

Mapping the Extent and Intensity of a Natural Disaster Using Social Media

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Overview

- Motivation
- Methodology
 - Processing and finding relevant information
 - Mapping Extent
 - Mapping Intensity
- Results
 - Hurricane Arthur
 - Hurricane Sandy
- Comparison
- Conclusion

Motivation

- Analyze Re
- Reinsurance companies insure insurance companies
- Currently:
 - Expert visit the region of the catastrophe
 - Documents and report findings
- Alternate/additional damage assessment
- Real-time, affordable, and reliable

Data Processing

- Geolocated social media (latitude and longitude)
- MongoDB
 - Location: Sphere with centre and radius
 - Content: Relevant social media
 - Standard Deviation Ellipse: Preliminary extent assessment

Most used hashtags on July 4th

- { "_id" : "MTVCLASH", "value" : 79530 }
- { "_id" : "gameinsight", "value" : 74145 }
- { "_id" : "BRA", "value" : 59072 }
- { "_id" : "COL", "value" : 52848 }
- { "_id" : "GER", "value" : 50003 }
- { "_id" : "WorldCup", "value" : 44499 }
- { "_id" : "FRA", "value" : 37032 }

- { "_id" : ".*arthur*", "value" : **7201** }

Hashtags containing arthur on July 4th

- { "_id" : "Arthur", "value" : 4260 }
- { "_id" : "HurricaneArthur", "value" : 2312 }
- { "_id" : "arthur", "value" : 303 }
- { "_id" : "hurricanearthur", "value" : 123 }
- { "_id" : "FindArthur", "value" : 51 }
- { "_id" : "ArthurNYC", "value" : 40 }
- { "_id" : "TropicalStormArthur", "value" : 34 }
- { "_id" : "ARTHUR", "value" : 28 }
- { "_id" : "ThanksArthur", "value" : 15 }

Mapping Extent

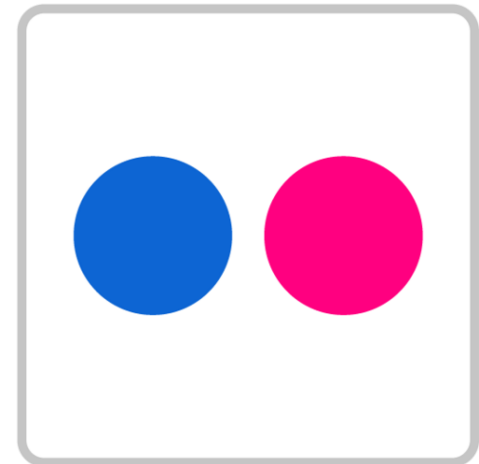
- Minimum bounding rectangle
- Buffering zones
 - Calculate consecutive means
 - Connect means by line
 - Buffer resulting shape

Mapping Intensity

- Spatial aggregation
 - Create grid
 - Count point occurrences within each cell
 - Create raster

Social Media

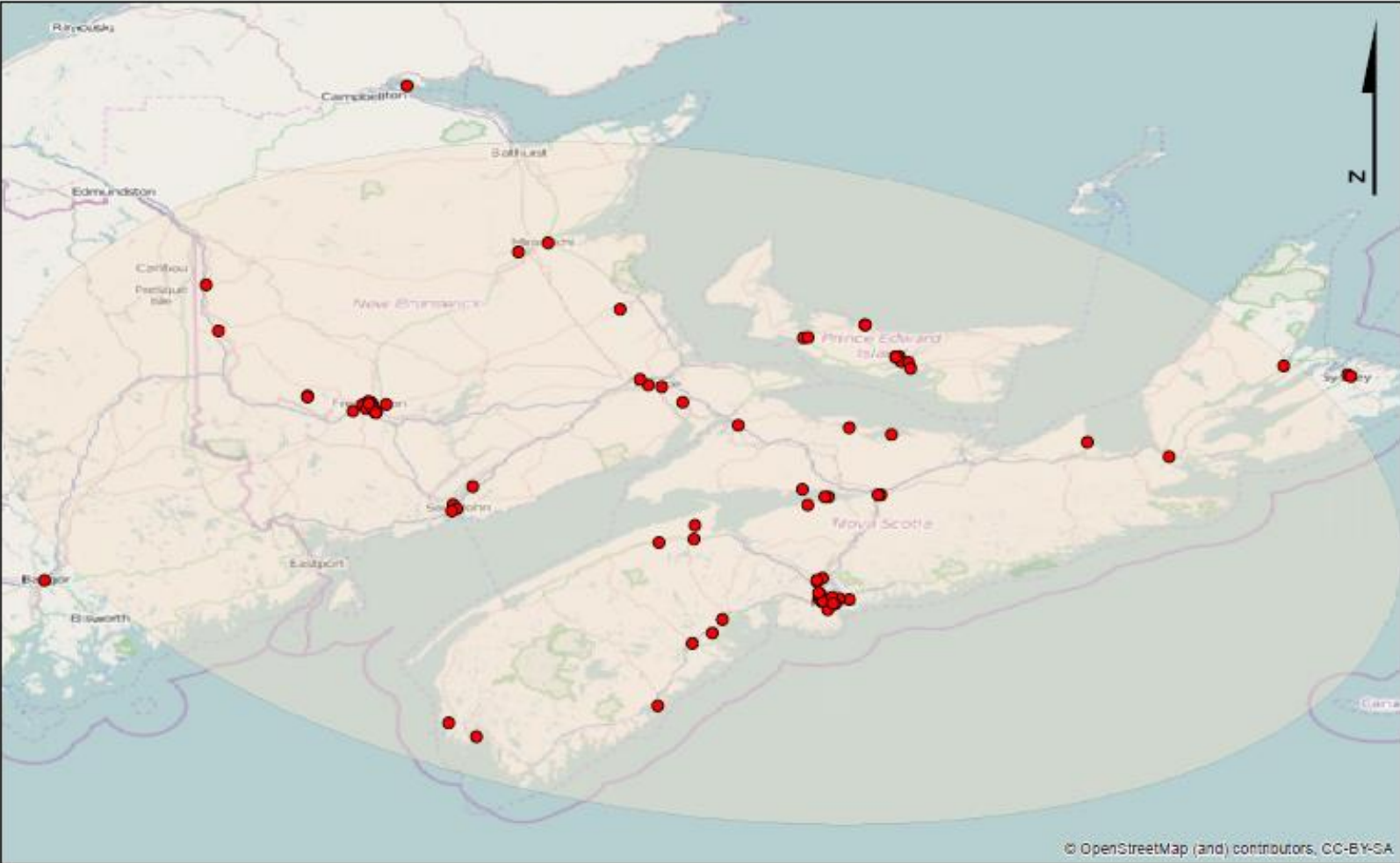
- Twitter dataset
 - Hurricane Arthur
 - Maritime Provinces
 - New York
 - July 1 – 7, 2014
 - 1 – 1.25 million geolocated tweets daily
- Flickr dataset
 - Hurricane Sandy
 - New York
 - Oct. 28 – Nov. 3, 2012
 - 10 million images for 10 year period



Hurricane Arthur Results



Geolocated tweets with Arthur contained in body of tweet



Geolocated tweets containing “arthur” in Fredericton, NB July 6, 2014

-The fact that everyone and their cousins are getting gas right now is kind of freaking me out... #arthur #tropicalstorm

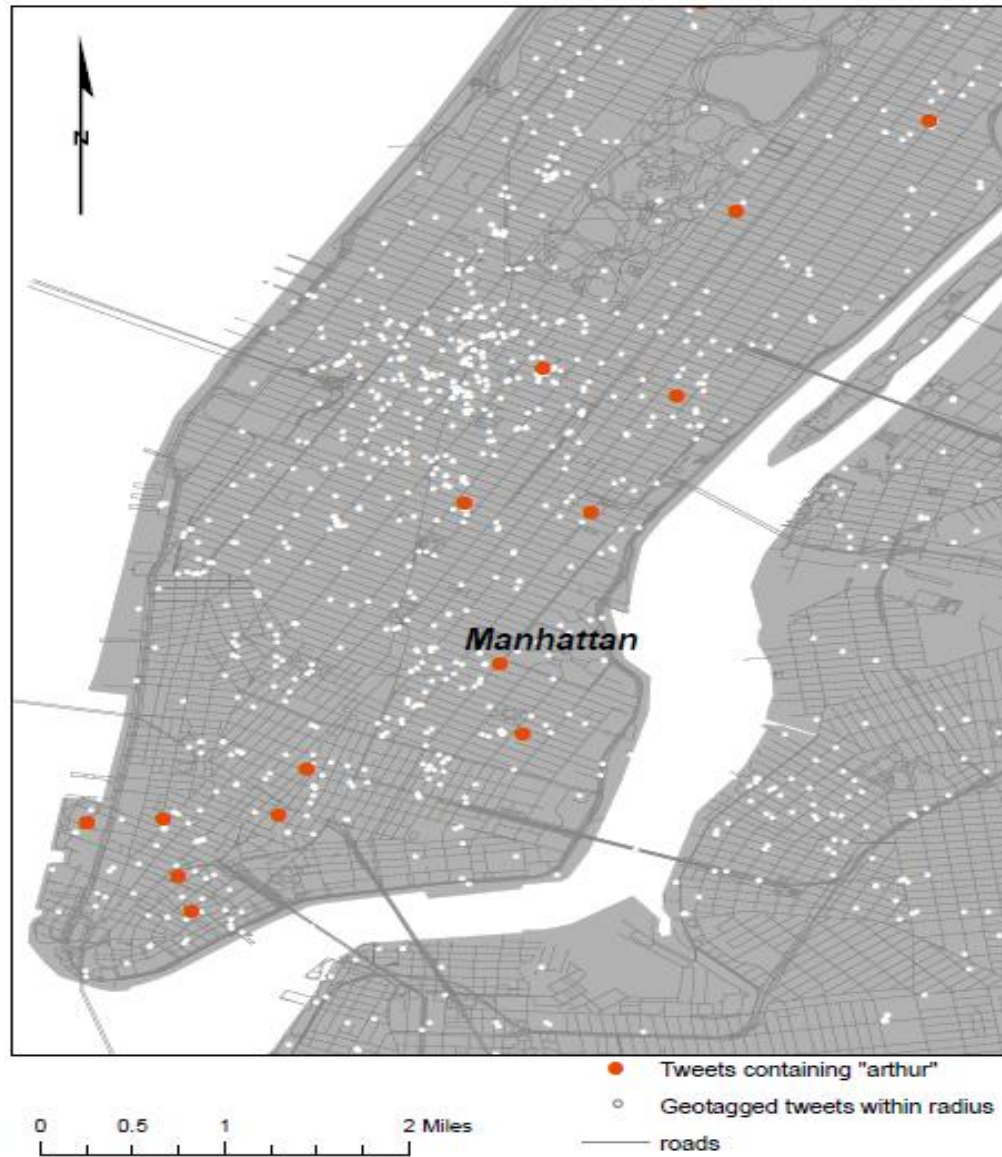
- Phillis Road #Arthur <http://t.co/021khAAEfc8>

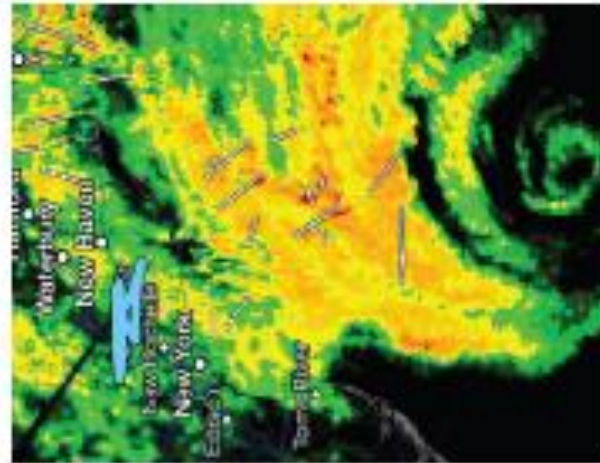


0 0.75 1.5 3 Miles

• Tweets containing arthur

New York City tweets for July 4th, 2014





Hurricane Sandy Results

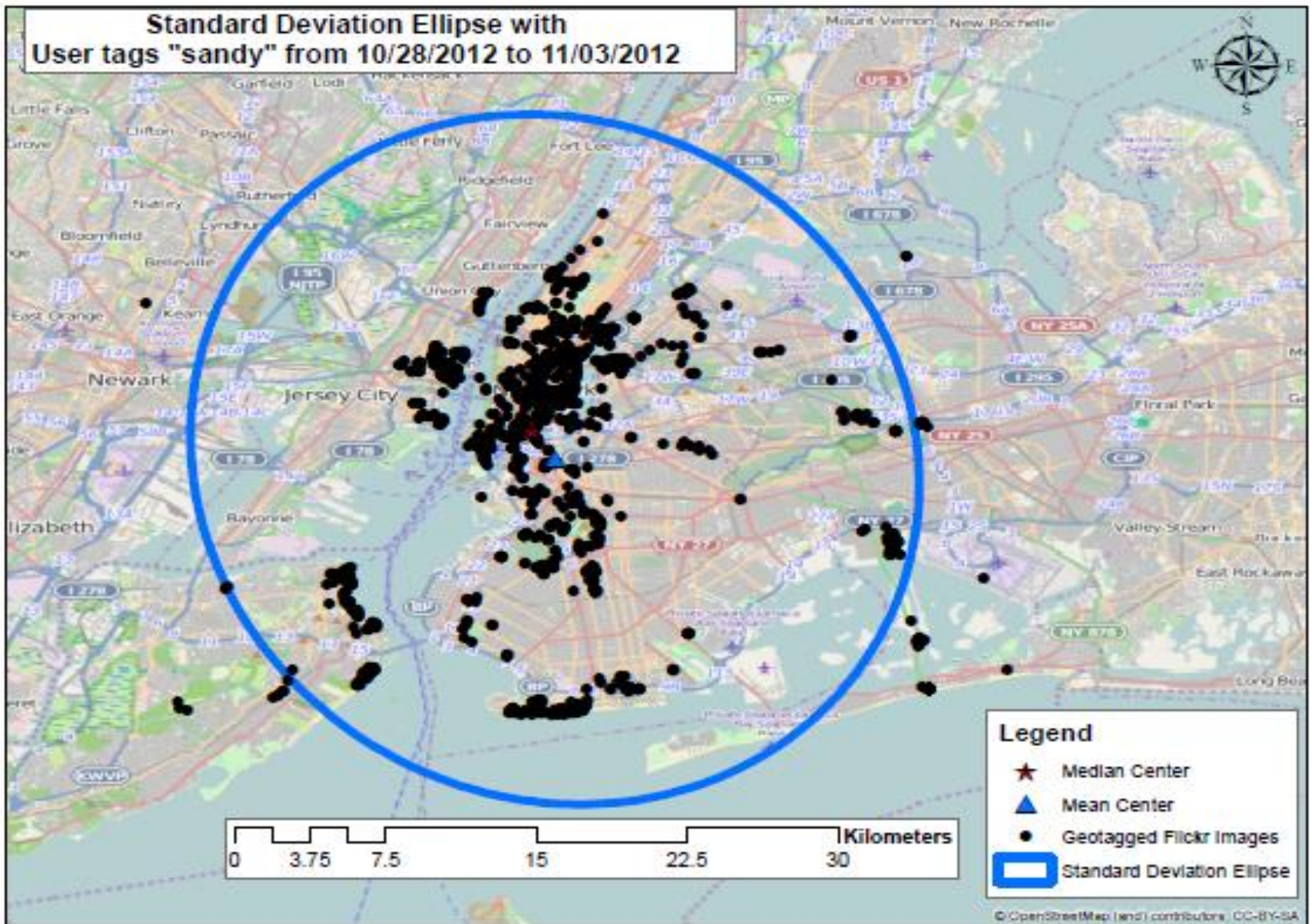




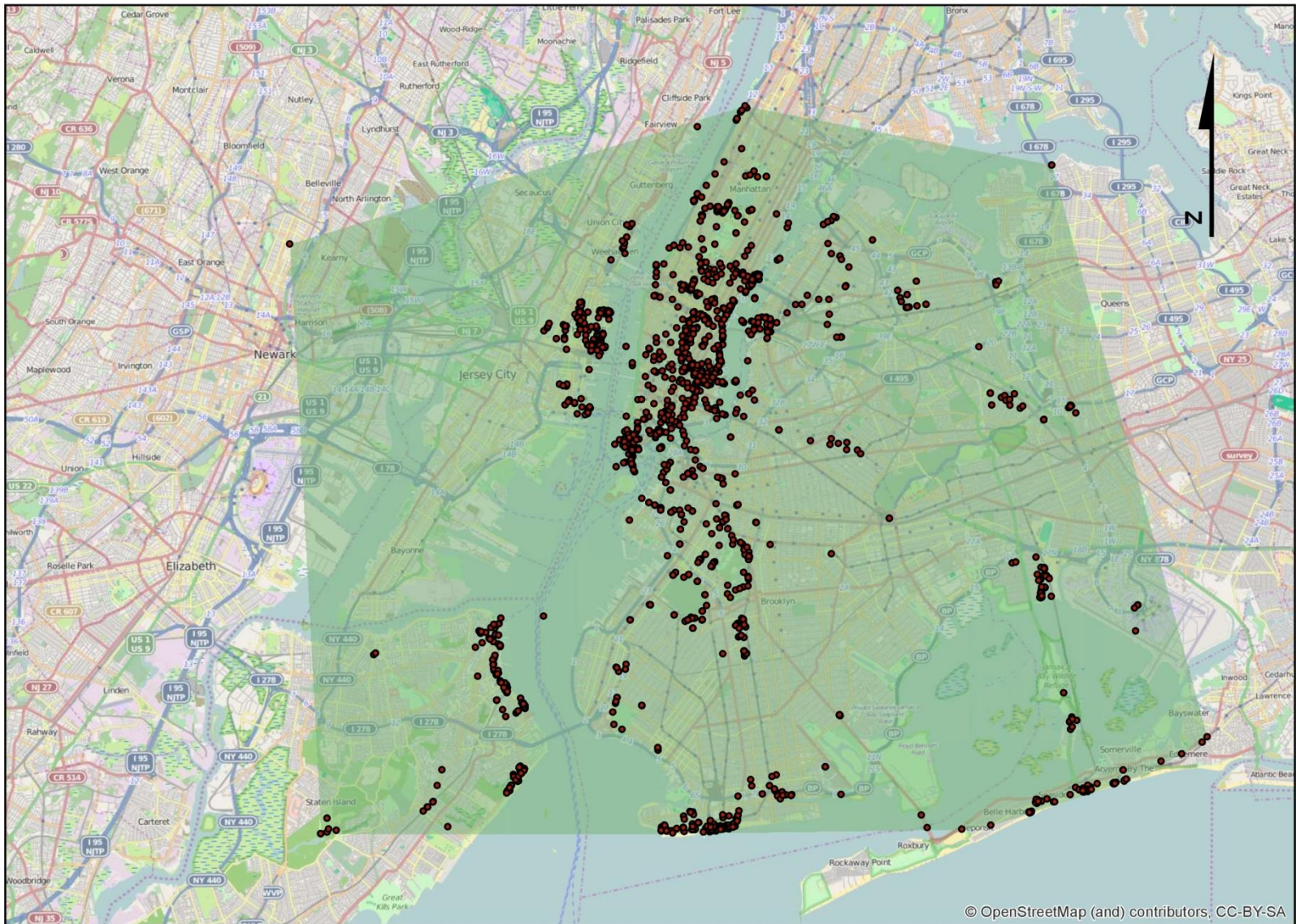




Standard Deviation Ellipse with User tags "sandy" from 10/28/2012 to 11/03/2012



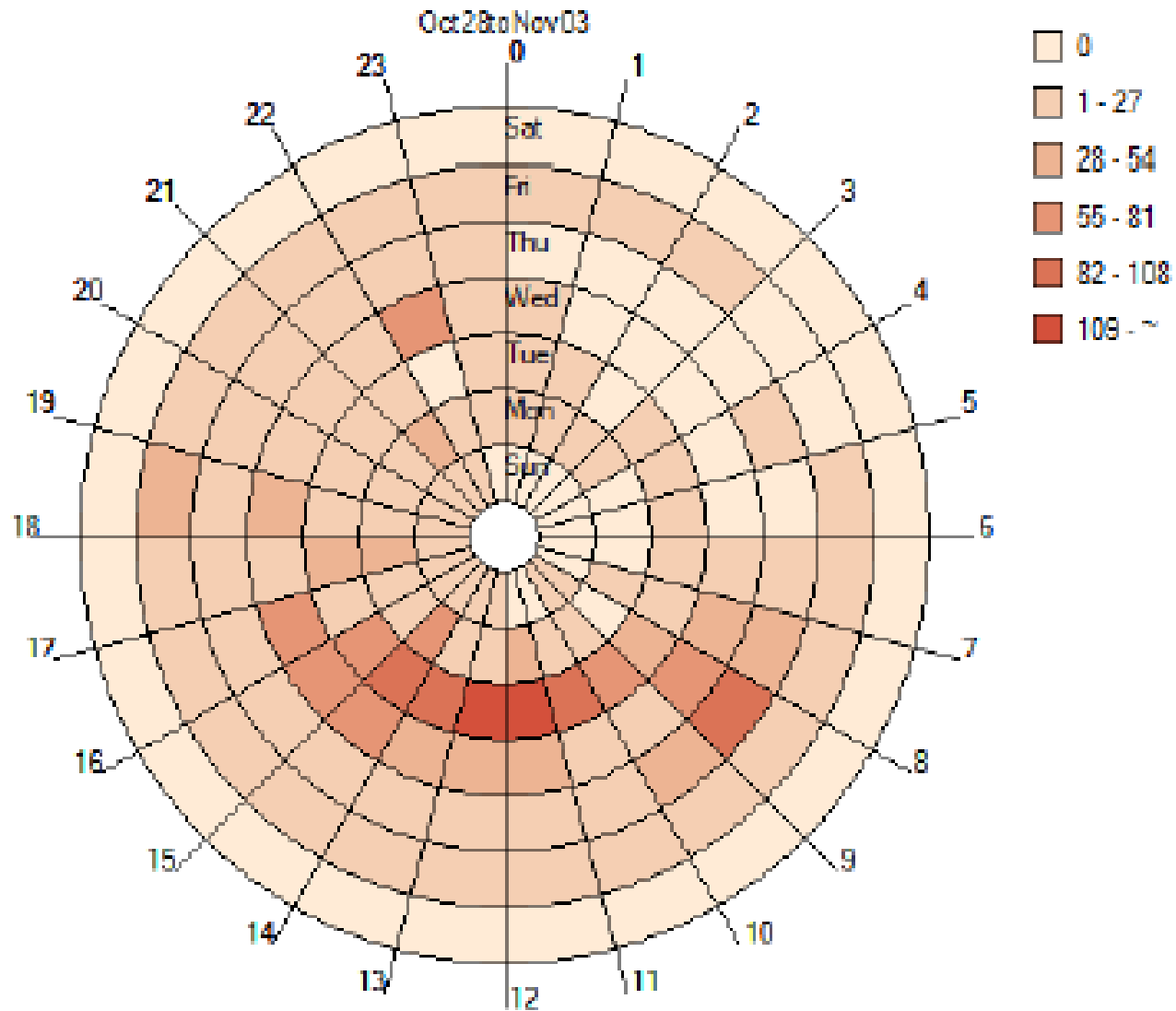
Hurricane Sandy in New York Oct. 28 - Nov. 3



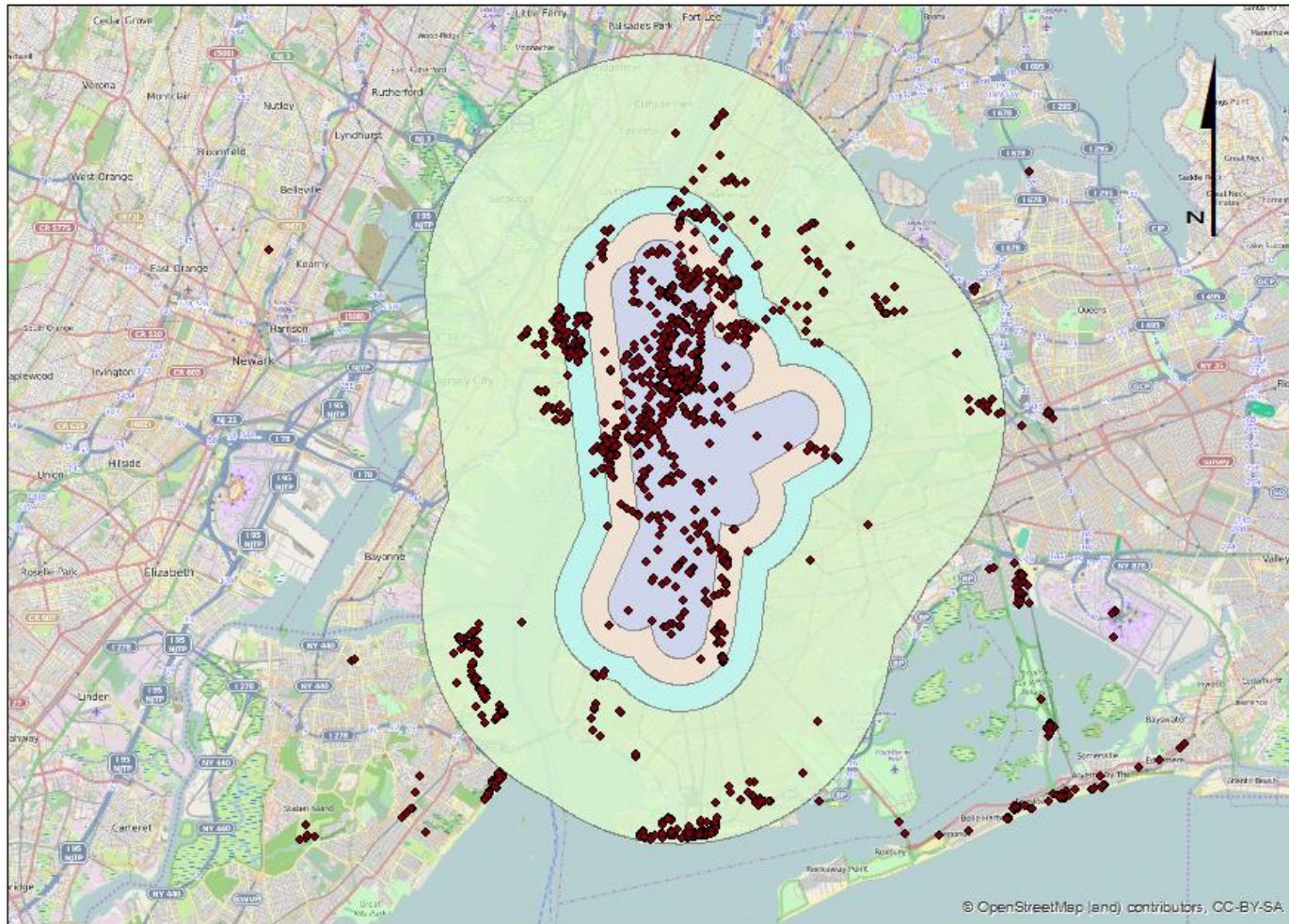
© OpenStreetMap (and) contributors, CC-BY-SA



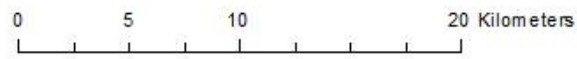
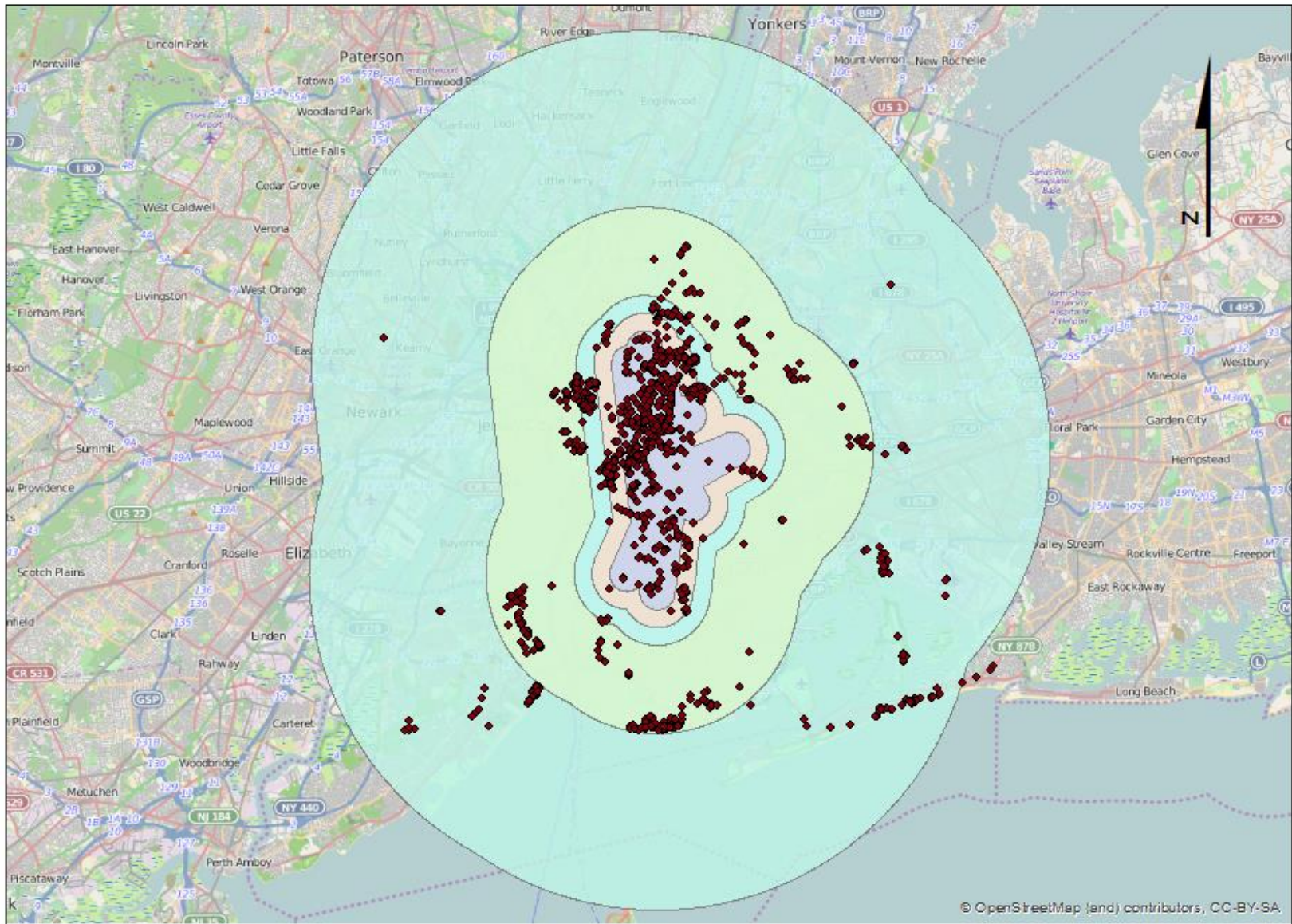
Data Clock from October 28 to November 03



NYC Buffer for Extent

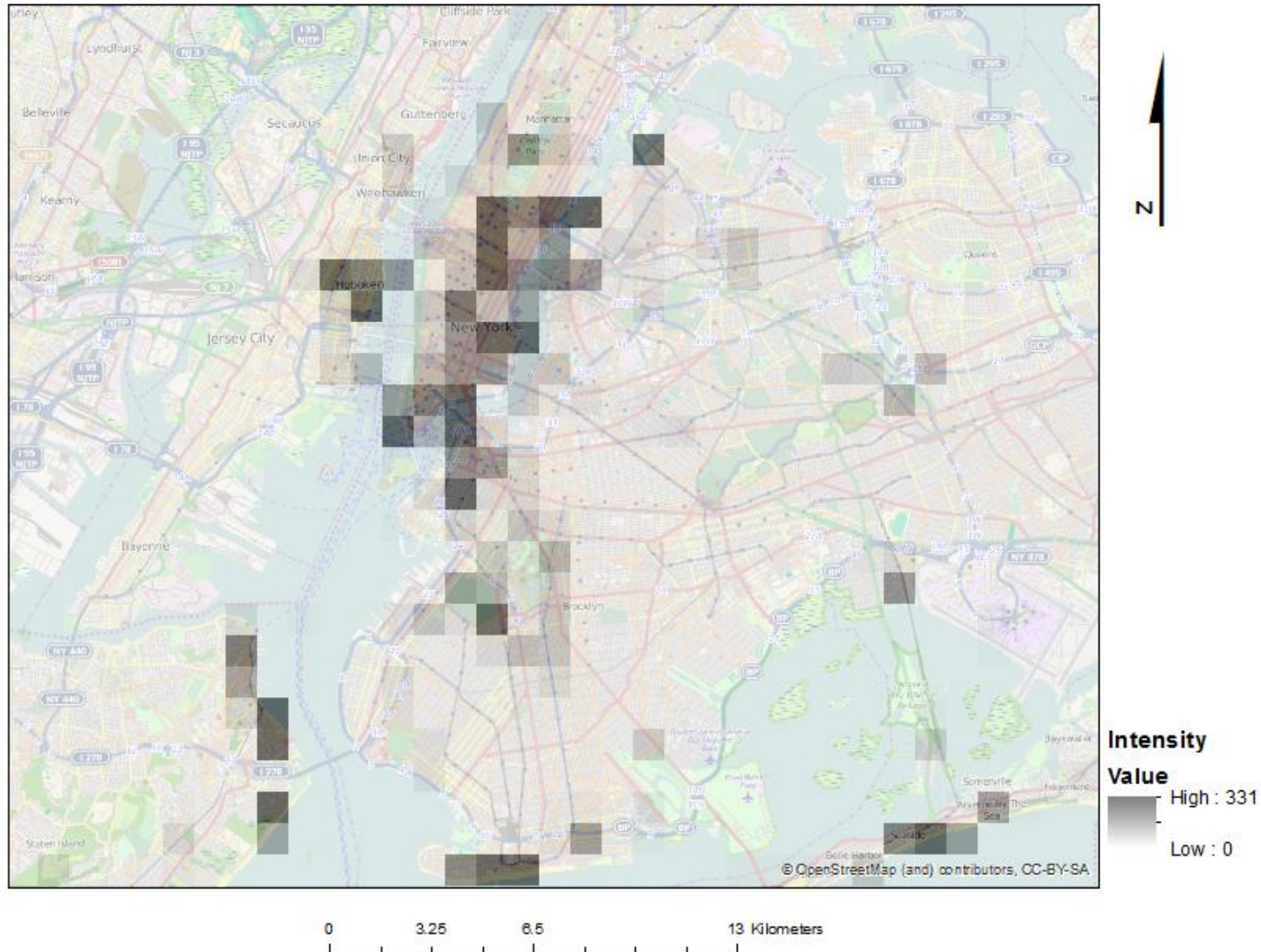


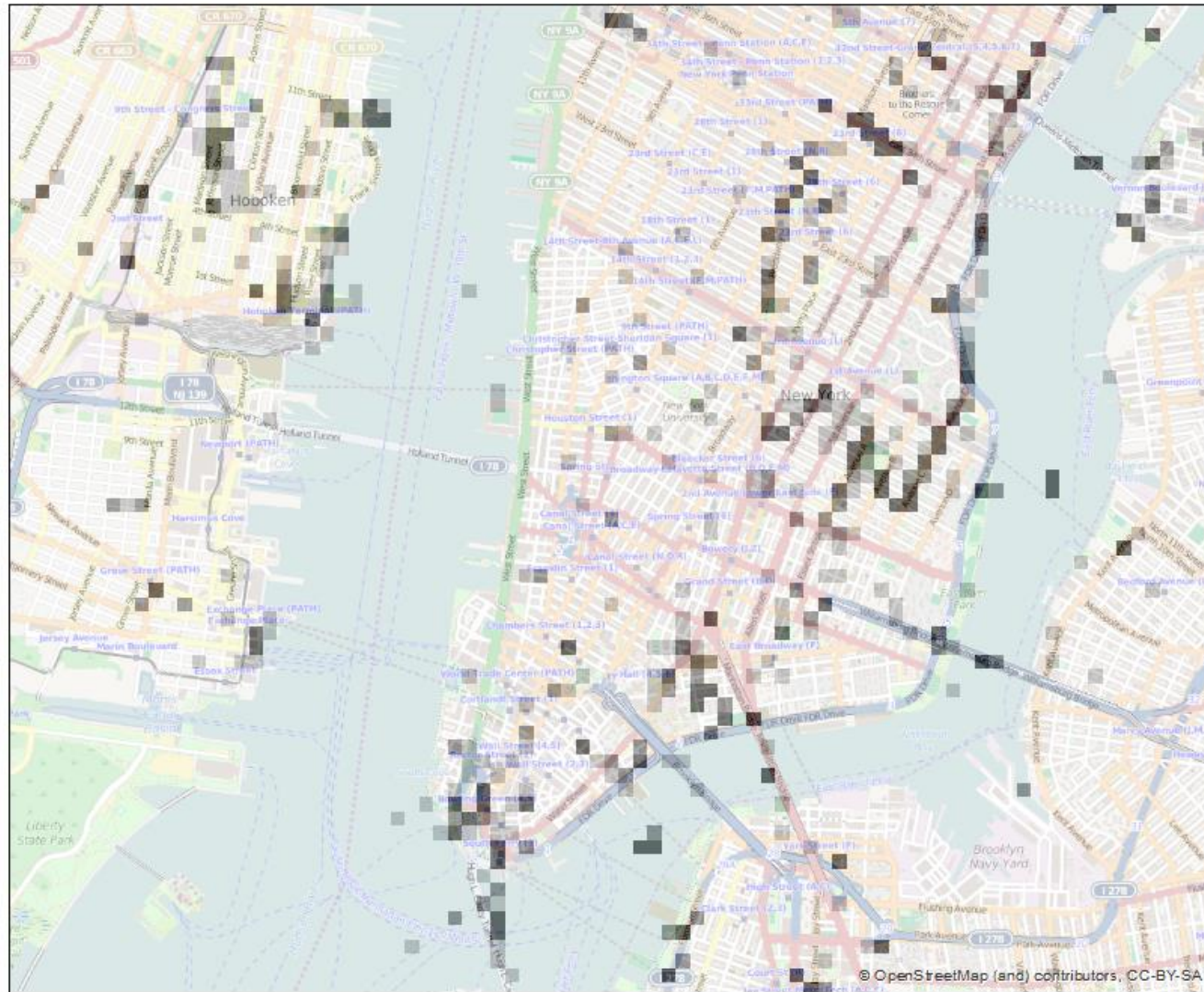
0 4 8 16 Kilometers



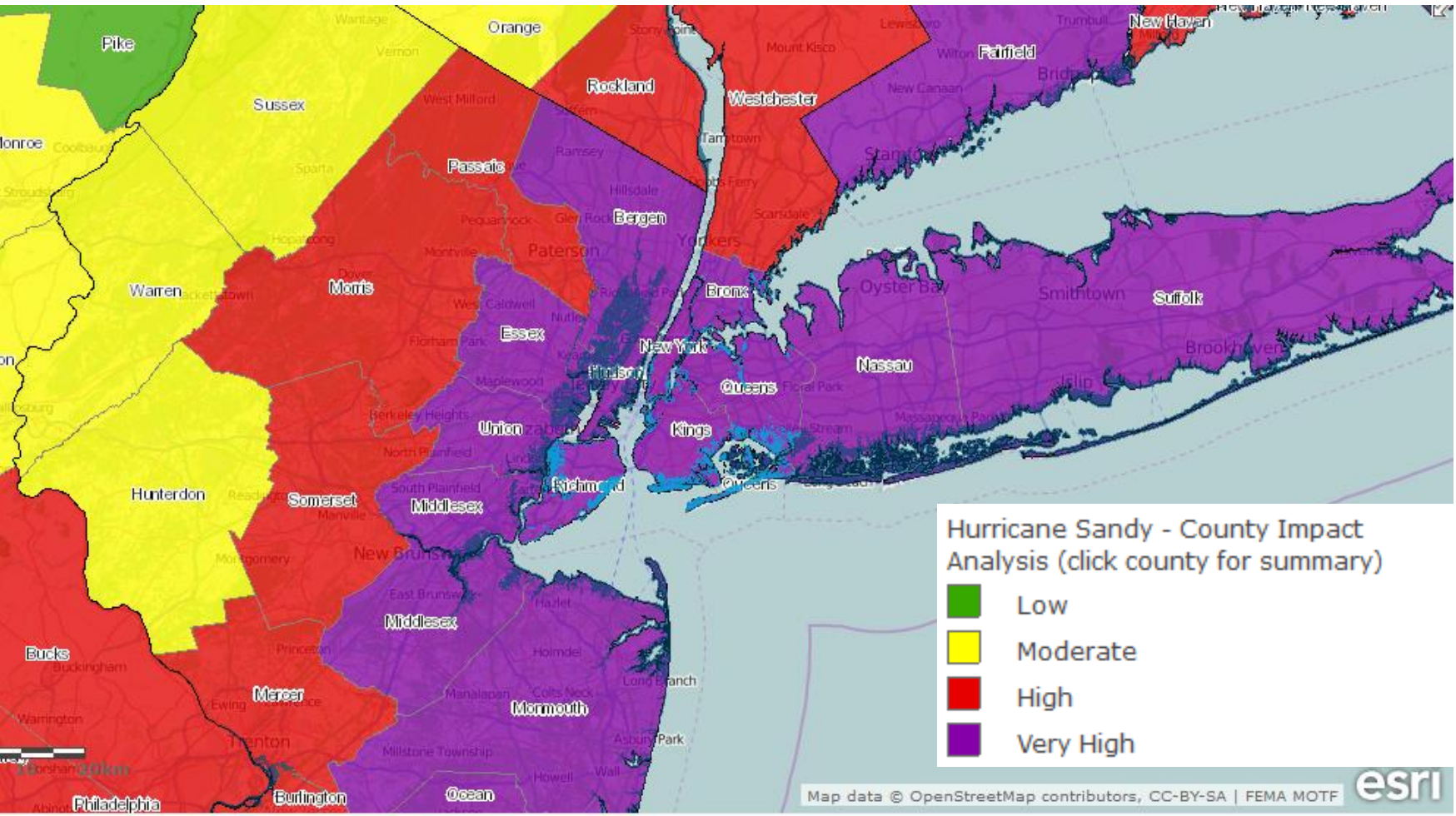
18km buffer

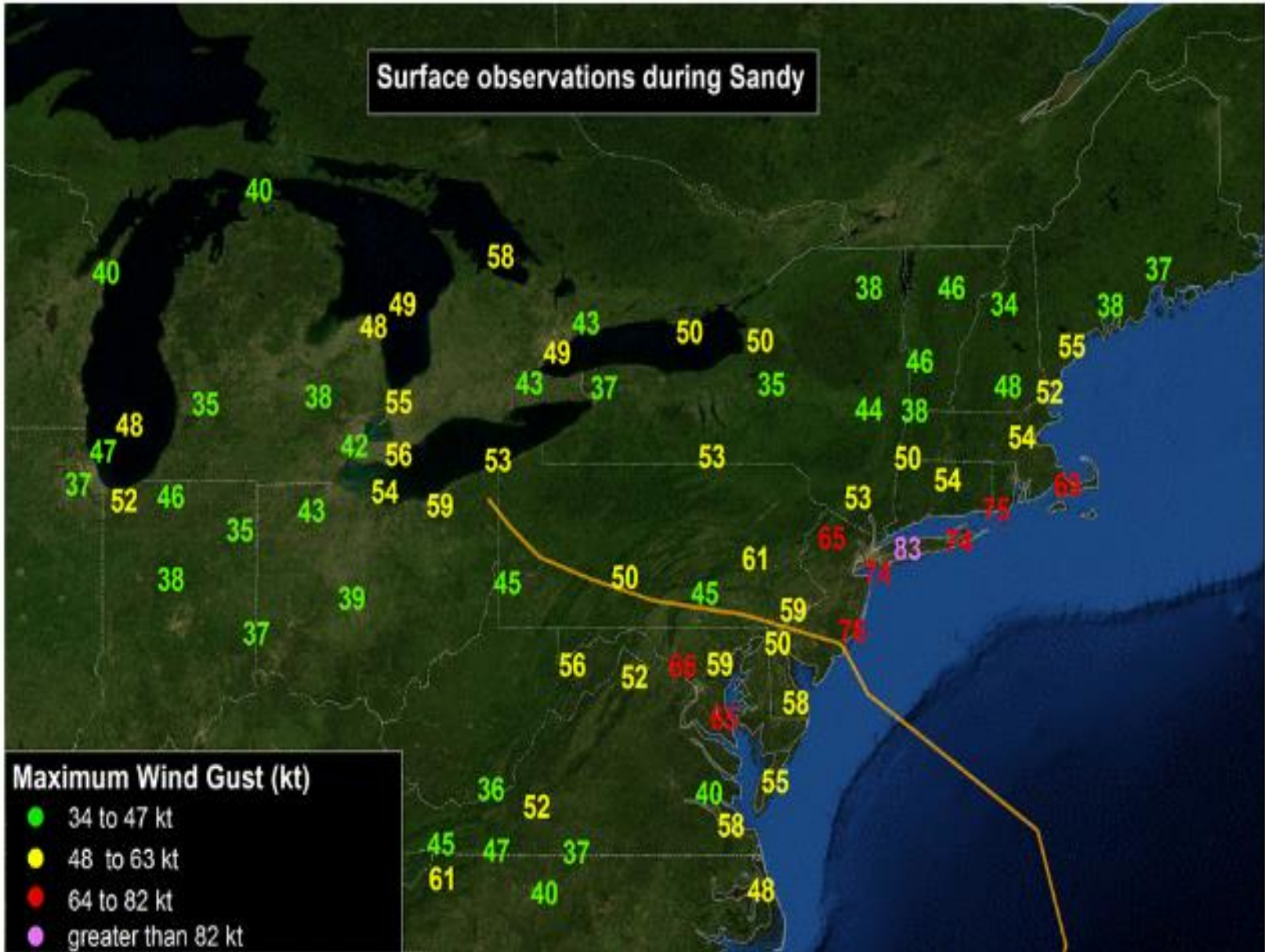
NYC Hurricane Sandy Intensity





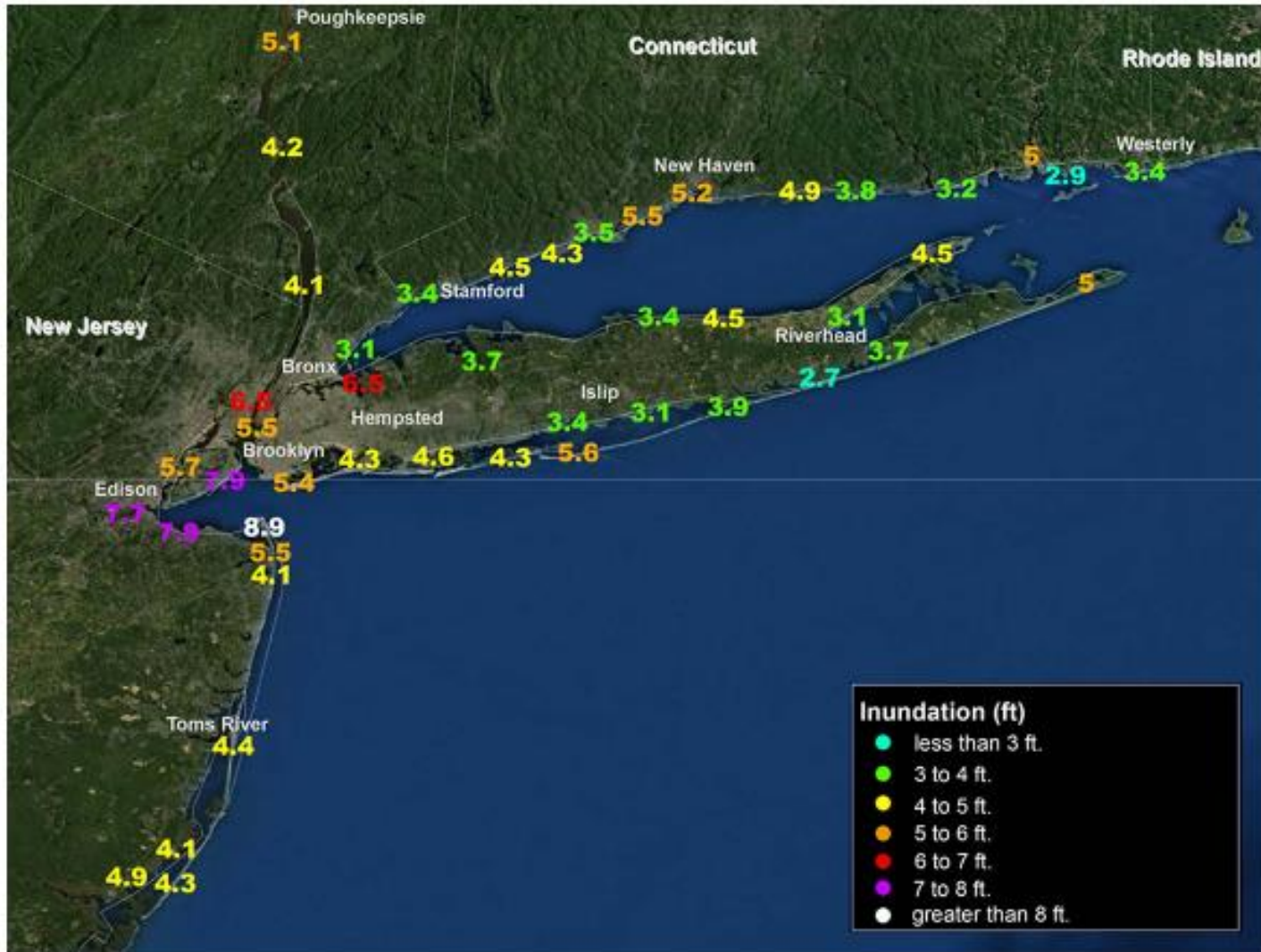
FEMA – Sandy Impact Analysis





(NATIONAL HURRICANE CENTER, 2013)

Inundation Levels



(NATIONAL HURRICANE CENTER, 2013)

Conclusion

- Real time
- Affordable
- Reliable
- Event detection
- Extension
- Intensity



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