Sedimentary record of distal floodplain dynamics and tropical storm frequency from blocked-valley lakes on the east coast of South Africa

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Project Rationale and Aim

Blocked-valley lakes form as tributary valleys become impounded by relatively more rapid aggradation rates of the mainstem floodplain, and thus exhibit a stratigraphy that is tightly coupled with the dynamics of flooding and sediment dispersal of the mainstem. A research project was initiated to advance understanding of the palaeo-environmental archive potential of blocked-valley lakes on the Mfolozi floodplain, eastern South Africa. The region is affected by large flood events related to tropical cyclones. Following previous work on the floodplain it was hypothesised that clastic layers in blocked-valley lake peats mark incursions of sediment-rich floodwater associated with large storm events. To develop the chronology needed to test this hypothesis, it is necessary to advance the application of OSL dating in these environments through analytical developmental work. Thus, funding was sought for PhD fieldwork to collect cores for stratigraphic analysis and OSL dating. The field campaign took place in early July 2014.

2014 Field Campaign

Cores were taken at three sites on the Mfolozi Floodplain (Fig. 1), using percussion and vibro-corers supplied by Wits University. The first site ('Futululu') was located adjacent to a splay deposit near the northern floodplain-blocked-valley lake margin. The splay is present in aerial photography from 1935, and represents a failed/partial avulsion that may have occurred during a large storm event.

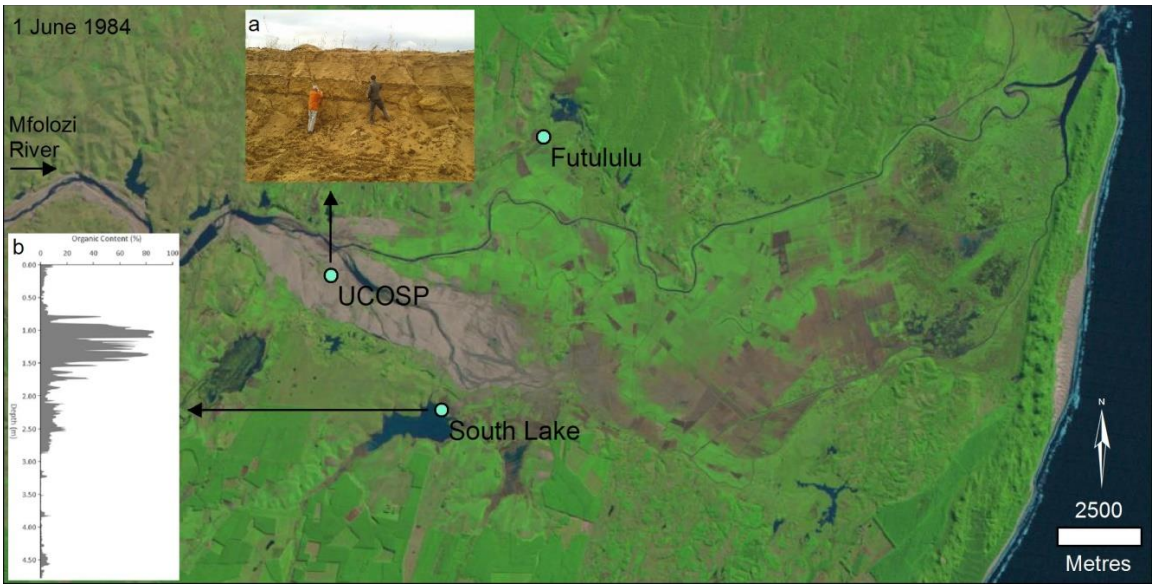

Figure 1: The Mfolozi floodplain shortly after the passage of Cyclone Domoina (1984). Core locations are shown in relation to a large flood-fan deposit left in the wake of the cyclone (image source: USGS).

The second site ('UCOSP') comprised an exposed face of an extensive floodplain fan deposit (Fig. 1, inset a), uncovered by recently-initiated sand mining on the floodplain. The exposed face was sampled for OSL dating by hammering aluminium tube segments into the centre of discreet strata, while material deeper than the exposed face was vibro-cored using 6 m long aluminium tubes. The third site ('South Lake') was located similarly to the first, but on the opposite floodplain margin. A core from this site has been a focus of preliminary laboratory analysis by Wood and Toms at the University of Gloucestershire Cheltenham Luminescence Laboratory. Loss on ignition at 10 mm increments through the length of the core shows an interlamination of peat and clastic sediment characteristic of flood event stratigraphy in these environments (Fig. 1, inset b), which is encouraging at the start of chronological work.

BSG funding provided a platform for the development of a larger multidisciplinary project that will compliment and extend the OSL work by drawing on collaborations with Marc Humphries (Wits University, sediment geochemistry), Fred Ellery and Chabala Mbao (Rhodes University, radionuclide dating), and Jemma Finch (University of KwaZulu-Natal, pollen analysis).