

An aerial photograph of a city, likely Washington D.C., showing a dense urban landscape with various buildings, roads, and a prominent highway interchange. A semi-transparent white box is overlaid on the top half of the image, containing the title and subtitle text.

An Urban Sub-Network of NADP Monitoring Stations

Chapter 2: Annual Update

The Influence of Spatiotemporal Heterogeneity



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Roads as nitrogen deposition hot spots

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Abstract. Mobile sources are the single largest source of nitrogen emissions to the atmosphere in the US. It is likely that **a portion of mobile-source emissions are deposited adjacent to roads and thus not measured by traditional monitoring networks**, which were designed to measure long-term and regional trends in deposition well away from emission sources.

.....

Understanding the impact of mobile source emissions is especially important in urbanized and suburban areas like the northeastern US where vehicles account for over 50 % of total NO_x emissions (Butler et al. 2005).

*The devil lurks in the details
so should we ignore them?*



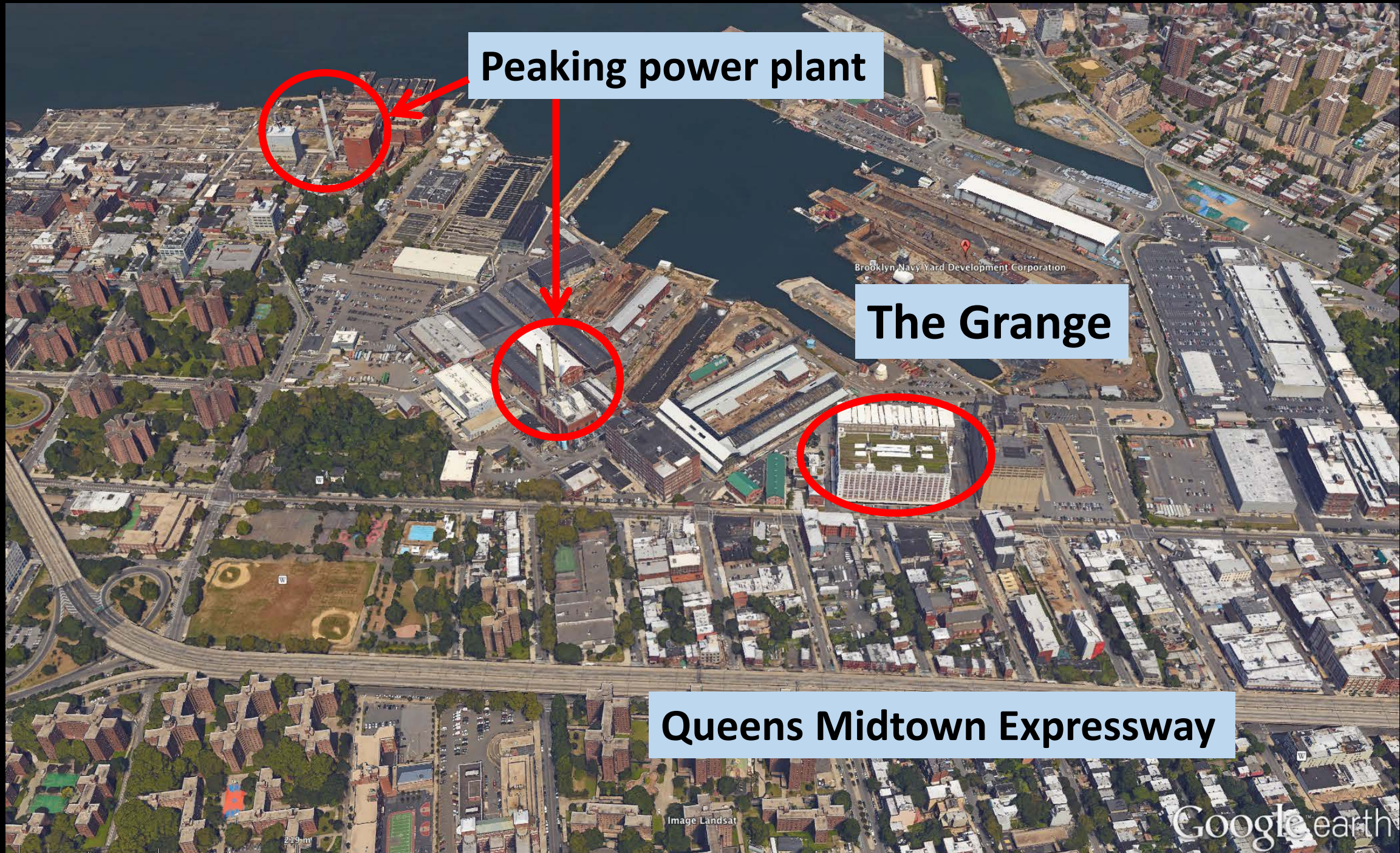
***The Grange at the Brooklyn Navy Yard:
An on-farm test case***



Peaking power plant

The Grange

Queens Midtown Expressway



Brooklyn Navy Yard Development Corporation

Image Landsat

Google earth

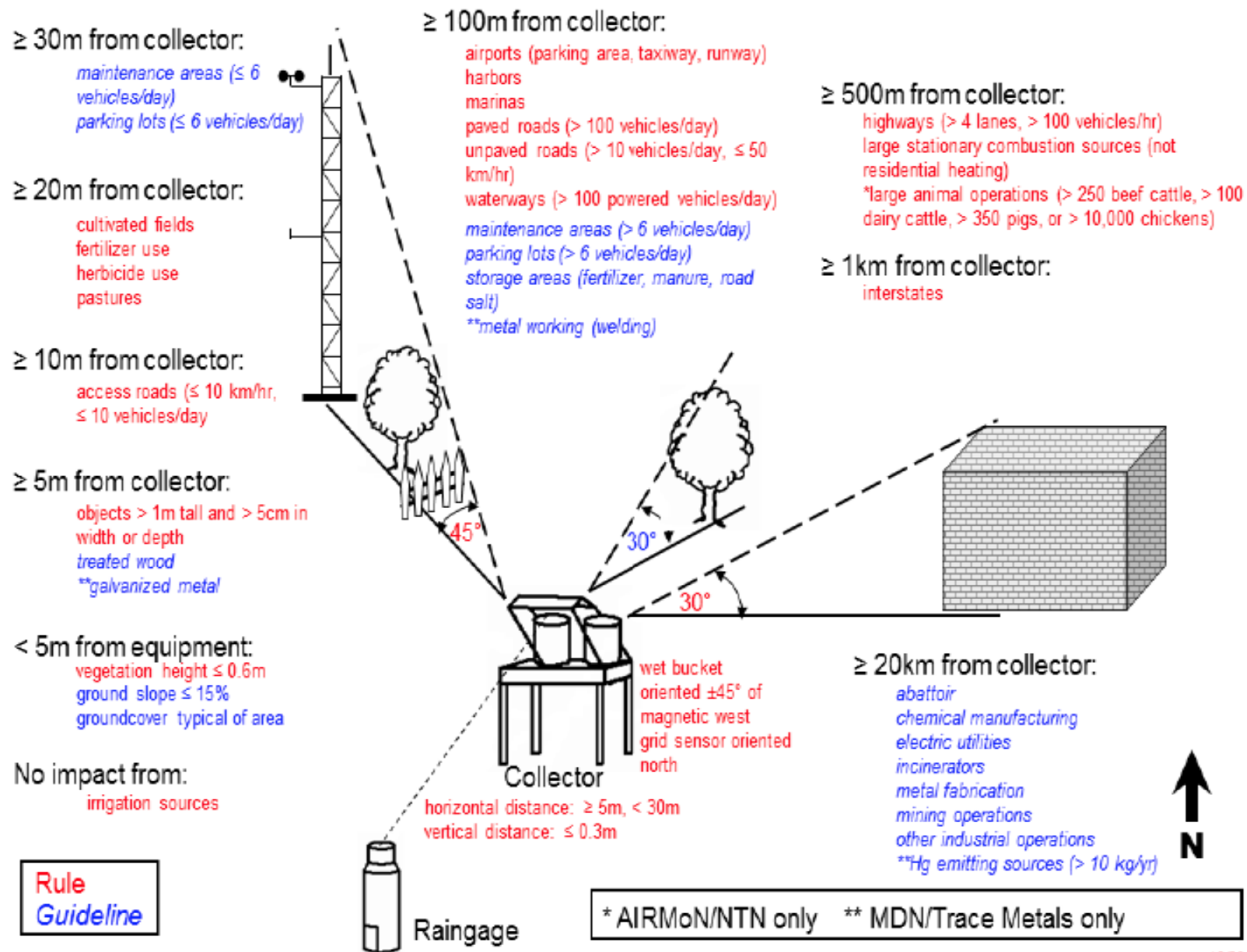


Raised roofs

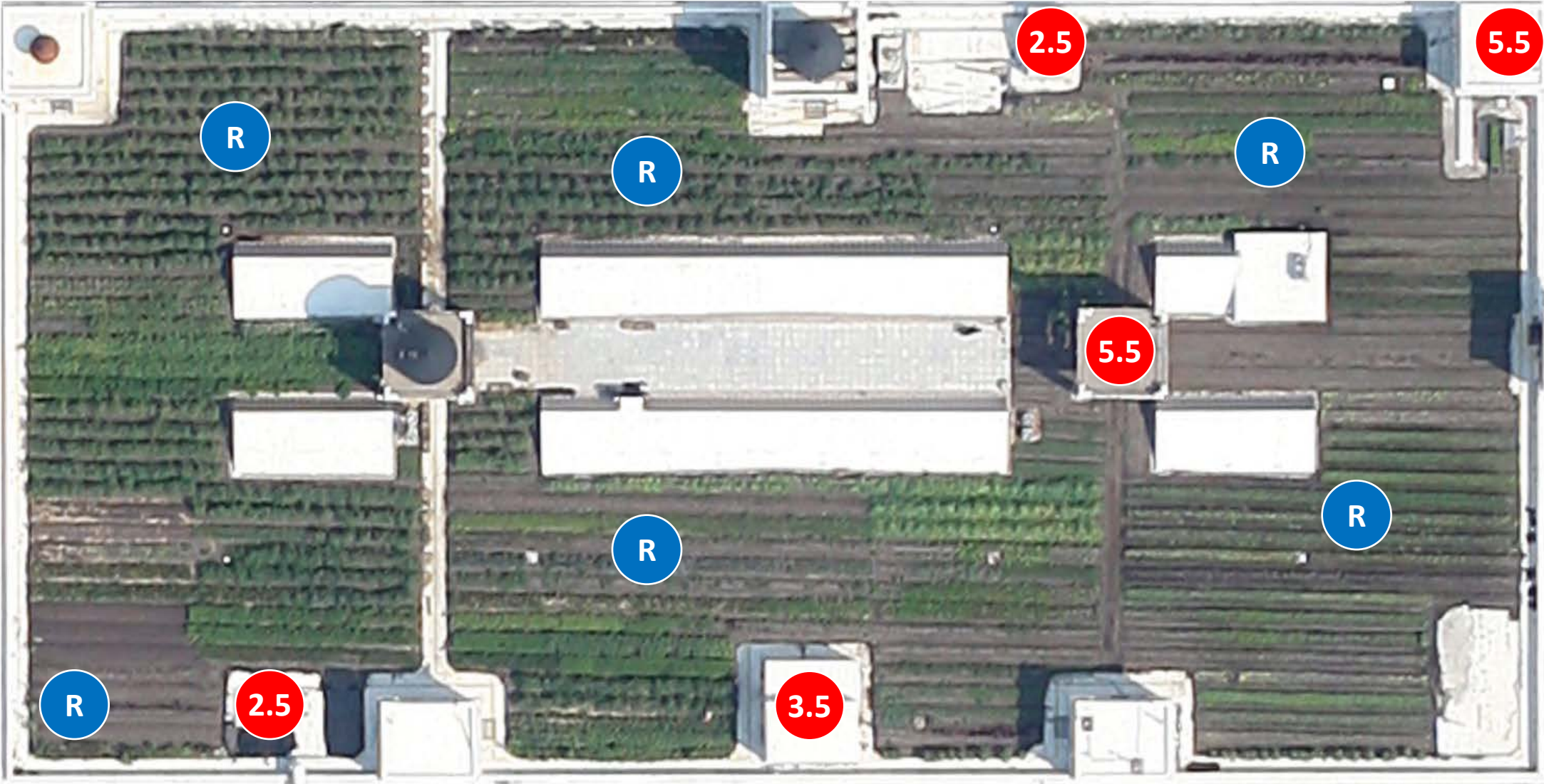


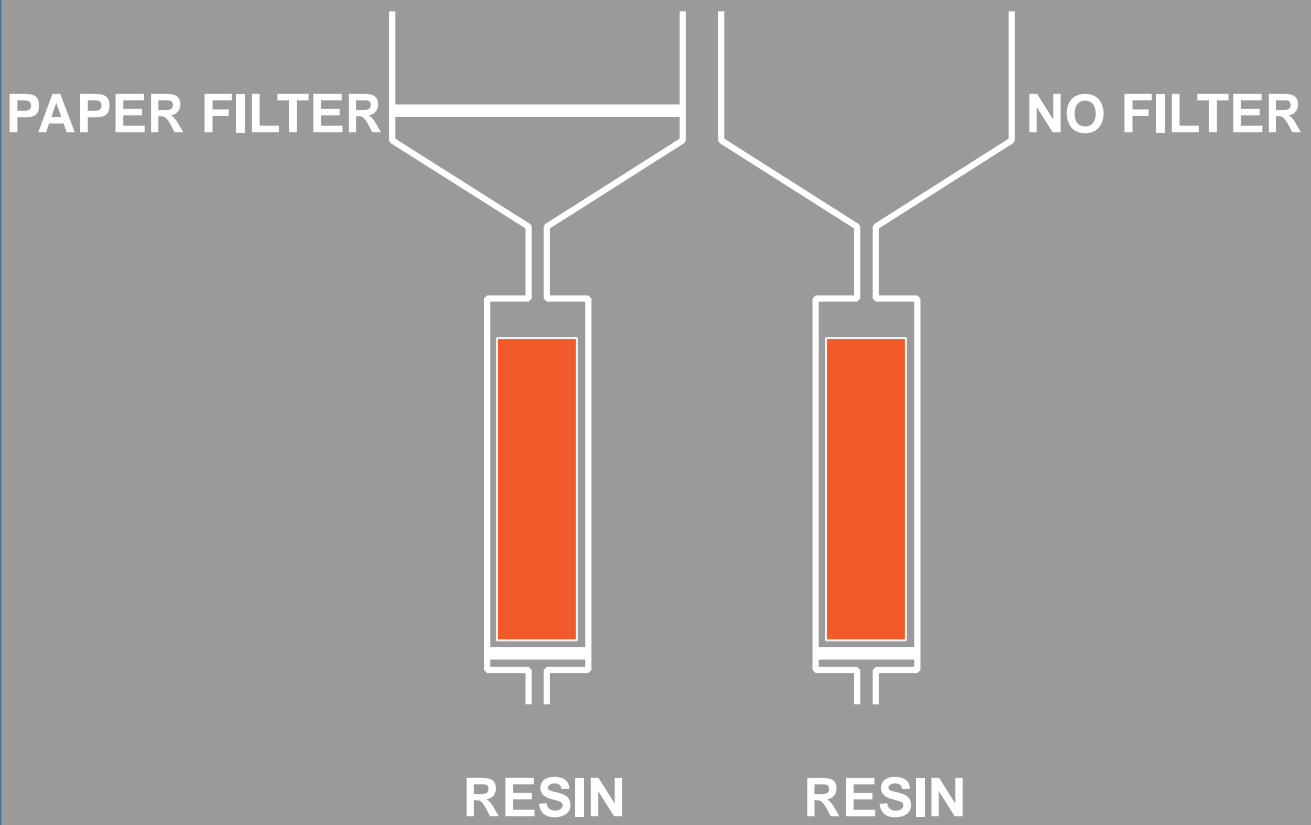
How do we meet these criteria?

NADP Siting Criteria – Wet Deposition



11 Sampler Locations



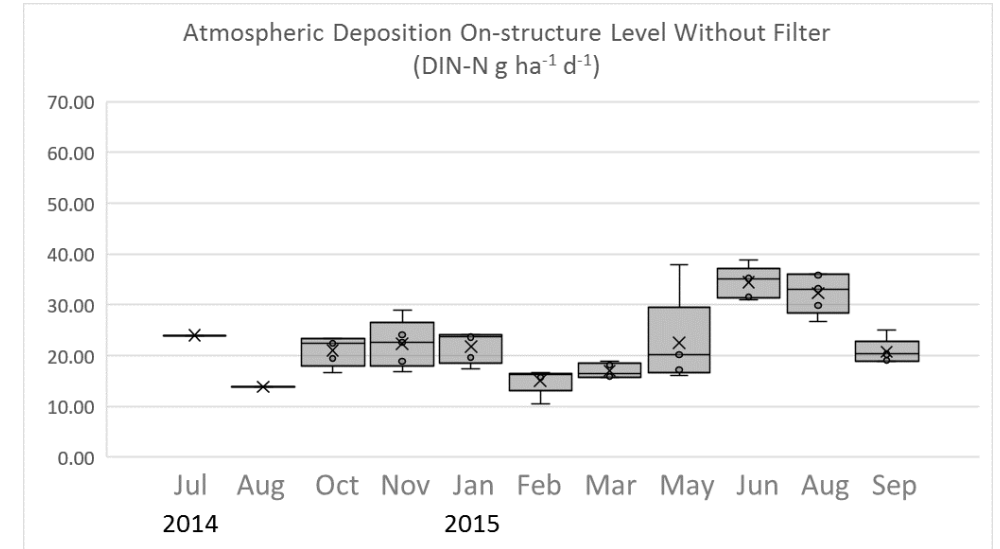
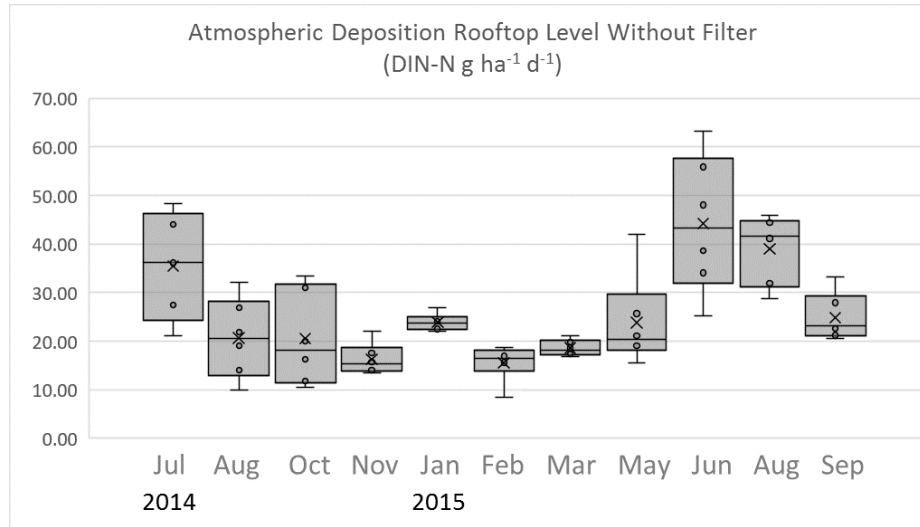


Effects of Height and Filters: Total N

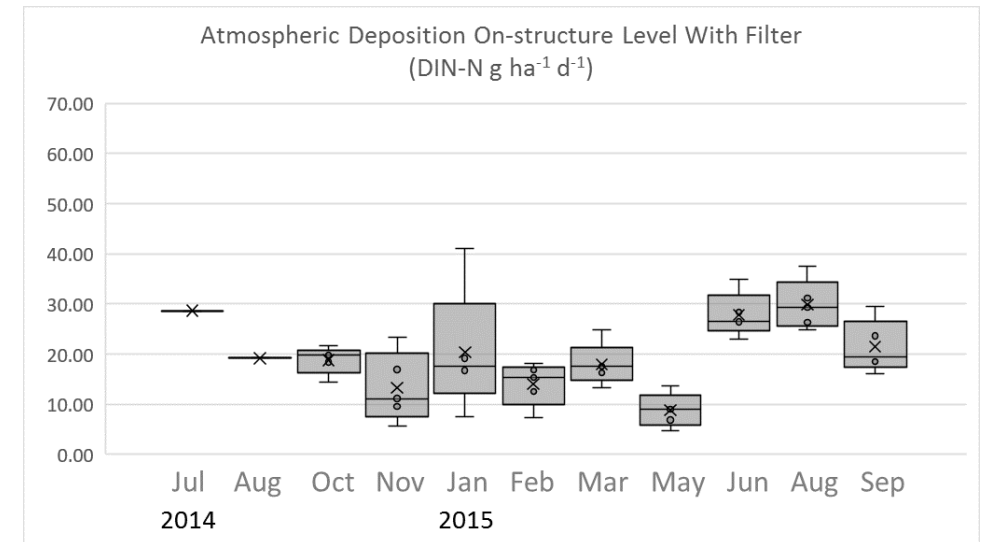
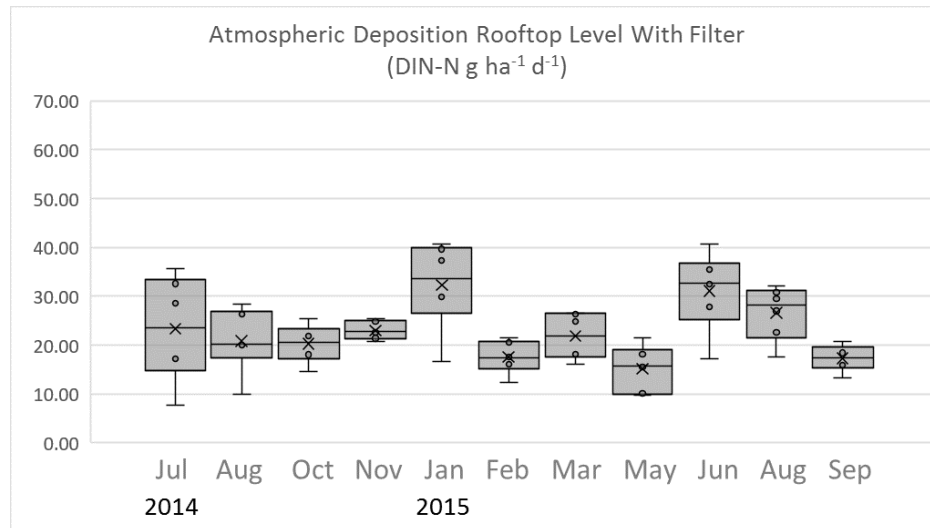
Roof

Elevated

- Filter



+ Filter

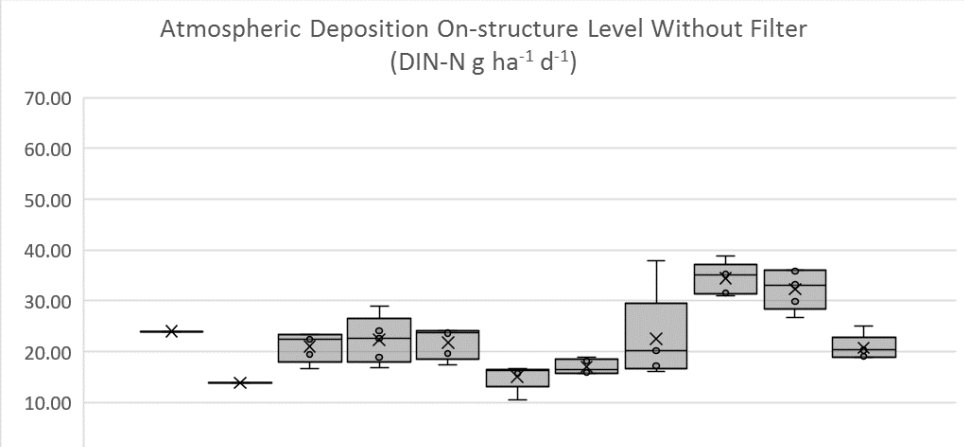
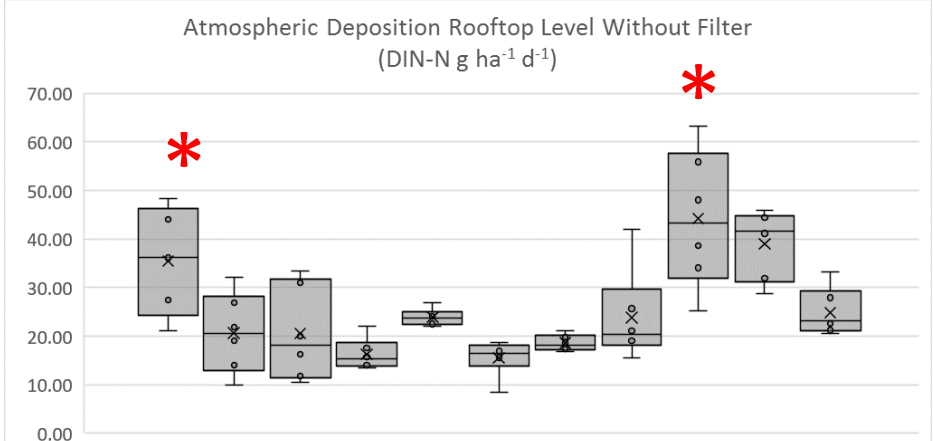


Effects of Height and Filters: Total N

Roof

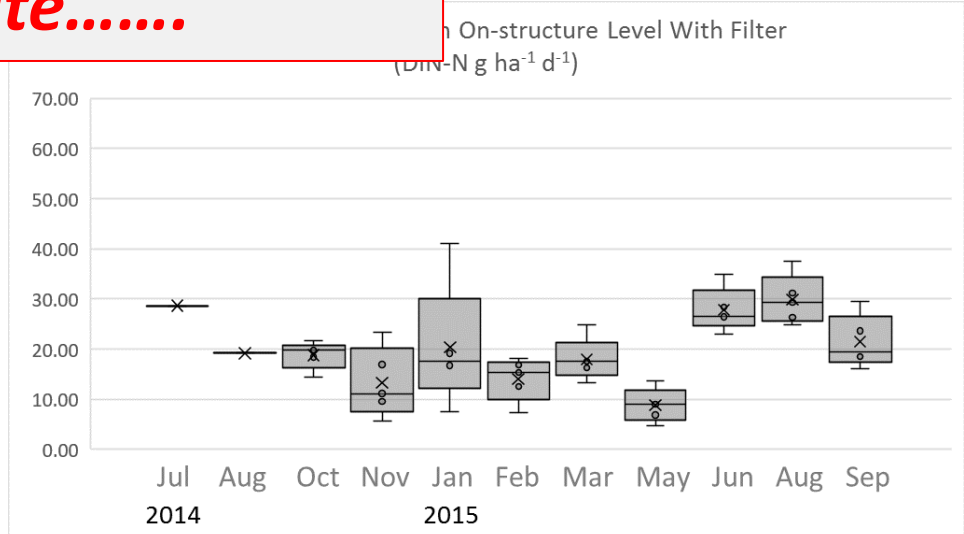
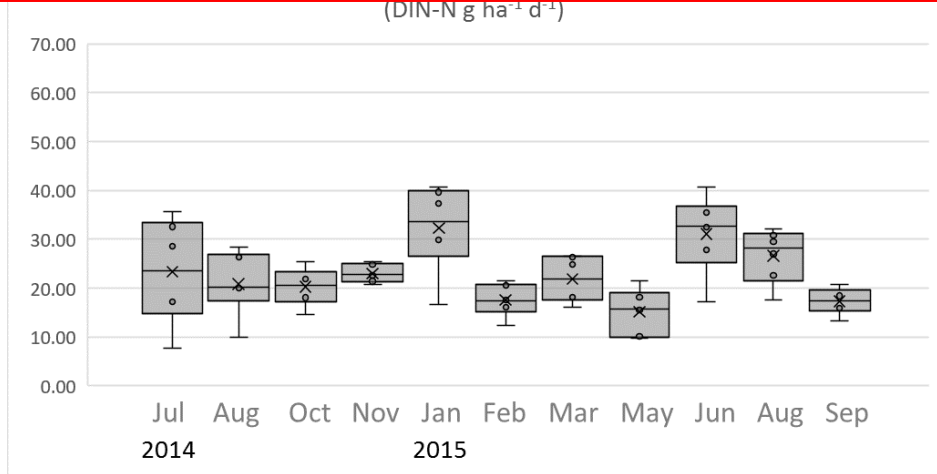
Elevated

- Filter



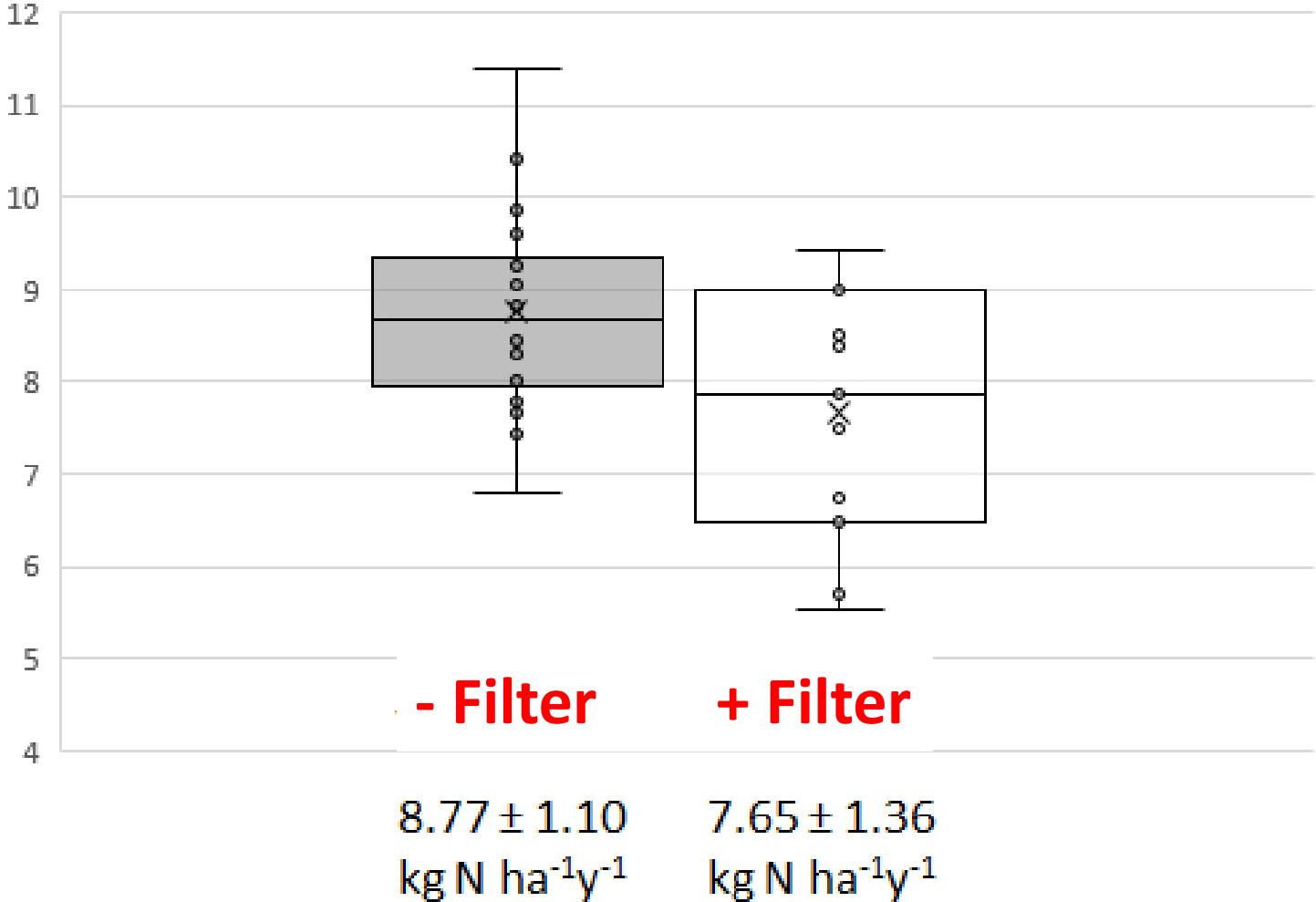
Seasonal peaks in July for unfiltered samplers suggest fine particulate contribute.....

+ Filter



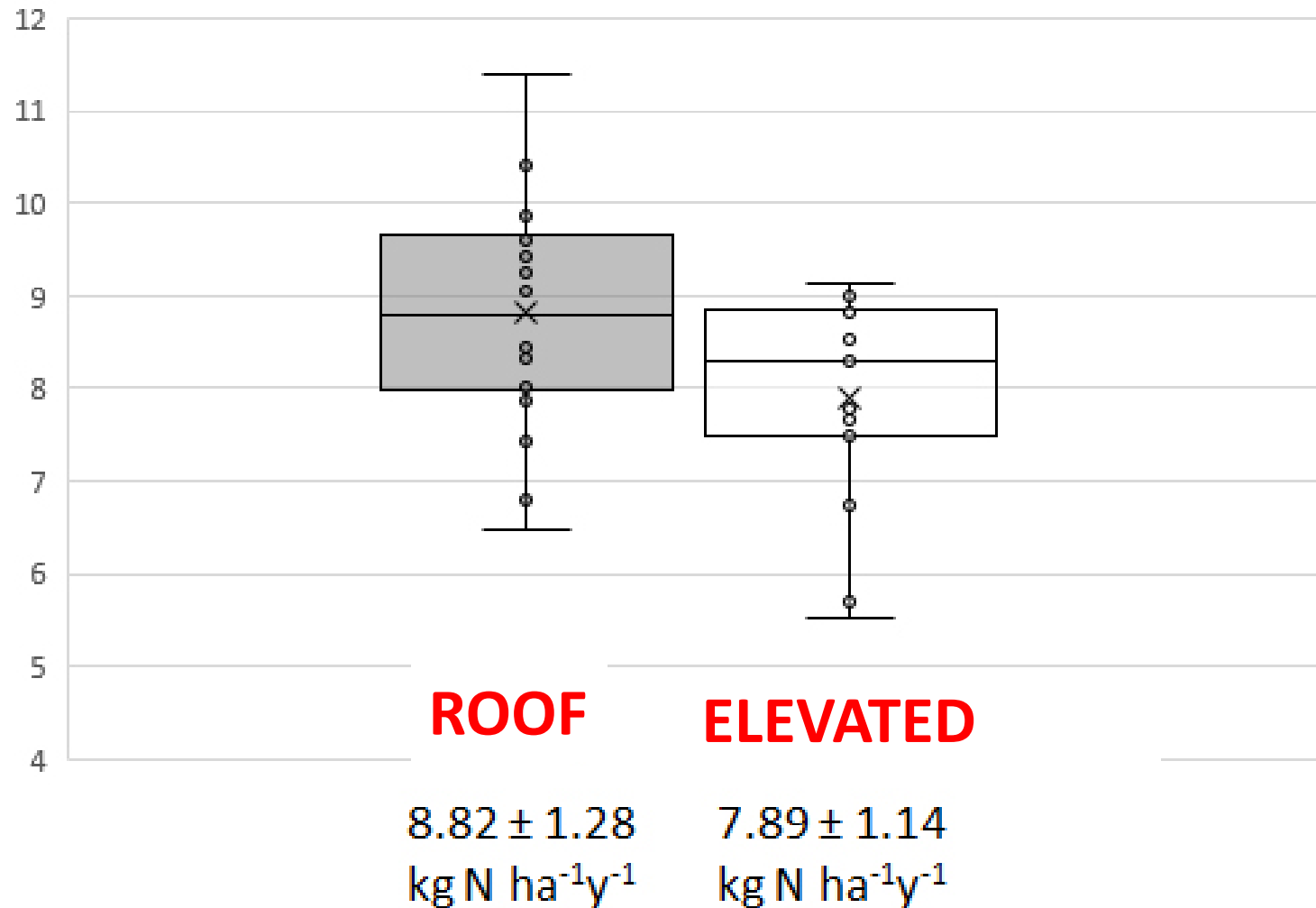
Total Annual N Deposition: Filter Effects

Atmospheric Bulk N Deposition
with v.s. without filter
(kg N ha⁻¹y⁻¹, 8/29 2015 - 2016)



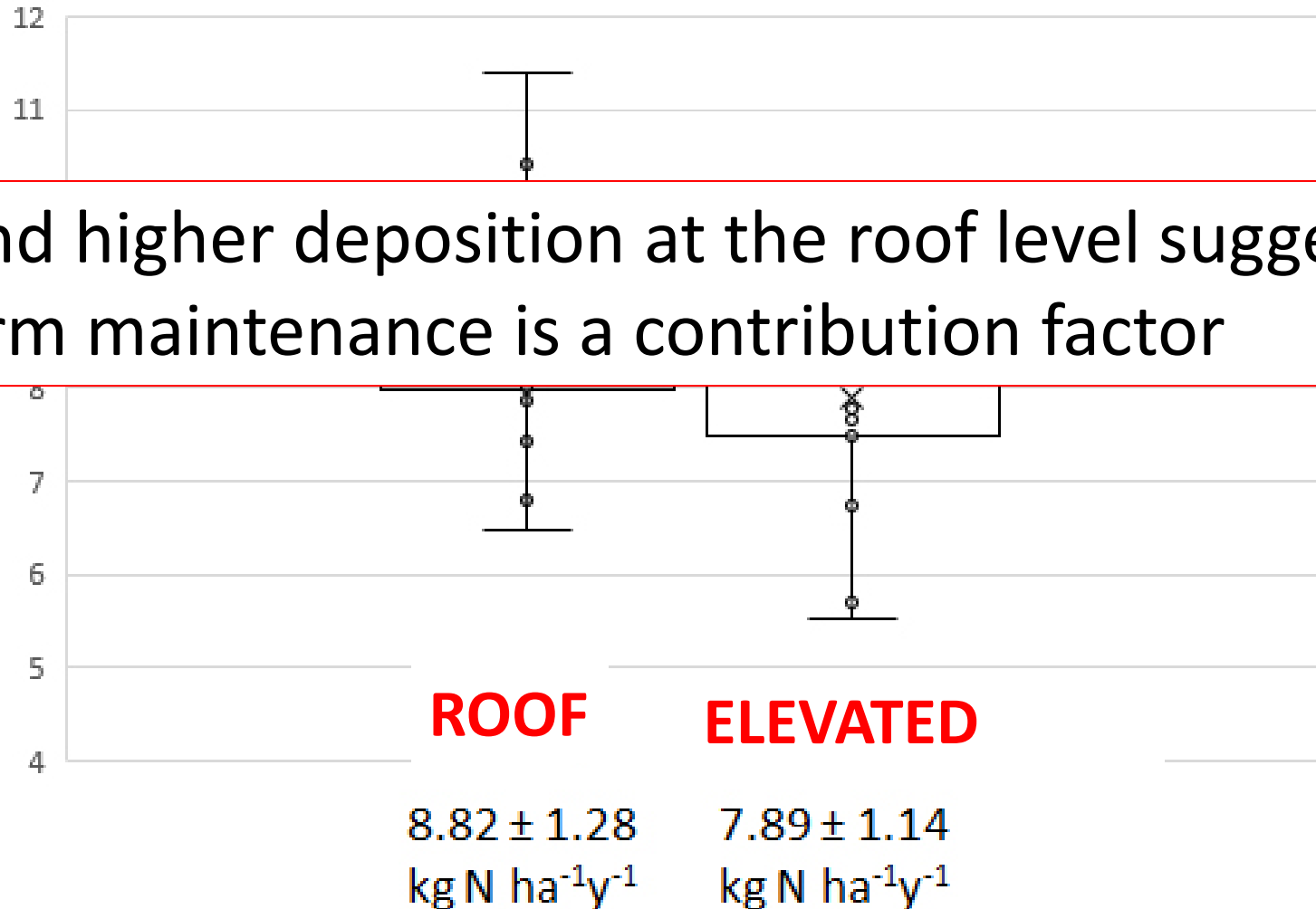
Total Annual N Deposition: Elevation Effects

Atmospheric Bulk N Deposition
rooftop v.s. on top of structure
(kg N ha⁻¹y⁻¹, 8/29 2015 - 2016)



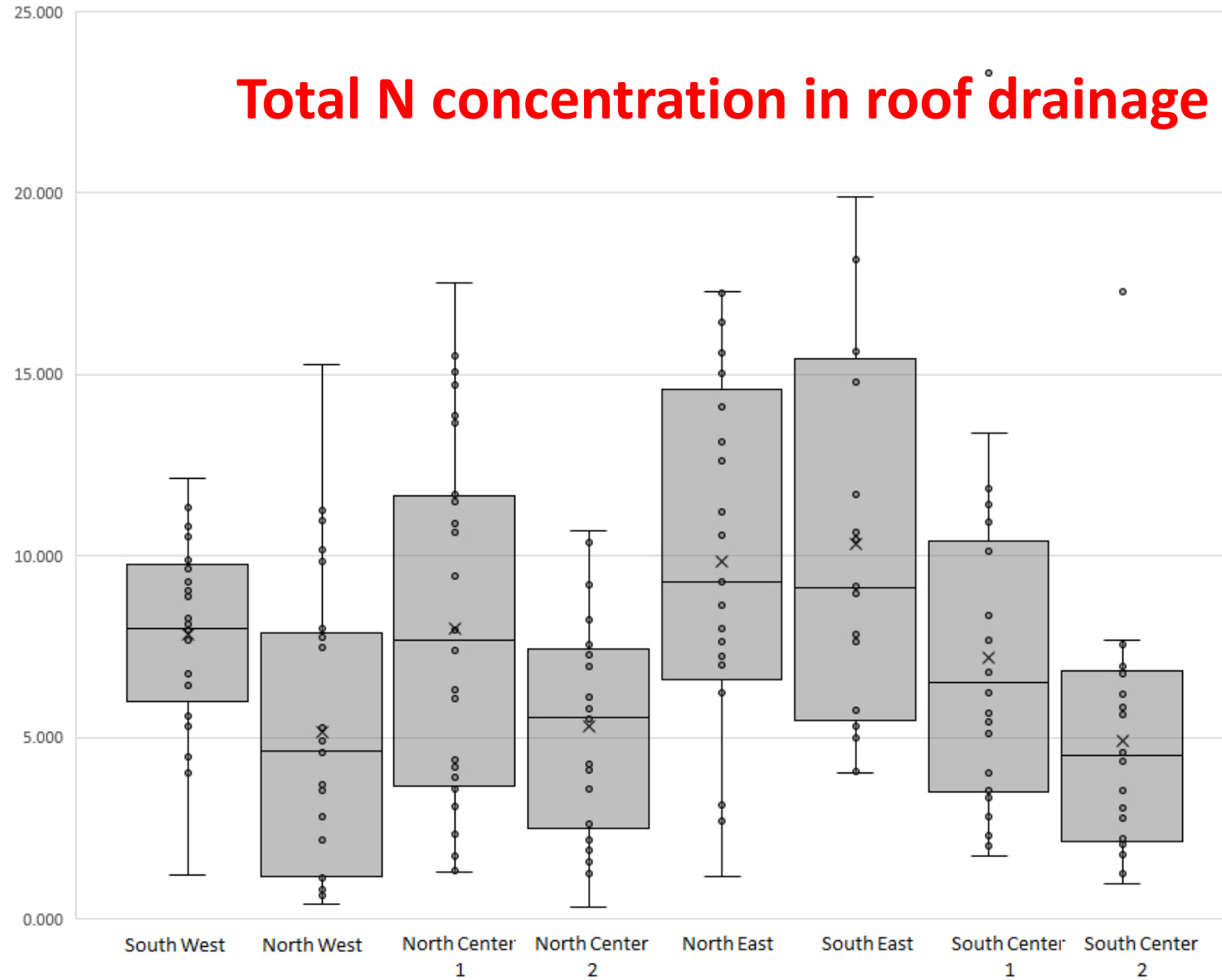
Total Annual N Deposition: Elevation Effects

Atmospheric Bulk N Deposition
rooftop v.s. on top of structure
(kg N ha⁻¹y⁻¹, 8/29 2015 - 2016)



In terms of critical loads, the concentrations and total mass of N leaving the farm via storm sewers and then entering surface water is an important variable to consider.

Comparison of DIN Concentration in 8 Roof Drains
(NO₃, NH₄-N mg / liter)

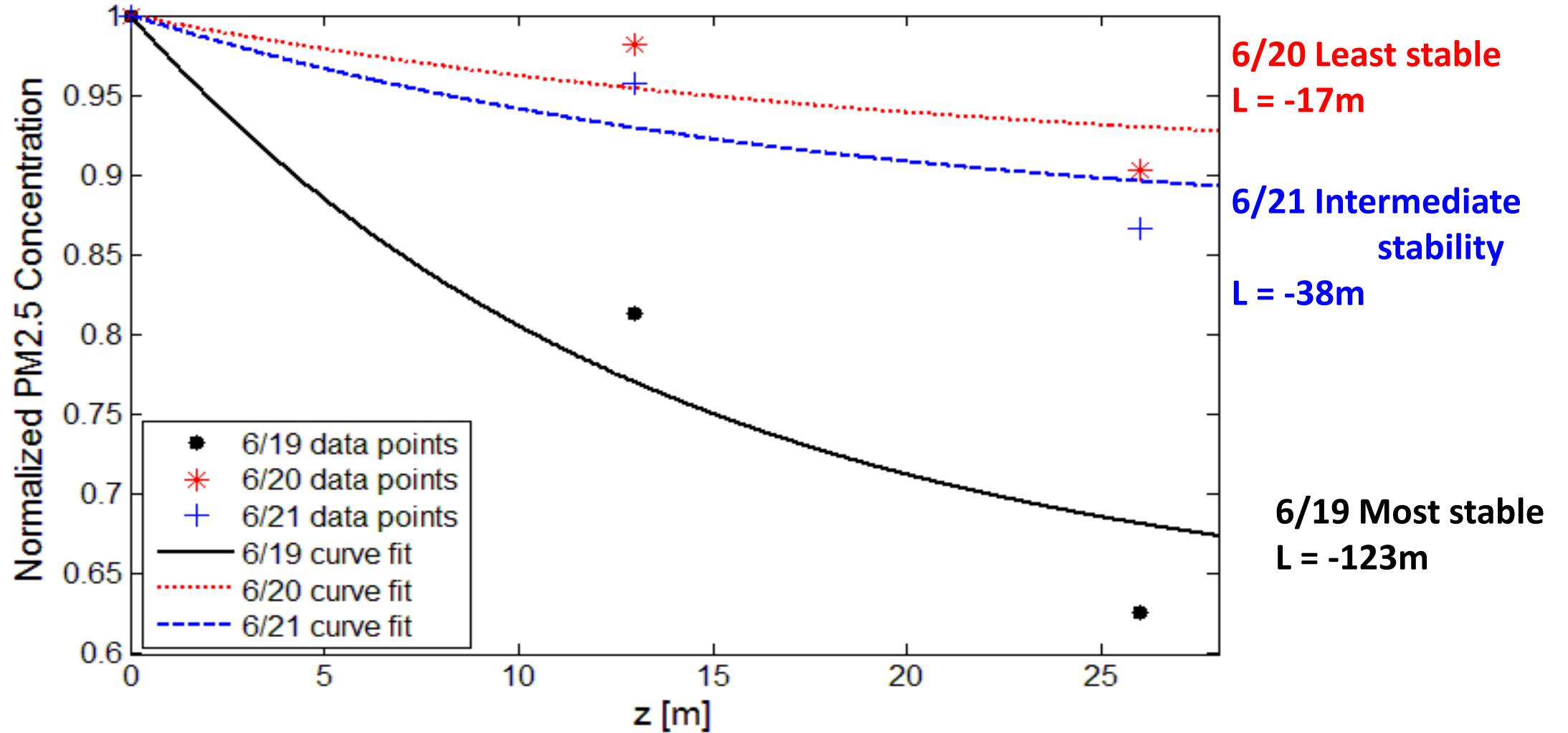


How do rooftop measurements compare with ground level measurements?

Height Affects PM2.5

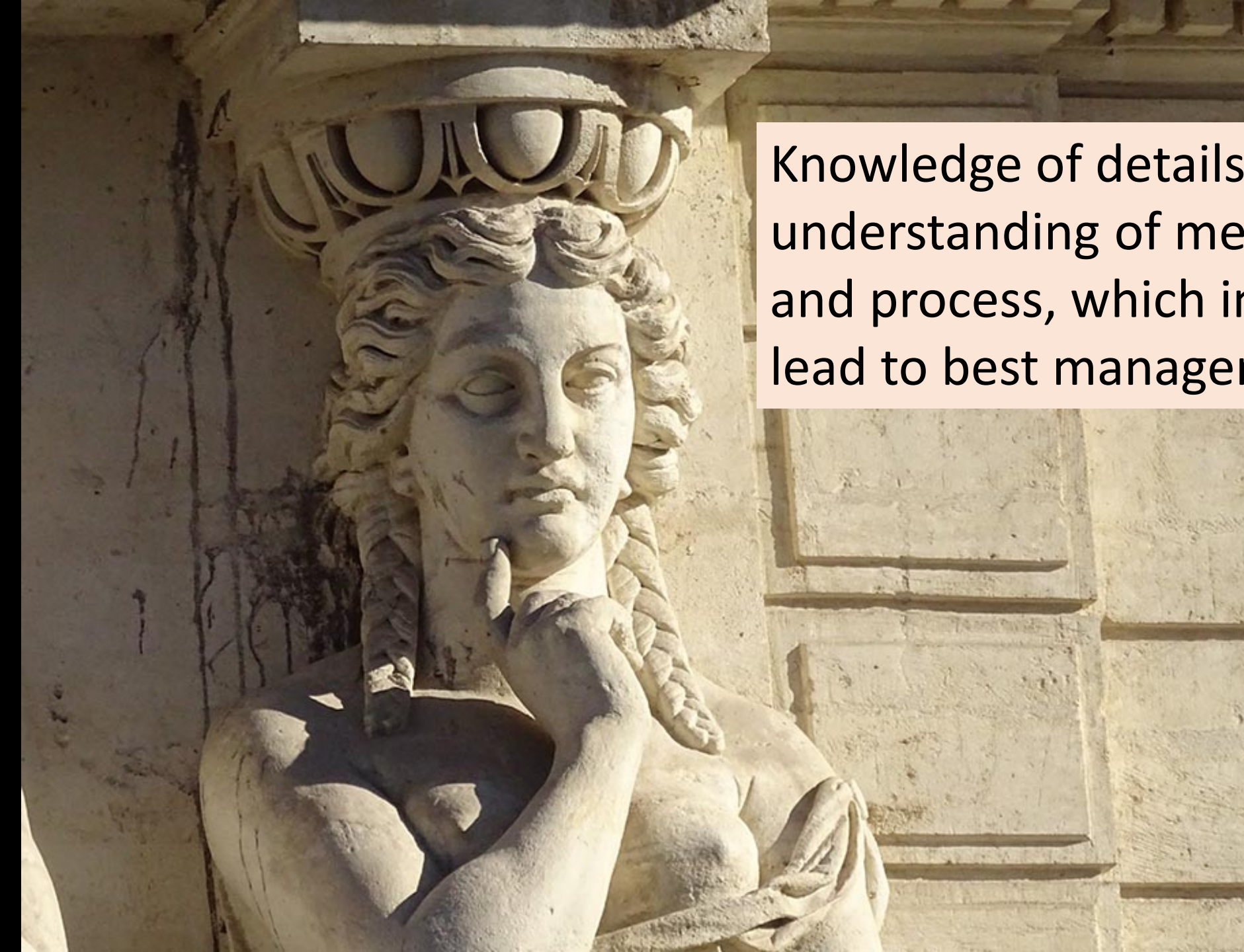
Concentration declines with height

Stable atmospheric conditions increase rate of decline



*The devil lurks in the details
so should we ignore them?*



A classical stone sculpture of a woman, likely a personification of a virtue or deity, with a crown and braided hair, resting her chin on her hand in a contemplative pose. The sculpture is set against a background of a classical architectural wall with rectangular panels.

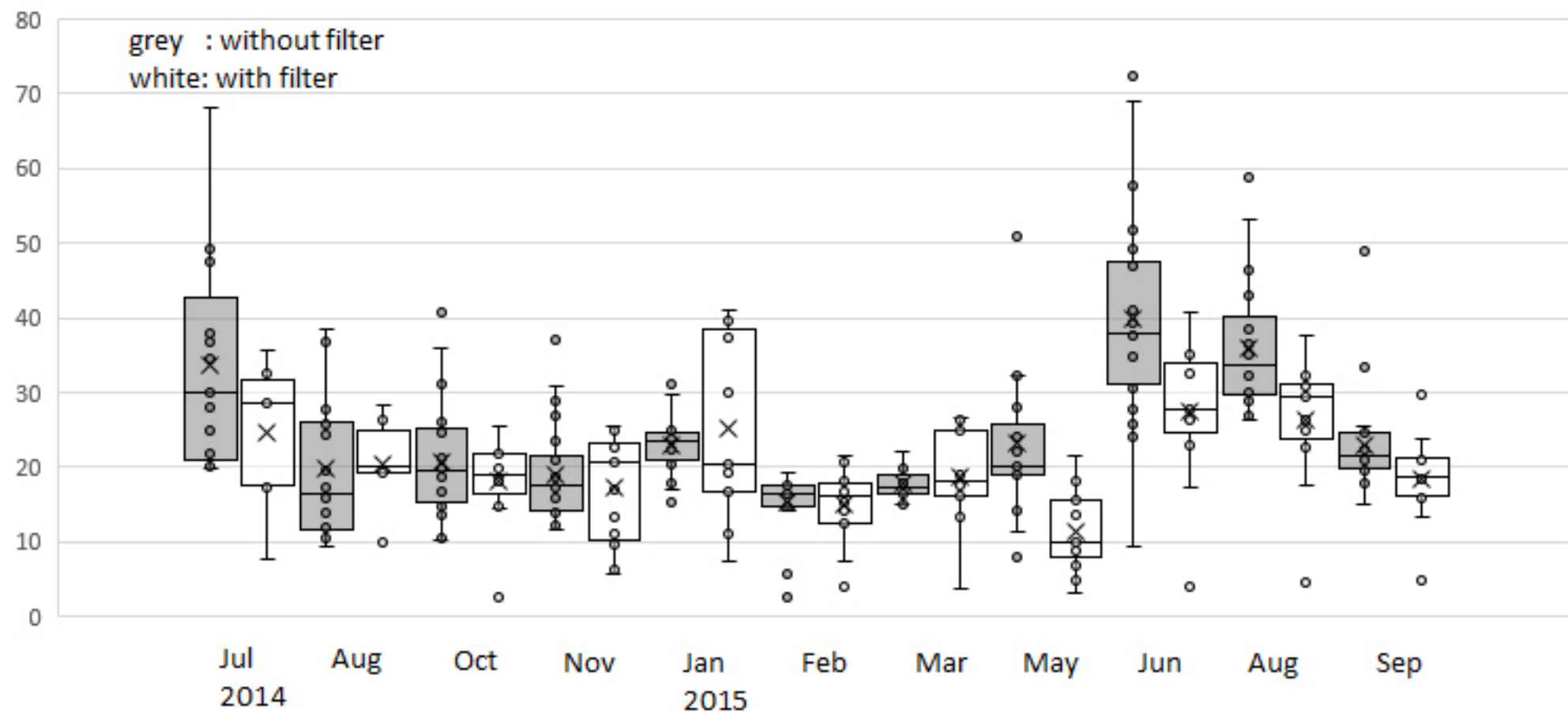
Knowledge of details increases understanding of mechanism and process, which in turn can lead to best management practices



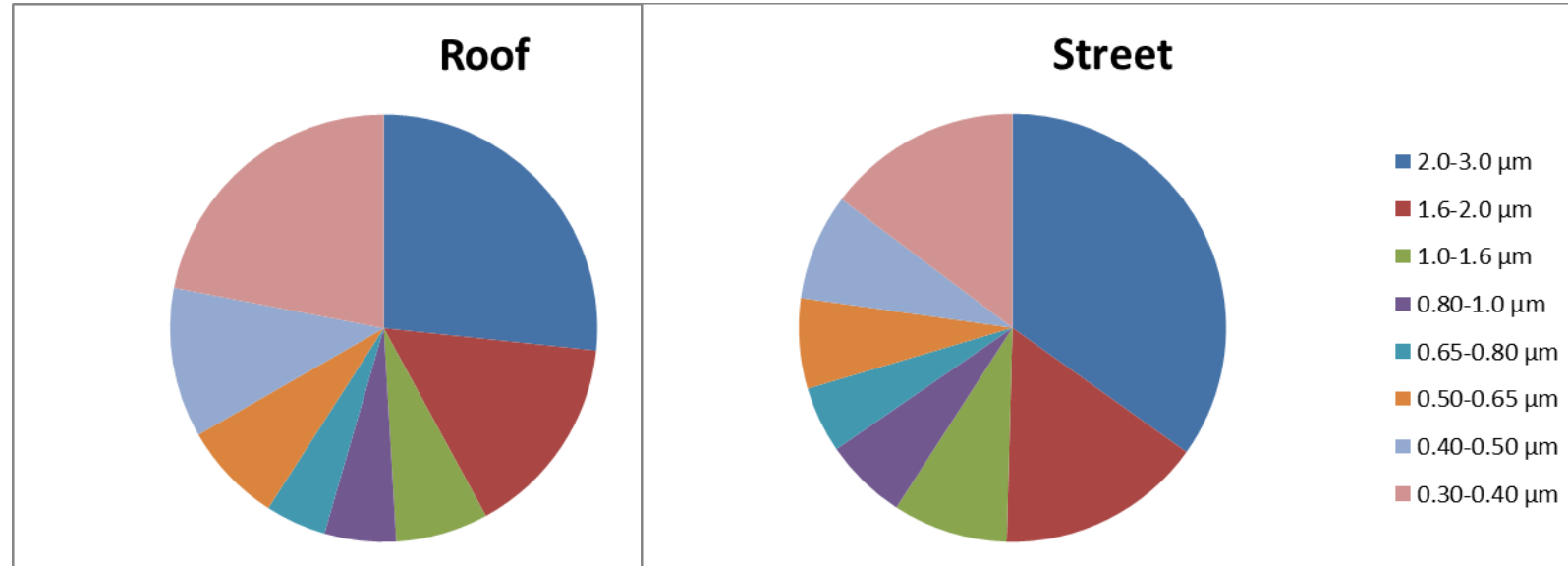
Which sampler location (roof or elevated) gives the most useful estimate of N deposition?

Can the difference between samplers with filters and samplers without filters be used as an estimate of dry deposition?

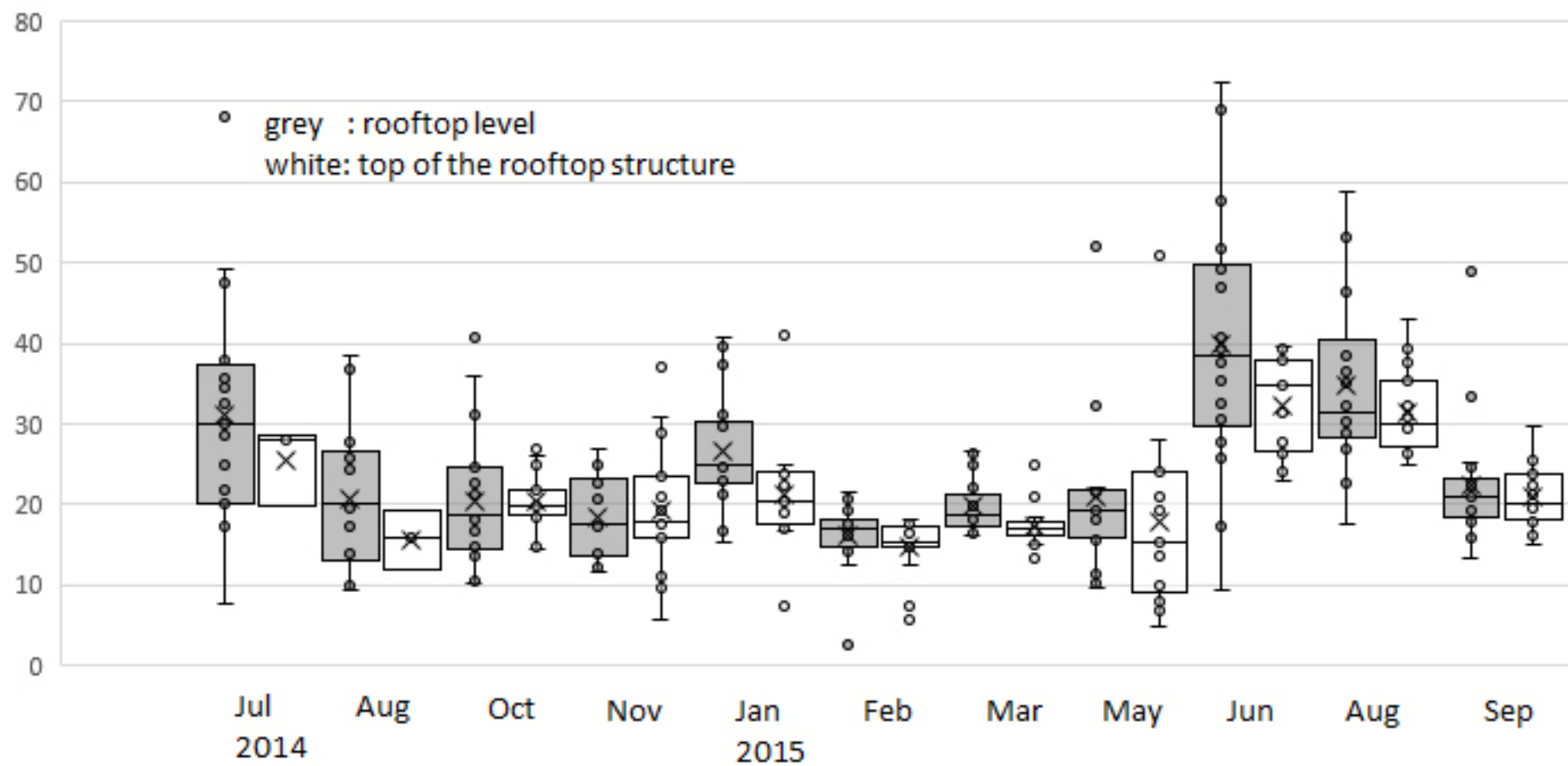
Atmospheric Bulk Deposition with v.s. without filter (N g / ha⁻¹ d⁻¹)



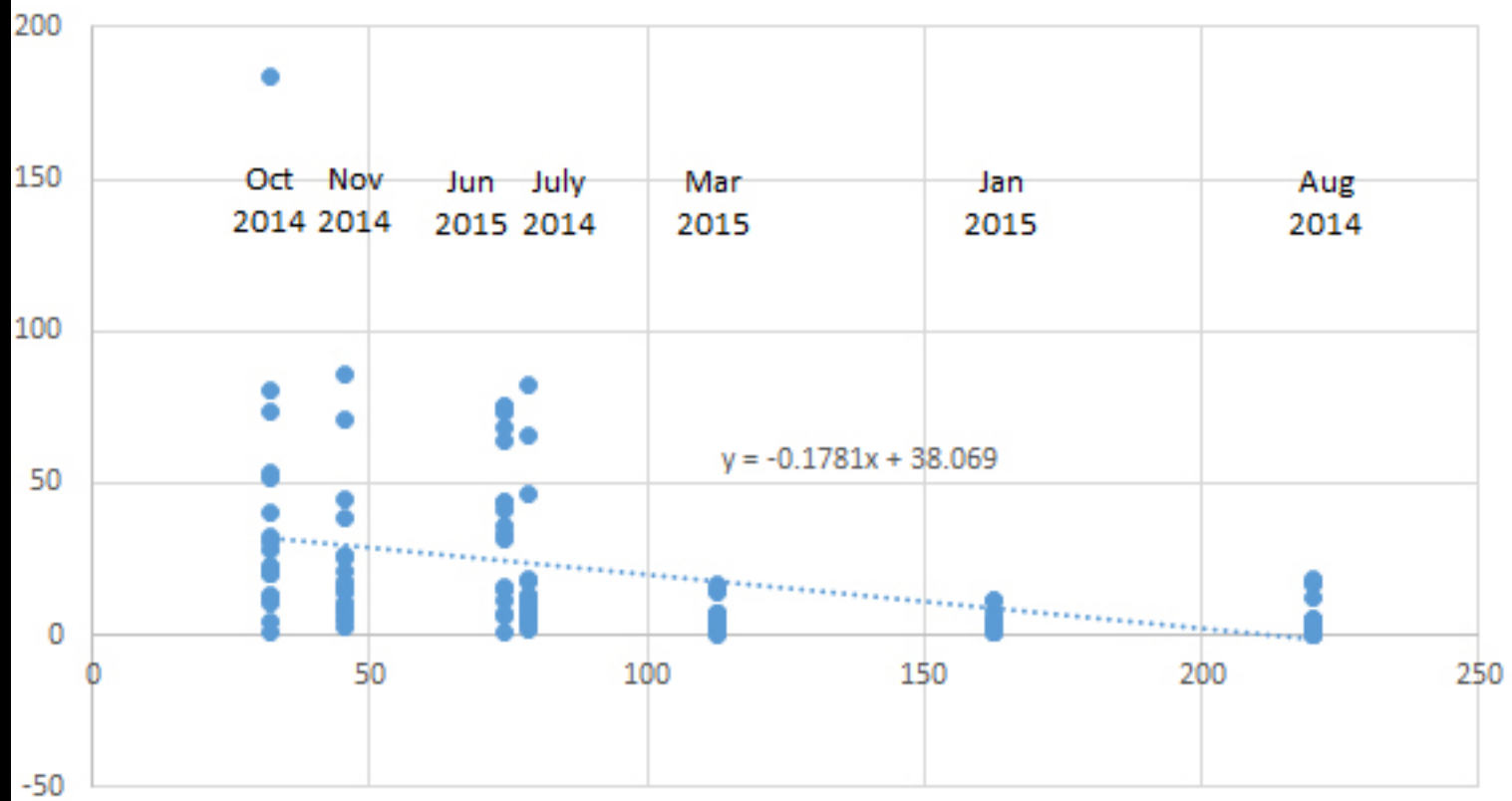
Proportion of each particle size class



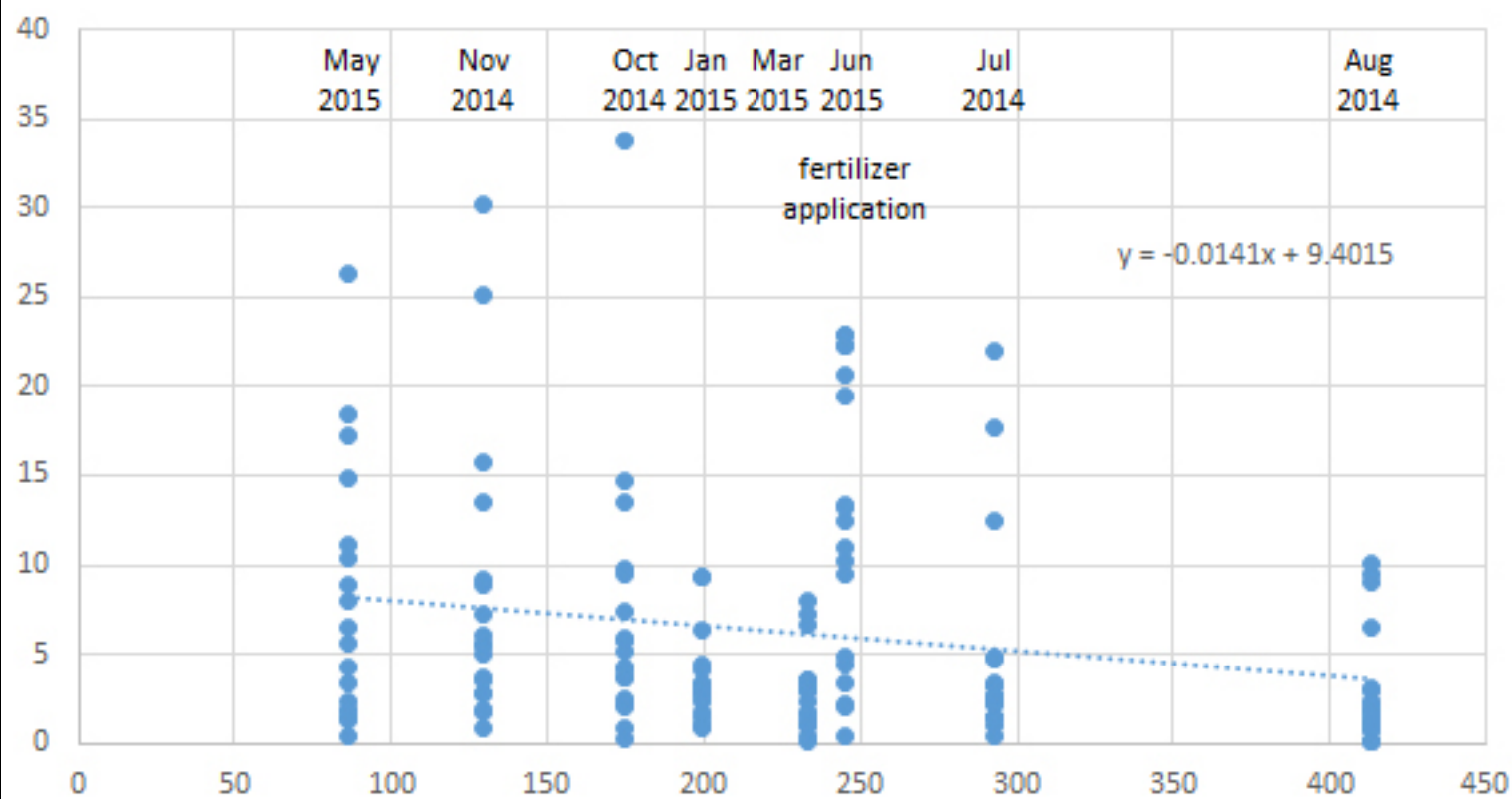
Atmospheric Bulk Deposition rooftop v.s. structure (N g / ha⁻¹ d⁻¹)

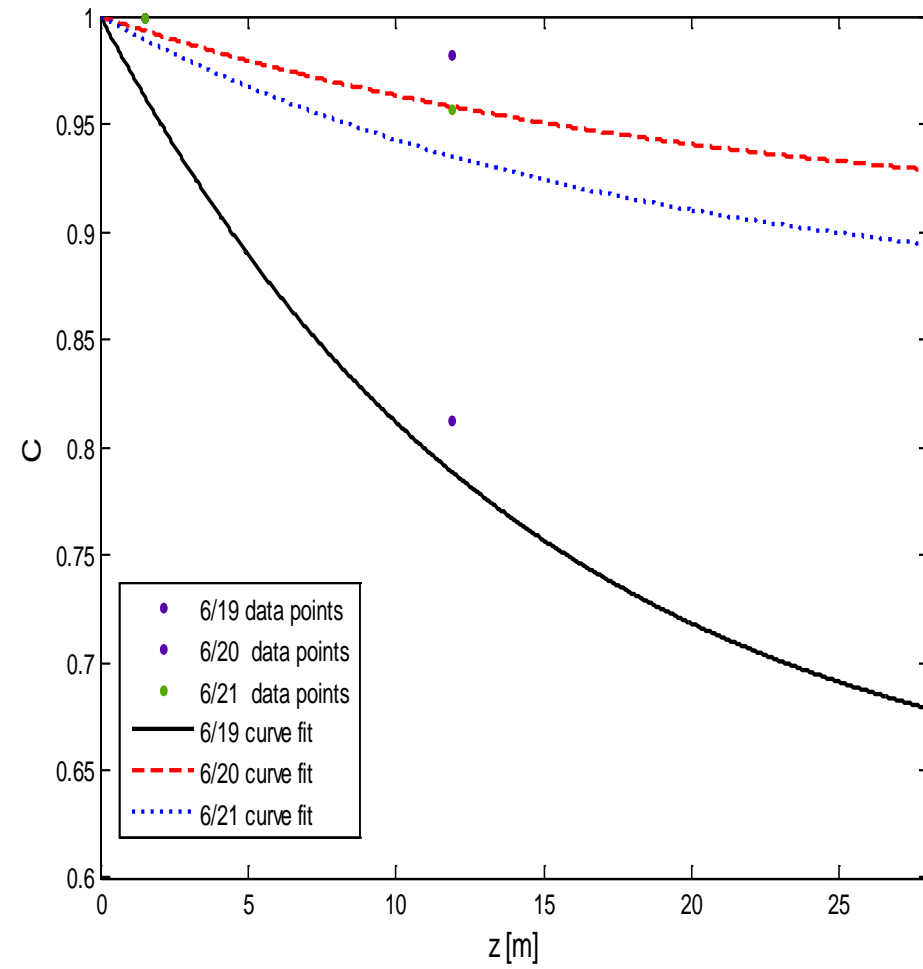


Water Input (Precipitation + Irrigation - ET, mm)
and
DIN Concentration (mg NO₃, NO₄-N / liter)



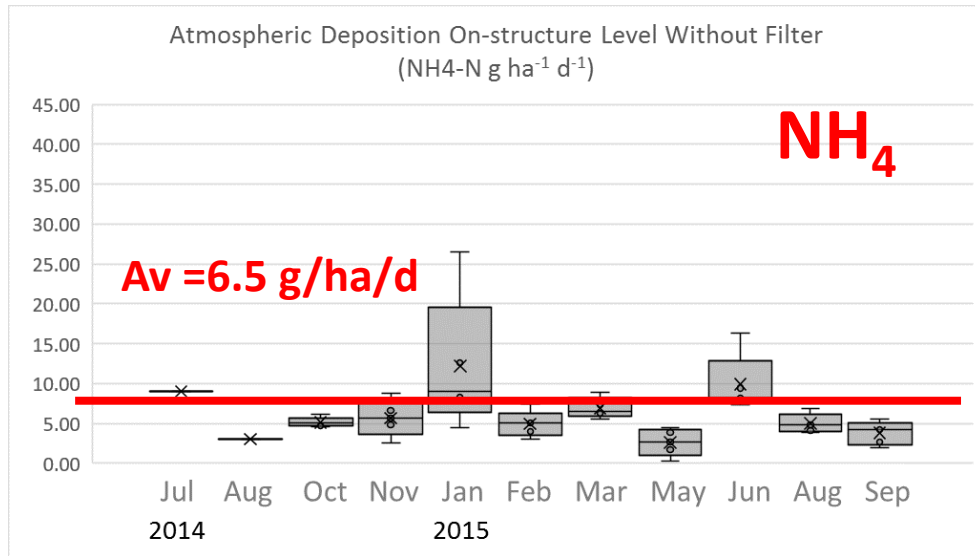
Water Input (Precipitation + Irrigation, mm)
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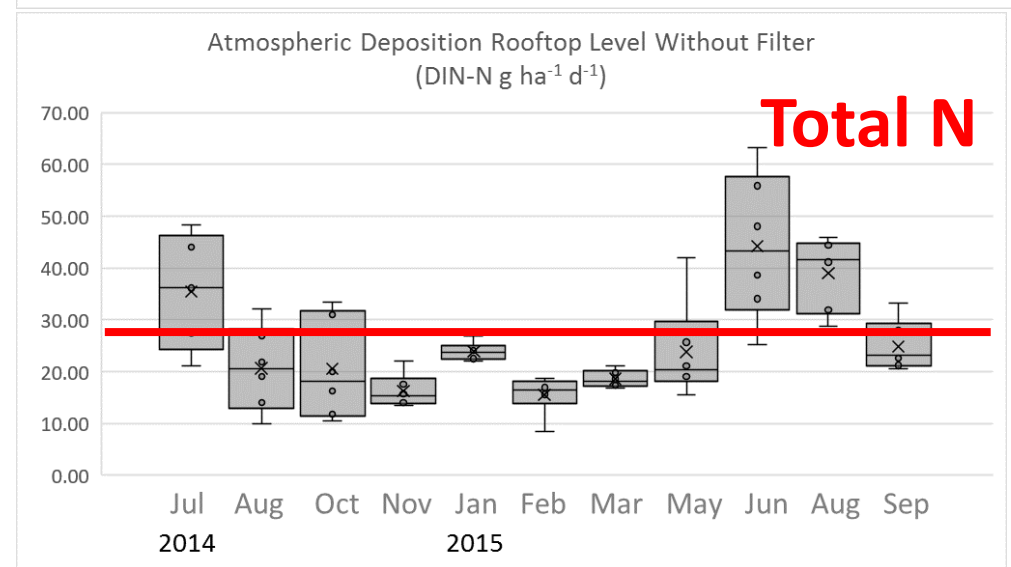
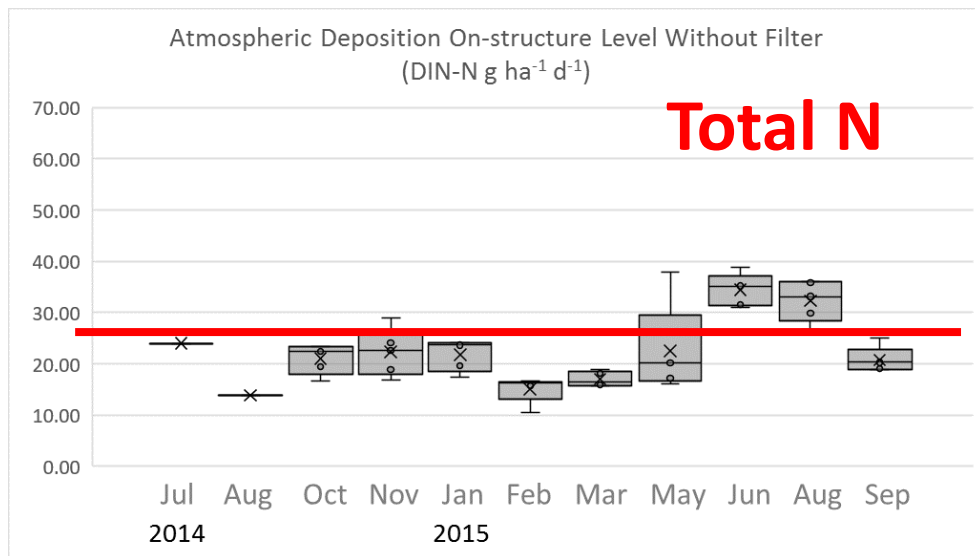
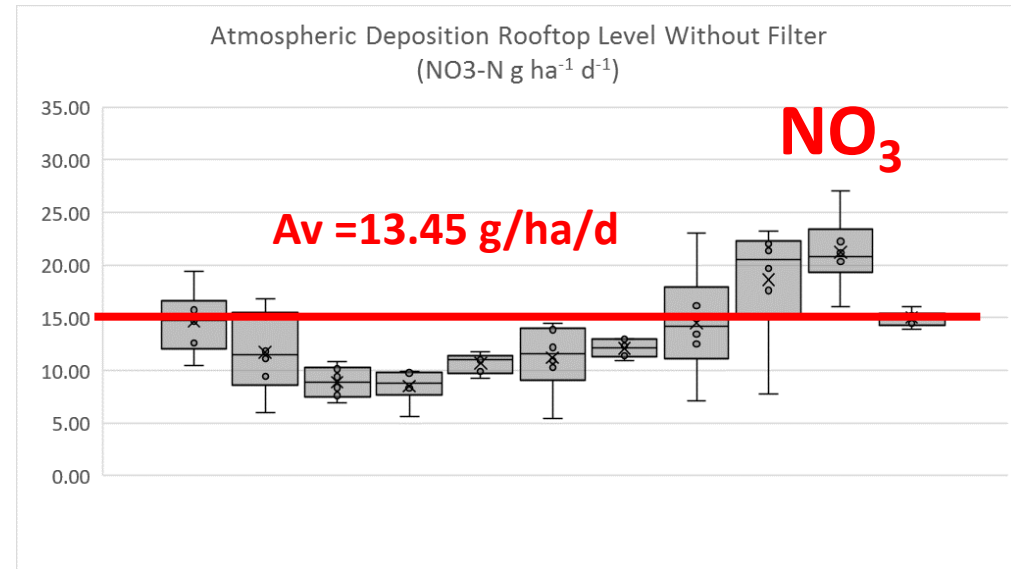


Roof > Elevated, $\text{NO}_3 > \text{NH}_4$

Elevated

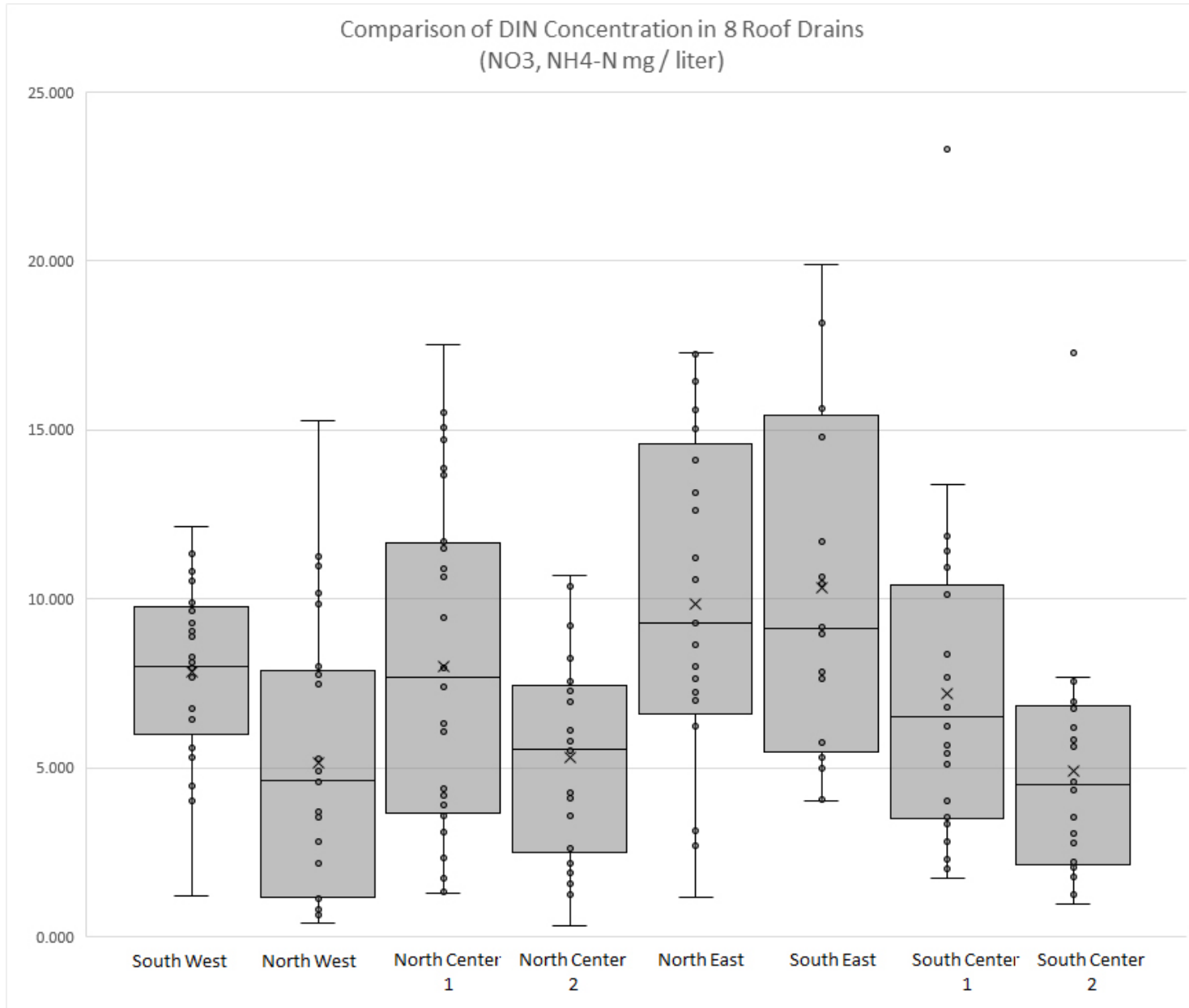


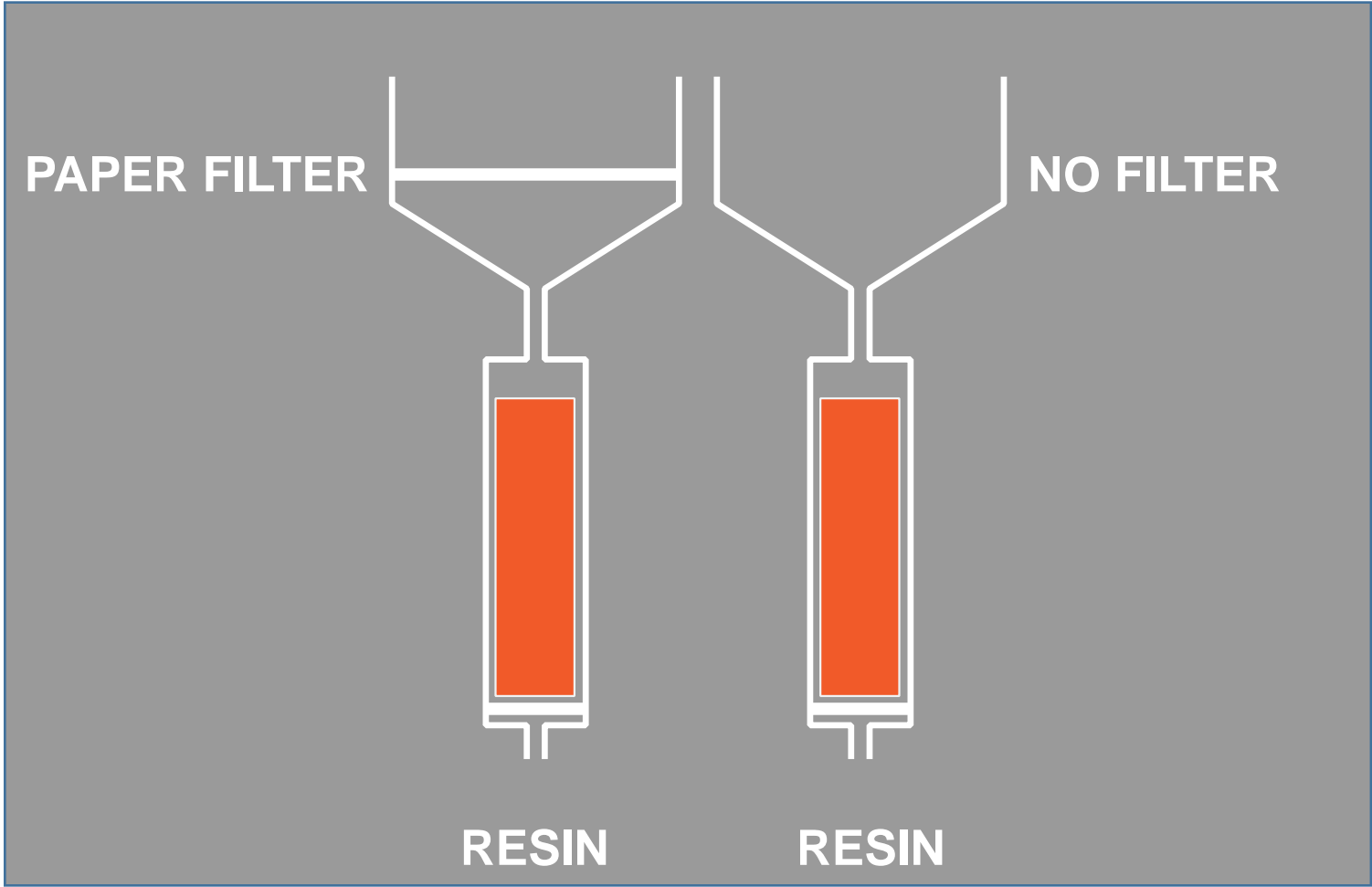
Roof





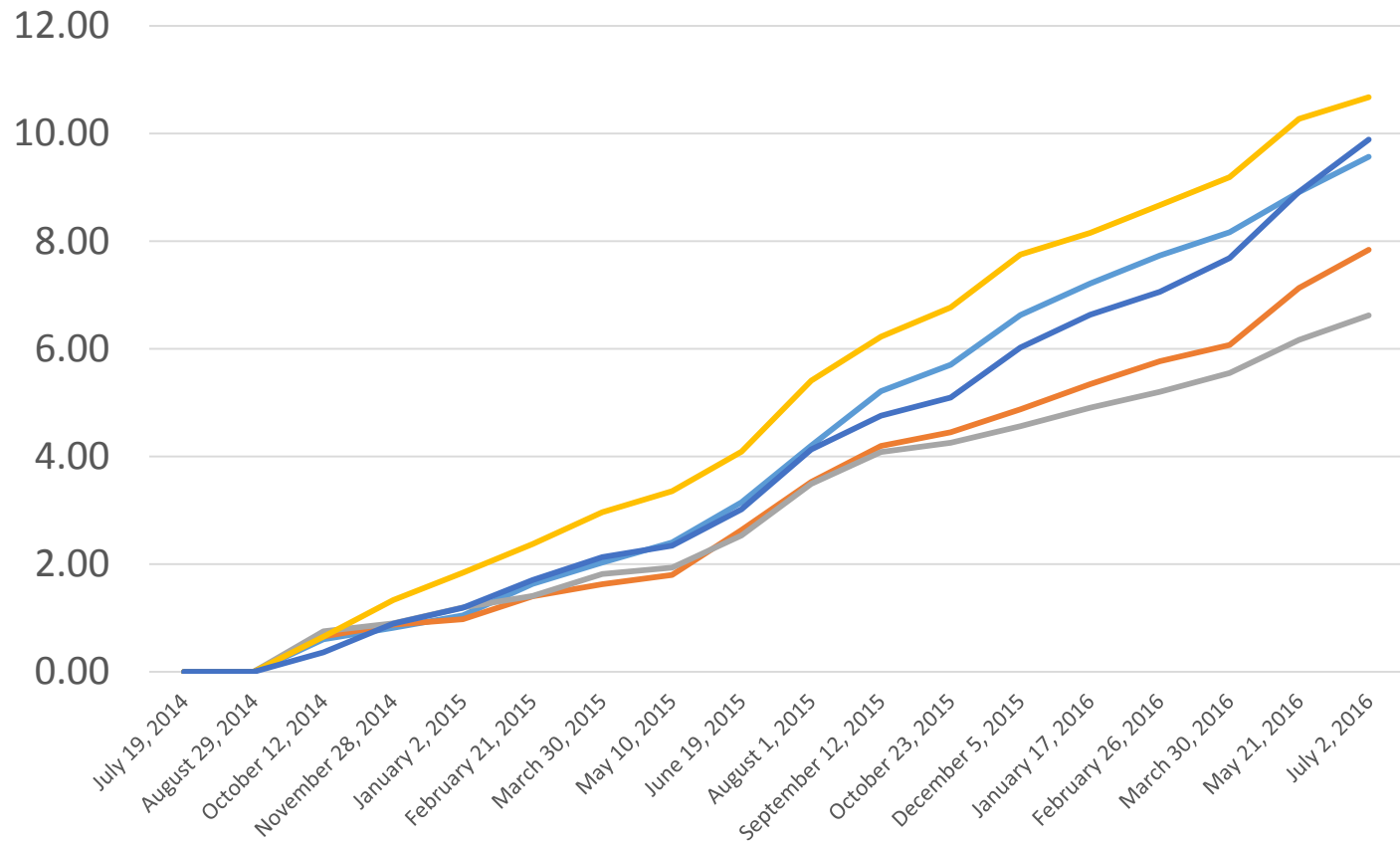
Spatial Hotspots: Roof Drains



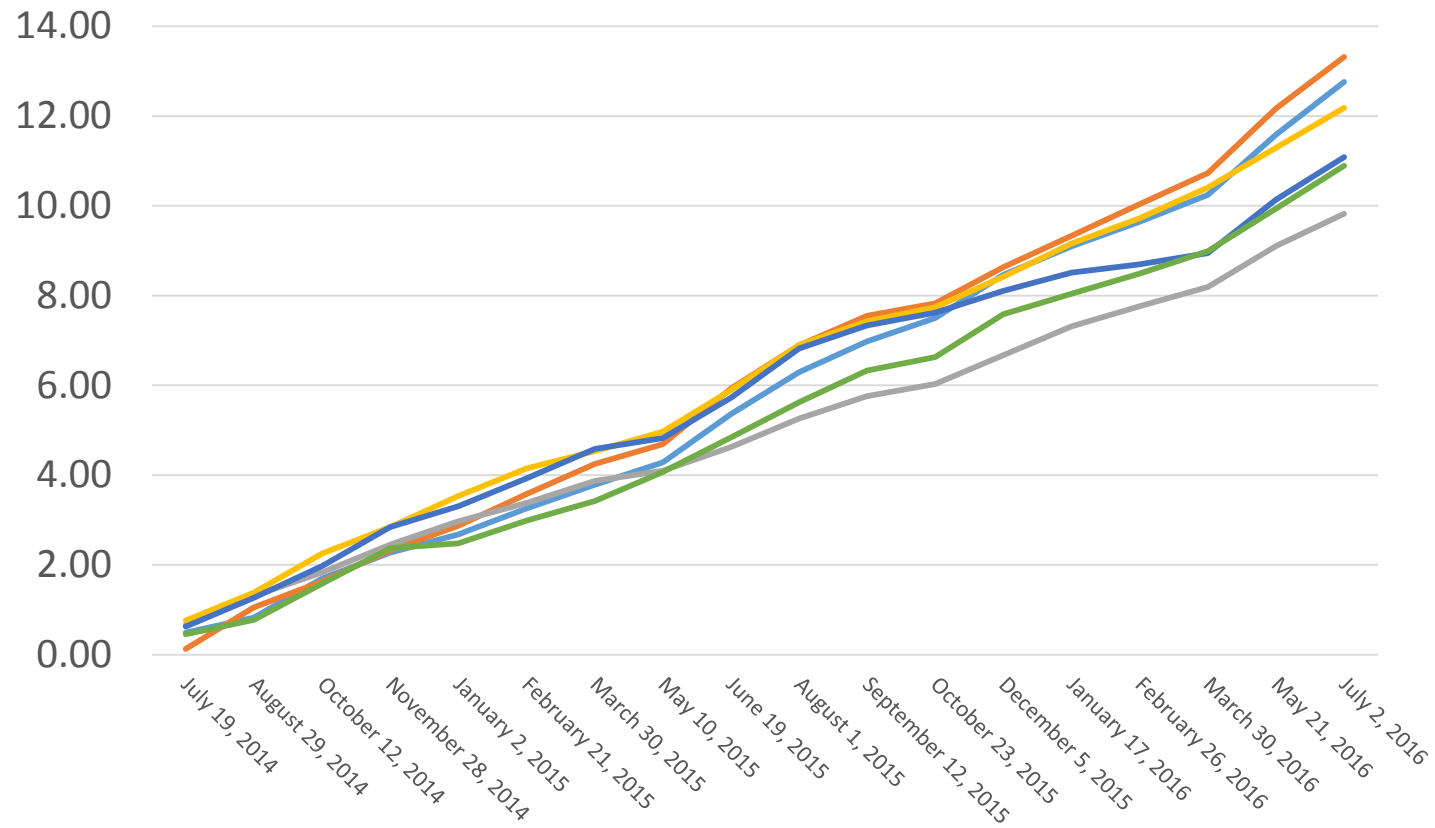


NO₃-N Atmospheric Bulk Deposition (On-structure Level, With Filter)

NO₃-N g ha⁻¹ d⁻¹

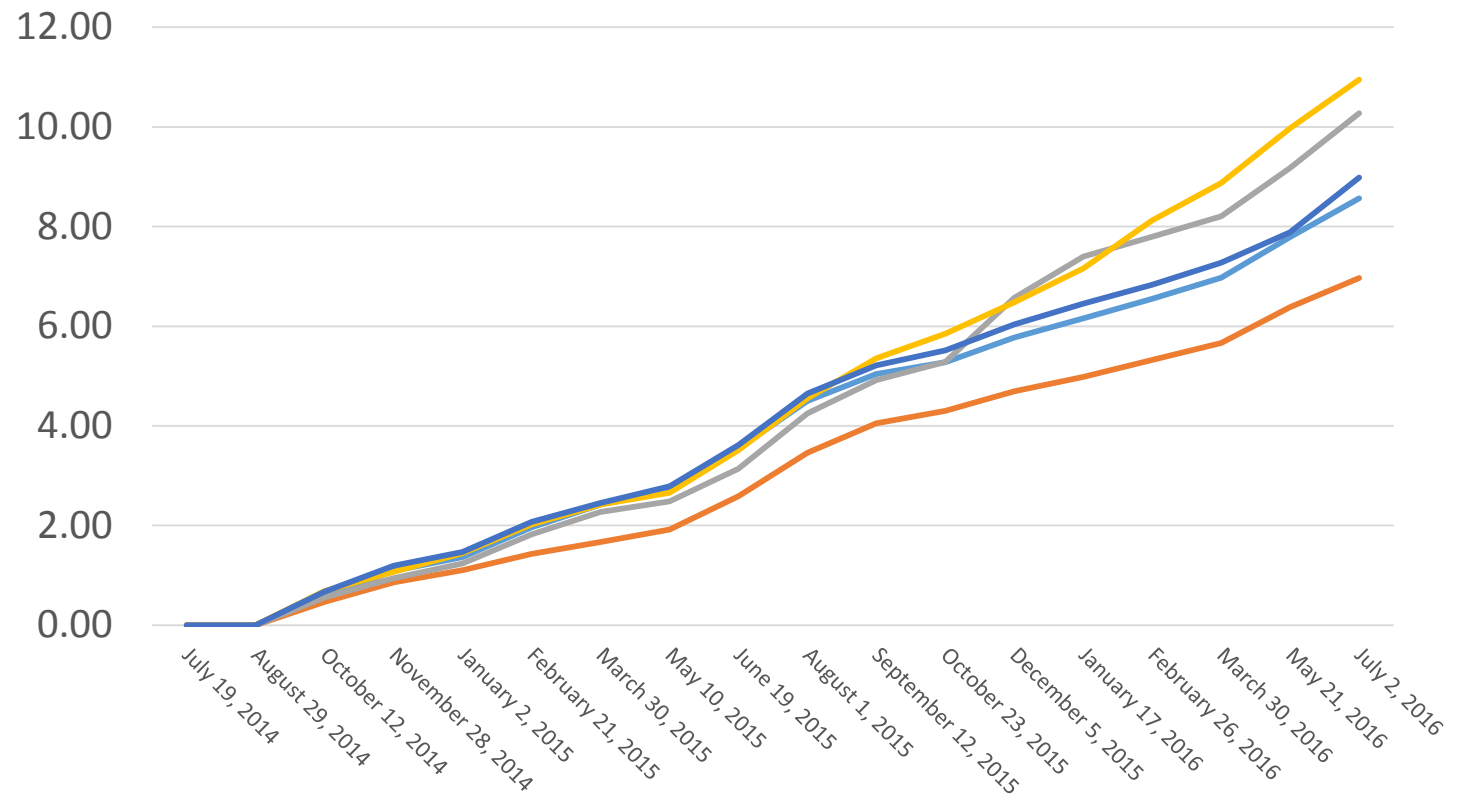


NO₃-N Atmospheric Bulk Deposition (Rooftop Level, With Filter) NO₃-N g ha⁻¹ d⁻¹



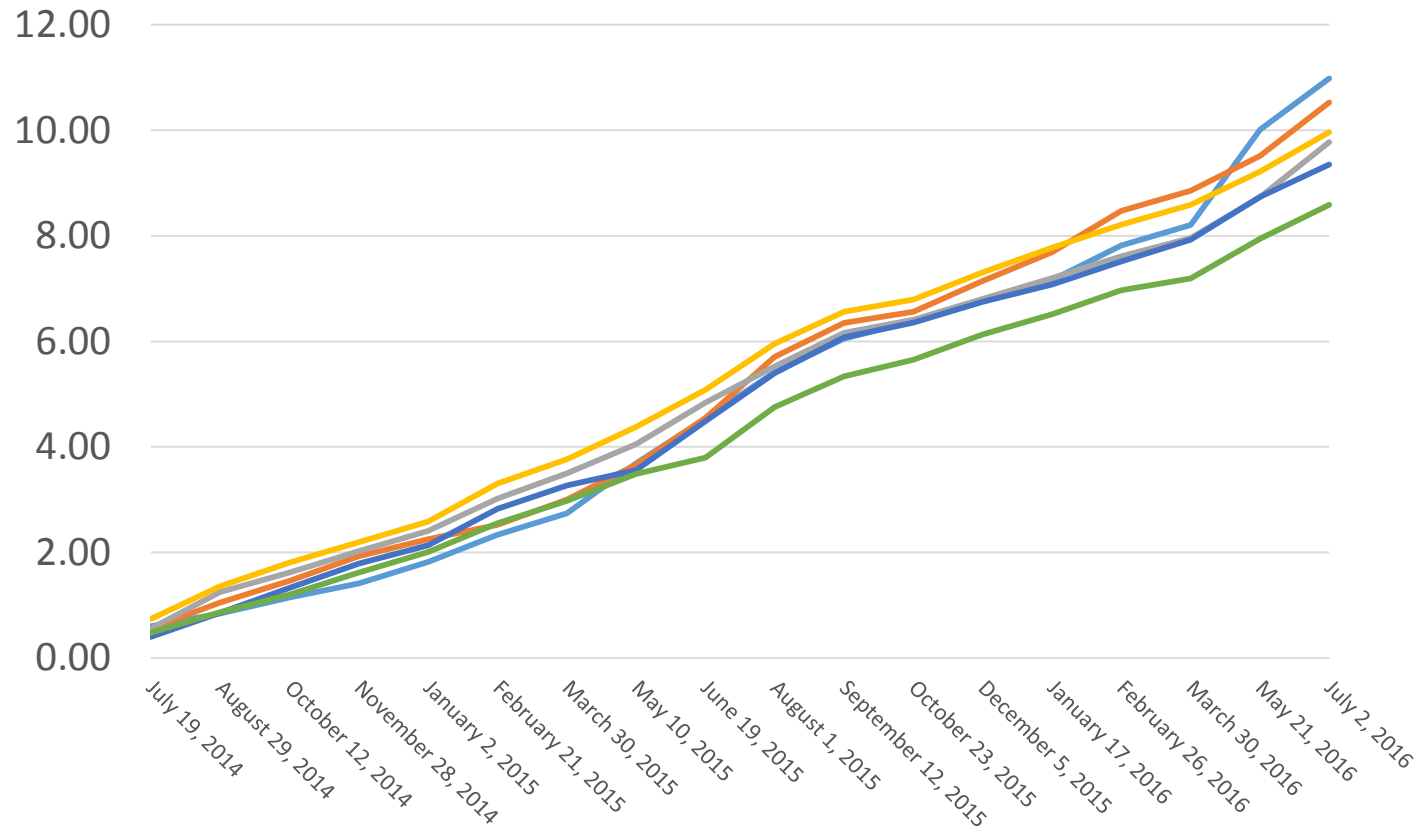
NO₃-N Atmospheric Bulk Deposition (On-structure Level, Without Filter)

NO₃-N g ha⁻¹ d⁻¹



NO₃-N Atmospheric Bulk Deposition (Rooftop Level, Without Filter)

NO₃-N g ha⁻¹ d⁻¹





SOIL RESIN BAG





Creating a Sub-Network of NADP Monitoring Stations in Urban Centers: Test Cases in NYC and Boston

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Lucy Hutyra¹, Steve Decina¹, and Yoshi Harada²









Comparison of DIN Concentration in 8 Roof Drains
(NO₃, NH₄-N mg / liter)

