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An ∼85-kyr climate record from the lowland Neotropics (Guatemala): The Lago Petén Itzá Scientific Drilling Project

F.S. Anselmetti (1), D. Hodell (2), D. Ariztegui (3), M. Brenner (2), J. Curtis (2), A. Gilli (2), D. Grzesik (2), S. Kutterolf (4), A.D. Mueller (1) and PISDP scientific party

(1) Geological Institute ETHZ, Zurich, Switzerland (flavio.anselmetti@erdw.ethz.ch), (2) Department of Geological Sciences, University of Florida, Gainesville, FL, USA, (3) Institute F.-A. Forel, University of Geneva, Switzerland, (4) Leibniz Institute for Marine Sciences, IFM-GEOMAR, Kiel, Germany

As part of a recent ICDP initiative, we recovered >1.3 km of lake sediment at seven sites of varying water depths in Lago Petén Itzá, northern Guatemala. Multiple holes were drilled at each core site using the GLAD800 drill-rig mounted on the RV/Kerry Kelts superbarge. This ensured complete recovery of lacustrine sediment sequences that contain a long, continuous record of continental climate change from the lowland Neotropics. Initial radiocarbon and tephrochronologic dating indicates the record spans the last ∼85 kyr (back to MIS 5a), permitting study of long-term tropical hydrologic and temperature changes and correlation to other regional and global paleoclimate records. Lake Petén Itzá is the deepest lake in the lowlands of Central America, with a maximum depth >160 m. It is hydrologically "closed," making it highly sensitive to past changes in the ratio of evaporation to precipitation. Pre-drilling seismic surveys and the new drill cores confirm that the lake sediments are sensitive recorders of past hydrologic changes as reflected by variations in lithology and physical properties. Initial research efforts are focused on Site PI-6 (water depth = 71 m) that was drilled to a maximum sediment depth of 75.9 m. Radiocarbon dates on terrestrial organic matter are well ordered and indicate a mean sedimentation rate of 1 mm/yr to ∼44 kyr BP at a depth of ∼49 m. The age of the basal section is constrained by an identified ash layer at 70.4 m, 1.5 meters above limestone bedrock. The elemental geochemical fingerprint of this rhyolitic tephra layer is consistent with the Los Chocoyos eruption of the Atitlán Caldera around 84 kyr BP. This age of the tephra layer re-

sults in a sedimentation rate of ∼0.6 mm/yr for the lower section and chronologically confines the basal transgressional sequence, which represents the onset of lacustrine sedimentation in the basin. At Site PI-6, the top 10.8 m were deposited during the Holocene and consist primarily of gray carbonate clay with abundant charcoal. The Pleistocene/Holocene boundary is marked by a transition to Holocene clay from underlying, interbedded, dense gypsum sand and clay deposited during the Late Glacial (∼17 to 9.3 kyr). This transition represents a switch from relatively arid conditions during the Late Glacial to moister climate during the early Holocene. In contrast to the Late Glacial period, the earlier Last Glacial Maximum (LGM), from 23 to 17 kyr, consists of gray carbonate clay that is similar to Holocene deposits, suggesting high detrital input and high lake level, i.e. moist conditions. This finding contradicts previous results that suggested the LGM was dry in the Guatemalan lowlands. In Lake Petén Itzá, clay deposition during the LGM was preceded by interbedded gypsum and gray carbonate clay deposited before ∼23 kyr during Marine Isotope Stage 3 (MIS 3), indicating alternating wet-dry conditions. Sediments deposited during MIS 4 and 5a consist of fine-grained clay-rich lithologies with variable contents of carbonate and organic matter. Pollen and stable isotopic analyses of Site PI-6 are being used to test the preliminary paleoclimatic interpretations inferred from lithologic changes.