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Review of some time of concentration equations for southern Brazil

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The time of concentration (tc) of an urban catchment is a fundamental parameter for the design of stormwater drainage systems. In the lack of hydrological data for its estimation, several equations were proposed; however, almost none of them were verified in Brazilian conditions, leading to great uncertainties. Hence, the present work aims to test several time of concentration equations frequently used in Brazil, such as those proposed by Kirpich, Mccuen, Dooge, Pilgrim and McDermott, Desbordes and Schaake. The verification was accomplished by comparison with measured data from the urban sub-basins of Prado Velho and Gregório, located in the Southern and Southeastern regions of Brazil, respectively. The results were presented in terms of average absolute percentage error, which regarding the application of the equations in the two sites it was observed that only two of them resulted errors lower than 100%, in relation to the observed tc, and the Schaake equation showed the best approximations, with an error of 52%. At the Gregório sub-basin the best estimative of the tc also was found using Schaake equation, presenting an error of 28%, while the second best estimate, Mccuen, presented a much higher error (174%). In the other hand, the equations tested showed better results in the Prado Velho sub-basin, where only one resulted in an error greater than 100%. In this basin, Mccuen showed the best approximations (13%) related to the measured tc, followed by Desbordes (50%). The considerable variations observed in this study enlighten the urge of a more detailed analysis in further studies to better assist the selection of tc values, especially for Brazilian's urban basins.