Geophysical Research Abstracts
Vol. 19, EGU2017-11341, 2017
EGU General Assembly 2017

Centennial-to-millennial scale climate change during the last 100,000 years: a Southern Hemisphere perspective

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The response of past terrestrial ecosystems to abrupt climate change is central to the debate surrounding the consequences of future climate change. Many centennial-to-millennial scale episodes of rapid change over the past 117,000 years have been reported, notably the Dansgaard-Oeschger events of Greenland and the North Atlantic and Antarctic Isotope Maxima. Best expressed in past climate records from the polar and tropical regions, the timing, amplitude and duration of these changes are variable on a global scale, and it is unclear how the events are generated and transmitted to cause such asynchronous patterns. The southern mid-latitudes form a poorly understood piece of the puzzle. Our Marsden-funded project aims to increase understanding of the New Zealand climate system in relation to global patterns over the last 100 kyr by developing high-resolution climate records from the lake sediments contained within Auckland's maars. These crater lakes are unique, because their sediments are laminated throughout and the sedimentation rate is very high. Additionally, the numerous (>50) volcanic ash layers contained within the sediments act as anchor points in our chronologies. We have adopted a multiproxy approach that combines data from biotic, molecular biomarker isotope and geochemical analyses. The remit of my doctorate is to produce two independent, but complementary, temperature reconstructions from chironomid remains (mean summer temperatures) and pollen (mean annual temperatures) from Lake Pupuke sediments. This approach will eventually help us to address whether abrupt climate change events or changes in seasonality influenced climate and biota over the past 100,000 years in northern New Zealand, and whether these changes were driven by triggers from the North Atlantic, Antarctica or the tropics.