Comparison of spatial variability of fuzzy and non-fuzzy rainfall erosivity data in Oromieh Lake Basin, Iran

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ABSTRACT

Because of limitation in access to rainfall intensity, erosivity index (EI_{30}) could be estimated from readily available parameters that cause uncertainty in erosivity data. In this study, fuzzy logical approach is applied on the imprecise values of EI_{30} and its spatial variability has been investigated by the kriging interpolation method and comparised with spatial variability of non-fuzzified EI_{30} in Oromieh Lake Basin. Among different erosivity indexes/parameters based on rainfall amount, only modified Fournier (FI_{mod}) have been shown high correlation with EI_{30} in 10 synoptic stations. A local model was used for estimating EI_{30} from FI_{mod} in other 35 stations without rainfall intensity data. In these 35 stations, the EI_{30} values were fuzzified. Three membership functions of trapezoid and triangular types were defined for elevation as input and the EI_{30} as output variables. The erosivity index values were defuzzified by centeroid method. After, the semivariogram was determined for fuzzified and non-fuzzified erosivity index. The minus values of the Mean Bias Error (MBE) related to kriging and fuzzy kriging were shown underestimated values of the EI_{30}. The Mean Absolute Error (MAE) of kriging compared to fuzzy kriging was shown a decline of 10 percent. Both output maps of interpolation methods indicated similar decreasing trend from North to south with the highest erosivity (900 $MJ\ mm\ ha^{-1}\ h^{-1}\ y^{-1}$) in the north.

Keywords: EI30, fuzzy logic, interpolation, kriging, uncertainty