

Reconstruction of Quaternary Paleo Lake Levels of Urmia by Studying Lake Terraces

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Extended Abstract

Introduction

Lake Terraces are geomorphological evidence of climate change during quaternary. Location of these terraces location in different elevation shows paleo water lake level fluctuations. Investigation about Urmia Lake terraces was conducted by Bobek (1973). He found those terraces in 45-55 meter above Urmia water level on that time. According to Bobek, development of lake area in paleo Pleistocene period and cold Pleistocene periods was caused by reduction of temperature about 5 centigrade and reduction of evaporation. It is important that we don't have any comprehensive investigation on Urmia lake terraces and many of these terraces and paleo shorelines remained unknown up to now. The aims of this research investigation of quaternary terraces of Urmia Lake represent their elevations and reconstruction of the areas affected by these fluctuations.

Urmia Lake Basin is located in Northwest Iran and in the lowest part of this depression, surrounded by High Mountain with elevation more than 2000 meter above sea level. Urmia Lake is the largest inland lake in Iran and the second largest saltwater lake in the world. Tabriz fault activity causes uplift in this region of northern segment of the fault and it creates a barrier against the flow of surface and underground. This has led to formation of Lake Urmia. This lake is located in a shallow subsidence with an average depth of 6 meters, but its deepest point is the northwest corner with 13 meters deep. There are 102 large and small islands within the limits of the Lake Urmia. Salt water is more than 350 grams per liter.

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Materials and Methods

Geological data, sediment and morphometric data were gathered through library studies and fieldwork. Then, Quaternary sediments in the coastal zone boundaries were reconstructed and paleo lake boundaries were also determined using GIS and RS techniques. Aerial photos, satellite imagery and digital elevation model of SRTM90 m was used. In field work, lake terraces were detected by investigation of sediment laminations, sedimentological characteristics such as Granulometry, color, type, location of strata and specially fossils located in the sediment. Granulometry of the sediments were analyzed in sedimentology lab of Geological survey of Iran using Vibratory Sieve Sahker. Percentage of sand and silt were determined and analyzed using Gradistat 4 software and the curves were plotted. Binocular Microscope was used for paleontology investigation. The elevations of terraces were measured with a Differential Global Positioning system (DGPS). After determining the height of the terrace, the extent of Urmia lake paleo water level was also determined using 150 topographic map sheet at scale of 1:25000. It was related to the block 1:250000 of Tabriz, Urmia, Mahabad and Khoy through a digital elevation model with a resolution of 10 m. Urmia Plao Lake extent was reconstructed based on satellite images.

Discussion

In the recent years, due to the occurrence of hydro- climatic droughts over the past few decades and extensive dam construction on main rivers and high water evaporation, the lake area decreased and experienced significant changes in water level. The lake terraces are the best evidence to reconstruct the paleo geomorphological situation in coastal environment and occurrences of these terraces shows climate change and tectonic phases. Hence, identification of the Urmia Lake terraces was employed to reconstruct the situation of paleo environment. In field studies, the lake terraces were detected by geomorphological, sedimentary structures, sediments grain size and especially fossil collections in the sedimentary layers. Since many terraces are buried in the river sediments, they are very difficult to detect and create the river or human activities such as road construction. Using a sequence of periods of water level fluctuations and long dry periods and wet-laying sedimentary sequences were used for this reconstruction. After identifying the terraces, geographic location and the exact height were also determined using DGPS. In field studies, 24 lake terraces were found in Quaternary sediments. Lowest terraces are located in Islami Island in elevation of 1297 meters and the highest terraces in Damirchi with elevation of 1366 meters.

Conclusion

Elevation of lake terraces are variable from 1297 meter to 1366 meter and consequently the areas affected by fluctuations in lake water levels were different. The maximum extent of lake level fluctuation has occurred in the south part of Urmia Lake. In this region the slope is very low and experienced the slightest change in the water level of the lake. The large extent of this region is affected by water level fluctuations. In the northern and western parts of the lake, impact of water level fluctuations is low due to the steep slope. At an altitude of 1297 meters (terrace Sh-1) the area of the lake was about 9,658 square kilometers. The extent of lake on that time increased about 6560 square kilometers compared to 2011. Gacha Bashi terrace (1311 m in

elevation) in West Golmankhaneh Peninsula is dated by Sabouri (2010) to be resulted about 46,000 years before present. The elevation of the terrace after the gathering and corrections of errors by GPS dual frequency was 1336.6 meter. At that time, the islands of Minadoab, Malekan, Bonab, Azar Shahr, Naghadeh and Mahabad Cities were buried under Urmia lake water. The lake water also reached near the Urmia city. The highest terrace is located near Tsuj (Ts-2) City in Northwest part of the lake parallel to Damirchi DM-1 in Northwest part of Malekan with elevation 1366 meters. The extent of the lake at that time was about 13900 km and the water reached to Tabriz city.

Keywords: *eostatic, lake terrace, quaternary, Urmia Lake.*

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