Proposal: Development of a Local Cloud Field Quality Measurement Experiment (LCF QME)

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BBHRP and MicroBase P_i

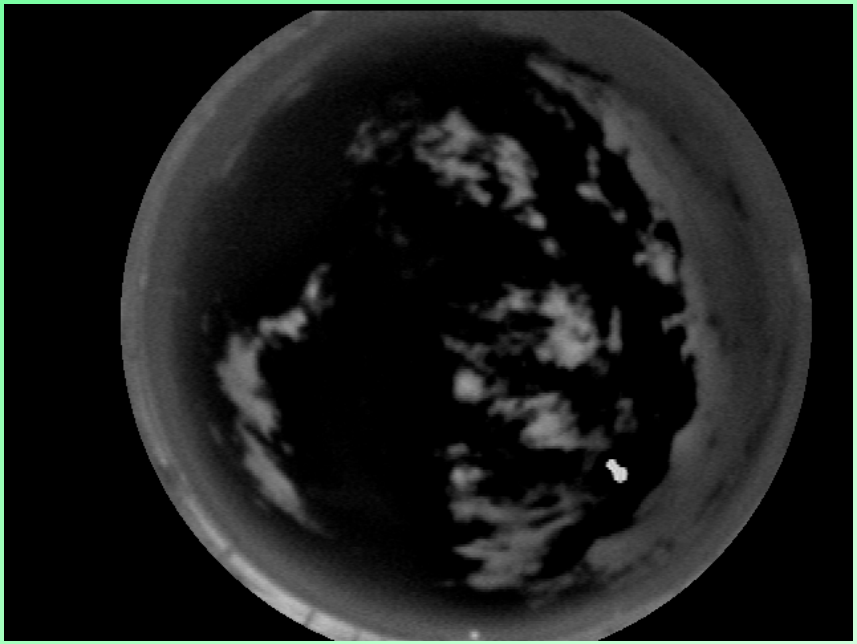
- Currently uses 20-minute time series of ARSCL to produce cloud microphysics
- Kassianov et al. (2004) show that for broken cumulous cloud fields, a 15-minute time series of ARSCL will capture the cloud fraction within 20% only about 25% of the time.

TSI Retrievals

- Kassianov et al. (2004) Also show:
  - 15-minute 100^{O} FOV TSI retrievals are effectively “cloud fraction”
  - Combining 15-minute TSI 100^{O} and 160^{O} retrievals allows estimation of the cloud aspect ratio for broken cloud fields
  - Both the cloud fraction and aspect ratio are directly comparable to the ARSCL time series analysis
  - All ARM TSIs are currently retrieving the 100^{O} and 160^{O} retrievals.
  - New IR Sky Imager also spec’ed for 100^{O} and 160^{O} retrievals

Sky Image at SGP GIF
with sun exposed

IRSI



10/19/2005 16:00:09

TSI

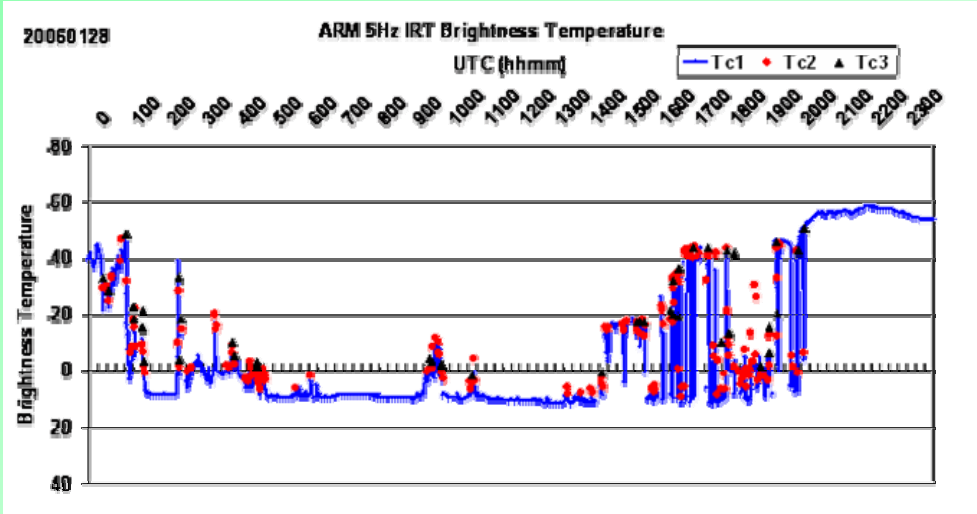
10/19/2005 16:00:00

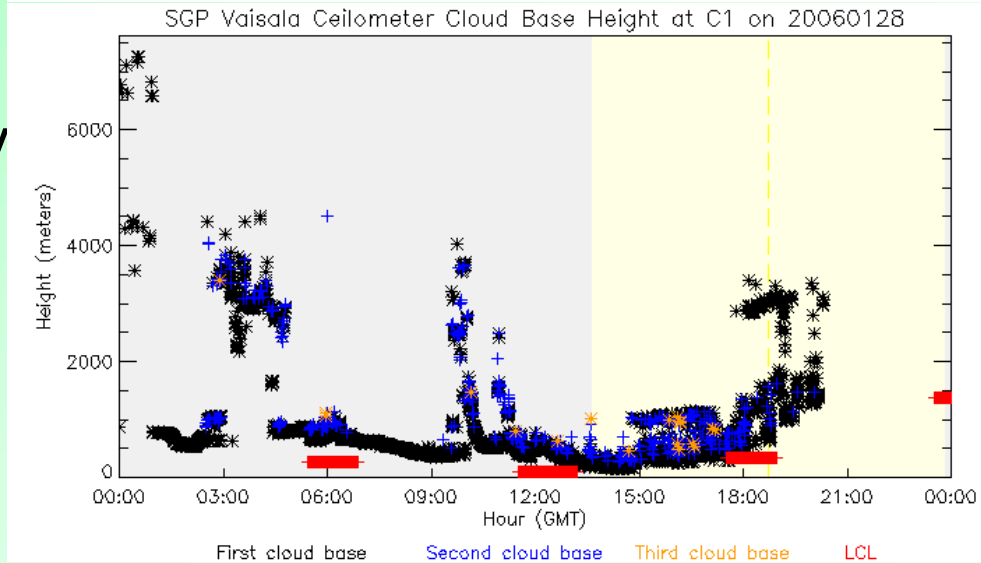
IRT Retrievals

- New IRTs at 11 Extended Facilities, and in progress Central Facilities
  - Extended range down to -100 C
  - 5 Hz sampling
- Analysis code developed for processing data to screen for clear-sky/opaque cloud layers

IRT Cloud Temperature Screening

- Conditional sampling detects clear-sky and opaque-cloud data
  - produces 1-minute frequency histogram of all temperatures
  - screens for temperature of up to three opaque cloud layers or clear-sky
- Methodology developed to account for intervening atmosphere below cloud





Flux Analysis Summary

- More than just surface radiation measurements
  - Detected clear-sky periods (total and “LW effective”)
  - Clear-sky upwelling and downwelling SW and LW
    - for cloud effect/forcing
  - SW total and LW effective fractional sky cover
  - Clear-sky effective LW emissivity
  - Effective cloud transmissivity
  - Cloud visible optical depths (OVC)
  - Cloud effective radiating temperature
    - (LW Scv > 50%)
  - Crude effective cloud radiating height

Flux Analysis Talk: BBHRP Breakout, 4 pm, Ballroom C

Other Instruments/Retrievals

- AERI (cloud temp, thin opt depth)
- MFRSR CLDOD (optical depth and effective radius)
- CLD VIS (MPL cloud visible optical depth)
- Other…

Proposal for new VAP

- Local Cloud Field QME
  - combine data/retrievals to produce best estimate of local cloud field macrophysical properties
  - “local” here meaning significantly affecting the hemispheric instruments

  Inputs:
  - TSI (100 Deg FOV, cloud aspect ratio) [also IRSI]
  - ARSCL (temporal cloud fraction, heights, aspect ratio)
  - IRT (clear/cloud temp)
  - AERI (cloud temp, thin opt depth)
  - MFRSR CLDOD (optical depth and effective radius)
  - CLD VIS (MPL cloud visible optical depth)
  - Flux Analysis (listed variables)

Proposal for new VAP

- use for MicroBase --> BBHRP P_i
  - Can maintain purity for closure analyses by eliminating Flux Analysis retrievals
  - Can include Flux Analysis for “best product”
  - “0^{th}” order: does ARSCL time series represent local cloud field
    - Is 20 minutes of ARSCL appropriate for given situation?
  - Use in conjunction with MicroBase, similar to using MWR and sondes for Merged Sonde
- Fodder for CRM comparisons
- Statistical/climatological analyses

Why a QME, not a VAP?

- All of the pieces are available
  - Are there others?
- How do the pieces relate to each other?
- What is the optimal means to compare/combine them?
- How best to produce the “best estimate” microphysics distributions for MicroBase?
- This effort will require on-going development for some time, similar to MicroBase and BBHRP, with a “team” of sponsors

I think it is an appropriate time to get started on developing a local cloud field description.

Thank You