U-Th dated late Pleistocene tufas linked to human occupation in the semi-arid southern Kalahari

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Ga-Mohana Hill North Rockshelter (GHN) in the Northern Cape Province of South Africa is situated within the Summer Rainfall Zone, in the semi-arid (~300-400mm mean annual rainfall) southeastern edge of the Kalahari Basin. This location is significant as the dominant narrative for the evolution of modern humans has focused on Middle Stone Age archaeological sites along the southern cape coast of South Africa, with coastal resources and favourable climate conditions argued as key factors in driving the evolution of *Homo sapiens*. Semi-arid regions in the interior of South Africa, such as the southern Kalahari Basin, are often considered to have been too dry to sustain significant human occupation and activity, and have thus been overlooked. However, GHN does indeed preserve rich stratified Middle and Later Stone Age deposits, as well as abundant large relict tufa deposits that cover the surrounding hillside. These tufas, which are ambient temperature, freshwater calcium carbonate deposits, are indicative of past periods of flowing surface waters and shallow pools on the hillside. Laser ablation trace element mapping was used to pre-screen the tufa samples to target layers with high $^{238}\text{U}$ and little to no $^{232}\text{Th}$ concentration for U-Th dating. The resultant ages show that the tufa system at Ga-Mohana was active during five distinct intervals over the last 110 ka, three of which closely coincide with the timing of human occupation at the site, itself dated via OSL. The coincidence of tufa formation and human occupation suggests that the tufa-forming waters were a critical resource to human populations living in the area. This hitherto undiscovered source of fresh water, more than 600 km inland and as far back as 110 ka, stands to challenge the notion of an empty and arid interior.