Preliminary results of a paleoenvironmental study of sediments from Canyon Lake, Alaska: geochemical proxies, plant macrofossils and tephra analysis.

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Canyon Lake is a small (625 m^2), shallow lake (3 m) located near the Richardson Highway in the upper reaches of the Copper River Basin, Alaska. A 255 cm core extracted from Canyon Lake consists of 205 cm of organic-rich gyttja deposits above a distinct contact with compact glaciolacustrine silt. This contact is thought to represent the drainage of Lake Atna, a glacial lake that filled the Copper River Basin until the early Holocene. The approximate date of this event is poorly constrained and will be improved by an AMS ^{14}C chronology in progress. Currently, the only date from the core comes from a tephra layer at 113 cm that has been positively correlated with a 3360 BP eruption of Mt. Hayes using electron microprobe analyses of Na_2O, K_2O, CaO and Fe_2O_3.

In order to better understand the paleoecological context of the transition between Lake Atna and Canyon Lake I conducted geochemical analyses and investigated the macrofossil record from the Canyon Lake cores. The results of these analyses make a strong case for a turbid glacial lake during Atna times, with significant primary productivity in a region with considerable terrestrial erosion. The glaciolacustrine silts are rich in minerals and have a magnetic susceptibility (SI units) 10 times higher than the gyttja. These compact layers are low in H_2O and C_{ORG} content. Enriched $\delta^{13}C$ values and low C/N ratios indicate that there was high primary productivity in the glacial lake. This does not contradict the presence of terrestrial macrofossils in the glaciolacustrine sediments, as these are may be reworked and evidence of soil erosion in the basin.

A transitional zone of post-glacial lake development follows the glaciolacustrine period. This zone is approximately 15 cm thick and is characterized by reduced inorganic sediment load (low magnetic susceptibility) and abundant shallow or emergent aquatic vegetation. The macrofossil record is dominated by the seeds or spores of aquatic plants (*Nuphar, Potamogeton, Nitella*) as well as evidence of mosses and freshwater bryozoans (*Cristatella mucedo, Plumatella sp*.). Unlike other depths in the core, enriched $\delta^{13}C$ values from this zone are associated with an increase in the C/N ratio. The increase in the C/N ratio is interpreted to be the result of an increased terrestrial plant to phytoplankton ratio in lake basin. Through most of the core high C/N ratios are associated with depleted $\delta^{13}C$; the enriched $\delta^{13}C$ values from this zone may imply both high vegetation and significant phytoplankton activity.

The upper 190 cm of sediment have increasingly high H_2O and C_{org} content towards the top of the core, showing a decrease in compaction and increase primary productivity. Primary productivity levels can be assessed using fluctuations in $\delta^{13}C$ and the C/N ratio, which appear to be negatively correlated in this zone. Low C/N ratios are associated with high organic N, which is associated with phytoplankton in lake systems. When the C/N ratio is low, $\delta^{13}C$ values are enriched, indicating reduced fractionation for the lighter isotope.