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Actuarial Weather Extremes: Rainfall Totals for Hurricane Dorian

Rainfall Totals for Hurricane Dorian

During the first eight days of September, Hurricane Dorian traversed 2000 miles from the Caribbean Sea to the Labrador Sea. The powerful storm slammed into the Bahamas on September 1, and then hugged the U.S. east coast, moving slowly northward from Florida to Virginia between September 2 and 6. Thereafter, Dorian moved off the U.S. shore, traveling rapidly in a northeastern direction. On September 7 and 8, Dorian hit the Canadian provinces of Nova Scotia, New Brunswick and Prince Edward Island, before finally heading east into the open ocean. The storm's high winds and heavy rain, coupled with storm surge[1], caused extensive damage, particularly in the Bahamas where the death toll is estimated to be at least 50 [2].

In this short report, we summarize Dorian's rainfall totals as measured via data from the Global Historical Climatology Network[3] (GHCN). Table 1 shows rainfall measurements for the 15 weather stations that experienced the greatest total rain accumulation during the storm. For each station, the total multi-day rainfall is shown, along with total rainfall for the peak day.

The rainfall on the peak day is ranked relative to historical one-day rainfall totals using data from 1960 to 2018 for dates running from late August to mid-September. Because some stations have relatively short data histories, the rankings were computed by merging historical data across all stations within 10 miles of the station-of-interest. Using this approach, the average ranking across the 15 stations shown in Table 1 is 99.7%, which means that only 0.3% of historical observations exceed the daily rainfall totals produced by Hurricane Dorian. In addition, one of the stations has a rank of 100% which indicates a record level of rainfall.

Table 1

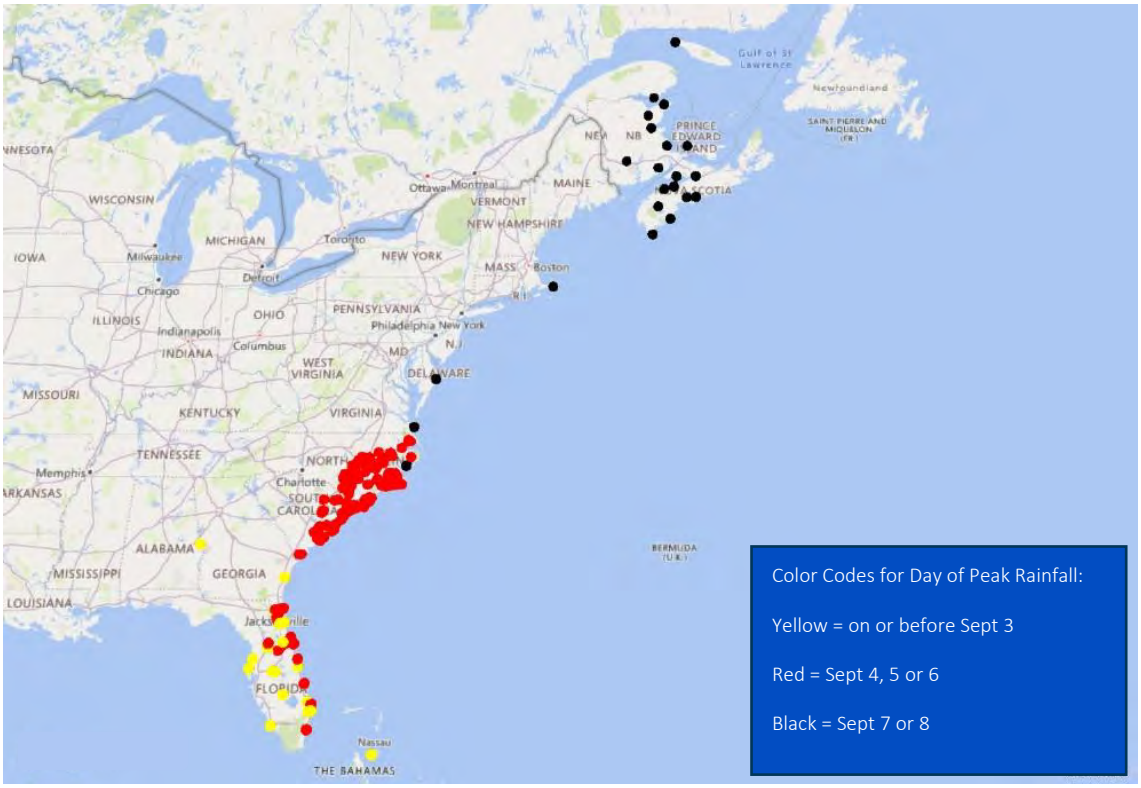
Top Fifteen Cumulative Rainfall Totals During Hurricane Dorian (source: GHCN data)

City or Name of Weather Station	State	Total Rainfall (Inches)	Rainfall on Peak Day (Inches)	Peak Day	% Ranking of Peak-Day Rainfall	Total Daily Observations Used to Compute Ranking
PAWLEYS ISLAND 5.6 NNE	SC	15.2	10.1	Sept 6	99.9%	2914
GEORGETOWN CO AP	SC	13.6	13.4	Sept 5	100.0%	1778
WILMINGTON 8.0 ENE	NC	13.0	10.2	Sept 6	99.8%	4031
MCCLELLANVILLE 7 NE	SC	12.6	10.4	Sept 5	99.9%	1785
WILMINGTON INTL AP	NC	11.2	8.6	Sept 5	99.8%	4186
N MYRTLE BCH AP	SC	10.8	10.4	Sept 5	99.9%	1396
MCCLELLANVILLE 0.5 ESE	SC	10.8	5.6	Sept 5	99.9%	1617
WILMINGTON 7 SE	NC	10.5	7.7	Sept 6	99.7%	2732
SURFSIDE BEACH 1.0 NE	SC	10.3	5.8	Sept 6	99.4%	3747
SUNSET BEACH 1.7 WNW	NC	9.9	5.4	Sept 6	99.6%	2233
MURRELLS INLET 4.0 NE	SC	9.8	6.1	Sept 6	99.4%	3629
MYRTLE BEACH 8.4 WNW	SC	9.7	5.2	Sept 5	99.3%	3930
MYRTLE BEACH 5.0 WNW	SC	9.7	5.0	Sept 5	99.3%	4413
ELIZABETH CITY CGAS	NC	9.0	6.6	Sept 6	99.9%	2513
JAMESVILLE 6.1 SW	NC	8.8	7.2	Sept 6	99.8%	1662

[1] https://en.wikipedia.org/wiki/storm_surge
[2] https://www.bloomberg.com/news/articles/2019-09-10/the-latest-dorian-death-toll-rises-to-50-in-the-bahamas
[3] https://www.ncdc.noaa.gov/data-access/land-based-station-data/land-based-datasets/global-historical-climatology-network-ghcn

Figure 1

GHCN Weather Stations with At Least 3 Inches of Rain During Hurricane Dorian (source: GHCN data)



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