

Poster Presentation:

Mobile and Fixed-site Woodsmoke Monitoring in Upstate NY

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ABSTRACT

A multi-year assessment of ambient woodsmoke PM from residential heating appliances is being conducted in upstate NY.

Measurement methods and results from winter 2013-2014 fixed-site and mobile platform measurements in Saranac Lake and Lake Placid NY are summarized. Short-term PM concentrations exceeded 2 mg/m³ at one location.

New visualization tools were developed to show the rapid changes in PM concentrations encountered during mobile monitoring.

Inversion conditions were directly assessed for each mobile monitoring evening using measurements of temperature and elevation while driving up out of the valley.

Project Goals and Methods

Mobile PM monitoring to characterize areas with elevated WS PM:

- Thermo pDR1500 nephelometer for PM-fine surrogate
 - 1-second time resolution with high sensitivity
- Ambient temperature, recording GPS (position, elevation, speed)
- 13 evening runs December-March 2014
 - Nights with low wind speed and potential inversion conditions
- Real-time PM plots to inform driver of hotspots
- “Background” PM measured between towns and up Mt. Pisgah

Fixed-Site Monitoring in Saranac Lake:

- NESCAUM “WS-Kit”, pDR1500 for 1-minute PM
- Late January-April 2014
 - Unattended operation, remote (internet) access
- Modest near-source impacts
 - 1-minute PM data allows ID of local vs. regional events

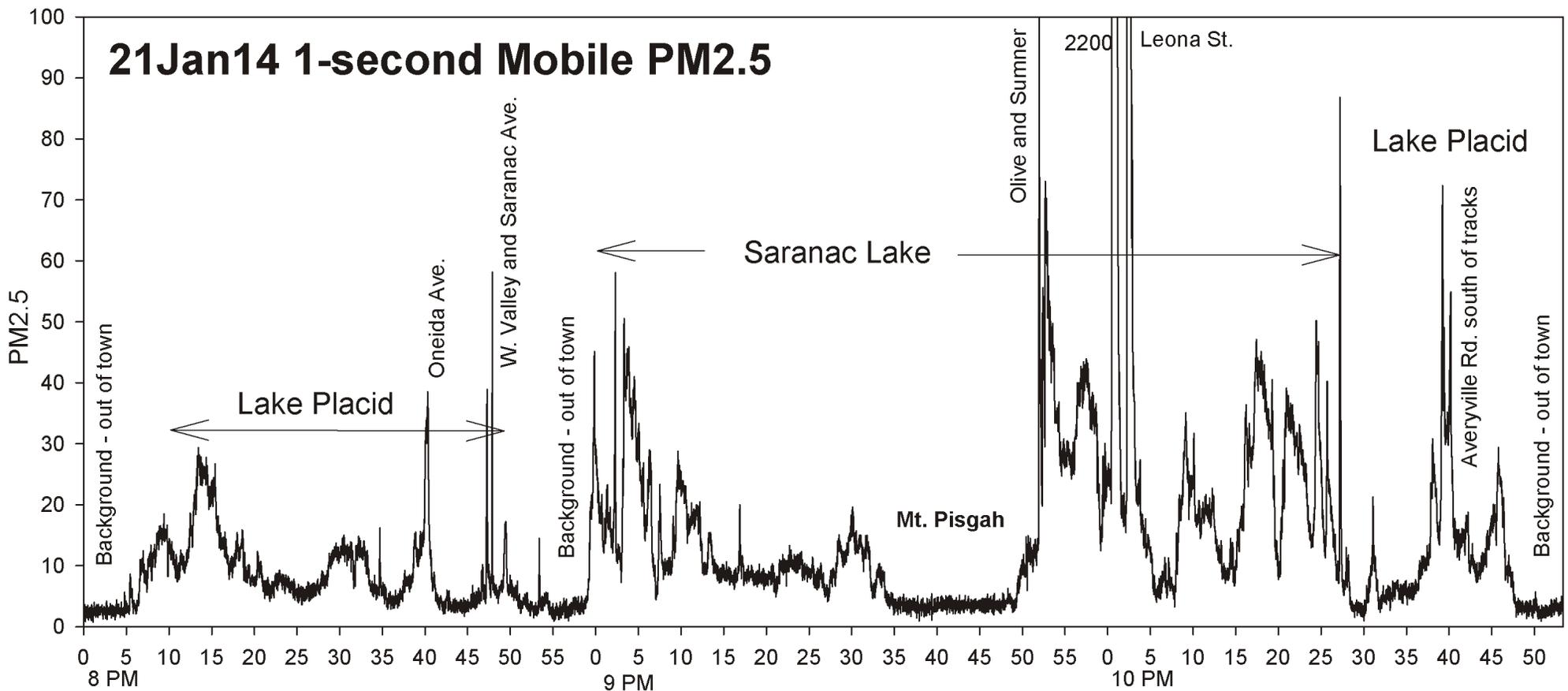
Saranac Lake Topography - not really a valley.



Summary of Mobile Measurement Results

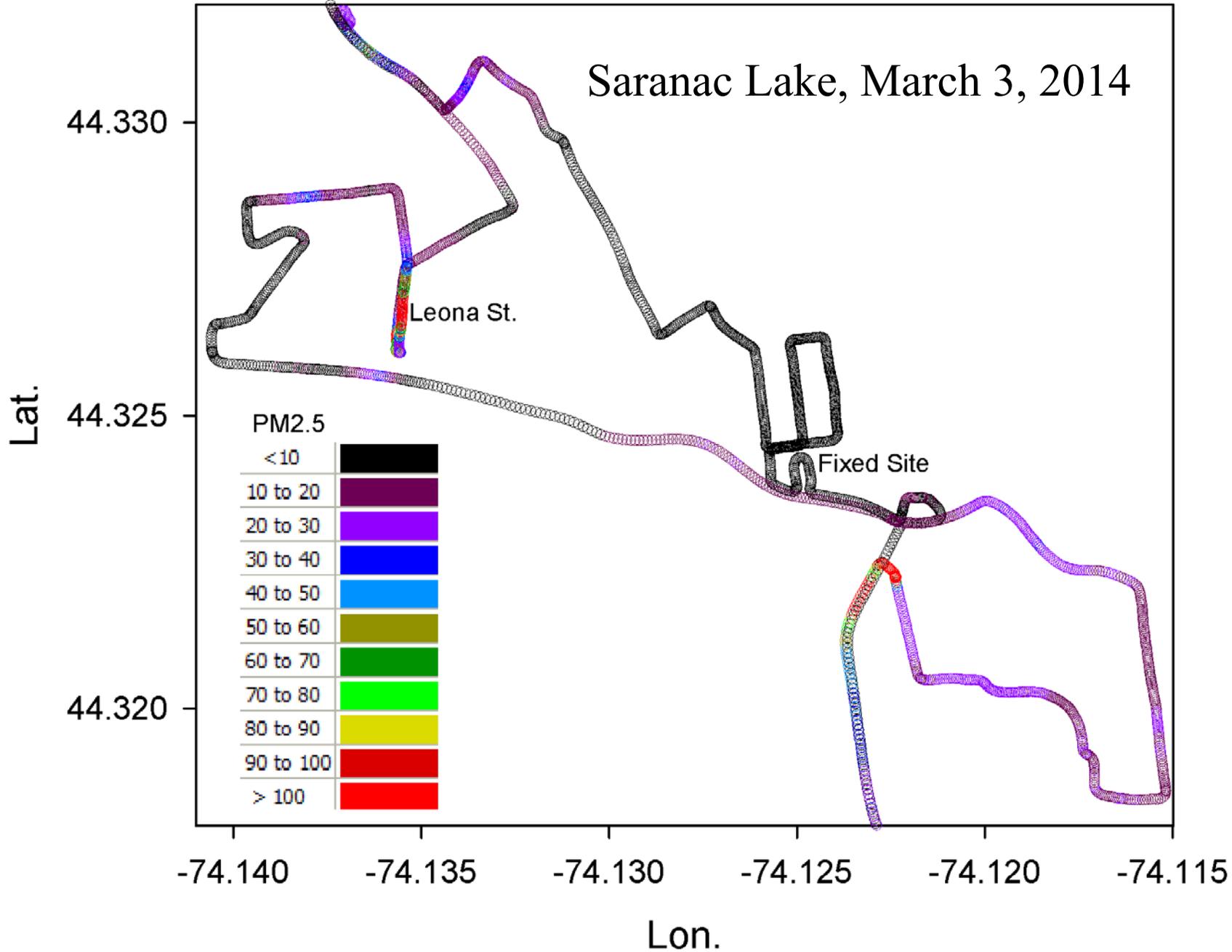
- Several areas with elevated PM identified; max. PM 2200 $\mu\text{g}/\text{m}^3$
- Weak "valley accumulation" effect; PM elevated only near sources
- Hot-spot locations often varied from night to night

Example of Time-Series Mobile PM Data:



"Slinky[®]" spatial plots showing route, speed, and color-coded 1-sec. PM

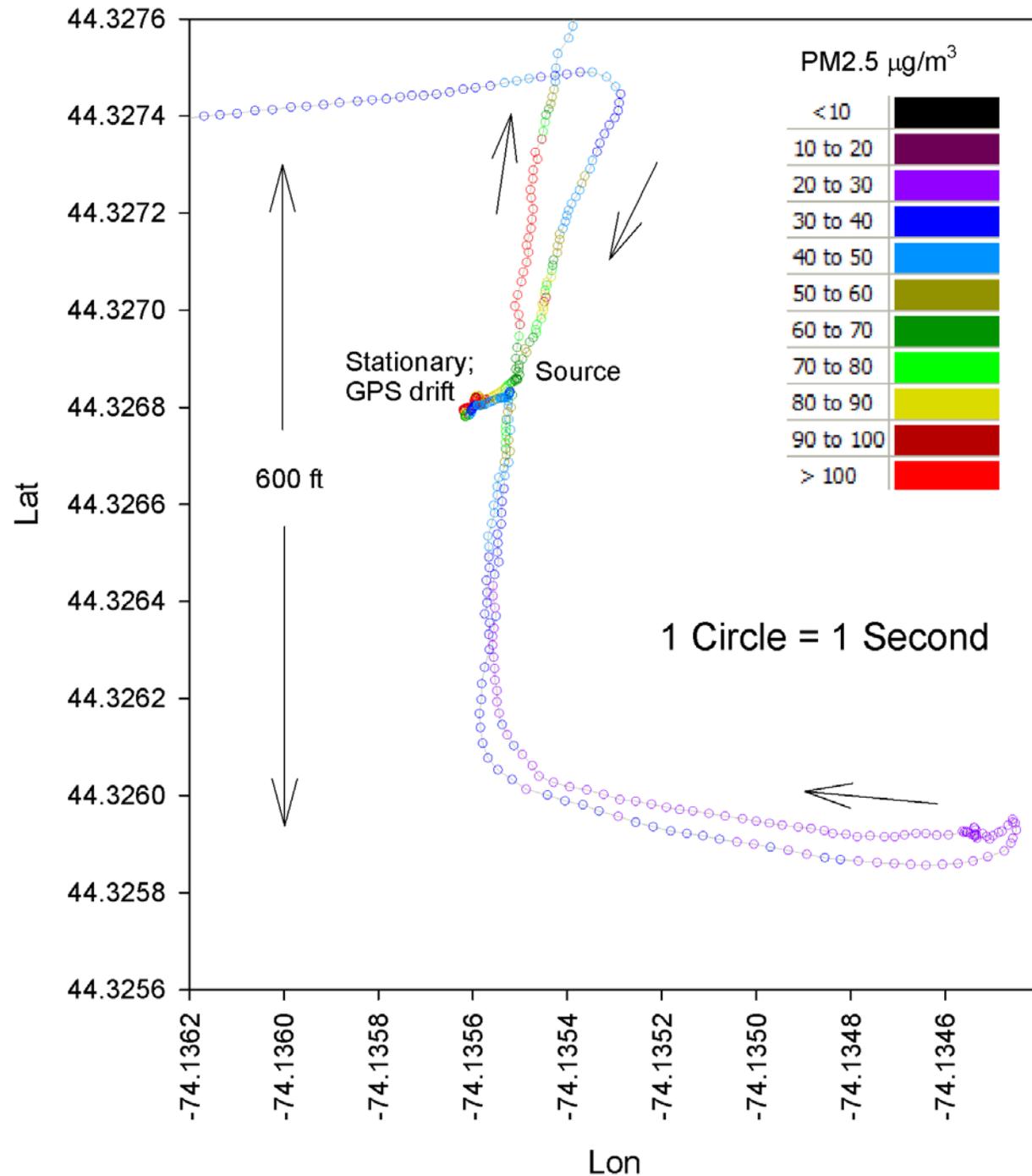
Saranac Lake, March 3, 2014



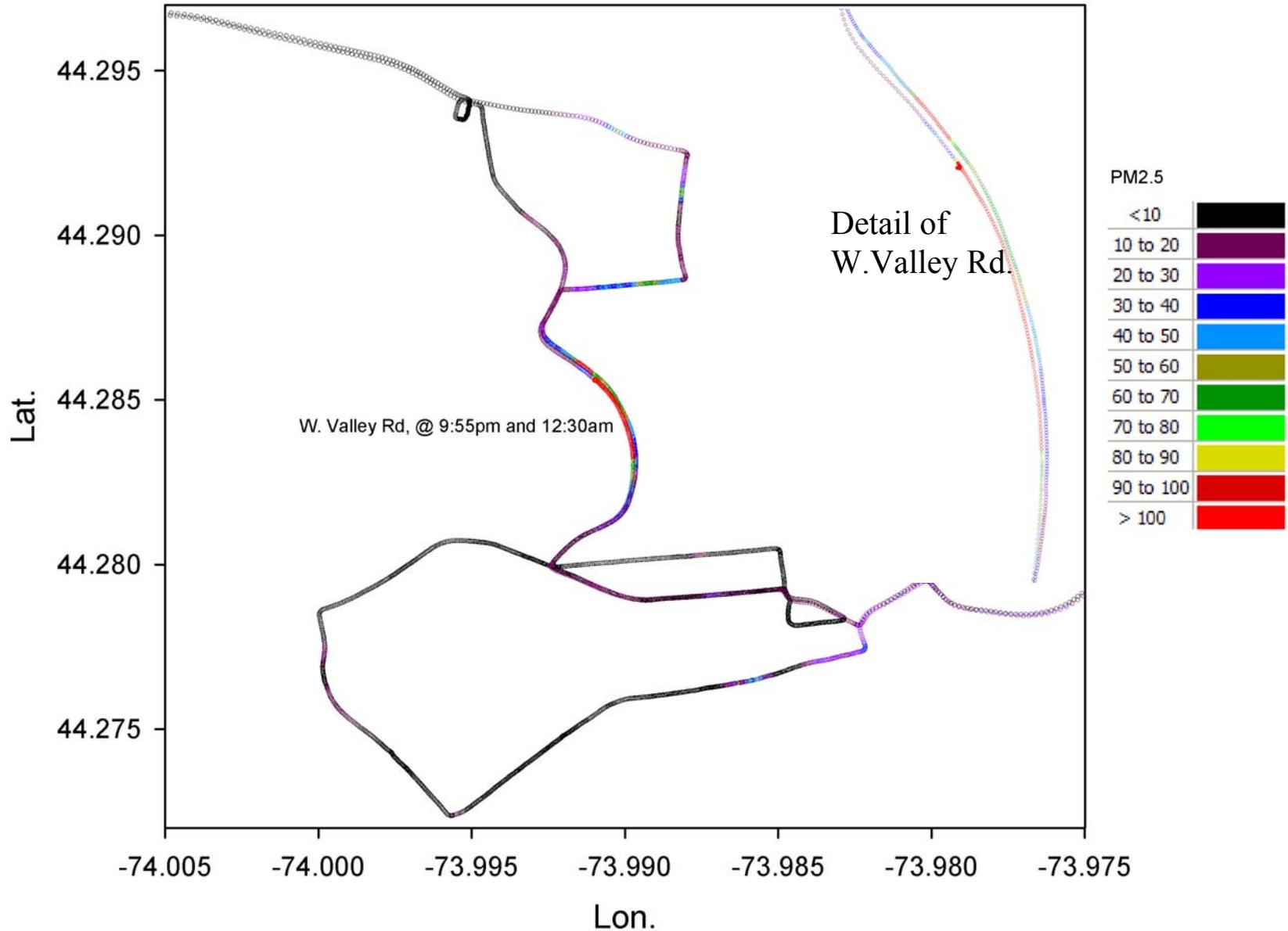
Detail Available in Slinky Plots

Jan. 3, 2014

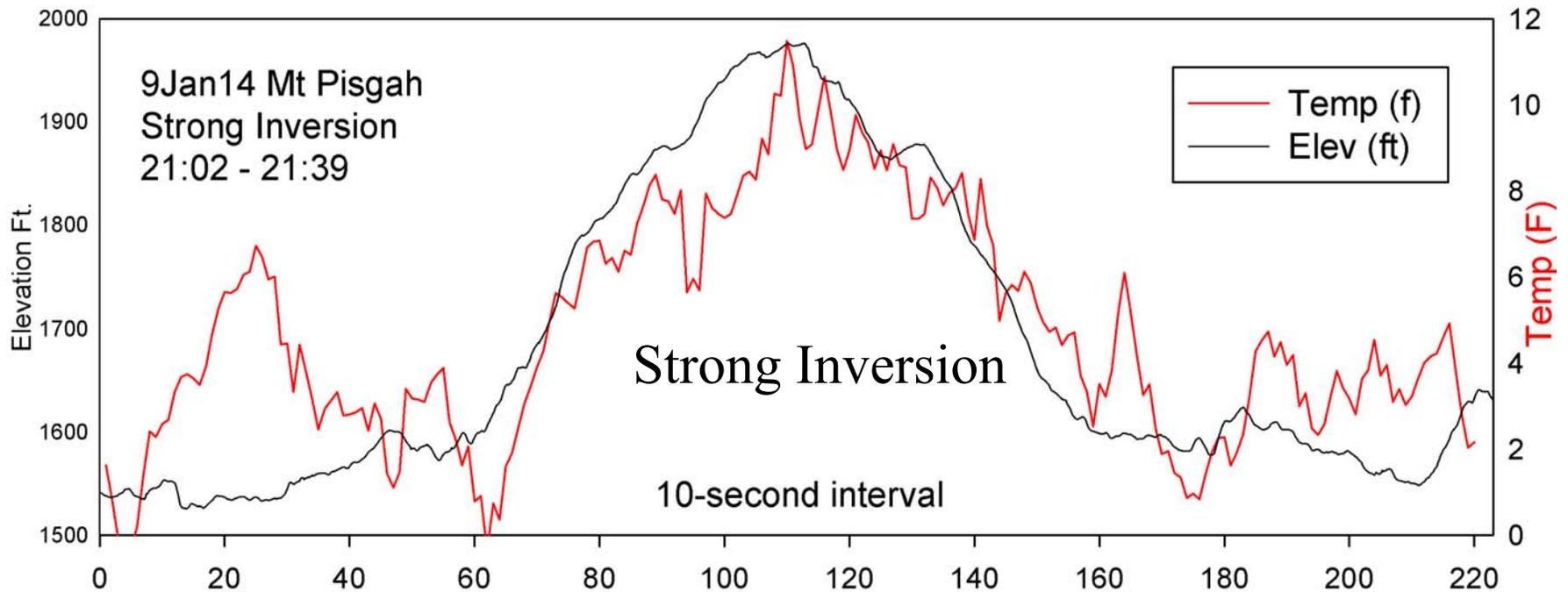
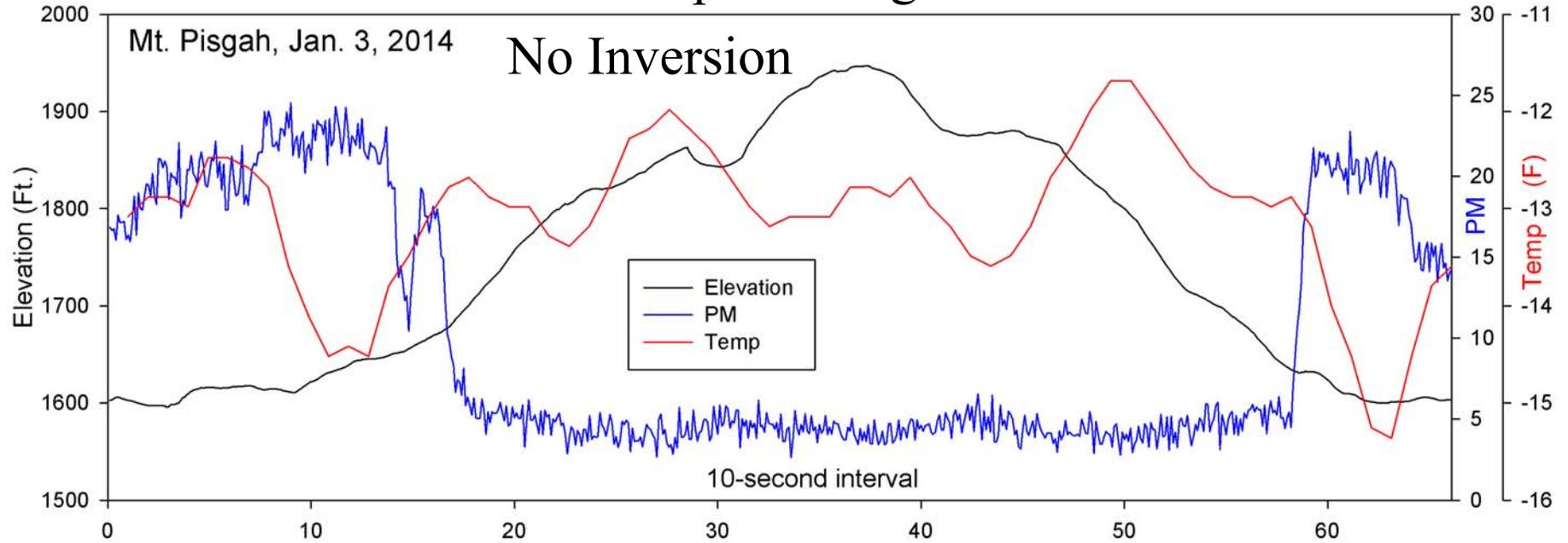
Leona St.,
Saranac Lake



Lake Placid Mobile PM2.5, March 17, 2014



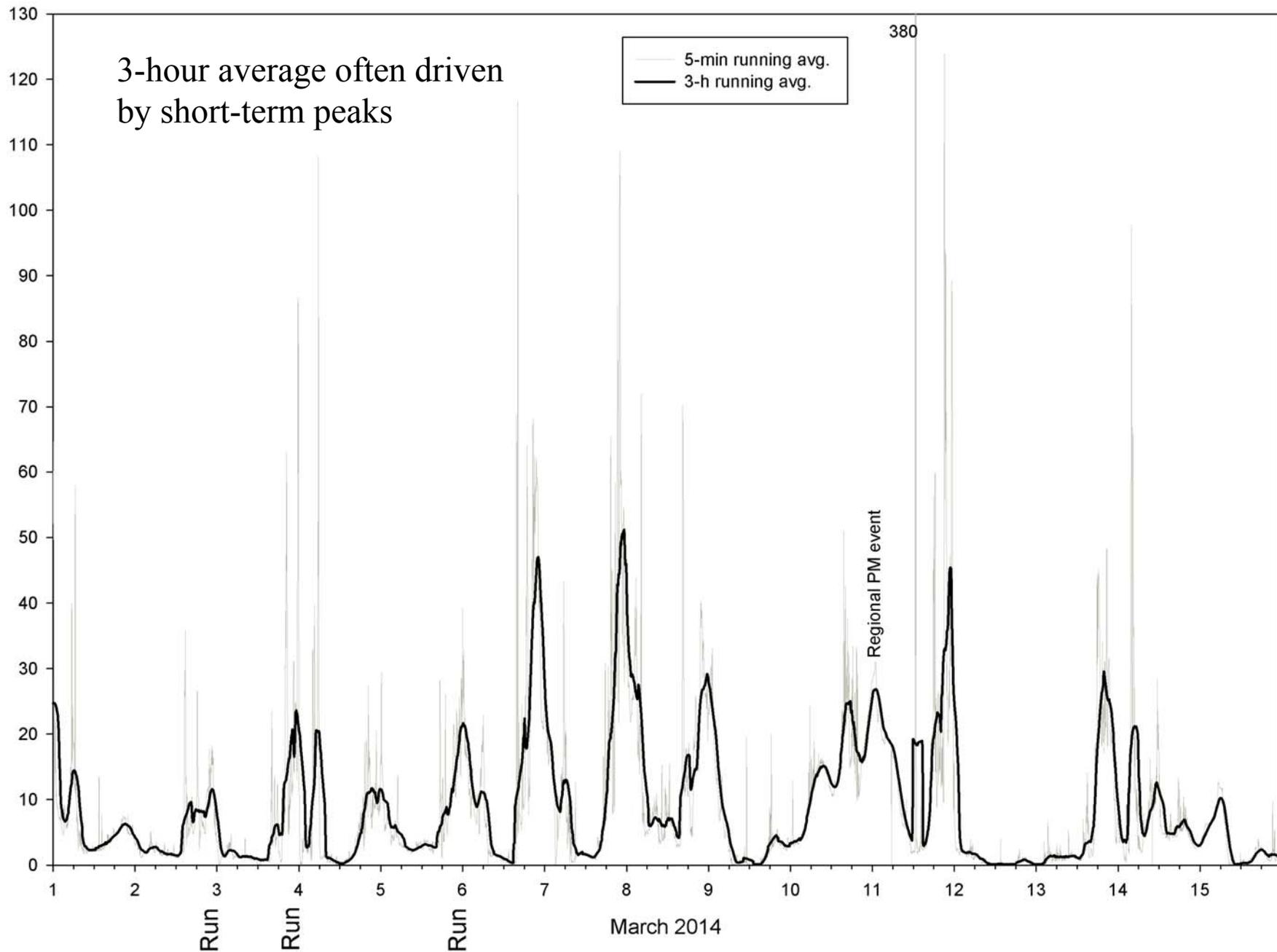
Inversion Measurements: Drive up Mt. Pisgah in Saranac Lake



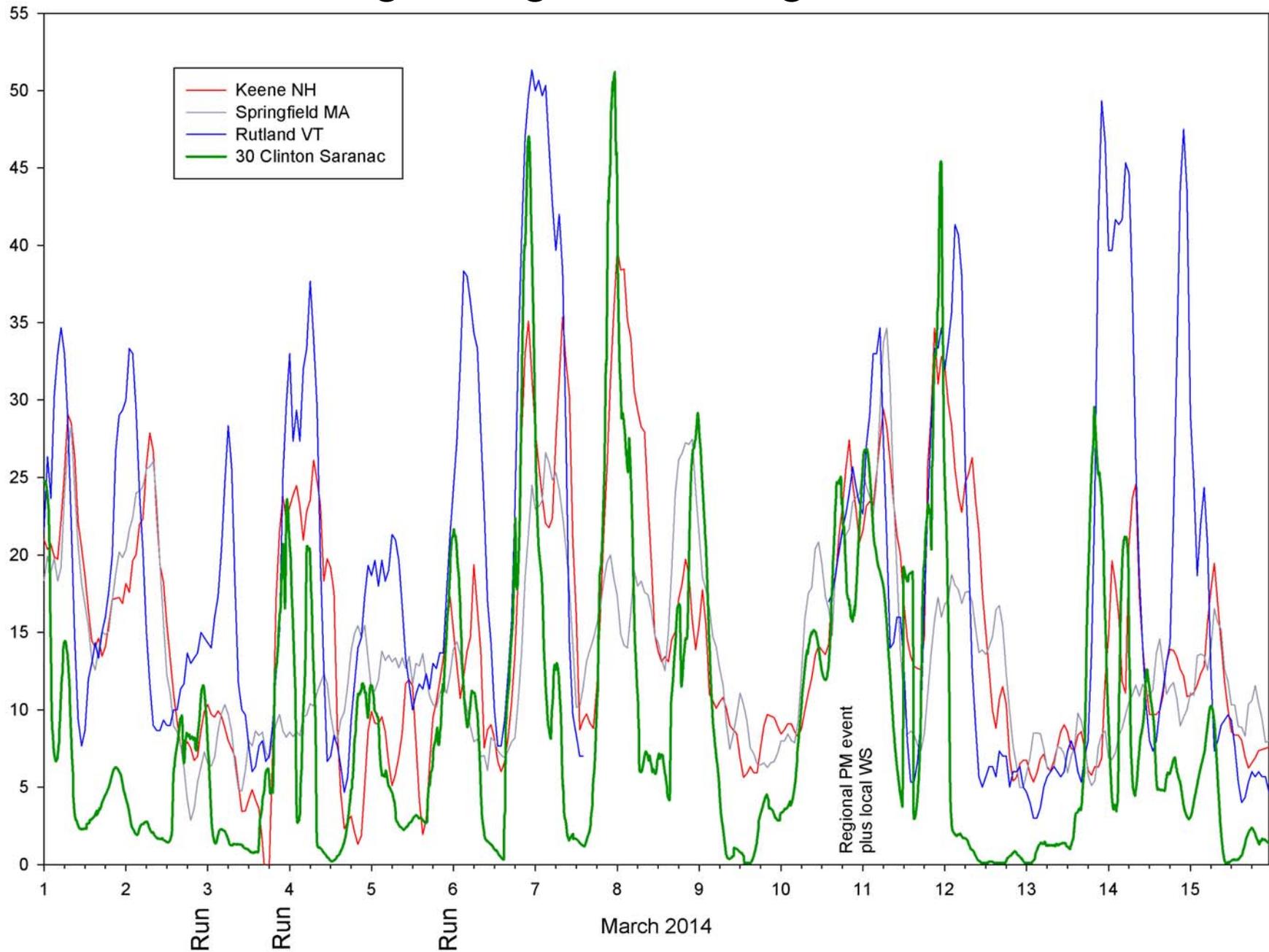
Example of Mobile Run Summary: First Six Runs

Date	30Dec13	3Jan14	9Jan14	16Jan14	21Jan14	3Feb14
Day of Week	Monday	Friday	Thursday	Thursday	Tuesday	Monday
Start/End time (EST)	9:35 pm-12:15 am	8:25-11:30 pm	7:10-10:50 pm	8:20-11:00 pm	8:00-10:45 pm	9:30-11:55 pm
Temperature, F	+2	-13	+3	+18	-13	+17
Inversion, F	~ 2 (weak)	0 (no inversion)	7 (strong)	0 (no inversion)	0-1 (weak to no inversion)	0 (no inversion)
Saranac Lake PM _{2.5} (µg/m ³)	Generally < 10, no valley accumulation. Leona St. 1500	Generally 15-30; Leona St. 150	20-30; 100-200 near 30 Clinton Ave.; Leona St. 400	10 to 30; Leona St. 1000	10 to 40; Leona St. 2200	5 to 10; Leona St. 160
Lake Placid PM _{2.5} (µg/m ³)	N/A	Generally 20-60; 2 hotspots of 160 and 145	20 to 40; Max 450 at River and West Valley	peak of 40-60, otherwise not elevated	5 to 30; max 75	Max 45 at Oneida Ave.

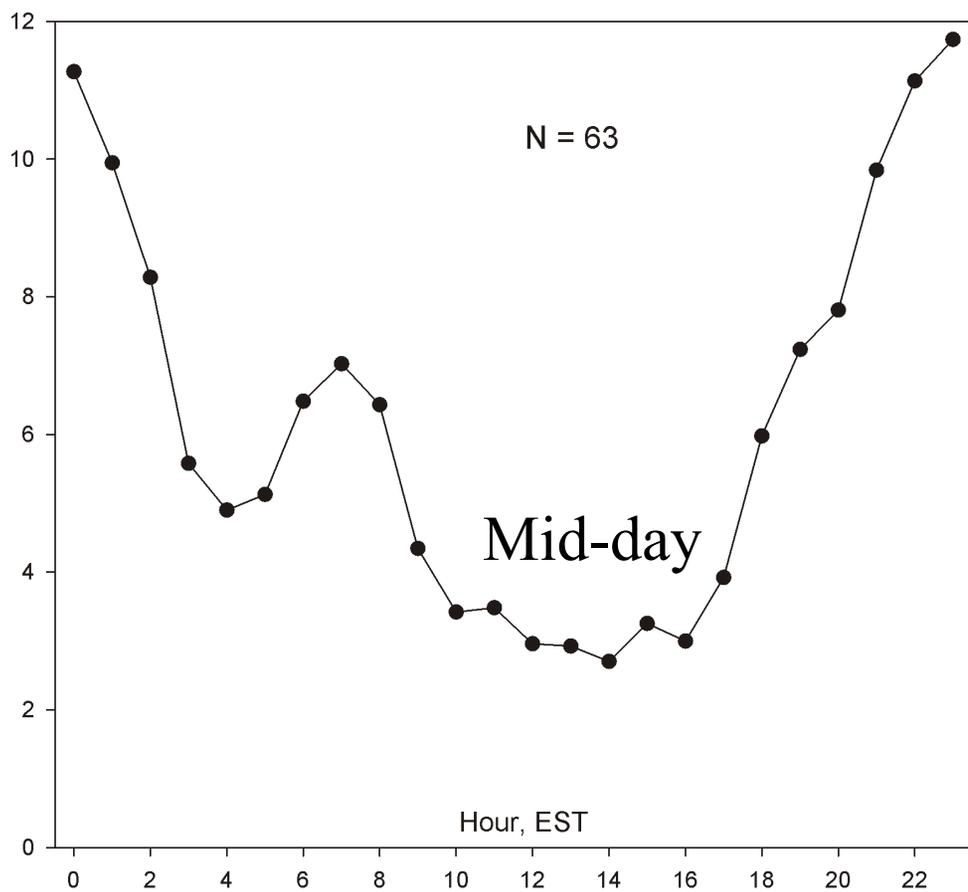
Fixed Site 1-Minute PM2.5: 5-minute and 3-hour running average



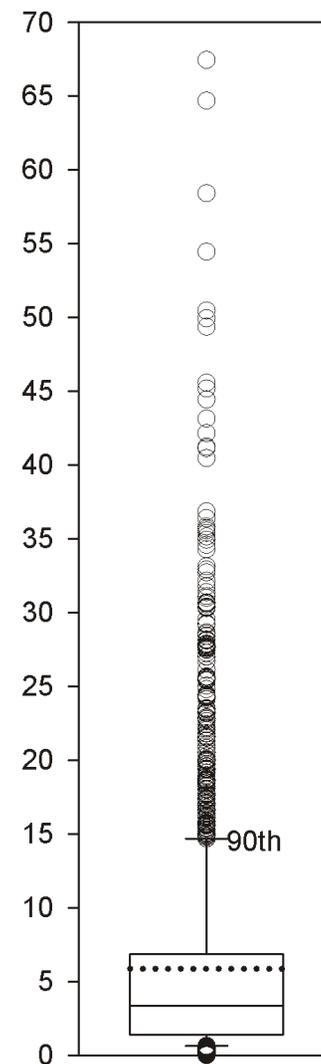
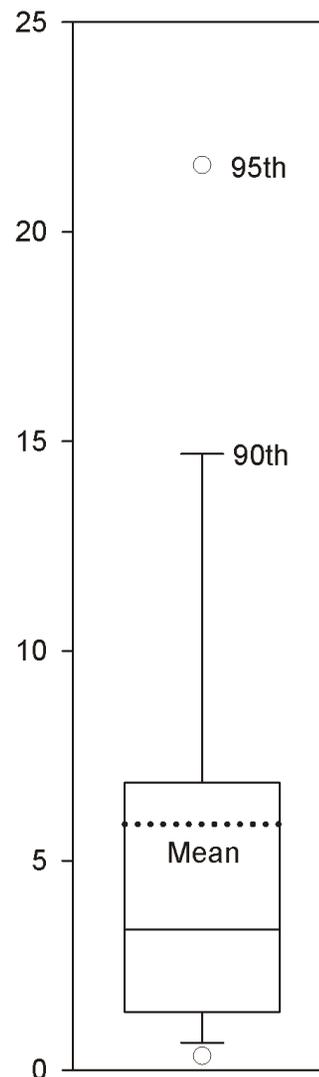
4-Site 3-Hour Running Average PM2.5: Regional Context for Fixed Site



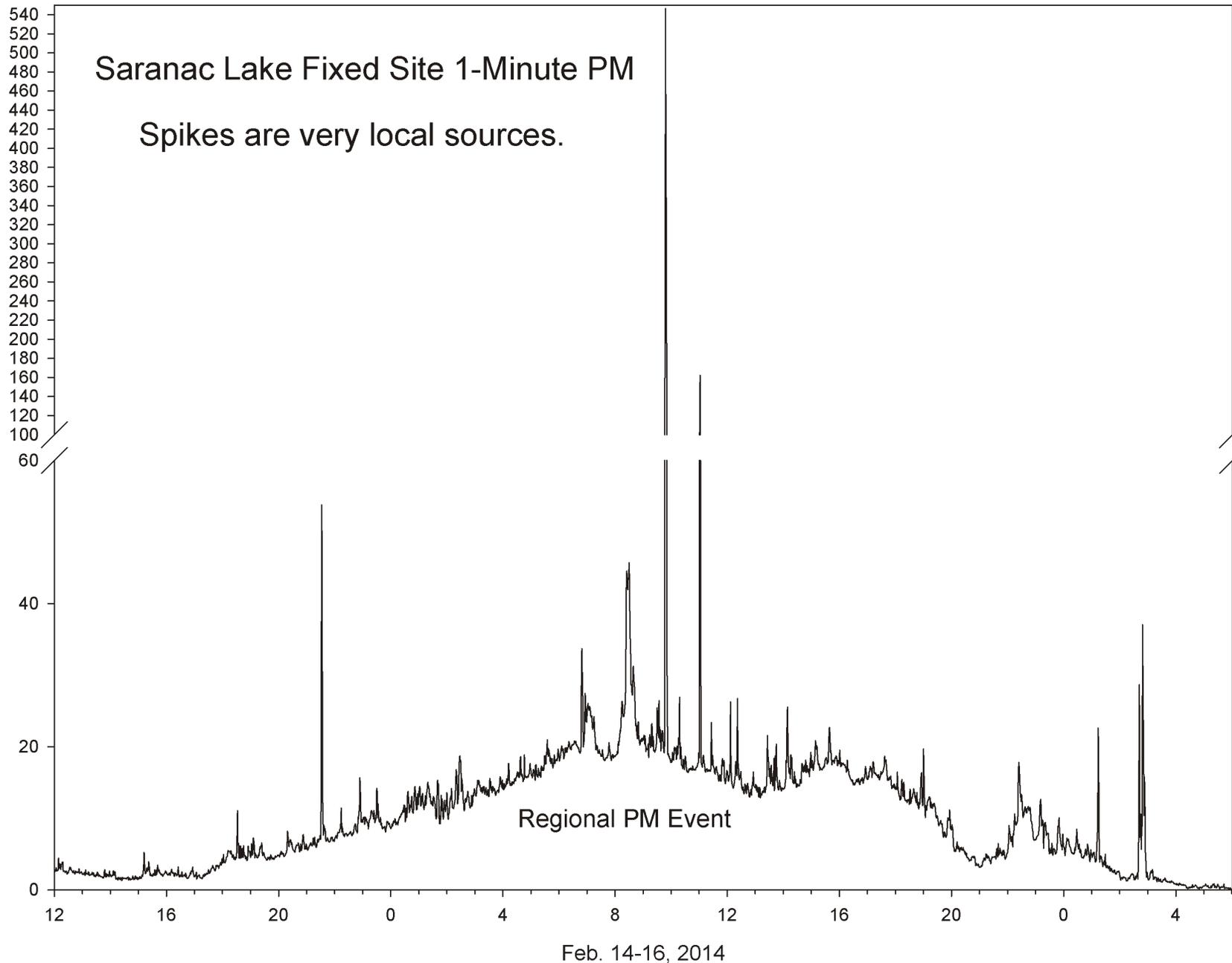
Fixed Site PM2.5: Diurnal and 1-hour Distributions, Feb. - March 2014



“Classic” Woodsmoke Pattern



Example of Regional PM2.5 Event With Local Woodsmoke Source



Conclusions.

- 1-second mobile PM measurements identify woodsmoke hotspots
- Large WS PM concentration gradients were common on small spatial scales (local source influence)
- Fixed site monitoring may not represent small town WS PM peak concentrations
- A combination of mobile and fixed site monitoring can provide spatial and temporal detail
- Woodsmoke PM was generally present only in populated areas
- Inversion conditions were not a dominant factor for elevated PM
- 1-minute PM data can separate local and regional PM components

Acknowledgments.

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Inversion forecasting