Geophysical Research Abstracts
Vol. 20, EGU2018-9505, 2018
EGU General Assembly 2018

The Unit Hydrograph in Brazil at the research, teaching and engineering levels: a call for a unit hydrograph calibration tool

Camyla Innocente and Pedro Luiz Borges Chaffe
Federal University of Santa Catarina, Florianópolis, Brazil (camylainnocente@gmail.com)

The Unit Hydrograph Theory (UH, developed in 1932) is one of the most applied techniques for design flood estimation, especially in ungauged and data scarce areas. The UH has a wide range of applications such as: streamflow regionalization, flood risk assessment and real-time forecast. Historically, there are several different models that can be divided in four different main categories: i) traditional or empirical; ii) conceptual; iii) probabilistic; iv) geomorphological. Each one of those categories has a singular approach for estimating the hydrograph shape. The traditional approach is related to the physical characteristics of the basin. Given the complexity of the hydrological systems, a small number of characteristics might not be able to adequately represent the watershed processes. Thus, a conceptual approach emerged based on reservoir behavior. After that first approach, many others were created, with different reservoirs configurations (e.g., series and parallel). A conceptual UH may be equivalent to and modeled as the shape of a probability density function (PDF), giving rise to probabilistic approach, which a PDF is used to represent the UH. The geomorphological UH combines the traditional and conceptual approaches, in which the basin characteristics are considered a hydrological system composed by hillslope and stream. We did a bibliographic research in Scopus database and concluded that, in the world, the geomorphological UH is the most commonly used. In Brazil, the traditional approach is used by 40% of Brazilian HU articles, and only 20% use the geomorphological model. The traditional method, is mentioned in all hydrology books and remains as the most applied procedure. The geomorphological approach is referred to only in 15% of the hydrology books. All engineering manuals presented the traditional UH methods. We believe that the knowledge must follow this path: from research to teaching and from teaching to engineering. In the XXII Brazilian Water Resources Symposium in 2017 we applied a questionnaire and 90% of hydrology professors responded that, on a scale from 1 to 10, the propensity to teach geomorphological UH would be >= 8 if there were an appropriate tool, since none of these professors currently teaches the geomorphological model in their classrooms. Thus, we did a tool to calibrate a geomorphological UH and other models. Our tool was made using the MATLAB platform and the required inputs are only the physical or geomorphological characteristics of the basin and rainfall and runoff data. The users can choose between the recursive digital base flow, the model for the distribution of rainfall excess and the UH model. We tested our tool at an urban watershed (4.08 km^2) and in that case the model that best represented the watershed behavior was geomorphological UH.