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Investigation of the Discharge and Sediment Load Trend in Mordaghchai Using Non-Parametric Tests

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1-Introduction

The most important parameter of water resources management among the various components of the hydrological cycle of a watershed is the river discharge; the pattern of water consumption in different sectors of industry, urban and domestic, agriculture, etc., is affected by changes in river discharge. On the other hand, soil deposition and erosion are the world's biggest environmental concerns; erosion is the primary source of sediments that pollute rivers and settle in dams. Determining the discharge rate and sediment changes is crucial in prioritizing catchment management. In recent years, sediment and river discharge changes have become an important issue worldwide. Many researches have been done to analyze the trend of climate change variables such as precipitation, temperature and hydrological components of the basin, such as sediment and runoff, as well as water quality parameters (Bayati Khatibi et al., 2014: 93 & Haji et al., 2017: 121). One of the best methods to assess the hydro-climatic conditions of catchments is to analyze the trend of change.

This method is often used to examine changes in a variable over time. Based on the presented materials, it can be concluded that analysis of river sedimentation trends and runoff time series in watershed management is very important. This article aims to analyze the trend of monthly, seasonal and annual changes in the flow and sediment of the Mordaghchai River.

2-Methodology

Mordaghchai watershed (Mordochai) is one of the main tributaries of Zarrinehrud in the eastern part of Lake Urmia. Residents of the area use this river as an important source of water. This paper investigates the trend of gradual and rapid changes in flow rate (1974-2017) and sediment load (1977-2016) of Mordaghchai River in East Azerbaijan province.

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This study was carried out in Gheshlagh Amir hydrometric station on three-time scales: annual, seasonal and monthly, using non-parametric methods. To analyze the trend of changes, the Modified Mann-Kendall test was used to analyze runoff and sediment data of the Gheshlagh-Amir hydrometric station. Also, the Sen's slope estimator was used to estimate the slope of the trend line and the non-parametric Pettitt test was used to investigate the abrupt changes in the runoff and sediment time series.

3-Results and Discussion

The results show that annual, monthly and spring, summer and winter discharges significantly decrease at the level of 5%. The annual and all-season sediment load data significantly decreased by 5%. Also, there is a significant decrease in sediment load in all months except March, April and October. The results of the Pettit test show that the average annual discharge in the period after the breaking point (1998) has decreased by 45% compared to the period before the breaking point. Also, the average annual sediment load after the breaking point (1996) has decreased by about 52% compared to the previous period.

4-Conclusions

This study examines the trend of monthly, seasonal and annual changes in the flow and sediment of the Mordeghchai River in East Azerbaijan using non-parametric Modifies Mann-Kendall, Sen's slope estimator and Pettit tests. The results show that annual, monthly and spring, summer and winter discharges significantly decrease at the level of 5%. The annual and all-season sediment load data significantly decreased by 5%. Also, there is a significant decrease in sediment load in all months except March, April and October. The results of the Pettitt test show that the average annual discharge in the period after the breaking point (1998) has decreased by 45% compared to the period before the breaking point. Also, the average annual sediment load after the breaking point (1996) has decreased by about 52% compared to the previous period.

Based on this, managers must manage the water resources of the basin by adopting appropriate strategies in the future because the decrease in flow will cause severe environmental consequences in the watershed.

Keywords: Runoff, Sediment, Modified Man-Kendall, Sen’ slope estimator, Pettitt test, East Azerbaijan province.

5-References

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