



Comparison the accuracy of predicted maize evapotranspiration using real time meteorological data and conventional methods in Karaj climate

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Abstract

Accurate estimation of crop evapotranspiration has a major role in optimum agricultural water management. The aim of this study was to evaluate the accuracy of using real time (3days in-advance forecasts) temperature data for estimation of maize evapotranspiration comparing to conventional methods in Karaj, Iran. To achieve this goal, the crop evapotranspiration (ET_c) was calculated using FAO ET_o Calculator software. Two climatic data set were deployed for comparisons i.e. 10 years (2004-2014) mean values of meteorological data of maize growing season and real-time 3-days forecast of temperature. Actual values of evapotranspiration based on a water balance approach were measured using watermark sensors during the summer 2014 as a control treatment. Comparison of ET_c measurements with estimations obtained by using different climatic data and also a combined set of data (real time and long term means) revealed that estimated values of ET_c using combined weather dataset for amount of 551.6 mm/season and ET_c values estimated using 3 days forecasts of air temperature (497.2 mm) had maximum (12%) and minimum (2%) difference with actual ET_c values obtained by water balance method i.e. 565.64 mm, respectively. Both proposed methods showed underestimation. Further studies are recommended for more scrutiny.

Keywords: Evapotranspiration, Karaj, Soil water Balance, Real time data, Watermark sensor

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Evaluation the performance of genetic programming in modeling mean monthly temperature in different climates of Iran

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Abstract

Mean monthly temperature is one of the most important parameters in agroclimatic studies and hence several approaches have been proposed for its precise estimation. In this study, the genetic programming approach is used to model monthly mean temperature in selected synoptic stations namely; Mashhad, Sanandaj, Tabriz, Ghazvin and Kermanshah with cold-arid climate and Yazd, Kerman, Zahedan, Bam and Zabol with warm-arid climate. Genetic programming approach was performed in two steps. 1. Training and 2. Validation. In first step, the time series with six different patterns were prepared and trained. Then, in the second step, the obtained models were validated using coefficient of determination (R^2) and root mean square error (RMSE) indices. Finally, based on these statistics, selected models were proposed for selected stations. The results showed that, genetic programming is an appropriate method for modeling mean monthly temperature. The result also indicated that, model performs better in warm-arid climates. The best results were obtained in 4th pattern of cold-arid and 5th pattern of warm-arid climates. Among the studied stations, Zabol showed the most acceptable results with R^2 and RMSE of 0.96 and 1.91°C, respectively.

Keywords: Genetic programming, Modeling, Monthly mean temperature, Iran

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Study of the relationship between the some climate signals (SOI, NAO, MEI, NINO) and meteorological drought in Kerman province, Iran

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Abstract

Drought which causes great losses to human life and natural ecosystems occurs very frequently in Iran. In recent years, Kerman province, southeast of Iran has been severely affected by this phenomenon. The aim of this study is to assess the relation between climate signal and meteorological drought (lack of adequate rainfall) in this region. Climate signals, as indications of changes in ocean/atmosphere temperature and pressure, are one of the most influential parameters on global scale weather patterns. The effect of these signals on the spatial and temporal patterns of rainfall in a give region is quite important in drought monitoring studies. In this study the impact of climate signals MEI, NAO, NINO1, 2, NINO3, NINO3, 4, NINO4, SOI on rainfall in Kerman province has been studied. Monthly data of 64 rain gauges for 36 years period from 1970 onwards and corresponding values of mentioned signals for same period were retrieved and used. The Standardized Precipitation Index (SPI) in 1, 3 and 12 month time scale were elaborated for drought monitoring. The correlation between climatic signals and SPI, were examined in six different cases (simultaneous and delayed phase). The results showed that MEI, NINO4, SOI have greatest impact on Kerman rainfall in different time scales, i.e. monthly seasonal and annual.

Keywords: drought, climate signals, SPI index, Kerman

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Recognition of homogeneous regions of heavy and super heavy precipitation in Iran by intergroup variance quality control indices

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Abstract

The aim of this study is spatial clustering of the rainfall patterns of Iran. In order to perform this research daily interpolated precipitation from Asfazari^{**} database during 21/03/1961 to 31/12/2004 has been used. Considering the country's area and study period, a database with dimension 15992×7187 has been created with time (days) as the rows and spatial location as the columns' pixels. For every calendar day of year and each pixel, heavy and super heavy precipitation have been calculated based on 95 and 99 percentiles. Besides, two data base with dimension 7187×366 obtained. Regionalization was performed using cluster analysis with Ward linkage method. For determining number of clusters, 11 variance inter groups quality control indices have been applied on the different clustering. The results showed that Iran can be clustered to five homogeneous regions of heavy and super heavy precipitation. Daily and monthly precipitation thresholds were also calculated for each region. In general, the results indicated that applied quality control indices have are suitable for spatial analysis and detecting number of homogeneous regions of heavy and super heavy precipitation across Iran.

Keywords: Regionalization, heavy and super heavy precipitation, Iran, cluster analysis

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** Named after an Iranian Climatologist.



Assessment of drought hazard index using standardized precipitation index (Case Study: Semnan province, Iran)

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Abstract

Drought occurrence has great impact on the quantity and quality of ground and surface water which in turn affects different aspects of human life including agriculture, water resources and socio-economic issues. Few researches have been performed so far on spatial analysis of drought hazard in Iran. The aim of this study is to determine the spatial and temporal patterns drought hazard index (DHI) and producing the map of this index in Semnan province, Iran. The Standardized Precipitation Index (SPI) was deployed at 3 and 12 months' time scale for generating the map of drought hazard Index (DHI). Kriging and Natural Break methods were elaborated in GIS environment for zoning and classification respectively. The results showed that in 3 month time scale, highest droughts hazard are observed in the northern and central parts of the province and for the 12 month time scale, droughts pose highest hazard to the southern parts would experience the highest values of DHI.

Keywords: Drought, Kriging, Hazard, Natural break, SPI, Semnan

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The agroclimatic classification of northern east of Iran based on thermal and humidity conditions

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Abstract

Climatic classification based on ecological capacity and weather conditions of different regions has great importance in agroclimatic studies. In this study an agroclimatic classification of north eastern of Iran using Papadakis and effective rainfall methods has been carried out. CROPWAT ver.8.0 software was used to calculate effective rainfall. To regionalize the point data, geostatistic methods were used. The obtained values were elaborated using ARCGIS 10.2 to generate the spatial distribution maps. Cross-efficiency evaluation of geostatistical methods indicated that Empirical Bayesian Kriging (EBK) produces a higher efficiency. Based on the winter and summer temperature and plants temperature stability, ecological types of oats and cotton are dominant in the region, respectively. According to these ecological types, a warm continental regime is dominant the region. Considering humidity conditions of the region expressed in terms of potential evapotranspiration (PET) and monthly rainfall, the climate of northeastern Iran categorized as arid Mediterranean and arid climates. The highest amount of effective rainfall, as a major moisture index, is observed in month of March and April. Based on the ratio potential evapotranspiration to monthly precipitation ration from the north to the south, the number of humid months decreases southward. The spatial distribution of (PET) increases from the north to the southern parts. Similarly, effective rainfall and humidity index (HI) values were decreased. Taking into account the thermal and humidity conditions, the northeastern region of Iran's climate is classified as continental arid/ semi-arid and desert classes. Humidity conditions play a major role in determining climate classes in the studied region. Further studies using other climatic indices are recommended for more scrutiny.

Keywords: Agroclimatology, Effective Rain, Potential evapotranspiration, Humidity Index, Climatic Classes

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