Improved long-term ARM records for cross-site/cross-campaign data comparison

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Cross-site/time comparison

- Cross-site analysis can be very powerful at yielding insights
- With the ever growing list of ARM deployments, there are now so many opportunities for cross-site/cross-time analysis:
  - Comparing MCS deep convection in the Amazon to SGP (Die Wang)
  - Comparing Ice nuclei abundance across many campaigns (Paul DeMott)
  - Examining aerosol variations over 20 years of SGP data (Peter Marinescu)
  - Marine low cloud comparisons
    - subtropics (e.g. MAGIC vs. LASIC)
    - middle & high latitudes (MARCUS vs. COMBLE or ENA)

Terai et al. 2019

JGR Atmospheres

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Key Points:
- The cloud optical depth response to warming is driven by the liquid water path response
- The adiabatic lapse rate and phase-partitioning response to warming contribute to cold-cloud response
- The inversion strength and decoupling response to warming contribute to warm-cloud response

Mechanisms Behind the Extratropical Stratiform Low-Cloud Optical Depth Response to Temperature in ARM Site Observations

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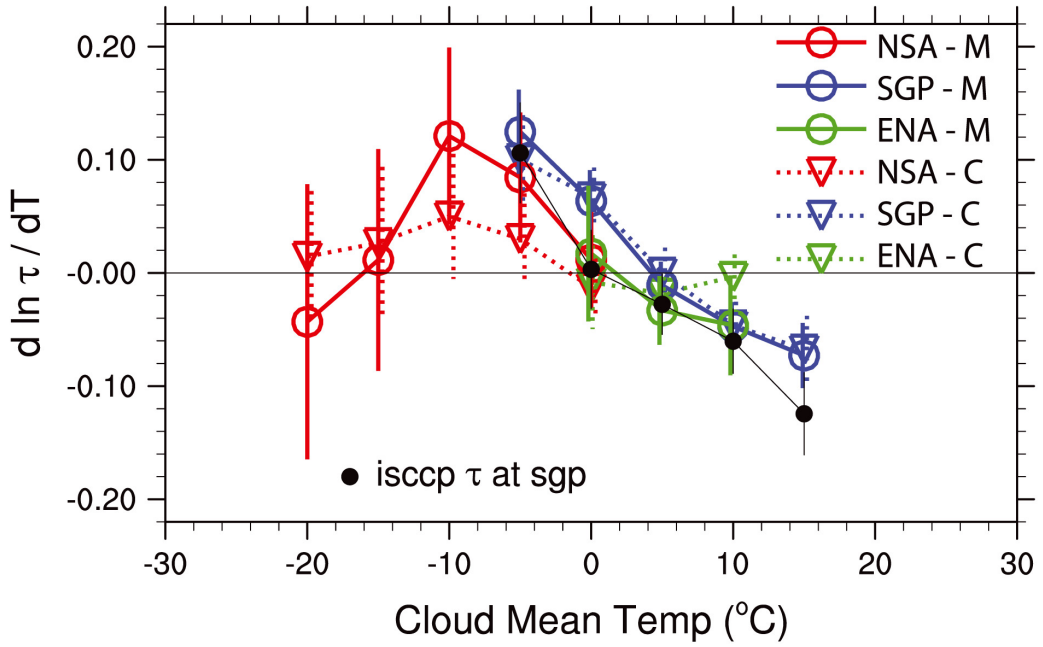

1 plot with data from 3 sites and 2 τ retrieval algorithms

Data Characteristics	
3 sites	SGP, ENA, NSA
Cloud retrieval algorithms	• Cloud boundaries (ARSCL) • LWP (MWRRET) • 2 τ retrievals (MPL(Chiu)/MFRSR(Min0] • 3 water content, particle size retrievals (Shupe/Turner, Mace/Dong, Dong)
Meteorological Events	Single Layer Low-Level Overcast Clouds under an Inversion
Duration	• 9 total years across the 3 sites but only 556 hours • Note years were during 2003-2010 (older years)

Questions regarding VAP data needs for multi-site, multi-year, regime-specific science studies

- Is all of the basic/routine and meteorological context data (soundings, ARSCL, LWP, surface radiation, surface fluxes, variational or NWP analysis) available in a quality-controlled form (e.g., ARMBE) from all sites and AMF campaigns?
- How would data users identify when and where the historical data is good?
- Is data quality summary information (at a campaign overview level) only available through word-of-mouth or through laborious searches?
- How can ARM facilitate identification of regimes of interest, but in a way that is preserves data-user flexibility?
- Is reprocessing possible to achieve better calibrated data? (e.g., cloud radar calibration via CloudSat, Kollias et al. 2019 AMT)
- If one processes old data, how does one prioritize which data gets processed?
  - Scientific value and interest (e.g. the 1st international AMF deployment: Niger 2006)
- How does one balance the need for attention to data from older vs. newer data/campaigns?

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Atmospheric Measurement Techniques Discussions

Calibration of the 2007-2017 record of ARM Cloud Radar Observations using CloudSat

Pavlos Kollias[1,2], Bernat Puigdomènech Treserras[3] and Alain Protat[4]

The findings of this study are critical to past, on-going and planned studies of cloud and precipitation and ***should assist the DOE ARM to build a legacy decadal ground-based cloud radar dataset for global climate model validation.***