



Translator Support for COMBLE

Science Product Development Led by a Team of Scientists

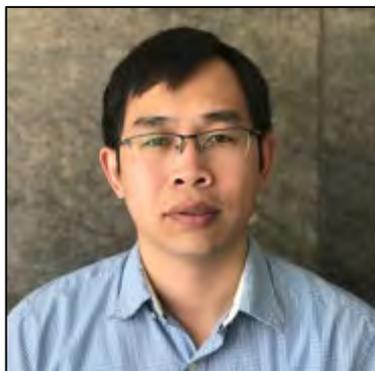
Translator Group



Shaocheng Xie
Lead Translator
Modeling POC



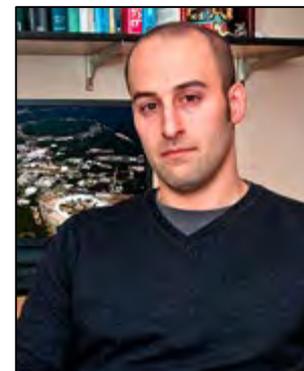
John Shilling
Aerosol POC
TRACER POC



Damao Zhang
High-latitude POC
MOSAIC POC



Scott Collis
Convective POC
CACTI POC



Scott Giangrande
Warm Clouds POC
COMBLE POC



Krista Gaustad
Software
Development



Ken Kehoe
Data Quality

Core VAPs

VAP	Primary Measurement	Translator	Progress
AOD	Aerosol optical depth	Shilling	
AOP	Aerosol optical properties from AOS	Shilling	
KAZR-ARSCL	Cloud boundaries, radar reflectivity, radar moments	Giangrande	Processing
MPLCMASK	Cloud mask, attenuated backscatter, depolarization ratio	Zhang	Processed(M,S)
MWRRET	Liquid water path, precipitable water vapor	Zhang	
AERINF	Longwave spectra radiance	Zhang	Processed(M)
QCECOR	Latent heat flux, sensible heat flux	Xie	
QCRAD	LW, SW surface irradiances	Zhang	
RADFLUX	Clear sky broadband surface irradiances, cloud fraction	Zhang	
DLPROF	UV wind profiles, clear air vertical velocity stats	Zhang	
INTERPSONDE	Profiles of temp, humidity, pressure, wind	Giangrande	Processed(M)
PBLHT	PBL Height from sounding	Zhang	Processed(M)

Optional VAPS

VAP	Primary Measurement	Translator
MFRSRCIP	Column-intensive aerosol properties	Shilling
SASHEVISAOD	Aerosol optical depth, hyperspectral from 375-1020 nm	Shilling
SASHENIRAOD	Aerosol optical depth, in bands from 1000-1700 nm	Shilling
AERloe	Boundary-layer temp, humidity, LWP	Zhang
ARMBE	Hourly-mean data with additional QCs	Xie
CFAD	Reflectivity CFAD for comparison to simulator output	Xie
MFRSRCLDOD	Cloud optical depth, effective radius	Zhang
MICROBASE	Ice water content, liquid water content, cloud droplet size	Giangrande
NDROP	Droplet number concentration, cloud adiabaticity	Zhang
SURFSPECLALB	Spectral surface albedo	Zhang
MERGEDSONDE	Profiles of temp, humidity, pressure, wind	Giangrande
VARANAL	Large-scale advective tendencies of temperature and moisture, vertical velocity, and analysis domain mean surface and TOA fluxes	Xie

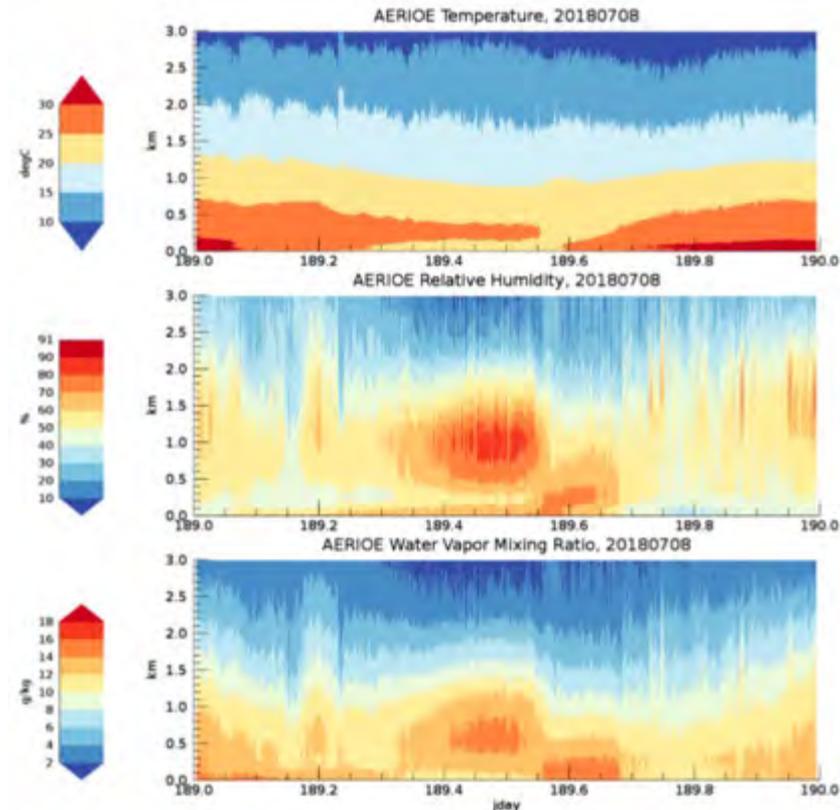
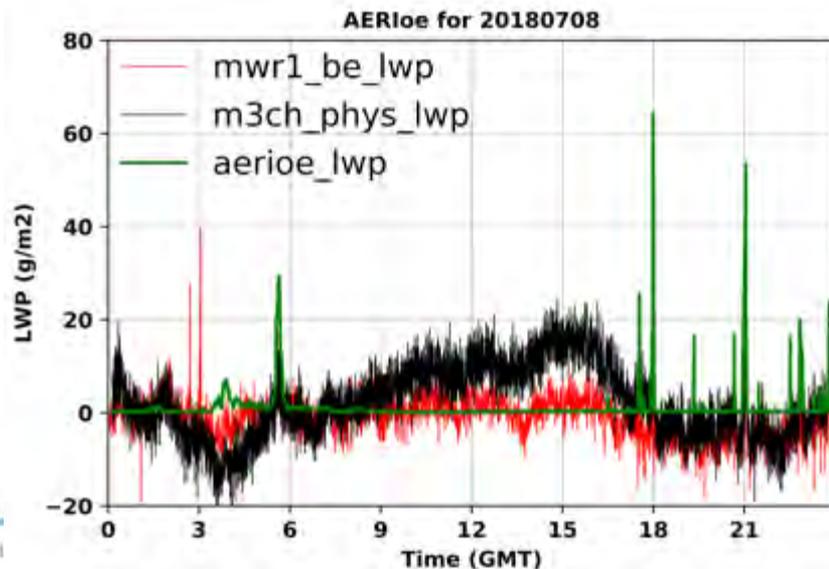
AERIOe

Translator contact: Zhang, damao.zhang@pnnl.gov

Physical retrieval of temperature and water vapor mixing ratio profiles and cloud properties

Progress:

- *Computationally intensive*: Running operationally on Stratus cluster at SGP CI (201601-now), E32, E37, and E39, planned for COMBLE in FY21



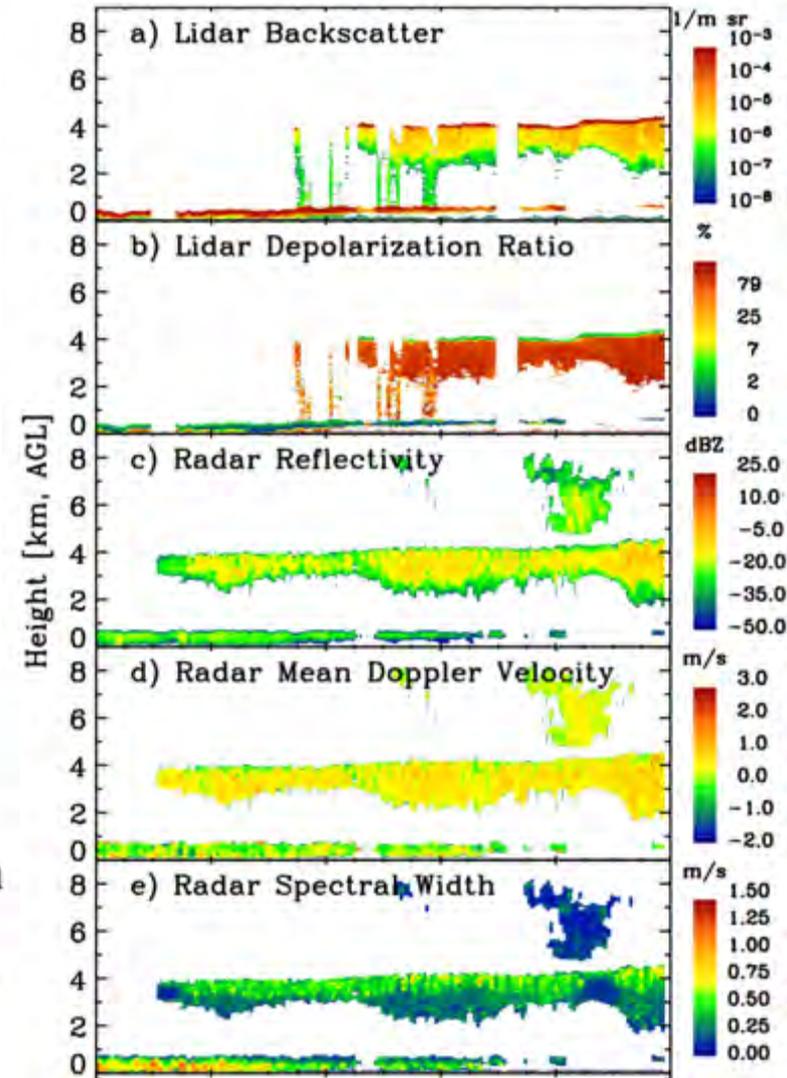
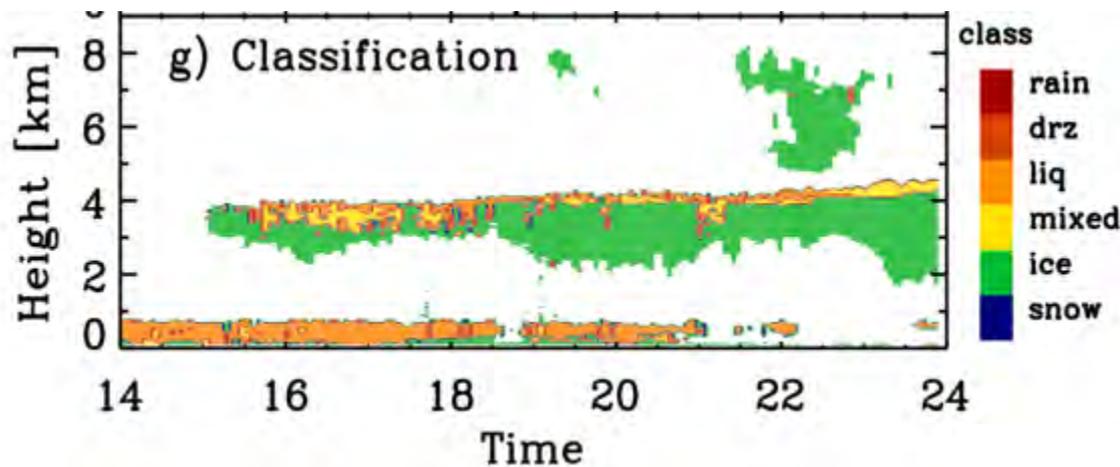
(Figures from Riihimaki et al., 2019)

Code from Dave Turner

Multisensor Cloud Phase Classification

Translator contact: Zhang, damao.zhang@pnnl.gov

- Multi-sensor cloud phase classifier:
 - **Inputs:** Lidar backscatter coefficient and linear depolarization, radar reflectivity, Doppler velocity and spectral width, MWR liquid water path, and temperature sounding
 - **Outputs:** Cloud phase classification
- Planned in FY21

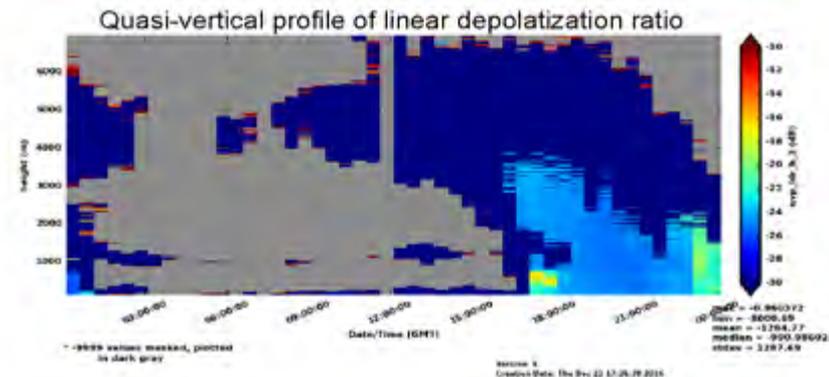
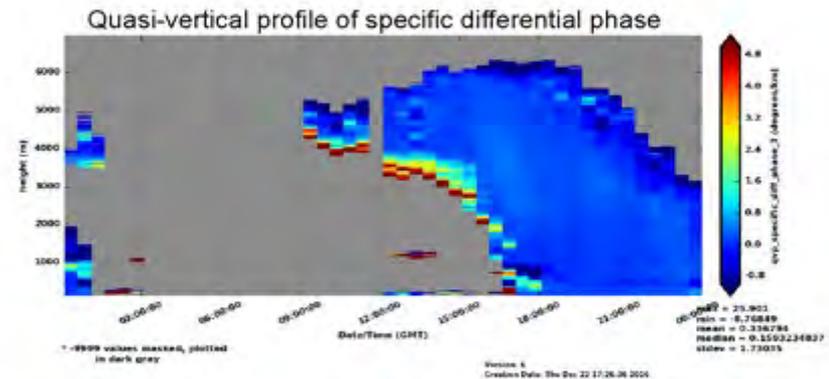
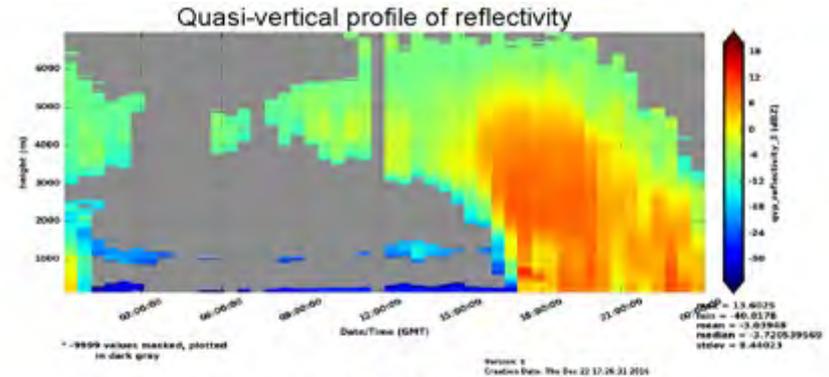


(Shupe 2007)

New SACR ADV VAPS Available

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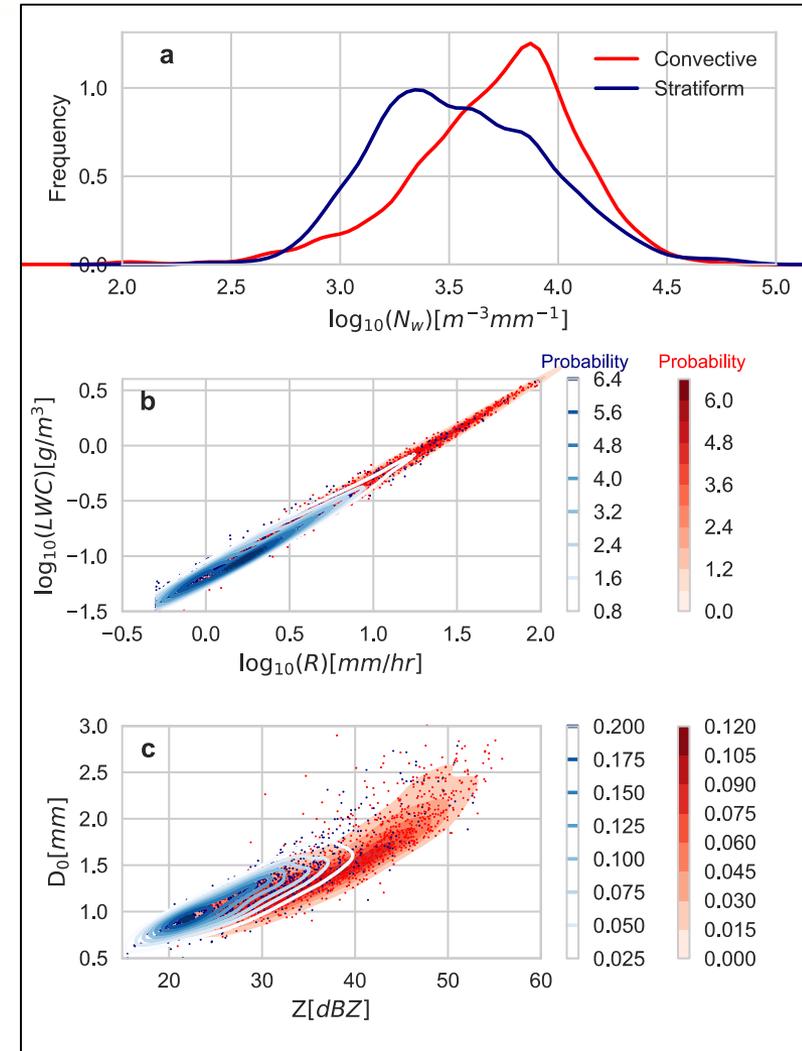
- Several SACR VAPs now populating the Archive:
 - Quasi-Vertical Profiles (QVPs).
 - Velocity Azimuth Displays (VAD).
 - RHI, CAPPI gridding (SACRGRID).
- Recent AMF campaign products:
 - CACTI (available, well-calibrated)
 - COMBLE (Summer 2020, now incorporating calibration)



Disdrometer VAPs (LD / VDIS-QUANTS)

Translator contact: Giangrande, sgrande@bnl.gov

- Based on open-source PyDSD code (J. Hardin).
- Microphysical insights (~1 min):
 - Rainfall Rates, LWC, Reflectivity Z
 - Drop Size Distribution (shape, slope, Nt)
- T-Matrix scattering for dual-pol radar quantities (Z , Z_{DR} , K_{DP})
 - All ARM radar wavelengths covered.
- Now In Production: Parsivel²
 - 2DVD added for FY 2020.
 - ENA, SGP, MAO, ANX, ...



Plan for Large-Scale Forcing for COMBLE

Cheng Tao, Shaocheng Xie (LLNL)

- **Methodology:** The COMBLE forcing will be derived using the constrained variational analysis approach developed by Zhang and Lin (1997), which utilizes constraints from both surface and TOA observations
- **Input fields:**
 - Relevant PIs will be contacted for data availability
 - ECMWF ERA-5 reanalysis data (Upper-level background data)
 - GOES VISST data (TOA radiative fluxes)
 - Ground-based observational data at AMFI (available on ARM Archive for the full COMBLE period)
 - Data stream: 30ecorMI.bl, sondewnpnMI.bl, metMI.bl, tsiskycoverMI.bl, gndrad60sMI.bl, sebsMI.bl
 - Other potential datasets: COMBLE is collaborating with several international campaigns, e.g., MOSAiC, (AC)³

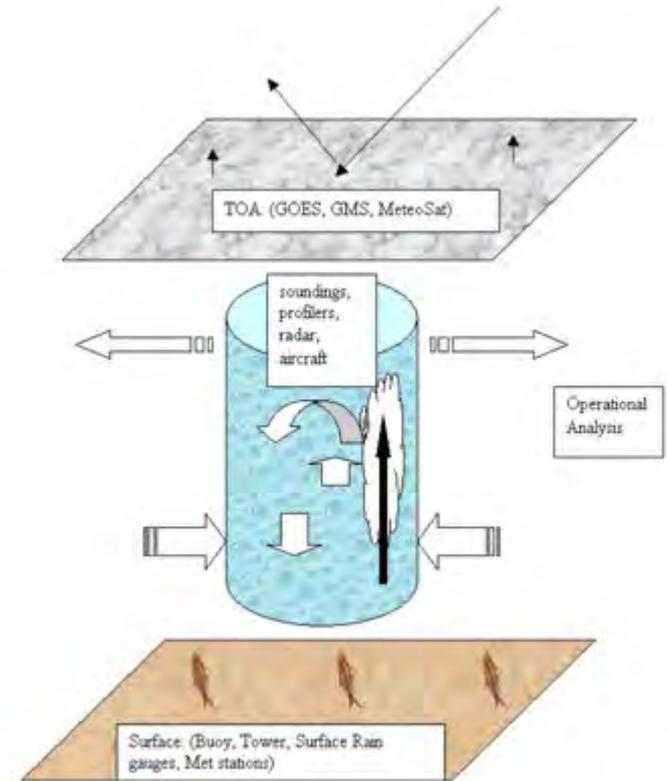
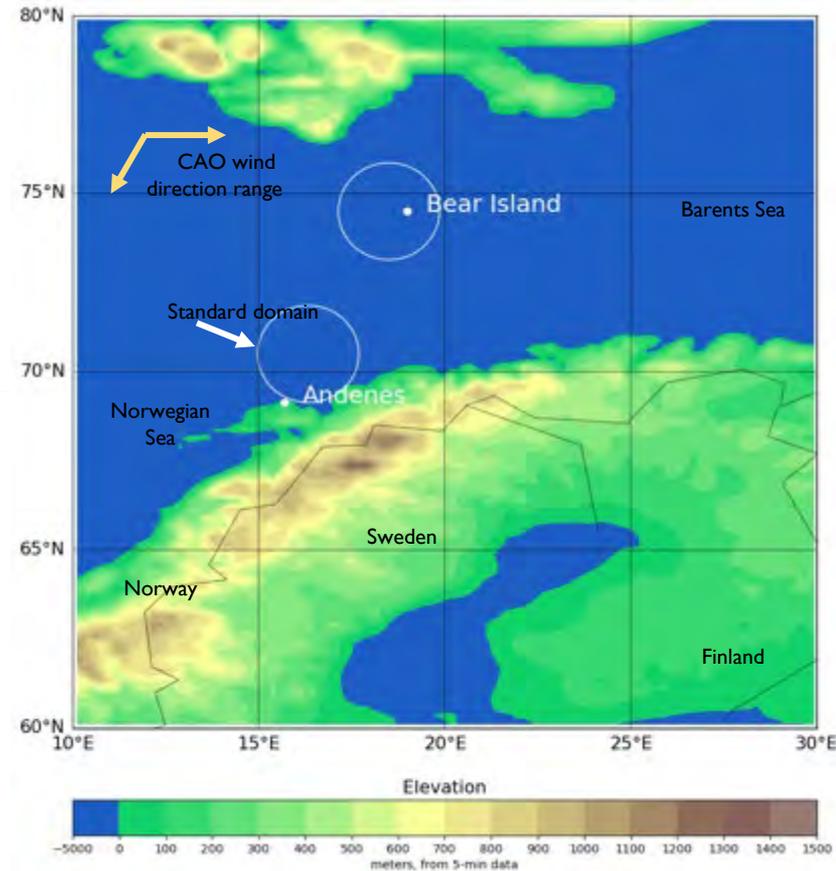


Figure 1. Schematic figure of an atmospheric column in VARANAL.

Analysis Domain for COMBLE

Cheng Tao, Shaocheng Xie (LLNL)

- The AMFI is sited near Andenes, Norway ---- a town on an island in the northeastern part of the country.
- Standard analysis domain (150 km in radius)
 - The AMFI is located at the southwest edge of the domain
 - To exclude the impact of different surface types on the observed surface radiative and turbulent heat fluxes, the domain is over water only
- Other analysis domain (150 km in radius)
 - To provide the time evolution of large-scale environmental conditions as clouds and precipitation propagating southward in cold-air outbreaks, another domain with the center near the Bear Island is proposed along the cold-air outbreaks wind direction



Other Modeling Data Products

Yuying Zhang, Shaocheng Xie (LLNL)

ARMBE: The ARM Best Estimate (ARMBE) data product assembles a best estimate of cloud, radiation, atmospheric quantities, and surface/land properties into one single dataset.

- ARMBE-CLDRAD
- ARMBE-ATM

ARM CFAD for utilizing ARM cloud radar simulator for improving the comparison between model clouds and ARM observations

