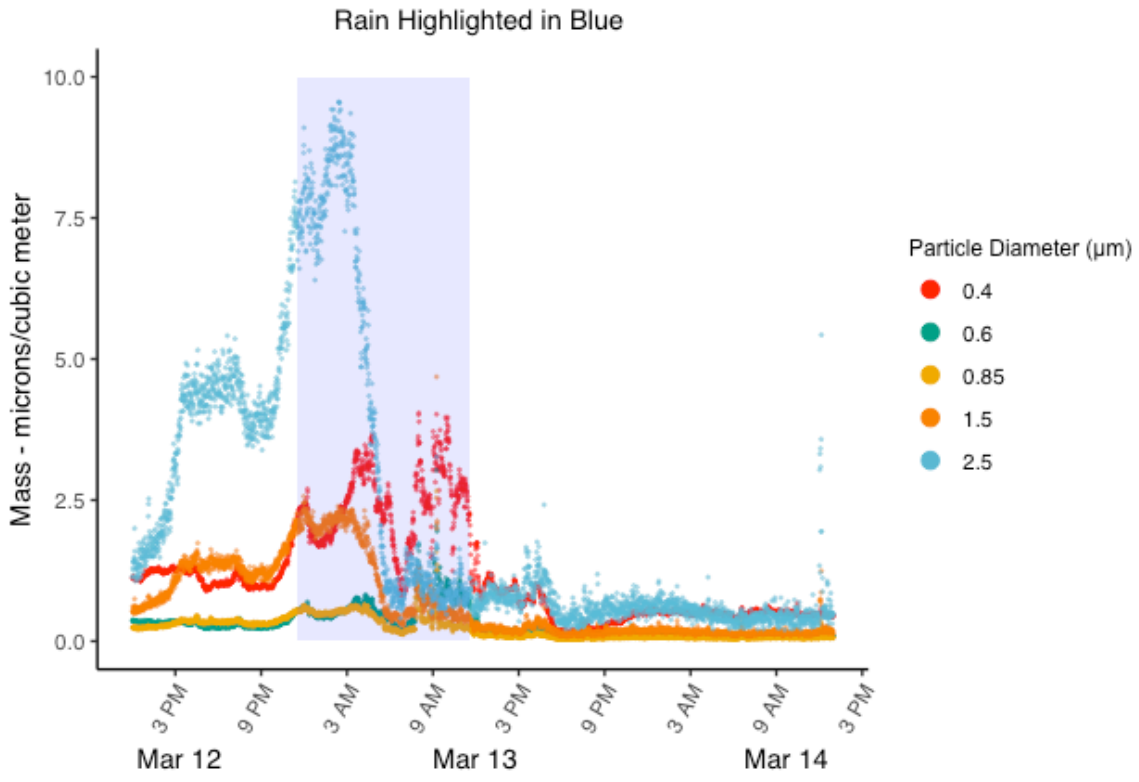
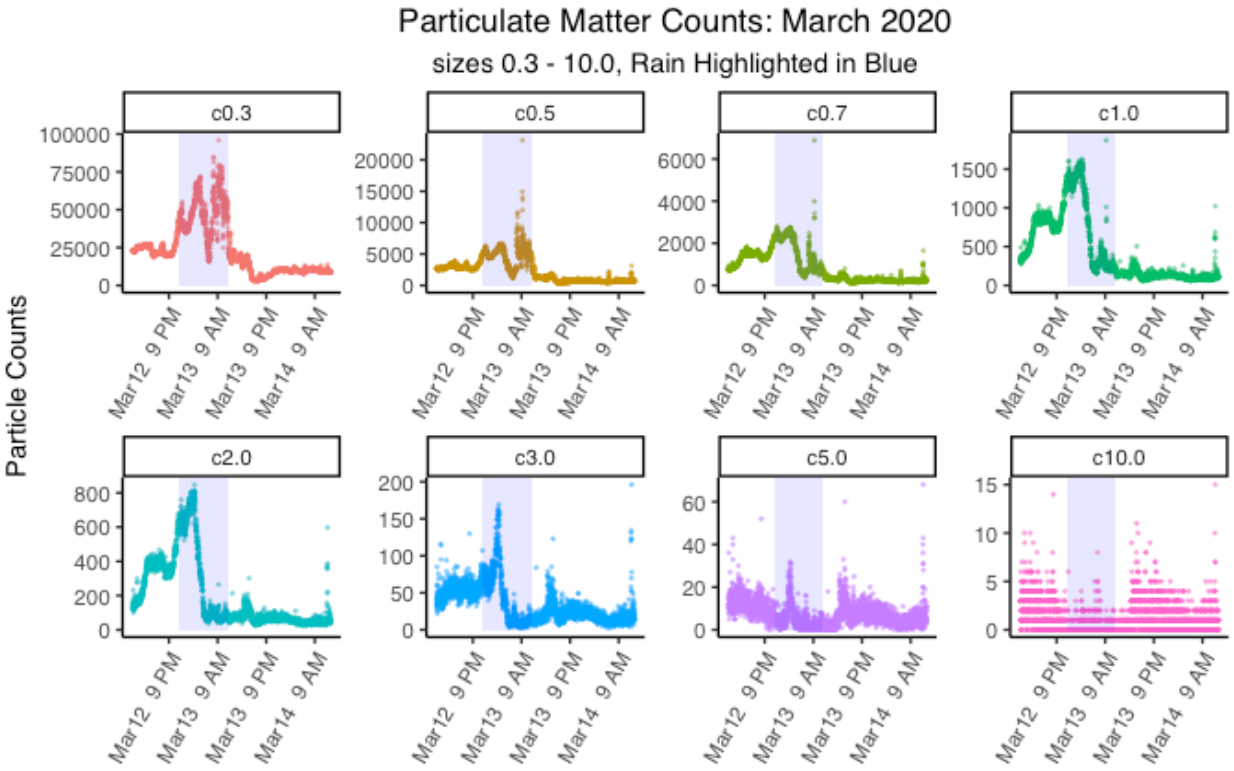
Bard

Data from the Center for the Study of Land, Air, and Water at Bard College
Air Quality Research in Kingston, New York
Dataset 2

General Trends: Rain

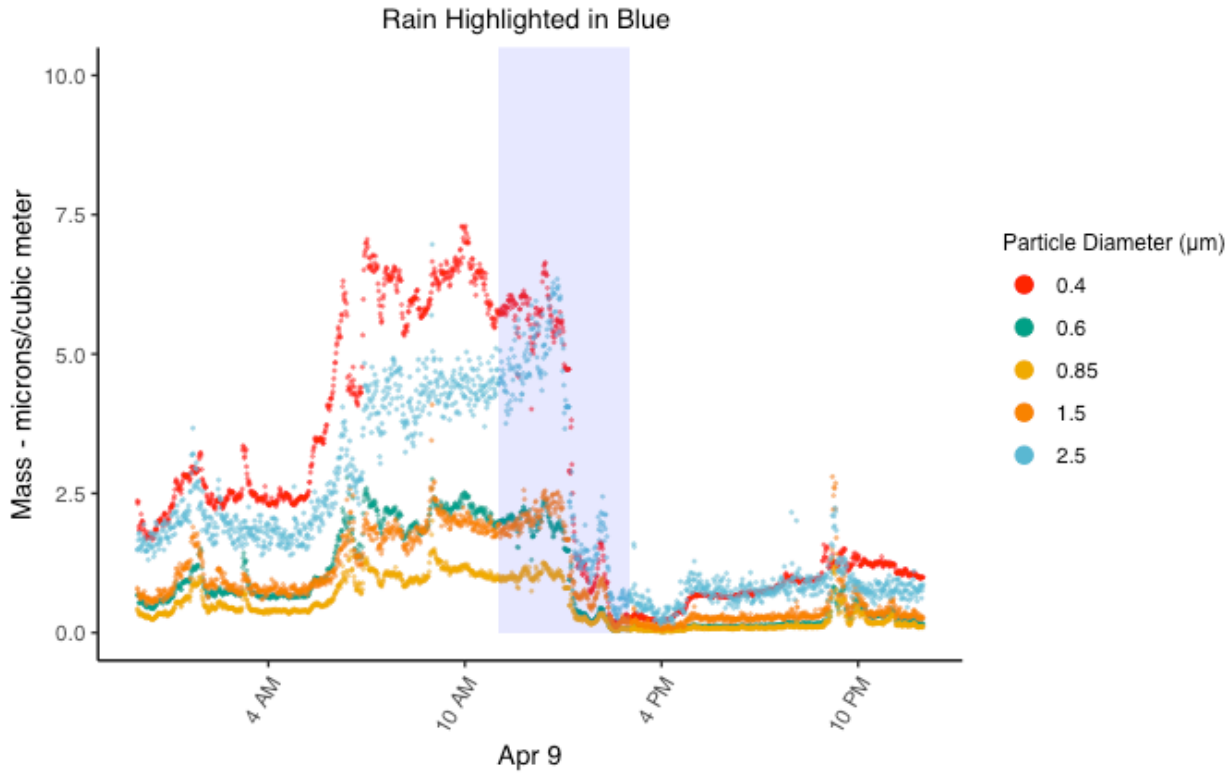


Particulate matter is a sensitive measurement. It retains high susceptibility to change as a function of many other variables. Meteorological patterns are incredibly important when monitoring particulates, with temperature, relative humidity, wind speed, wind direction, and rainfall among the most important parameters. Rainfall, for example, is known to reduce the presence of airborne particulates through a process known as washing. Ouyang et al., 2015 found that washing can reduce the presence of PM2.5 between 10-30 μg/m³ with just 5mm of rainfall. Other studies, however, have documented different phenomena. Sun et al., 2019 found that light precipitation (0.1-0.5mm) resulted in increased PM2.5 mass counts, moderate precipitation (0.5-10mm) yielded no discernable correlations, and heavy precipitation (>10mm) resulted in decreased PM2.5 mass counts. They discovered a similar trend with PM10.0, (increased mass counts with precipitation <10mm, and decreased mass counts with precipitation >10mm). Zalakeviciute et al., 2018 found that heavy precipitation (≥9mm) resulted in decreased PM2.5 concentration in denser urban areas, but on city outskirts PM2.5 concentration decreased with precipitation regardless of intensity. The above figure shows mass concentrations for five different particle sizes at our monitoring site from 3pm on March 12, 2020 to 3pm on March 14, 2020. Rain began to fall on the evening of March 12 into the morning of the following day. The rainfall period, highlighted by a blue column, seems to correlate with a significant drop in PM2.5 and PM1.5. The visual trend seems to suggest that the rainfall on this particular day resulted in a washing effect with respect to particulates. See particulate matter over the same period of time with pre-mass-converted data on the below figure for an alternate look at this trend for all of the particle sizes observed.

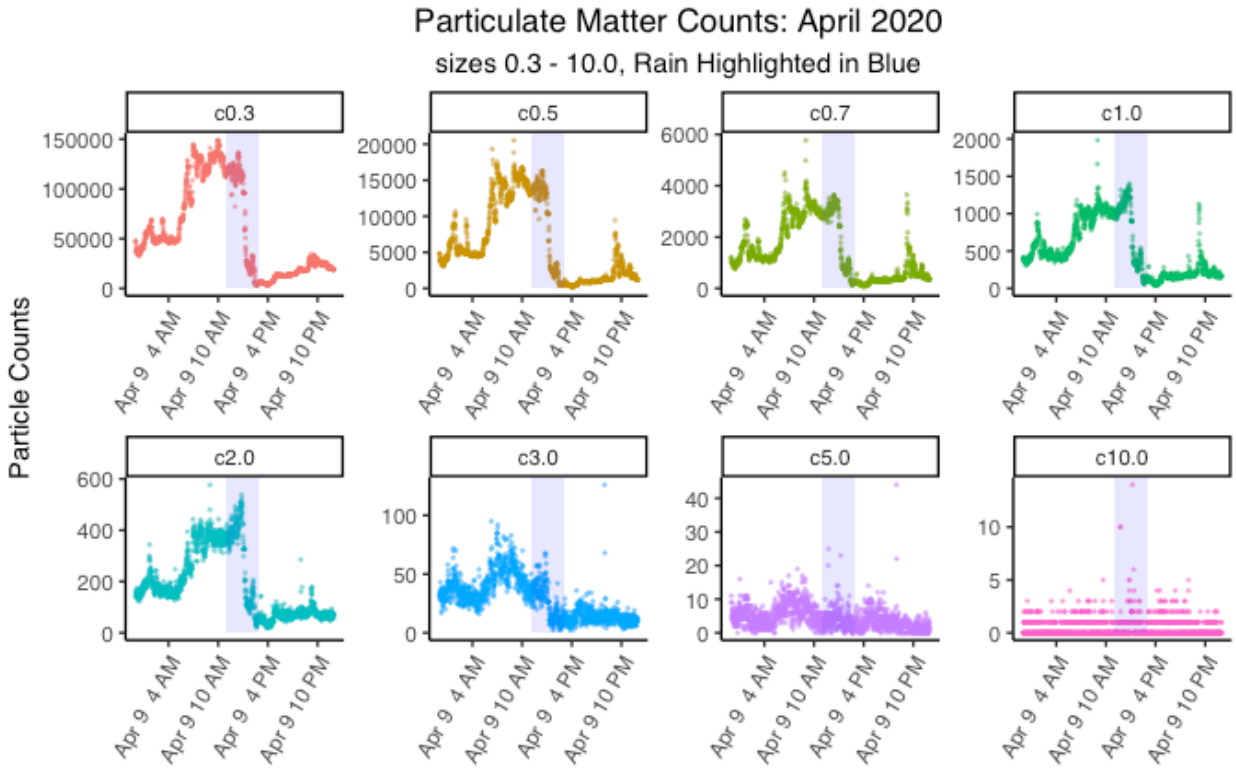


When observing the above figure the washing effect appears strongest among mid-range particle sizes (1-3 µg). Smaller particle sizes (0.3-0.7 µg) appear to have initial decreases in concentration toward the start of the rain event but begin to climb again toward the end of the rain event. Larger particle sizes (0.5-10.0 µg), however, appear to show little to no discernable trend during the rain event.

Spring showers clearly had an effect on our particulate measurements. See the below figure for a look at particulate mass concentrations during another rain event.



And below see the same rain event with pre-mass-converted data for an alternate look at the trend.



The above figures both show evidence of a potential washing event on April 9, this time with the pre-mass-converted data showing a similar trend for all particle size classes smaller than 5 µg.