**A 5000-year record of flooding and river response to landscape disturbance, Whanganui River, Aotearoa New Zealand**

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# ABSTRACT

# Recent, extreme flood events in New Zealand and elsewhere have demonstrated the impacts and risks posed by high-magnitude low-frequency flooding, emphasising the urgent need for further research. In New Zealand, the short instrumental record is a major constraint on our understanding of the frequency, magnitude and catchment responses associated with high-magnitude, low-frequency events. Exploration of the paleoflood history of New Zealand is limited, and the few works that do exist largely focus on lacustrine archives. Floodplain environments function as sediment sinks during flood events, recording episodes of flooding and landscape disturbance, thereby providing a means to enhance understanding of past extreme events. This paper focuses on reconstructing the timing, magnitude, and origin of flooding events preserved in a valley meander cutoff in the lower reaches of the Whanganui River, western North Island of New Zealand. Using a novel application of computed tomography scanning (CT) in combination with physical sedimentology, a 5000-year record of both flooding and landscape disturbance has been revealed. A robust, high-resolution chronology has been developed from 23 radiocarbon dates facilitating estimation of individual event ages and identification of periods of increased event frequency within the Whanganui catchment. This record is the longest fluvial paleoflood record in New Zealand, and one of the first paleoclimate and environmental records from this region. Flood frequency is increased between ~5-4.3 ka, 3.2-3 ka, 2.75-1.7 ka, 1.4-1.1 ka and 0.9-0.4 ka. Changes in flood frequency are likely the result of interactions between a shifting South Westerly Wind belt (SWW) and variability in El Niño-Southern Oscillation (ENSO) throughout the late Holocene. The impacts of Taupō Volcanic Centre (TVC) volcanism and seismicity are captured in the record, such as the ~1.7 Ka Taupō eruption and identification of landslide dam breakout deposits at ~3.5 Ka that provide insight into the potential future risk posed by deep seated land sliding and landslide dams within the Whanganui catchment and other soft rock hill country catchments.

# REFERENCES

Fuller, I.C., Macklin, M.G., Toonen, W.H., Turner, J. and Norton, K., 2019. A 2000 year record of palaeofloods in a volcanically-reset catchment: Whanganui River, New Zealand. Global and Planetary Change, 181, p.102981.