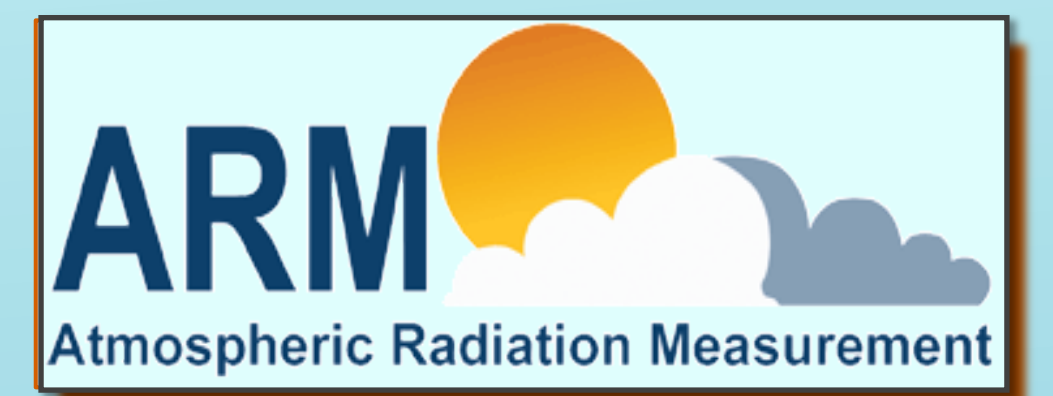


ASR Cloud Modeling Data Development at LLNL

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Introduction

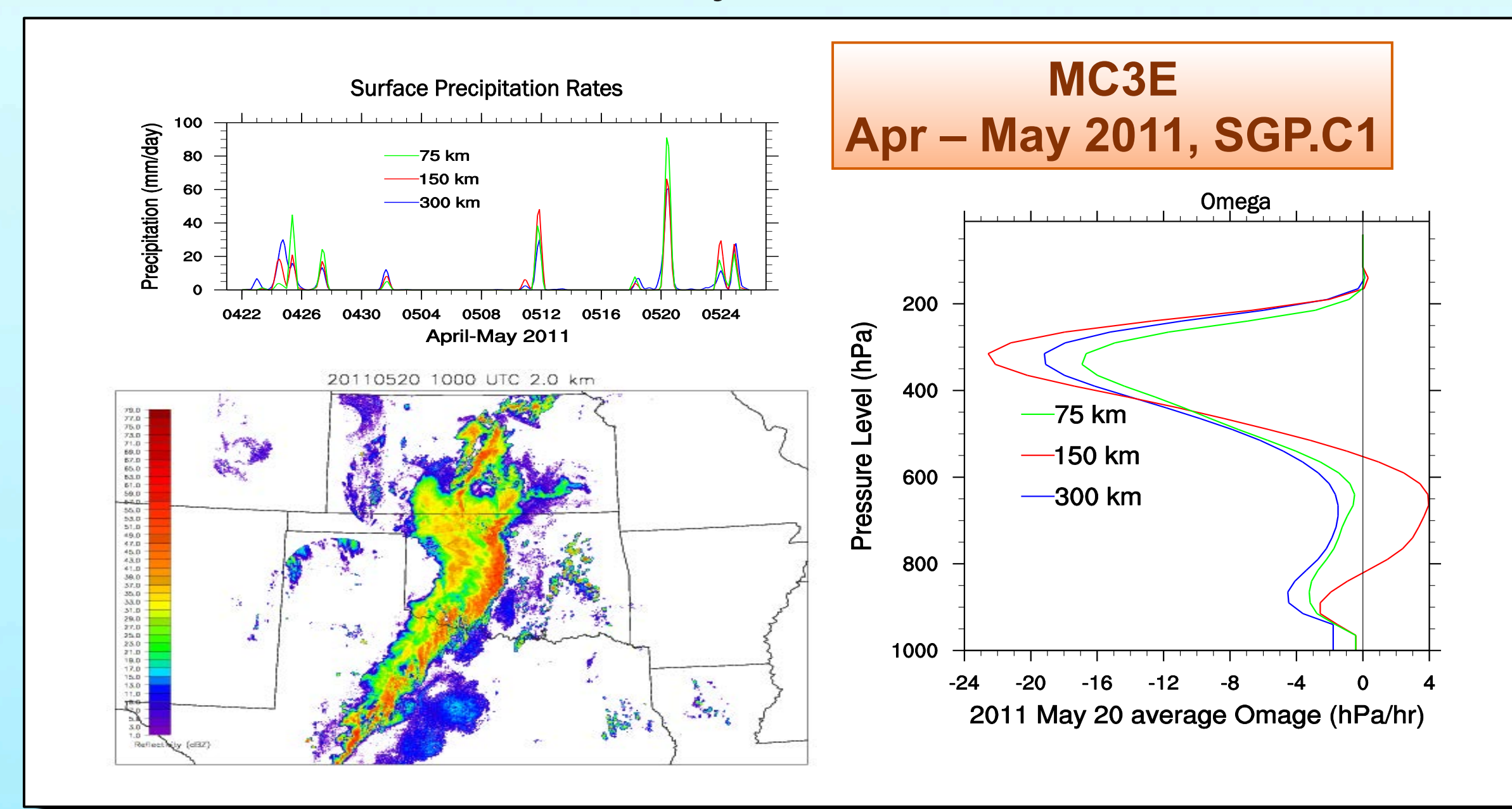
This poster presents new additions, updates and future plans for the cloud modeling Value Added Products (VAPs) being developed by the Lawrence Livermore National Laboratory (LLNL) ARM Infrastructure team.

These include:

1. the ARM showcase **Climate Modeling Best Estimate (CMBE)** for SGP.C1,
2. **the large-scale forcing datasets**
 - MC3E IOP (22 Apr – 25 May 2011)
 - AMF China (1 Nov – 30 Nov 2008)
3. **the ARM Cloud Retrieval Ensemble Dataset (ACRED).**

MC3E Multiscale Forcing

The multiscale-domain forcing data was developed over the 3 analysis domains centered at central facility with a diameter of **300 km** (standard SGP forcing domain size), **150 km** and **75 km**, to support modeling studies on various-scale convective systems

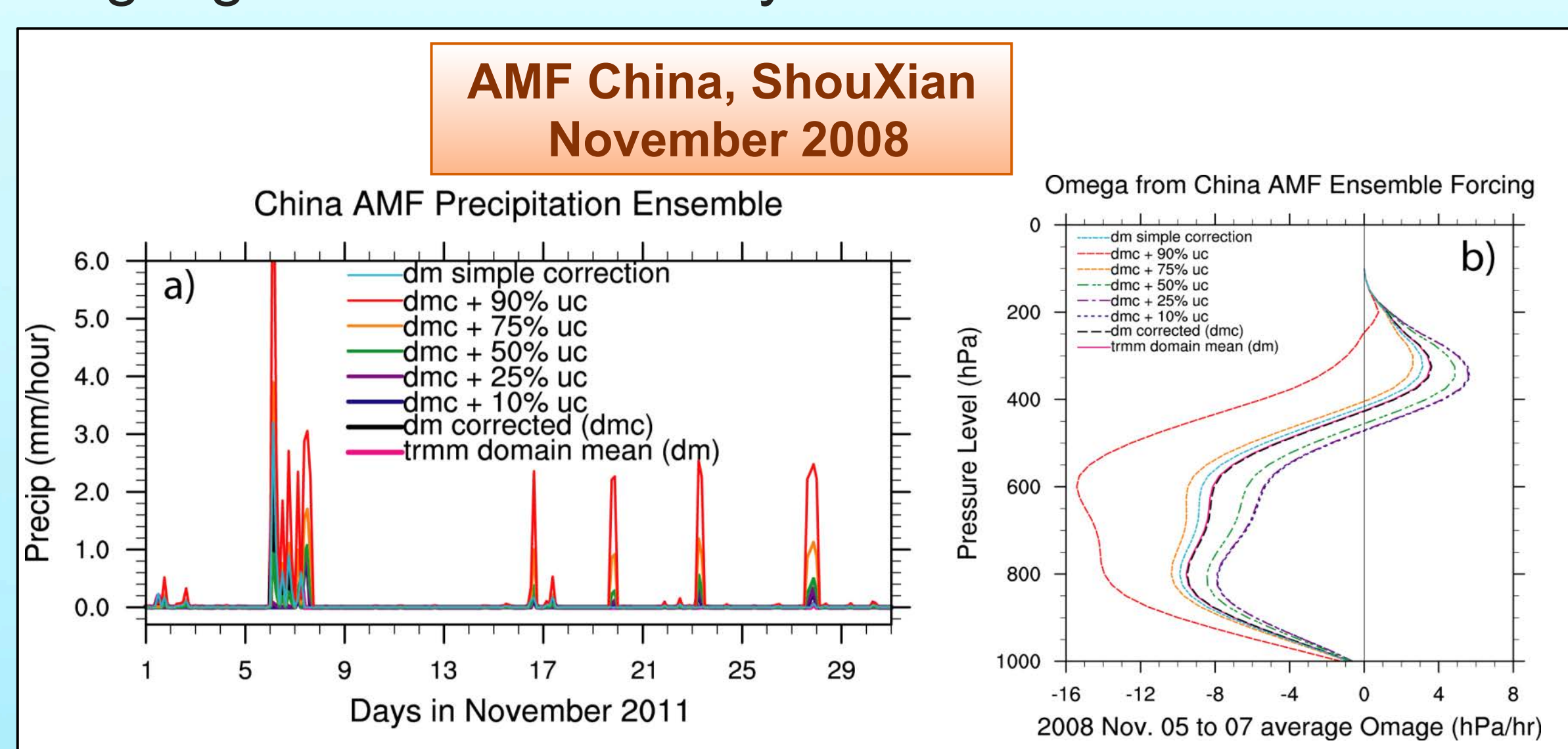


Data Download:

http://iop.archive.arm.gov/arm-iop/0eval-data/xie/scm-forcing/iop_at_sgp/MC3E/

AMF China Ensemble Forcing

The ensemble forcing data was developed based on observations by **AMF at ShouXian China**. To address the uncertainties in precipitation measurements, an ensemble of precipitation rates are developed based on one surface rain gauge data and 3-hourly TRMM satellite Data.



Data Download:

http://iop.archive.arm.gov/arm-iop/0eval-data/xie/scm-forcing/iop_at_hfe/

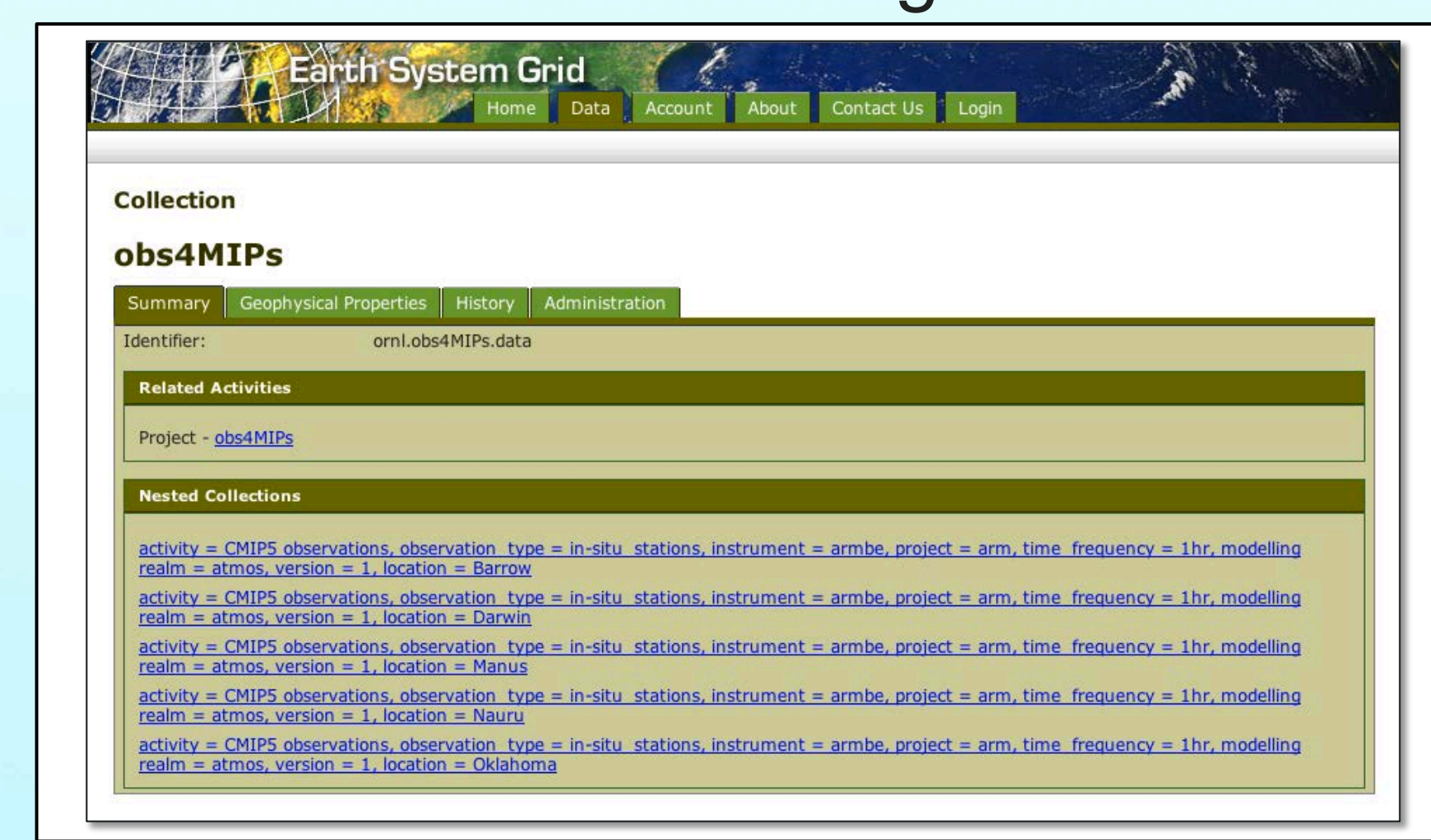
CMBE Updates

The enhanced CMBE for SGP include:

- New variables:
 - **surface clear sky radiative fluxes**, for calculating effective cloud albedo for quantifying the surface SW impact of clouds,
 - **latent and sensible heat fluxes from ECOR**, instrument (in addition to fluxes from BAEBBR).
- New **improved cloud fraction** algorithm that does not rely on ceilometer/lidar cloud base estimate that can be faulty when lidar is not working (mainly before 2000), This change does not affect the cloud fraction when both lidar and radar are operational, which is the data we always recommend to use.
- The **most recently reprocessed MWRRET** liquid water path, precipitable water.
- **The most recent surface and TOA radiative flux.**
- This data has now a **DOI number**, that should be used to reference it.

CMBE for IPCC CMIP5

The CMBE data (named ARMBE) is published in Earth System Grid Federation (ESGF) data holdings, which serves the IPCC CMIP5 data. Our dataset is being used as a validation dataset for evaluating IPCC CMIP5 models.



ORNL ESGF Portal <http://esg.ccs.ornl.gov/esgcat/>

The CMBE data is used in the Cloud Feedback Model Intercomparison Program (CFMIP) as part of CFMIP-OBS datasets



<http://climserv.ipsl.polytechnique.fr/cfmip-obs/>

It is also part of **Obs4MIPs**, a pilot activity to make observational products more accessible for climate model intercomparisons



<http://obs4mips.llnl.gov:8080/wiki/>

DOI Numbers & Reference

CMBE data has a DOI number and should be referenced by it.

Data Reference and Download:

sgpC1cmbe-clrad <http://dx.doi.org/10.5439/1035355>

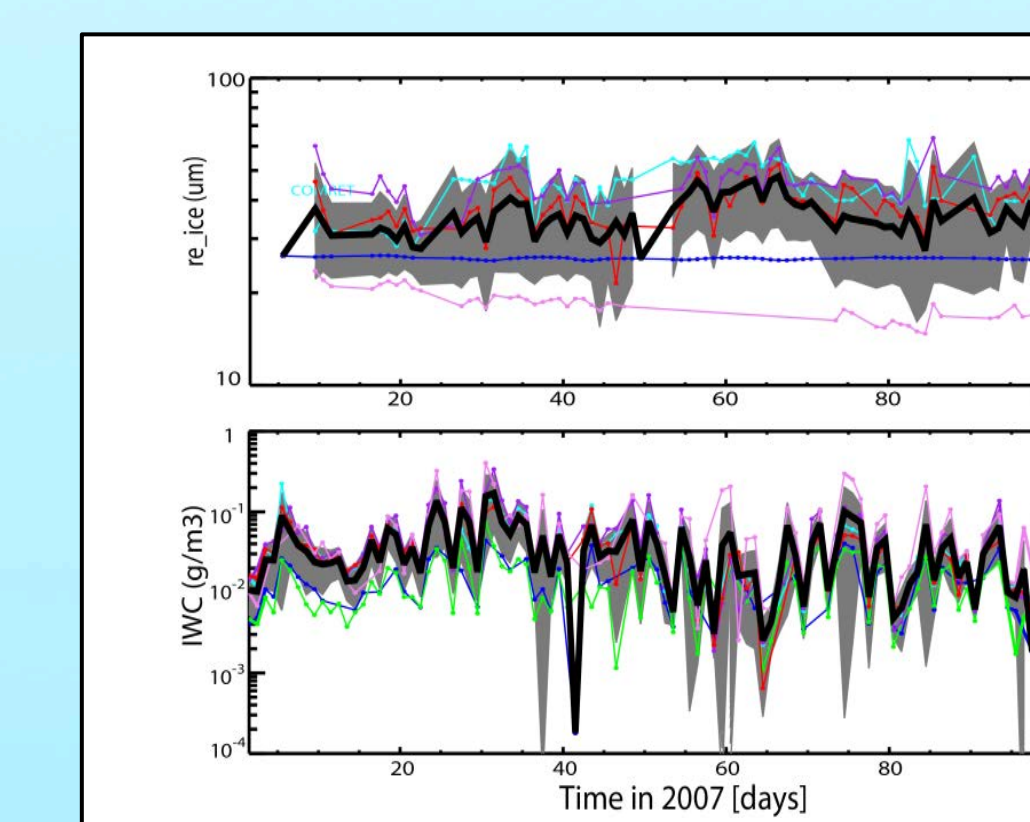
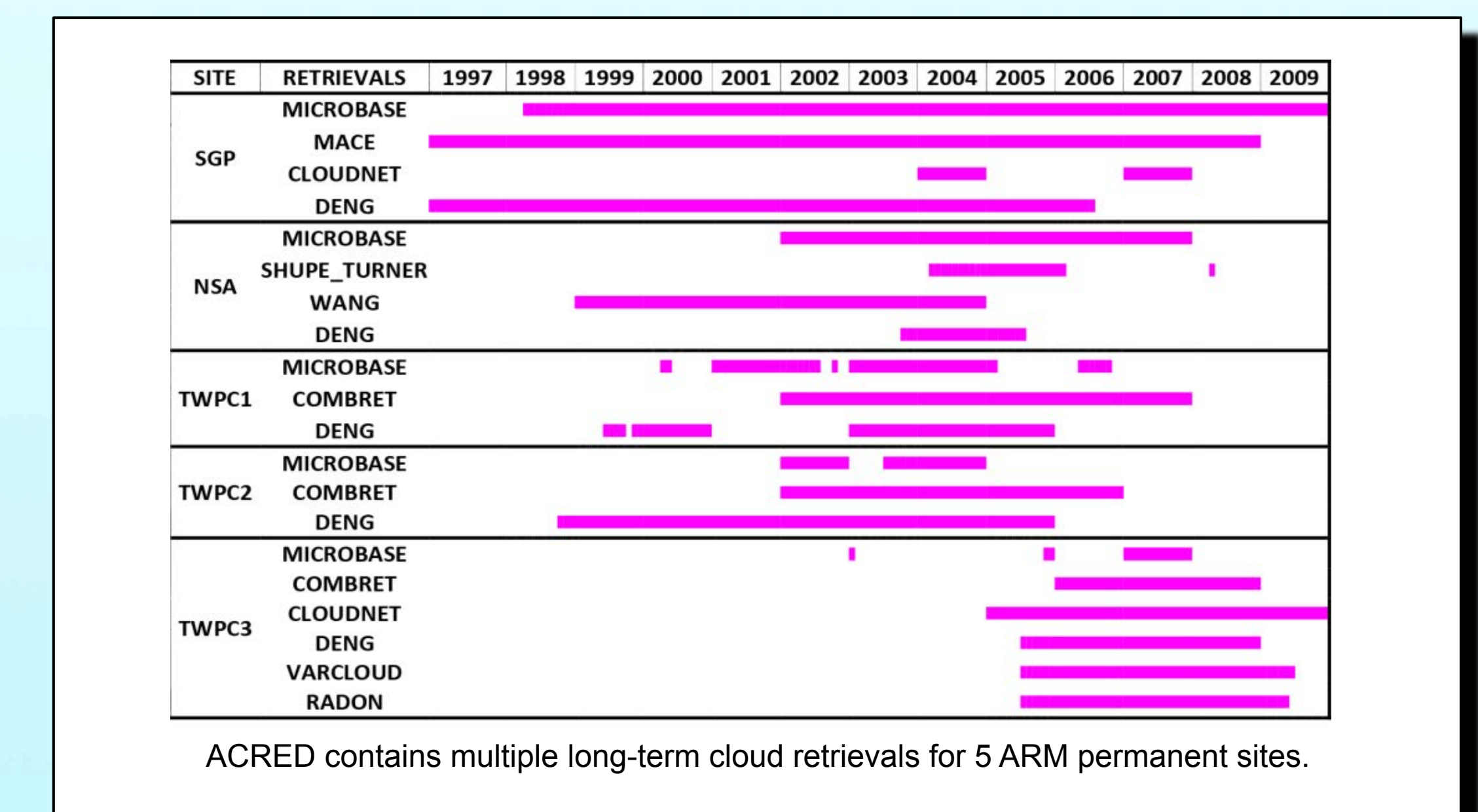
sgpC1cmbe-atm <http://dx.doi.org/10.5439/1035356>

CMBE description: <http://www.arm.gov/data/cmbe/>

Xie, S., R.B. McCoy, S.A. Klein, et al., 2010: Clouds And More: ARM Climate Modeling Best Estimate Data. *Bull. Amer. Meteor. Soc.*, 91, 13–20. doi:10.1175/2009BAMS2891.1

ACRED

The **ARM Cloud Retrieval Ensemble Dataset (ACRED)** containing nine different cloud retrieval products has been developed over the 5 ARM permanent research sites. It has 1 hour time and 45 m vertical resolution.



An example showing the difference in ice cloud properties retrieved from 6 different cloud retrieval algorithms at 11 km. The shadow area provides a crude estimate of the uncertainty in these retrievals. The data is plotted on a log scale and for the **ARM Darwin** site in 2007.

Data Download and Reference

http://iop.archive.arm.gov/arm-iop/0eval-data/xie/cloud_retrieval_ensemble_dataset/
Zhao C., S. Xie, S. Klein, et al. "Toward Understanding of Differences in Current Cloud Retrievals of ARM Ground-based Measurements", JGR, in review.

Future Goals

• **CMBE – will become ARMBE**

- Change name (to ARMBE) and metadata for production ARM VAP (you will be able to order ARMBE through the standard ARM Archive)
- Create ARMBE for AMF China and AMF Azores
- Develop ARMBE-RIPBE product
- Update all sites to current date
- Add area-average ARMBE
- Add statistical ARMBE data to ESGF and update to current

• **Large-Scale Forcing**

- Create ensemble forcing for MC3E IOP
- Create forcing for ARM AMIE IOP

• **ACRED**

- Create ensemble MICROBASE cloud retrieval dataset
- Develop ensemble parameters for other selected retrievals
- Incorporate ACRED with RIPBE for running BBHRP Tests
- Create hi-resolution (1 min) ACRED data

Acknowledgement

This work is supported by the DOE ARM program and the ASR Cloud Lifecycle Working Group. We would like to thank those who provided us the necessary data to develop these data products. Drs. B Xi, X. Dong, and A. Kennedy have made a considerable contribution to the CMBE data development.