



Analysis of the water level change in a tropical maar-lake (Lake Alchichica, Puebla, México)

Raúl Alberto Silva Aguilera (1) and Oscar Arnoldo Escolero Fuentes (2)

(1) Posgrado en Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México, (2) Instituto de Geología, Universidad Nacional Autónoma de México

Alchichica is a deep alkaline crater lake located in an endorheic basin of Central Mexico with an arid climate. The main features of this lake are the presence of both modern and subfossil cyanobacterial microbialites (particularly stromatolites) and the existence of some endemic species. Furthermore, this lake provides supporting, regulating and cultural ecosystem services. In recent years, it has been observed a fast lowering in the water level of the lake, which has exposed a large portion of the microbialites. Two factors has been proposed as the main causes of the water level change: climate change and the intensive groundwater exploitation for agriculture in the zone. However, it had not been conducted any detailed study. We estimated a reconstruction of the water balance of the lake from the year 1966 to 2015. The reconstruction was elaborated using: historical atmospheric data (air temperature, evaporation and precipitation) registered by a weather station located near the lake shore, remote sensing techniques for historical images analysis and a bathymetric model of the lake basin. In addition, we evaluated the groundwater flow in and out of the lake through a hydrogeological monitoring (measurement of water levels, temperature and electric conductivity) of wells in the area, and the construction of three piezometers in the area of the lake shore. The results of this study provide, on the one hand, a conceptual model of the interaction of groundwater and lake, which besides helping to estimate the water balance, could be very useful for a better understanding of some ecological processes in the lake. On the other hand, the historical reconstruction of the water balance provides a preliminary diagnosis of the water level change, which is fundamental in the context of lake management for the future conservation of Alchichica.