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Update on Cloud Modeling Data Products for CLWG

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and

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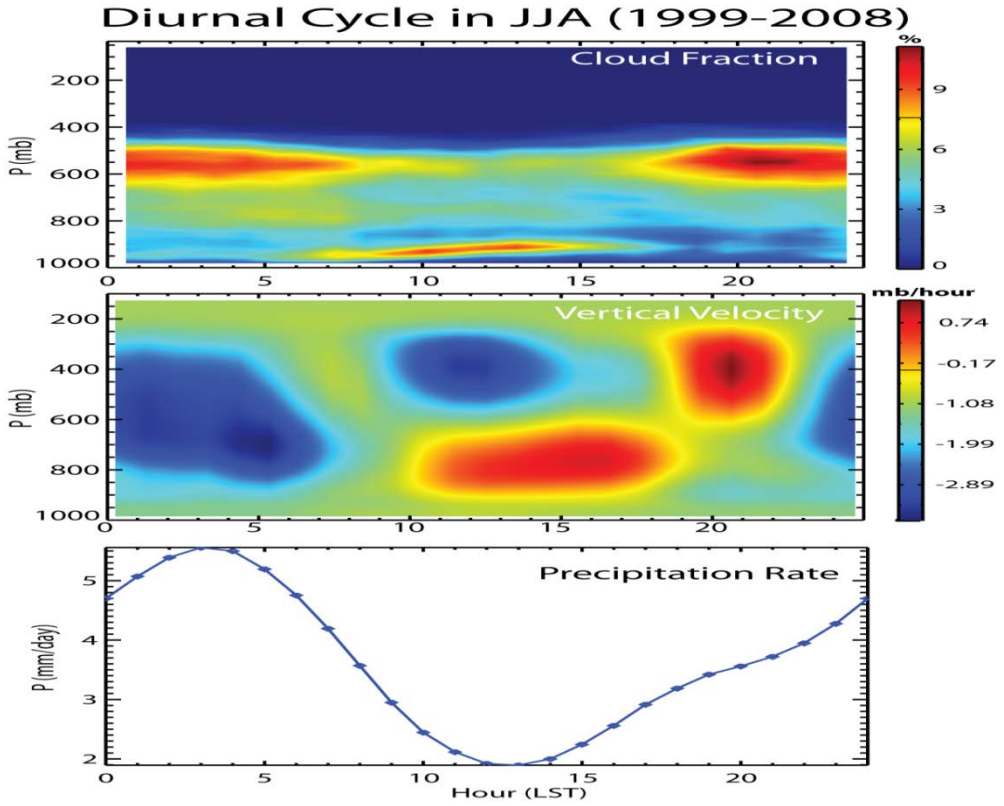
Overview

- **Large-Scale Forcing Dataset**
  - **Multi-year continuous forcing data**
  - **Forcing for AMFs**
- **Climate Modeling Best Estimate (CMBE) Dataset**
- **Cloud Retrieval Ensemble Dataset (CRED)**

1. Large-Scale Forcing Data

- **Extend the long-term continuous forcing data at SGP to recent years (1999-2009) – RUC constrained by ARM observations through VA.**



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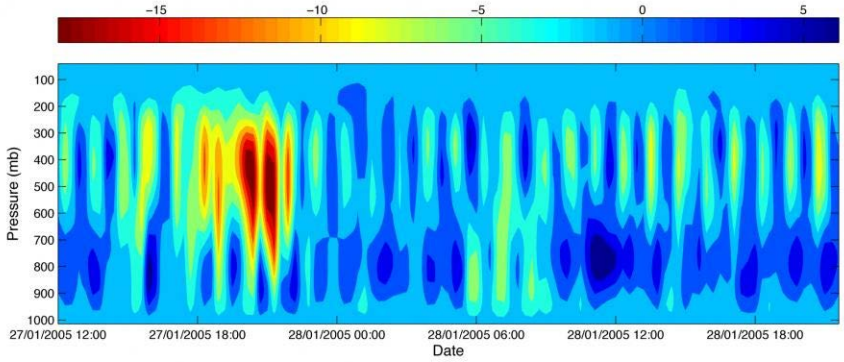
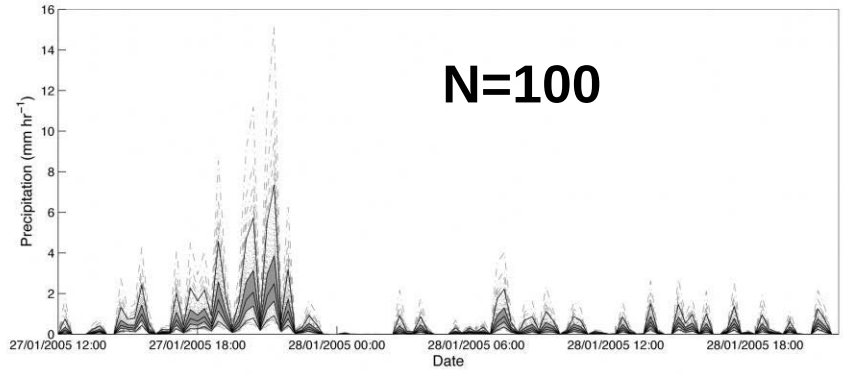
Large-Scale Forcing Data

- **Long-term, large-scale ensemble forcing data for Darwin – ECMWF constrained by C-POL rainfall through VA**

  Christian Jakob and Laura Davies (Monash University) collaborated with the LLNL Team



Available for three wet seasons from 2004-2007



Ensemble data was generated by considering potential errors in C-POL rainfall

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Forcing for AMFs

AMF-China

Aerosol Indirect Effects

(May 2008 – Dec 2008)

AMF Azores

Clouds, Aerosol, and Precipitation in the Marine Boundary Layer

(5/1/2009-12/31/2010)

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Ensemble Forcing for AMF?

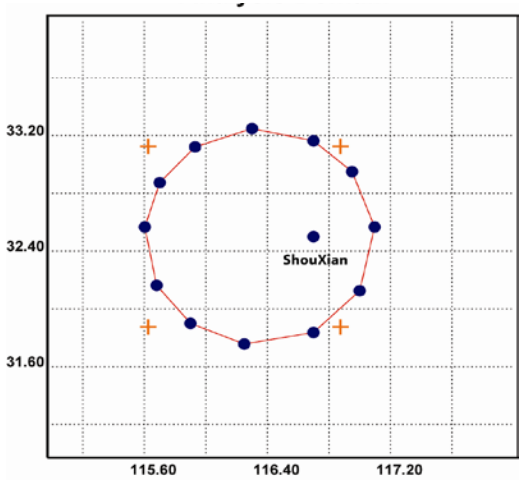
Most required observations are only available at the AMF site

- Surface radiation, turbulent fluxes, and surface meteorological fields
- TOA radiations
- Sounding (4 times/day)
- WCAR-ARSCL
- MERRA/ECMWF analyses

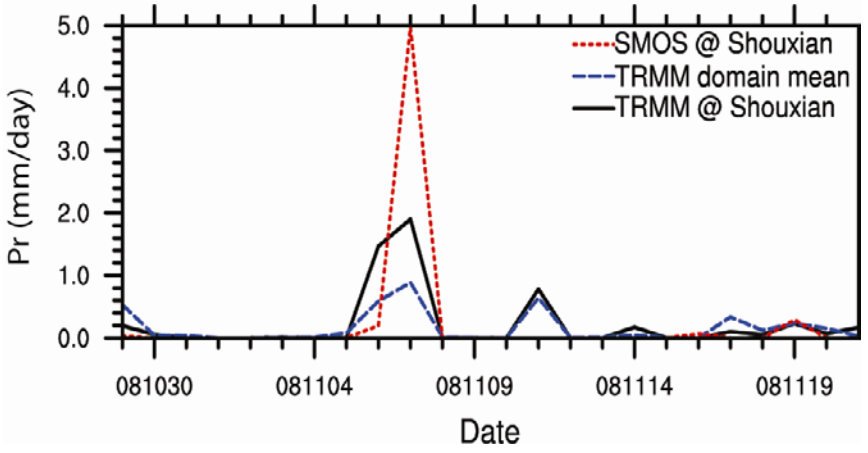
We plan to create an ensemble forcing dataset from NWP analyses by perturbing key constraints such as surface precipitation rates

Analysis will be performed over a 1.5 x 1.5 degree domain

Analysis Domain



China AMF Precipitation



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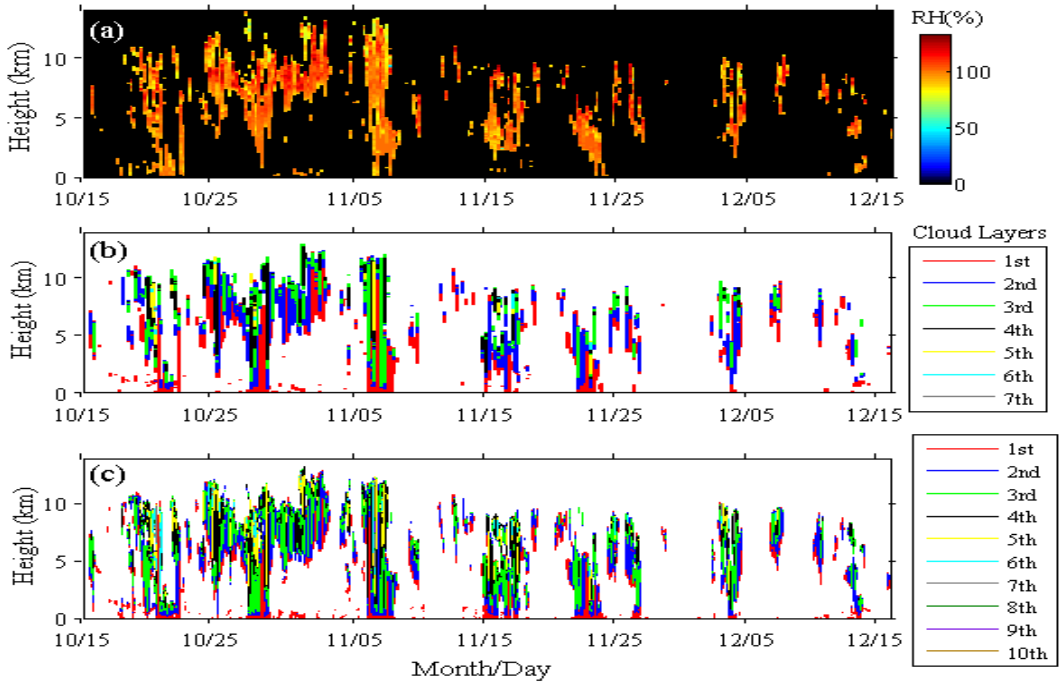
Forcing will be developed for periods that are important to address science questions

- ***10/20/08-11/20/08 is currently selected for AMF-China, based on the feedback from Zhanqing Li, the PI of the AMF China***



- **Most complete coverage, including WCAR-ARSCL**
- **Highest frequency of cloud presence**
- **Three major cloud/precipitation events**
- **A case study has been done for the Nov. 17 event**

Feedback is needed from CLWG!

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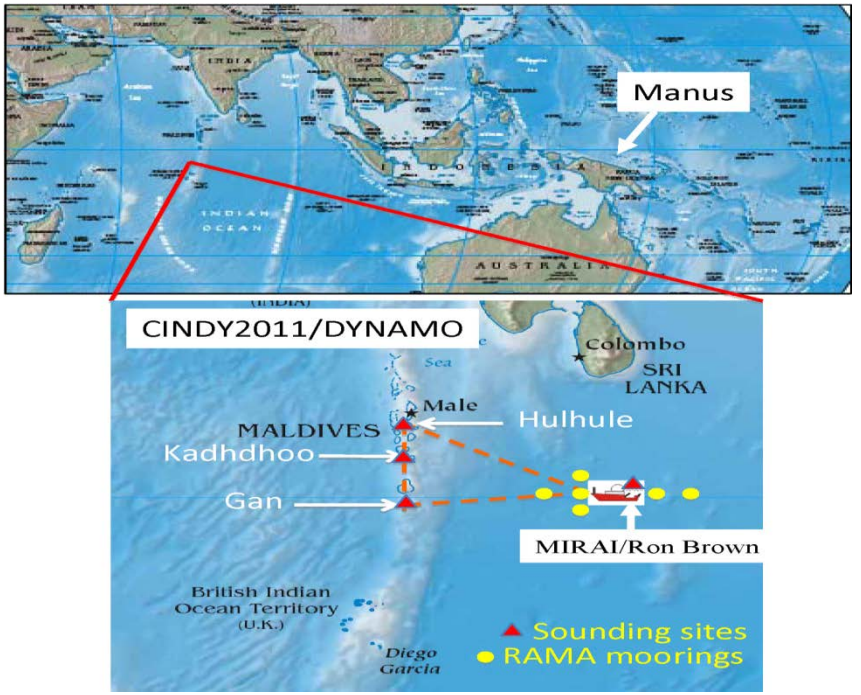
Forcing for MC3E and AMIE

MC3E: Midlatitude Continental Convective Clouds Experiment

(April - May 2011, SGP)

AMIE: ACRF MJO Investigation Experiment

(10/1/2011-03/31/2012, Manus and Gan)



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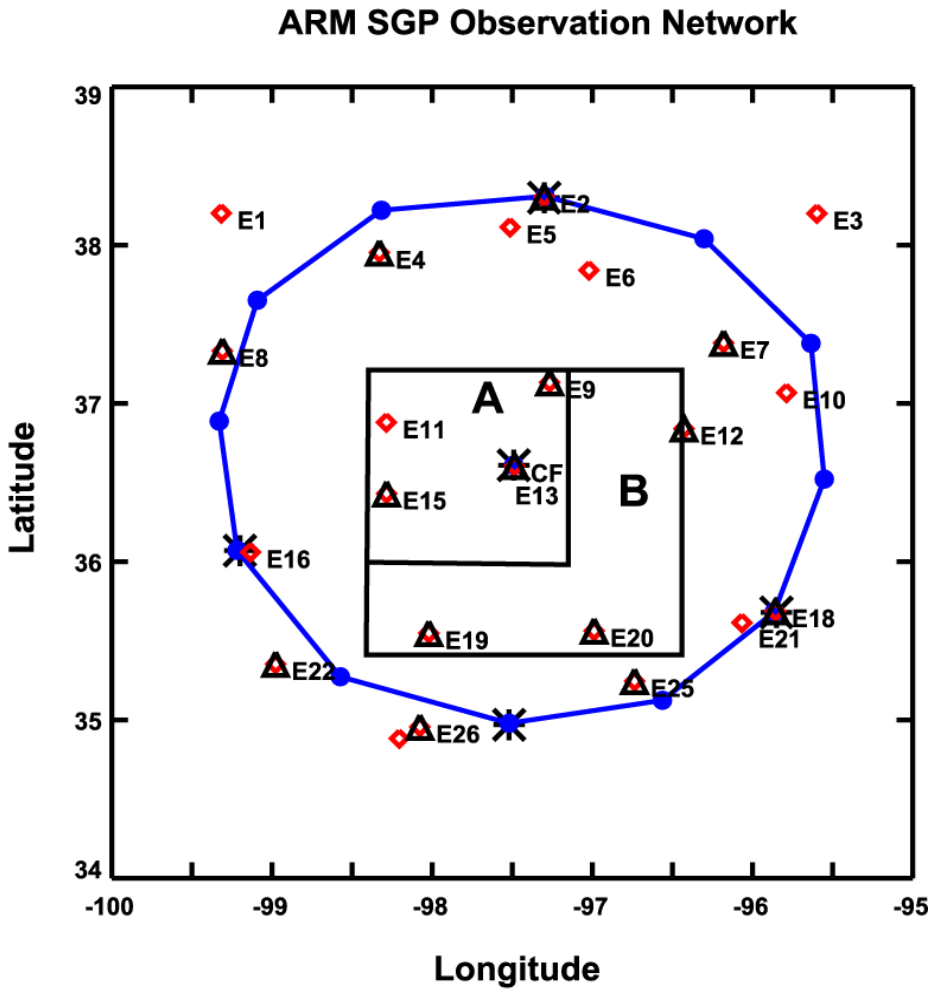
Multi-scale forcing for selected case studies

e.g. 10km x 10km, 30km x30km, 100km x100km domains for March 2000 IOP



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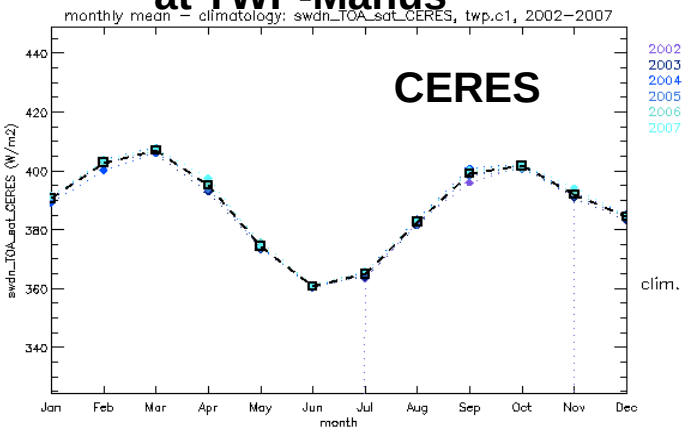
2. Recent Updates to CMBE

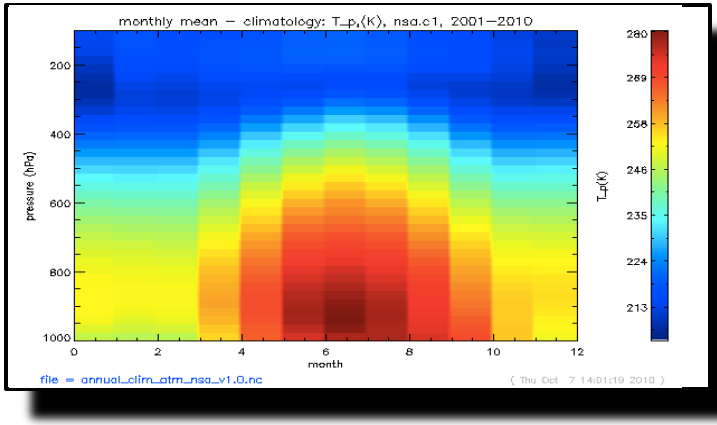
- **CMBE-CLDRAD**
  - Cloud fraction profiles
  - Total clouds
  - LWP/PW
  - Surface radiative fluxes
  - TOA radiative fluxes (*New for NSA and TWP*)
  - Satellite retrieved clouds (*New for NSA and TWP*)

- **CMBE-ATM (*New for NSA and TWP*)**
  - Soundings
  - NWP analysis data
  - Surface heat fluxes
  - Surface precipitation
  - Surface temp, RH, and winds

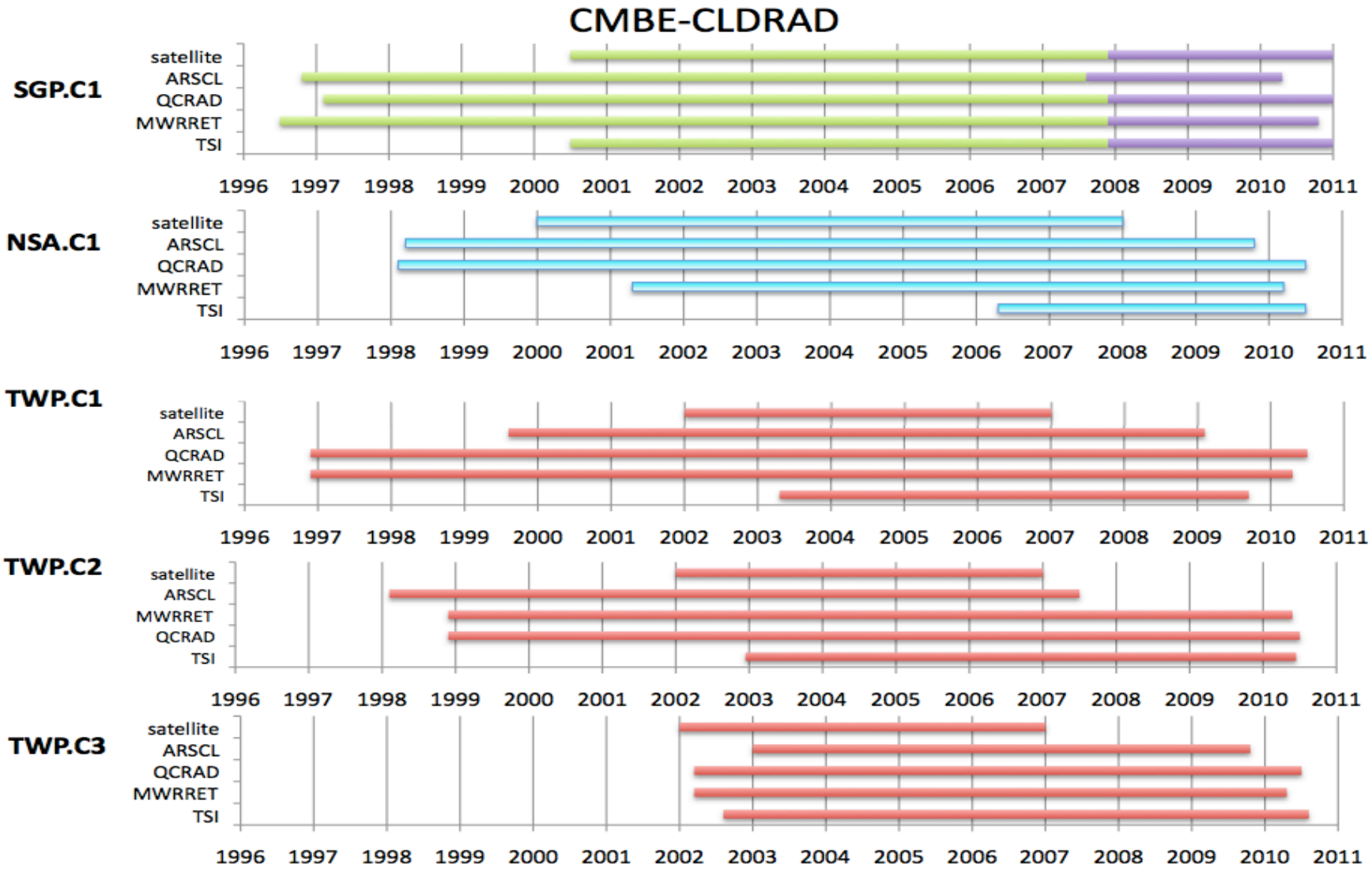
Monthly Mean TOA SWdn at TWP-Manus



Monthly Mean T at NSA



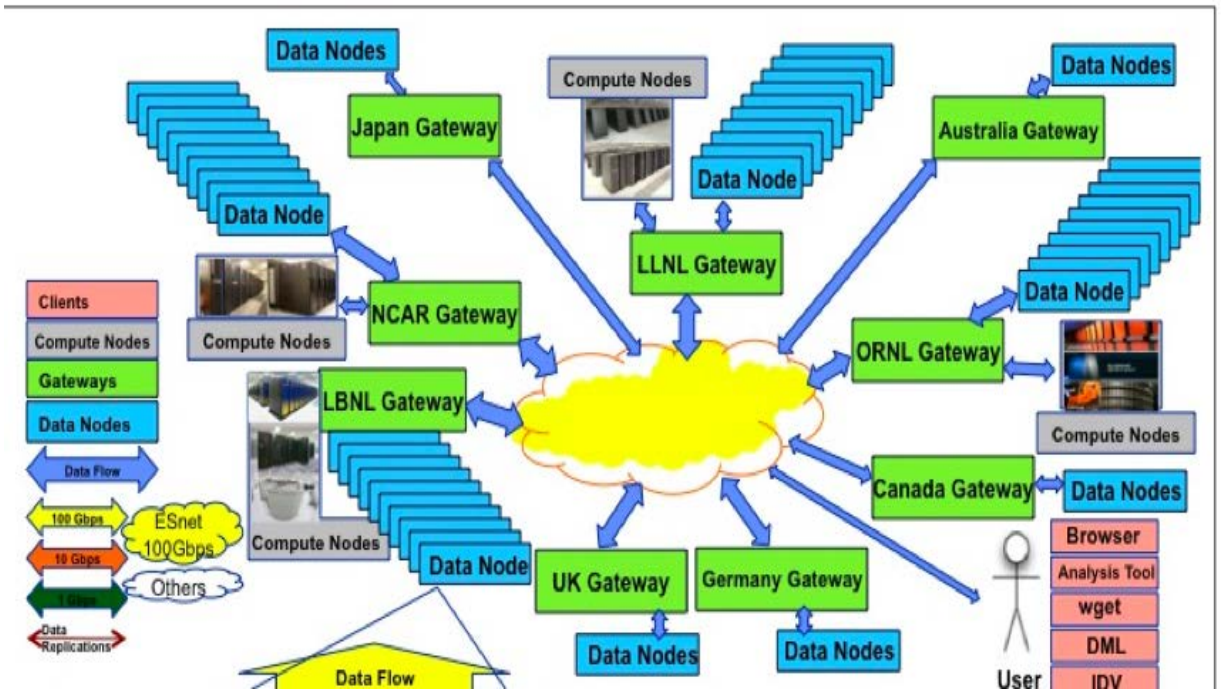
CMBE Data Availability



CMBE Is Being Publishing in ESG for IPCC Model Evaluation

- **Evaluate IPCC models**
- **Facilitate the use of ARM in a broader community**

ESG: Earth System Grid



The ESG is the next generation infrastructure that enables distributed data analysis through sharing of climate model output data (IPCC and other) and observational data sets

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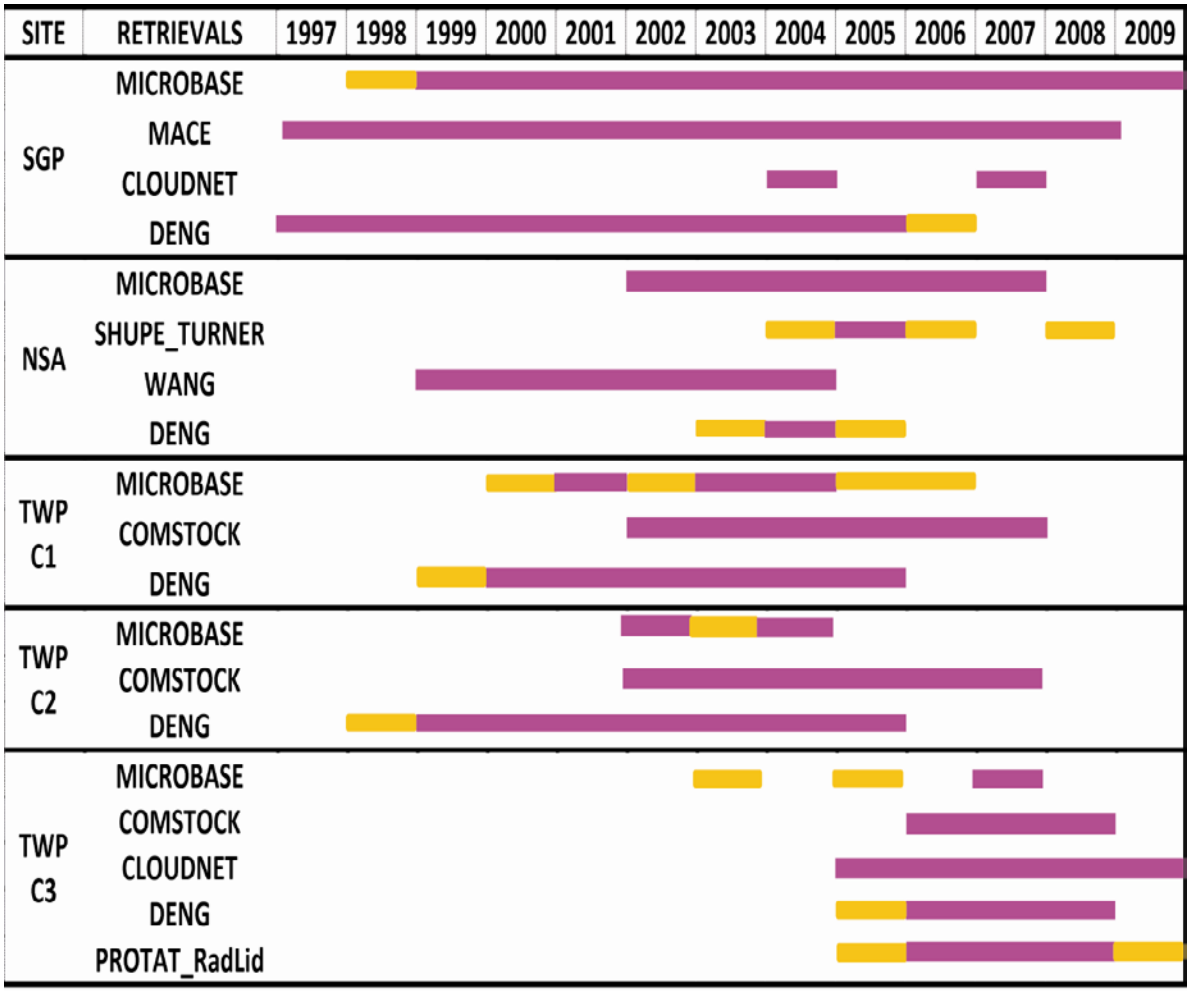
Future Plan on CMBE Data

Further Enhancement of CMBE

- ***Clear-sky radiative flux and effective cloud albedo (SGP)***
- ***Area-mean quantities (SGP)***
- ***Surface soil measurements (SGP)***
- ***Surface SH and LH (NSA)***
- ***TRMM precipitation (TWP)***
- ***ISCCP (all sites)***
- ***CMBE-RIPBE (cloud retrievals and aerosol properties)***
- ***CMBE-CRED (ensemble cloud retrievals)***
- ***CMBE-AMF***

3. Cloud Retrieval Ensemble Dataset (CRED)

8 ARM Ground-Based Cloud Retrievals



Note that Purple bar means whole year, yellow bar means partial year.

- **Contain:**
  - LWC/LWP/Re_liq
  - IWC/IWP/Re_ice
  - Optical depth
- **Multiple years**
- **SGP, NSA, TWP sites**
- **CMBE resolution: 45m, hourly data**
- **Web Page for quick plots**
- **Technical report**
- **More data are coming**
- ***First version is under review and will be released soon!***

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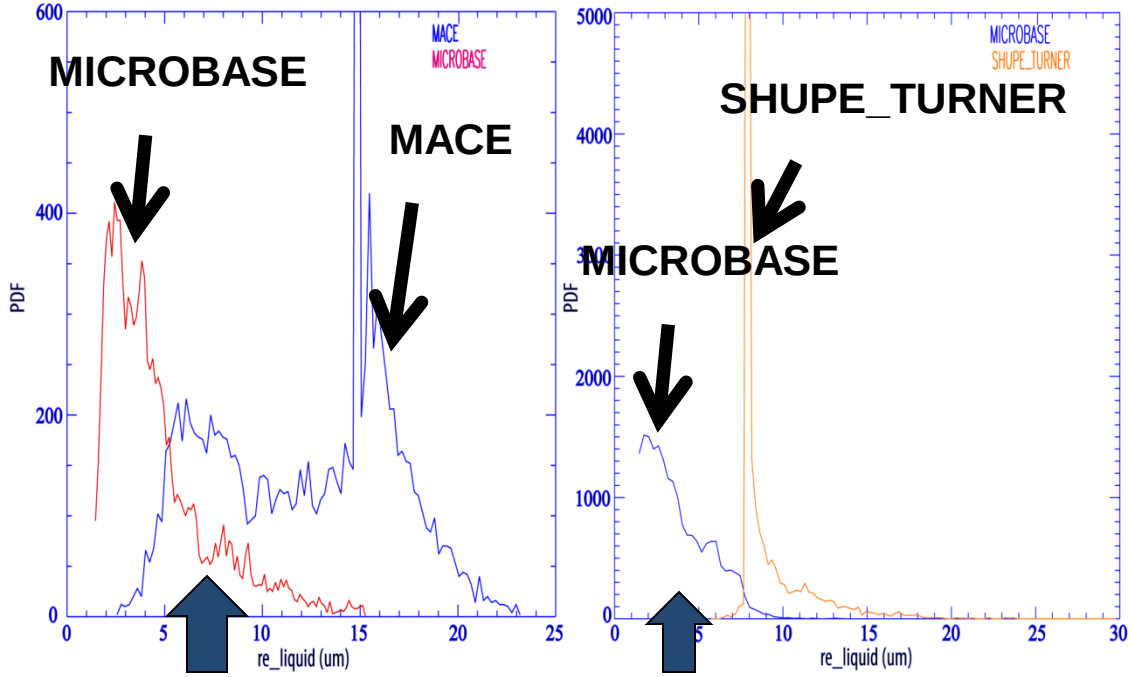
Theoretically Understanding Differences in ARM Cloud Retrievals

Large difference in liquid effective radius



Differences are in:

- **Instruments**

  Radar, Lidar, AERI
- **Algorithms**
- **Input (cloud masks)**
- **Constraint (MWR-LWP)**

The water vapor/droplet competition mechanism used in MICROBASE limits its particle size

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Comments?

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