

Project Summary
Rocky Mountains Cooperative Ecosystem Studies Unit

Project Title: Transport and Deposition of Airborne Nitrogen and Sulfur in Rocky Mountain NP
Discipline: Natural
Type of Project: Technical Assistance
Funding Agency: National Park Service
Other Partners/Cooperators: Colorado State University
Effective Dates: 9/1/2007 – 9/30/2009
Funding Amount: \$978,676 [\$529,032 added in FY08]

Investigators and Agency Representative:

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Project Abstract: The NPS-Air Resources Division will work with Colorado State University on the RoMANS study. This project addresses analysis of data collected as part of the 2006 Rocky Mountain Airborne Nitrogen and Sulfur Study (RoMANS) spring and summer field campaigns. New measurements are planned of organic nitrogen deposition in Rocky Mountain National Park. The continued development and maintenance of the NPS mobile air sampling laboratory and publication of findings from previous NPS-sponsored investigations, including the IMPROVE nitrate study constitute major objectives of this research.

Specific activities RoMANS data analysis activities planned for this project include:

- Analysis of temporal and spatial trends in wet deposition. Preparation of a journal publication highlighting key findings from RoMANS wet deposition measurements.
- Comparison of wet and dry deposition fluxes of key nitrogen species at the RoMANS core site. Evaluation of the influence of averaging time on calculated dry deposition fluxes for key species.
- Analysis of spatial and temporal trends in PM_{2.5} and trace gas concentrations across the entire RoMANS sampling network. Preparation of a journal publication highlighting these observations.
- Collaboration with NPS modeling efforts focused on simulating RoMANS airborne concentration fields and deposition fluxes.

The FY2008 additions to this project include preparation for a RoMANS II field study, with sampling to occur in November 2008-August 2009. The objectives of RoMANS II include:

1. Quantify ROMO wet deposition inputs of inorganic nitrogen and sulfur species across a full annual cycle. Conduct measurements on a daily timescale to permit comparison with regional transport patterns.
2. Measure concentrations in ROMO of key inorganic nitrogen (nitrate, ammonium, nitric acid, and ammonia) and sulfur (sulfur dioxide, sulfate) species across a full annual cycle to establish seasonal variability. Conduct measurements on daily or faster timescales to permit comparison with regional transport patterns.
3. Quantify ROMO dry deposition fluxes of key species (PM_{2.5} nitrate, ammonium, and sulfate; gaseous nitric acid, and ammonia) across a full annual cycle. Conduct measurements on daily or faster timescales to permit calculation of daily or higher time resolution dry deposition fluxes for comparison with regional transport patterns.
4. Conduct measurements of wet deposition of organic nitrogen at a daily timescale in ROMO to determine seasonal changes in organic N wet deposition fluxes and to compare with regional transport patterns.
5. Complete testing of custom NO_y instrument for gas and particle phase organic N measurement. Deploy tested instrument to RMNP to characterize NO_y concentrations at high time resolution (~hourly) to permit comparison with regional transport patterns.

Outcomes with Completion Dates: Final Report is due by September 30, 2008; peer reviewed publications are due throughout 2007-2008. For part II of this project the final report and conference on the results are due by the end of September 2009.

Keywords: Colorado State University, NPS-Air Resources Division, Rocky Mountain NP, RoMANS, nitrogen deposition, sulfur deposition, organic carbon, wet and dry deposition