

Keep Complaining Because Satellites Can't See Underground

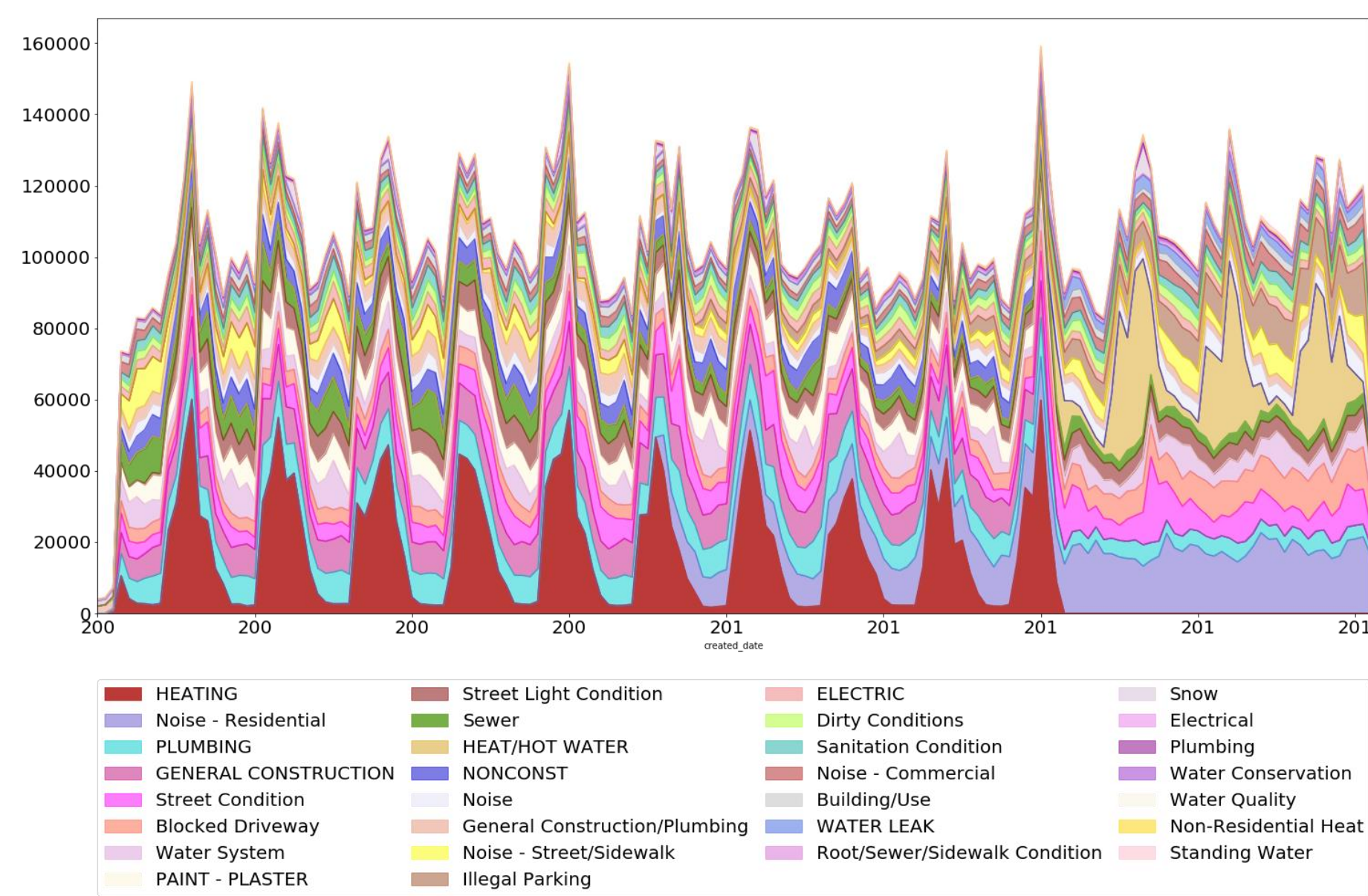
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Abstract

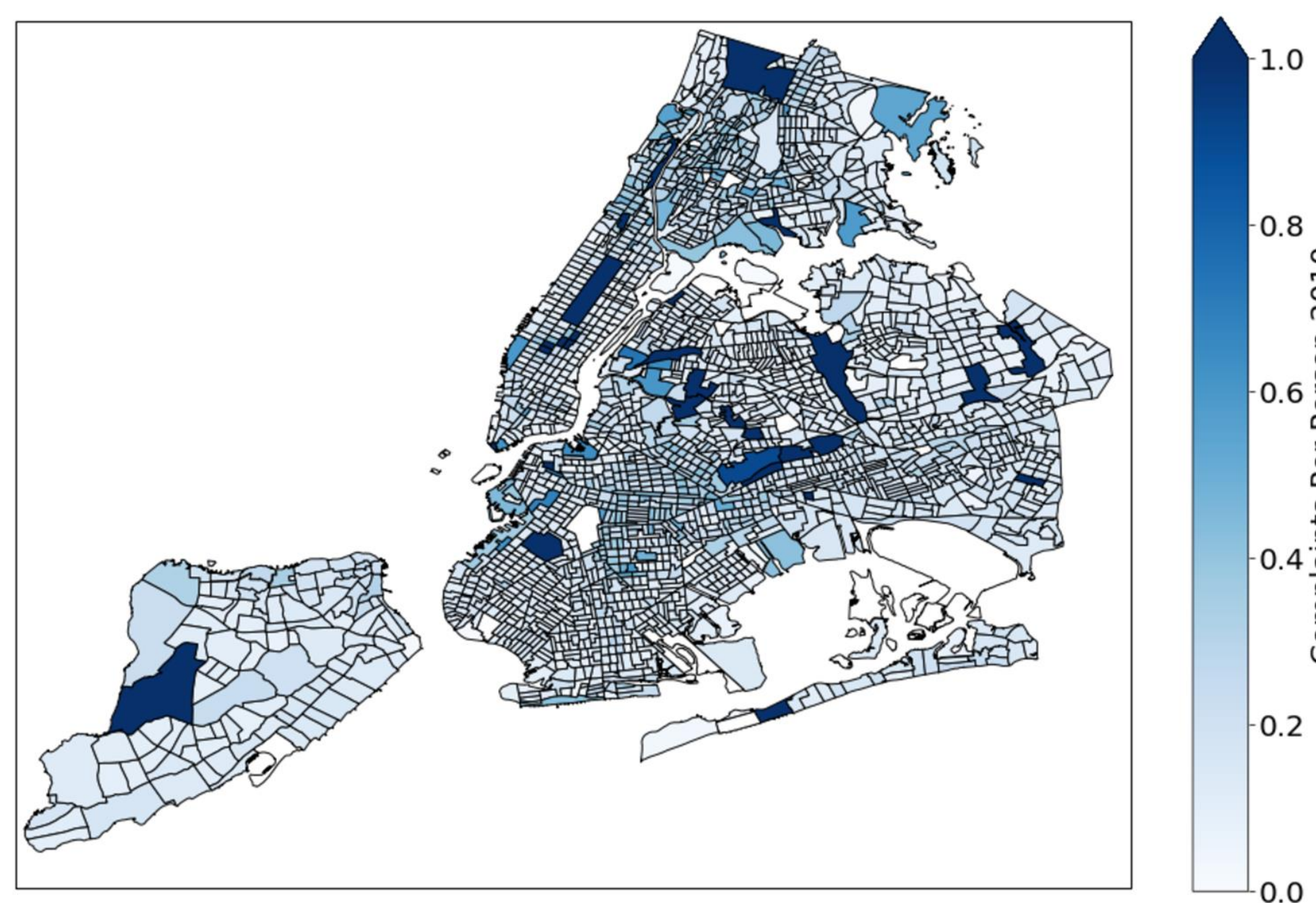
Using remote sensing to study weather in urban areas is challenging because most activity takes place indoors or underground, in a tract of land that's much smaller than many satellite spatial resolutions. As a substitute, there are many local datasets that can potentially provide information about the local impacts of the weather, such as the 311 hotline residents use to report municipal issues. To isolate the impacts of weather, we aggregate over space and time to reduce the noise in the data and then normalize the data to account for uneven distributions of people and complaints. We then compare the potentially weather related 311 reports with global monthly summaries of weather observations from the Global Historical Climatology Network (GHCN) to analyze the impact of weather events as reported by the residents of NYC.

Can We Use 311 as a Satellite?

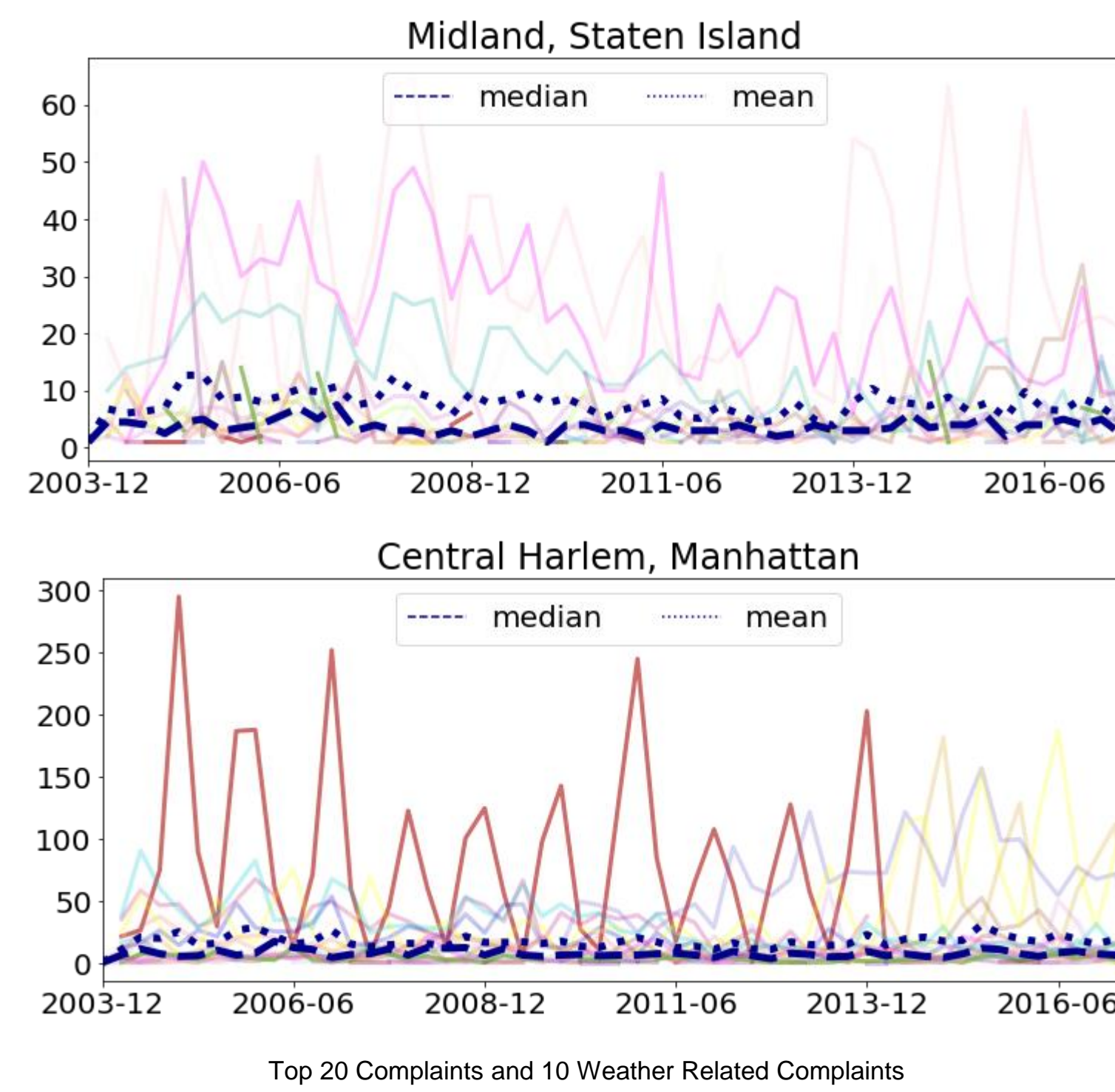
311 is the U.S. Federal Communications Commission code for reporting non-emergencies. Many cities, including NYC, use it as a hotline for residents to report municipal issues. New York City's 311 dataset contains over a 100 million reports, many of which are potentially related to the impacts of weather events. We selected the 20 most common types of complaints and 10 that may be weather related to establish a baseline frequency of complaints.



Some census tracts complain more frequently than others, but we are only interested in complaints that are weather related. There are always weather related complaints, but we theorize that if something has gone wrong—such as aging infrastructure, catastrophic events, etc.—then the weather related complaints will spike. We explored normalization techniques to filter out the information that was valuable to this study.



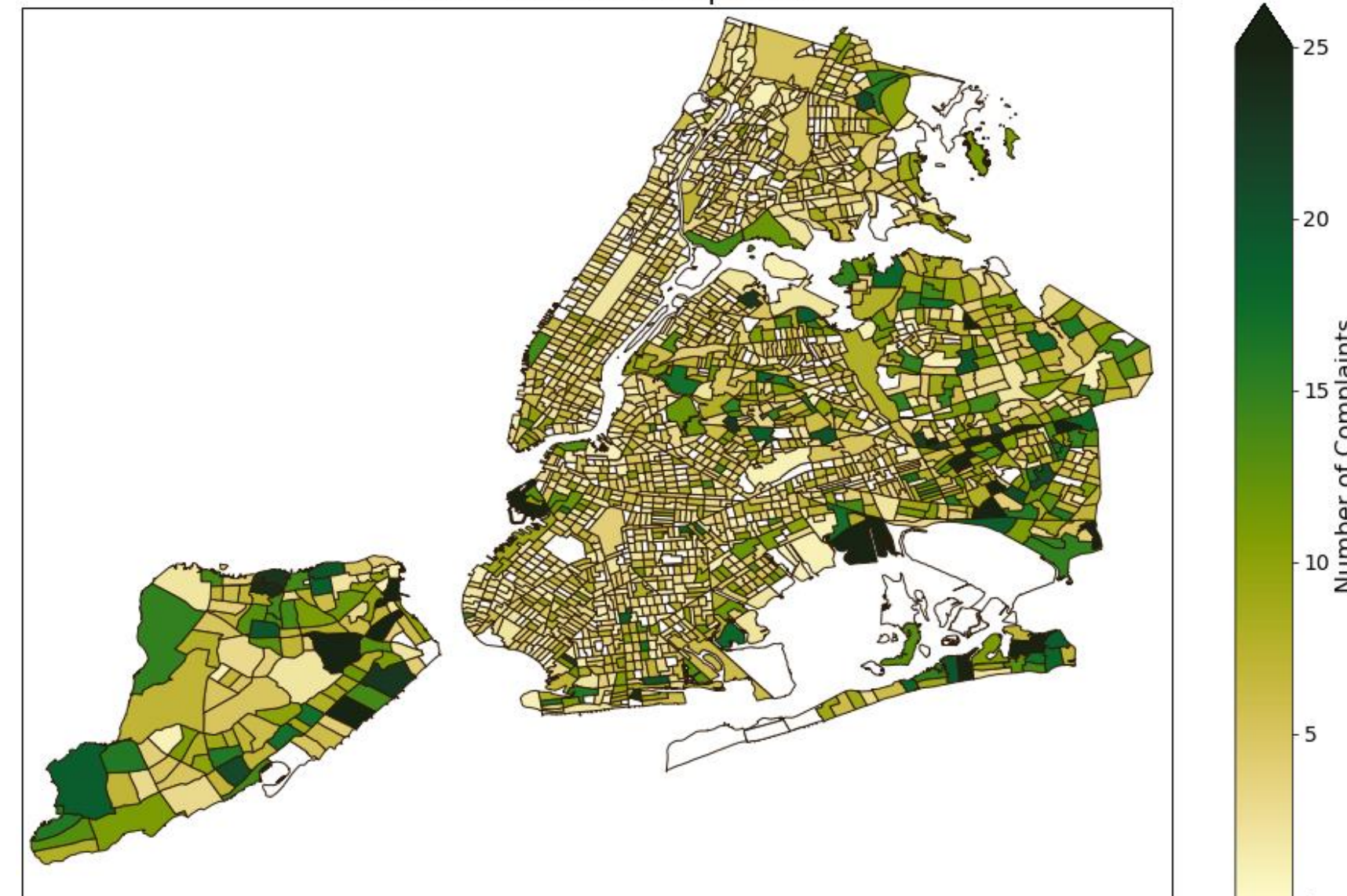
Why Normalize?



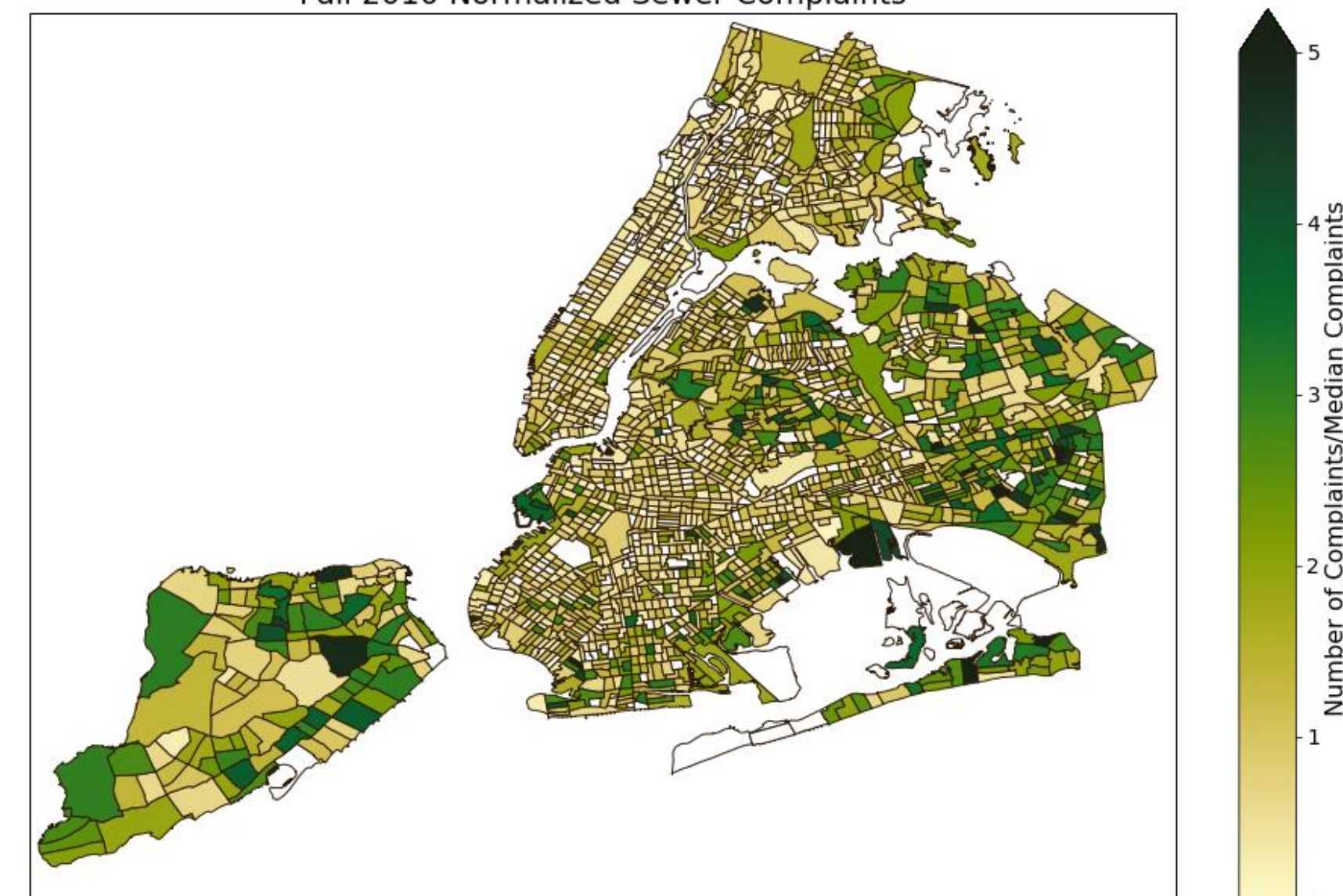
Top 20 Complaints and 10 Weather Related Complaints

In order to account for differences in how often people complain, we normalize our data. We grouped the reports by census tract and by type of complaint. After organizing the data, we took the frequency over time of each individual type of complaint. Following this computation, we normalized each tract by taking the median of the frequencies in the tract and dividing it by the mean of the median. We chose the median instead of the mean because the median doesn't jump when there are outliers in the data and is overall more consistent over time.

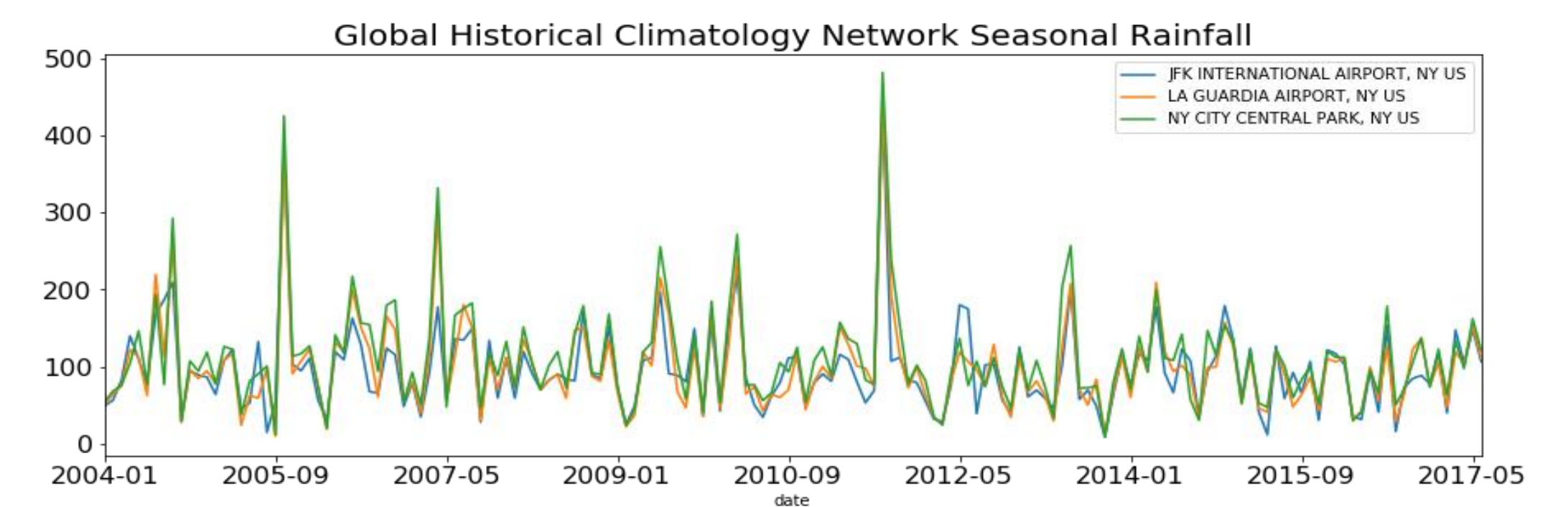
Fall 2010 Sewer Complaints



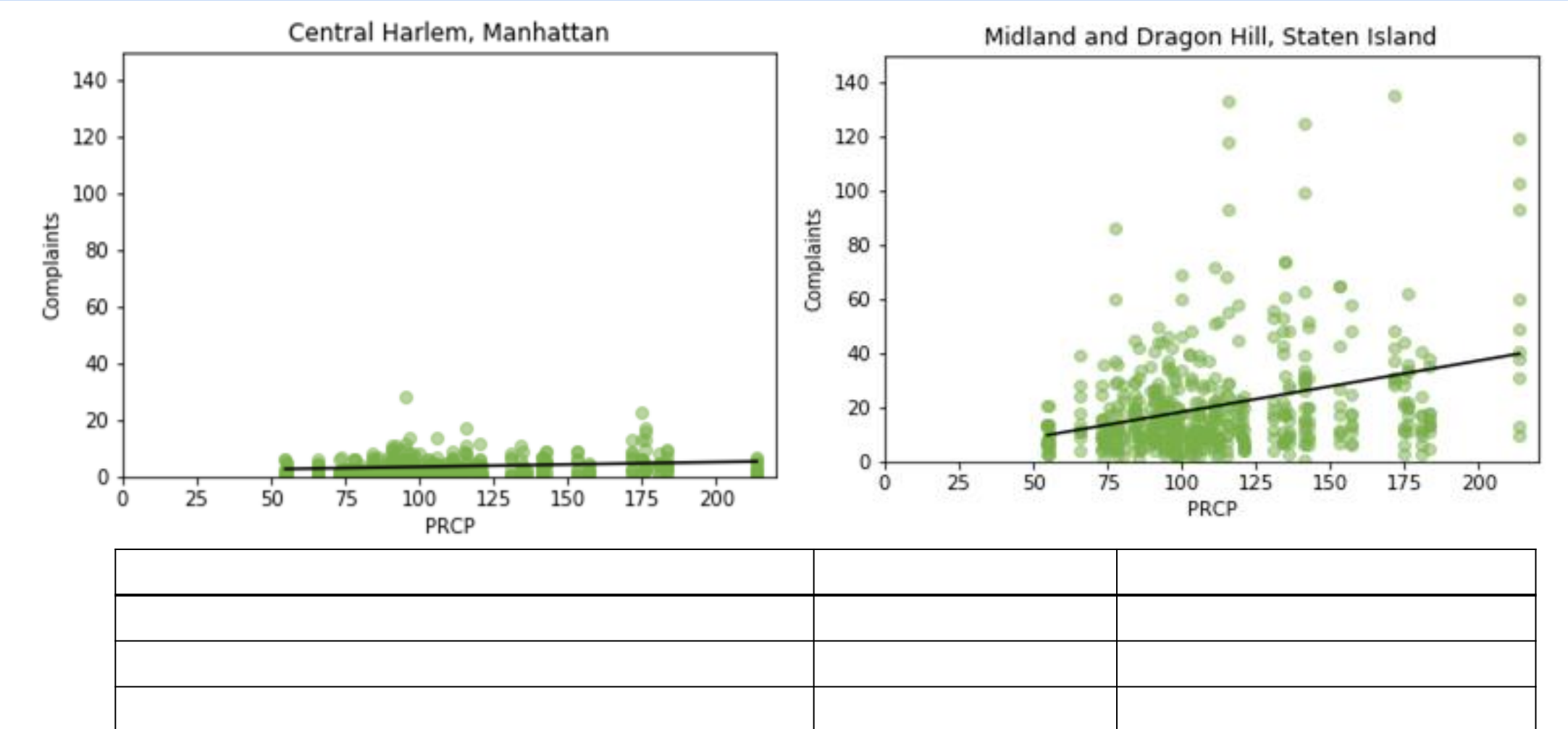
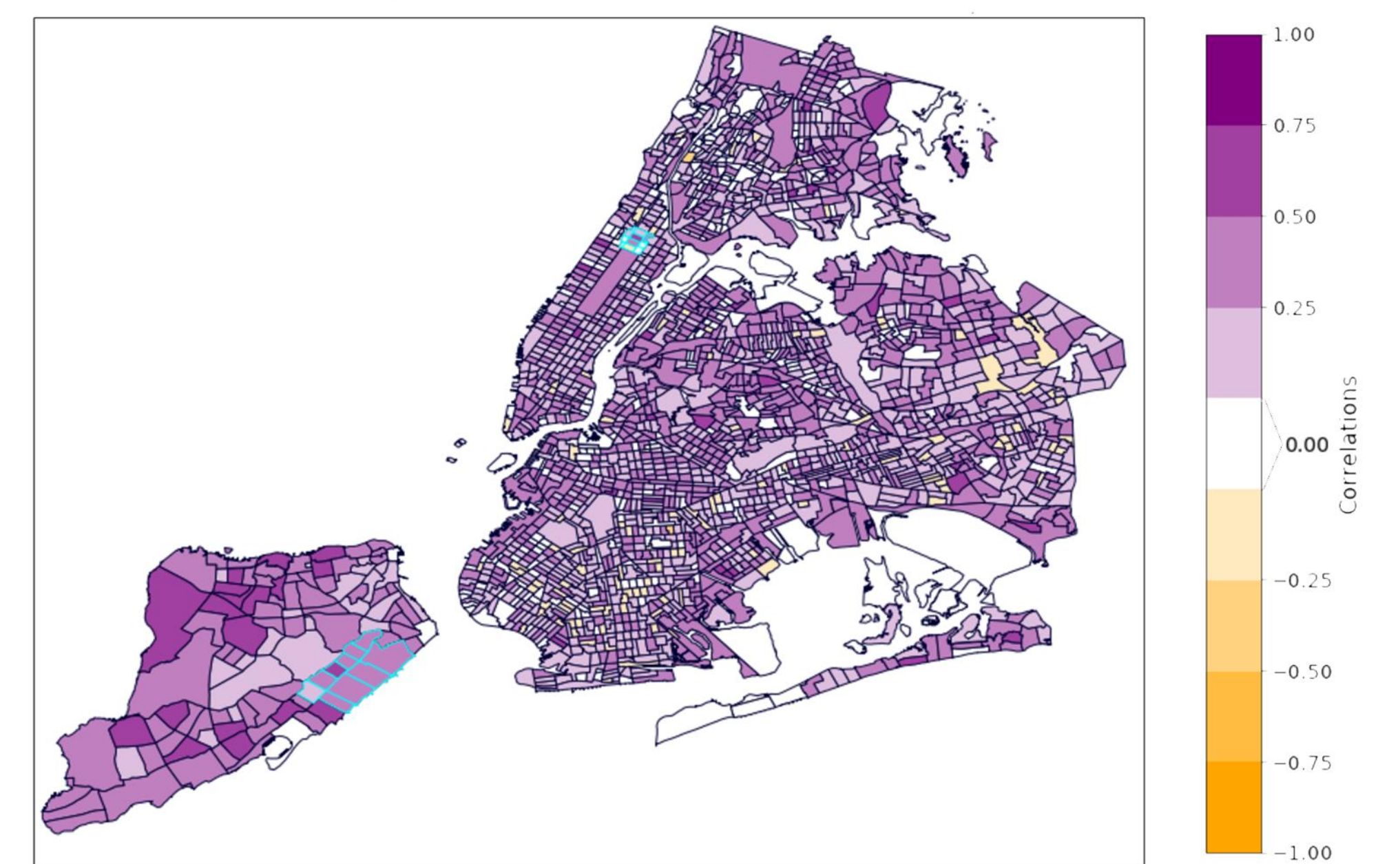
Fall 2010 Normalized Sewer Complaints



Can We See Weather Impacts?



311 Sewer Reports and GHCN Rainfall



We found a strong positive correlation between rainfall and sewer complaints in Staten Island and a weak correlation in Central Harlem. The relationship in Central Harlem may be weaker because it is inland and urban, compared to the more rural coastal tracts in Staten Island. This trend shows up in many coastal census tracts, and we infer that these areas are being impacted more due to flooding from overflowing bodies of water. Continuing this project, we will look at other types of complaints and weather conditions.

Acknowledgements and References

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