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MTA EXPLORATORY DATA ANALYSIS : Severe Storm Events 2021

INTRODUCTION

145 Street station – Hurricane Ida

- Motivation:
  - City of New York experienced water inundation at various subway stations in 2021
- Objectives and Goals:
  - Investigate relationship between precipitation and ridership
  - Observe patterns in passenger movement in severe storm events
  - Provide data to assist the City of New York in effective deployment of resources and target stations for infrastructure upgrade

METHODOLOGY

Data	Metrics	Tools

▪ MTA Turnstile data
▪ NOOA Daily Precipitation Data
▪ MeteoStat Hourly Precipitation Data
▪ NYC Stormwater Flood Map
▪ NY State Subway Location Data
	▪ Correlation between precipitation and entries/exits at stations
	▪ Deep dive into 2 storm days
	  ▪ 9/1 Hurricane Ida (173mm rain)
	  ▪ 10/26 storm day (63mm rain)
	▪ Looked at turnstile entries/exits delta between no precipitation day vs. severe storm day
		▪ SQL Alchemy
		▪ Pandas
		▪ NumPy
		▪ Matplotlib
		▪ Seaborn
		▪ GeoPandas & Contextily

RESULTS

Overall correlation

	DAILY_TOTALS	prcp
DAILY_TOTALS	1.000000	-0.007948
prcp	-0.007948	1.000000

Top 10 negative correlations

STATION	Correlation
RIT-ROOSEVELT	-0.188326
RIT-MANHATTAN	-0.181363
AQUEDUCT N.COND	-0.110041
9TH STREET	-0.092444
HIGH ST	-0.090189
CENTRAL PK N110	-0.089969
THIRTY THIRD ST	-0.082308
14TH STREET	-0.080730
74 ST-BROADWAY	-0.080674
BEACH 90 ST	-0.079236

Top 10 positive correlations

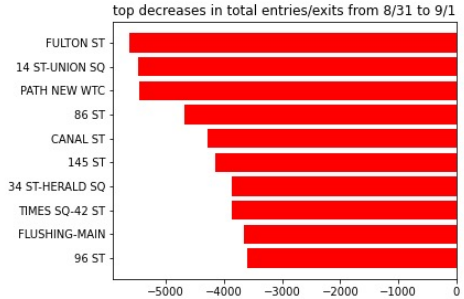
STATION	Correlation
METS-WILLETS PT	0.083597
BROAD ST	0.069876
CLARK ST	0.040543
HOWARD BCH JFK	0.030097
HEWES ST	0.022044
JFK JAMAICA CT1	0.020262
E 143/ST MARY'S	0.019920
HUNTERS PT AV	0.018867
68ST-HUNTER CO	0.017549
DITMAS AV	0.016226

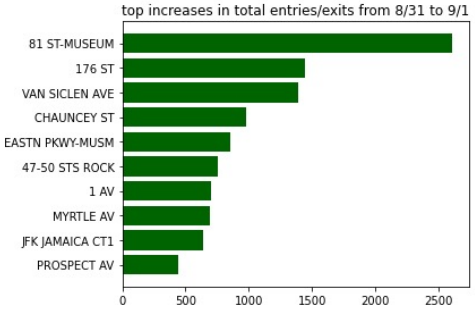
Subway Locations NYC

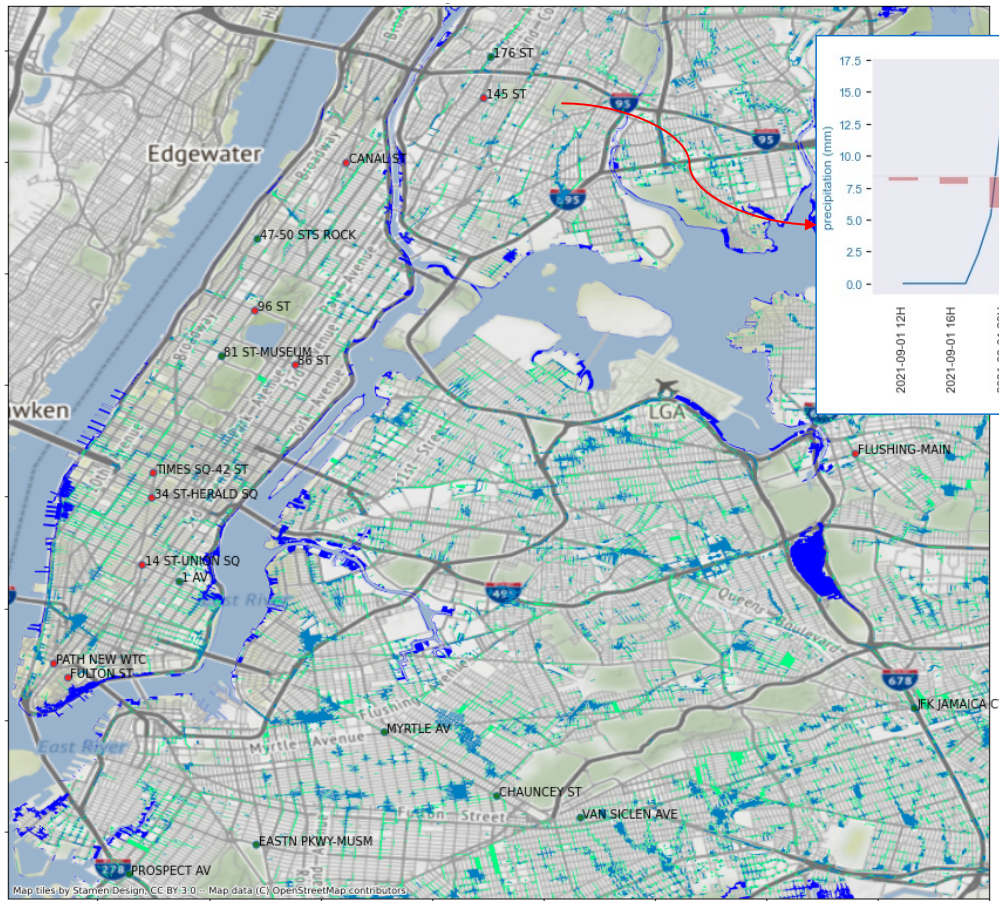
- Overall slight negative correlation between precipitation and total entries/exits at a station
- Slightly stronger negative correlations than positive correlations, at a station level

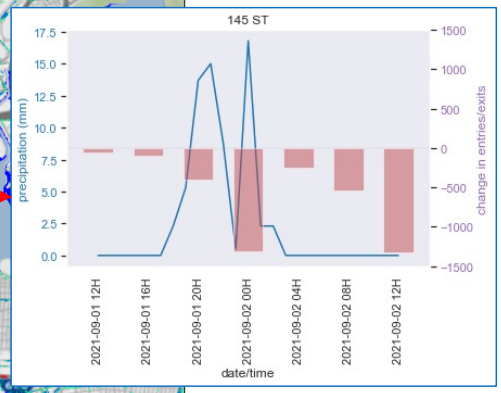
Wednesday September 1st Hurricane Ida

- Used previous day which had zero precipitation as baseline
- Big drops in entries/exits across all main subway stations
- Increases at certain stations, mostly further out in the boroughs





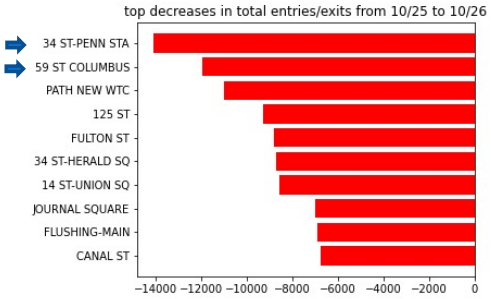


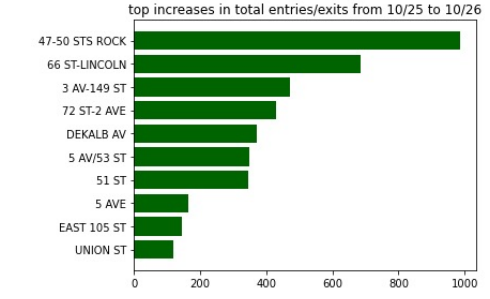


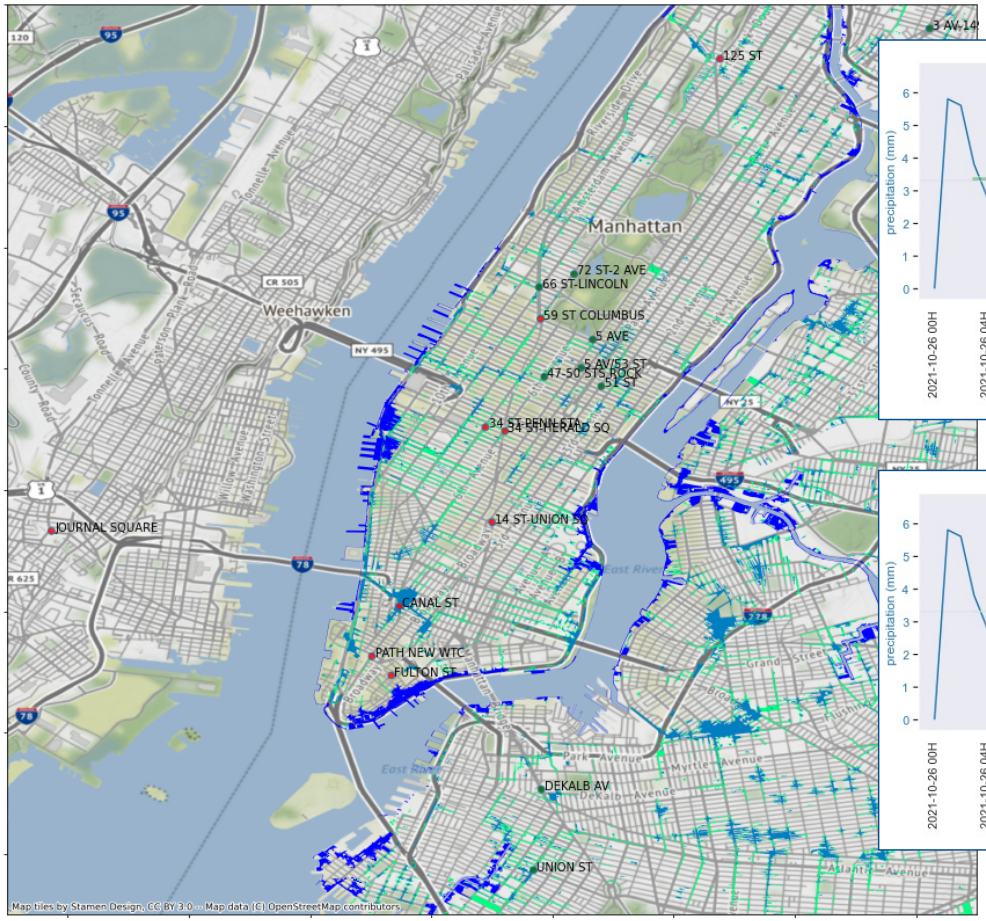
- Known flooding at 145 Street reflected in the data

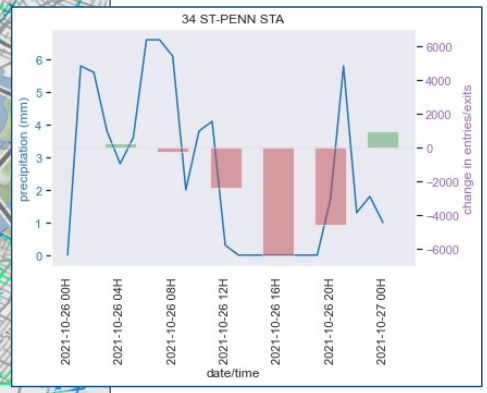
Tuesday October 26th Storm Day

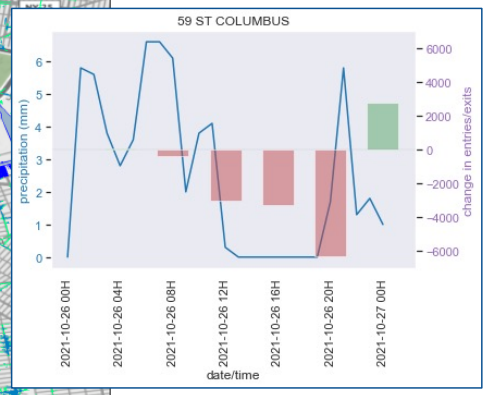
- Storm day was preceded by a day with no precipitation, so the 25th was used as a baseline for comparison.
- Again, main passenger hubs experienced highest decreases.
- Lag in impact compared to Hurricane Ida.











CONCLUSION

- Overall slight negative correlation between rides and precipitation
- Main passenger hubs were most negatively impacted by storms
- 145 Street Station which was known to be flooded was supported by the data and looking into station upgrade is recommended

FUTURE WORK:

- Further research into turnstile level data. Are there particular entrances which are being more impacted than others due to location or elevation?
- Look at recovery rates after a storm - how quickly does each station resume to normal passenger levels.
  - Targeted upgrade for those stations which have slow recovery rate.
- Investigate other storm days in prior years, do we see recurring stations?