Welcome and Logistics
Storm Peak Laboratory

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High elevation, mountain-top atmospheric research facility readily accessible under all weather conditions

Storm Peak Laboratory
Owned and Operated by Desert Research Institute
Located in Northwest Colorado on the US National Forest

A Brief History of Storm Peak Laboratory

1979-1989: Research projects on winter orographic storms led by Prof. Lewis Grant from Colorado State University, with cloud and precipitation studies conducted by Randy Borys and other CSU scientists using space in ski lodge (1979-1980)

The researchers obtained small trailer on Storm Peak (1981-1983) and later on Mt. Werner (1984-1989)

1989-1994: Prof. Grant retires from CSU, USFS permit transferred to Dr. Borys at Desert Research Institute; continued research using instrumented trailers with the assistance of Dr. Wetzel.

1995: DRI builds a permanent facility at Mt. Werner site

2006: Dr. Borys retires, and Dr. Hallar and Ian McCubbin begin leading the facility.

Summer 2011 – Major upgrade funded by National Science Foundation ARRA funds

Aerosol, Cloud, and Trace Gases Research and Education Facility

Located on Steamboat Springs Ski Resort

Elevation: 3220 m (10,530 ft)

Pressure: ~ 690 mb

In cloud ~25% of time in the winter

Mixed Phase Clouds

9 Person Bunkhouse

Full Kitchen, Running Water

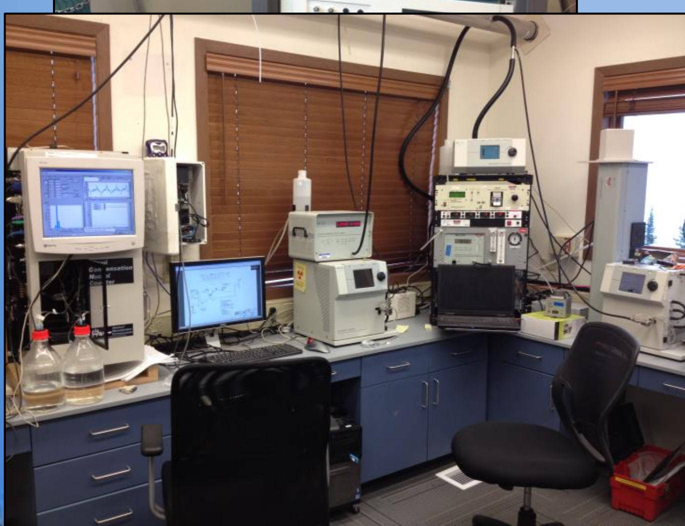
Facility and Guest Instruments

National Science Foundation ARI-R^2 MAJOR RENOVATION:

- New Aerosol Manifolds
- New Wet Chemistry Lab
- High Speed Internet Connection - 150 Mbps

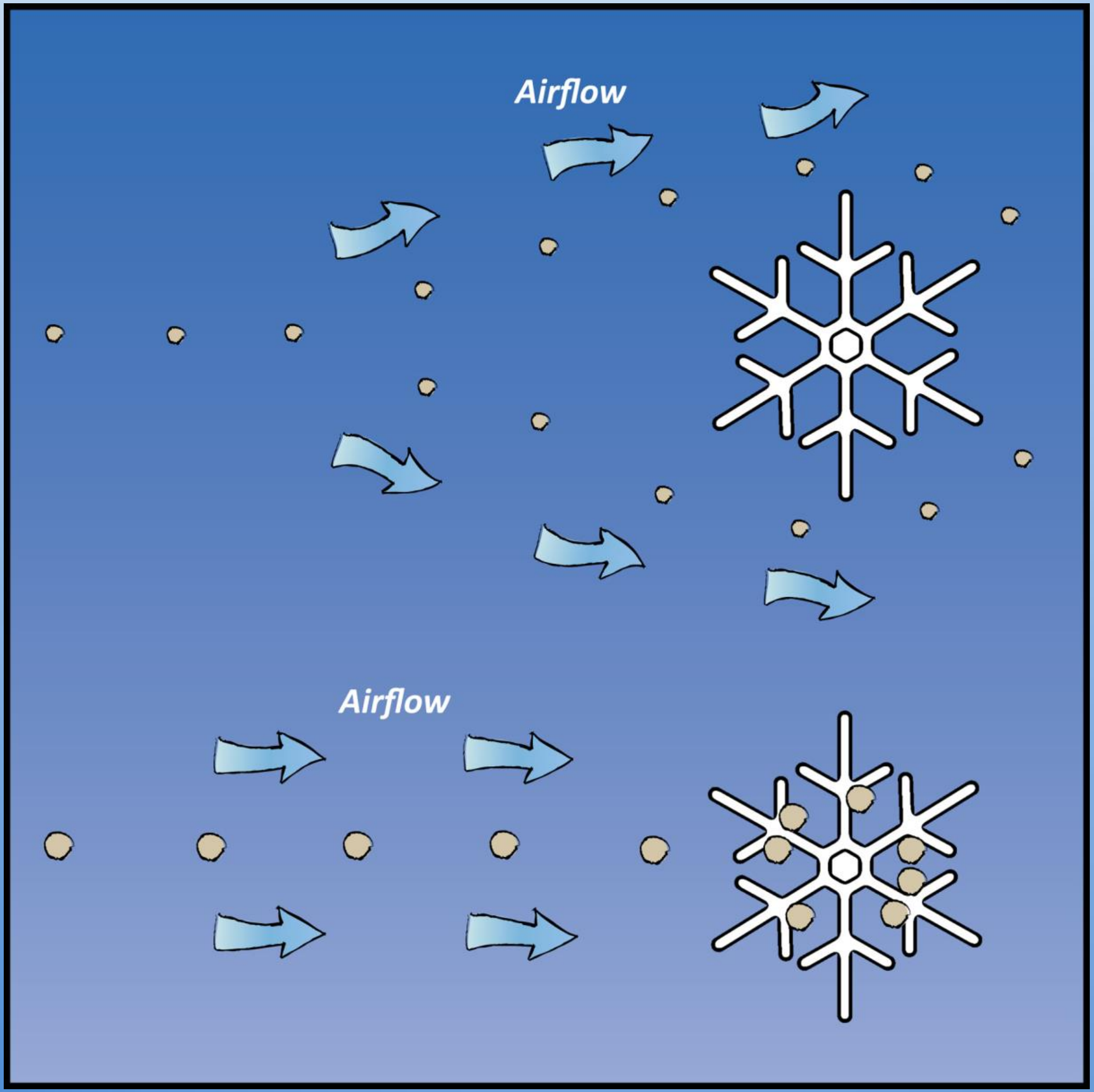
SPL Current Equipment

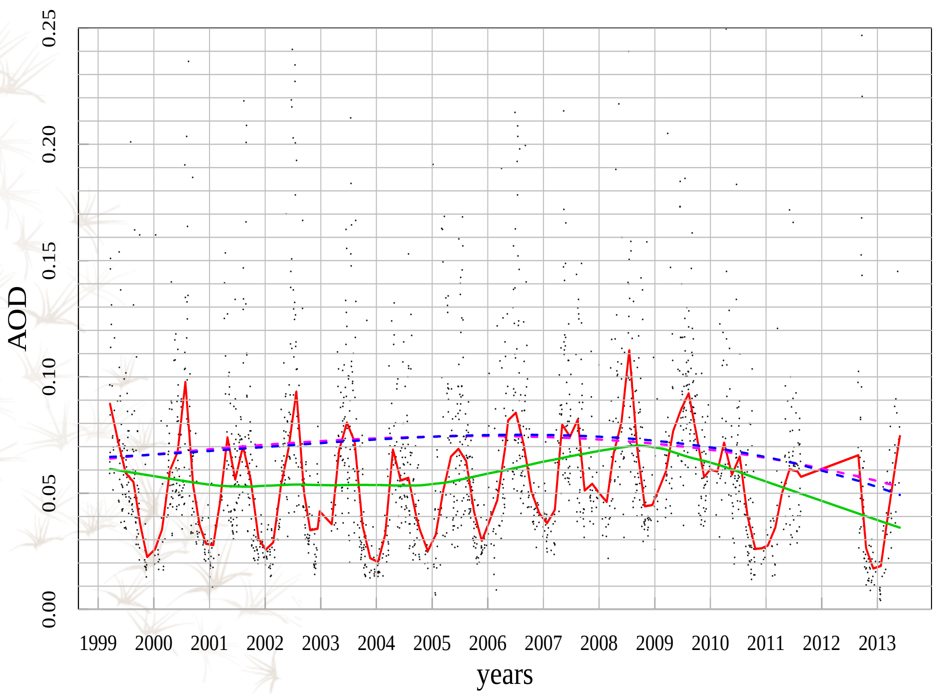


- Aerosol Concentration
- Aerosol Optical Properties
    - TSI Nephelometer - 3λ
    - PSAP - 3λ
- Aerosol size distributions
    - TSI Nano-SMPS, SMPS & APS
- DMT Cloud Condensation Nuclei (CCN)
- Multi-Filter Shadow-band Radiometer (UV & Visible)
- DMT Cloud droplet size distributions probes
    SPP-100 forward scattering spectrometer 2–47 μm
    Cloud Imaging Probe 25–1550 μm
    Precipitation Imaging Probe 100-6200 μm
- CO_2 Measurement - Britt Stevens, NCAR
- O_3, SO_2, CO, NO_x Measurements
- Water Vapor Isotope – Picarro
- Cold Room- Cloud Sieves
- Meteorological Station – 7 on Mountain

Inhibition of Snowfall by Pollution Aerosols

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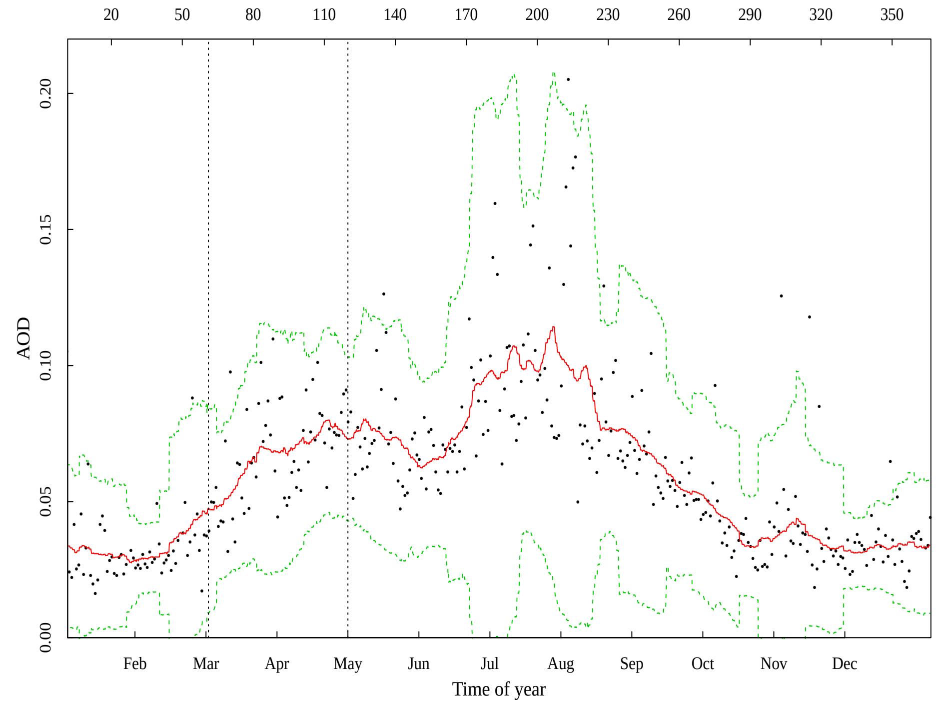
years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AOD
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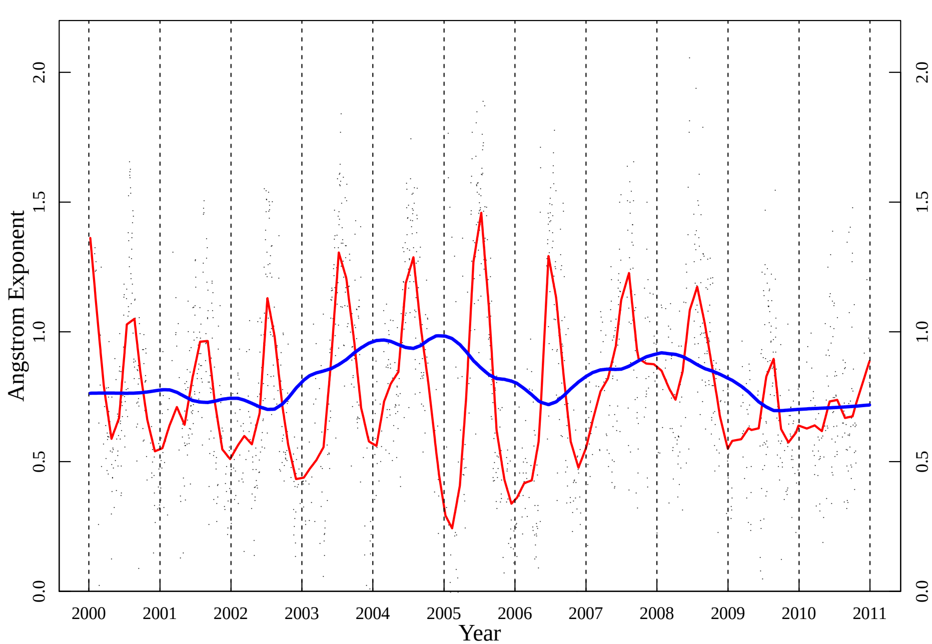
Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Time of year


Angstrom Exponent
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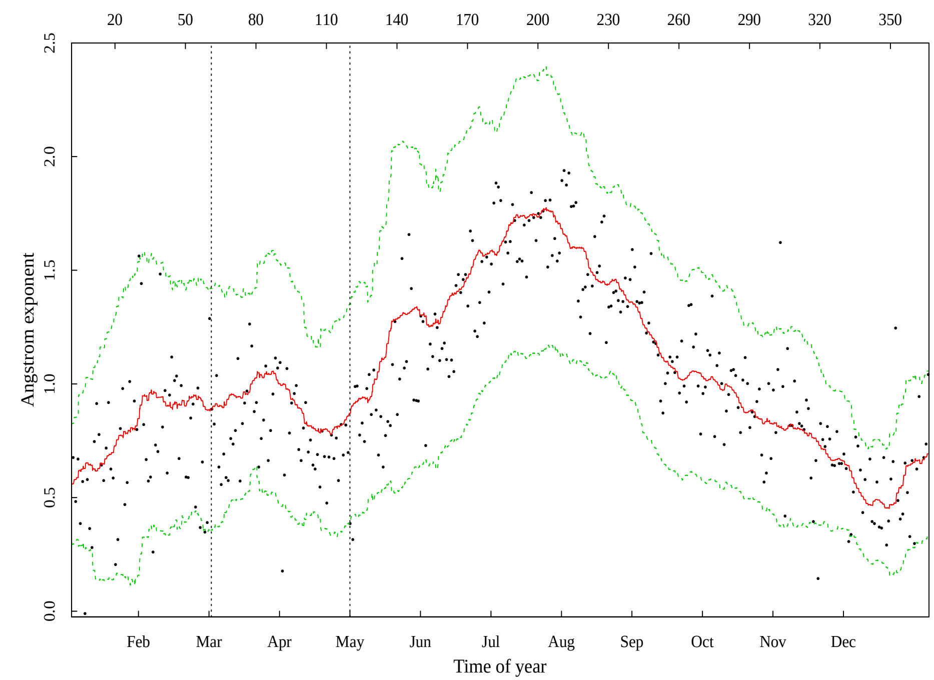
20 50 80 110 140 170 200 230 260 290 320 350
Angstrom exponent
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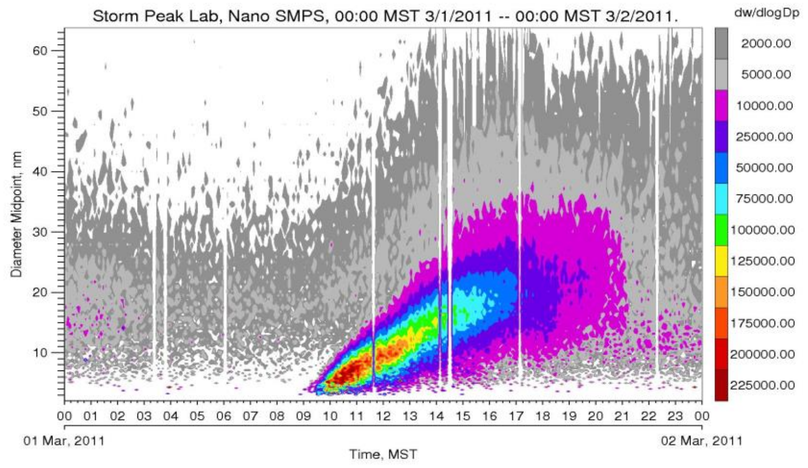
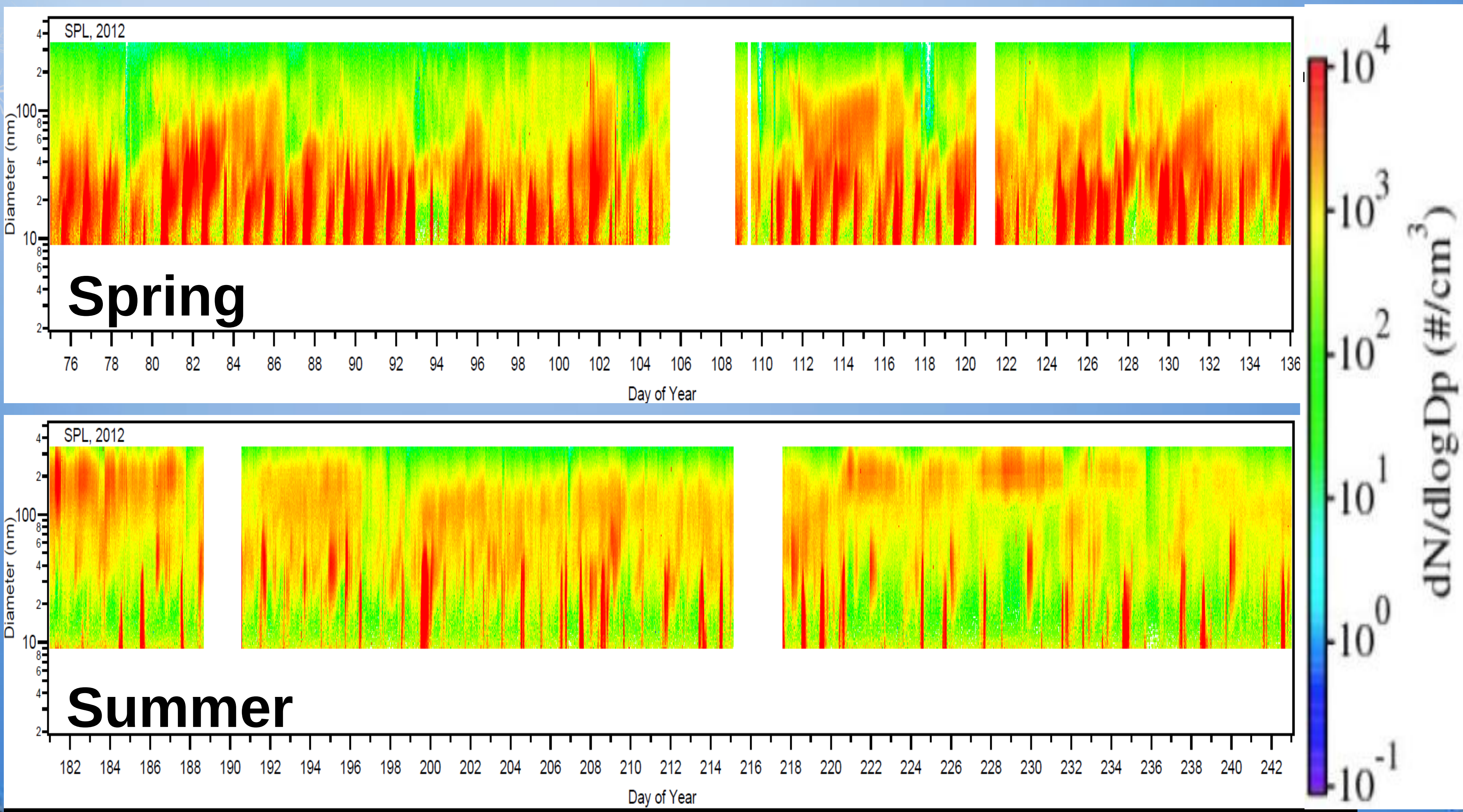
Summary of New Particle Formation



Measured Property	Spring (March, April, May)	Summer (June, July, Aug)	Winter (Jan, Feb)
Number of Total Days Studied	215	80	179
Percentage of Days with NPF event	56%	43%	52%
Average Initiation Time (MST)	12:12 ± 104 min	11:42 ± 102 min	12:41 ± 91 min

Particle size distribution measurements show significant difference in particle formation and properties during spring and summer at SPL.



Conclusion and Potential Cause

The likely source of frequent NPF in this area is due to SO_2 from multiple coal fired power plants located directly West of region.

$$O_3 + H_2O \longrightarrow 2OH$$
$$OH + SO_2 + M \longrightarrow H_2SO_4\ (s)$$

What is the impact of coal burning in the Western US on aerosol loading and CCN?

Hallar, A.G., et al., 2011: Persistent Daily New Particle Formation at a Mountain-Top Location, Atmospheric Environment, doi:10.1016/j.atmosenv.2011.04.044.

THANK YOU FOR YOUR ATTENTION!

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Storm Peak Laboratory

for atmospheric science

http://stormpeak.dri.edu

DRI Desert Research Institute

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