Hurricane Ida Case Study

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Antecedent Conditions

Hurricane Henri - August 22-23, 2021

PRE (Predecessor Rainfall Event)

Record-breaking rainfall: 1.94” in one hour observed at Central Park ASOS

4.47” 24-hour rainfall reported at Central Park ASOS

One of the wettest days in Central Park since Long Island flooding event August 14, 2014
Formation and Rapid Intensification of Hurricane Ida
Formation and Rapid Intensification of Hurricane Ida

1500 UTC August 26, 2021

Tropical Depression Nine formed (Max sustained winds 35 mph)

1655 UTC August 29, Ida makes landfall as Category 4 hurricane (Max sustained winds 150 mph)

1500 UTC August 26, 2021
Tropical Depression Nine formed (Max sustained winds 35 mph)
Stalled frontal boundary to the north of Ida
Concentrated divergence over Northeast Trough axis
Frontogenesis is juxtaposed with the warm front over southern New York & New Jersey.
Air mass well north of the warm front in 50s and low 60s, dewpoints in 40s or low 50s

0000 UTC
02 September
Ida brought an influx of warm, moist tropical air (1-3 standard deviations above normal) to the Northeast U.S. as it propagated north from the Gulf of Mexico.

Strong southwesterly winds downstream of the amplifying trough enhanced the moisture transport from the Gulf and western Atlantic.

The combination of high precipitable water values and forcing for ascent due to the surface frontal boundary and strong jet streak resulted in intense rainfall.
Moisture Transport & PWAT Anomalies for Northeast U.S.

NAEFS Mean Integrated WV Transport (kgm^-1 s^-1) and Standardized Anomaly
HOUR 000 - VALID 00:00 UTC Thu Sep 02 2021

Relative to the 22-Aug to 12-Sep 1979-2009 CFSR climatology

NAEFS Mean Precipitable Water (in) and Standardized Anomaly
HOUR 000 - VALID 00:00 UTC Thu Sep 02 2021

Relative to the 22-Aug to 12-Sep 1979-2009 CFSR climatology
NWS RFC 3 Hour Flash Flood Guidance on 1 Sep 2021 12 UTC
Estimated amount of Three Hour Rainfall needed for non-urban Flash Flooding to commence
NWS RFC 3 Hour Flash Flood Guidance on 1 Sep 2021 12 UTC

Estimated amount of Three Hour Rainfall needed for non-urban Flash Flooding to commence.
Total 24 Hour Precipitation (in)
Ending at: Thursday, 2021-09-02
At 04:00 AM

24-h rainfall amounts of up to 8 inches in NYC & Long Island

24-h rainfall amounts of ~1 inch in Capital Region
Deep moisture through the column

45-55 kt mid-level jet resulted in high moisture transport
23 UTC 01 September - 0230 UTC 02 September 2021 ENX Loop of Very Heavy Rain Training Over Mid-Hudson Valley & Western New England. Notice Sharp Gradient over Capital District
24 Hour T-Storm Summary
Ending At 1 AM On
Thursday, 2021-09-02

Data From MRMS:
- Peak MESH 500 m Hail (Fill),
- 0-2 km Rotation Track (Gray),
- CG Lightning Strikes (Pink)

NYS Mesonet Gusts
Above 40 mph Listed (Black)
Ida: Max 1 Hour Rainfall

inches

- Standard Mesonet Site
- Con Edison Site
- ASOS Site

NYS Mesonet
UNIVERSITY AT ALBANY

Strategic Partner
conEdison, inc.
Impacts in NYC

First and second ever Flash Flood Emergency issued by the National Weather Service Office in Upton, NY for NYC
Deep moisture through the column

Northerly/backing winds in the lower troposphere suggesting dry/cold air advection
Impacts in Upstate New York & Connecticut

Though rainfall was not as intense as in NYC, rainfall totals still reached 4 to 6 inches in Ulster and Dutchess Counties in NY as well as Litchfield County CT which prompted Flash Flood Warnings. Regretfully, there was one fatality to flooding in Litchfield County.
Impacts in Upstate New York & Connecticut

Esopus, Ulster County

Rainfall total approx. 4 inches in 24 hours
Conclusions

● The heavy rainfall from TS Henri only ten days earlier resulted in wet antecedent conditions and therefore meant NJ and southern NY was more vulnerable to flash flooding

● The combination of an exceptionally moisture rich environment from Ida’s extratropical transition and high moisture transport in the presence of strong forcing for ascent from a jet streak aloft and frontogenesis along a warm front resulted in heavy rainfall that persisted for multiple hours in southern NY.

● Record-breaking rainfall in the NYC metropolitan area resulted in the first ever Flash Flood Emergency issued by the local NWS office and widespread flooding over southern NY

● However, the strong precipitation gradient limited the effects of the heaviest rainfall from impacting most of the Capital region