A 500-year record of paleoclimate and paleoenvironment from the
Lacandon Forest, southern Mexico

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Tropical karst Lakes Metzabok (550 masl, surface area = ~77 ha, zmax = 25 m) and Nahá (832 masl,
surface area = ~57 ha, zmax = 36 m) are located in the Lacandon Forest, in the state of Chiapas,
southern Mexico. The region is characterized by high aquatic and terrestrial biodiversity. We
generated high-resolution paleoclimate and paleoenvironmental records that span the last ~500
years, using invertebrate remains (ostracodes and gastropods) and geochemical variables
(elemental and mineralogical contents) in sediment cores from the two water bodies. We collected
a short sediment core from each lake (Metzabok = 46 cm, Nahá = 60 cm) and analyses were
carried out at 1-cm intervals. Uppermost sediments in the cores were dated using
²¹⁰Pb and
¹³⁷Cs,
and deeper deposits were dated by
¹⁴C. Ostracodes and snails were identified to species level and
their abundances were quantified. Concentrations of Ti and Fe were determined by portable XRF.
The geochemical record reveals information about past climate variability, human-mediated
erosion and transport of terrigenous elements. Changes in ostracode and gastropod assemblages
mainly reflect past lake level fluctuations and changes in water conductivity. The dominant
ostracode species was Cytheridella ilosvayi and the most common gastropod is Aroapyrgus sp.,
indicative of water depths ≤40 m and low water conductivity, respectively. Analysis of the
ecological distances between samples suggests that Lake Metzabok is unstable, with frequent
ecological changes equal to or greater than 50% of the community. These changes may have
resulted from dramatic environmental differences associated with hydrological dynamics during
dry and rainy seasons. The Nahá record presents two environmental conditions, i.e. periods of
high stability and periods of change, when the system was in transition from a dry period to a
wetter one, or vice versa. Despite differences between the two lakes with respect to elevation, size,
depth, and seasonal dynamics, both records contain evidence of droughts ca. 300 and 200 yr BP,
during the Little Ice Age. Whereas both records show a long-term tendency towards higher
moisture conditions, the high-resolution of our study enabled us to detect fluctuations between
dry and wet periods over the last 500 years that previous studies failed to recognize.