Iranian Journal of Ecohydrology, Vol. 1, No. 3, Winter 2015

Contents

Assessing groundwater quality for drinking and irrigation and selection of the most appropriate spatial interpolation method (Case study: West of Marivan city, Iran)

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Received: 4 December 2014 Accepted: 9 February 2015

Abstract

Groundwater quality assessment and selection of appropriate methods of zoning depends on the region conditions, and the data availability. The correct choice of interpolation is a key milestone and a major step forward in the management of groundwater resources. The aim of this study was to evaluate the quality of groundwater for drinking and irrigation purposes in the west of Marivan city, Iran. For this purpose, data from 1985 to 2011, and the parameters of salinity, chlorine, concentration of dissolved substances, sulfate, water hardness, sodium, sodium adsorption ratio were used. Analysis of variance (ANOVA) and the LDS test was used to compare treatments and the differences between various stations respectively. For determining the most appropriate location and zoning methods for the above parameters, geographical information system (GIS) was used. For this purpose, a geostatistics method of simple Kriging, and deterministic techniques such as inverse distance weighting, radial basis function, local estimator and general estimators were applied to annual and seasonal data. The results showed that the quality of water in the area is appropriate and acceptable for drinking. Also for the irrigation, most of the study area is located within an acceptable range. Different criteria such as the root mean squared error (RMSE), mean absolute error (MAE) and coefficient of determination (R2) were used to evaluate spatial interpolation results. Based on these criteria, among the different methods of interpolation techniques, the local estimator for estimating the parameters of sulfate, soluble solids concentration and salinity, the radial basis function for estimating parameters of sodium and sodium absorption ratio, and the general estimator method for chlorine at annual scale were the most appropriate methods.

Keywords: Drinking and irrigation, Groundwater quality, Interpolation, Marivan, Zoning.

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Predicting streamflow using data-driven model and time series

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Received: 16 December 2014 **Accepted: 11 February 2015**

Abstarct

Accurate forecasting of streamflows has been one of the most important issues playing a key role in allotment of water resources. River flow simulations to determine the future river flows are important and practical. Given the importance of flow in the coming years, in this research three stations were simulated in 2002-2011: Haji Qooshan, Ghare Shoor and Tamar in Gorganrood Cachment. To simulate river flow, time series (Auto Regression) and data driven based on support vector machine (SVM) was used for both monthly and weekly. The results showed that both methods in Tamar have low precision and Haji Qooshan station have good precision in monthly simulation. SVM increase 0.29 coefficient determination and decreases 0.35 RMSE error in Ghare Shoor station and perform more accurate than time series. Both methods simulate weekly discharge in low precision in Tamar and Ghare Shoor. Coefficient determination of time series is 0.91 and SVM is 0.86 in weekly simulation. DDR statistics show that the SVM has greater precision than time series in monthly simulation and equal precision in weekly simulation in Haji Qooshan station. The results of this study show that the SVM method is more accurate than time series in monthly and weekly simulation. The accuracy of both methods is on monthly basis rather than weekly. The accuracy of both methods is greater on monthly rather than weekly.

Keywords: Data mining, Gorganrood, River flow, Support vector machine, Time series.

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Flood hazard zoning and management strategies in district 1 and 3 of Tehran

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Received: 5 December 2014 Accepted: 19 February 2015

Abstract

The aim of this study is to assess effective factors in flooding and determine vulnerable areas in first and third Tehran Municipality areas, therefore suggest the proper management ways to avoid this disaster. Flooding disaster could have serious financial and fatal casualties, especially in urban areas. To reduce damages and hurts of flooding in these areas, hydrological, topographical, human features and … were used as separated layers in GIS and they were prioritized with a method like AHP. As the results areas with risks of flooding were determined. In this study the areas with high risks and low risks were recognized. Studying area was classified into five different classes and their areas were calculated. The very high risk area occurs in 16.21 km^2 and respectively 19.11, 17.06, 9.67 and 1.84 km^2 of areas were classified as high, medium, low and very low risks areas. By using this information, there could be proper plans and strategies to control floods and even utilizing flood water.

Keywords: AHP method, Flood management, GIS, Tehran municipality, Urban flood.

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Validation of Global Climate Models (GCMS) for Temperature and Rainfall Simulation in Kermanshah, Ravansar and West Islamabad Stations

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Received: 6 January 2015 **Accepted: 26 February 2015**

Abstract

The objective of this study was to evaluate the ability of ten GCMs and three Emission Scenarios to reproduce the rainfall and temperature parameters in Kermanshah, Ravansar and West Islamabad stations located inside Qaresou basin in Iran using the average weighting method, over 1989-2008 period. At first, the models output and the scenarios were provided for this period. Then, the models validation was carried out using Mean Absolute Error (MAE), Root Mean Square Error (RMSE), Bias, and Nash – Sutcliffe criteria. Moreover, the models and scenarios uncertainty analysis was assessed by the weighting method. Based on these criteria, HADGEM1 and BCM2 had the best efficiency in Kermanshah station for mean temperature and rainfall simulation respectively. For Ravansar station the best models were ECHO-G and HADCM3, while for the West Islamabad was ECHO-G. The overall results of this analysis showed that the best applied GCMs and emission scenarios for simulation of temperature and rainfall in the study area are ECHO-G (A2) and HADCM3 (A1B), respectively.

Keywords: AOGCM, Climate change, Qare-Sou, SRES, Uncertainty.

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Evaluation of the efficiency of AWBM, sacramento and tank rainfall runoff model in runoff simulation in Arazkoose - Goorganrood Basin, Golestan Porovince

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Received: 6 January 2015 Accepted: 26 February 2015

Abstract

According to variety of accessible hydrological models, evaluateing the efficiency of models for different management objectives are essential. Therefore, models with simple structure and using minimal input that can provide an acceptable result can serve as an effective tool to watershed managers. Hence, the objective of this research is to evaluate the relative performances of the lumped conceptual-based hydrological AWBM, Sacramento and Tank rainfall runoff models for daily simulation in Arazkoose tributary of Goorganrood River, Golestan porovince. Automatic calibration of the models were done for a 5-year period (1984-1988), followed by a 4-year validation period (1992-1995). The results were evaluated by several criteria, i.e. Root Mean Square Error (RMSE) and Nash coefficient efficiency coefficient (ENS) and the coefficient of determination (R2). According to the evaluation criteria the results were satisfactory. Statistic and graphic results show that Sacramento model is performing most accurately among the models with R2= 0.823, ENS= 0.677 and RMSE= 4.565 in calibration periods and R2= 0.719, ENS= 0.669 and RMSE= 7.905 in validation periods. Simulation of the Models was more accurate for calibration period rather than validation period. Also the models' minimum and average values of runoff are accurate and despite good simulated peak flow values, the results show that the models cannot accurately simulate all of the peak values. Since these models do not require much input data, they can be preferred for surface water resources management.

Keywords: Arazkoose, Goorganrood, Model, Rainfall runoff, Simulation.

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Investigation of sodium chloride equilibrium adsorption isotherms in aqueous solution by Zeolite and Perlite

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Received: 7 January 2015 **Accepted: 7 March 2015**

Abstract

Deficiency of water resources is one of the major challenges at the global scale and also in Iran. The existence water resources of oceans and seas such as the Caspian Sea and Persian Gulf in the north and southern parts of Iran respectively, can be considered as the alternative to dominate the future problem. This study is processed absorption of NaCl based-on natural Zeolite and Perlite. In order to obtain of different sizes in five classes, the standard sieves used based on ASTM with determined D of 20, 40, 80, 120 and 200 for granulometric process. The salty water used with different concentration in the range of 25 to 10000 mg/l. To determine the rate of chloramine in samples nitrate of silver with 0.02 mol and potassium chromate used as indicator for detecting of chloramine titration in suspension. The effects of different parameters were examined such as concentration, adsorbent dosage and particles size. The extracted results had indicated that, with declination of the particles size, it can be expected to increase the percentage of sodium chloride removal. Similarly, due to increasing the adsorbent dosage, more absorption will increase in this process. The Freundlich and Langmuir models were used to obtain the isotherm equilibrium curve. The results showed that sodium chloride absorption had a better fitting (R2=97%) using Zeolite from Freundlich model and Perlite also with a meaningful of (R2=96%) in Langmouier model.

Keywords: Equilibrium isotherm, Freundlich, Langmouir and Caspian Sea, Mineral adsorbents.

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Monitoring of Khiav River water quality during geothermal exploration drilling at Sabalan Geothermal field, Northwestern Iran

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Received: 19 January 2015 Accepted: 10 March 2015

Abstract

In this paper, the results of surface and ground water quality monitoring during drilling of three deep exploratory wells in geothermal project in North West of Sabalan in Meshkinshahr are analyzed. The region has been investigated by various researchers to generate electricity using geothermal energy. Drilling in deep geothermal projects, a variety of materials such as cement, bentonite, barite, soda ash, sodium chloride, etc. are used in the process of drilling and fixing wells enabling large amounts of pollutants into the aquifers that may discharge into the Khiav River. This study have tried to identify the possible effects of drilling three exploration wells on the Khiav River and hot and cold springs in an area in Sabalan. The water quality of Khiav River is very important because it supplies drinking and irrigating water for Meshkinshahr city and suburbs with a population about 200, 000 people. Residents of villages and many nomadic families use cold springs as drinking water sources in the summer, as well as many tourists who travel there to visit touristic attractions and hot springs may be affected by possible changes in water quality of these springs. Therefor monitoring the changes in the quality of hot and cold springs in the area is significantly important. The results of 18 months of investigation indicate that drilling activities have no significant effect on the water quality of Khiav River and springs. Levels of some high heavy metals concentrations of other elements are less than the standard for drinking water.

Keywords: Environmental effects, Exploration drills, Geothermal energy, Heavy metals, Monitoring, Water pollution.

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