Supplement of

Large discrepancies between event- and response-based compound flood hazard estimates

Table S1. Datasets, authors, and sources of the data used to setup the SFINCS model for Gloucester City (NJ).

Name	Authors	Source
Hydrologic Units	NJDEP Bureau of GIS	https://gisdata-njdep.opendata.arcgis.com/datasets/02599a9424254a4ea33e689941559e3c_17/explore
DEM CoNED	U.S. Geological Survey NOAA	https://www.usgs.gov/special-topics/coastal-national-elevation-database-applications-project/data
Landcover classes	NJDEP Bureau of GIS	https://gisdata-njdep.opendata.arcgis.com/documents/njdep::land-use-land-cover-of-new-jersey-2015-download/about

Table S2. Datasets searched and used for the SFINCS flood model validation.

	Database	Source	Resolution	# Events
1	Global Flood Database	https://global-flood-database.cloudtostreet.ai/#interactive-map	500-250m	1 in 2001
2	USGS HWMs	https://stn.wim.usgs.gov/fev/	Point	None
3	NOAA Storm Events	https://www.ncdc.noaa.gov/stormevents/ Keywords search: Coastal Flood, Flood, Heavy rain, Hurricane, Storm surge/tide, Tropical Storm, Tropical Depression, Winter Storm, Winter weather Region: Camden County	Narrative	None
4	FEMA	Flood Risk Map: https://map1.msc.fema.gov/data/FRP/FRM_Coastal_34007_20170424.pdf?LOC=f509865d8cfc4b3f81267fa59019847d	Point	1 in 2009
5	Local News	https://www.courierpostonline.com/story/news/local/south-jersey/2019/06/20/floodwaters-ruin-artifacts-gloucester-city-historical-society/1514980001/	Point	1 in 2019

		https://www.courierpostonline.com/story/news/local/south-jersey/2019/06/21/westville-gloucester-city-clean-whats-left-after-flooding/1529203001/		
6	Global Flood Monitor	https://www.globalfloodmonitor.org/ Tweet: https://twitter.com/stormchaser0026/status/1281677885124771840	Point	9 events, 1 with photo
7	MyCoast: New Jersey	https://mycoast.org/nj/high-water	Point	None
8	Local Authorities	Camden County Municipal Utilities Authority (CCMUA) Regional Flooding Study. Phase 1 Final Report. CDM Smith, 2023	Areas, points	6 regions identified as frequently flooded
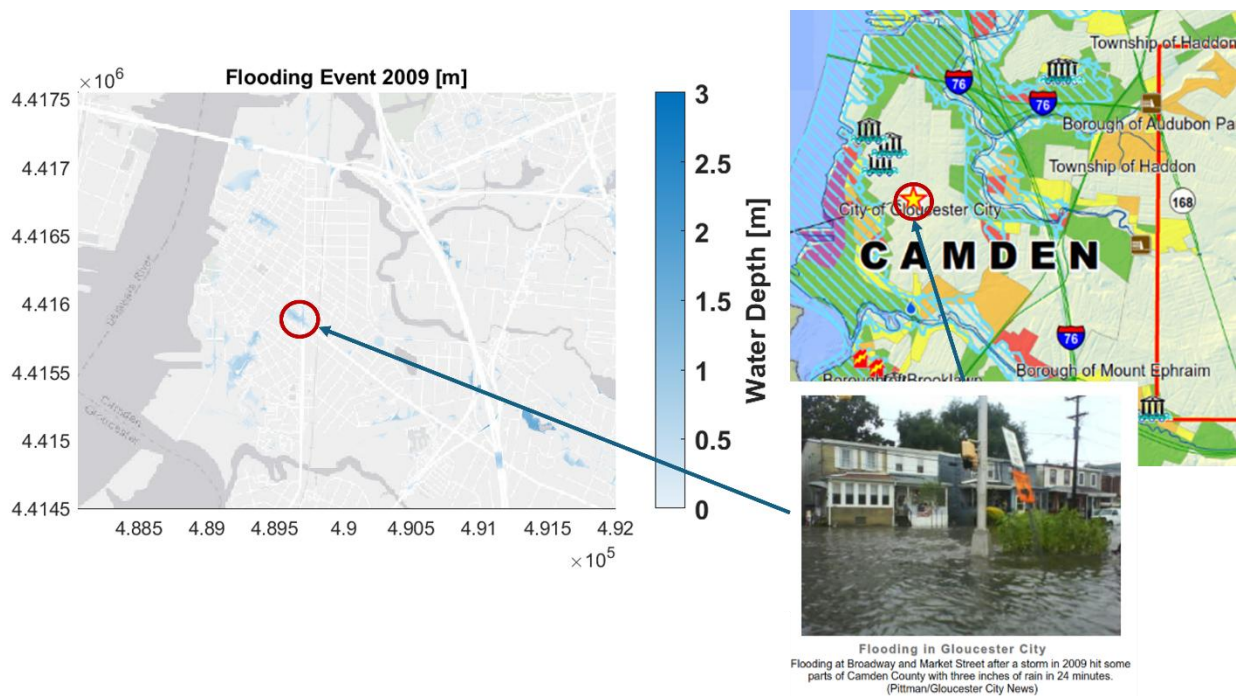
Figure S1. Flood map resulting from the simulation (neglecting infiltration) of the 2009 flood event reported in the FEMA Risk Map. Average water depths of 36cm are estimated for the intersection shown in the photo (red circle). Figure from Pollack et al., (2024).
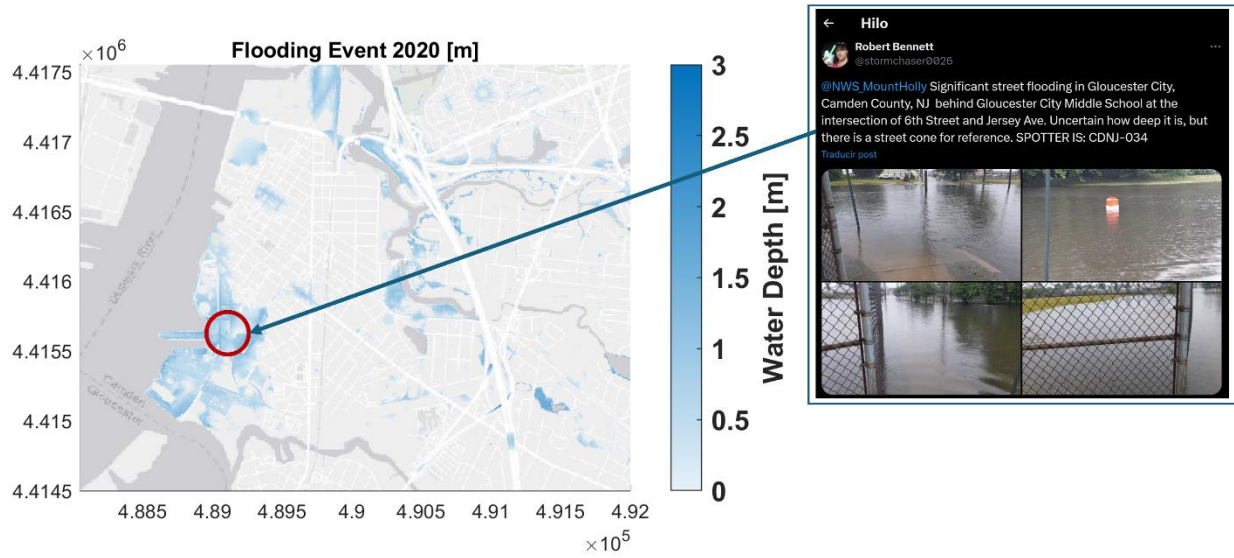
Figure S2. Flooding resulting from the simulation of the flood event in 2020 reported via Twitter and corresponding tweet showing flooding in the region marked with a red circle. Average water depths estimated by the SFINCS model are of 72 cm. Figure from Pollack et al., (2024).
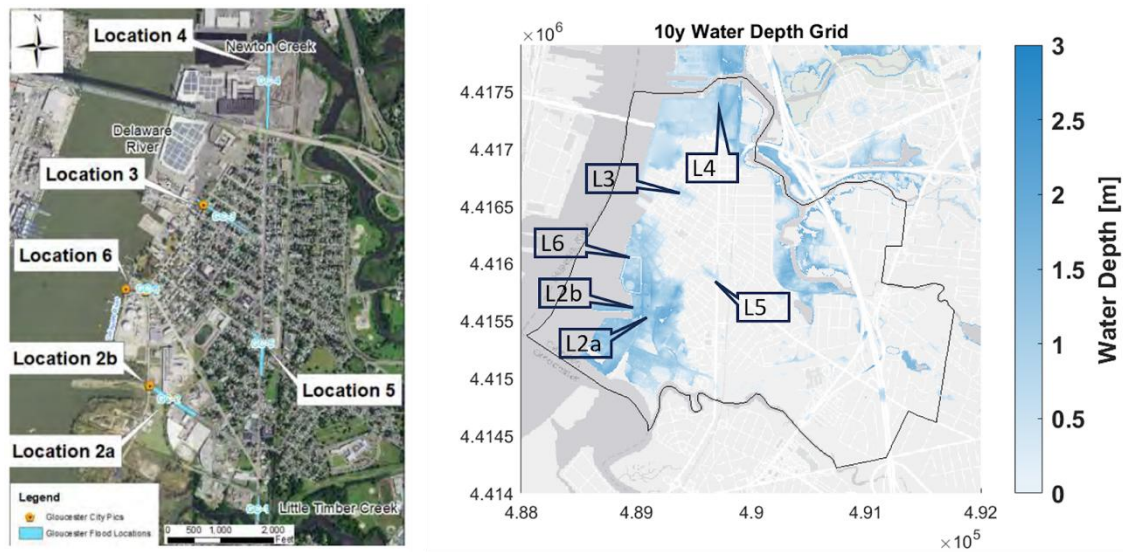
Figure S3. Left panel shows the locations in Gloucester City where flooding is frequently reported by the Camden County Municipal Utilities Authority (CCMUA) (source: Regional Flooding Study. Phase 1 Final Report. CDM Smith, 2023). Right panel shows the water depths from the simulation of the 10- year event, highlighting the flood prone areas identified by CCMUA. Figure from Pollack et al., (2024).
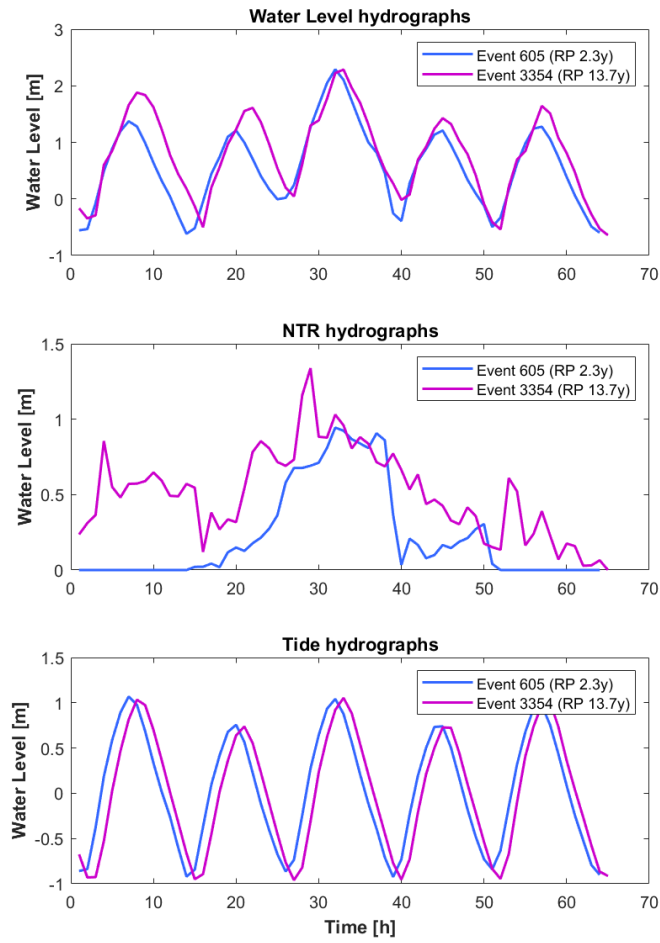
Figure S4. Time series of water levels, NTR, and Tide of the synthetic events that produce the 1% AEP water depth from the response approach.
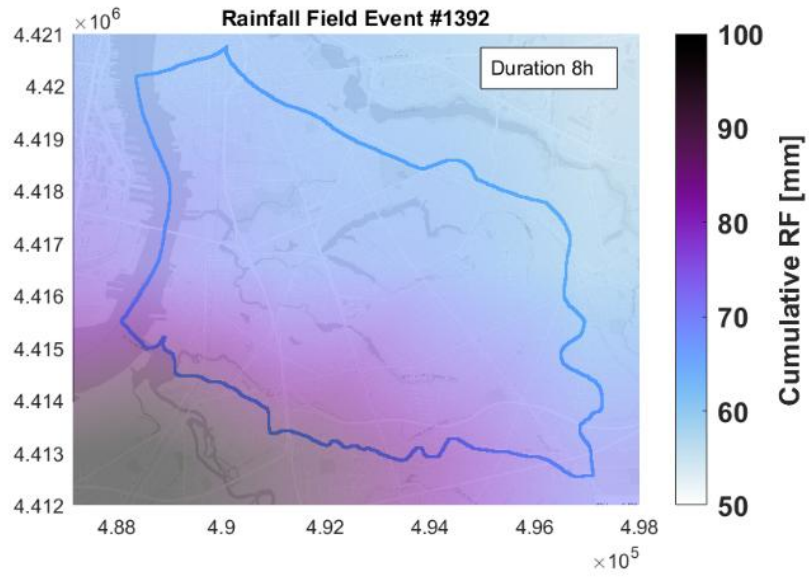
Figure S5. Accumulated rainfall field (over the event duration) of one of the events that produces the 1% AEP water depth in the pluvial hotspots of the study site. The return period of this event is 8.26 years.
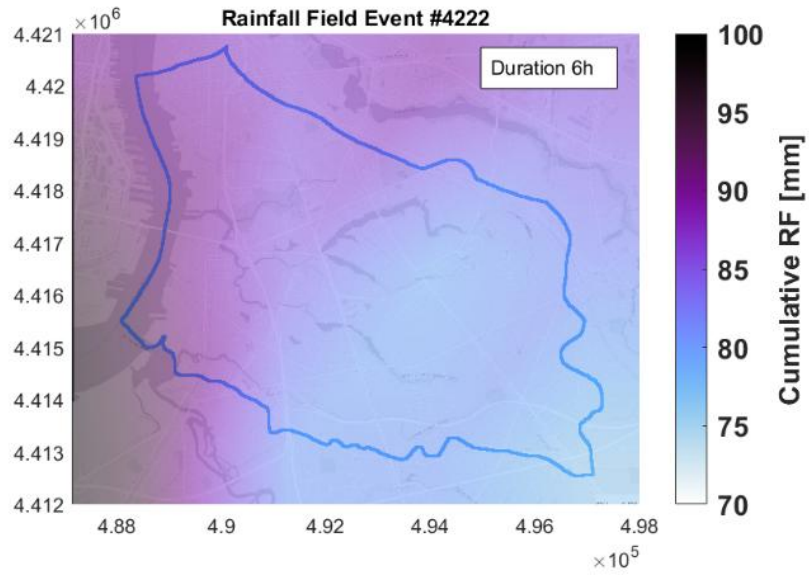
Figure S6. Accumulated rainfall field (over the event duration) of the other event that produces the 1% AEP water depth in the pluvial hotspots of the study site. The return period of this event is 8.85 years.