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## **Cyclones, tsunamis and Polynesian occupation – a 3500 year record from Mangaia in the South Pacific**

Chagué-Goff, C.<sup>1,2</sup>, Chan, J.C.H.<sup>1</sup>, Goff, J.<sup>1</sup> and Gadd, P.<sup>2</sup>

<sup>1</sup>School of BEES, UNSW Australia, Sydney, Australia, c.chague-goff@unsw.edu.au

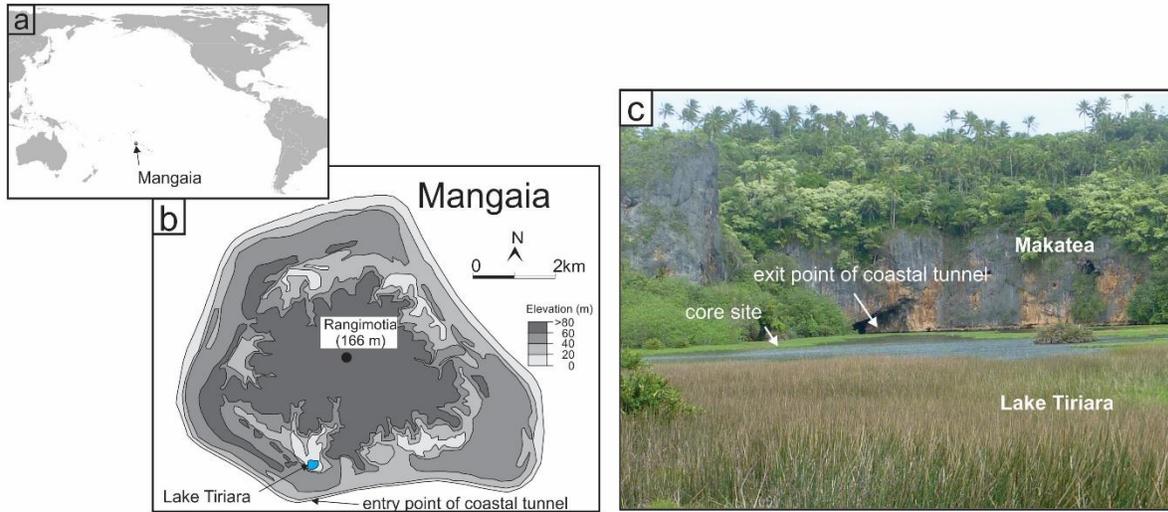
<sup>2</sup>Australian Nuclear Science and Technology Organisation, Lucas Heights, Australia

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A peat sequence taken from the shore of Lake Tiriara, Mangaia, Cook Islands (Fig. 1) provided insights into long and short-term environmental changes over the last 3,500 years in this South Pacific island. A continuous high resolution record obtained by ITRAX core scanning was complemented by grain size, diatom analysis and <sup>14</sup>C dating. The record preserved in the peat sequence includes a peatland infilling stage followed by alternating dry and wet periods. A notable steady increase in clay associated with high counts of detrital elements from 2,000-1,700 cal yr BP is attributed to increased erosion, which is most probably linked with human colonisation and/or more intense chemical weathering linked with a wetter climate. Freshwater gastropods (*Melanooides* sp.), which might have been introduced by humans, or may be native, occupied the wetland during a period of lower water level about 1,000-1,100 cal yr BP.

Short-term changes in the elemental profiles are often linked with a slight coarsening of the inorganic fraction that is however only revealed after grain size analysis. Peaks in marine indicators (Br, Cl, S, and/or Ca) associated with marine-dominated diatom assemblages most probably represent marine incursions through an underground tunnel in the makatea, a fossilised, uplifted coral limestone rim. While none of the marine event units present characteristics typical of cyclone or tsunami deposits, the concurrent or absent peak of detrital elements (Fe, Si, Rb, Ti, K) attributed to increased erosion of the volcanic cone associated with heavy rainfall during cyclones is used to distinguish both types of events, as also suggested by PCA.

This study provides an interesting insight into the timing of Polynesian occupation of islands to the east of Tonga and Samoa and also throws light on the occurrence of high energy marine inundations noted elsewhere within the South Pacific.



**Figure 1** (a) Location of Mangaia in the Pacific Ocean; (b) Map of Mangaia showing the location of Lake Tiriara and the entry point of the coastal tunnel. (c) Photo of Lake Tiriara with makatea in the background. The core site is shown, close to the makatea and the exit point of the coastal tunnel [Photo James Goff].

