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Investigating Post-Glacial Environmental Gradients with Lacustrine Sedimentary Records: An Example from the Uinta Mountains of Northeastern Utah, U.S.A

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The physiography and location of the Uinta Mountains in northeastern Utah provide a unique opportunity to investigate the evolution and/or persistence of environmental gradients during the post-glacial period. The mountains form the longest east-west oriented range in mid-latitude North America (~150 km), allowing paleoenvironmental records to be compared between slopes with north and south aspects. The range also straddles a modern climate boundary, with the eastern part receiving more than half its annual precipitation from the summer monsoon, while the western sector receives the majority of its precipitation from Pacific frontal systems during winter months. Thus paleoenvironmental records from the opposing ends of the range offer the potential for illuminating past changes in precipitation patterns. To capitalize on these opportunities, continuous sediment cores were retrieved from 20 lakes clustered in six parts of the range: east, central, and west across both the north and south slopes. The lakes range in elevation from 2960 to 3475 m, from 4 to 20 m in depth, and from 1 to 45 ha in area. Retrieved cores range from 140 to 370 cm in length; the upper ~10 to 100 cm was too loosely consolidated to be successfully retrieved with the percussion corer. Age control is provided by more than 100 AMS radiocarbon dates on terrestrial macrofossils, daphnia ephippia, and pollen concentrates. Basal sediment in the cores dates to the latest Pleistocene, while core tops range from 2000 to 500 years old. Loss-on-ignition at 550ºC was calculated at 1-cm intervals for all cores as a proxy for organic matter content, yielding a dataset of over 5000 samples. Analysis of these records reveals that mean LOI per lake is inversely proportional to elevation. Nearly all cores penetrated deep enough to record the transition from inorganic to organic sedimentation in their respective lakes. This switch occurred ca. 12 ka BP in most lakes, and appears to have taken less than 1000 years. Lakes from the monsoon-dominated eastern Uintas record enhanced inwashing of terrestrial material during the early Holocene, consistent with heightened monsoon activity during the insolation maximum. Many LOI records from lakes in the drought-sensitive western Uintas record a pronounced LOI minimum between 4.4 and 4.0 ka BP, synchronous with a climate reorganization noted in the northern Rocky Mountains and a major drought event in middle North America. Efforts to investigate additional proxies

in these cores, including biogenic silica and C:N ratios, are ongoing.
