LAKE-SEDIMENT RECORDS OF HOLOCENE DROUGHTS, INDIGENOUS AGRICULTURE, AND PREHISPANIC VEGETATION AND FIRE REGIMES FROM THE MIRAVALLES LAKE DISTRICT OF NORTHWESTERN COSTA RICA

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Stratigraphic analyses of sediment profiles from lakes and wetlands provide key data for understanding long-term interactions between humans and the environment. We focus on sediment records from six lakes on the seasonally dry, lower Pacific slope of Miravalles volcano in the Guanacaste province of northwestern Costa Rica (10.7° N, 85.2° W). These lakes are located within one of the few lake districts in Costa Rica, in which multiple lakes exist that share a common mode of formation, age, and climate setting. They thus present unique opportunities for comparative paleolimnological research. The Miravalles lakes occupy depressions from 330–570 masl in undulating topography created by a volcanic debris avalanche about 8300 years ago, and range from less than 1 ha to 4.4 ha in size. Today they are surrounded by cattle pastures and remnant forest. Previously undocumented petroglyphs on lakeshores, with motifs related to the theme of water, indicate prehistoric human interaction with the lakes. Pollen, microscopic charcoal, and sediment characteristics in profiles from the six lakes document initial forest development following the debris avalanche and associated eruptive phenomena, and subsequent shifts in moisture availability, vegetation composition, and fire incidence. Analyses of macroscopic (>250 μm) charcoal fragments too large to be dispersed long distances by wind indicate repeated fires within lake watersheds. These fires likely resulted from natural ignition (from volcanism and lightning) as well as human activity. The upper sections of all six lake sediment profiles contain maize pollen and charcoal from agricultural fires. The earliest maize pollen, found at Laguna Martínez, is associated with charcoal dated to 5500 cal yr BP, and constitutes the earliest evidence for maize cultivation in all of Costa Rica. Maize is a fully domesticated plant that can persist on the landscape only with human assistance; the distribution of its pollen in the Miravalles lake sediments thus demonstrates the presence of settled humans within the northern Pacific lowlands for over five millennia. Diatom assemblages in the San Pablo core suggest changes in lake levels that generally match climate interpretations from pollen and sediment characteristics, but seem not to show effects of prehistoric agriculture.
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