

Lake sedimentation induced by a volcanic eruption

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The Usu Volcano, Hokkaido, Japan was erupted on 31 March 2000 after a pause of 23 yrs. For 4 to 9 April, groundwater, boiled up by the magma, produced 'thermal mudflows' by entraining the fine-grained tephra as suspended sediment (Ui, 2000). The mudflows, flowing down into the neighboring Lake Toya (maximum depth, 179.0 m), could easily induce sediment-laden underflows (or turbidity currents) in the inflow point of the lake, because the lake was then thermally uniform (Chikita, 1990; Chikita et al., 1996). The turbid layer, observed at depths of more than 100 m in the lake, was first built up by the underflows. For periods of June 2000 to August 2002, we monitored water turbidity and flow velocity, and caught suspended sediment with traps, in order to investigate the dynamic behaviors of suspended sediment in the turbid layer. In 2000, water turbidity near the lake bottom increased at rainfalls of more than 12 mm/h, indicating the production of sediment-laden underflows by mudflows. The maximum speed of the underflows was calculated at ca. 23 cm/s. In 2001, the turbidity increased at more than 20 mm/h rainfalls. This indicates a decrease in the scale and occurrence of mudflows. In 2002, the turbidity did not increase, irrespective of the magnitude of rainfalls. Meanwhile, the amount of trapped deposits ranged from 9.7 to 12 mg/day in 2000, from 1.3 to 3.7 mg/day in 2001 and from 0.8 to 1.2 mg/day in 2002. This consistent decrease corresponds to the yearly depletion of mudflows. The deposition of suspended sediment at the lake bottom is approximately explained by the gravitational settling in still water.

References:

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