U.S. DEPARTMENT OF ENERGY | Office of Science

DOE/SC-ARM-15-072

# ARM Climate Research Facility Quarterly Value-Added Product Report

C Sivaraman

October 2015

ARM CLIMATE RESEARCH FACILITY

## DISCLAIMER

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## Fourth Quarter:
## July 1 to September 30, 2015

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Office of Science, Office of Biological and Environmental Research

# Abstract

The purpose of this report is to provide a concise status update for Value-Added Products (VAPs) implemented by the Atmospheric Radiation Measurement (ARM) Climate Research Facility. The report is divided into the following sections: (1) new VAPs for which development has begun; (2) progress on existing VAPs; (3) future VAPs that have been recently approved; (4) other work that leads to a VAP; (5) top requested VAPs from the ARM Data Archive; and (6) a summary of VAP and data releases to production and evaluation. New information is highlighted in blue text. New information about processed data by the developer is highlighted in red text. The upcoming milestones and dates are highlighted in green.

# Acknowledgements

This report is developed largely from the information submitted by the developers and task leads to the Extraview reporting system (http://ewo.arm.gov). Special thanks to our VAP development team for providing timely and complete updates to the Engineering Change Orders and Engineering Work Orders and to Rolanda Jundt, who edits this report and makes sure that this information is posted accurately on the ARM website.

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# 1.0 New Value-Added Products (VAPs)

This section describes new activities that have begun in the last quarter after being approved by the Atmospheric Radiation Measurement (ARM) Engineering Review Board.

## 1.1 ARM Metrics and Diagnostic Tool

Translator: Shoacheng Xie, Lawrence Livermore National Laboratory

Developer: Chengzhu Zhang, Lawrence Livermore National Laboratory

Engineering Change Order-01204 has been approved to facilitate the use of ARM data in climate model evaluation. This tool will develop an ARM-oriented metrics and diagnostics package for the global climate community. The focus will be on process-oriented diagnostics that are particularly aimed to improve the representation of cloud and precipitation related processes in climate models, such as those included in the World Climate Research Programme (WCRP) Coupled Model Intercomparison Project (CMIP), including the Community Earth System Model (CESM) as well as the U.S. Department of Energy (DOE) Accelerated Climate Model for Energy (ACME).

## 1.2 Aerosol Chemical Speciation Monitor (ACSM) Harmonization VAP

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Alison Tilp, Brookhaven National Laboratory, Tim Shippert, Pacific Northwest National Laboratory

Engineering Change Order-01219 has been approved to modify the ACSM datastreams as follows:

1. Expand the ACSM ingest to generate an autonomous b-level datastream that includes content from the raw *.itx files.

2. Generation of a new datastream, ACSM.c1, with updated calibrations, post-processed species mass concentrations, and organic mass spectra and error matrices required for the positive matrix factorization (PMF) implicit in the subsequent Organic Aerosol Component Analysis (OACOMP) VAP.

3. Generation of new datastream ACSMTOTALMASS.c1 which compares ACSM total mass concentrations against estimates of total mass concentration derived from the collocated Differential Mobility Analyzer (DMA).

4. Expansion of OACOMP output to include robust quality control (QC) inherited from b-level, from total mass comparisons, from data quality report (DQR) database, and any that result from the PMF routine (if any).

# 2.0 Existing VAPs

This section describes the status of each VAP and the ongoing activities that were approved to improve the performance of or maintain existing VAPs. The information is extracted primarily from the monthly updates provided by the development team in the Engineering Change Orders (ECOs).

## 2.1 ARM Cloud Retrieval Ensemble Data Set (ACRED)

Translator: Shaocheng Xie, Lawrence Livermore National Laboratory

Developer: Qi Tang, Lawrence Livermore National Laboratory

Status: In development

Tier: Evaluation

Engineering Work Order-13590 has been approved to address the uncertainty in cloud retrievals and provide three different retrievals at the five ARM fixed research sites.

No additional work has been approved.

## 2.2 ARM Radar Cloud Simulator

Translator: Shaocheng Xie, Lawrence Livermore National Laboratory

Developer: Yuying Zhang, Lawrence Livermore National Laboratory

Status: In development

Tier: Evaluation

Engineering Change Order -01120 has been approved to develop an ARM Cloud Radar Simulator for global climate models.

We are working actively with the COSP (Cloud-Feedback Model Intercomparison Project Observation Simulator Package) team to implement the ARM simulator into COSP version 2, which is featured with an enhanced interface to handle individual or new instrument simulators.

## 2.3 Atmospherically Emitted Radiance Interferometer Noise Filter (AERINF)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Tim Shippert, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.4 AERI Profiles of Water Vapor and Temperature (AERIPROF)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Tim Shippert, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.5 Aerosol Best Estimate (AEROSOLBE)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Annette Koontz, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.6 Aerosol Intensive Properties (AIP)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Annette Koontz, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.7 Aerosol Modeling Testbed (AMT)

Translator: Jerome Fast, Pacific Northwest National Laboratory

Developer: Chen Song and Manish Shrivastava, Pacific Northwest National Laboratory

Status: Operational

Tier: Evaluation

Engineering Work Order-13683 has been approved to move data from the Brookhaven National Laboratory (BNL) Aerosol Life Cycle Intensive Operational Period (IOP) to the modeling testbed VAP.

No progress was made last quarter.

Next milestone: On hold until priorities are identified.

## 2.8 Aerosol Optical Depth (AOD) Derived from Either Multi-Filter Rotating Shadowband Radiometer (MFRSR) or Normal Incidence Multi-Filter Radiometer (NIMFR)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Connor Flynn, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.9 Aerosol Observing System Cloud Condensation Nuclei Average (AOSCCNAVG)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Yan Shi, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.10 Aerosol Observing System Correction (AOSCORR)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Annette Koontz, Pacific Northwest National Laboratory

Status: On hold

Tier: Evaluation

Engineering Work Order-00934 was approved to apply instrument corrections and calibrations to handle the BNL Aerosol Observing System (AOS) datastream.

This ECO has been closed since this task has been absorbed into the AOS harmonization task.

## 2.11 ARM Best Estimate Atmospheric Measurements (ARMBEATM)

Translator: Shaocheng Xie, Lawrence Livermore National Laboratory

Developer: Qi Tang, Lawrence Livermore National Laboratory

Status: Operational

Tier: Production

Engineering Change Order-14547 has been approved to make corrections to produce ARMBE.

Migration of the ARMBEATM products to ARM Data Integrator (ADI) is 70% complete.

Next milestone: Release of the product to Data Management Facility (DMF).

## 2.12 ARM Best Estimate Cloud Radiation Measurements (ARMBECLDRAD)

Translator: Shaocheng Xie, Lawrence Livermore National Laboratory

Developer: Qi Tang, Lawrence Livermore National Laboratory

Status: Operational

Tier: Production

Migration of this product to ADI has been completed.

Next milestone: Release of the product to DMF.

## 2.13 ARM Best Estimate 2-Dimensional Grid (ARMBE2DGRID)

Translator: Shaocheng Xie, Lawrence Livermore National Laboratory

Developer: Qi Tang, Lawrence Livermore National Laboratory

Status: In development

Tier: Evaluation

Engineering Change Order-01080 was approved to merge various datastreams and interpolate them onto a common 2-dimensional (2D) grid with a uniform temporal resolution of a 1-hour interval; the same as that used in current ARM Best Estimate (ARMBE) data sets.

The technical report has been completed and the preliminary data for year 2012 are being developed.

## 2.14 ARM Best Estimate 2-Dimensional Station-Based (ARMBE2DSTNS)

Translator: Shaocheng Xie, Lawrence Livermore National Laboratory

Developer: Qi Tang, Lawrence Livermore National Laboratory

Status: In development

Tier: Evaluation

Engineering Change Order-01080 was approved to develop an hourly station-based surface data set that contains the same variables as ARMBE2DGRID.

The technical report has been completed and the preliminary data for year 2012 are being developed.

## 2.15 Active Remote Sensing of Clouds (ARSCL)

Translator: Mike Jensen, Brookhaven National Laboratory

Developer: Karen Jones, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.16 Areal Averaged Spectral Surface Albedo (AREALAVEALB)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Krista Gaustad, Pacific Northwest National Laboratory

Engineering Change Order-01094 was approved to implement an algorithm developed to calculate the white-sky areal average albedo from only an upward-looking Multi-Filter Rotating Shadowband Radiometer (MFRSR) during overcast conditions.

Status: In development

Tier: Evaluation

The data have been released to evaluation.

## 2.17 Best Estimate Fluxes from Energy Balance Bowen Ratio (EBBR) Measurements and Bulk Aerodynamics Calculations (BAEBBR)

Translator: Shaocheng Xie, Lawrence Livermore National Laboratory

Developer: Krista Gaustad, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.18 Broadband Heating Rate Profile (BBHRP)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Tim Shippert, Pacific Northwest National Laboratory

Status: In development

Tier: Evaluation

There are no open ECOs for this VAP.

## 2.19 Best Estimate Surface Radiative Flux (BEFLUX)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Yan Shi, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.20 Cloud Concentration Nuclei Profile (CCNPROF)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Chitra Sivaraman, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.21 Cloud Classification (CLDCLASS)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Chaomei Lo, Pacific Northwest National Laboratory

Status: No development

Tier: Evaluation

There are no open ECOs for this VAP.

## 2.22 Corrected Moments in Antenna Coordinates (CMAC)

Translator: Scott Collis, Argonne National Laboratory

Developer: Scott Collis, Argonne National Laboratory

Status: In development

Tier: Evaluation

There are no open ECOs for this VAP.

## 2.23 Corrected Moments in Antenna Coordinates Version 2.0 (CMAC2)

Translator: Scott Collis, Argonne National Laboratory

Developer: Jonathan Helmus, Argonne National Laboratory

Status: In development

Engineering Change Order-01077 was approved to establish a pre-processing echo identification; improve upon linear-phase processing, allowing for larger areas of differential phase on backscatter previously not considered; and correction of correlation coefficient for low signal-to-noise ratio.

No progress was made in July and August. In September, the unfolding algorithm was failing and with minor modifications to the algorithm parameters, all cases were successfully unfolded.

Next milestone: Complete linear-phase processing implementation.

## 2.24 Convective Vertical Velocity VAP (CONVV)

Translator: Scott Collis, Argonne National Laboratory

Developer: Kirk North, McGill University

Status: In development

Tier: Evaluation

There are no open ECOs for this VAP.

## 2.25 Doppler Lidar Profile VAP (DLPROF)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Chitra Sivaraman, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.26 G-Band Vapor Radiometer Precipitable Water Vapor (GVRPWV)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Annette Koontz, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.27 Interpolated SONDE (INTERPSONDE)

Translator: Mike Jensen, Brookhaven National Laboratory

Developer: David Troyan, Brookhaven National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.28 Ka-Band Zenith-Pointing Radar Active Remote Sensing of Clouds (KAZRARSCL)

Translator: Mike Jensen, Brookhaven National Laboratory

Developer: Karen Johnson, Brookhaven National Laboratory

Status: In development

Tier: Evaluation

Engineering Change Order-00899 was approved to initiate and coordinate the development of an ARSCL-like VAP to enhance the scientific value of data collected by the Ka-band ARM zenith radar (KAZR), the follow-on to the now-retired millimeter-wavelength cloud radar.

Approximately a year of evaluation data has been produced for each site: Southern Great Plains (SGP), North Slope of Alaska (NSA), Tropical Western Pacific (TWP) Manus Island, Papua New Guinea (C1), and TWP Darwin, Australia (C3).

Next milestone: Release of the VAP to production.

## 2.29 Langley Regression (LANGLEY)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Annette Koontz, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.30 Microwave Radiometer-Scaled SONDE Profiles (LSSONDE)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Annette Koontz, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.31 Merged Sounding (MERGESONDE)

Translator: Mike Jensen, Brookhaven National Laboratory

Developer: David Troyan, Brookhaven National Laboratory

Status: Operational

Tier: Production

Engineering Change Order-00889 was approved to move the data to production.

Most of the problems identified have been resolved.

Next milestone: The deadline to release this VAP to production and reprocess historical data sets has been moved due to other higher priorities.

## 2.32 MFRSR Column Intensive Properties (MFRSRCIP)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Annette Koontz, Pacific Northwest National Laboratory

Status: In development

Tier: Evaluation

Engineering Change Order-00823 has been approved to develop a VAP to retrieve aerosol column intensive properties from the MFRSR, including single-scattering albedo, asymmetry parameter, and bi-modal log-normal size distributions.

Clear-sky test has been successfully implemented and the VAP has been released to production.

## 2.33 Cloud Optical Depth from MFRSR (MFRSRCLDOD)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Yan Shi, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.34 Micro-ARSCL (MICROARSCL)

Translator: Mike Jensen, Brookhaven National Laboratory

Developer: Ed Luke, Brookhaven National Laboratory

Status: In development

Tier: Evaluation

There are no open ECOs for this VAP.

## 2.35 Continuous Baseline Microphysical Retrieval (MICROBASE)

Translator: Mike Jensen, Brookhaven National Laboratory

Developer: Meng Wang, Brookhaven National Laboratory

Status: On hold

## 2.36 Mapped Moments to Cartesian Grid (MMCG)

Translator: Scott Collis, Argonne National Laboratory

Developer: Scott Collis, Argonne National Laboratory

Status: Operational

Tier: Evaluation

There are no open ECOs for this VAP.

## 2.37 Micropulse Lidar Cloud Optical Depth (MPLCOD)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Chaomei Lo, Pacific Northwest National Laboratory

Status: No development

Tier: Evaluation

There are no open ECOs for this VAP.

## 2.38 Micropulse Lidar Polarized Average (MPLAVG)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Annette Koontz, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.39 Micropulse Lidar Cloud Mask (MPLCMASK)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Chitra Sivaraman, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.40 Microwave Radiometer Retrievals (MWRRET)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Krista Gaustad, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

Engineering Change Order-00526 has been approved to transition the product from evaluation to production, release the product, and process historical data.

No progress was made during this quarter.

Next milestone: Complete processing of mobile facility data from Cape Cod, Massachusetts (PVC), and Los Angeles, California, to Honolulu, Hawaii (MAG).

## 2.41 Microwave Radiometer Retrieval Version 2 (MWRRET2)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Krista Gaustad, Pacific Northwest National Laboratory

Status: In development

Tier: Evaluation

Engineering Change Order-00985 has been approved to update the current retrieval algorithm to be more flexible, so it can work with any set of microwave frequencies to retrieve precipitable water vapor and liquid water path.

No progress was made during the last quarter. We are waiting on guidance to move forward on the development of the VAP.

Next milestone: Process SGP, TWP, and Gan Island, Maldives (GAN), data with the latest code; no deadline has been set.

## 2.42 Multi-Angle Snowflake Camera (MASC)

Translator: Chitra Sivaraman, Pacific Northwest National Laboratory

Developer: Krista Gaustad, Pacific Northwest National Laboratory

Engineering Change Order-01173 has been approved to develop and implement the software that applies automated image processing in near real time to output data products from the multi-angle snowflake camera (MASC). A new datastream will be created for a hydrometeor microphysics VAP derived from MASC image data. Tim Garrett, Cale Fallgatter, and Konstantin Shkurko from Fallgatter Technologies will be contracted to provide Matlab- and Python-based software to derive snowflake microphysical characteristics.

The contract to develop the VAP has been completed. No progress with regards to development was made during the last quarter.

## 2.43 Marine ARM GPCI Investigation of Clouds Navigation Best Estimate (NAVBE)

Translator: Mike Jensen, Brookhaven National Laboratory

Developer: Tami Toto, Brookhaven National Laboratory

Status: In development

Tier: Evaluation

Engineering Change Order-01071 was approved to create the Marine ARM GPCI[1] Investigation of Clouds (MAGIC) Navigation Best Estimate (MAGNAVBE) VAP to consolidate many different sources of instruments on the ship that collected global positioning system and inertial navigation system measurements during the MAGIC campaign. This consolidation will result in a single, continuous datastream, rather than approximately a dozen different datastreams.

[1] GPCI = GCSS Pacific Cross-section Intercomparison, a working group of GCSS
GCSS = GEWEX Cloud Systems Study
GEWEX = Global Energy and Water Cycle Experiment, a core project of the World Climate Research Programme.

The NAVBE for all MAG and ARM Cloud Aerosol Precipitation Experiment (ACAPEX; ACX for the site code) campaign days has been placed in evaluation.

Next milestone: No new milestones have been set.

## 2.44 Droplet Number Concentration (NDROP)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Chitra Sivaraman, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.45 Organic Aerosol Component Analysis (OACOMP)

Translator: Jerome Fast, Pacific Northwest National Laboratory

Developer: Tim Shippert, Pacific Northwest National Laboratory

Status: In development

Tier: Evaluation

Engineering Change Order-00838 has been approved to develop a VAP to estimate organic aerosol components from aerosol mass spectrometers and aerosol chemical and speciation monitors to be deployed at ARM's sites and as part of the mobile AOS (MAOS).

A new ECR has been approved to generate calibrated input files for this VAP.

Next milestone: No milestone has been set.

## 2.46 Planetary Boundary Layer Height (PBLHT)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Chitra Sivaraman, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

Engineering Change Order-00893 has been approved to initiate and coordinate the development of a VAP to implement methods for planetary boundary layer (PBL) height detection using radiosondes, ceilometer, and micropulse lidar data.

The algorithm has been implemented as well as the qc flags, and the first set of data plots are being generated.

Next milestone: The milestone to release the PBL VAP to evaluation using the MPL method has been moved to December 31, 2015.

## 2.47 Quality Checked Eddy Correlation (QCECOR)

Translator: Shaocheng Xie, Lawrence Livermore National Laboratory

Developer: Yunyan Zhang, Argonne National Laboratory

Status: Operational

Tier: Production

The Engineering Work Order has been approved to improve and develop QCECOR with the newly installed Surface Energy Balance System (SEBS) for SGP sites.

Historical data have been processed. The data and data object design (DOD) are being reviewed.

Next milestone: Migrate the VAP to ADI.

## 2.48 Data Quality Assessment for ARM Radiation Data (QCRAD)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Yan Shi, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

Engineering Change Order-15035 has been approved to run the second level (c2) of the VAP and process data at Manacapuru, Brazil (MAO).

An issue was found when producing data for MAO. The fix has been implemented and tested. The DOD has been submitted for review.

Next milestone: Process c2 data level.

## 2.49 Quantitative Precipitation Estimate (QPE)

Translator: Scott Collis, Argonne National Laboratory

Developer: Scott Collis, Argonne National Laboratory

Status: On hold

Tier: Evaluation

Engineering Work Order-00936 was approved to produce the QPE VAP for the Manus C-band scanning ARM precipitation radar for ARM MJO[2] Investigation Experiment (AMIE) campaign data.

Due to reconfiguration efforts for the ARM Facility, this VAP has been put on hold.

## 2.50 Radiation Flux VAP (RADFLUX)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Krista Gaustad, Pacific Northwest National Laboratory

Engineering Change Order-00675 has been approved to develop the VAP. This VAP will use surface broadband radiation measurements to detect periods of clear skies and produce continuous clear-sky estimates to run the c2 level of the VAP.

Historical data for several sites have been processed and released to production.

Next milestone: Run the VAP at the DMF.

## 2.51 Radiatively Important Parameters Best Estimate (RIPBE)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Tim Shippert, Pacific Northwest National Laboratory

Status: Operational

Tier: Evaluation

There are no open ECOs for this VAP.

## 2.52 Raman Lidar Profiles—Aerosol Scattering Ratio (RLPROFASR)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Chitra Sivaraman, Pacific Northwest National Laboratory

[2] Madden-Julian Oscillation

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.53 Raman Lidar Profiles—Best Estimate (RLPROFBE)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Chitra Sivaraman, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.54 Raman Lidar Profiles—Depolarization Ratio (RLPROFDEP)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Chitra Sivaraman, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.55 Raman Lidar Profiles—Extinction (RLPROFEXT)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Chitra Sivaraman, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.56 Raman Lidar Profiles—MERGE (RLPROFMERGE)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Chitra Sivaraman, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.57 Raman Lidar Profiles—Mixing Ratio (RLPROFMR)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Chitra Sivaraman, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.58 Raman Lidar Profiles—Temperature (RLPROFTEMP)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Chitra Sivaraman, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.59 Clutter Removal in Radar Wind Profiler (RWP) Doppler Spectra (RWPCLUT)

Translator: Scott Collis, Argonne National Laboratory

Developer: Jonathan Helmus, Argonne National Laboratory

Engineering Change Order-01091 was approved to identify non-atmospheric returns in the Doppler spectra data from the radar wind profiler (RWP) for improved estimation of moments and winds.

This work was put on hold at the BNL meeting in October 2014.

## 2.60 Scanning ARM Cloud Radar Correction VAP (SACRCOR)

Translator: Michael Jensen, Brookhaven National Laboratory

Developer: Jonathan Helmus, Argonne National Laboratory

Engineering Work Order-01038 has been approved to develop a scanning ARM cloud radars (SACR) corrections VAP to enhance the scientific value of data collected by the Ka-, W- and X-band scanning ARM cloud radars.

Data have been staged in the evaluation area and are retrievable using the ARM Data Discovery Tool. Thumbnails have been generated based on ARM Data Archive requirements.

## 2.61 Shortwave Array Spectroradiometer Hemispheric Aerosol Optical Depth (SASHE AOD)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Brian Ermold, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

Engineering Work Order-16705 was approved to apply stray light correction to diffuse hemispheric measurements. The VAP has been updated and has been released to production in this quarter.

## 2.62 Shortwave Array Spectroradiometer Hemispheric Column Intensive Properties (SASHECIP)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Annette Koontz, Pacific Northwest National Laboratory

Status: In development

Tier: Evaluation

Engineering Change Order-01014 has been approved to develop a VAP to retrieve aerosol-column-intensive properties from the shortwave array spectrometer hemispheric column, including single-scattering albedo, asymmetry parameter, and bi-modal log-normal size distributions. The proposal is to extend the MFRSRCIP product to use measurements from the SASHE, including wavelengths in the near-infrared, which will improve the retrieval sensitivity to coarse-mode particles.

No progress has been made to this VAP. It is on hold until MFRSRCIP is completed.

## 2.63 Shortwave Array Spectroradiometer Hemispheric Langley (SASHE LANGLEY)

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Brian Ermold, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.64 SGP Area Surface Cloud and Shortwave (SW) Radiation Grid (SFCCLDGRID)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Krista Gaustad, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

Engineering Change Order-01107 has been opened to update the VAP to make it operational again and to work more flexibly on the current arrangement of extended facilities as well as with new arrangements in the future.

The instrument mentor is developing a technique to create a grid using the comma separated value (CSV) files provided to him in April.

## 2.65 SONDE Adjust (SONDEADJUST)

Translator: Mike Jensen, Brookhaven National Laboratory

Developer: David Troyan, Brookhaven National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.66 Sea-Surface Temperature (SST)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Yan Shi, Pacific Northwest National Laboratory

Status: In development

Tier: Evaluation

Engineering Change Order-00970 has been approved to develop and derive SST from the infrared thermometer measurements for the MAGIC deployment.

Next milestone: Awaiting Atmospheric Sounder Spectrometer for Infrared Spectral (ASSIST) data to continue development.

## 2.67 Ship Correction (SHIPCOR)

Translator: Mike Jensen, Brookhaven National Laboratory

Developer: David Troyan, Brookhaven National Laboratory

Status: Operational

Tier: Evaluation

There are no open ECOs for this VAP.

## 2.68 Ship Motion Correction for CEIL, HSRL, and MPL

Translator: Mike Jensen, Brookhaven National Laboratory

Developer: David Troyan, Brookhaven National Laboratory

Status: In development

Engineering Change Order-00996 was approved to create a VAP that will post-process data from the unstabilized Vaisala ceilometer (VCEIL), high spectral resolution lidar (HSRL), and MPL for ship deployments

All data for VCEIL, MPL and HSRL have been released to evaluation.

## 2.69 Surface Spectral Albedo (SURFSPECALB)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Krista Gaustad, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.70 Shortwave Flux Analysis (SWFLUXANAL)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Krista Gaustad, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.71 Tower Water Vapor Mixing Ratio (TWRMR)

Translator: Laura Riihimaki, Pacific Northwest National Laboratory

Developer: Krista Gaustad, Pacific Northwest National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.72 UHF ARM Profiling Radar Actively Remotely Sensed Atmospheric Layers (UAPARSAL)

Translator: Scott Collis, Argonne National Laboratory

Developer: Edwin Campos, Argonne National Laboratory

Status: Operational

Tier: Principal Investigator (PI) Data Product

There are no open ECOs for this VAP.

## 2.73 Variational Analysis (VARANAL)

Translator: Shaocheng Xie, Lawrence Livermore National Laboratory

Developer: Yunyan Zhang, Lawrence Livermore National Laboratory

Status: Operational

Tier: Evaluation

## 2.74 Vertical Velocity in Stratiform Rain (VVSR)

Translator: Mike Jensen, Brookhaven National Laboratory

Developer: Karen Johnson, Brookhaven National Laboratory

Status: Operational

Tier: Evaluation

Engineering Change Order-00865 was approved to initiate and coordinate the development of the VAP to generate profiles of vertical air motion during large-scale stratiform liquid precipitation. It will include information on the horizontal and vertical sheer of the velocity.

Next milestone: No new milestone has been set.

### 2.75 W-Band ARM Cloud Radar Active Remote Sensing of Clouds (WACRARSCL)

Translator: Mike Jensen, Brookhaven National Laboratory

Developer: David Troyan, Brookhaven National Laboratory

Status: Operational

Tier: Production.

MAO and TMP reprocessing has been completed and the data are being shipped to the ARM Data Archive.

## 3.0 Future VAPs

This section describes new activities that may begin in the next quarter.

An implementation plan was written for the cloud classification VAP.

## 4.0 VAP Metrics

This section lists the top VAPs requested by users from the ARM Data Archive during fiscal year (FY) 2015. Figure 1 shows the VAPs requested by users from the ARM Data Archive during the last four quarters ordered by number of unique requests. Figure 2 shows the VAPs requested by users from the ARM Data Archive during the last four quarters ordered by unique users and figure 3 shows the VAPs downloaded from the evaluation area for the last four quarters.

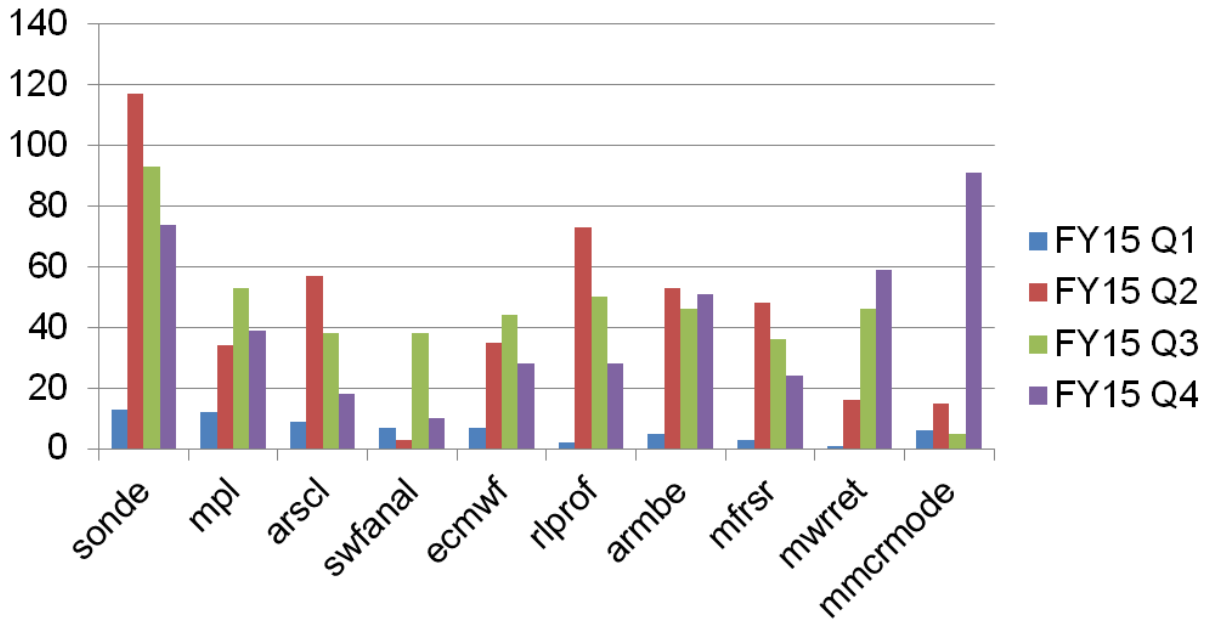


**Figure 1**. Downloaded ARM Data Files – Production Data/Unique Requests.

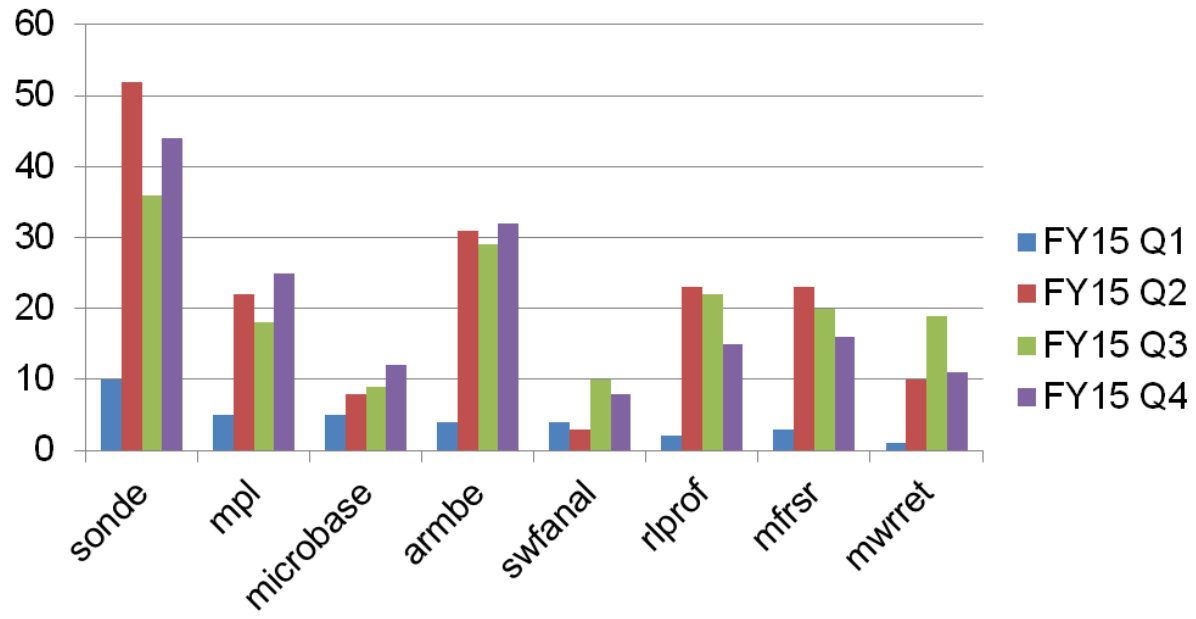


**Figure 2**. Downloaded ARM Data Files – Production Data/Unique Users.

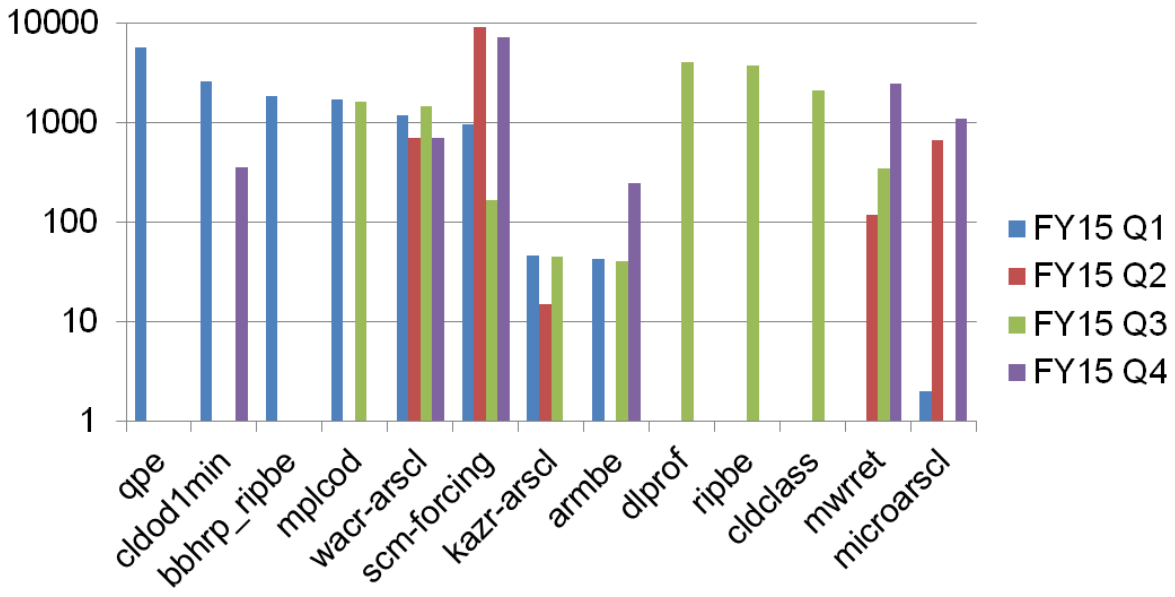


**Figure 3**. Downloaded ARM Data Files – Evaluation Data.

# 5.0 Summary

This section describes the summary of VAP and data releases to production and evaluation.

## 5.1 Products Released to Production

This section includes VAPs that are released to production for automated operations by the ARM DMF.

**Table 1**. VAPs Released to Production

| VAP | Action |
|---|---|
| RADFLUX | Released to production. |
| SASHEAOD | Released to production. |

## 5.2 Data Released to Evaluation

This section includes VAPs that are being released to the evaluation area for user feedback for the first time.

**Table 2**. Data Released to Evaluation

| VAP | Action |
|---|---|
| AREALAVEALB | Four years of SGP data released to evaluation. |

| | |
|---|---|
| NAVBE | MAG and ACX data released to evaluation. |
| KAZRARSCL | One year of SGP, NSA, TWP C1 and TWP C3 data released to evaluation. |
| SACRCOR | Data for Cape Cod, Massachusetts (PVC), SGP, and Hyytiälä, Finland (TMP), released to evaluation. |
| SHIPCORR for VCEIL, HSRL, MPL | Data for MAG and ACX released to evaluation. |

## 5.3 Data Released to the ARM Data Archive

This section includes data that are being released to the ARM Data Archive by the developer through a manual process.

**Table 3**. Data Released to the ARM Data Archive

| **VAP** | **Action** |
|---|---|
| RADFLUX | Historical data for most NSA, TWP, and SGP extended facilities released to ARM Data Archive. |
| MPLCMASK | ACX data processed and released to ARM Data Archive. |

## 5.4 Significant Development

This section provides a summary of significant improvements.

**Table 4**. Significant Developments

| VAP | Action |
|---|---|
| RADAR Simulator | Actively working with COSP team. |
| ARMBEATM | ARMBEATM is continuing to be migrated to ADI. |
| ARMBECLDRAD | Migrated to ADI |
| ARMBE2DGRID | Technical report has been completed and the preliminary data for year 2012 are being developed. |
| ARMBESTNS | Technical report has been completed and the preliminary data for year 2012 are being developed. |
| PBLHT | The algorithm development has been completed. |
| QCECOR | Data have been produced for the newly installed Surface Energy Balance System (SEBS) for SGP sites. |
| QCRAD | An issue was found when producing data for MAO. The fix has been implemented and tested. The DOD has been submitted for review |
| WACRARSCL | Data for MAO and TMP have been reprocessed. |


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