

Hydroclimate changes across the Amazon lowland over the past 45,000 years

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The challenges of projecting tropical precipitation response to anthropogenic warming underscore the need for quantitative data on tropical hydroclimate history. Precipitation reconstruction from the tropics however has been difficult, particularly in the Amazon Basin, one of Earth's major centers of deep atmospheric convection. There has been controversy over whether the Amazon Basin was significantly dry or remained wet during glacial times, largely because most study sites are located in the basin periphery and interpretations can be complicated by sediment preservation, chronology uncertainties, and topographical setting. Here we report a highly resolved, U-Th dated, speleothem oxygen isotopic record through much of the last ~45,000 years from Paraíso Cave in eastern Amazonia. We show that rainfall in this region was substantially low in the last glacial period, during the last glacial maximum in particular, whereas it became noticeably abundant during the mid-Holocene, likely responding to glacial boundary condition changes in temperature and atmospheric CO₂ concentration. When comparing with cave records from the western edge of the lowland, we find that the Amazon Basin was widely dry during the recent glacial period, probably due to a dramatically weakened water recycling by reduced plant transpiration, although the rainforest may have persisted through time.