

Climatic and environmental changes at southeastern coast of Lake Biwa during last 3000 years inferred from borehole temperatures

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Sub-surface temperature distribution is disturbed with a change in ground surface temperature that is closely related to air temperature. Thermal disturbance on sub-surface temperature distribution is treated as a noise in measurement of heat flow. On the other hand, the thermal disturbance has information about temperature change at the ground surface. By analyzing the thermal disturbance carefully, we can reconstruct past temperature change at the ground surface.

In order to infer past climatic change in Kinki district in central Japan, we measured temperatures in a borehole at the Karasuma site, on the southeastern coast of Lake Biwa, and reconstructed sediment surface temperature history during the last 3000 years. The reconstructed temperature history shows apparent Medieval Warm Period, Little Ice Age, and contemporary temperature warming. However, the large amplitude of the temperature changes up to 5-6 K in the late 12th century and the mid 17th century could not be explained by past climatic change only. These temperature changes appear to coincide with occurrences of two destructive earthquakes (1185 AD and 1662 AD) that caused water level changes of Lake Biwa. It suggests that the reconstructed sediment surface temperature history reflects the environmental change due to tectonically induced water level changes of the lake. It suggests that the reconstructed sediment surface temperature history reflects the environmental change due to the tectonically induced water level changes of the lake. By assuming that annual mean of ground surface temperature was higher than that of lake bottom temperature in shallow depth, the amplitude of the sediment surface temperature change may be attributed to a combined effect of past climatic and environmental changes. Thus, we suggest that the borehole temperature at the Karasuma site preserves information on not only past climate change but also past environmental changes due to tectonically induced water level changes.