Majid Rezaei Banafsheh[1]
Tahereh Jalali Ansaroodi[2]
Mohammad Ali Hasanpour Aqdam Beglu[3]

Analysis and Modeling of Groundwater Level Changes in Tasuj Basin by Autoregressive Moving Average Process

Introduction

Excessive use of groundwater is one of the most important challenges in the utilization of water resources. Dependence of agricultural and horticultural production to this natural resource is to the extent that excessive use and sometimes imbalanced has caused to decrease of groundwater levels in many parts of the country. One of the most common methods in the world is use of time series for patterning and prediction of groundwater level. The use of this technology is expanding in some matters of hydrology, hydrogeology, meteorology and even irrigation. Rahmani and Sadahi (2004) has used time series model for patterning and forecasting groundwater level in Bahar Hamedan- plain and Concluded in case of remain constant patterns of use and also no change in the recharge aquifers, Bahar Hamedan- plain during the next twenty years will face with reducing 17.5 meter of

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1- Natural Geographic Groups, Climatology Orientation Tabriz University.
2- Ph.D in Climatology, University of Tabriz.
3- M.Sc. in Geology– Hydrogeology.

water level Compared to current state of the aquifers. Habashi (2014) for predicting of groundwater level of urmia plain used from time series model and reported its operation Satisfactory.

Matherials and Methods

Considering the importance of groundwater resources in providing of majority water requirement in Tasuj basin and the importance of optimal and sustainable use of groundwater resources in this basin, the aim of this study is prediction of changes in groundwater levels in Tasuj basin with suitable model of time series. For this purpose, groundwater level data was received in monthly scale from regional water organization in East Azerbaijan province between 1373-1391. During the period studied, cumulative level of groundwater in Tasuj basin declined about 15 meters. On the average, each year reduced about 78 cm of the ground water level in this basin. to identify of primary model for a static series used autocorrelation function and Partial autocorrelation function. In time series analysis is possible several pattern are recognized for describe a series of data. To choose the best pattern among different models be used generally, Akaike information criterion.. In order to validation of predicted data by the model amounts of R^2 and MARE calculated between observed and predicted data. In this study high amount of coefficient determination (0.99) and low values of mean absolute relative error (0.001) is represent of relatively accurate prediction.

Discussion and Conclusions

Among different models ARIMA (2,0,3) model by having lowest Akaike information were suitable than other models. Therefore decline of groundwater level from 1392 to 1401 year compared to the base year (1373) were fitted with model (2,0,3) and groundwater level changes was predicted until year 1401 in software R with obtained model. The results showed assuming continuing of present condition of application in

Tasuj basin mean of cumulative decline groundwater level in tenth year of forecast than the first year of forecast (1392) would be 7.25 meter. Results of modeling and forecasting could be applied to optimal and sustainable management of groundwater resource in the Tasuj basin. Optimal management and modification the pattern of water consumption is necessary according to the spread of Tasuj watershed and significant trend in reduction of groundwater volume during the prediction year.

Conclusions

in this study, time series modeling used to forecast the groundwater level in order to manage and policies in the field of water resources in critical condition. For this purpose, the box model (ARIMA) used. The results showed that the high ability of ARIMA model to predict. Predicted values of Arima model showed. Cumulative decline of groundwater level in the first year (1392) and last year's forecast (1401) Compared to the base year (1373) will be respectively 15.9 and 23.15 meter. Results of this study is in accordance with other researchers, such as Rahmani and Sadahi(1383), Kohestani (1388) and Karami (1390).