



Lakes El Sol and La Luna: environmental sensors in extinction

Estela Cuna¹, Margarita Caballero², Martha Gaytán¹, Javier Alcocer¹

¹ Facultad de Estudios Superiores Iztacala, Universidad Nacional de México; ² Instituto de Geofísica, Universidad Nacional de México



We support the Sustainable Development Goals

WLC18- 0030

Introduction

Inside the Nevado de Toluca volcanic crater, the high mountain lakes El Sol and La Luna are sensitive to natural and anthropogenic disturbances, constituting sensors of global and environmental change. In addition, the lakes are of great cultural relevance since pre-Hispanic times.

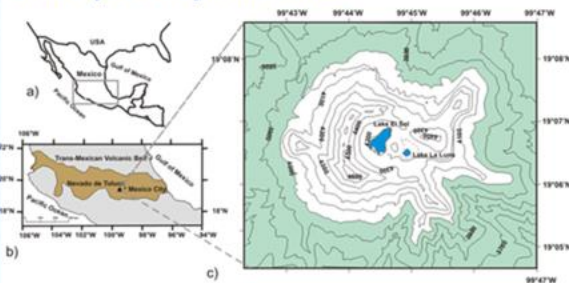


Figure 1 a) México b) Location of the Nevado de Toluca, central Mexico c) La Luna and El Sol lakes in the crater of the Nevado de Toluca volcano, 3800 m snm



Development

Its high sensitivity has been demonstrated in studies that have been carried out on its sediments (analysis of biological remains, magnetic susceptibility and dating, which have made it possible to identify the environmental changes that have occurred in the area since 1000 years AD to date, such as periods of drought related to the Mexican Revolution, drier and colder climates that correspond to the Little Ice Age, a more humid and warmer climate that corresponds to the Medieval Warm Anomaly, until the beginning of the current Global Warming (Cuna et al, 2014 ; Cuna et al. 2015; Zawisza et al., 2017) There are studies that demonstrate its vulnerability to anthropogenic and environmental disturbances (Ibarra-Morales et al, 2020) and the impact on local populations, where a total turnover is being recorded. (Alcocer et al, 2021).

Anthropic activities in the APFFNT are increasing (SSEM, 2018; Ejido San Juan de las Huertas, 2018):

18,000 visitors per day



All these are factors that alter the ecosystem, affecting the loss of their potential as sensors of climate variability and therefore of current Climate Change

Proposals

- Given its environmental and cultural importance, it is urgent to implement measures to mitigate the anthropogenic impact, such as: reducing the entry of visitors, establishing boundaries and enforcing them, not allowing vehicles to enter the crater area, educating and informing visitors about the fragility and importance of this ecosystem and the importance of not taking vegetation from the area, not leaving garbage including the feces of your pets and avoiding lighting fires as much as possible, as well as working together with the surrounding communities in the search for solutions to the current problem.
- Finally, considering the scientific evidence of the sensitivity of these lakes to natural and anthropogenic environmental changes, request the competent authorities to recategorize Nevado de Toluca as a National Park in favor of its conservation..

Referencias

Alcocer, J. ; Oseguera, LA; Ibarra-Morales, D. ; Escobar, E. ; García-Cid, L. Respuestas de las comunidades de macroinvertebrados bentónicos de dos lagos tropicales de alta montaña al cambio climático y la desacidificación. *Diversidad* 2021 , 13 , 243.
 Cuna, E., Zawisza, E., Caballero, M. et al. Impactos ambientales del enfriamiento de la Pequeña Edad de Hielo en el centro de México registrados en los sedimentos de un lago alpino tropical. *J. Paleolimnol.* 51, 1–14 (2014).
 Cuna E, Caballero M, Zawisza E, et al. Historia ambiental de un lago alpino en el centro de México (1230-2010). *TIP Rev Esp Cienc Quim Biol.* 2015;18(2):97-106.
 Ibarra-Morales, D., Alcocer, J., Oseguera, LA et al. Deposition a granel y composición iónica principal en una remota región tropical: Nevado de Toluca, México. *Agua Aire Suelo Pollut* 231, 413 (2020).
 Zawisza, E., Cuna, E., Caballero, M., Ruiz-Fernandez, A., Szeroczyńska, K., Woszczyk, M. y Zawiska, I. (2016). Cambios ambientales durante el último milenio registrados en Cladocera subfósil, diatomeas y geoquímica de sedimentos del Lago El Sol (Centro de México). *Geological Quarterly*, 61 (1), 81-90.