Application of artificial intelligence based and multiple regression techniques for monthly precipitation modeling in coastal and inland stations

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ABSTRACT

The aim of this study was to apply artificial intelligence (AI) based and linear conventional techniques for monthly precipitation modeling in Famagusta (a coastal) station and Nicosia (an inland) station of northern Cyprus. To do so, adaptive neuro fuzzy inference system (ANFIS, as a hybrid technique), support vector regression (as a new AI technique) and multiple linear regression (MLR, as conventional regression technique) were applied in two scenarios. Scenario 1 involved the use of six meteorological parameters as inputs to develop four models from each technique using different input combinations, while Scenario 2 employed the use of only precipitation data at several time lags up to 12 months for the modeling. The results showed that better prediction could be achieved in inland area due to complex and irregular behavior of precipitation in the coastal region. The results also demonstrated that ANFIS models have better performance than models developed by other applied techniques. Scenario 1 models were more efficient and reliable and averagely increased prediction of Scenario 2 models up to 13% for Famagusta station and 18% for Nicosia station in the validation phase. The general results of the study implied that where other meteorological data are not available, precipitation data at previous time steps could sufficiently model monthly precipitation in the study stations.

Keywords: Adaptive neuro fuzzy inference system; Meteorological parameters; Precipitation modeling; Support vector regression