



U.S. DEPARTMENT OF  
**ENERGY** | Office of  
Science

DOE/SC-ARM-15-038

## **ARM Climate Research Facility Quarterly Value-Added Product Report**

C Sivaraman

July 2015



## **DISCLAIMER**

This report was prepared as an account of work sponsored by the U.S. Government. Neither the United States nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the U.S. Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the U.S. Government or any agency thereof.

# **ARM Climate Research Facility Quarterly Value-Added Product Report**

**Third Quarter:  
April 1 to June 30, 2015**

C Sivaraman

July 2015

Work supported by the U.S. Department of Energy,  
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.

## Contents

Abstract.....	iii
Acknowledgements.....	iv
1.0 New Value-Added Products (VAPs).....	1
1.1 Multi-Angle Snowflake Camera (MASC) VAP .....	1
2.0 Existing VAPs .....	1
2.1 ARM Cloud Retrieval Ensemble Data Set (ACRED).....	1
2.2 ARM Radar Cloud Simulator.....	1
2.3 Atmospherically Emitted Radiance Interferometer Noise Filter (AERINF).....	2
2.4 AERI Profiles of Water Vapor and Temperature (AERIPROF) .....	2
2.5 Aerosol Best Estimate (AEROSOLBE) .....	2
2.6 Aerosol Intensive Properties (AIP) .....	3
2.7 Aerosol Modeling Testbed (AMT) .....	3
2.8 Aerosol Optical Depth (AOD) Derived from Either Multi-Filter Rotating Shadowband Radiometer (MFRSR) or Normal Incidence Multi-Filter Radiometer (NIMFR).....	3
2.9 Aerosol Observing System Cloud Condensation Nuclei Average (AOSCCNAV).....	3
2.10 Aerosol Observing System Correction (AOSCORR) .....	4
2.11 ARM Best Estimate Atmospheric Measurements (ARMBEATM) .....	4
2.12 ARM Best Estimate Cloud Radiation Measurements (ARMBECLDRAD).....	4
2.13 ARM Best Estimate 2-Dimensional Grid (ARMBE2DGRID) .....	5
2.14 ARM Best Estimate 2-Dimensional Station-Based (ARMBE2DSTNS) .....	5
2.15 Active Remote Sensing of Clouds (ARSCL).....	5
2.16 Areal Averaged Spectral Surface Albedo (AREALB).....	6
2.17 Best Estimate Fluxes from Energy Balance Bowen Ratio (EBBR) Measurements and Bulk Aerodynamics Calculations (BAEBBR) .....	6
2.18 Broadband Heating Rate Profile (BBHRP).....	6
2.19 Best Estimate Surface Radiative Flux (BEFLUX).....	7
2.20 Cloud Concentration Nuclei Profile (CCNPROF) .....	7
2.21 Cloud Classification (CLDCLASS).....	7
2.22 Corrected Moments in Antenna Coordinates (CMAC).....	7
2.23 Corrected Moments in Antenna Coordinates Version 2.0 (CMAC2) .....	8
2.24 Convective Vertical Velocity VAP (CONVV) .....	8
2.25 Doppler Lidar Profile VAP (DLPROF) .....	8
2.26 G-Band Vapor Radiometer Precipitable Water Vapor (GVRPWV).....	9
2.27 Interpolated SONDE (INTERPSONDE) .....	9
2.28 Ka-Band Zenith-Pointing Radar Active Remote Sensing of Clouds (KAZRARISCL) .....	9
2.29 Langley Regression (LANGLEY) .....	10
2.30 Microwave Radiometer-Scaled SONDE Profiles (LSSONDE).....	10

2.31 Merged Sounding (MERGESONDE) .....	10
2.32 MFRSR Column Intensive Properties (MFRSRCIP).....	10
2.33 Cloud Optical Depth from MFRSR (MFRSRCLDOD).....	11
2.34 Micro-ARSCL (MICROARSCL) .....	11
2.35 Continuous Baseline Microphysical Retrieval (MICROBASE) .....	11
2.36 Mapped Moments to Cartesian Grid (MMCG).....	12
2.37 Micropulse Lidar Cloud Optical Depth (MPLCOD) .....	12
2.38 Micropulse Lidar Polarized Average (MPLAVG).....	12
2.39 Micropulse Lidar Cloud Mask (MPLCMASK) .....	12
2.40 Microwave Radiometer Retrievals (MWRRET).....	13
2.41 Microwave Radiometer Retrieval Version 2 (MWRRET2).....	13
2.42 Marine ARM GPCI Investigation of Clouds Navigation (NAVBE).....	13
2.43 Droplet Number Concentration (NDROP).....	14
2.44 Organic Aerosol Component Analysis (OACOMP).....	14
2.45 Planetary Boundary Layer Height (PBLHT).....	15
2.46 Quality Checked Eddy Correlation (QCECOR) .....	15
2.47 Data Quality Assessment for ARM Radiation Data (QCRAD) .....	15
2.48 Quantitative Precipitation Estimate (QPE).....	15
2.49 Radiation Flux VAP (RADFLUX) .....	16
2.50 Radiatively Important Parameters Best Estimate (RIPBE).....	16
2.51 Raman Lidar Profiles—Aerosol Scattering Ratio (RLPROFASR).....	16
2.52 Raman Lidar Profiles—Best Estimate (RLPROFBFE).....	17
2.53 Raman Lidar Profiles—Depolarization Ratio (RLPROFDEP).....	17
2.54 Raman Lidar Profiles—Extinction (RLPROFEXT) .....	17
2.55 Raman Lidar Profiles—MERGE (RLPROFMERGE).....	17
2.56 Raman Lidar Profiles—Mixing Ratio (RLPROFMR) .....	18
2.57 Raman Lidar Profiles—Temperature (RLPROFTEMP).....	18
2.58 Clutter Removal in Radar Wind Profiler (RWP) Doppler Spectra (RWPCLUT).....	18
2.59 Scanning ARM Cloud Radar Correction VAP (SACRCORR).....	18
2.60 Shortwave Array Spectroradiometer Hemispheric Aerosol Optical Depth (SASHE AOD).....	19
2.61 Shortwave Array Spectroradiometer Hemispheric Column Intensive Properties (SASHECIP) .....	19
2.62 Shortwave Array Spectroradiometer Hemispheric Langley (SASHE LANGLEY) .....	19
2.63 SGP Area Surface Cloud and Shortwave (SW) Radiation Grid (SFCCLDGRID) .....	20
2.64 SONDE Adjust (SONDEADJUST) .....	20
2.65 Sea-Surface Temperature (SST).....	20
2.66 Ship Correction (SHIPCOR).....	21
2.67 Ship Motion Correction for CEIL, HSRL, and MPL.....	21

2.68 Surface Spectral Albedo (SURFSPECALB)..... 21

2.69 Shortwave Flux Analysis (SWFLUXANAL) ..... 21

2.70 Tower Water Vapor Mixing Ratio (TWRMR)..... 22

2.71 UHF ARM Profiling Radar Actively Remotely Sensed Atmospheric Layers  
(UAPARSAL) ..... 22

2.72 Variational Analysis (VARANAL)..... 22

2.73 Vertical Velocity in Stratiform Rain (VVSR)..... 22

2.74 W-Band ARM Cloud Radar Active Remote Sensing of Clouds (WACRARSCL) ..... 23

3.0 Future VAPs ..... 23

4.0 VAP Metrics ..... 23

5.0 Summary..... 23

5.1 Products Released to Production..... 23

5.2 Data Released to Evaluation ..... 24

5.3 Data Released to the ARM Data Archive ..... 24

5.4 Significant Development..... 25

## Tables

Table 1. VAPs Released to Production.....24

Table 2. Data Released to Evaluation .....24

Table 3. Data Released to the ARM Data Archive .....24

Table 4. Significant Developments.....25



## 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 and Measurement (ARM) Engineering Review Board.

### 1.1 Multi-Angle Snowflake Camera (MASC) VAP

Translator: TBD

Developer: Krista Gaustad, Pacific Northwest National Laboratory

Engineering Change Order-01173 has been approved to develop and implement the software for operational use for automatic Multi-Angle Snowflake Camera (MASC) image data analysis in near-real time. 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.

## 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.

[This task is complete. The Continuous Baseline Microphysical Retrieval \(MICROBASE\) Ensemble Data Products \(MICROBASEEN\) for Cloud Retrievals have been released to the evaluation area.](#)

### 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

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

The radar interest group has provided suggestions on how to apply a height-dependent minimum detectable reflectivity to both ARM and Contoured Frequency by Altitude Diagram (CFAD) model data.

## **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 (AOSCCNAV)**

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.

The original plan has been put on hold due to discrepancies between the National Oceanic and Atmospheric Administration's (NOAA) AOS data and BNL's AOS data. A teleconference was held with key stakeholders in April 2014, and this task has been put on hold until the ingest work is completed.

## **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.

The VAP development team from Lawrence Livermore National Laboratory (LLNL) visited Pacific Northwest National Laboratory (PNNL) to attend a tutorial on ARM Data Integrator (ADI). Initial migration for these products to ADI has begun and a path forward has been determined.

## **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

Development of ARMBECLDRAD for the ARM Mobile Facility China deployment is on hold until the land data set development has been completed.

## 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 2D grid with a uniform temporal resolution of a one-hour interval; the same as that used in current ARM best estimate (ARMBE) data sets.

[This task is complete. The data have been released to the ARM Data Archive.](#)

[Next milestone: Complete the technical report.](#)

## 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.

[This task is complete. The data have been released to the ARM Data Archive.](#)

[Next milestone: Complete the technical report.](#)

## 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 (AREALB)**

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

[Validation of the yearly albedo results continues. These data are almost ready to be released to evaluation.](#)

[Next milestone: Complete the technical report and release VAP.](#)

## **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.

The development of gate identification and gate filter capabilities for attenuation correction has been completed and implemented.

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: Evaluation

Engineering Work Order-01035 and -01036 have been approved to create two VAPs—the vertical profiles of horizontal wind speed and direction using the velocity-azimuth-display (VAD) algorithm from the Doppler Lidar data and the cloud and vertical velocity statistics (WSTAT) from the Doppler Lidar data.



The DLPROF VAD and WSTAT process has been released to production. Historical data for VAD have been processed, reviewed, and archived. The technical report has been sent for publication.

Next milestone: Complete historical processing.

## **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.

Completed the outstanding tasks for the KAZRCOR (KAZR corrections) portion of the KAZR-ARSCL effort. Waiting on input and for Merged Sounding (MERGESONDE) issues to be resolved.

Next milestone: Release of the VAP to production has been moved to September 30, 2015.

## **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 (MERGSONDE)**

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: Release VAP to production and reprocess historical data sets.

## **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 is being implemented.

Next milestone: Release of the VAP to run at the Data Management Facility (DMF) has been pushed back to September 30, 2015.

### **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 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 n microwave frequencies to retrieve precipitable water vapor and liquid water path.

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

Next milestone: Process Southern Great Plains (SGP), Tropical Western Pacific (TWP), and Gan Island, Maldives (GAN), data with the latest code by March 30, 2015.

## 2.42 Marine ARM GPCI Investigation of Clouds Navigation (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<sup>1</sup> 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.

The handling of days, with extensive missing data, is 99% complete. Several minor issues with the data under evaluation have been identified and corrected.

Next milestone: Analyze data for the extensive missing data from the Kearfott Seaborne Navigation System (SEANAV) model KN-5051-G.

## 2.43 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.

## 2.44 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).

Found an issue with time shift in Differential Mobility Analyzer (DMA). Waiting for feedback from translator with a path forward.

Next milestone: No milestone has been set.

---

<sup>1</sup> 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.

## 2.45 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 filtering and interpolation algorithm is implemented; testing continues.](#)

[Next milestone: Release the PBL VAP to evaluation using the MPL method by August 30, 2015.](#)

## 2.46 Quality Checked Eddy Correlation (QCECOR)

Translator: Shaocheng Xie, Lawrence Livermore National Laboratory

Developer: Yunyan Zhang, Argonne National Laboratory

Status: Operational

Tier: Production

There are no open ECOs for this VAP.

## 2.47 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.

[All QCRAD c2 data have been sent to the ARM Data Archive.](#)

## 2.48 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<sup>2</sup> Investigation Experiment (AMIE) campaign data.

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

## **2.49 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.

**The VAP algorithm is being updated to read additional comma-separated value (CSV) files. Data level c2 from Nauru Island and Darwin, Australia, have been processed.**

**Next milestone: The production release deadline has been extended to September 30, 2015.**

## **2.50 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.

## **2.51 Raman Lidar Profiles—Aerosol Scattering Ratio (RLPROFASR)**

Translator: Connor Flynn, Pacific Northwest National Laboratory

Developer: Chitra Sivaraman, Pacific Northwest National Laboratory

Status: Operational

---

<sup>2</sup> Madden-Julian Oscillation



Tier: Production

There are no open ECOs for this VAP.

## **2.52 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.

## **2.53 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.

## **2.54 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.

## **2.55 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.

## **2.56 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.

## **2.57 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.

## **2.58 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.*

## **2.59 Scanning ARM Cloud Radar Correction VAP (SACRCORR)**

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 processed from SGP, PVC, and Hyytiälä, Finland (TMP) with the final parameter to calculate the significant-feature mask and McGill-corrected Doppler velocity.

## **2.60 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

There are no open ECOs for this VAP.

## **2.61 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 this 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.

## **2.62 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.

## **2.63 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 CSV files provided to him in April.](#)

## **2.64 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.

## **2.65 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.

## **2.66 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.

## **2.67 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

No progress made due to other higher priorities.

## **2.68 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.

## **2.69 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.

## **2.70 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.

## **2.71 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.

## **2.72 Variational Analysis (VARANAL)**

Translator: Shaocheng Xie, Lawrence Livermore National Laboratory

Developer: Yunyan Zhang, Lawrence Livermore National Laboratory

Status: Operational

Tier: Evaluation

## **2.73 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 shear of the velocity.

Next milestone: No new milestone has been set.

## **2.74 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.

There are no open ECOs for this VAP.

## **3.0 Future VAPs**

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

[An implementation plan is being written for the ARM-oriented metrics/diagnostics for global climate models.](#)

## **4.0 VAP Metrics**

Metrics from the ARM Data Archive were not available at the time this report was published.

## **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
DLPROF VAD	Released to production.
DLPROF WSTATS	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
MICROBASEEN	Data 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
ARMBE2DGRID	Data released to ARM Data Archive.
ARMBESTNS	Data released to ARM Data Archive.
DLPPROF WIND	All historical data have been processed and released to ARM Data Archive.
QCRAD c2	Data released to ARM Data Archive.



## 5.4 Significant Development

This section provides a summary of significant improvements.

**Table 4.** Significant Developments

VAP	Action
ACRED	MICROBASE Ensemble data have been released to evaluation.
RADAR Simulator	Users have provided feedback on height-dependent minimum detectable reflectivity to both ARM and CFAD model data.
ARMBEATM	ARMBEATM is being migrated to ADI.
ARMBE2DGRID	The data have been released to ARM Data Archive.
ARMBESTNS	The data have been released to ARM Data Archive.
AREALB	Validation of the yearly albedo results continues.
CMAC2	The development of first gate identification and gate filter has been completed and implemented.
DLPROF	The wind profile and wind statistics VAP has been released to production. Historical data for wind profile have been released to ARM Data Archive.
KAZRARSCL	KAZRCORR portion is completed.
MERGESONDE	Most of the issues with the data have been resolved.
PBLHT	The filtering and interpolation algorithm is implemented.
RADFLUX	Data have been processed for TWP C2 and TWP C3 for data level c2.
SACRCORR	Data have been processed for SGP, TMP, and PVC with the final parameter to calculate the significant feature mask and McGill-corrected Doppler velocity.



U.S. DEPARTMENT OF  
**ENERGY**

---

Office of Science