Integrated Datasets: CoCoRaHS in GHCN

- GHCN = Global Historical Climatology Network
  - Family of monthly, daily, and hourly datasets
  - Surface observations from land stations around the globe
  - Many data sources are integrated and quality-controlled
- Daily (GHCNd, 1750-present):
  - 3.1 billion observations across many meteorological elements
  - Includes 133 million CoCoRaHS observations (over all elements) for 1998-present
  - Stations must have >=100 observations for a meteorological element
- Monthly Precipitation (GMP4, 1697-present):
  - Totals calculated from GHCNd, augmented with other sources
  - Months must have <=5 missing days (observers should report 0 values!)

CONUS Precipitation in GHCNd

Average Number of Daily Precipitation Observations
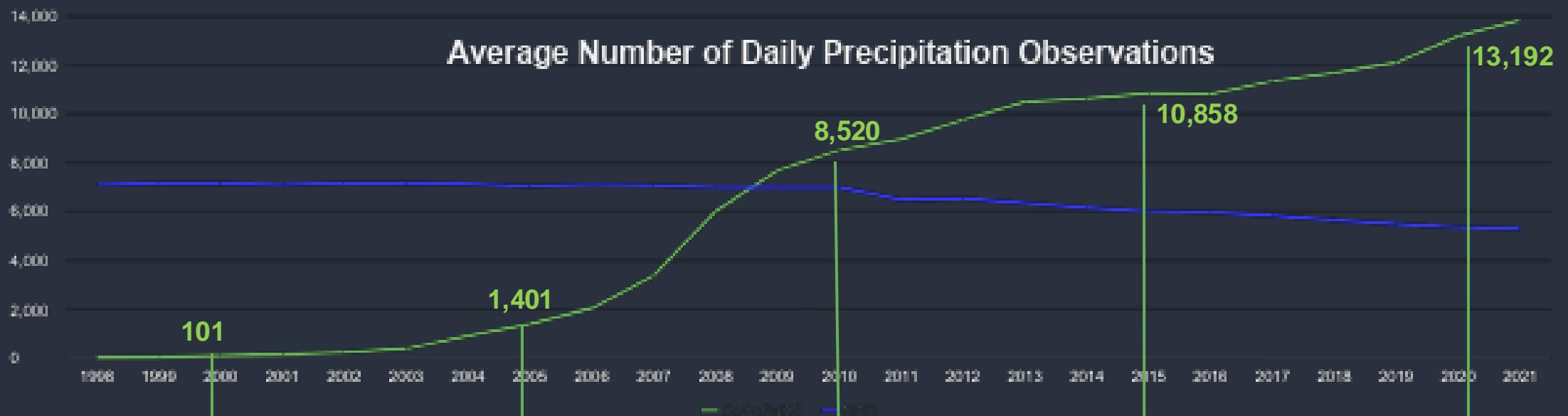
Derived Products:
1991-2020 U.S. Climate Normals

- Traditional Normals:
  - For U.S.-operated GHCNd stations with at least 10 years of sufficiently complete data
  - Includes 760 precipitation and 52 snowfall stations from CoCoRaHS
- Estimated normals:
  - For stations with two to nine sufficiently complete years
  - Includes 4680 CoCoRaHS sites

Capturing Extremes

Kansas
Max annual PRCP total
75.33", 2019
Farlington 0.8 NNE

New Jersey
Max annual PRCP total
90.65", 2011
W Milford TWP 3.2 NE

Maryland
Max annual PRCP total
84.56", 2018
Catonsville 1.2 NW

**Delaware**
All-time max SNOW depth
28.0", Feb. 7, 2010
Greenwood 2.9 SE
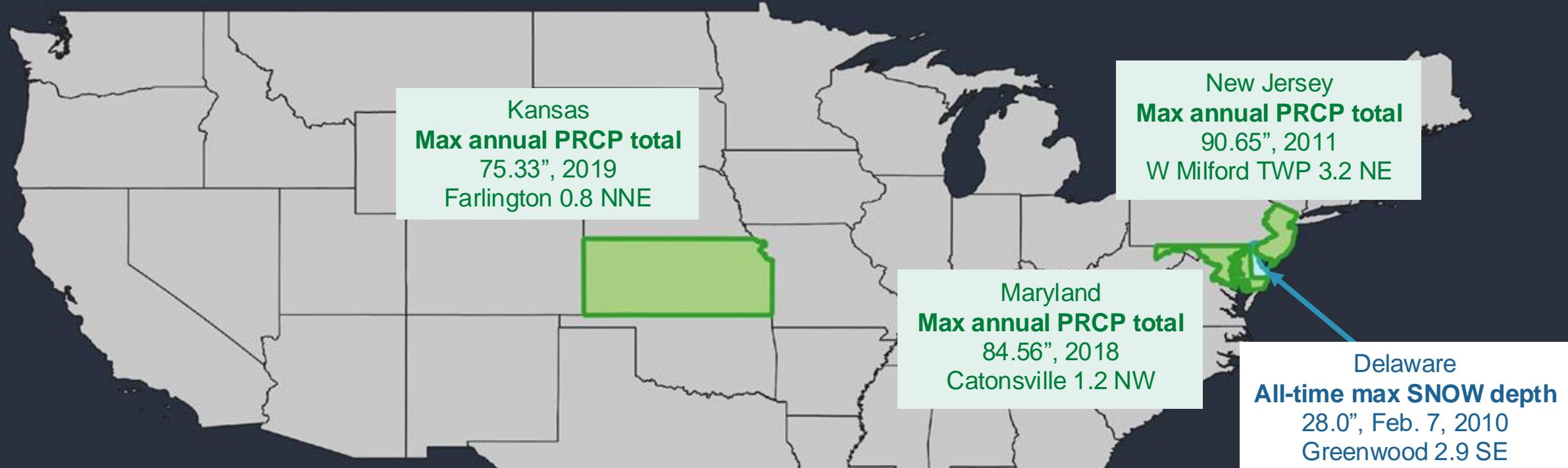
Capturing Extremes: Hurricane Ian

- Ian was a strong Category 4 hurricane that made landfall in Florida on September 28, 2022

- Highest 10 storm totals in Florida:

Location	Network	Amount
DAYTONA BEACH SHORES 1.8 SSE	CoCoRaHS	25.66
DAYTONA BEACH	NWS	21.49
NEW SMYRNA BEACH 8.5 W	CoCoRaHS	21.09
NEW SMYRNA BEACH 1.4 WNW	CoCoRaHS	19.34
EDGEWATER 2.4 N	CoCoRaHS	19.02
ORMOND BEACH 4.1 ESE	CoCoRaHS	16.59
FROSTPROOF 4.6 SW	CoCoRaHS	16.50
ORLANDO SANFORD AP	NWS	16.10
LAKE HELEN 0.9 S	CoCoRaHS	15.77
WINTER SPRINGS 0.6 S	CoCoRaHS	15.56

Hurricane Ian Precipitation
September 27-30, 2022

Total Precipitation (inches)
- <1.00
- 1.00-5.00
- 5.01-10.00
- 10.01-15.00
- >15.00

National Centers for Environmental Information

Preliminary Data.
Totals include WBAN, COOP
COCORAHS surface stations
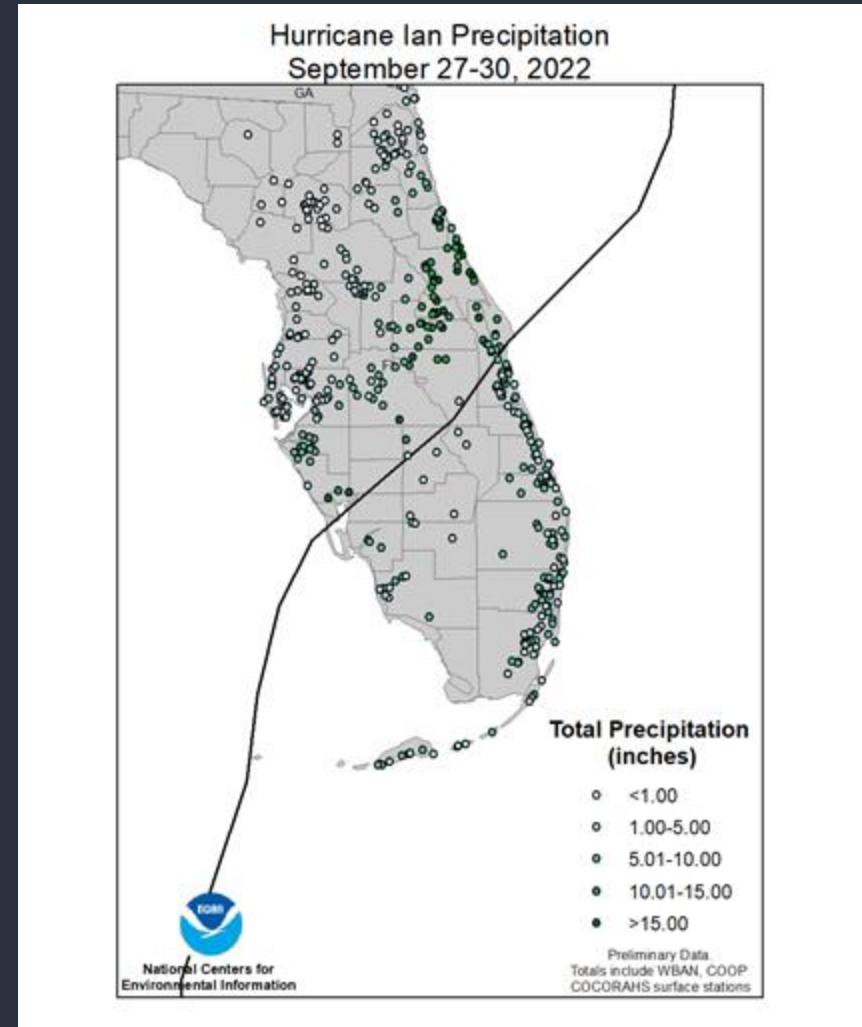
Mapping Events

- For long-term historical context, nClimGrid-Daily:

  – Gridded fields for Contiguous U.S., 1951-present

  – Daily Tmax, Tmin, and Tavg and daily precipitation

  – Precip data from NWS and SNOTEL

  – No CoCoRaHS, to maintain greater temporal network consistency

  – Includes only data with observation times of morning (5-9AM) and midnight

- For more complete event mapping:

  – Including CoCoRaHS triples the number of input observations, but limits comparable period to the last 10-15 years.

  – Areas with sparse COOP observations particularly benefit.

  – Sept. 29, 2022, example: Including CoCoRaHS decreases the proportion of grid points with <3 stations within 30 miles from 47% to 18%.

Event Mapping: Hurricane Ian

nClimGrid Daily
w/o CoCoRaHS

nClimGrid Daily
w/ CoCoRaHS
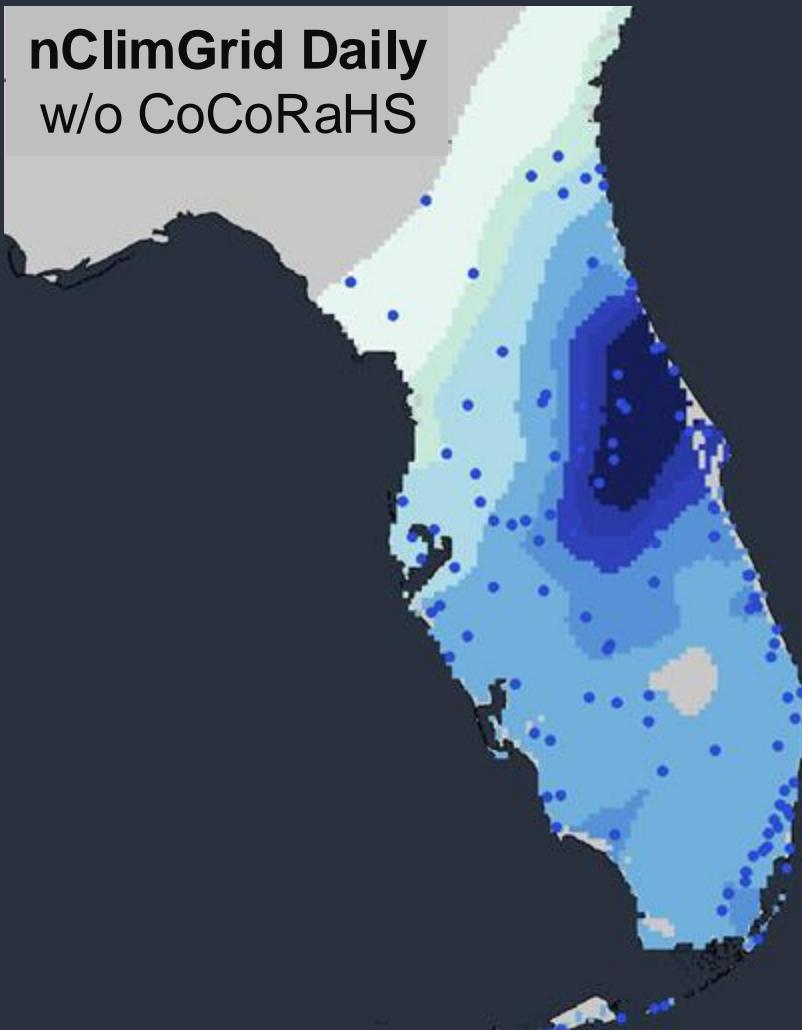
GHCND Stations
- CoCoRaHS
- NWS

- <= 0.1
- 0.1 - 1.0
- 1.0 - 2.0
- 2.0 - 4.0
- 4.0 - 6.0
- 6.0 - 8.0
- 8.0 - 10.0
- 10.0 - 12.0
- 12.0 - 14.0
- > 14.0
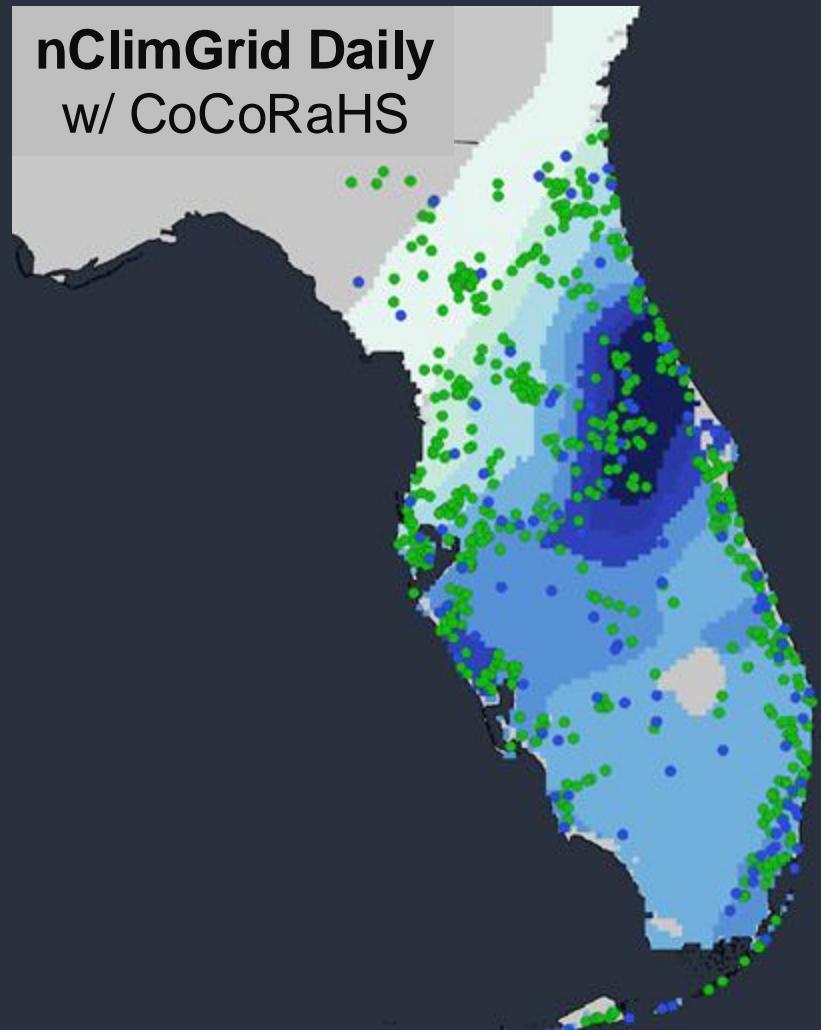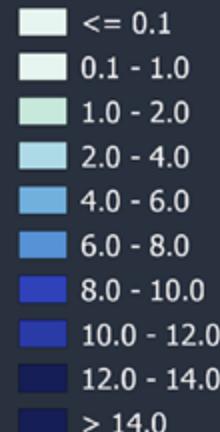
Event Mapping: Tropical Storm Ophelia

nClimGrid Daily w/CoCoRaHS
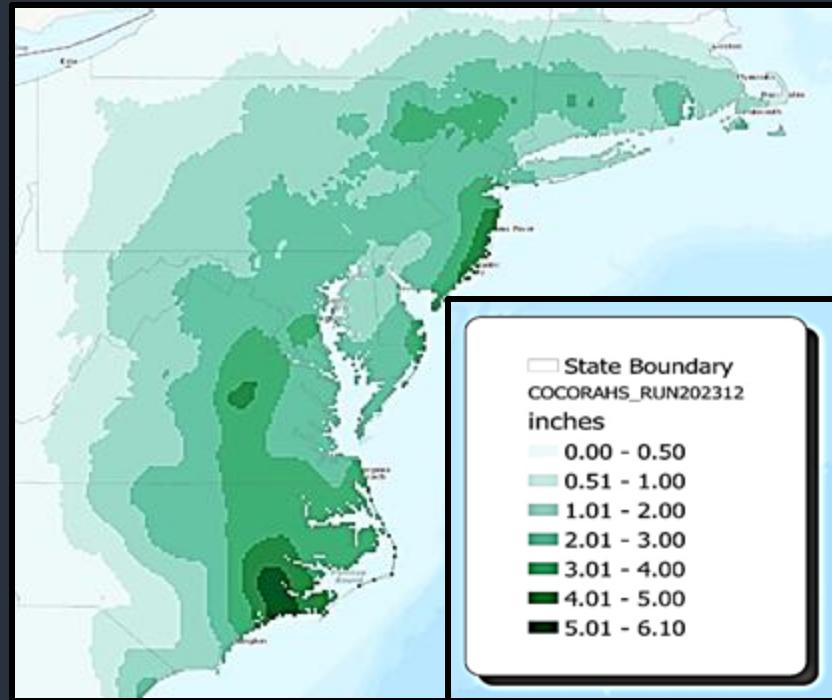
Weather Prediction Center
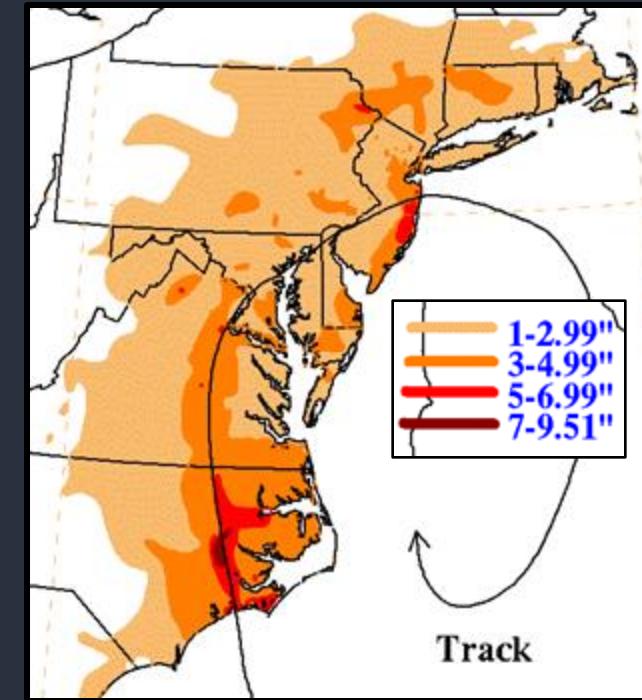
Summary

- GHCN and Normals include CoCoRaHS observations.

- CoCoRaHS improves spatial coverage and identification of extremes.

- CoCoRaHS-enhanced gridded precip fields inform NCEI's reports.

- Operational enhanced gridded product is under consideration.

References

- GHCN-Daily
  - https://www.ncei.noaa.gov/products/land-based-station/global-historical-climatology-network-daily

- GHCN-Monthly
  - https://www.ncei.noaa.gov/products/land-based-station/global-historical-climatology-network-monthly

- 1991-2020 US Climate Normals
  - https://www.ncei.noaa.gov/products/land-based-station/us-climate-normals

- NClimGrid-Daily
  - https://www.ncei.noaa.gov/products/land-based-station/nclimgrid-daily