



Aerosol Working Group Meeting

Boulder, CO

September 30 - October 2, 2009

October 1 Merger

ARM + ASP \Rightarrow ASR

Atmospheric System Research Program

ARM Climate Research Facility (ACRF)

AWG Mission Statement

The primary objective of ARM's aerosol research is to quantify the impact of aerosols on the radiative balance of Earth's climate system, both directly and indirectly through their influence on clouds.

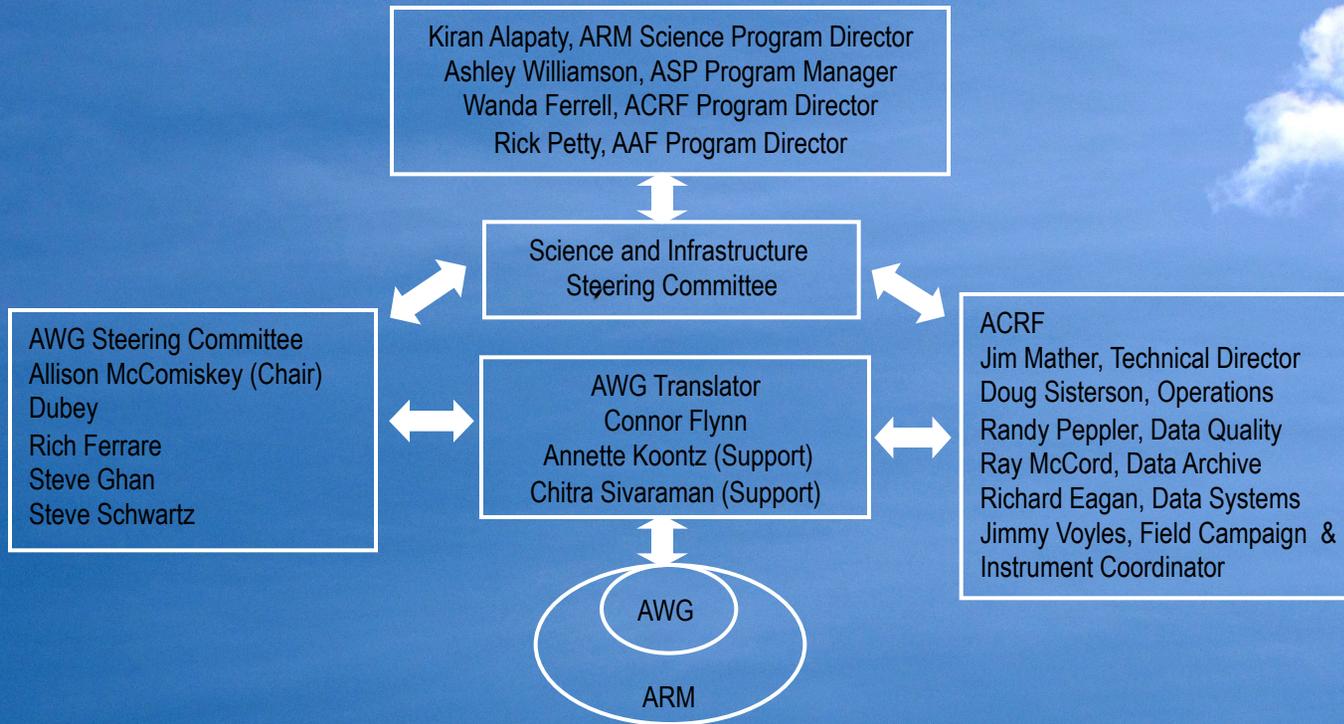
To this end the program uses in situ and remote sensing observations from surface-based, airborne and satellite platforms together with process to global-scale modeling.



Meeting Overview

Wednesday		
8:00 – 10:00 AM	Aerosol Instrumentation and Measurement Overview data product development Value Added Products (VAPs)	<u>AWG Plenary</u>
10:30 – 12:15 AM	Introduction to the Atmospheric System Research (ASR)	<u>Joint Plenary</u> Panel Discussion (Alapaty, Ferrell, Williamson)
	science talks: invited speakers / aerosol-cloud modeling	<u>Joint Plenary</u>
3:50 – 5:30 PM	ACRF Data Priorities data product development Value Added Products (VAPs)	<u>Joint Plenary</u> Panel Discussion (Mather, Peppler, Shupe)
6:00 PM	Aerosol Icebreaker Poster Session	
Thursday		
	science talks: ISDAC	<u>Joint Plenary</u>
3:45 – 5:30 PM	Aerosol Science Discussion	<u>AWG Plenary</u>
Friday		
8:00 – 10:00 AM	Aerosol Field Campaigns / IOPs Discussion	<u>AWG Plenary</u>
	science talks: Aerosols	<u>AWG Plenary</u>

AWG Infrastructure



<http://www.arm.gov/instruments/mentors.php>

Instrument/Title	Affiliation	Translator/Mentor
AWG Translator AWG Translator Support AWG Translator Support	PNNL	Connor Flynn Annette Koontz Chitra Sivaraman
Atmospheric Emitted Radiance Interferometer (AERI)	U of Wisconsin	Dave Turner
Aerosol Observing System (AOS)	NOAA	John Ogren / Anne Jefferson
Multifilter Rotating Shadowband Radiometer (MFRSR) / Normal Incidence Multifilter Radiometer (NIMFR)	NOAA	Gary Hodges
Micropulse Lidar (MPL)	ANL	Richard Coulter
Raman Lidar (RL)	PNL	Rob Newsome
Rotating Shadowband Spectroradiometer (RSS)	NOAA	Peter Kiedron
Tandem Differential Mobility Analyzer (TDMA)	Texas A&M	Don Collins
Cimel Sunphotometer (CSPHOT)	BNL	Laurie Gregory



Funded Aerosol Science

INVESTIGATORS	AFFILIATION	PROJECT TITLE
Ferrare, Rich; Dave Turner	NASA	Evaluating Global Aerosol Models and Aerosol and Water Vapor Properties near Clouds
Li, Zhanqing; Christian Kummerow	U of Maryland	Use of ARM Mobile Facility (AMF) Data to Study Aerosol Indirect Effects in China
Marshak, Alexander; Wiscombe, Warren; Chiu, Christine; Knyazikhin, Yuri	NASA	Use of ARM Measurements of Spectral Zenith Radiance for Better Understanding of 3D Cloud-Radiation Processes and Aerosol-Cloud Interaction
Boybeyi, Zafer	GMU	
Feingold, Graham, Allison McComiskey	NOAA ESRL	
Liu, Peter	ENV. Canada	
McFarquhar, Greg	UIUC	
Phillips, Vaughan	U of Hawaii	
Prenni, Anthony	CSU	
Berg, Larry	PNNL	Cloud-Aerosol Interactions: Influence of Cloud and Transport Processes on Aerosol Size Distribution and Optical and Microphysical Properties
Bond, Tami	U of Illinois	Optical Properties of Moderately-Absorbing Organic and Mixed Organic/Inorganic Particles at Very High Humidities
Chuang, Cathy	LLNL	Global Modeling and Validation of Formation, Transformation, and Radiative Forcing of Secondary Organic Aerosols
Daum, Peter H.	BNL	Aerosol-Cloud Interactions: Field Studies and Interpretation
Davidovits, Paul	Boston College	Laboratory Experiments and Instrument Development for the Study of Atmospheric Aerosols
Ervens, Barbara	U of Colorado	A Study of Cloud Processing of Organic Aerosols Using Models and CHAPS Data
Fast, Jerome	PNNL	Influence of Aging of Heterogeneous Mixtures of Aerosol and Gases on Aerosol Optical and Microphysical Properties
Finlayson-Pitts, Barbara	U of California, Davis	Formation of Secondary Organic Aerosols (SOA) Via Nitrate Ion Photochemistry In and On Particles
Gaffney, Jeffrey	U of Arkansas	Natural Radionuclides and Isotopic Signatures for Determining Carbonaceous Aerosol Sources, Aerosol Lifetimes, and Washout Processes
Ghan, Steve	PNNL	Integration of Field Studies and Laboratory Experiments to Improve the Representation of Aerosol Properties and Processes in Climate Models
Hostetler, Chris	NASA Langley	Characterizing Aerosol Distributions and Optical Properties Using the NASA Langley Airborne High Spectral Resolution Lidar (HSRL)
Kleinman, Lawrence I.	BNL	Field Studies on the Atmospheric Evolution of Aerosols and their Optical Properties
Lee, Yin-Nan	BNL	Determination of Aerosol Inorganic and Organic Composition: Implications for Formation, Evolution, and Optical and Cloud Nucleating Properties
Madronich, Sasha	UCAR	Secondary Organic Aerosols: Detailed Modeling and Comparison with MILAGRO Observations
Marley, Nancy	U of Arkansas	Aerosol Absorption and Scattering Measurements: Field Measurements and Laboratory Characterizations
Martin, Scot	Harvard College	Laboratory Studies of the Reactive Chemistry and Changing CCN Properties of Secondary Organic Aerosol, Including Model Development
McGraw, Robert. L.	BNL	New Particle Formation: Mechanisms and Influence on Atmospheric Aerosol Properties
McMurry, Peter	U of Minnesota	Growth Rates of Freshly Nucleated Particles
Paulson, Suzanne	U of California, LA	Optical Properties and Mass Measurements of Representative Aerosols
Schwartz, Stephen. E.	BNL	Modeling Aerosol Processes in the DOE Atmospheric Science Program
Sedlacek, Arthur J.	BNL	Evolution of the Optical Properties of Carbonaceous Aerosol
Seinfeld, John	Cal Tech	Mechanisms of Formation of Secondary Organic Aerosols and Implications for Global Radiative Forcing
Wang, Jia n	BNL	Effects of Atmospheric Aerosols on Clouds and Precipitation
Wexler, Anthony	U of California, Davis	Process Models of the Equilibrium Size & State of Organic/Inorganic Aerosols for the Development of Large Scale Atmospheric Models & the Analysis of Field Data
Zaveri, Rahul	PNNL	Processes Controlling Production and Transformation of Secondary Organic Aerosols
Ziemann, Paul; Sonia Kreidenweis, Markus Petters, Roger Atkinson, Janet Arey	U of California, Riverside	Laboratory Studies of Processing of Carbonaceous Aerosols by Atmospheric Oxidants



Recovery Act Instrumentation - Aerosols

Instrument Title	Mentor	Group	Measurements	SGP	NSA	TWP	AMF1	AMF2	MAOS	AAF
Ultra-High Sensitivity Aerosol Spectrometer (<i>enhanced</i>)	Cziczo	Aerosols	Aerosol size, number; 50 nm to 1µm						1	1
Dual Column Cloud Condensation Nuclei Counter (CCN)	Tomlinson	Aerosols	Number of activated aerosols (CCN), two selectable supersaturations			1(D)			1	1
Single Particle Soot Photometer (SP2)	Sedlacek	Aerosols	Black Carbon mass, size, composition, single particle scattering of non-absorbing particles						1	1
Scanning Mobility Particle Sizer (SMPS)	Wang	Aerosols	Aerosol size distribution; 15 nm to 450 nm						1	1
Photo-Acoustic Soot Spectrometer (PASS), 3 Wavelength	Dubey	Aerosols	Aerosol absorption, scattering coefficient						1	1
Humidigraph (3 Relative Humidities with 3 single wavelength nephelometers)	Cziczo	Aerosols	Aerosol scattering coefficient as a function of relative humidity							1
Humidigraph (Scanning Relative Humidity with 3 single wavelength nephelometers)	Cziczo	Aerosols	Aerosol scattering coefficient as a function of relative humidity.			1(D)		1	1	
Counter-Flow Virtual Impactor (CVI)	Cziczo	Aerosols	Liquid water content and particle number concentration							1
Particle Into Liquid Sampler-Ion Chromatography-Water Soluble Organic Carbon (PILS-IC-WSOC)	Lee	Aerosols	Aerosol chemical composition, anions, cations, water soluble organic carbon						1	1
Cloud Condensation Nuclei (CCN)	Tomlinson	Aerosols	Condensation nuclei spectra					1		
Particle Soot Absorption Photometer (PSAP), 3 Wavelength	Springston	Aerosols	Aerosol absorption coefficient			1(D)		1		
Nephelometer, 3 Wavelength	Springston	Aerosols	Aerosol scattering coefficient			2(D)		2	1	
Condensation Particle Counter (CPC), 10 nm to >3000 nm particle size range	Springston	Aerosols	Condensation particle concentration, 10 nm to >3000 nm			1(D)		1	1	
Condensation Particle Counter (CPC), 2.5 nm to >3000 nm particle size range	Springston	Aerosols	Condensation particle concentration, 2.5 nm to >3000 nm						1	
Hygroscopic Tandem Differential Mobility Analyzer (HTDMA)	Cziczo	Aerosols	Aerosol growth factor as a function of humidity			1(D)		1	1	
Proton Transfer Mass Spectrometer (PTRMS)	Shilling	Aerosols	Volatile organic compounds						1	



Recovery Act Instrumentation - Radar & Lidar

Instrument Title	Mentor	Group	Measurements	SGP	NSA	TWP	AMF1	AMF2	MAOS	AAF
Hyper-Spectral Resolution Lidar (532 nm)	Newsom	Lidars	Cloud and aerosol properties		1 (B)			1		
Raman Lidar and upgrade (355, 387, and 408 nm)	Newsom	Lidars	Vertical profiles of water vapor mixing ratio, cloud and aerosol related quantities	1 (U)		1(D)				
Doppler Lidar (353 nm)	Newsom	Lidars	Clearair vertical velocities and cloud properties	1		1(D)	1			
Micropulse Lidar (532 nm)	Coulter	Lidars	Cloud and aerosol properties					1		
Micropulse Lidar upgrades (532 nm)	Coulter	Lidars	Cloud and aerosol properties	1(U)	1(U)	1(UD)	1(U)			
Boundary Layer Cloud System (Ceilometer, Present Weather System, and Sunphotometer)	Morris	Lidars	Cloud, surface meteorology, and aerosol properties	1	1 (B)	1(D) 1(M)	1	1		
Scanning C- band (4-8 GHz) Precipitation Radar	Widener	Radars	3-Dimensional cloud reflectivity, precipitation, and velocities	1		1(M)				
Scanning X- band (8-12.5 GHz) Precipitation Radar	Widener	Radars	3-Dimensional cloud reflectivity, precipitation, and velocities	3-4	1(B)					
Scanning Cloud Radar W-Band (95 GHz), Ka-Band (35 GHz)	Widener	Radars	3-Dimensional cloud reflectivity, and velocities	1	1(B)		1			
Scanning Cloud Radar X-Band (8-12.5 GHz), Ka-Band (35 GHz)	Widener	Radars	3-Dimensional cloud reflectivity, precipitation, and velocities			1(D) 1(M)		1		
Millimeter Wave Cloud Radar (Ka-band, 35 GHz) Signal Processor Upgrade	Widener	Radars	Vertical profiles of cloud reflectivity and velocities	1	1(B)	1(D) 1(M)				



Recovery Act Instrumentation - Other

Instrument Title	Mentor	Group	Measurements	SGP	NSA	TWP	AMF1	AMF2	MAOS	AAF
Radar Wind Profiler (RWP) (new 1290 MHz, and existing 915Mhz)	Coulter	Atmospheric State	Profiles of windspeed and direction (u,v,w)					1	6 (U)	
Digicora Radiosonde System	Coulter	Atmospheric State	Atmospheric profiles of temperature, water vapor, horizontal winds, and pressure					1		
SONic Detection And Ranging (SODAR) System (1000 to 4000 Hz)	Coulter	Atmospheric State	Wind velocity and direction (u,v,w) in the lower atmosphere						1	
Remote Balloon Launcher (RBL)	Coulter	Atmospheric State	Automated soundings--atmospheric profiles of temperature, water vapor, horizontal winds, and pressure		1					
Aircraft Integrated Meteorological Measurement System (AIMMS-20)	Hubbe	State Parameters	5-port air motion sensing: true air speed, altitude, angle-of-attack, side-slip - and temperature, relative humidity							1
Eddy Correlation (ECOR)	Cook	Surface Fluxes	Vertical water vapor surface fluxes, latent and sensible heat, soil moisture and temperature- and Carbon Dioxide	M	1 (B)	1(D)				
Trace Gas Instrument System (Research-Grade)	Springston	Gases	Carbon Monoxide, Sulphur Dioxide, Nitric Oxide/Nitrous Dioxide/Nitrogen Oxides, Ozone) [CO, SO2, NO/NO2/NOy, O3]						1	1
Gas Analyzer (Cavity Ringdown)	Dubey	Gases	Carbon Dioxide, Methane, Water Vapor (CO2/CH4/H2O)							1
Ozone Monitor	Springston	Gases	Ozone concentration			1(D)		1		
Solar Spectrometer (300 to 2000 nm)	Flynn	Solar Spectrometry	Solar spectral radiance and irradiance	1				1		
Atmospherically Emitted Radiance Interferometer (AERI), (3-19.2 microns)	Turner	Infrared Spectrometry	Vertical profiles of temperature and water vapor mixing ratio	1		1 (D)	1			
Atmospherically Emitted Radiance Interferometer, Extended Range (AERI-ER), (3-25 microns)		Infrared Spectrometry	Vertical profiles of temperature and water vapor mixing ratio		1 (B)					
Microwave Radiometer, 3 Channel (MWR3C), K-Band (20-30 GHz), and W-Band (89 GHz)	Cadeddu	Microwave Radiometry	Vertical or 2-Dimensional profiles of precipitable water vapor and liquid water path			1(D) 1(M)	1	1		



Stimulating New Datastreams

New Observations \Rightarrow New Datastreams

- what are the desired products?
- what accuracy is needed for different applications?
- what are data priorities?
- when/where (what sites) are they needed?

ACRF Activities: Value Added Products/Best Estimate Datasets

- Geophysical Parameters

overarching best estimates data product

- Radiatively Important Parameters Best Estimate (RIPBE)

separate BBHRP inputs from the model to provide an independent database of continuous parameters needed to run a RT model



AWG Recommendations (STM 2009)

Value Added Products / Best Estimate Datasets

- CCN closure
- aerosol extinction closure

new instrumentation for characterizing aerosol chemical composition provides information to produce turn-key VAPs that result in these closures at several ARM sites (SGP and AMFs) [*activities in collaboration with ASP*]

- Aerosol Best Estimate

invigorate and structure ABE so that it provides the kind of information and the most accurate information that is useful to modelers, supplements observations of cloud and radiation, and is easy to implement in radiative closure studies at field measurement sites and AMFs where sufficient observations exist [*ongoing ARM activities*]