A million years of regional hydroclimate oscillations in West Africa reconstructed from Lake Bosumtwi

Mathias Vinnepand¹, Christian Zeeden¹, Thomas Wonik¹, William Gosling², Anders Noren³, Jochem Kück⁴, Simona Pierdominici⁴, Silke Voigt⁵, Mehrdad Sadar-Abadi¹, Arne Ulfers⁶,¹, Sylvester Danour⁷, Kweku Afrifa⁸, and Stefanie Kaboth-Bahr⁹

¹Leibniz Institute for Applied Geophysics, Hannover, Germany (Mathias.Vinnepand@leibniz-liag.de)
²University of Amsterdam, Amsterdam, The Netherlands
³University of Minnesota, Continental Scientific Drilling Facility, United States of America
⁴Deutsches GeoForschungsZentrum (GFZ) Potsdam, Germany
⁵Goethe University Frankfurt, Germany
⁶University of Münster, Germany
⁷Kwame Nkrumah University of Science and Technology, Kumasi, Ghana
⁸University of York, United Kingdom
⁹Freie Universität Berlin, Germany

Situated within a 1.07 million-year-old meteorite crater, Lake Bosumtwi in Ghana stands as a pivotal location for comprehending fluctuations in the hydro-climatic situation in sub-Sahara West Africa. The region is highly sensitive to climate oscillations due to the movements of the tropical rain belt driven by atmospheric circulation leading to pronounced dry or wet conditions on seasonal to orbital scales. Considering that climatic changes may trigger severe socio-economic crises in this area due to negative impacts on the agricultural sector- especially the cacao farming, a better understanding on the responses of the regional hydro-climatic situation to global warming tendencies is crucial. Recently a robust age-depth model was developed for the lacustrine sequence of Lake Bosumtwi, the only continental record spanning the last million years in West Africa. This provides the unique opportunity to gain detailed insights into the hydroclimatic situation. Yet, the natural gamma radiation (NGR) signal that we interpret as a proxy for terrestrial sediment input throughout the 300 m thick record, triggered by fluvial in wash from the crater rims, shows quasi-cyclic patterns. Based on this along with evidence from additional proxies, we discuss these patterns at Lake Bosumtwi and their relation to orbital forcing including fluctuations in the hydroclimate.