

Lake-level increasing under the climate cryoaridization conditions during the Last Glacial Maximum

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A lake genesis and lake-level increasing during the Last Glacial Maximum (LGM) are the paramount issues in paleoclimatology. Investigating these problems reveals the regularities of lake development and figures out an arid territory conditions at the LGM stage. Pluvial theory is the most prevalent conception of lake formation during the LGM. This theory is based on a fact that the water bodies emerged and their level increased due to torrential rainfalls. In this study, it is paid attention to an alternative assumption of lake genesis at the LGM stage, which is called climate cryoaridization. In accordance with this hypothesis, the endorheic water basins had their level enlarged because of a simultaneous climate aridity and temperature decrease.

In this research, a lake-level increasing in endorheic regions of Central Asia and South American Altiplano of the Andes is described. The lake investigation is related to its conditions during the LGM. The study also includes a lake catalogue clearly presenting the basin conditions at the LGM stage and nowadays. The data compilation partly consists of information from an earlier work of Mikhail Amosov, Lake-levels, Vegetation And Climate In Central Asia During The Last Glacial Maximum (EGU2014-3015).

According to the investigation, a lake catalogue on 27 lakes showed that most of the water bodies had higher level. This feature could be mentioned for the biggest lakes of the Aral Sea, Lake Balkhash, Issyk-Kul etc. and for the small ones located in the mountains, such as Pamir, Tian-Shan and Tibet. Yet some lakes that are situated in Central Asian periphery (Lake Qinghai and lakes in Inner Mongolia) used to be lower than nowadays. Also, the lake-level increasing of Altiplano turned to be a significant feature during the LGM in accordance with the data of 5 lakes, such as Titicaca, Coipasa-Uyuni, Lejia, Miscanti and Santa-Maria.

Most of the current endorheic basins at the LGM stage were filled with water due to abundant precipitations. For example, the paleo-lakes of Bonneville and Lahontan located in the Great Basin, US vividly present the pluvial hypothesis. However, the lake-level of Central Asia and Altiplano altered because of a simultaneous climate cooling and moisture decrease. This phenomenon is called a climate cryoaridization.

The moisture reduction in two studied regions is proved by the palinologic data. Beside the fact above, the climate cryoaridization of Altiplano lakes is also confirmed by the data taken from the flatland water bodies of South America that are located to the north of the described region. Even though they had an influence from Amazon convective center with its humid air masses moved towards Altiplano, these flatland lakes used to have lower level at the LGM stage.

According to the explained hypothesis, there is one more assumption supporting an increasing effect of cryoaridic lakes. These water bodies occurred on the endorheic basins due to the snow accumulation in the surrounding mountain ranges, hence the snow line moved down closer to the Altiplano valleys.