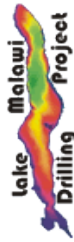


# Lake Malawi Drilling Project

Malawi



## Goal & Scientific Objective

The Lake Malawi Drilling Project want to gain (i) a continuous, high-resolution (annual-decadal) record of past climates in the continental tropics over the Bruhnes epoch, and (ii) to determine if tropical African climate responded to changes in low-latitude precessional insolation (23-19 kyr) or to high-latitude ice volume (100 kyr and 41 kyr) forcing, in the last part of the Pleistocene. Furthermore (iii) assess the phasing of lake level changes in Lake Malawi in the last half of the Pleistocene, (iii) determine from the high-resolution Lake Malawi drill core records if high-frequency, climate variations are superimposed on glacial-interglacial timescale variations, (iv) establish how interannual African climate variability has changed in association with longer-term climate variations and (v) determine the long-term evolution of tropical East African climate.

## Operational Achievements

Two sites were drilled and recovered more than 623 m of core.

At the Deep site, at 600 m water depth, were drilled four holes, one extended down to 380 m.

At the High-resolution site, three holes were drilled down to 40 m in 350 m water depth

Downhole logging (spectrum and total gamma) inside drill pipe was performed by the ICDP Operational Support Group

## Data & Sample Access

Lake sediments are stored in the National Lacustrine Core Facility at the University of Minnesota (LacCore)

## Web & Media Resources

<http://malawidrilling.syr.edu/>

<http://malawi.icdp-online.org/>

## Timeline

2003 ICDP proposal submission

2005 (February – March) drilling operations

## Principal Investigators

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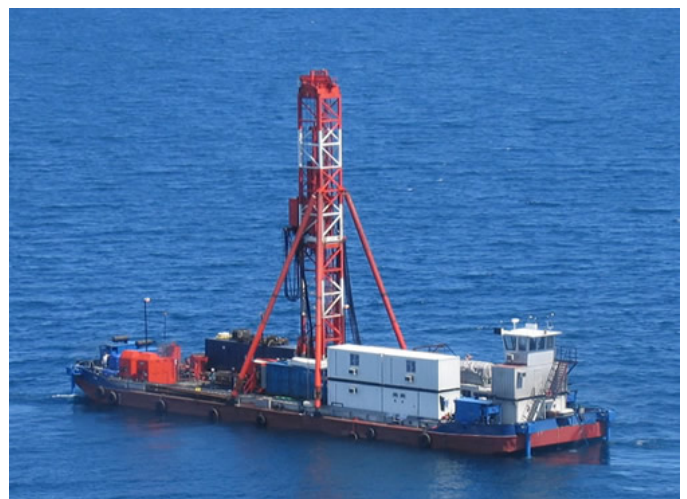
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Eric Onyango Odada, University of Nairobi

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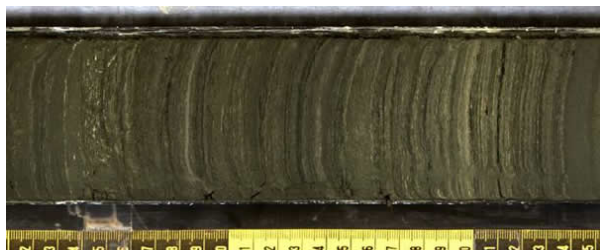
*Drill rig at Lake Malawi (Scholz et al. 2006)*

## Scientific Findings

Geochronological analyses results suggest that the deep site in the central basin is about 1.5 Ma old at its base and that the holes in the north basin bottom out in shoreface sand deposits are about 80,000 years old.

The paleoclimate records indicate an interval of high-amplitude climate variability between 145,000 and ~60,000 years ago, when several severe arid intervals reduced Lake Malawi's volume by more than 95%.

After 70,000 years ago climate shifted to more humid conditions and lake levels rose. During this latter interval however, wind patterns shifted rapidly and perhaps synchronously with high-latitude shifts and changes in thermohaline circulation. This transition to wetter, more stable conditions coincided with diminished orbital eccentricity, and a reduction in precession-dominated climatic extremes. The observed climate mode switch to decreased environmental variability is consistent with terrestrial and marine records from in and around tropical Africa.



*Finely-laminated, diatom-rich silty-clay, deposited during lake highstands (<http://malawidrilling.syr.edu>).*

## Key Publications

Scholz, C.A.; Cohen, A.S.; Johnson, T.C.; King, J.W.; Moran, K. (2006): The 2005 Lake Malawi Scientific Drilling Project. *Scientific Drilling* 2 17-19. doi:10.2204/iodp.sd.2.04.2006

Scholz, C.A.; Johnson, T.C.; Cohen, A.S.; King, J.W.; Peck, J.A.; Overpeck, J.T.; Talbot, M.R.; Brown, E.T.; Kalindekaffe, L.; Amoako, P.Y.O.; Lyons, R.P.; Shanahan, T.M.; Castaneda, I.S.; Heil, C.W.; Forman, S.L.; McHargue, L.R.; Beuning, K.R.; Gomez, J.; Pierson, J. (2007): East African megadroughts between 135 and 75 thousand years ago and bearing on early-modern human origins. *Proceedings of the National Academy of Sciences of the United States of America*, Early Edition 6pp.

Christopher A. Scholz (eds.) (2011): Southern hemisphere tropical climate over the past 145ka: Results of the Lake Malawi Scientific Drilling Project, East Africa. *Palaeogeography, Palaeoclimatology, Palaeoecology*, Volume 303, Issues 1–4, Pages 1-168.

Lyons, R.P.; Scholz, C.A.; Cohen, A.S.; King, J.W.; Brown, E.T.; Ivory, S.J.; Johnson, T.C.; Deino, A.L.; Reinthal, P.N.; McGlue, M.M.; Blome, M.W. (2015): Continuous 1.3-million-year record of East African hydroclimate, and implications for patterns of evolution and biodiversity. *Proceedings of the National Academy of Sciences of the United States of America* 112(51) 15568-15573. doi:10.1073/pnas.1512864112

Johnson, T.C.; Werne, J.P.; Brown, E.T.; Abbott, A.; Berke, M.; Steinman, B.A.; Halbur, J.; Contreras, S.; Grosshuesch, S.; Deino, A.; Lyons, R.P.; Scholz, C.A.; Schouten, S.; Sinninghe Damsté, J.S. (2016): A progressively wetter climate in southern East Africa over the past 1.3 million years. *Nature*. doi:10.1038/nature19065