MODELLING OF THE AREAL DISTRIBUTION OF PRECIPITATION IN THE SERRA DO MAR ESCARPMENT, SAO PAULO, BRAZIL

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I. INTRODUCTION

The variability of the annual total of precipitation over the Serra do Mar Escarpment, Sao Paulo State, Brazil, has been studied by many authors (Cruz, 1974; de Ploey and Cruz, 1979; Conti, 1975; Guidicini and Iwasa, 1976; Sant'anna Neto, 1990; Tatizana, Ogura, Cerri and Rocha, 1998; Nunes, 1990; Nunes and Modesto, 1992; Araki and Nunes, 2005) and by means of different viewpoints (annual variability, daily amounts that trigger landslides and floods, precipitation-elevation relationships and long-term changes in rainfall patterns). However, further evaluations are required due to the importance of the area: it presents a rich mosaic of ecosystems along with extensive climatic and topographic diversity, with the Atlantic Rainforest, mangroves, estuarine wet-lands, and marine mammals and birds. The region also responds for considerable parcels of all economic activities at national and regional levels, with 29 municipalities and 13.652.822 inhabitants, 36% of the total population of the state of Sao Paulo. In addition, the area could be affected by climatic changes, which might dramatically modify both physical and socio-economic characteristics of the region.

II.OBJECTIVES

The study aimed to detect patterns in the areal distribution of extreme precipitation events in the coastal region of Sao Paulo State, Brazil, which result in devastating floods and landslides; however, their spatial distribution is not fully understood.

III. THE STUDY AREA

At the eastern edge of the Atlantic Ocean, along with the variations in its relief, the region presents a variety of local climatic conditions. It is affected by tropical, subtropical and midlatitude controls, and during summer, when convective activity is greater, the SACZ influences the rainfall regime, with band cloud cover and rainfall remaining semi-stationary for several consecutive days, contributing to flooding and landslides in the area. Because the region presents uncontroversial location advantages, there is a major concentration of industries, oil and natural gases fields and pipelines. In addition, tourism is an important activity in the region and contributes to both the increase in value of the coastal region and deficits in the infrastructure, also creating a marginal population segment. Slumps appeared rapidly and this occupational pattern and the pollution generated by the industrial complexes speeded up landslides, mudslides and urban floods, causing damages to vegetation. Therefore it is of ultimate importance to evaluate the areas which present higher risk to be affected by extreme precipitation events.

The complex topography of the area and the vegetation pattern - mainly constitute by the remaining of the Atlantic Rainforest - influences the volume of the rainfall and its areal distribution, but the relation among these processes is not fully understood and requires further investigation.

IV. METHODS

In this study daily amounts of precipitation and data from Digital Elevation Model (DEM), SRTM *(*Shuttle Radar Topographic Mission*)*, generated by interpherometry technique from InSAR, version 2, with spatial resolution of 90 m were used for generating different spatial scenarios, considering conditions of both windward and leeward in relation to the atmospheric systems which affect the area and produce precipitation. The model validation considered the impacts caused by heavy rainfall events.

V. PARTIAL RESULTS

Geostatistics has proved useful to determine the complex relationship among height, complex topography, distance from the coast and rainfall totals in coastal zone of Sao Paulo state. Besides, by using Geostatistics, it was possible to establish relationships among the variables based on mathematical approaches, which are less subjective and, therefore, more precise.

Because the area experiences remarkable diversity in rainfall totals due to the complex arrangements involving geographical site factors and the precipitation generating mechanisms, with annual totals ranging from approximately 1480 to 4100mm, the impacts triggered by precipitation might be more dramatic in the sectors which receive higher amounts of rainfall, especially if the sector presents high population density. Thus, one could reinforce the relevance in incorporating the topography variation, especially in terms of windward and leeward side, which produce rainfall gradient mainly from east to west. The demarcation of the different rainfall zones by means of DEM and SRTM has also proved suitable to the scale adopted, so that the study contributes to estimate the areas which present higher risk to disasters triggered by extreme rainfall events.

Next steps shall incorporate vegetation patterns which also influence the rainfall totals in different ways.

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