I. Introduction

Extreme meteorological events are a normal behavior of the Earth’s climate. One of these events, extreme rainfall, has its primary impact in regional and local areas. Climatology of rainfall (runoff) can help identify areas of higher risk of floods. Flash floods and crop damage. This study focuses on local climatology to identify risk associated with 24h and 48h periods. Examples of applications of results are demonstrated.

II. Data

- CCDC Daily Surface Data
- WBAN and Cooperative Network stations
- Florida Climate Center archive
- Period: 1948 – 2008
- Daily precipitation totals
- Focus on 24h and 48h rainfall in Florida
- Consider annual maxima, partial duration values, and frequency spectra of one-day and two-day rainfall.

III. Procedures

1. Rainfall frequency spectra (Stephens et al. 2003)

2. Extremes

   - Variability of rainfall greatest in observed maxima; focus on risk from extremes.
   - For extreme quantile calculations, convert observed one-day and two-day rainfall to x-hour values:
     One-day to 24h: 1.13; Two-day to 48h: 1.05 (per Huff and Angel 1992).
   - Fit Generalized Extreme Value (GEV) Distributions whose moments are derived via L-moments:
     \[ f(x) = \frac{1}{\beta} \exp \left( \frac{x - \mu}{\beta} \right) \left[ 1 + \frac{\gamma}{\beta} \left( \frac{x - \mu}{\beta} \right) \right]^{-1 - \gamma} \]
   - L-moments (Hosking 1990) defined in terms of linear combinations of order statistics.

   - \( \mu \) is the location parameter; \( \gamma \) is a scale parameter; \( \beta \) is a shape parameter

3. Calculate a risk index (after Hogue et al. 1997). Use 100-yr (i = 100) quantiles, \( Q_{50i} \) and \( Q_{95i} \), and upper confidence limits, \( L_{95ui} \) and \( L_{95ai} \). The goal is to reflect degree of hazard addressed by including 48h amounts in assessments.

\[ HFi = Q_{50i} - Q_{95i} \]
\[ VFi = L_{95ui} - L_{95ai} \]

4. Combined use of annual maximum and partial duration rainfall may produce more representative design-storm criteria and surface runoff risk estimates.

IV. Risk of Extreme Rainfall at Local Sites

1. Compute quantiles, \( Q_i \), for various return periods from GEV distributions fitted to original samples. Convert one- and two-day rainfall to 24h and 48h amounts.

   - Use balanced resampling procedure to calculate 95% confidence intervals for extreme rainfall quantities (Barn 2003).
   - For this study, distributions of various quantities were calculated via permutation of 500 random samples.

2. Calculate a risk index (after Hogue et al. 1997). Use 100-yr (i = 100) quantiles, \( Q_{50i} \) and \( Q_{95i} \), and upper confidence limits, \( L_{95ui} \) and \( L_{95ai} \). The goal is to reflect degree of hazard addressed by including 48h amounts in assessments.

\[ HFi = Q_{50i} - Q_{95i} \]
\[ VFi = L_{95ui} - L_{95ai} \]

V. Revisited Applications

1. Consider combined results from annual maximum and partial duration data, as used in design-storms (Song-James 2000).

VI. Summary

1. Rainfall frequency spectra indicate greatest variability in local one-day and two-day maxima. This supports local focus on extremes. Other quantities are more suitable for regional application.

2. Differences between annual maximum one-day and two-day rainfall vary yearly and among Florida stations, suggesting variability of risk in 48h versus 24h. A Risk Index quantifies such variability in risk of extreme rainfall.

3. Higher values of the Risk Index suggest consideration of potential for 48h, as well as 24h, extreme rainfall in runoff risk assessment. The impact of tropical cyclones is evident at several coastal stations, but not all. This further supports consideration of local climatologies.

4. Combined use of annual maximum and partial duration rainfall may produce more representative design-storm criteria and surface runoff risk estimates.

VII. References

9. (Complete reference list available upon request)