THE RAINFALL DISTRIBUTION ON THE METROPOLITAN AREA OF RIO DE JANEIRO

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ABSTRACT

This work presents preliminary results of the distribution of rainfall throughout the Metropolitan Area of Rio de Janeiro (MARJ). The available raingage network of the Rio de Janeiro municipality was employed to understanding the intra-variability associated with the complex terrain and urban land cover. The probability distribution function observed in different areas inside the MARJ shows statistical similarities. Both the Gamma and Weibull probability distribution function approximates the empirical distribution in the area for strongly positive skewness. Another found is the presence of diurnal cycle especially for convective thunderstorms in the summer.

1. INTRODUTION

To support the development of tools of nowcasting addressed to be used in the support actions over the complex terrain found on the Metropolitan Area of Rio de Janeiro (MARJ), the teams of the Laboratory of Experimental Hydrometeorology (LHYDEX) and the Laboratory of Micrometeorology and Modeling (LabMiM) at the Institute of Geosciences of the Federal University of Rio de Janeiro, in Brazil, have carried out research projects, including systematic measurements, modeling of the tropical Urban Boundary Layer (UBL) as well as investigations of relationships between the tropical UBL and the associated hydrometeorology. It is worth-wise to mention that some single and clustered rainstorms are responsible by a large number of hazards, composed by soil-water mass of debris in avalanche movement, flash flooding over prone areas, also reveling unexpected risk areas, as well as defining vary fast flows running along watersheds with shorter-response times, with loss of homes and lives.

2. METODOLOGY

First, the raingage network with 32 places of measurements in the MARJ was employed in this work to understanding the seasonal and hourly intra-variability associated with both the urbanization and the complex terrain. The rainfall data for each place was concentrated, checked and organized along a continuous axis of time, every 15 minutes. Most of the statistical results were obtained with R package tools, only for the positive values. The statistical analysis includes empirical histograms, boxplots and the fit the some probability distribution functions (Gamma and Weibull) (Wilks, 2011).

3. RESULTS

To exemplify the statistical work applied to the set of rainfall data of GEORIO network we present ahead some results of the Anchieta station in the MARJ. The **Figure 1** shows the distribution of the rainfall, in units of (mm h^{-1}), along the days of the year and hours of the day for Anchieta station of the GEORIO network. It is notable the convective precipitation is concentrated in the afternoons mainly during the summer, presenting a delay from the summer to the autumn. During the transition months

(September, October and November) the frequency of precipitation decreases in relation to the summer frequency. The empirical probability density function (f.d.p.) for the Anchieta station of the GEORIO network in the MARJ is presented in **Figure 2**. In a similar way that the found for other stations in MARJ, the rainfall distribution features a defined positive skewness. The **Figure 3** presents the comparison among the different boxplot plotted for each one of the 32 raingages in the GEORIO network. The median along the network is smaller than 2 mm h^{-1}. The boxplot comparison seem indicate that a cluster analysis should be considered further in the analysis.

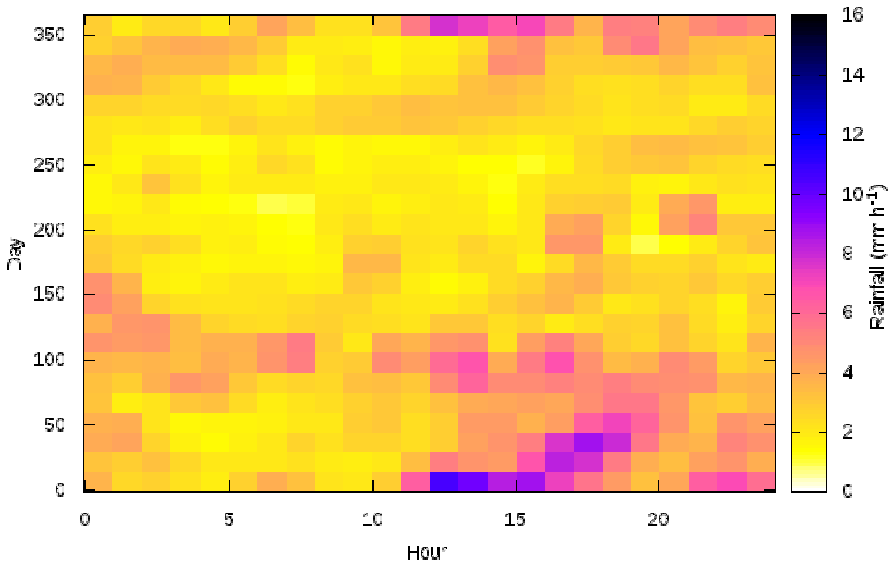

Figure 1 Rainfall distribution as a function of the day of the year and hour of the day for the Anchieta station in the MARJ.

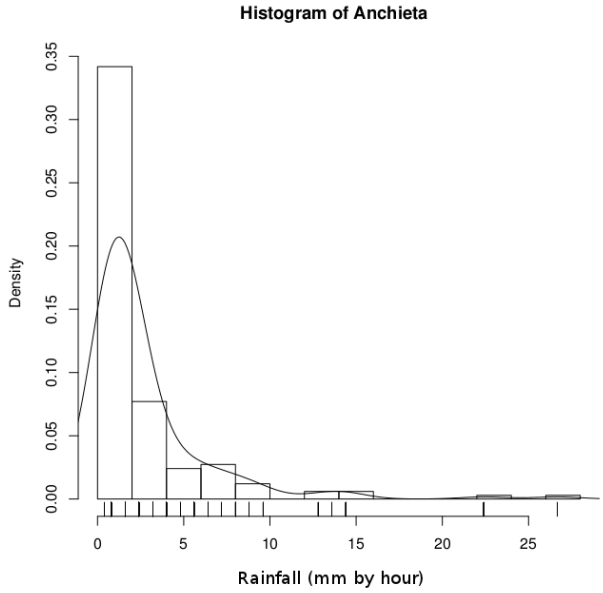

Figure 2 Empirical probability density function for Anchieta station in the MARJ. The continuous line is a spline fit.

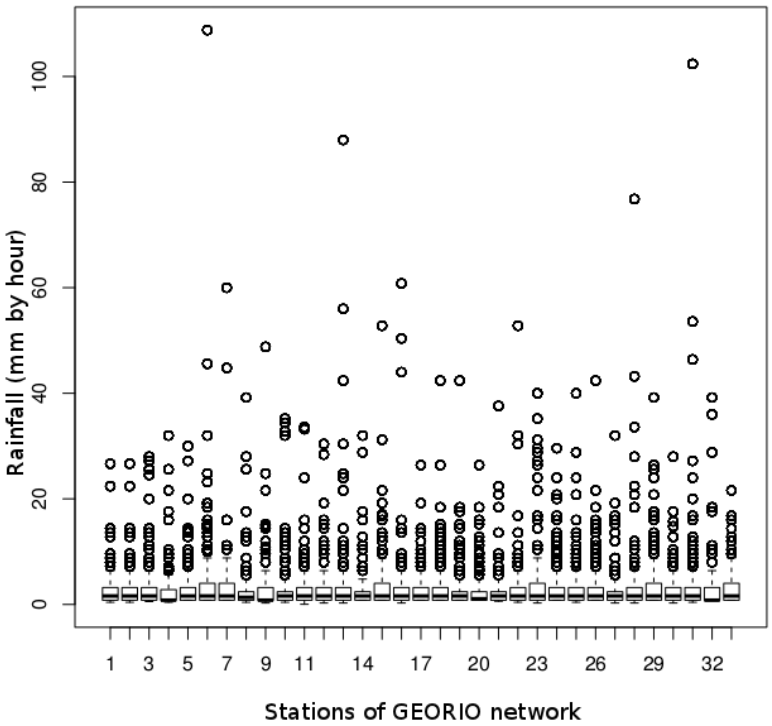

Figure 3 Comparison of boxplot for each one of the 32 raingages in the network of stations carried out by GEORIO.

REFERENCES

Wilks, D. S., 2011: *Statistical Methods in the Atmospheric Sciences*, Volume 100, Third Edition (International Geophysics). Academic Press. ISBN-13: 978-0123850225. 704 p.

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