Making BBHRP a user-run retrieval evaluation tool

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Use radiative closure at the surface and TOA to give some constraint on cloud retrievals.

Work needed to meet QUICR requests:

1. **Make BBHRP User Run**

*A beta version of retrieval test-bed BBHRP is now available on the BDS.*

2. **Prepare RIPBE input files at other sites**

Progress is being made on producing spectral albedo, one of the needed inputs for RIPBE at other sites.

Radiatively Important Parameters Best Estimate (RIPBE)

Collects all needed inputs for radiative transfer calculations, and surface/TOA flux validation data

Cloud retrievals

Aerosol retrievals
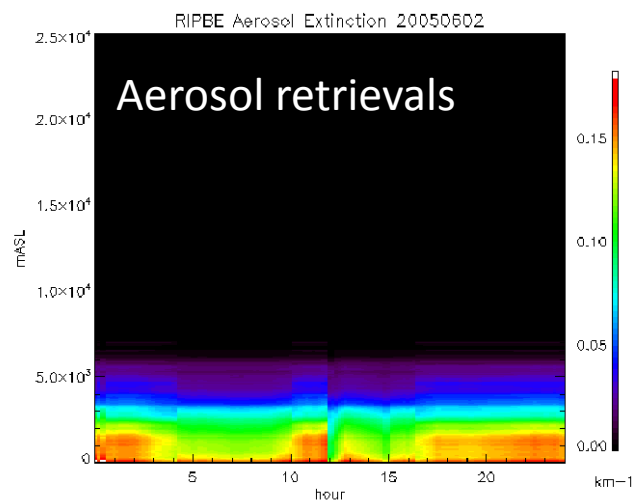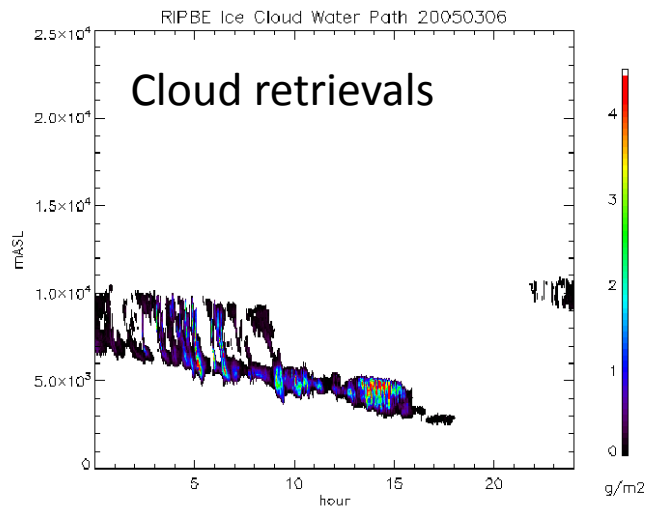
RIPBE Inputs:

Cloud retrievals: microbase
- LWC, IWC, LiqRe, IceRe

Aerosol inputs: ABE
- Extinction, single scattering, asymmetry

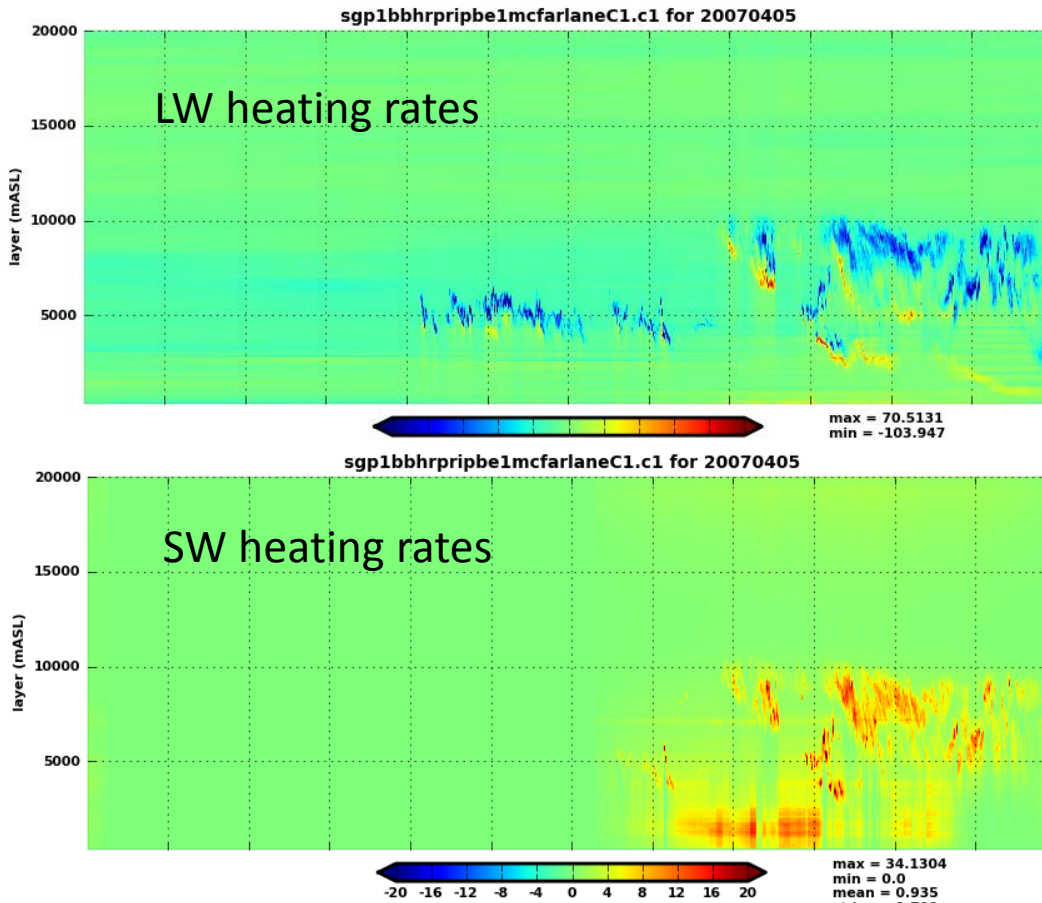Thermodynamic profiles: mergedsonde

Surface Albedo: surfspecalb

Trace gasses: time varying O_3, CO_2, others fixed

Surface Temperature: irt10m

Surface Fluxes: qcrad

Clear Sky identification: swfanal

RIPBE & BBHRP overview:

Broadband Heating Rate Profile (BBHRP) VAP

Calculates:

- LW & SW heating rates
- LW & SW fluxes

Details:

- 1 min & 30 min average files
- Height resolution determined by cloud data, (microbase uses 45 m)
- Uses RRTM radiative transfer model
- Uses RIPBE files as input but can also be run with user input files in a RIPBE like format (e.g. ACRED retrievals)
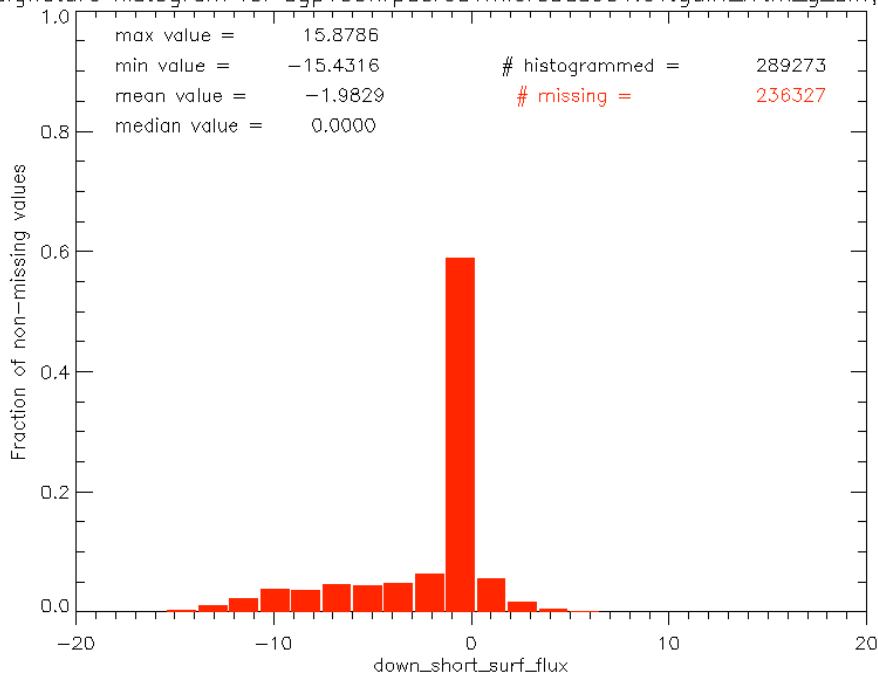
1. Make BBHRP User Run:

A beta version of retrieval test-bed BBHRP is now available on the BDS.

▶ A run script that can be user customized for:
  ■ Any RIPBE formatted input files
  ■ User-chosen RRTM model
▶ Basic documentation to run the script on the ARM BDS cluster
▶ RRTM & RRTM_G models currently available
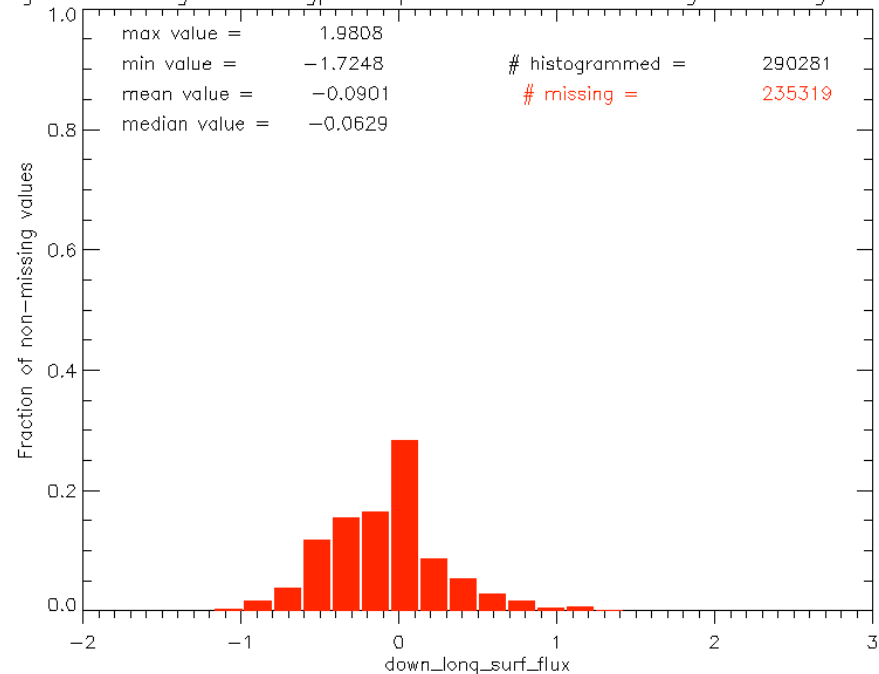▶ SGP RIPBE input data from 2002-2007 & MC3E period

Using RRTM_G can give an order of magnitude faster processing on *appropriate computing system*

Signature histogram for sgp1bbhrpacred1microbaseC1.c1.gdiff_rrtm_g_diff, 2

max value = 15.8786	
min value = −15.4316	# histogrammed = 289273
mean value = −1.9829	# missing = 236327
median value = 0.0000	

Signature histogram for sgp1bbhrpacred1microbaseC1.c1.gdiff_rrtm_g_diff, 2

|	
max value = 1.9808	
min value = −1.7248	# histogrammed = 290281
mean value = −0.0901	# missing = 235319
median value = −0.0629	

Example of RRTM & RRTM_G differences:
- Downwelling shortwave surface fluxes ~ 2 W/m^2 bias
- Downwelling longwave surface fluxes ~.1 W/m^2 bias

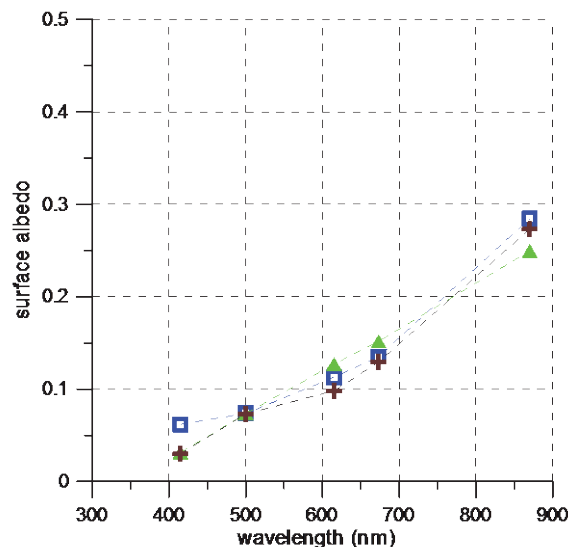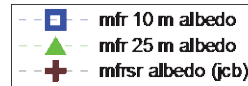*Progress by Jim Barnard, Evgueni Kassianov, & Connor Flynn on calculating spectral surface albedo from only downlooking MFRSR data (Kassianov et al. 2004, manuscript in preparation):*

SGP surface albedo June, July, Aug 2010
- mfr 10 m albedo
- mfr 25 m albedo
- mfrsr albedo (jcb)
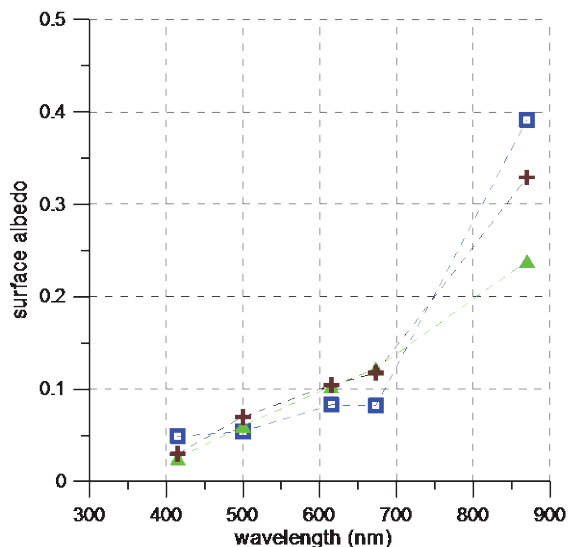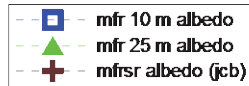
SGP surface albedo Sept, Oct, Nov 2010
- mfr 10 m albedo
- mfr 25 m albedo
- mfrsr albedo (jcb)

$$\tau = \frac{\frac{4}{3}(\frac{1}{r}-1)}{(1-A)(1-g)} \quad (\text{Eq. 1})$$

r = transmission/ Cos[SZA]^1.5
A = surface albedo
g = cloud droplet asymmetry parameter (about 0.87 for liquid water clouds)

Based on Barnard & Long (2004), *J. App. Meteor.*

Currently planned projects:

► PSUADE UQ Sensitivity tests of MICROBASE (& other retrievals?) Qi Tang & Shaocheng Xie

► Darwin retrieval assumptions Alain Protat

Next year: Develop RIPBE at other sites

► Feedback from group on priorities for:
  ■ Sites (Darwin, COPS, etc?)
  ■ time periods