

## Upside Down Lake

Mono Lake has “turned-over,” that process where stagnant water at the bottom of the lake is mixed with water from the lake’s surface layers, kind of like shaking up a well-constructed latté. This is the first time the lake has fully mixed since it stratified in 1995 in response to El Niño runoff and lower diversions by LADWP. The graph below shows the vertical distribution of physical and chemical properties of Mono Lake water. These data were collected by the Mono Lake Microbial Observatory crew on 23 November, 2003 at Station 6 southeast of Paoha Island in the deepest part of the lake (see station map elsewhere in this web site). The vertical lines, especially of temperature, conductivity and excess density show that the lake has mixed completely to the bottom (compare these profiles with profiles shown elsewhere on this web site from the same station collected in mid-summer 2000). The lack of a density gradient means that the lake will continue to mix as it cools through the rest of the winter, a process that causes the surface water to become denser and sink to the bottom. Eventually the whole lake will reach a temperature of approximately 2 °C.

Vertical mixing like this also ventilates the bottom waters of the lake. The data shown here indicate that most of the water in the lake is currently completely devoid of oxygen. Oxygen is being mixed into the lake from the atmosphere and produced in the lake by plant growth. The chlorophyll fluorescence data and the transmissometer data indicate a fairly high plant biomass in the lake (the apparent low chlorophyll levels at the surface is an artifact caused by the physiological state of the plants). Despite these sources of oxygen, microbial respiration consumes oxygen faster than it enters the water. Microbial respiration is stimulated by mixing-induced increases in the vertical fluxes of compounds like methane, ammonia, sulfide and dissolved organic carbon that accumulated in the bottom water and sediments of the lake while it stagnated. The bacteria will eventually consume all of this “food” and their growth will slow down, allowing the water to become oxygenated all the way to the bottom once again.

