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Time of Concentration equations: the role of morphometric uncertainties in flood risk analysis and management

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The perception of flood risk by the responsible authorities on the flood management disasters and mitigation strategies should be based on an overall evaluation of the uncertainties associated with the procedures for risk assessment and mapping production.

This contribution presents the results of the development of mapping evaluation of the time of concentration (tc). This parameter reflects the time-space at which a watershed responds to rainfall events and is the most frequently utilized time parameter, and is of great importance in many hydrologic analysis. Accurate estimates of the tc are very important, for instance, if tc is under-estimated, the result is an over-estimated peak discharge and vice versa, resulting significant variations on the flooded areas, and could have important consequences in terms of the land use and occupation of territory, as management's own flood risk.

The methology used evaluate 20 different empirical, semi-empirical and kinematics equations of tc calculation, due to different cartographic scales (1:200000; 1:100000; 1:25000; LIDAR 5x5m &1x1m) in in two hydrographic basins with distinct dimensions and geomorphological characteristics, located in the Gredos Mountain range (Spain).

The results suggest that the changes in the cartographic scale, has not influence as significant as one might expect. The most important variations occur in the characteristics of the fequations, use different morphometricparameters in the calculations. Some just are based on geomorphological criteria and other magnify the hydraulic characteristics of the channels, resulting in very different tc values. However, we highlighting the role of cartographic scale particularly in the application of semi-empirical equations that take into account changes in land use and occupation. In this case, the determination of parameters, such as flow coefficient, curve number and roughness coefficient are very sensitive to cartographic scale.

Sensitivity analysis demonstrates that the empirical equations are simpler (e.g Giandotti, Chow, Temez), since it is based only on the geometrical characteristics of the basin and therefore the results tend not to reflect the dynamic range leadings to worse results of tc.The application of these equations based on local parameters should not be applied to other regions that have distinct geomorphological and climatic characteristics, since greatly influences the results.The semi-empirical and kinematics equations (e.g SCS, Kinematic Wave) tc is reflected mainly in the form of the hydrograph, particularly in the Lag-time. Thats seems be an appropriate to the integrated analysis of hydrographic basins. Moreover, these methods are fundamental to understand spatio-temporal dynamics within the basin, even if some parameters are difficult to calculate.

The best way to calibrate and evaluate the obtained concentration time values, should be based on known events, calibrated by rating curves records.