Application of quadratic membership functions to hydrological cases

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ABSTRACT

In the design of water management projects, there is vagueness in the measured data, and the classical linear regression becomes problematic in cases where the data set is too small, or there is difficulty in verifying that the error is normally distributed, or if there is vagueness in the relationship between the independent and dependent variables, or if there is ambiguity associated with the event, or if the linearity assumption is inappropriate. Therefore, the classical regression gives imprecise and inaccurate output data, and in such cases, the fuzzy set theory method provides the alternative means of treating the uncertainty in water management problems. In the present article, two cases are presented. Firstly, a fuzzy linear relation between runoff and precipitation is considered for 25 storms in Monocacy River at Jug Bridge, Maryland, USA, and a possibilistic linear fuzzy model runoff–precipitation is presented, considering the precipitation as crisp data, the runoff as fuzzy data and the coefficients as fuzzy. Secondly, a linear fuzzy model for rainfall data between two meteorological stations located in the region of Central Macedonia (Northern Greece) is also presented, with crisp data in one station and fuzzy data in the other.

Keywords: Fuzzy regression; Runoff–precipitation; Triangular numbers; Rainfall data

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