Geophysical Research Abstracts,
Vol. 11, EGU2009-13596-1, 2009
EGU General Assembly 2009

High-resolution reconstruction of Arctic paleoclimate derived from 53 million year old kimberlite-hosted Metasequoia wood

J.J. Walker (1), J. Halfar (1), D. Schulze (1), Z. Gedalof (2), and G.W.K. Moore (1)

(1) CPS Department, University of Toronto at Mississauga, Canada, (2) Department of Geography, University of Guelph, Canada

The recovery of exceptionally well preserved Eocene wood from kimberlite pipes in the Lac de Gras region of the Northwest Territories, Canada, has allowed for the characterization of the local temperature and hydrologic patterns on an annual scale for this arctic ecosystem (present day latitude: 64 deg N). Wood fragments of ancient Metasequoia sp. trees mixed into the crater facies during kimberlite emplacement were recovered from the Ekati and Diavik diamond mines. Wood recovered from the Ekati "Panda" pipe, which has been dated using Rb-Sr age determination at 53.3 +/- 0.6 million years, is unique in that it exhibits extremely low vitrinite reflectance values, comparable to that of modern near-surface peats. The implication is that the wood has undergone minimal thermal or compressional alteration, thus preserving the geochemical signatures originally formed during growth. Ring width measurements representing over 100 years of climate data show congruence between multiple samples, thus enabling the development of a floating master chronology. Patterns contained in this chronology are of particular interest as the early Eocene was characterized by a period of unusual warming that has been compared to modern day climate change. Wood cellulose does not exchange atoms with its surroundings after formation, making it an ideal candidate for stable isotope analysis once it has been separated from associated whole-wood components. A robotic micromilling device was used to collect whole wood samples of latewood from annual tree rings. The -cellulose in the samples will be isolated and analyzed for 13C and 18O, generating a 34-year floating chronology that can be used to reconstruct decadal scale temperature and humidity patterns. Successful application of this technique suggests that a longer Eocene chronology, using additional wood samples recovered from the Panda pipe as well as samples from neighbouring pipes in the Lac de Gras region, can be developed.