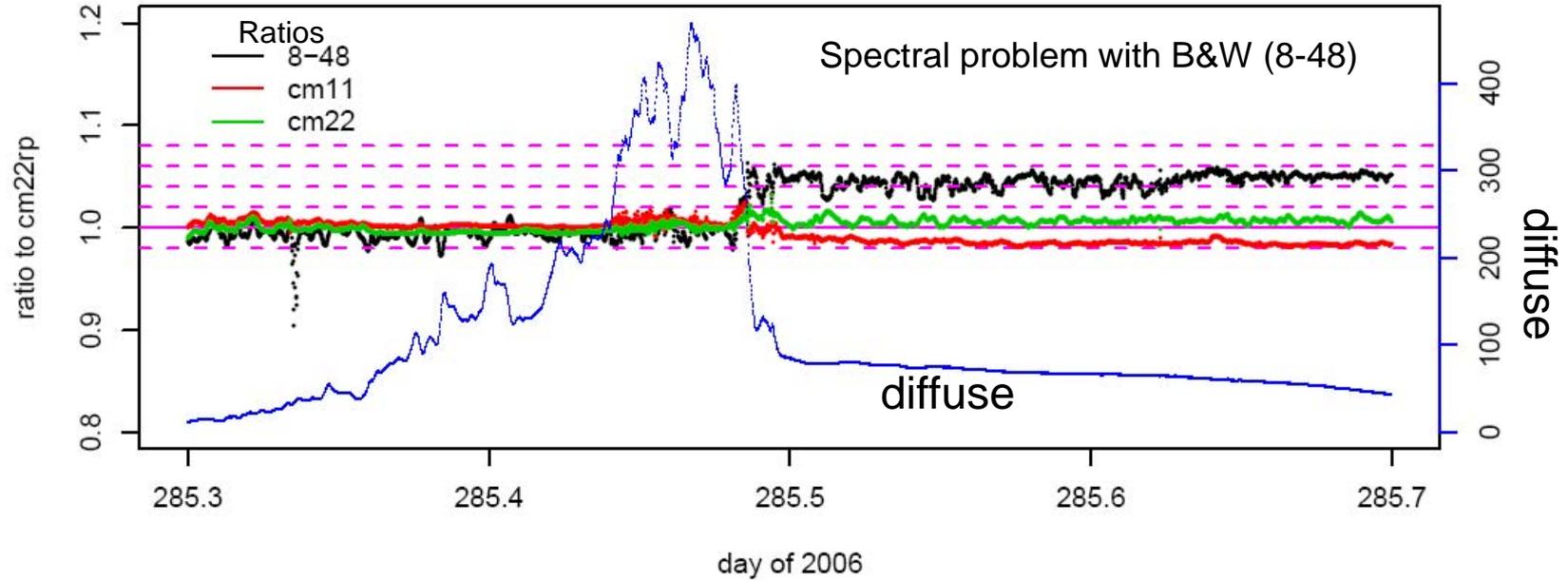


Common Shade/unshade cal



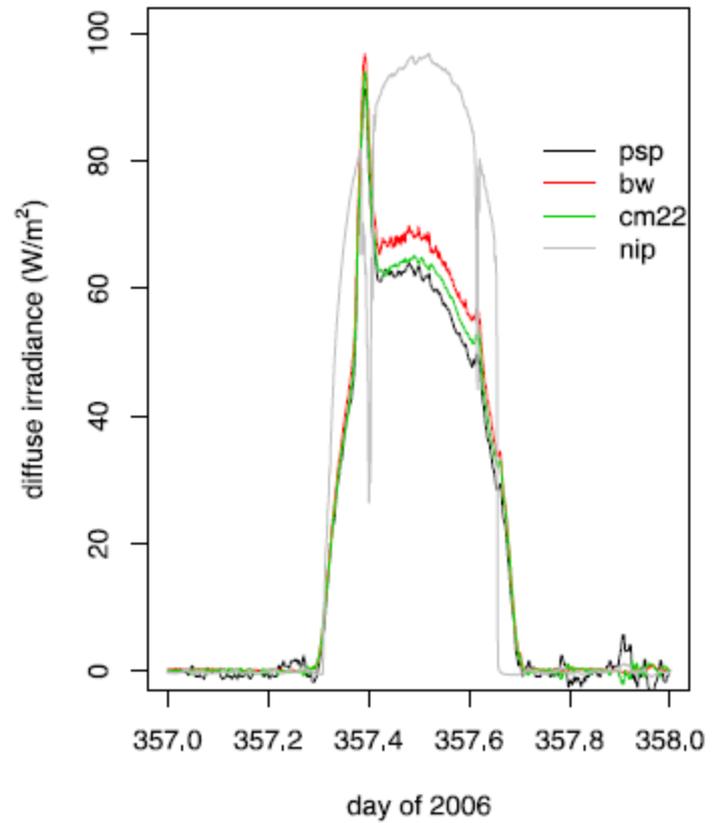
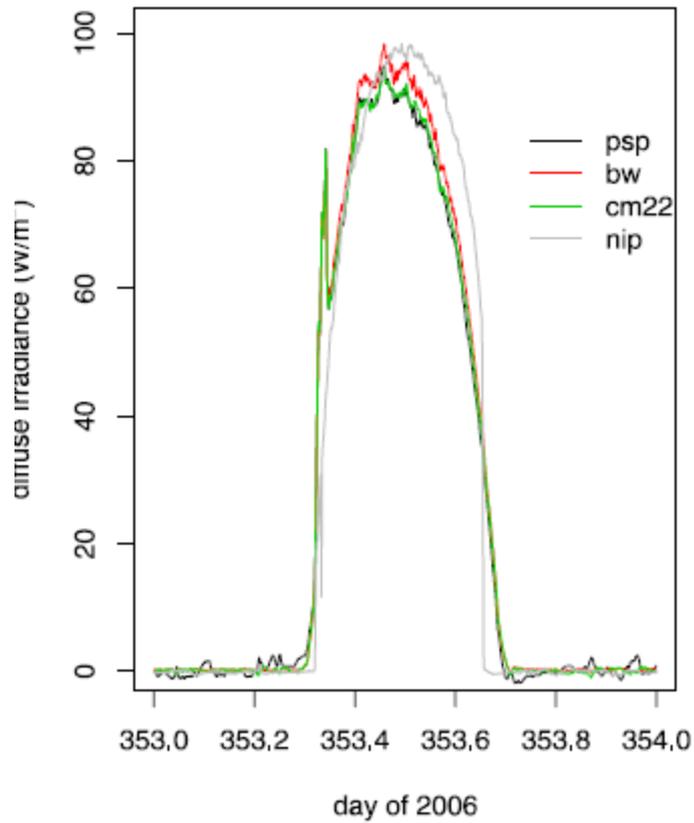
Percent differences and direct (unscaled)

Overcast Then Clear Day



A PSP with the Swiss ventilator (+ direct unscaled)

MICHALSKY ET AL.: DIFFUSE IRRADIANCE WORKING STANDARD



Recommended Diffuse Reference Standard Group (Triad)

- CM22 ser. # 990010 (R. Philipona mods., ventilated and heated)
- CM22 ser. # 010047 (ventilated and unheated)
- CM21 ser # 069059 (ventilated and unheated)

Solar Diffuse Ref. Standard Features

- CMxx-Triad – accurate to 2.2% +0.2 Wm⁻²
- Traceable to WRR and NIST voltage and current standards.
- Can be replicated w/o the Triad if:
 - Collocated w/ shaded and ventilated pyrgeometers
 - Zero offsets determined from night pyrgeometer data
 - Pyranometers calibrated by shade/unshade method using WRR abs cavity and $z = \sim 45$ deg
 - Use of shade disks, not bands
 - Angular response no worse than the Michalsky et al. 2007 test instruments
 - Data recording to equivalent 0.05 Wm⁻² accuracy

Conclusions

- Ref. Triad available to ARM* accurate to 2.2% + 0.2 Wm⁻²
- Spectral response issues preclude 8-48 (B&W in general) from reference group & accuracy.
- Reference accuracy can be replicated by commercial instruments with characteristics similar to Ref Triad and with prescribed mode of operation.
- General field replication yet to be demonstrated

*CM22RP under control of PMO/Davos