

## **Examining terrestrial paleoclimate during the Early Miocene: Biomarker and stable isotope records from a varved freshwater diatomite in New Zealand**

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### **Abstract**

This proposal seeks funds to generate a 100,000-year-long record of terrestrial climate change for southern New Zealand during the Early Miocene. The Miocene is an important time period in Earth's history because CO<sub>2</sub> levels were similar to modern and terrestrial ice volume was much reduced. Thus, in many ways the Miocene provides a good analog for projected future climate scenarios and can improve our understanding of the behavior of Earth's climate system under modified boundary conditions. Foulden Maar (45.5 °S, 170.2 °E) on South Island, New Zealand is a unique sedimentary archive with great potential for Early Miocene climate reconstruction. The sedimentary deposit formed in a crater lake and contains an annually laminated (varved) diatomite sequence representing approximately 100,000 years of sedimentation. The diatomite was deposited in an anoxic basin, resulting in excellent preservation of organic materials, including molecular biomarkers that can be used for detailed paleoclimate reconstruction. Marine records of benthic  $\delta^{18}\text{O}$  from around the world's oceans and sediment stratigraphies from cores offshore Antarctica indicate that Antarctic glaciers and ocean water temperatures responded to orbital forcing during the Miocene. However, the behavior of the Early Miocene atmosphere and the response of the terrestrial environment to climate forcing at this time are poorly constrained. The planned work will generate a 100,000-year-long record of  $\delta\text{D}$  of precipitation and biomarker-based records of vegetation change at Foulden Maar at 2,000-year time steps during the Early Miocene and will also yield a detailed biomarker assay from the lacustrine sediments. In addition to publishable datasets, the research will provide numerous preliminary data to be used for writing full NSF proposals.