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Pajarito Aerosol Couplings to Ecosystems (PACE) Field Campaign Report

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Acronyms and Abbreviations

ACES	Atmospheric Climate and Ecosystem Site
ACSM	Atmospheric Chemistry Speciation Monitor
ARIES	Aryabhatta Research Institute of Observational-Sciences
ARM	Atmospheric Radiation Measurement Climate Research Facility
BNL	Brookhaven National Laboratory
FIDO	Field Instrument Deployments and Operations, an ARM team
GVAX	Ganges Valley Aerosol Experiment
IISc	Indian Institute of Science
IOP	intensive operational period
LANL	Los Alamos National Laboratory
MAOS	Mobile Aerosol Observing System
PACE	Pajarito Aerosol Couplings to Ecosystems

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1.0 Background

Between December 2011 and April 2012, a team of researchers (see Figure 1) from Los Alamos National Laboratory (LANL) worked on the Pajarito Aerosol Couplings to Ecosystems (PACE) intensive operational period (IOP). PACE's primary goal was to demonstrate routine Mobile Aerosol Observing System (MAOS) field operations and improve instrumental and operational performance. LANL operated the instruments efficiently and effectively with remote guidance by the instrument mentors. This was the first time a complex suite of instruments had been operated under the ARM model and it proved to be a very successful and cost-effective model to build upon.

Figure 1. The PACE team.

2.0 Notable Events or Highlights

LANL's newly renovated Atmospheric Climate and Ecosystem Site (ACES) provided the location for the PACE campaign. As part of the ACES, the Pinyon-Juniper site was chosen as the primary point for research because it is ideal to examine the biogenic aerosols produced by mixed conifer forests. The site included long-term monitoring of the ecosystem, soil, radiation, and hydrological cycle. PACE deployment has allowed the operational team to gain real field deployment experience, such as tuning instruments over a range of conditions at the site. Researchers used the MAOS-Aerosol and Chemistry

suite as well as LANL CO_2 and isotope instruments throughout the campaign. The aerosol and carbon measurements will elucidate how ecosystems, fires, and pollution influence aerosols, clouds, and rain in the U.S. Southwest, which is experiencing significant drought and is vulnerable to climate change.

During the campaign, Ganges Valley Aerosol Experiment (GVAX) researchers, Dr. Umesh Chandra Dumka from the Aryabhatta Research Institute of Observational-Sciences (ARIES) at Nainital and Mr. Ajay S. Nair from the Indian Institute of Science (IISc) at Bangalore, came to LANL and spent nearly nine weeks with PACE researchers. The collaboration between PACE and these two GVAX researchers from India provided an opportunity to operate valuable aerosol measurement systems and gain data analysis experience. The relationships built between the PACE team members and Dr. Dumka and Mr. Nair are certain to benefit both GVAX and the wider ARM community, and build international collaborations with India.

Manvendra Dubey of LANL was the PACE PI. The operations were led by Curt Dvonch, who was assisted by Dr. Allison Aiken, Caleb Arata, and Anna Trugman. ARM's Field Instrument Deployments and Operations (FIDO) team assisted with instrument deployment. The LANL-FIDO team coordinated the logistics with Paul Ortega as the principal contact. BNL mentors included Stephen Springston, Yin-nan Lee, Art Sedlachek, Fan Mei, Gunner Senum, and Chongai Kwang.

3.0 Results

The results of PACE are still being analyzed, but to illustrate the nature and variability of the aerosols we show the chemical composition measured by the Atmospheric Chemistry Speciation Monitor (ACSM). While the mean composition of the aerosols during the period was dominated by organics, there were episodes when sulfate and nitrate became equally important, presumably from transport of pollutants to our site (Figure 2). Carefully designed calibrations and sampling of reactive organic compounds like sesquiterpenes is being performed to expand the MAOS-C ability to study biogenic aerosols for future campaigns. PACE was the first operational step to expand ARM/ASR chemistry monitoring with state-of-the art measurements in the field. Though it entailed hard work, it was fun, productive, and valuable for the long term.

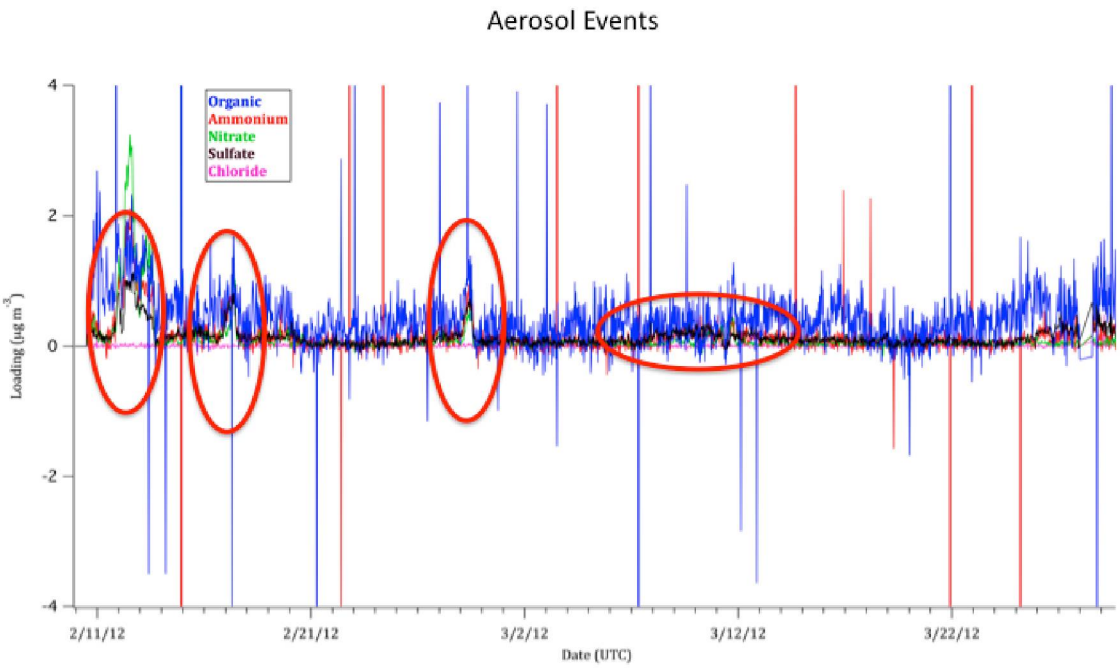

Figure 2. PACE aerosol composition episodes.

The PACE data set has been placed in the ARM Data Archive.

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