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Water table management effects on quantityand quality of water drains out of Under ground drainage

Mahmoud Mashal*[*1], Javad Kamrani[2], Farhad Mirzaie Asli[3]

1. Assistant Professor, Depart ment of Irrigation and Dra inage Engineering, Collage of Abour aihan, University of Tehran, Pakdasht, Tehran, Iran (Corresponding Author*)
2. MSc., Department of Irrigation a nd Drainage Engineering, Collage of Abouraihan, University of Tehran, Pakdasht, Tehran, Iran
3. Assistant Prof essor, Department of Irrigation and Recl amation Engineering, College of Agriculture and Natural Resources, University of Tehran, Karaj - Iran

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Abstract

Concerns about nitrate pollution in groundwater and downstream systems cause development of surface water management system to reduce losses of agricultural drainage waternitrate in subsurface drainage Usingsubsurfaceirrigationfromexistingdrainagelines, drainage waterduring the growing seasonandout ofseasoniscontrolled.The overall objectiveofthisstudy was to evaluatethe effect of controlled draina geonnitrate losses viadrainage out letanda physical m odel usedtosimulate theconditions ofarealfarm. Plan includesofsix treatments, onetreatmentfreedrainage(FD)outputat a depth of80cm fromthe soil surfacedrainageandcontrolleddrainagetreatments(CD_1, CD_2), which drainsthe water tablecontrolledat45 and25 cm, respectively, at a depthofthe soilsurface. Each level has two drainage treatments applied nitrate fertilizer (urea) N_1 (100 percent) and N_2 (50 percent). The results showed that the amount of drain output, there are significant differences between the treatm ents drained ($P<0.0001$, $F=45.42$). Controlled drainage treatments (CD_1 and CD_2) compared with treatment FD, 57.9 and 80.5 percent have reduced the volume of drainage water, Respectively, and CD_2 treatment the amount of drainage water compared with CD_1 treatment 53.8 percent reduced. 100 percent of the nitrate fertilizer, controlled drainage(CD_1 and CD_2) in com parison with free drainage (FD) rates of nitrate loss to the 55.8 and 82.5 percent have reduced, And 50 percent of nitrate fertilizer, the am ount of nitrate loss from controlled drainage to the 30.3 and 70.4percent, respectively. Controlled drainage can be improved to reduce the role of nutrientsin the soil and reduce nitrate removal.

Keywords: Controlleddrainage, Free drainage, Lysimeters, Nitrate, Statistics Analysis

Email: mmashal@ut.ac.ir

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Assessment of theoretical salt leaching models (Case Study: LabarLands -Saveh Plain)

***Mahmoud Mashal*[*1], *Mohammad Daneshvar*[2], *Sayid Emami*[3] , *Maryam Varavipour*[4]**

1. Assistant Professor, Department of Irrigation and Drainage Engineering, Collage of Abouraihan, University of Tehran, Pakdasht, Tehran, Iran (Corresponding Author*)
2. Postgraduate student, Department of Irrigation and Drainage Engineering, Collage of Abouraihan, University of Tehran, Pakdasht, Tehran, Iran
3. Postgraduate student, Department of Irrigation and Drainage Engineering, Collage of Abouraihan, University of Tehran, Pakdasht, Tehran, Iran
4. Assistant Professor, Department of Irrigation and Drainage Engineering, Collage of Abouraihan, University of Tehran, Pakdasht, Tehran, Iran

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Abstract

Soil salinization is a process in which the accum ulation of soluble salts in soil profile can affect soil physical and chem ical properties, such as osm otic pressure, perm eability and hydraulic conductivity. These, in turn, can seriously impair or completely stop the growth of plants. In this study, four theoretical models for predicting soil leaching contains including Series of Reservoirs Model (SRM), Theoretical Plate–Thickness Model (TPTM), Convection – Disp ersion Model(CDM) and Num erical Model (NM) were studied in order to select and intr oduce the best model for predicting ultimate soil salinization. The results of these models were com pared with real data obtained from field experiments. To do this, 15 basin plots (each has one square meter) were firstly built. Then, five leaching depths of 20, 40, 60, 80 and 100 cm were applied to basins in three rows. Results revealed that the investigated m odels showed different performance for the different depths of leaching. Overall, Series of Reservoirs Model (SRM) was able to estimate the ultimate salinity more accurately.

Keywords: Convection–Dispersion Model (CDM), salinization, saline-sodic soils, Series of Reservoirs Model (SRM), Theoretical Plate-Thickness Model (TPTM).

Email: mmashal@ut.ac.ir

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Feasibility of using rice husk instead of drain pipe and envelope material

***Ali Reza Masoudi*[1], Abdolmajid Liaghat*[2]**

1. M.Sc. Student, Department of Water Engineering, Faculty of Agriculture, University Tehran, Karaj , Iran (Corresponding Author*)
2. Professor, Department of Water Engineering, Faculty of Agriculture, University of Tehran, Karaj , Iran

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Abstract

Due to the im portant role of subsurface drainage in m anaging the ground water level, there are many researches focused on finding a new and m ore economic way to develop subsurface drainage technologies. Lack of proper drainage system in northern Iran has caused huge implantation of rice and it is impossible to have second im plantation in this region. One reason of insufficiency of current drainage systems in this region might be the absence of envelope material like sand and gravel or in some cases the long transportation of gravel envelope m aterials to the project site which rises drainage cost. In this region, rice husk is considered as wastage of rice production. Production of rice husk is estim ated to be 600 thousands tons every year in Iran, which can be potentially used in drainage system s. The m ain objective of this research is to investigate the feasibility of using r ice husk instead of drain pipe and envelope materials. The perform ance of drainage syst em using rice husk was studied in a laboratory model and the obtained results were com pared with the conventional gravel envelope m aterials in terms of their drainage capacity and reaction factor for water table drawdown. The m aximum drainage discharge was m easured to be 0.13 and 0.12 lit/s in the case of rice husk and envelope m aterials, respectively. The corresponding values for the reaction factor were estimated to be 8/937 and 9/899 day^{-1}, respectively. The results also showed good functi ons of rice husk in decreasing water table and supporting the drainage needs.

Keywords: drainage, hydraulic conductivity, laboratory model, reaction factor, rice husk, sand cover.

Email: a.masoudi@ut.ac.ir

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Effect of Vegetation Cover Type on Average, Maximum and Minimum Air Temperature in Isfahan City

Elham Shafieyoun[1], Mahdi Gheisari*[2] , Mohammad Mehdi Majidi [3], Jahangiri Abedi Koupaie [4], Seyed Farhad Mousavi [4] , Sayid Eslamian [5]

1. M.Sc. Student, Department of Water Engineering, Faculty of Agriculture, Isfahan University of Technology, Isfahan, Iran
2. Assistant Professor, Department of Water Engineering, Faculty of Agriculture, Isfahan University of Technology, Isfahan, Iran (Corresponding Author*)
3. Associate Professor, Department of Plant Breeding, Faculty of Agriculture, Isfahan University of Technology, Isfahan, Iran
4. Professor, Department of Water Engineering, Faculty of Agriculture, Isfahan University of Technology, Isfahan, Iran
5. Retired Professor, Department of Water Engineering, Faculty of Agriculture, Isfahan University of Technology, Isfahan, Iran

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Abstract

Vegetation cover on a variety of different land uses in different parts of a city creates different forms of heat flow that this, in turn, generates the main framework of urban microclimate. The objective of this study is to survey the effect of land cover type on air temperature in the Isfahan city. To do this, five regions in the Isfahan city with different land cover type were selected. In each region automatic weather stations were installed in order to measure air temperature. The measurements were logged over a year every 5 min; then an hourly average of temperature data was calculated for all analysis. The results showed a significant difference between air temperatures in different parts of the city covered by different land cover type. The highest maximum air temperature difference was 3.51° C between Station 2 and reference station in November. The highest minimum air temperature difference was 8.15° C between Station 1 and reference station in July. The results also showed that in all seasons especially in spring and summer, there is a significant difference ($P<0.01$) between air temperature in the city and air temperature in the reference station. Air temperature in the city was strongly influenced by the land cover type and extent of vegetation cover. Therefore, the measurement of air temperature in the city is necessary for irrigation management.

Keywords: land use, landscape irrigation, urban microclimate, urban heat island.

Email: gheisari@yahoo.com

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Develop a non-parametric model to simulate monthly hydrological data

***Salman Sharifazar*[*1], *ShahabAraghinejad*[2]**

1. Instructor, Department of Water Engineering, College of water and soil, University of Zabol, Zabol – Iran (Corresponding Author*)
2. Associate Professor, Department of Irrigation and Reclamation Engineering, College of Agriculture and Natural Resources, University of Tehran, Karaj - Iran

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Abstract

One of the water resources modeling requirements is sufficient knowledge of long-term series of meteorological and hydrological parameters. In this study the nearest neighbor resampling method presented by Lall and Sharma was developed. In the developed model, the KNN regression was used for time series forecasting instead of local polynomial used in the developed algorithm by Prairie. In this case problems caused by polynomial degree estimation were solved. This caused that multivariate time series simulation became feasible. To evaluate the performance of the developed model recorded data in the Kawtar hydrometer station located on one of the main branch of Mahabad River and Mahabad synoptic station were used. The results from time series simulation showed that the developed model is able to keep important statistical characteristics of historic series. In addition, it could solve the classic nearest neighbor resampling method problem in order to produce values not seen in the historical record. Also, this model showed that it could simulate the multivariate hydrologic series.

Keywords: Mahabad River, multivariate, nearest neighbor resampling, non-parametric model, time series.

Email: s.sharifazari@ut.ac.ir

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Assessment of Flood Management Options by M-TOPSIS Model

***Nastaran Chitsaz*[1], *Mohammad Ebrahim Banihabib*[*2]**

1. M.Sc. Student, Department of Water Engineering, Aboureyhan Campus, University Tehran, Pakdasht , Iran
2. Associate Professor, Department of Water Engineering, Aboureyhan Campus, University Tehran, Pakdasht , Iran (Corresponding Author[*])

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Abstract

The multi-criteria decision m aking model is an im portant tool for decision m aking in water resource management. In this paper, the TOPSIS m odel was used to rank seven flood m anagement options in the Gorganrood river flood m anagement project, including conservati on of natural condition, Golestan reservoir management, levee construction, diversions-channel construction, flood forecasting and warning system, flood insurance, and integration of flood warning system and flood insurance. Economical, technical, social and environm ental qualitative values a nd criteria weights were determ ined by expert judgment and used to evaluate options. Due to lim itations in the TOPSIS m odel, the M-TOPSIS m odel was used and obtained results were compared with the TOPSIS model outputs. The results showed that the M-TOPSIS model would produce better results for ranking options and sensitivity analysis of criteria weights. Therefore, given the significance of soci al and environm ental criteria, this m odel is recommended for ranking flood management options.

Keywords: flood management, Gorganrood, m ulti-criteria decision m aking, M-TOPSIS m odel, sensitivity analysis.

Email: banihabib@ut.ac.ir

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Underground Water Management through Combining Surface and Sub-surface Water Using Modflow Model in Urmia Plain

***Roza Jonoubi*[*1] , *Hosein Rezaie*[2] , *Javad Behmanesh*[3]**

1. M.Sc. Student, Department of Water Engineering, Faculty of Agriculture, University of Urmia, Urmia , Iran (Corresponding Author[*])
2. Associate Professor, Department of Water Engineering, Faculty of Agriculture, University of Urmia, Urmia, Iran
3. Assistant Professor, Department of Water Engineering, Faculty of Agriculture, University of Urmia, Urmia, Iran

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Abstract

The groundwater resources of the Urmia plain have been under intensive tension for the last recent years. This has caused the production and observation wells to become dry and in some local places well deepening to take place. In some other locations, the groundwater level is high and there is a danger of local water logging condition along with its associated drainage work. For the settlement of welfare groundwater resources, the modeling practice was used for the depiction of Urmia plain groundwater resources system reactions against different imposed management and executive scenarios. By the present work, the modeling with 28 observation wells took place for the year of 2008-2009. The comparison of calculated hydraulic head contour lines with that of the observed hydraulic head in nature showed a sound performance of the model. This made to impose and apply different scenarios in the model. To go forward, the decrement of 25 percent and the cease of pumping rate at western part of the plain caused average groundwater level rise of 0.5 to 4 meters in eastern part of the plain. This led to have an average groundwater level fall of 1 to 3.5 meters, respectively.

Keywords: groundwater resources, management scenario, modflow computer code, Urmia plain.

Email: Rjonubi@yahoo.com

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Assessment of Urmia Lake Water Interactions and Saltwater Intrusion to Surrounding Aquifers

***Fateme Jafari*[*1], *Mortaza Eftekhari*[2]**

1. Researcher, Research Insstitute, Ministry of Energy Water Research Institute, Tehran, Iran (Corresponding Author*)
2. Assistant Professor, Research Insstitute, Ministry of Energy Water Research Institute, Tehran, Iran

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Abstract

In the last decade, the water level of Urm ia Lake has experienced a dramatically drop. Although the causes of this lose have been investigated, the significance of groundwater supplies had not been concerned so much. In the present research, groundwater resources around the Lake were explored as its water supplier. The num ber of wells and groundwater withdrawal has been increased because of cultivation, dry farming, and agricultural activities growth; so aquifers of this area have been affected by saltwater influx. In this research, water surface contours used for evaluation of the Lake's groundwater inflows fluctuation and changes of aquifers' salinity were assessed for (the Lake) water interactions in two periods (2001 and 2011). According to the results, in Mahabad, Tabriz, Azarshahr, Shabestar-Soofian and Ajabshir aquifers the groundwater flow direction has changed from lake to aquifer.This m eans that the groundwater boundary input from these aquifers to the Lake are cut down. Large parts of aquifers around the Lake have been subjected to saltwater influx by change of groundwater flow direction whereas electrical conductivity of Tabriz, Mi andoab, Kahriz and Shiram in aquifers increased considerably. In conclusion, eastern aquifer situations are m ore critical than western ones and hi ghly vulnerable to quality degradation.

Keywords: coastal aquifers, groundwater, flow direction, salinity, salt water interface.

Email: fm_jafari@yahoo.com

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Assessment of Temporal and Spatial Salinity in Tidal Rivers Using COHERENS Model: Case Study of Bahmanshirriver

***Seyed Pouyan Pirnia*[1], *Jamal Mohammad Vali Samani*[2], *Mohammad Javad Monem*[3]**

1. M.Sc. Graduated of Water Structures Engineering, Department of Water Structures Engineering, Faculty of Agriculture, TarbiatModarres University, Tehran, Iran (Corresponding Author*)
2. Professor, Department of Water Structures Engineering, Faculty of Agriculture, TarbiatModarres University, Tehran, Iran
3. Associate professor, Department of Water Structures Engineering, Faculty of Agriculture, TarbiatModarres University, Tehran, Iran

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Abstract

The determination of temporal and spatial salinity in tidal rivers is significant in supplying water for agriculture purposes, particularly where there is no controller dam at the downstream. In this research, the COHERENS model was applied to study the hydraulics of water flow, salinity distribution and transmission at the Bahmanshir river. COHERENS is a 3D multi-purpose hydrodynamic model which is coupled to biological, resuspension and contaminant models. The model was calibrated and validated against water level and two wet and dry duration periods in 2002 and 2003, as well as salinity observation during a spring tide in 2003. Three sensitivity scenarios were conducted based on different river flows and wind conditions. The model results showed that salinity intruded further upstream under scenarios with low flow and downstream wind. However, the responses of salinity stratification to different environmental forcing function were not different in various portions of the river. Finally, using time series of salinity frontal movement, spatial and temporal patterns of salinity intrusion, and the best spatial and temporal thresholds for water withdrawal along the river were assessed. The results also indicated that adopting optimal compound conditions of discharge and intermittent water harvesting could be considered as an effective and practical way to achieve qualified water for agricultural activities.

Keywords: discharge, salinity intrusion, tide, wind.

Email: Pouyan.Pirnia@gmail.com

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Simulation of Taleghan Reservoir Daily Inflow Using Hammerstein-Wiener Models

***Behnam Ababaie*[1], *Teymour Sohrabi*[2], *Farhad Mirzaie Asli*[3]**

1. Ph.D. Student, Department of Irrigation & Reclamation Engineering, College of Agirculrue and Natural Resources, University of Tehran, Karaj, Iran (Corresponding Author*)
2. Professor, Department of Irrigation & Reclamation Engineering, College of Agirculrue and Natural Resources, University of Tehran, Karaj, Iran
3. Assistant Professor, Department of Irrigation & Reclamation Engineering, College of Agirculrue and Natural Resources, University of Tehran, Karaj, Iran

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Abstract

Hammerstein-Wiener (HW) models are capable in describing nonlinear dynamic systems. These models are nonlinear and have been widely used in a wide range of sciences due to their simplicity and having a physically-based concept. In this research, for the first time in hydrology and water resources management, three different structures of these models using daily temperature and precipitation data as model inputs were applied to simulate Taleghan Reservoir daily inflow using R^2, RMSE, SRMSE, MAE, d and PEP statistics and criteria. To do this, the reservoir data from 2006 to 2011 were utilized. The results obtained with (HW 1) and without (HW2) data pre-processing were compared with the results achieved from two different structures of artificial neural networks (ANNs) including (i) Feed-Forward ANN with two Hidden Layers (FeedF2) and (ii) Generalized Regression Neural Network (GRNN2). The results revealed that the HW models outperformed the ANN models. In particular, the mean and standard deviation of the inflow time series were simulated very accurately. The SRMSE values of the HW 1 model were 33% and 37% and while these values for the HW2 model were 28% and 43% over calibration and validation phases, respectively. Meanwhile, the accuracy obtained over calibration and validation phases were 50% and 71% for FeedF2 and 58% and 50% for GRNN2, respectively.

Keywords: artificial neural networks, Hammerstein-Wiener models, stream flow, water resources management.

Email: behnam.ab@gmail.com