

A Late Pleistocene Paleohydrologic Record of Sierra Nevada Runoff from Owens Lake, California

J. Platt Bradbury

Abstract

A 323-meter (about 800,000 year) core of lake deposits beneath Owens Lake playa, Inyo County, California, contains a nearly continuous paleolimnological record based on diatom assemblages. The core chronology is anchored by the Matuyama/Brunhes magnetostratigraphic boundary, by the Bishop ash near the base of the record, by the 500 ka Dibekkulewe ash at 224 meters, and by radiocarbon dates near the top. Throughout most of its history, Owens Lake was characterized by freshwater diatoms, indicating a positive hydrologic input from the Owens River and overflow to lake systems downstream. Both benthic and planktic freshwater diatoms dominate in ashy and sandy sediments between 800 and 440 ka and suggest shallow, open-water environments in a basin where sedimentation and subsidence were approximately balanced. After 440 ka, freshwater planktic diatoms dominate, implying that the Owens basin became deeper, perhaps as a result of increased rates of tectonic subsidence. The stratigraphic distribution of saline benthic and planktic diatoms record comparatively short intervals when the lake was shallow and saline. Nevertheless, periodic overflow during these times prevented deposition of evaporites. According to a chronology based on sediment mass accumulation rates, the alternation of saline and freshwater diatom assemblages approximately tracks the progression of oxygen isotope stages recorded in marine deposits. Even-numbered isotope stages representing glacial conditions are matched by episodes where freshwater planktic diatoms dominate, indicating abundant precipitation in the Sierra Nevada in response to a southward shift of storm tracks originating in the North Pacific around the Aleutian Low.