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ORIGINAL ARTICLE

Climate and agricultural history from the Petén Campechano in the Late Holocene Maya lowlands of southern Mexico

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Abstract

Multiple approaches were used to investigate agricultural and forestry practices of the Preclassic Maya in the Petén Campechano, southwestern Yucatan Peninsula, Mexico. Palaeoenvironmental inferences were based on pollen and geochemical data from sediment cores collected in lakes Silvituc and Uxul, and the Oxpemul Reservoir. These water bodies are near three archaeological sites that supported agricultural activity between ca. 900 BC and AD 750. After ca. AD 500 the area was under the control of the Kaan Dynasty. These sites show patterns similar to those in sediments from Lake Petén Itzá, northern Guatemala, but they are different from records from the northeastern part of the Peninsula at Lake Chichancanab. Changes in the patterns of abundance, increase and decrease of maize pollen, relative to that of other crops (Cucurbitaceae and Chenopodiaceae) reflect changes with respect to their cultivation and importance. High clay and gypsum content in the sediments may be related to deforestation, agriculture, and intervals of greater rainfall. Changes in sediment elemental concentrations were associated with droughts and human activities during the Classic Period after AD 250. The Classic droughts were more severe and prolonged than those of the Preclassic and thus had a greater impact for inhabitants of the Petén Campechano. This led to a cultural collapse by the seventh century, whereas settlements farther north on the Yucatan Peninsula persisted until the tenth century. Gradually increasing precipitation during the Postclassic (AD 1350–1850), contemporary with the Little Ice Age (LIA), is consistent with the paleoclimate history of the Guatemalan Petén. The response of ecosystems to droughts revealed the water vulnerability of the region and its influence on the sustainability of Maya settlements.

Keywords Fossil pollen · Geochemistry · Yucatán Peninsula · Campeche · Maya culture

Introduction

Palaeoenvironmental studies on the Yucatán Peninsula (YP) have addressed the importance of distinguishing human from climate signals in sediment archives by using multiple variables (Leyden 2002; Torrescano and Islebe 2006; Aragón-Moreno et al. 2012; Gutiérrez-Ayala et al. 2012; Torrescano-Valle and Islebe 2015; Gunn et al. 2017). Distinguishing between natural (climate-mediated) and human-influenced environmental changes in palaeoenvironmental records is a challenge. The presence and relative abundances of pollen taxa related to agriculture such as *Zea mays*, Cucurbitaceae, and Amaranthaceae, (now including the former Chenopodiaceae, WFO 2022), as well as disturbance vegetation like Poaceae, Asteraceae, and Euphorbiaceae, can be used to identify anthropogenic ecosystem modification. In addition, they mark different stages of occupation in a region and periods of low and high agricultural production. These

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