Geophysical Research Abstracts
Vol. 15, EGU2013-12663, 2013
EGU General Assembly 2013

Late Pleistocene and Holocene paleoclimate and alpine glacier fluctuations recorded by high-resolution grain-size data from an alpine lake sediment core, Wind River Range, Wyoming, USA

P. Thompson Davis (1), Björn Machalett (2,1), and John Gosse (3)

(1) Department of Natural and Applied Sciences, Bentley University, Waltham, MA 02452-4705 USA (pdavis@bentley.edu), (2) Humboldt-Universität zu Berlin, Institute of Geography, Climatology Group, Unter den Linden 6, Berlin, Germany (b.machalett@nakula.de), (3) Department of Earth Sciences, Dalhousie University, Halifax, Nova Scotia, Canada B3H 4R2 (john.gosse@Dal.Ca)

Varved lake sediments, which provide ideal high-resolution climate proxies, are not commonly available in many geographic areas over long time scales. This paper utilizes high-resolution grain-size analyses (n = 1040) from a 520-cm long sediment core from Lower Titcomb Lake (LTL), which lies just outside the type Titcomb Basin (TTB) moraines in the Wind River Range, Wyoming. The TTB moraines lie between Lower Titcomb Lake and Upper Titcomb Lake (UTL), about 3 km beyond, and 200 m lower than the modern glacier margin and Gannett Peak (Little Ice Age) moraines in the basin. Based on cosmogenic exposure dating, the TTB moraines are believed to be Younger Dryas (YD) age (Gosse et al., 1995) and lie in a geomorphic position similar to several other outer cirque moraines throughout the western American Cordillera. Until recently, many of these outer cirque moraines were believed to be Neoglacial age.

The sediment core discussed here is one of five obtained from the two Titcomb Lakes, but is by the far the longest with the oldest sediment depositional record. Two AMS radiocarbon ages from the 445- and 455-cm core depths (about 2% loss on ignition, LOI) suggest that the lake basin may have been ice-free as early as 16.1 or even 16.8 cal 14C kyr, consistent with 10Be and 26Al exposure ages from boulders and bedrock surfaces outside the TTB moraines. The 257-cm depth in the core marks an abrupt transition from inorganic, sticky gray silt below (<1% LOI) to more organic, less sticky, light brown silt above (4-10% LOI). Eight AMS radiocarbon ages on bulk sediment and macrofossils date the transition to about 11.6 cal 14C kyr. Thus, sampling resolution above the transition is about 22.57 yr and below the transition is about 12.56 yr, consistent with a decreased sediment accumulation rate in LTL when Younger Dryas ice pulled back from the TTB moraines opening up UTL as a sediment depositional basin.

The presented high-resolution grain size record reveals amplitudes and other structural features similar to delta 18O records from deep-lake ostracods in southern Germany, the Greenland ice core record, and speleothems in China. Major increases in the 2 – 8 μm grain size fraction indicative of increased glacier rock flour production between the 257 and 466 cm core depths appear to be roughly correlative with the YD-Alleröd-Bölling-Meiendorf-Heinrich 1 climate events recognized in other terrestrial records and Northern Atlantic Ocean marine cores, but provide much higher resolution than most of those records from a climate-sensitive alpine region in North America.