



Lake Bosumtwi Drilling Project

Ghana, West Africa



Goal & Scientific Objective

The aim of this drilling project involves two main objectives: 1) to determine a one-million-year, continuous paleoclimatic record from detailed multidisciplinary investigations of the post-impact crater fill sediment for studying abrupt climate change, ecosystem dynamics and biogeochemistry, human-environment interactions and hydrocarbon system and source rock dynamics and 2) to obtain a complete section through the impact breccia deposits in the central parts of the crater, both on top of the central uplift and in the surrounding crater moat for shock metamorphism and crater morphology studies.

Operational Achievements

Sixteen holes were drilled at six locations within the lake, to a maximum depth of 540 m. A total of about 2.2 km of core material was obtained.

Phase I: Five drilling sites with 14 holes. Total sediment recovery was 1833 m.

Phase II: Two boreholes were drilled, to depth of 540 and 450 m, and recorded a total core length of 360 m.

Downhole geophysical measurements were conducted by OSG in the impact section of the two boreholes of Phase II including televiwer, gamma ray, full waveform sonic, resistivity, and magnetic susceptibility. Zero- and multi- offset vertical seismic profiling was performed by the University of Alberta.

Web & Media Resources

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

www.univie.ac.at/geochemistry/koeberl/bosumtwi

Timeline

2002 ICDP proposal submission

2004 (July – August) Phase I sediment coring

2004 (September – October) Phase II impact rock coring

Principal Investigators

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Data & Sample Access

Lake sediment cores are stored in the National Lacustrine Core Facility at the University of Minnesota.

Impact rocks are stored at Federal Institute for Geosciences and Natural Resources, Berlin.

All data are archived by the Operational Support Group of the ICDP and can be accessed via the ICDP website.



The GLAD-800 lake drilling system on Lake Bosumtwi

Scientific Findings

Major results include a complete petrographic and geochemical record of the impactite fill. The geophysical studies have allowed the development of significantly improved three-dimensional models of the crater's volume.

The complete one million year lacustrine sediment fill was recovered from the crater, ending in impact-glass-bearing, accretionary lapilli fallout representing the initial days of sedimentation.

The measured porosities of impactites in both cores from impact rocks are extremely high (up to 38%) and bulk densities significantly lower than in metasediments, indicating a clear relation to the formation mechanism of the impactite units. Thus, the density and porosity data provide new constrains for seismic and gravity models.

The lowstands of Lake Bosumtwi evidenced from the seismic and sediment core data are interpreted as a response to increased aridity in this part of the equatorial tropics and may correlate to other observed continent-wide shifts in African climate over the past 100 ka, and possibly to rapid climatic shifts observed at high latitudes.



Impact breccia

Key Publications

Koeberl, C.; Peck, J.A.; King, J.W.; Milkereit, B.; Overpeck, J.T.; Scholz, C.A. (2005):

The ICDP Lake Bosumtwi Drilling Project: A First Report. *Scientific Drilling* 1 23-27. doi:10.2204/ioldp.sd.1.04.2005

Brooks, K., Scholz, C.A., King, J.W., Peck, J., Overpeck, J.T., Russell, J.M., Amoako, P.Y.O. (2005): Late-Quaternary lowstands of lake Bosumtwi, Ghana: evidence from high-resolution seismic-reflection and sediment-core data. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 216(3-4):235-249.

Milkereit, B., Ugalde, H., Karp, T., Scholz, C.A., Schmitt, D., Danuor, S.K., Artemieva, N., Kück, J., Qian, W., L'Heureux, E. (2006): Exploring the Lake Bosumtwi Crater — Geophysical Surveys, Predictions and Drilling Results. *Lunar and Planetary Science*, 37, March 13-17, 2006, abstract #1687.

Deutsch, A.; Heinrich, V.; Luetke, S. (2006): The Lake Bosumtwi Impact Crater Drilling Project (BCDP): Lithological Profile of Wellhole BCDP-8A. *Lunar and Planetary Science* 37 abstract #1292

Special Issue. Christian Koeberl, Bernd Milkereit and Wolf Uwe Reimold (eds.) (2007). *Meteoritics & Planetary Science* 42, Issue 4-5, 481–894.