CUNY Floodnet Sensor Lab: Finding Parallels and Understanding Flood Occurrence

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QR code to access FloodNet, a real-time data source for flood sensors all around New York!

Introduction

Over time,8 flooding has become an enduring issue in NYC. Ever since Hurricane Sandy in 2012, which caused immense damage to the coast of New York and many families, flooding has become all the more prominent. Basements flowing with water, damaged homes from the impact of the floods, this issue needs to be dealt with. A recent spike in the amount of floods occurring has come from industrialization and release of greenhouse gases (GHGs) into the environment around us leading to increased atmospheric warming. These recent impacts have led to many "flood activators" like glaciers and ice sheets melting increasing sea levels which accelerate the rate of flooding. It is important to find ways that help the communities affected by floods and be able to track and know when a flood is coming. Our project aims to find patterns within floods and find ways that floods can be controlled and perhaps all the more preventable.

Methodology

- We worked with ASRC, the Advanced Science Research Center, to build the flood sensor to see how it works, as well as looked at past data collected through their FloodlNet data that they will provide to us.
- Using these resources, we hoped to look for patterns within the flood research in past years to make connections into
  - how flood sensors may help alert experts for potential flooding
  - how they can potentially help track and store damage done to use when identifying potential floods.
- Additionally, we plan to analyze the effectiveness of current flood sensors in predicting and preventing flood events (Looking specifically at a flood on September 29th,2023)

Figure 1 : The interior of the Flood Sensor. It uses an ultrasonic sensor to detect objects underneath it, like flooding. This can lead to some inconsistencies like objects placed under the sensor causing data to spike even if it is highly unlikely for there to be a flood.

Figure 2 : The exterior of the Flood sensor. The Flood sensors are usually placed outside in capsules to prevent damage to them. The cap on the right is the cover to the tube and the system is powered with the solar cell on top.

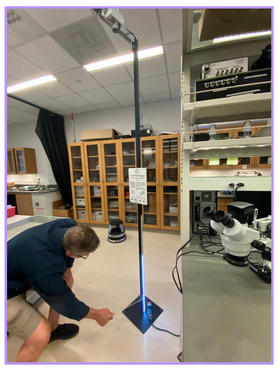
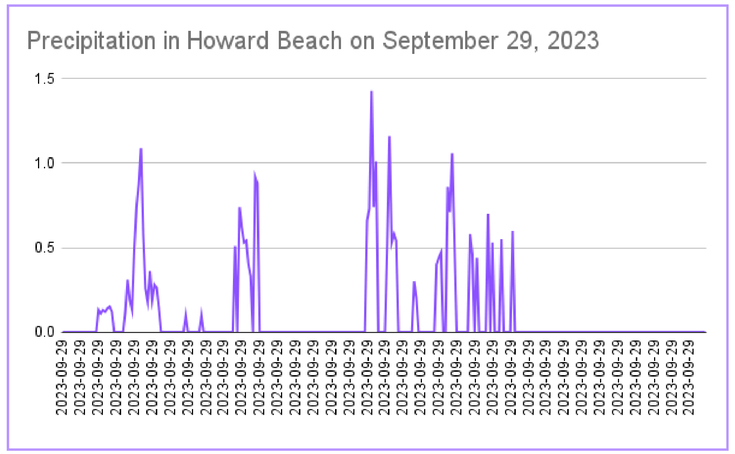
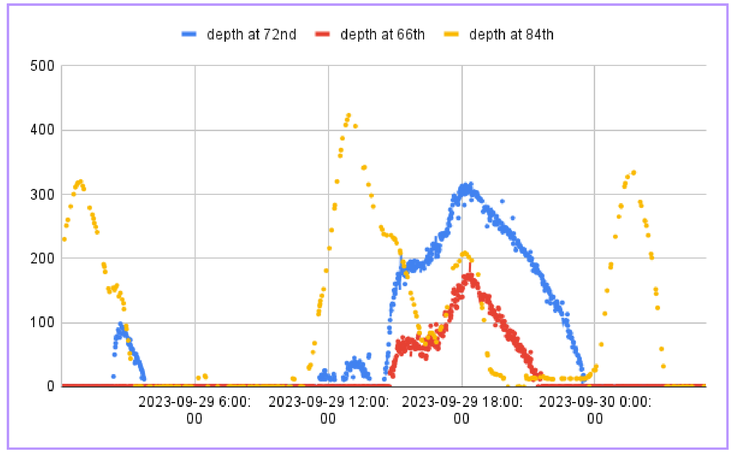


Figure 3: The example flood sensor in the lab. As you can see when objects get close to it, the lights at the bottom glow. While the lights would not be seen on a flood sensor outside, this is an example of how the detection works on it if placed on a pole.





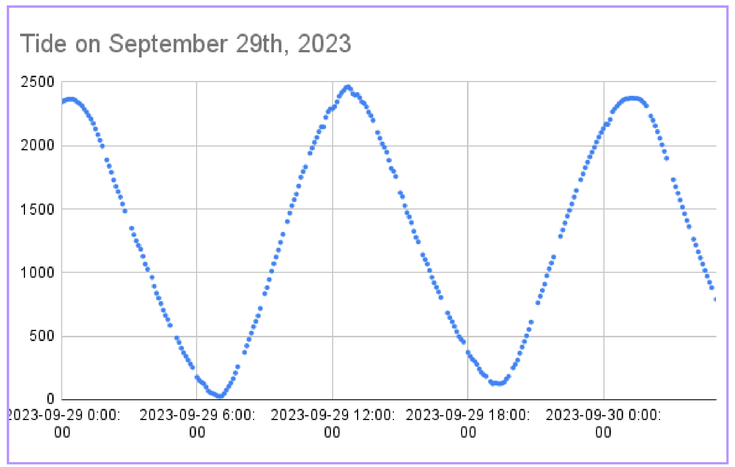


Figure 4 : This graph shows the precipitation in Howard Beach on September 29th, 2023. We gathered this data from the weather sensor in Howard Beach as there isn't one in the Rockaways. As you can see, there was heavy rainfall in the morning of this day which led to extreme flooding in the Rockaway.

Figure 5: This graph shows the flood depth at different streets in Rockaway on September 29th, 2023; at Beach 84th, Beach 72nd, and Beach 65th, respectively. Using the data from the weather station in Howard Beach to get the precipitation, we can infer that the heavy rainfall contributed to the flooding in the Rockaways.

Figure 6: This graph shows the Tide in the Rockaways on September 29th. We gathered this data from the weather sensor in Howard Beach. The High Tides contributed to flooding in the Rockaways, particularly on Beach 84th street.

Results

- Even though Howard Beach is not the Rockaways, it is a very close neighbor. Knowing this, the heavy rainfall in Howard Beach most likely contributed to the Flooding in the Rockaways.
- The Depth of the flood at each time is significant. We can see that Beach 84th Street had extreme flood depth earlier due to a high tide, and as the heavy rainfall started the flood sensors (at 72nd and 66th) then received the heavy flooding.
- We can also draw from each graph that 84th Street is heavily affected by the high tides seeing that there is high tide at the same time of immense flood depth on 84th.
- This also goes for the low tide coinciding with the high precipitation and flood depth on 72nd and 66th because we can infer, based on the graphs, that precipitation heavily impacts the lower streets in Rockaway than the higher streets.
- As you can see, the graphs are aligned, and you can see at specific points in time where the tide and precipitation affected the flood depths in the Rockaways.

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