

Temperature stratification and geothermal heat flux into deep caldera lakes Shikotsu, Kuttara, Tazawa and Towada

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Temperature profiles over the stratification period between July and November 2007 allowed a quantification of the acquired heat geothermal heat fluxes into the deepest waters of four caldera lakes. Because of their enormous depth, heat input from the lake bed was locally separated from heat fluxes from the surface. Hence, geothermal heat input could be measured directly. Two lakes showed a geothermal heat flux of 0.29 or 0.27 W/m² (Lake Shikotsu and Lake Tazawa), as found in other regions not affected by volcanism, while both other lakes (Lake Kuttara and Lake Towada) showed enhanced heat input of 1 or 18.6 W/m², respectively. Within our investigated set, all lakes acquired more heat from the underground than the continental heat flux average. Hence, the heat flux into the lakes from the ground was not dominated by the average temperature gradient implied by the inner heat of the Earth. Other effects like the general temperature difference of deep lake water and the groundwater or local sources of heat in the underground deliver more important contributions. Obviously the flow of water in the underground can play a decisive role in the heat transport into the deep waters of lakes.