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Flood hazards analysis based on changes of hydrodynamic processes in fluvial systems of Sao Paulo, Brazil.

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The metropolis of Sao Paulo, with its 7940 Km^2 and over 20 million inhabitants, is increasingly being consolidated with disregard for the dynamics of its fluvial systems and natural limitations imposed by fluvial terraces, floodplains and slopes. Events such as floods and flash floods became particularly persistent mainly in socially and environmentally vulnerable areas. The Aricanduva River basin was selected as the ideal area for the development of the flood hazard analysis since it presents the main geological and geomorphological features found in the urban site. According to studies carried out by Anthropic Geomorphology approach in São Paulo, to study this phenomenon is necessary to take into account the original hydromorphological systems and its functional conditions, as well as in which dimensions the Anthropic factor changes the balance between the main variables of surface processes. Considering those principles, an alternative model of geographical data was proposed and enabled to identify the role of different driving forces in terms of spatial conditioning of certain flood events. Spatial relationships between different variables, such as anthropogenic and original morphology, were analyzed for that purpose in addition to climate data. The surface hydrodynamic tendency spatial model conceived for this study takes as key variables: 1- The land use present at the observed date combined with the predominant lithological group, represented by a value ranging 0-100, based on indexes of the National Soil Conservation Service (NSCS-USA) and the Hydraulic Technology Center Foundation (FCTH-Brazil) to determine the resulting balance of runoff/infiltration. 2- The original slope, applying thresholds from which it's possible to determine greater tendency for runoff (in percents). 3- The minimal features of relief, combining the curvature of surface in plant and profile. Those three key variables were combined in a Geographic Information System in a series of tests to get weighted values, defining fuzzy limits in the resulting matrix. For comparison purposes, with this method it was possible to create surface hydrodynamic tendency charts of different periods of urban consolidation. Considerable changes of superficial hydrodynamic tendencies in our universe of study were identified, specially pointing to the expected positive tendency change for runoff, due to the current predominant urban land uses. Furthermore, the model enabled an associated analysis with interpolated pluvial values, pointing and quantifying, in terms of runoff volume increase, the influence of occupied areas to the occurrences of floods in areas previously not-known to be affected.