



Volcanic heat flux and short-term holomixis during the summer stratification period in a crater lake

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ABSTRACT: We sampled Lake Katanuma from 1998 to 2002 at weekly or biweekly intervals, except in winter. This dimictic volcanic lake has a pH of 2.0-2.2. In summer, volcanic heat at the lake bottom results in a small water temperature difference of 3-7° C between the epilimnion and hypolimnion. During the April-August stratification period in 1998, 1999, and 2002, the entire water column mixed for 1-8 d, when air temperature declined 4-8° C from the epilimnion temperature. During these mixing events, anoxic, hydrogen sulfide-rich water from the hypolimnion spread over the entire lake. In contrast, distinct short-term turnover did not occur during the stratification period in 2000 or 2001. However, the early onset of autumn turnover in August 2000 and 2001 caused anoxic conditions with negative Eh values to persist for ~2 weeks throughout the entire water column. Volcanic heat flux from the lake bottom fluctuated from 29.0 to 35.8 W m⁻² from year to year. The frequency and duration of short-term holomixis thus depended on interannual variations in volcanic heat flux and weather.

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