Abstract

Analysis of the mineral and chemical composition of aeolian sands, as well as those from potential fluvial, alluvial, or lacustrine sources can provide valuable information on sand sources and transport pathways, as demonstrated for dune fields in many areas. The results of such analyses can be used to constrain the conditions in which dune construction occurred. The mineralogical composition and chemical characteristics of the sands from Owens Lake dunefields were determined using X-ray fluorescence spectrometry (XRF) and X-ray diffraction (XRD) analysis. The grain size distributions were determined using a Laser粒径分析技术. The results indicate that the primary source of sand for dune fields in the Owens Lake basin is sediment derived from the Sierra Nevada Mountains, via the Owens River. Sand in the northeastern sector of the basin is hypothesized to be the adjacent Coso Wash system draining the Coso Range.

Owens Lake Dunefields

Dune fields and associated sand sheets occur in two main locations adjacent to Owens Lake (1) the northeastern sector of the basin in the area between the Owens River and the southeast of Keeler; comprising from northeast to southwest: the Lizard Tail Dunes, Swansea Dunes, Keeler Dunes, and Keeler-Sulphate Dunes, and (2) the Olancha Dunes in the south- eastern part of the lake basin on the plains of the Coso Range. The dunes and sand sheets occur in those areas where lake sediment was absent from the area of the Owens River delta across the dry bed of Owens Lake (Lancaster et al., 2011). During previous climatic wet periods of low lake levels, sands exposed in deltaic areas and on fringing lake plains were deflated by NW winds to form the Lizard Tail and Keeler-Sulphate dunes.

Based on the compositional data presented here, it is considered that the primary source of sand for dune fields in the northeastern sector of the Owens Lake basin is sediment derived from the Sierra Nevada, via the Owens River. Sand in the southern part of the basin, especially the Olancha Dunes was likely sourced from eolian processes occurring on the Coso Range.

Sediment from fluvial and alluvial sources reached the dunefields in the northeastern sector of the basin by wind transport across the exposed bed of Owens Lake during periods of lake-levels. The pathway by which sand reached the Olancha Dunes is less clear, but probably involved transport from the South Sand Sheet, via the area of the Owens River delta across the dry bed of Owens Lake (Lancaster et al., 2011). During previous climatic wet periods of low lake levels, sands exposed in deltaic areas and on fringing lake plains were deflated by NW winds to form the Lizard Tail and Keeler-Sulphate dunes.

Study Area

Sand samples were collected from representative sand dune areas and from potential source rock units that included fluvially transported sand adjacent to the Owens River, two washes on the Keeler Fan, and the western margin of the basin in the Coso Wash to the south.

To the north of Owens Lake dunefields is the Sierra Nevada Mountains, which lies to the west of the Owens Valley and Owens Lake. The compositional data indicate that the dunefield sands are very similar and are composed of an average of 45% quartz, 33% plagioclase and 12% K-feldspar, with minor amounts of calcite and other minerals. The relative proportions of quartz, plagioclase, and K-feldspar indicate that the sands are derived from granodioritic source rocks. It is therefore considered that the primary source of sand for dune fields in the Owens Lake basin is sediment derived from the Sierra Nevada Mountains, via the Owens River and washes draining the Sierra Nevada, which lies to the west of the Owens Valley and Owens Lake. The sand samples from potential fluvial, alluvial, and lacustrine sources reached the dunefields in the northeastern sector of the basin by wind transport across the exposed bed of Owens Lake during periods of low lake levels. The pathway by which sand reached the Olancha Dunes is less clear, but probably involved transport from the South Sand Sheet, via the area of the Owens River delta across the dry bed of Owens Lake (Lancaster et al., 2011). During previous climatic wet periods of low lake levels, sands exposed in deltaic areas and on fringing lake plains were deflated by NW winds to form the Lizard Tail and Keeler-Sulphate dunes.

The results of these studies indicate the close connections that exist in this area between sediment supply from alluvial and lacustrine sources and dune construction. We are currently seeking to define the relationships between Holocene changes in lake level and periods of dune construction.