Optically and thermally stimulated luminescence dating of Birimi, a multi-component archaeological site in Ghana, Africa

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Birimi is an archaeological site located in the sub-Saharan northern region of Ghana, Africa, south of the Gambaga Escarpment. The site, situated on a river terrace of the ephemeral Birimi stream, contains archaeological remains of three cultural components. The oldest component is of Middle Stone Age (MSA) technology and is overlain by the Late Stone Age ceramic producing Kintampo cultural level and the youngest Iron Age component. The MSA artifacts consist of stone implements only, hence this component was dated by optically stimulated luminescence (OSL) used on the quartz-rich sediment surrounding the tools. The Kintampo level was dated by two geoarchaeological chronology techniques, namely thermoluminescence (TL) used on both ceramic and burnt house daub fragments, and radiocarbon dating used on small pieces of charcoal. Smelters used for iron refining are also present at Birimi and were dated by TL. The MSA level yielded an age of 32.5 ± 7.5 ka, the only absolute age for the MSA in Ghana. TL dates on 12 house daub fragments revealed three chronological occupation periods of the site by Kintampo peoples, 2300 to 2500 years, 2800 to 3300 years and 3800 to 4500 years, a culture formerly thought to have migrated intact into Ghana and to have remained for only ~500 years. The ceramic TL dates support the daub results, with the first two dates of 2653 ± 174 years and 4815 ± 281 years falling into the early and late chronological occupation periods. Four Kintampo associated radiocarbon dates in the range 3400 to 3800 years coincide with the middle occupation. TL smelter ages show that iron technology was practiced at the site as early as 1550 ± 80 years and continued at Birimi until 1020 ± 60 years. These results indicate that Birimi was a favoured living site for three separate cultures. This, along with SEM evidence that shows similar chemical weathering and diagenetic features on quartz sand grains of several levels, argues for a continuously favourable climate and relatively constant weathering regime in northern Ghana over the last 30,000 years.