

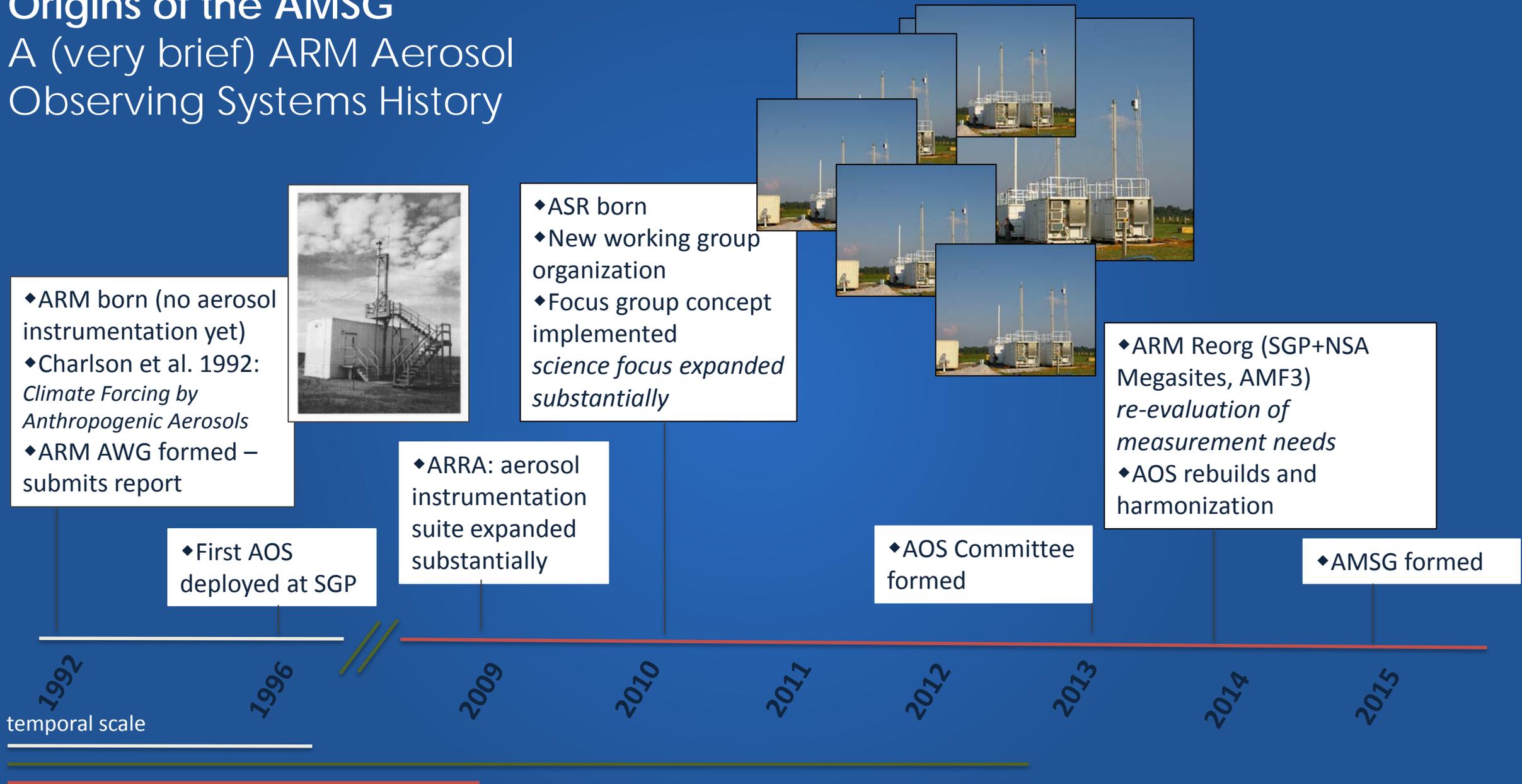
Aerosol Measurement Science Group



ASR/ARM PI Meeting
Tysons, VA, May 2-6 2016

Origins of the AMMSG

A (very brief) ARM Aerosol Observing Systems History



temporal scale

ARM Aerosol Measurement Science Group Charter

*"The ARM Aerosol Measurement Science Group (AMSG) is tasked with providing **enhanced coordination of ARM Climate Research Facility observations of aerosols and atmospheric trace gases with the needs of its Users**. Its objective is to ensure advanced, well-characterized observational measurements and data products at the spatial and temporal scales necessary for improving climate science and climate model forecasts. The primary function of the AMSG will be to **provide strategies to the ARM Technical Director and ARM Chief Operations Officer that can be used to implement a coherent measurement and data processing approach** that addresses the priority aerosol science needs of ARM and ASR. The group fulfills the need for an integrated oversight to the planning, coordination, and leadership of aerosol instrumentation selection and deployment, measurement strategy and quality, and data product development from both science and operations perspectives."*

http://www.arm.gov/publications/tech_reports/doe-sc-arm-tr-142.pdf

Objectives

- ✧ make recommendations to the ARM Technical Director for the development, implementation, and operational support of a **standardized and current set of baseline aerosol and trace gas measurements at ARM fixed and mobile sites** that meet the science objectives of ARM, ASR, and the Aerosol Life Cycle Working Group;
- ✧ ensure that the ARM Climate Research Facility baseline aerosol and trace gas measurements are **operated uniformly** across the program to effectively meet the scientific needs of the Users;
- ✧ work **cooperatively across science and operations** areas of the ARM and ASR Programs to improve the quality, characterization, calibration, measurement confidence, availability, and harmonization of aerosol and trace gas measurements and associated higher-order data products;
- ✧ make recommendations to the ARM Technical Director about **additional instruments and measurements** at either individual fixed ARM sites and/or specific mobile facility deployments that provide opportunities to meet scientific needs;
- ✧ make recommendations to the ARM Climate Research Facility about **operational and sampling strategies** required to address scientific needs;
- ✧ make recommendations to the ARM Climate Research Facility about strategies for **logistical and technical oversight of ARM site operations** for aerosol observations including the roles and responsibilities of site operations and system/instrument mentors, and how actions are to be tracked; and
- ✧ collaborate with **ARM Translators and the ARM Data Quality Office** to recommend efficient data processing approaches to provide timely, high quality, and relevant data products to the ARM Archive and Users.



ARM

CLIMATE RESEARCH FACILITY

DOE ARM
Program
Management

AMSG Makeup

ARM Technical Director



DOE ASR
Program
Management

Aerosol Measurements Science Group
Science and Operations Co-chairs

- ◆ ASR ALC Working Group Representative
- ◆ ASR CAPI Working Group Representative
- ◆ General science representatives: Observations, Modeling, and Aerosol Measurement Systems
- ◆ Technical Site Operations Representatives: SGP, NSA, AMF/ENA
- ◆ ARM Instrument Mentoring Coordinator
- ◆ ARM Aerosol System Mentor(s)
- ◆ ARM Aerosol Data Translator
- ◆ Data Quality Office representative

ASR
Working
Groups

AMSG Membership



Allison McComiskey
Science Co-Chair



Doug Sisterson
Operations Co-Chair/Instrument
Mentor Coordinator



Jerome Fast
ASR ALC-WG/General
Science: Modeling



Steve Ghan
ASR CAPI-WG



Stephen Springston
Aerosol System Mentor



Connor Flynn
Aerosol Data Translator

General Science



Art Sedlacek
Observations



Gannet Hallar: Aerosol
Measurement Systems



Chongai Kuang: Aerosol
Measurement Systems

Technical Site Operations



Matt Gibson
SGP



Fred Helsel
NSA



Allison Aiken
AMF/ENA



Josh King
Data Quality Office

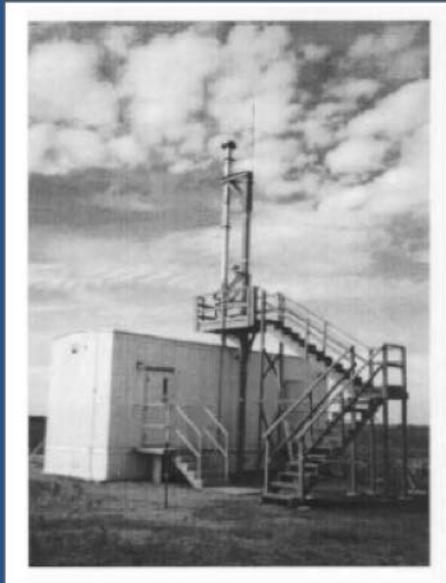
AMSG Scope

“The AMSG will address challenges in each of these areas to provide an **internally consistent end-to-end plan** for aerosol measurements that includes logistical, technical, and scientific perspectives for field deployments and that addresses all stages of deployments from instrument and measurement choices through to data product delivery. ”



- ✧ AOS Core Configuration
- ✧ AOS Physical Build
- ✧ Operational Strategies
- ✧ Sampling Strategies
- ✧ Data Processing: Cooperation with AOS Harmonization
- ✧ Deployment Logistics and Scientific Considerations
- ✧ PI-Infrastructure Interface
- ✧ Documentation and Accessibility

AOS Core Configuration



optical properties
1 μm and 10 μm size
cuts

dry
light extinction
CAPS 3 λ

light scattering
nephelometer 3 λ

light absorption
PSAP/TAP 3 λ

Aethalometer AE-33

humidified
light scattering
nephelometer +
humidograph 3 λ

number & size

number conc

CPC 3772 (> 10 nm)
CPC 3776 (> 2.5 nm)

size distribution

50 nm – 1 μm
UHSAS

size distribution

10 nm – 500 nm
SMPS

size distribution

400 nm – 15 μm
APS

CCN number conc.
spectrum with S
CCN-2

growth factor
HTDMA

aerosol chemical
composition

**non-refractory mass
concentration**
(ToF-)ACSM

gas phase chemistry

CO

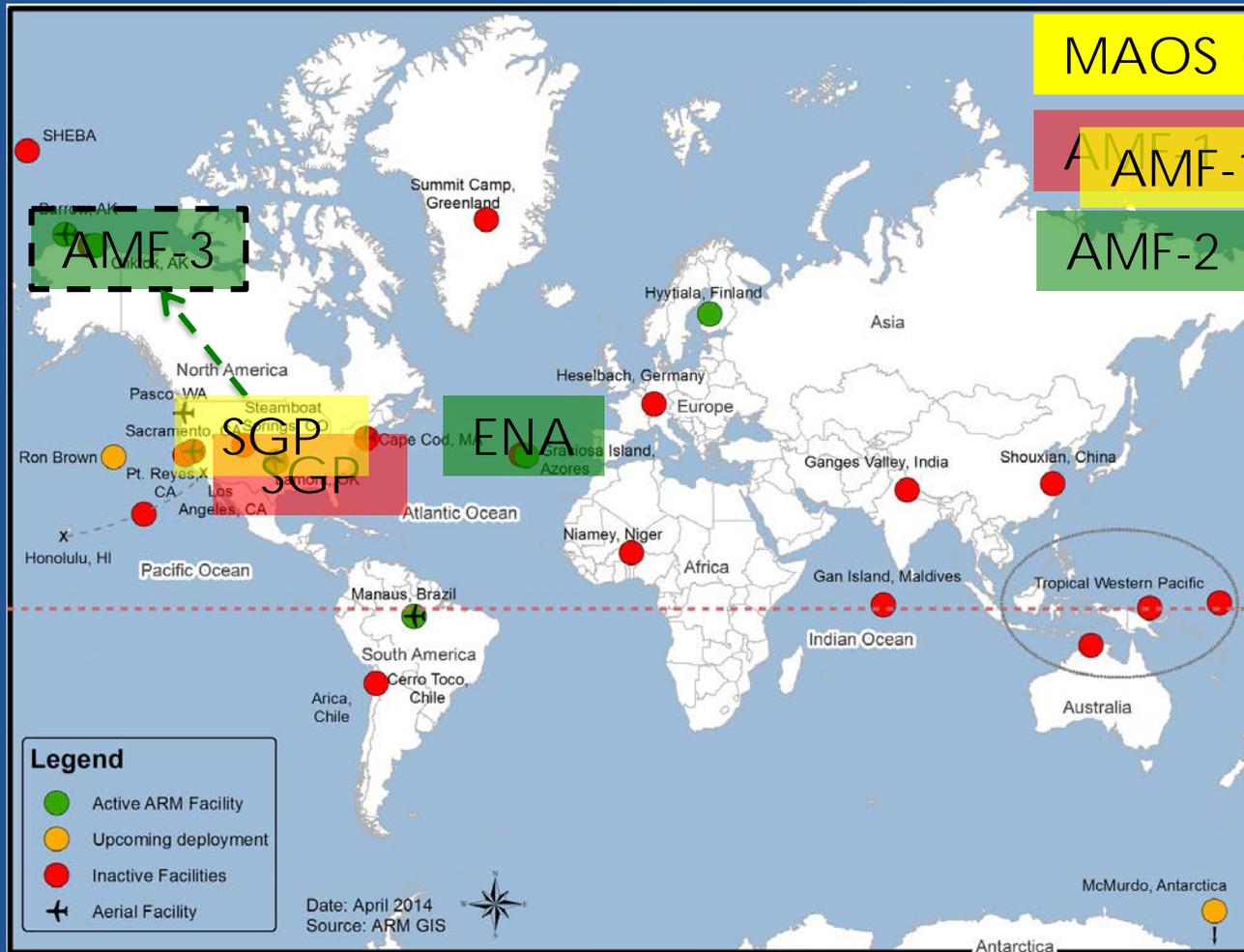
Los Gatos

O₃

Ozone Analyzer



Operational Strategies: MobileAOS (MAOS)



MAOS-A
"Aerosol"

MAOS-C
"Chemistry"

MAOS

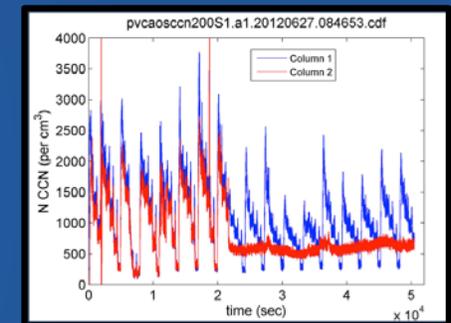
SO₂
NO_x /NO_y
SP2: black carbon concentration
PILS: water soluble organic carbon
PTRMS: volatile organic compounds
Humidigraph/nephelometer:
hygroscopicity [f(RH)]
?SPIN: Ice Nuclei

★ AOS Measurements Breakout
Thursday 8:30-10:30 AM

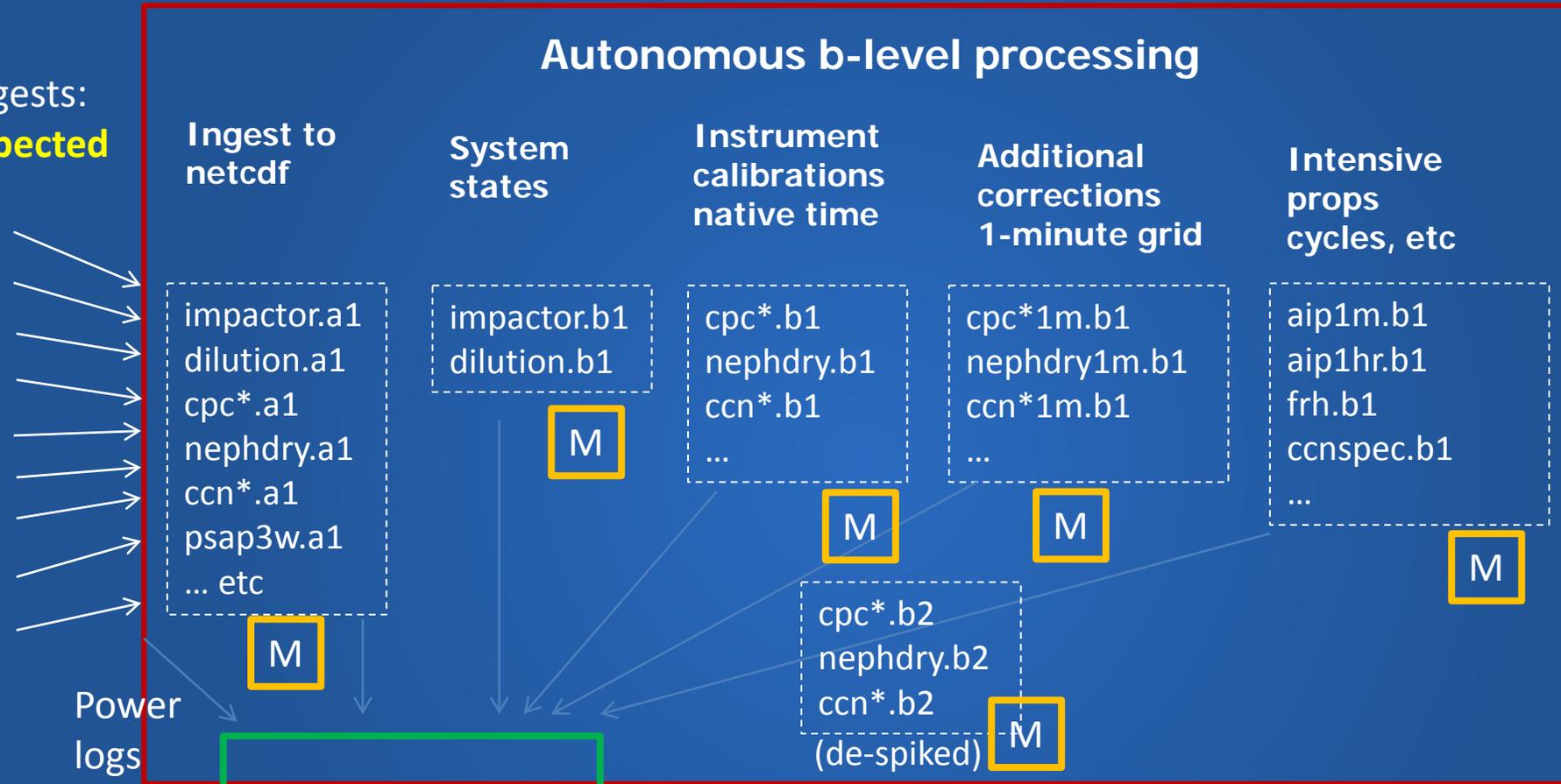
AOS Harmonization: What is it?

An infrastructure initiative to coordinate the efforts of mentors, DQO, and DMF for processing of AOS measurements including corrections, calibrations, QC, and QA, and Quicklooks.

1. Review content of initial AOS ingests
 - Identify and capture ALL info needed for subsequent processing
1. Autonomous generation of tiered products for quality-assessment
 - Unify field names, units, etc. between different datastreams
 - Identify, document, & unify corrections and calibrations
 - Integrate DQO quality assessment and quicklooks
2. Incorporates mentor expert assessment in post-processing
 - A. Collect, document, ingest, and archive mentor-processed data
 - B. Integrate post-provided calibrations and mentor-assessment in batch-run autonomous processes.



Updated ingests:
46 of 58 expected



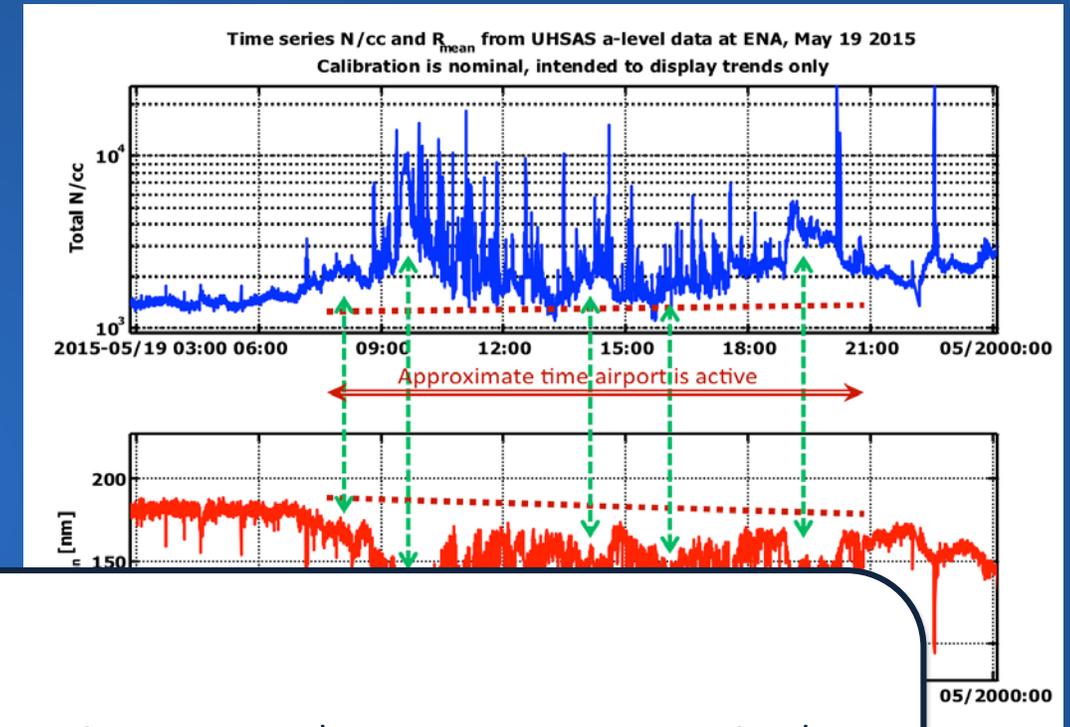
Harmonized
QC, b1 data
level: **12 of 57
expected**

Data Quality Office
(QL, DQPR, metrics)
Problem indication

Mentors
DOD, conf, DQRs
Problem resolution



Deployment Logistics and Scientific Considerations: ENA Siting

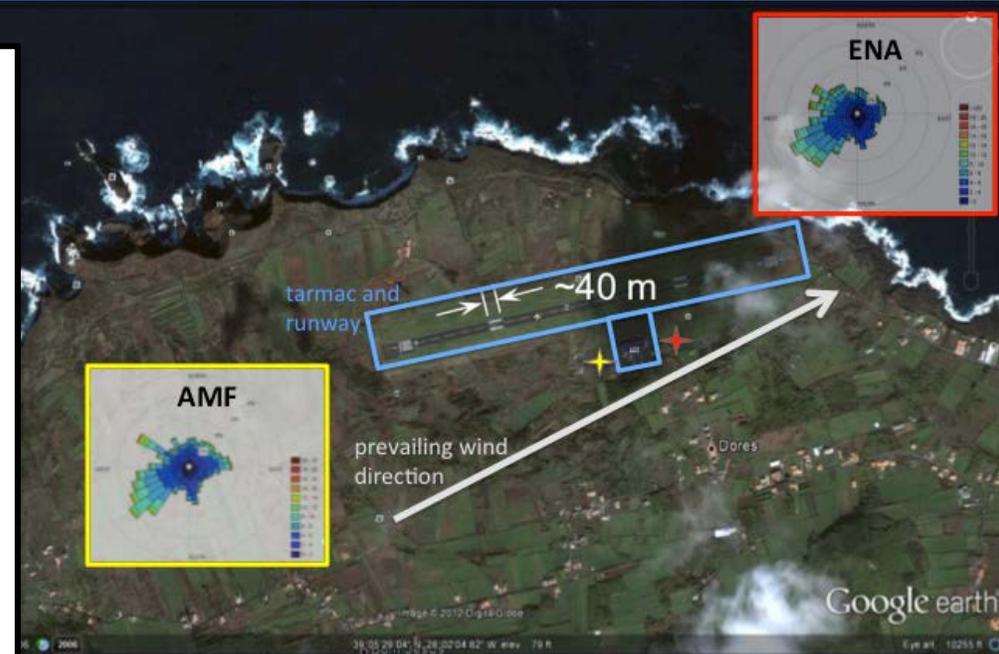
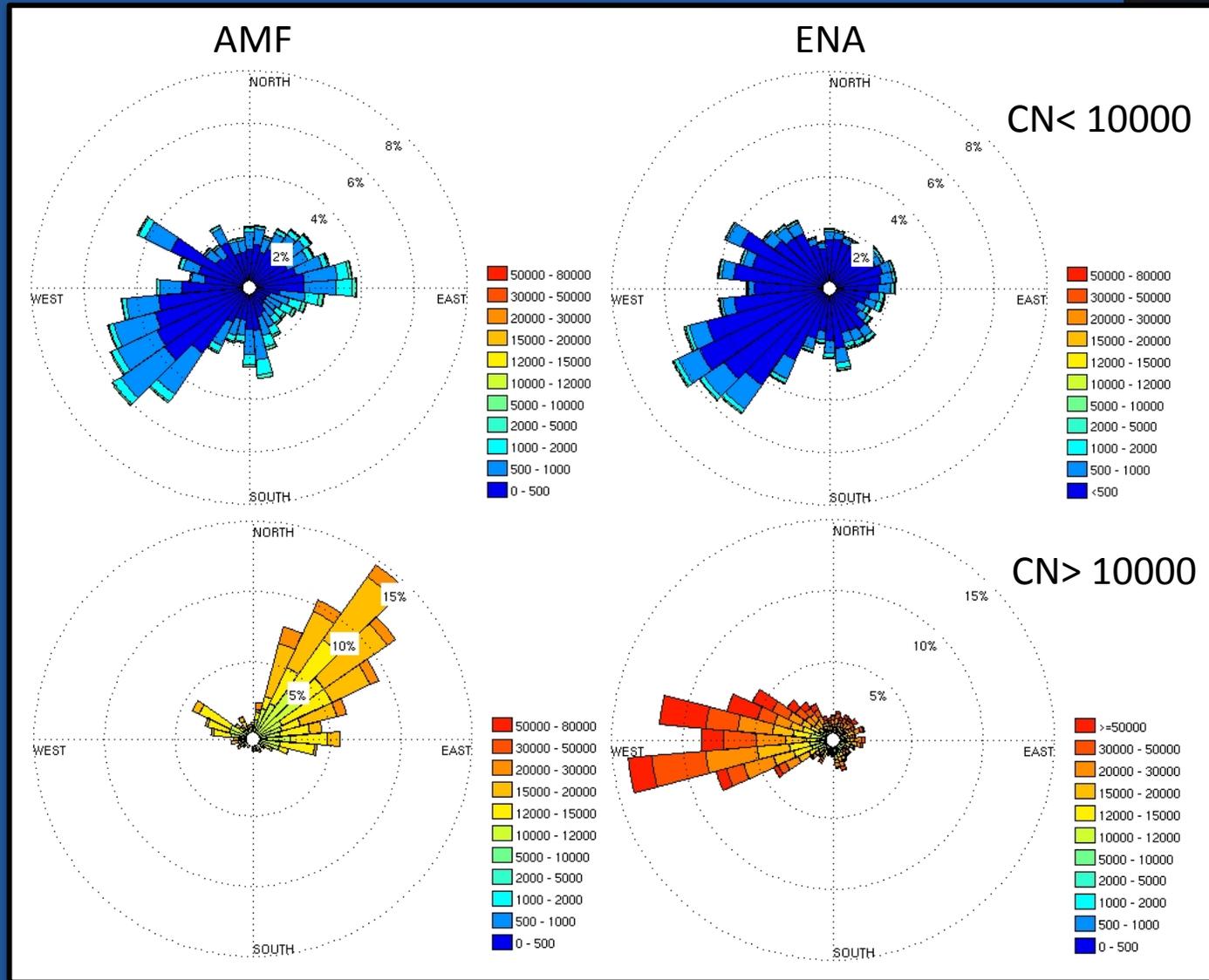


Measurement Concerns:

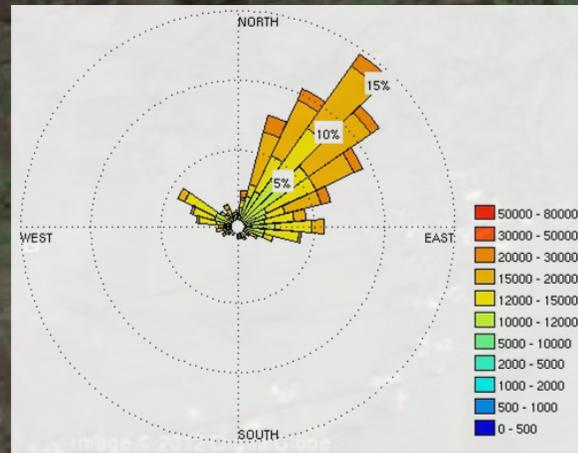
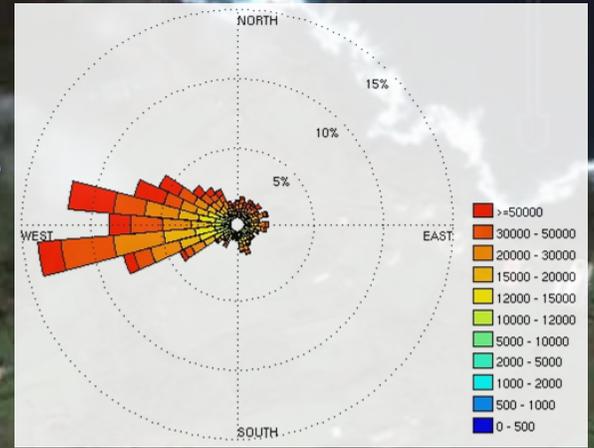
- ✧ Proximity to **wave breaking** at coast leading to excessive sea spray entering measurement inlet
- ✧ Proximity to **airport tarmac and runway** contaminating measurements from road and air traffic, especially idling aircraft on service vehicles on tarmac

ENA AOS mentors

Deployment Logistics and Scientific Considerations: ENA Siting



Deployment Logistics and Scientific Considerations: ENA Siting



Aerosol - General Topics
Wednesday 3:30-5:00
Sisterson et al. #14
Springston and Senum #13

Imagery Date: 2/5/2006 2006

39° 05' 29.04" N 28° 02' 04.62" W elev 79 ft

Eye alt 10255 ft

Google earth

AMSG Ongoing and Future Activities

- ✧ AOS inlet and system characterization for transmission efficiencies (Chongai Kuang, PI poster talk, Wednesday AM)
- ✧ CCN sampling and scanning protocols: lab testing and potential mini-IOP
- ✧ move from temperature to flow scanning will improve accuracy and greatly improve temporal resolution and range of %S
- ✧ aerosol absorption instrumentation and cross-comparisons and consistency checks
- ✧ documentation and interaction protocol with campaign PIs to improve building of optimized aerosol packages
- ✧ AOS automated cross-comparisons and consistency checks (AOSA4C)
- ✧ Aerosol Humidification and Activation Measurements Workshop

