



The Towuti Drilling Project: A new, long Pleistocene record of Indo-Pacific Climate

James M Russell (1), Hendrik Vogel (2), Satria Bijaksana (3), Martin Melles (4), and the Towuti Drilling Project Members Team

(1) Department of Earth, Environmental, and Planetary Sciences, Brown University, BOX 1846, Providence, RI, 02912, USA (James_Russell@Brown.edu), (2) Institute of Geological Sciences, University of Bern, Baltzerstrasse 1 +3, 3012 Bern, Switzerland (Hendrik.Vogel@geo.unibe.ch), (3) Faculty of Mining and Petroleum Engineering, Institut Teknologi Bandung, Jalan Ganesa 10, Bandung, Indonesia (satria@fi.itb.ac.id), (4) Institute of Geology and Mineralogy, University of Cologne, Zuelpicher Str. 49a, D-50674, Cologne, Germany (mmelles@unikoeln.de)

Lake Towuti is the largest tectonic lake in Indonesia, and the longest known terrestrial sediment archive in Southeast Asia. Lake Towuti's location in central Indonesia provides an important opportunity to reconstruct long-term changes in terrestrial climate in the Western Pacific warm pool, heart of the El Niño-Southern Oscillation. Lake Towuti has extremely high rates of floral and faunal endemism and is surrounded by one of the most diverse tropical forests on Earth making it a hotspot of Southeast Asian biodiversity. The ultramafic rocks and soils surrounding Lake Towuti provide high concentrations of metals to the lake and its sediments that feed a diverse, exotic microbial community. From May – July, 2015, the Towuti Drilling Project, consisting of more than 30 scientists from eight countries, recovered over 1,000 meters of new sediment core from 3 different drill sites in Lake Towuti, including cores through the entire sediment column to bedrock. These new sediment cores will allow us to investigate the history of rainfall and temperature in central Indonesia, long-term changes in the composition of the region's rainforests and diverse aquatic ecosystems, and the micro-organisms living in Towuti's exotic, metal-rich sediments.

The Indo-Pacific region plays a pivotal role in the Earth's climate system, regulating critical atmospheric circulation systems and the global concentration of atmospheric water vapor- the Earth's most important greenhouse gas. Changes in seasonal insolation, greenhouse gas concentrations, ice volume, and local sea level are each hypothesized to exert a dominant control on Indo-Pacific hydroclimate variations through the Pleistocene. Existing records from the region are short and exhibit fundamental differences and complexity in orbital-scale climate patterns that limit our understanding of the regional climate responses to climate boundary conditions. Our sediment cores, which span much of the past 1 million years, allow new tests of these hypotheses. Sediment core logging and lithostratigraphic data document major shifts in sediment composition, including alterations of lake clays and calcareous sediments in the upper ~100m and peats and gravels in the basal units of our records. These data show excellent agreement with major lithological transitions recorded in seismic reflection data, and indicate large changes in lake levels and hydroclimate through the late Quaternary. Prior work on Lake Towuti indicated a dominant control by global ice volume on regional hydroclimate, a hypothesis we now test through the analysis of these new cores. This presentation will review existing records from the region and show the first long geochemical and sedimentological records from Lake Towuti to understand orbital-scale Indo-Pacific hydrologic change during the late Pleistocene.