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Climate inferences between paleontological, geochemical, and geophysical proxies in Late Pleistocene lacustrine sediments from Summer Lake, Oregon, western Great Basin

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Paleontological, geochemical, and geophysical data from western Great Basin pluvial Summer Lake, Oregon have established a high resolution paleoclimate record during the late Pleistocene Mono Lake Excursion (∼34.75 ka), Dansgaard-Oeschger interstadials 6-8, and the end of Heinrich Even 4 (∼38 ka). Proxies of grain-size, magnetic susceptibility, carbon/nitrogen ratio, ostracode analysis and palynology from a depocenter core show new results with improved age control regarding high amplitude, high frequency changes in lake level, lake temperature, and regional precipitation and temperature which correspond directly with colder/warmer and respectively drier/wetter climates as documented with Northern Atlantic Greenland ice core data. Results from geophysical and geochemical analysis, and the presence of ostracode Cytherissa lacustris consistently demonstrate the correspondence of low lake conditions and colder water temperatures during Dansgaard-Oeschger stadials and the Mono Lake Excursion. The opposite holds true during interstadials. Smaller grain size, increases in carbon/nitrogen ratio and consistent absence of C. lacustris suggest periods of increased discharge into the lake, increased lake level, and warmer water temperatures. Warmer/wetter climate conditions are confirmed during interstadials 7 and 8 from pollen analysis. Existence of Atriplex, Rosaceae, Chrysothamnus and Ambrosia, and pollen ratios of Juniperus/Dip Pinus and (Rosaceae+Atriplex+Poaceae+Chrysothamnus+Ambrosia)/(Pinus+Picea+T. mertensiana+Sarcobatus) suggest warmer/wetter semi-arid woodland conditions during interstadials 7 and 8. This contrasts with absences in these pollens and pollen ratios indicating colder/drier continental montane woodland conditions during stadials and the Mono Lake Excursion. Increases in Juniper/Dip Pinus ratio suggest a warmer/wetter climate during interstadial 6 however additional proxies do not demonstrate comparative warmer/wetter climate, deeper lake level or increases in discharge. This may suggest a short-lived interstadial period in which: 1) characteristic plant species did not have enough time to migrate and flourish to record increases in the pollen record or carbon/nitrogen ratio and 2) lake size did not have enough time to increase comparably to record significant grainsize changes. With the exception of interstadial 6, these results confirm those of earlier studies at Summer lake and other Great Basin lakes in western North America with respect to the relationship between millennial-scale temperature changes throughout the northern hemisphere and the response of regional climate in western North America at semitropical latitudes.