

## Investigation of the effect of climate change on evapotranspiration and wheat water requirement in Bojnord region

Samira yarmohammadi<sup>1</sup>, Mehdi Zakerinia<sup>2\*</sup>, Khalil Ghorbani<sup>3</sup>, Afshin Soltani<sup>4</sup>

### Abstract

There is a general consensus among climate scientists about the rise in global temperature due to an increase in the anthropogenic greenhouse gases in the earth's atmosphere. This will undoubtedly change the pattern of evapotranspiration (ET) due to an increase in CO<sub>2</sub> concentration of the air with the resultant decrease in the stomata opening. Predication of the wheat plant ET was achieved by entering the minimum and maximum air temperature, precipitation and daily radiation for the 1983-2012 period into the downscaled LARS-WG software and its incorporation into the HadCM3 general circulation model under the A1B, A2 and B1 climate change scenarios for the 2011-2040 , 2041-2070, and 2071-2100 periods. Results of the general circulation model for Bojnourd area indicates that the temperature will increase in all months of the year up to 2100 year. There will also be an increase in precipitation, in December, January, February and March, and its decreases in April, May, August and September. The generated temperature and precipitation data were fed into the SSM-WHEAT as an application for making changing planting date for simulation of wheat growth. Results indicated that the change in the mean maximum and minimum temperature and also that of precipitation reduced rate-fed wheat's ET up to the year 2100. On the contrary, the ET of the late-planted irrigation wheat will be increased and it would be decreased in rainfed farming.

**Keywords:** Climate Change, General Atmospheric Circulation Model, Evapotranspiration, Wheat water requirement.

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## Comparison of Finite Volume Method and Smoothed Particle Hydrodynamic in Modeling of Flow over Sharp-Crested Weir

Ali Mahdavi<sup>1</sup>, Hossein Khorshidi<sup>2\*</sup>

### Abstract

This study presents a new hybrid algorithm for treating solid wall boundaries in the context of smoothed particle hydrodynamics (SPH) model. In this way, the basic concept is to fill an impervious region with some layers of dummy particles for improving the solution accuracy, and a single layer of repulsive particles to impose a no-penetration condition along the solid-fluid interface. The later consists of a new repulsion mechanism that, unlike the well-known Lennard-Jones model, induces no pressure oscillation close to the wall region. This hybrid boundary treatment technique is implemented in conjunction with a parameter-free smoothed particle hydrodynamics scheme to provide a Lagrangian solver for two dimensional Navier Stokes equations. The accuracy of the model is verified by recourse to challenging a numerical test defined for a free falling water jet from a sharp crested weir. The computed nappe profiles are compared with those of a finite volume method. Satisfactory agreement is found between all these results.

**Keywords:** SPH, Solid boundary condition, free surface flow, Sharp-crested weir, Finite volume method.

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## Evaluation and Comparison of the Artificial Neural Network and the HEC-HMS Models in the Simulation of the Rainfall-Runoff process and the development of Hydrograph in the Kasilian representative Basin

Farshid Safsheken<sup>1\*</sup>, Nader Pirmoradian<sup>2</sup>, Reza Afshin Sharifan<sup>3</sup>

### Abstract

The Rainfall-runoff process is a non-linear and a very complicated phenomenon. As collection of the reliable data is difficult, time consuming and expensive, hydrologists resort to the simulation of such events using the so-called black box models such as the artificial neural network (ANN). However, as such models have been developed and evaluated and different geographical settings, their comparison is essential if one desires to apply them to a certain watershed. To this end, the ANN (version 9-10-7) and the HEC-HMS models were evaluated and compared in generating hydrograph for the kasilian basin, to improve the models stability and training, the rainfall data were divided into four groups according to the Huff distribution of rainfall pattern. Furthermore, different combinations of transfer functions were used in the hidden and output layers. The ANN model was derived using the Qnet2000 software. The HEC-HMS model was also used to compare it with the ANN.

the absolute relative error of  $Q_p$ ,  $T_p$ ,  $T_b$ ,  $W_{75}$ ,  $W_{50}$ ,  $T_{50}$  and  $T_{75}$  parameters simulated using the ANN were 0.02-51.97, 0.55-41.23, 0.26-54.07, 0.23-202.62, 0.52-69.88, 2.21-82.07 and 2.42-55.76, respectively. Meanwhile these confines were 0.58-756.53, 0-250, 0-141.18, 2.84-575, 0.93-167.86, 3.33-350 and 2-266.67 using the HEC-HMS model. Regarding the relative error of the outcomes of each event, it can be concluded that the neural network in the most cases has been simulated all the parameters and the overall shape of the hydrograph with little error compared to the HEC-HMS model. Ofcourse the HEC-HMS model was rarely more accurately than the ANN in the some cases, for example, to simulate the peak, the base time and overall shape of hydrograph.

**Keywords:** Rainfall-Runoff hydrograph, Artificial Neural Network; HEC-HMS model.

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## Waterlogging Risk Mapping Using Remote Sensing and Field Data (Case Study: Qazvin)

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### Abstract

Protecting the quality of groundwater due to frequent usage of this resource in various sectors including agriculture, industry and drinking water is of great importance. One of the ways to prevent pollution of groundwater is identifying the vulnerable aquifers and land management. In this paper, four indicators, namely :(AVI, GOD, DRASTIC and SINTACS) have been used to delineate vulnerable areas on Qazvin plain of groundwater pollution. The data and information used in this article include satellite images for mapping land use and designated wetlands areas, maps with scale of 1: 25,000 for georeferencing satellite images and control points, groundwater depth information during different years, amount of rainfall in the region, transmissivity capability and apparent resistivity of the aquifer layer, depth to bedrock, soil texture, surface area, soil permeability, slope (use the map DEM), the thickness and the texture of aquifer layer, hydraulic conductivity parameters, soil texture of the unsaturated area, net recharge parameters and land use. Because of the importance of wetlands and land use parameters in determining the potential risk and vulnerability, these conditions have been identified using satellite imagery. Threshold method and control points, were used to determine the inundated areas of the plain has been. The phreatic surface has been composed and the ordinary kriging method which was achieved below the critical level. As the normal vulnerability factor contains effective parameters, it was selected as an indicator for vulnerability classification was selected. Vulnerability classes based on these indices were divided into 6 categories, without the risk of contamination, very low vulnerability, low, low-to-moderate, moderate-to-high and high, with the contribution of each class to the total area was 2.38, 20.73, 72.22, 20.5, 5.95 and 0.05 percent, respectively. **Keywords:** aquifer vulnerability and risk, sensitivity analysis, remote sensing, wetland, GIS.

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## Numerical Investigation of Hydraulic Jump Length and position in Ogee Chute

Mina Rouzegari<sup>1\*</sup>, Naser Talebbeydokhti<sup>2</sup>, Seyed Mehrab Amiri<sup>3</sup>

### Abstract

One of the most effective strategies for energy dissipation of hydraulic structures is hydraulic jump. The position of hydraulic jump play an important role in design of stilling basin. In this study, hydraulic jump in ogee spillways were simulated by using fluent software. The governing equations were solved through finite volume method and the standard model was applied for estimating the turbulence flow. The equations were discretized in structured mesh accommodate the well-defined boundaries and the volume of fluid (VOF) method was introduced to solve the complex free-surface problem. The study examined the effect of increasing the discharge and the slope on the hydraulic jump position and length. The results suggest that increasing the slope and discharge caused the spatial delay in hydraulic jump. It was found that in ogee spillway with a constant slope, the hydraulic jump length increases up to 120% when the discharge increases. Additionally, for a certain discharge and a constant length of spillway, increasing the slope of spillway decreases the hydraulic jump length up to 43%.

**Keywords:** Hydraulic jump, Ogee spillway, stepped spillway, VOF.

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## Collocated Discrete Least Squares Meshless (CDLSM) Method for Simulation of Mobile- Bed Dam Break Problems

Babak Fazli Malidareh<sup>1</sup>, Seyed Abbas Hoseyni<sup>2\*</sup>

### Abstract

Meshless methods have been added to numerical methods in recent decades, and have provided a wide range of scientific, research and engineering fields. The use of Meshless methods is still not extent to the finite element methods in engineering issues, but these methods may now be similar to those of the time when the finite element method begins to expand. In this research, a discrete least square meshless method with collocation points CDLSM is proposed. The concepts, mathematical relations, and formulation of this method are fully presented. In this simulation, collocation points are used for more efficiency and lower computing time by using least squares method, as well as using the series instead of integrals (discrete mode). Based on this method, the dam failure phenomenon has been solved in different cases and its verification has been used by comparison with analytical solution with experimental data whenever it is available. Comparison of numerical results with existing analytical and experimental data shows that the method has high efficiency and simulates the shock or discontinuity.

**Keywords:** Meshless Method, Dam Break, Least Square, Fixed Bed, Movable Bed.

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## Contribution of Wash and Channel Sediment Sources in Supplying Storm Suspended Sediment Load in the Galazchai Watershed

Seyed Hamidreza Sadeghi<sup>1\*</sup>, Pari Saeidi<sup>2</sup>, Abdulrasul Telvari<sup>3</sup>

### Abstract

Suspended sediment generation is a predominant process in most watersheds, which has an important role in total sediment yield reached the main outlet of the watershed. However, the determination of contribution of main sediment sources in the watersheds, as one of fundamental bases of sediment management practices, has been rarely considered. Hence, on the present case study was conducted Galazchai Watershed in West-Azarbaijan Province, Iran, with an area of some 103 km<sup>2</sup> to investigate the contribution of wash and bed sediment sources in total suspended sediment yield. Towards this attempt, sediment samples from 12 storm events which occurred during the spring of 2014 and autumn of 2014, were collected and subjected to laser particle size distribution measurement. The suspended sediment particle size distribution results verified a significant contribution of wash load with an average of 89.45± 11.95% in suspended sediment supply for the study storms. The mean contribution in the spring of 2014, summer of 2014 and autumn of 2014 were founded to be 92.17, 90.71 and 85.80%, respectively. The results consequently verified the necessity of special attention to management of watershed upstream in order to plan a proper sediment management of the study watershed.

**Keywords:** Sediment behavior, sediment particle size distribution, temporal contribution of sediment yield, watershed management.

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## **Participatory Appraisal of Water Users' Cooperatives (WUCs) Performance towards Irrigation Management of the Orchards Development Plan (Case Study: Tefin and Palangan Cooperatives in the Province of Kurdistan)**

Gholamhossein Karami<sup>1\*</sup>, Mehran Azizi<sup>2</sup>, Hossein Agahi<sup>3</sup>

### **Abstract**

The purpose of this study was to investigate the socio-economic impacts and analyze the internal and external factors affecting the performance of water users' cooperatives (WUCs) in the province of Kurdistan. Therefore, Tefin and Palangan cooperatives in the Sarvabad and Kamyaran Townships were studied using the qualitative methods and participatory rural appraisal (PRA). Due to the nature of this research, the sampling method was purposeful and non-probability. Thus, the data were collected by brain storming and focus group interviews until they had reached theoretical saturation point. The conventional coding was used in the data analysis for frequency measurement of the words and phrases, and a coherent summarization of information. Also the other part of the analysis was done using the SWOT model. Results show upon the member's viewpoint the main problem was the lack of adequate and continuous supervision on cooperatives from responsible authorities. The most important effects of cooperatives was change the land use system from farming to horticulture, new irrigation networks development, and access to modern technologies. Generally cooperatives' economic and social performance was assessed poor and average level, respectively. Also, based on the SWOT model, 15 point of strength and opportunity as advantages and 20 point of weakness and threats as limitations were identified in the irrigation network management of orchards development plan, and 10 strategies have been presented to improve the current situation of the cooperatives. The results of this research can be used by policy-makers and irrigatorists to reduce the recurring of such problems in design and implementation of the similar projects.

**Keywords:** Water users' cooperative (WUCs), Participatory rural appraisal, Socio-economic impacts, SWOT analysis.

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# Abstract

## Table of Contents

### Water Resources Engineering Journal

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**Participatory Appraisal of Water Users' Cooperatives (WUCs) Performance towards Irrigation Management of the Orchards Development Plan (Case Study: Tefin and Palangan Cooperatives in the Province of Kurdistan)**

Gholamhossein Karami, Mehran Azizi, Hossein Agahi

**Contribution of Wash and Channel Sediment Sources in Supplying Storm Suspended Sediment Load in the Galazchai Watershed**

Seyed Hamidreza Sadeghi, Pari Saeidi, Abdulrasul Telvari

**Collocated Discrete Least Squares Meshless (CDLSM) Method for Simulation of Mobile- Bed Dam Break Problems**

Babak Fazli Malidareh, Seyed Abbas Hoseyni

**Numerical Investigation of Hydraulic Jump Length and position in Ogee Chute**

Mina Rouzegari, Naser Talebbeydokhti, Seyed Mehrab Amiri

**Waterlogging Risk Mapping Using Remote Sensing and Field Data (Case Study: Qazvin)**

Hamed Mansoori, Vahid Yazdani

**Evaluation and Comparison of the Artificial Neural Network and the HEC-HMS Models in the Simulation of the Rainfall-Runoff process and the development of Hydrograph in the Kasilian representative Basin**

Farshid Safsheken, Nader Pirmoradian, Reza Afshin Sharifan

**Comparison of Finite Volume Method and Smoothed Particle Hydrodynamic in Modeling of Flow over Sharp-Crested Weir**

Ali Mahdavi, Hossein Khorshidi

**Investigation of the effect of climate change on evapotranspiration and wheat water requirement in Bojnord region**

Samira yarmohammadi, Mehdi Zakerinia, Khalil Ghorbani, Afshin Soltani

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