

What is the Continual Intercomparison of Radiation Codes (CIRC)?

- RT model intercomparison aspiring to become the standard for documenting the performance of RT codes in Large-Scale Models
- Sponsored by ARM and endorsed by GEWEX Radiation Panel and IRC
- Goal is to have RT codes of IPCC models report RT performance against the CIRC cases
- Phase I was launched on June 4, 2008

Differences from previous intercomparisons:

- Observation-tested LBL calculations to used as radiative benchmarks
- Benchmark results are publicly available
- ARM observations provide input (from a flux closure dataset named BBHRP)
- Flexible structure and longer lifespan than previous intercomparisons

CIRC website



Climate and Radiation Branch

NASA | Goddard | Lab for Atmospheres

CIRC: Continual Intercomparison of Radiation Codes

Home

Rationale

Input

Output

Cases

Results

Submit

Updates

Contact

Home

Rationale

Input

Output

Cases

Results

Submit

Updates

Contact

What is CIRC?

CIRC is in many respects the successor to the seminal [ICRCCM \(Intercomparison of Radiation Codes in Climate Models\)](#) effort that spanned the late 80's - early 00's. CIRC distinguishes itself from ICRCCM by its emphasis on using observations to build its catalog of cases. It is intended as an evolving and regularly updated reference source for GCM-type radiative transfer (RT) code evaluation, and similar to ICRCCM, its goal is to contribute to the improvement of solar and thermal RT parameterizations. CIRC is supported by DOE's [Atmospheric Radiation Measurement \(ARM\)](#) program and endorsed by the [GEWEX Radiation Panel \(GRP\)](#) and [IAMAS's International Radiation Commission \(IRC\)](#). More information on the rationale behind CIRC can be found [here](#). The invitation letter that launched Phase I on June 4, 2008 is available in [this page](#).

Register as a CIRC participant

While anybody can download the [input files](#) needed for the radiative transfer runs and the [reference output results](#), we urge users of this website to register as "CIRC participants". Registered CIRC participants will enjoy benefits such as:

- Updates via e-mail about improvements, additions, and corrections to the reference dataset and the accompanying documentation.
- An opportunity to have their results compared to those of other participants.
- Invitation to workshops on CIRC.
- Invitation to coauthor scientific papers on CIRC.

Please register as a CIRC participant by sending your name, affiliation and e-mail address to [Lazaros Oreopoulos](mailto:Lazaros.Oreopoulos).

<http://circ.gsfc.nasa.gov>

CIRC Practical Challenges

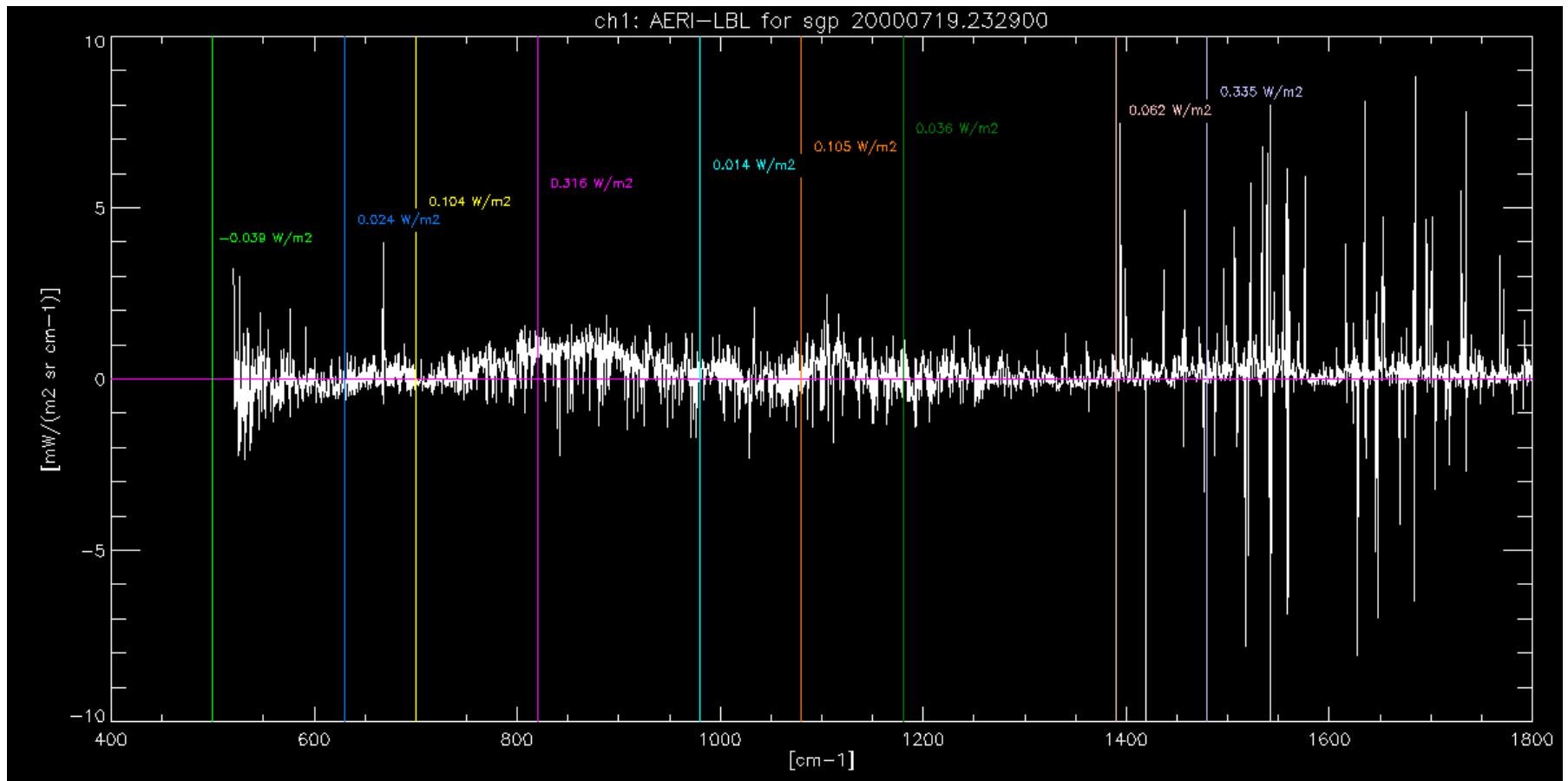
- For input and reference calculations to be credible, a reasonable level of agreement with observations is desirable
- ARM BBHRP dataset (v.1.4.1) is small; very few BBHRP cases satisfy our criteria:
 - ✓ homogeneous* (1D)
 - ✓ closure at TOA and SFC for both SW and LW
- LBL calculations are not standard in BBHRP
- Input for LBL calculations is not necessarily available from BBHRP (e.g., spectral surface albedo)
- Validation of LBL calculations

* See also *SPECTRE* paper by Ellingson and Wiscombe (BAMS 1996)

CIRC Phase I cases

Case	SZA	PWV (cm)	τ_{aer}	LWP (gm ⁻²)	LW _{SFC}	^{obs - LBL} LW _{TOA}	SW _{SFC}	SW _{TOA}
(1) SGP 9/25/00	47.9°	1.23	0.04		0.4%	-0.5%	0.5%	-3.1%
(2) SGP 7/19/00	64.6°	4.85	0.18		0.6%	-1.4%	-1.1%	8.4%
(3) SGP 5/4/00	40.6°	2.31	0.09		1.0%	-1.2%	-0.1%	-8.7%
(4, 5) NSA 5/3/04 2xCO ₂)	55.1°	0.29	0.13		1.2%	-0.6%	-0.8%	0.7%
(6) SGP 3/17/00	45.5°	1.90	0.24	263.4	1.1%	-3.0%	4.9%	-0.9%
(7) PYE 7/6/05	41.2°	2.42		39.1	0.2%	0.6%	-0.4%	-0.1%

LW QC: Spectral comparison with obs



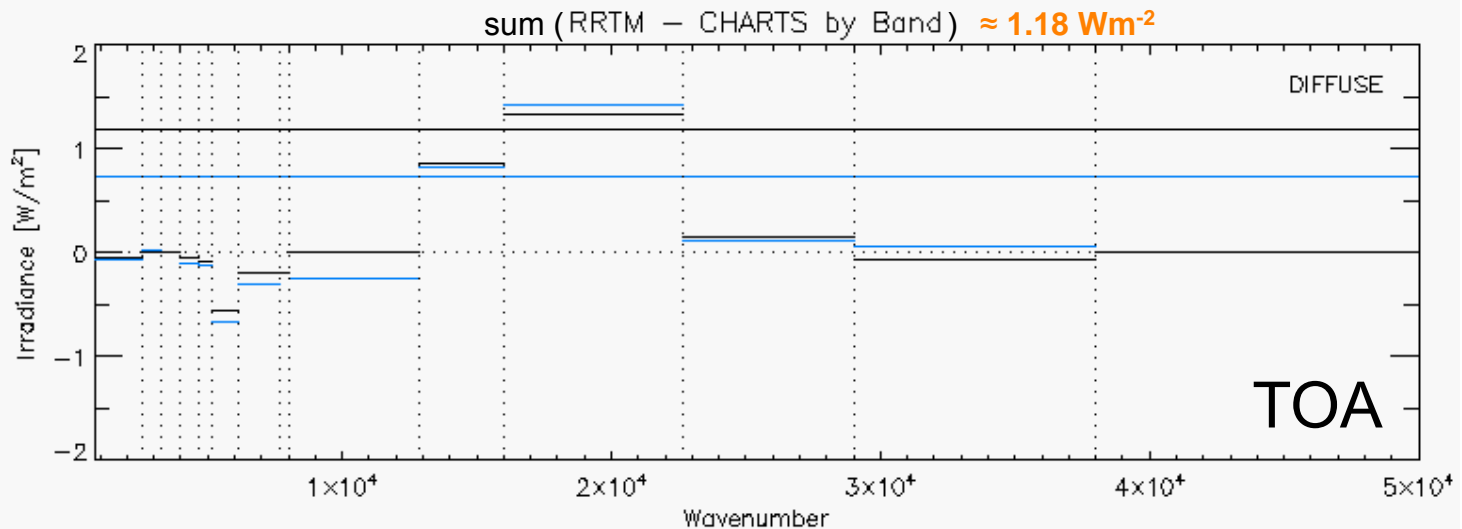
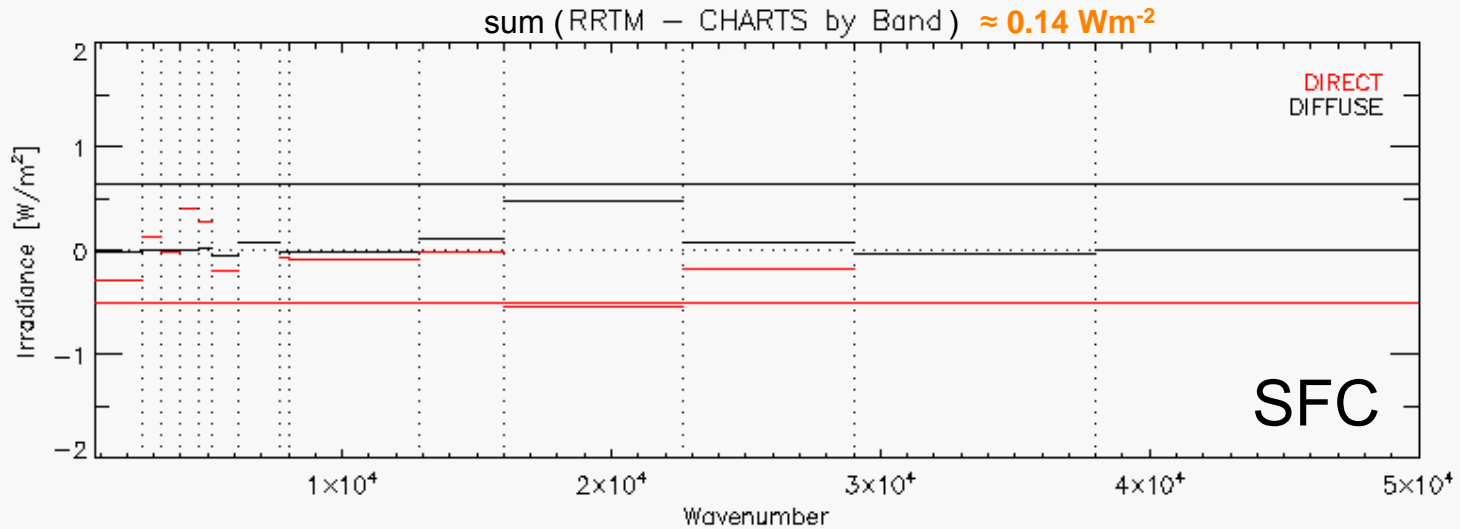
LBLRTM vs AERI

(runs and plot by T. Shippert)

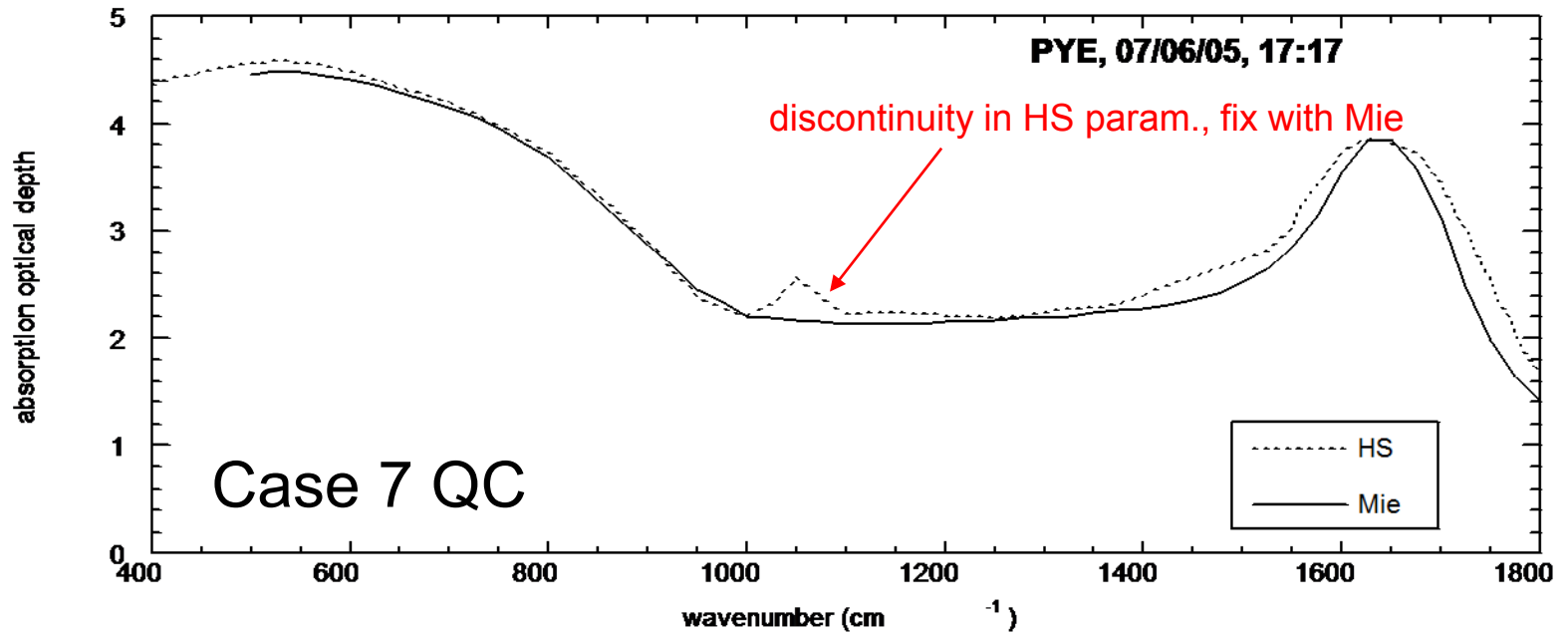
7/19/2000, SGP: Warm and moist

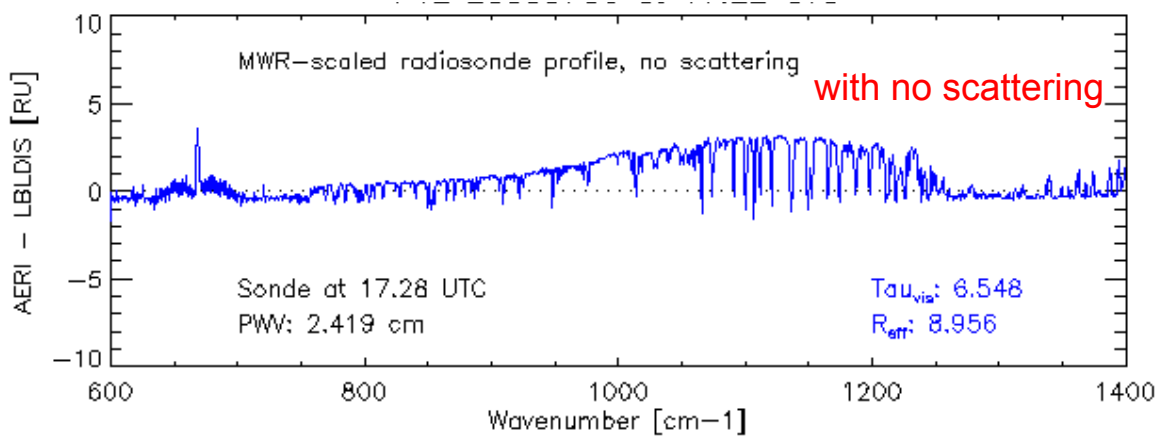
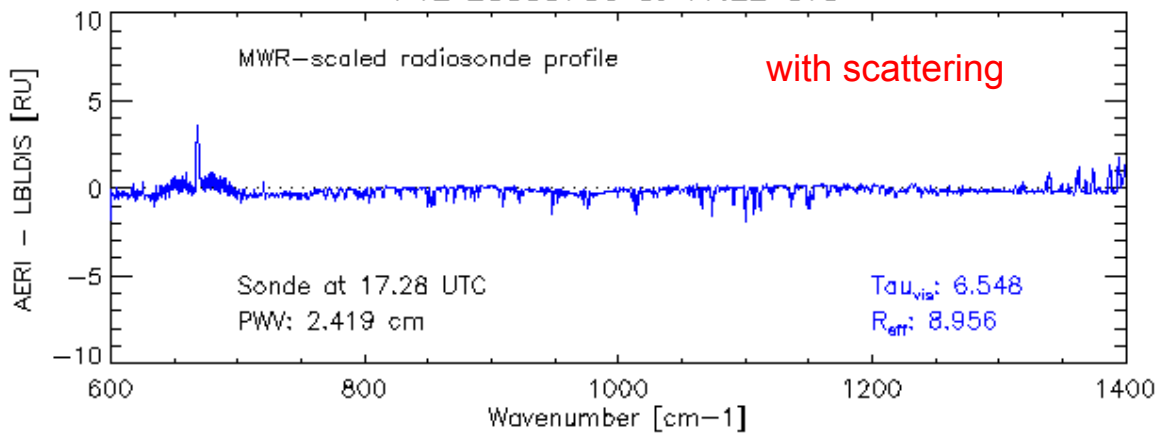
$LW_{TOA} = 292.6$ (LBLRTM), 288.6 (obs)
 $LW_{SFC} = 439.3$ (LBLRTM), 441.8 (obs)

SW QC: Spectral comparison with RRTM



QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.





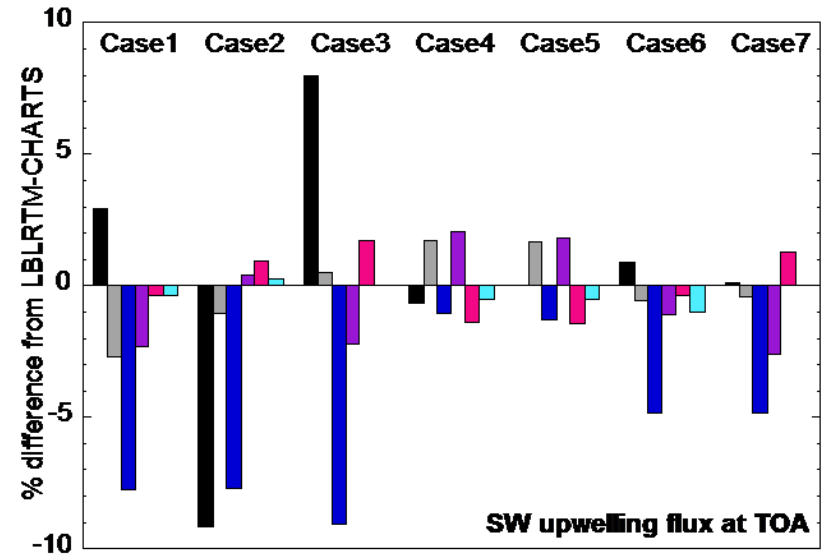
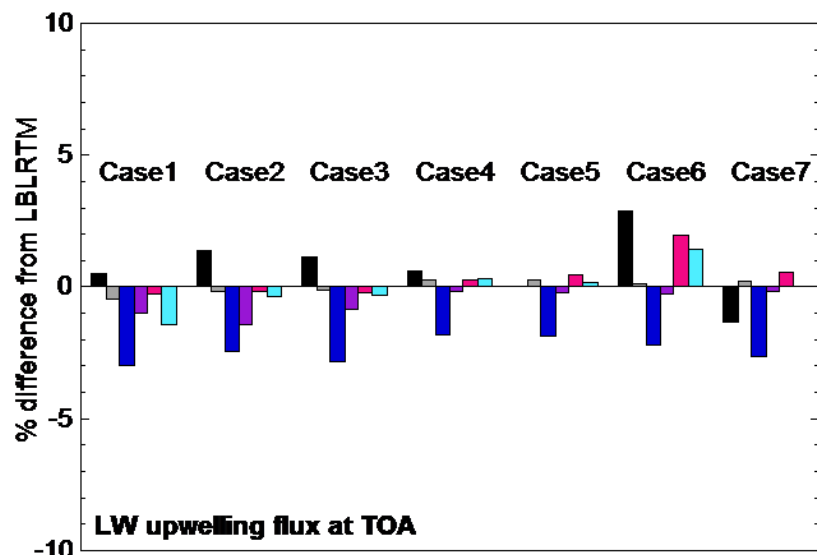
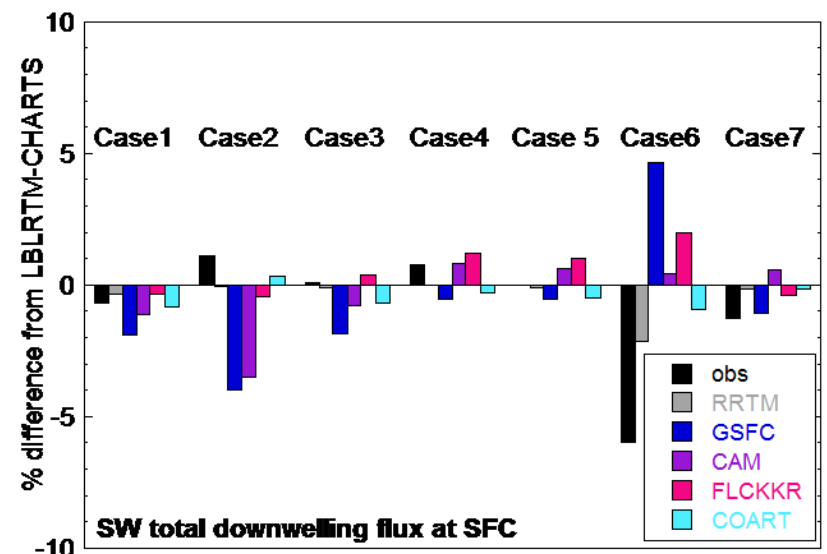
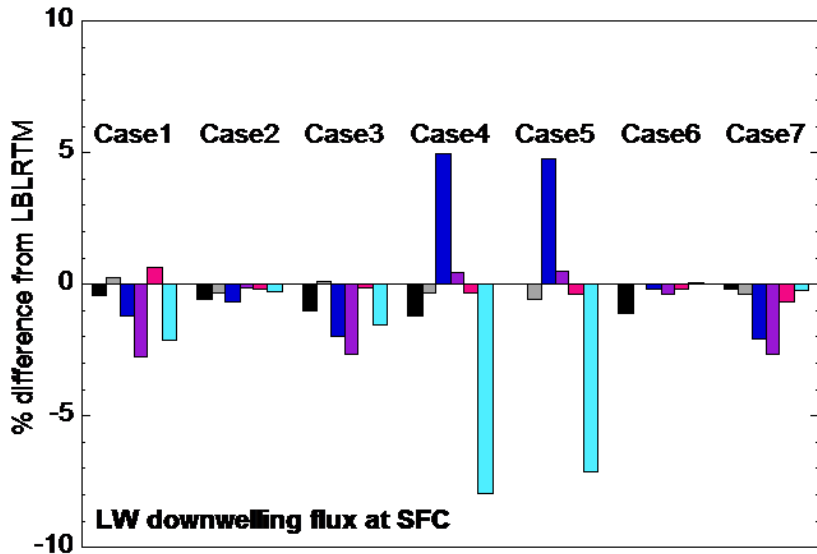
Turner's
LBLDIS

LBLRTM
(no scattering)

CIRC modus operandi (Phase I)

- Input & output (TOA and SFC fluxes at 1 cm^{-1}) and instructions on how to run the cases are openly available at CIRC website
- Only registered users (considered as formal participants) will enjoy certain privileges:
 - ✓ e-mail notifications about changes, updates, and corrections to the CIRC dataset.
 - ✓ priority to participate in workshops and publications
- Registered users may have to submit results within predetermined deadlines.
- Submitted results and intercomparison analysis will be posted on website
- Implementation details and performances of participating codes will be documented and evaluated

Phase I initial results, flux errors



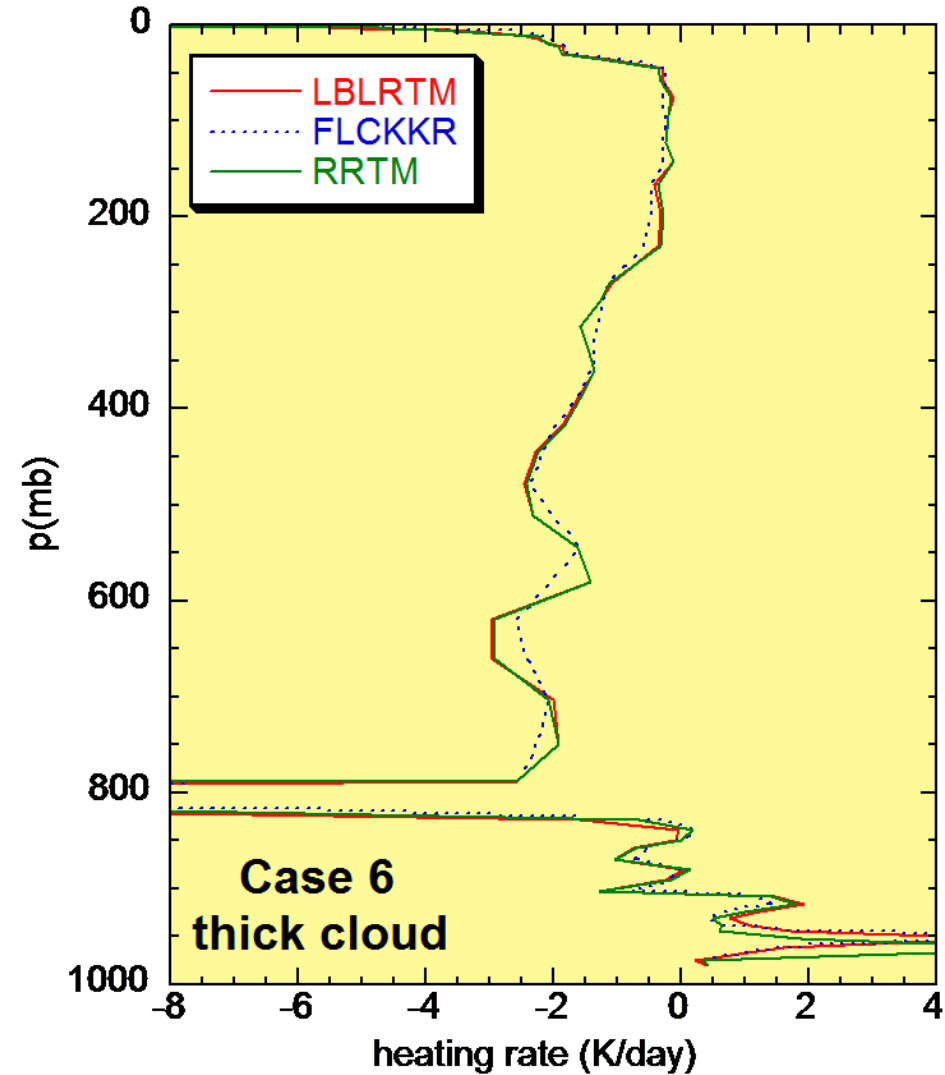
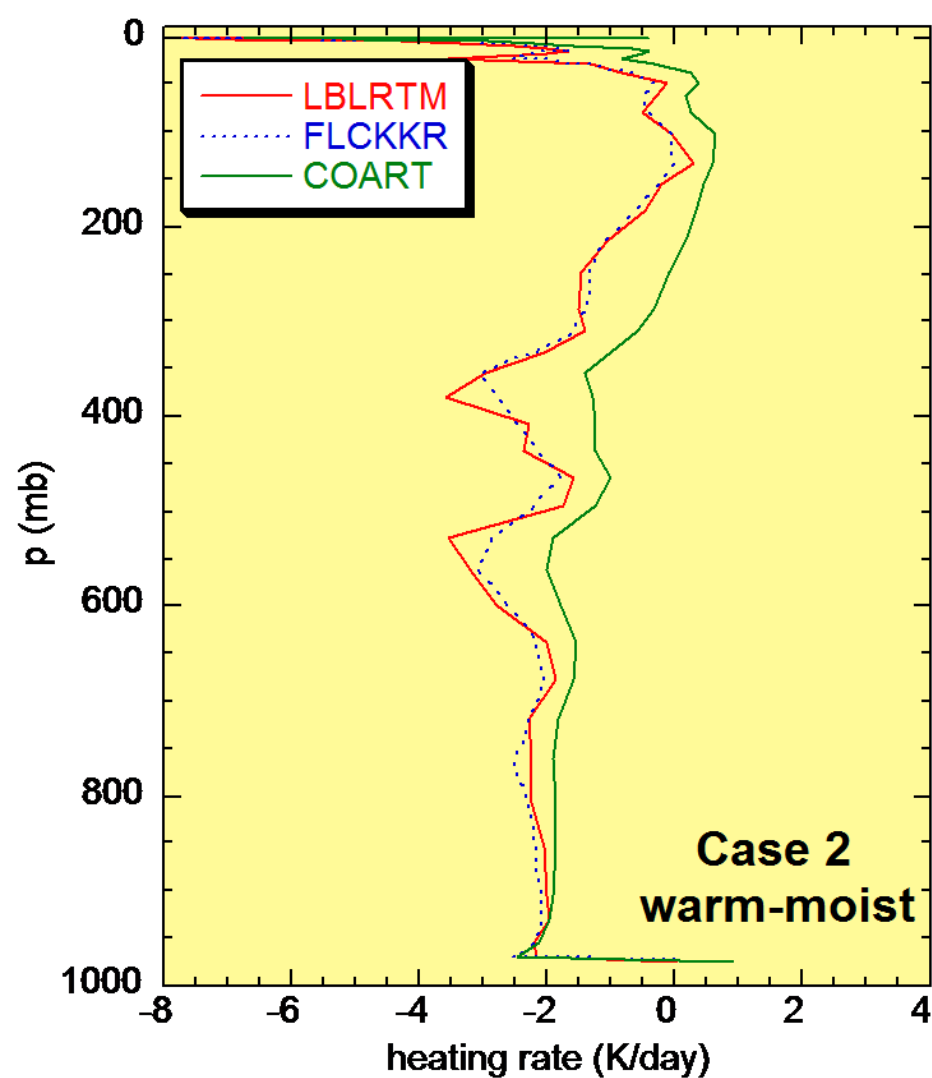
FLCKKR (= Fu, Liou Charlock, Kato, Kratz, Rose), submitted by Rose and Charlock
 COART (= Coupled Ocean-Atmosphere Radiative Transfer), submitted by Jin and Charlock

CIRC activities and future

- Poster and extended abstract for IRS 2008
- Greenlighted for short (“Nowcast”) BAMS article
- Submitted ARM proposal seeking funding for Phase II (ice clouds, SW spectral closure)
- “Pristine” and “cloudless” (Cases 6 & 7) versions under consideration
- Advertise via ARM web pages
- Workshop will be planned once there is critical mass
- Standards, certification, IRC support?

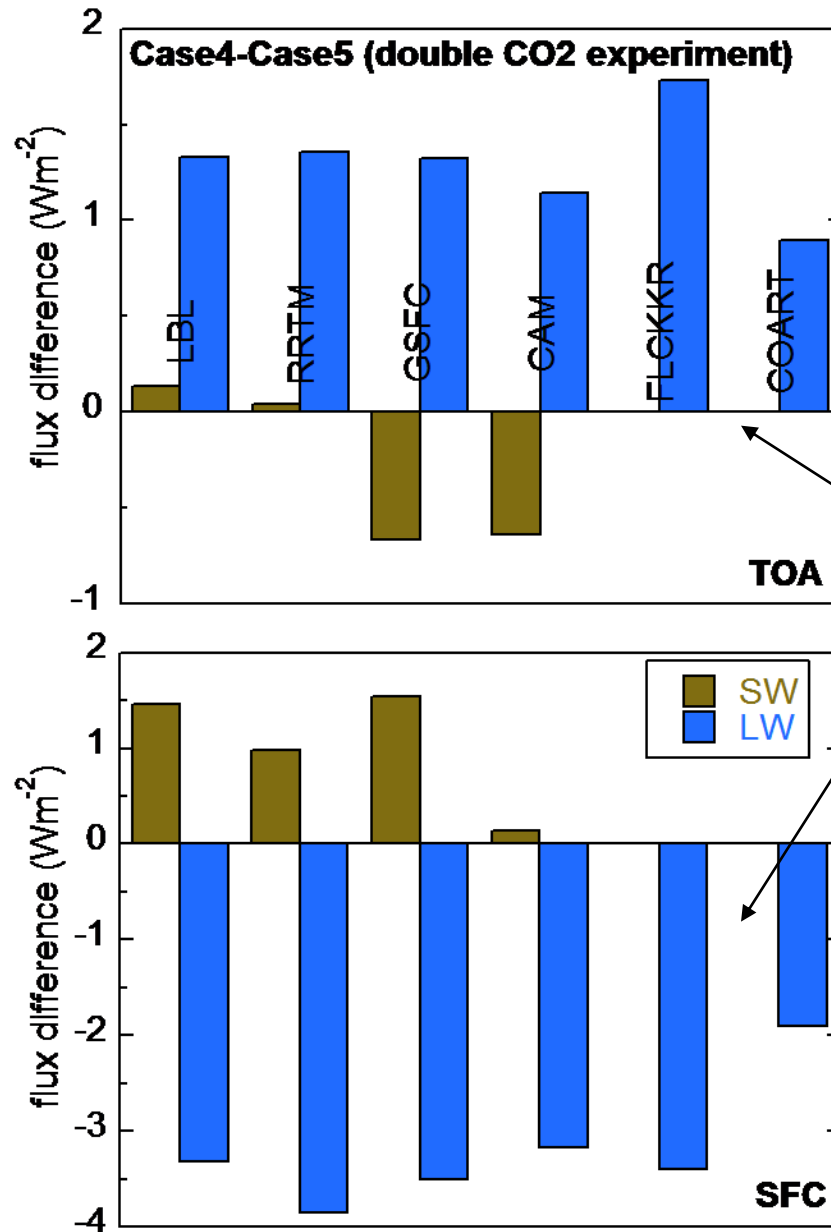
Additional slides

Phase I initial results, LW heating rates



No reference SW HR available from CHARTS

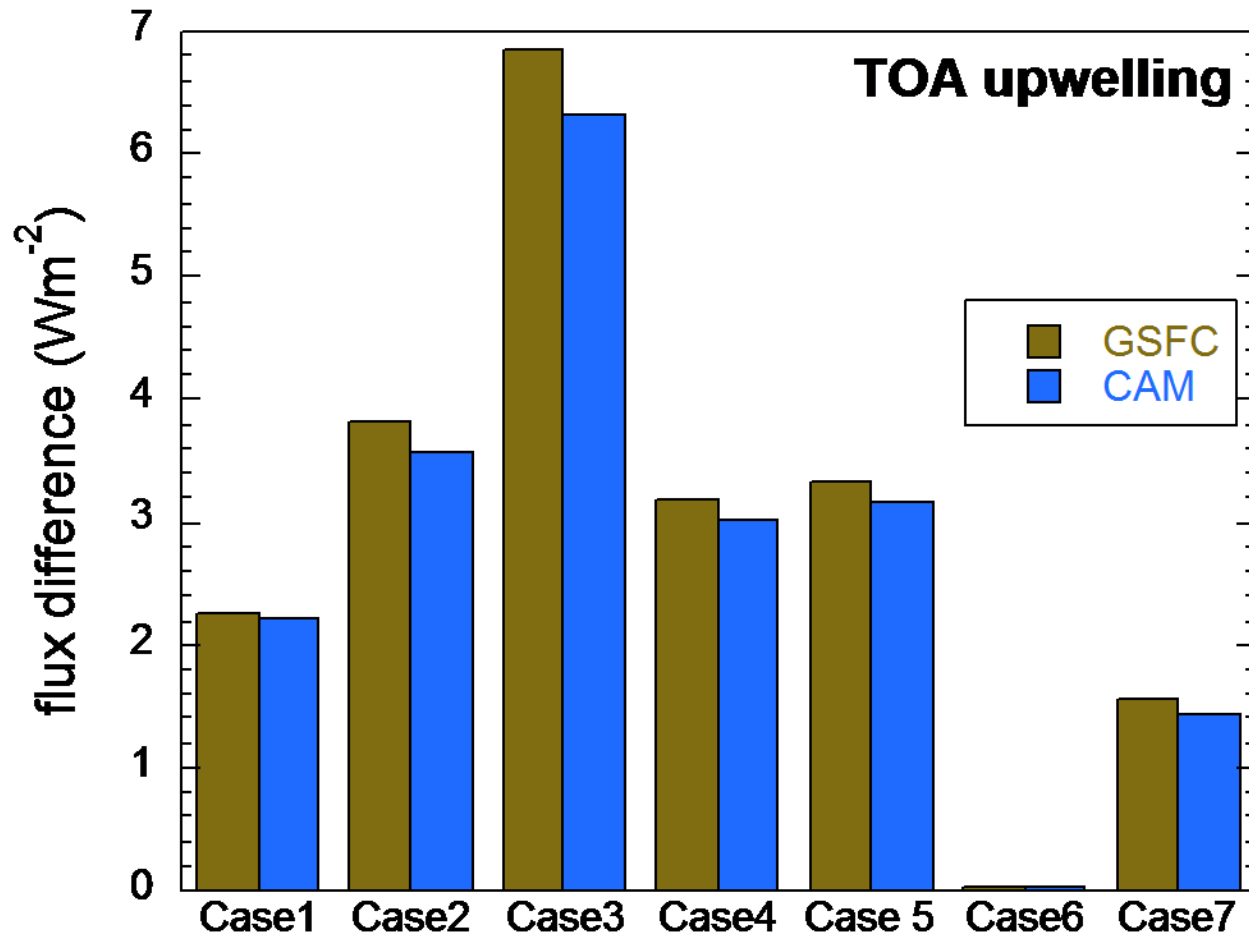
Phase I initial results, CO₂ forcing of dry atmospheres



FLCKKR and COART
have fixed CO₂ in SW

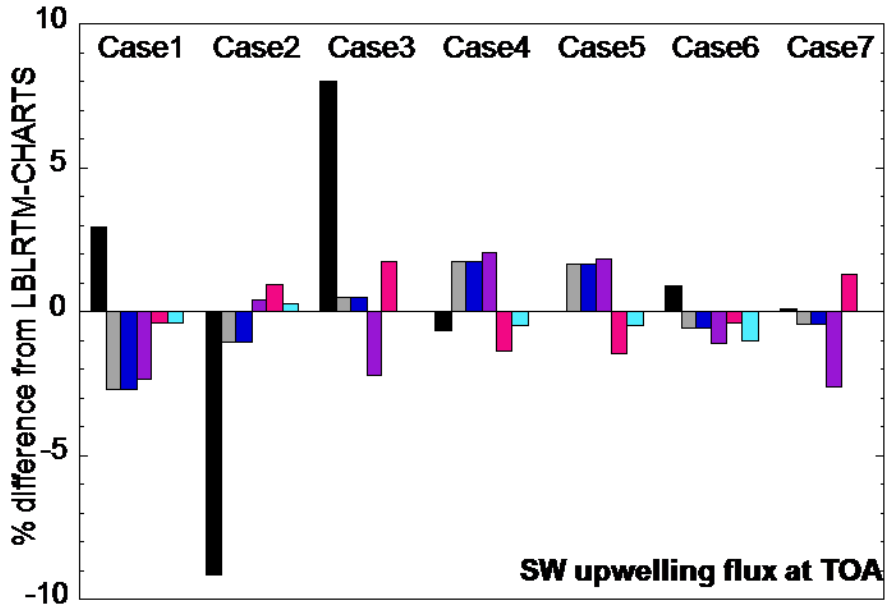
Importance of spectral surface albedo

weighted-unweighted sfc. albedo

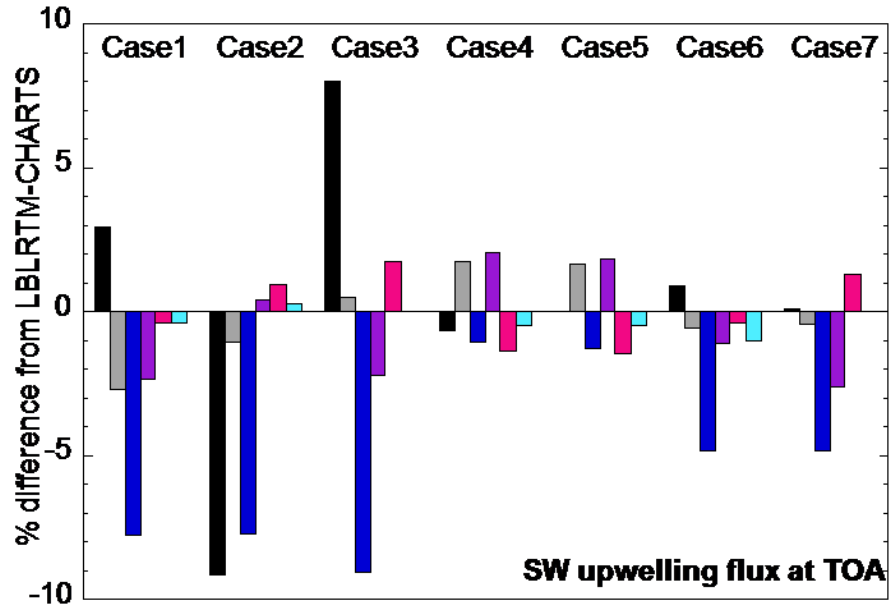


Importance of spectral surface albedo

weighted-unweighted sfc. albedo for GSFC



unweighted



weighted

LW QC: LBLRTM spectral comparisons with AERI

