Comparison of FSU’s High Resolution Historical Precipitation Database with Thiessen Polygon Gauge Amounts

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Overview

- Describe FSU’s historical precipitation database
- Briefly introduce Multisensor Precipitation Estimator (MPE)
- Discuss the use of Thiessen polygons
- Compare MPE amounts with Thiessen polygon estimates within Black Creek Basin for 1996-2003
- Examine two case studies
- Conclusions
Multisensor Precipitation Estimator

- Optimally combines gauge and radar-derived precip.
- Software developed by the National Weather Service (NWS) Hydrologic Research Laboratory
- Utilizes the strengths of each sensor
  - Gauges - Accurate point measurements
  - Radar - High resolution horizontal fields
- Final Product
  - 4 x 4 km² grid
  - Hourly totals
- Used at NWS offices and River Forecast Centers
Methodology

- **MPE algorithm**
  - Analyzes quality controlled gauge data onto HRAP grid
  - Picks radar that best “sees” each grid point
  - Calculates hourly gauge/radar bias for each radar
  - Multiply radar values by bias
  - Finally, combines gauge data with bias-corrected radar

- **Thiessen polygons**
  - Define area of gauge influence halfway to each nearest gauges
Black Creek Basin

Just southwest of JAX

Thiessen polygon

MPE 4x4 km² cell

Gauge

St. Johns River
Hourly MPE vs Gauge

Correlation = 0.850
Stdev(Diff) = 0.028
Mean(Diff) = 0.001
Mean[Abs(Diff)] = 0.003
n = 56679

MPE (in)

Gauge (in)
Hourly MPE vs Gauge

![Chart](image)

- **X-axis**: Gauge (in)
- **Y-axis**: MPE (in)

The graph shows a scatter plot with a trend line indicating a positive correlation between MPE and Gauge.
Hourly Cold Season MPE vs Gauge

- Correlation = 0.938
- Stdev(Diff) = 0.011
- Mean(Diff) = 0.000
- Mean[Abs(Diff)] = 0.001
- n = 27417
Hourly Warm Season MPE vs Gauge

Correlation = 0.831
Stdev(Diff) = 0.038
Mean(Diff) = 0.001
Mean[Abs(Diff)] = 0.005
n = 29262
Daily MPE vs Gauge

Correlation = 0.929
Stdev(Diff) = 0.129
Mean(Diff) = 0.012
Mean[Abs(Diff)] = 0.037
n = 1450
Daily Cold Season MPE vs Gauge

Correlation = 0.974
Stddev(Diff) = 0.055
Mean(Diff) = 0.003
Mean[Abs(Diff)] = 0.014
n = 741
Daily Warm Season MPE vs Gauge

Correlation = 0.917
Stdev(Diff) = 0.176
Mean(Diff) = 0.021
\[
\text{Mean[Abs(Diff)]} = 0.061
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n = 710
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Gauge = 2.05 in
MPE average = 0.79 in
MPE cell over gauge = 1.95 in

Gauge = 0.36 in
MPE average = 0.32 in
MPE cell over gauge = 0.42 in
Rainfall (in)

22Z July 19, 2002

Gauge = 1.01 in
MPE average = 0.80 in
MPE cell over gauge = 1.09 in

23Z July 19, 2002

Gauge = 0.17 in
MPE average = 0.76 in
MPE cell over gauge = 0.28 in
Conclusions

- **Statistical comparisons:**
  - Given different scales of data, MPE and gauges agree well.
  - Correlations, biases, and standard deviations all increase from hourly to daily data.
  - Better agreements during cold season…stratiform precip.
  - Less agreement during warm season…convective precip.
  - MPE provides superior spatial resolution.

- **Case studies:**
  - Heavy rainfall can occur over gauge or miss gauge, causing Thiessen polygon estimates to be too large or too small.
  - These situations often occur in convective scenarios (typically warm season).
Future Work

- Multiple basins to be studied
- Quantify differences that arise due to:
  - Storm type – convective or stratiform
  - Season – Cold vs. warm
  - Size of the basin
  - Gauge density within the basin
  - Time period of the calculations – hourly, daily, monthly, etc.
  - Area of Florida in which the basins are located
- Compare data sources using a hydrologic model

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Data are available

- 4 x 4 km² hourly data
- 1996-2004
- Florida, Georgia, and Alabama
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