Climate change in Gavkhouni Basin at the late Quaternary phase

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Extended Abstract

Introduction

In spite of its short time period compared with the earth long evolution history, quaternary has had a significant effect on the final formation of the landforms and vital resources. It is the final analysis of these levels and fully dependent on the earth genetic diseases and, above all, significant climate changes that have happened during this period. Gavkhouni basin morphological perspectives demonstrate several climate changes in quaternary. The effects of these changes are a completely known phenomenon on the lake. Indeed, the lake can be viewed as an archive within which quaternary climate changes evidence has been maintained.

Gavkhouni basin in the past had weather different from today weather. Thus, geomorphic forms and processes have experienced great evolutions during quaternary and have been different from today. Since the geomorphic evolution of Gavkhouni basin have been affected by the external processes, i.e., climate fluctuations of the Fourth Era, is the result of these processes operations at the present. Referring to these operations, the past climate fluctuations in the area can be demonstrated.

Materials and Methods

The purpose of this study is to determine the temperature and moisture changes and transitions through tracing and revival of hot-waters and lake terraces and presenting a schematic image of the recovered lake of quaternary in Gavkhouni basin. In order to achieve this aim, the statistics

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related to annual temperature and rainfall of 13 stations within the basin and around it were selected and, in the next stage, quaternary temperature was reconstructed using the Wright method based on the snow line, and the changes were plotted. Then, using the Peltier model with its two basic parameters o temperature and rainfall, the survey of morphoclimatic regions of Gavkhouni basin was measured both in Vurm and the current.

Results and Discussion

To estimate the current annual mean temperature and to provide isotherm map using the annual mean temperature and height of each station, a thermal gradient with correlation coefficient of 0.92 was obtained. Then, applying equation (1) in the height model of the basin isotherm lines provided minimum, maximum, and the mean statistics of the Gavkhouni lake basin. Then the locations of 153 glacial cirques within Gavkhouni Basin were determined using the curve form of topographical map within a height range of 2500-3400 meters. The snow line of the basin measured based on Wright model was 2500 meters. Assuming the annual mean temperature at snow line as 0o and by exploiting the relation of temperature and height as well as given the 5 o reduction in past temperature compared to that of the present, the mean temperature map during the cold period of the year was plotted and its minimum, maximum and mean were calculated. In the next stage, the nine-tuple regions were segregated using the Peltier graph, temperature parameters and annual rainfall and its result was plotted in the form of current morphoclimatic maps and the late quaternary phase.

Then, with regard to the studies conducted on Zagros basin lakes and the resulted linear relation between the two variables, ice maker survey and lakes survey, with the correlation coefficient 0.70, it was demonstrated that there was a kind of coupling between the height and survey of the ice maker and the survey of the lake. The more the height of the peaks are, the more is the survey of the ice maker and, as the result, the more the survey of the lake. Certainly, the lake survey and volume have decreased by the reduction of these variables at the present time. This suggests evidently the climate changes in the late quaternary phase compared to that of the present.

Conclusion

In order to investigate the weather fluctuations and environmental responses of Gavkhouni Basin, we concentrated on the past temperature and rainfall reconstruction. This measures the depth and volume of the lake and the survey of the lake ice maker in the past. Reconstruction of past temperature and rainfall and comparison with the present indicates a 1.5 times reduction in rainfall and 5 degrees increase in the mean temperature of Gavkhouni Basin. A contradict which has had so many climate and geomorphic changes as the consequence. Peltier method-based morphoclimatic maps show that the vastest survey of the basin was related to semi-arid region with 48.45% followed by Savan and Bouril regions with 35.28% and 14.95%, respectively. At the present, the semi-arid region with almost a double increase up to 83.24% has still the most survey of the region. Dried region with 13.79% is placed in the second rank. On the other hand, defining the limits of traced lake terraces through hot-waters represents the existence of a huge lake with a greater volume in the past. In other words, with correspondence of wet periods with glacial periods in the region, the basin extent has been augmented during the cold era by

increasing the rainfall and consequently increasing the river discharge. Therefore, the volume of Gavkhouni lake water reached to 892 km^3 at the time, but during the warm era it reached to 21 km^3 because of the reduction of ice maker concentrations in the region.

Keywords: allometry, cirque, climate change, morphoclimate, Peltier.