



Release of trace oxyanions from littoral sediments and suspended particles induced by pH increase in the epilimnion of lakes

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ABSTRACT: We measured the vertical distributions of dissolved vanadium (V), molybdenum (Mo), and tungsten (W) during a stratification period in Lakes Biwa, Ikeda, and Unagi-ike, which are located in the temperate zone of Japan. The concentrations of V and W in the epilimnia were 1.6-3.7 times (V) and 1.8-2.9 times (W) higher than those in the hypolimnia. The concentrations of V and W in the epilimnia were 2.94 ± 0.09 nmol L⁻¹ and 76.1 ± 5.7 pmol L⁻¹ in Lake Biwa, 10.5 ± 0.3 nmol L⁻¹ and 19.2 ± 1.3 pmol L⁻¹ in Lake Ikeda, and 18.4 ± 0.35 nmol L⁻¹ and 26.3 ± 1.8 pmol L⁻¹ in Lake Unagi-ike. The vertical distributions of Mo were homogeneous in all the lakes and its average concentration was 3.45 ± 0.21 nmol L⁻¹ in Lake Biwa, 1.18 ± 0.08 nmol L⁻¹ in Lake Ikeda, and 1.93 ± 0.09 nmol L⁻¹ in Lake Unagi-ike. We suggest that the higher concentrations of V and W in the epilimnia during the stratified period result from the release of these elements from the littoral sediments and suspended particles in response to the rise in pH, which is induced by high biological production. To test this mechanism, a laboratory experiment using lake water and sediment was carried out. The pH of the lake water was controlled by bubbling air with different CO₂ concentrations, and the experiment demonstrated that V and W were released from the sediments in response to the increasing pH.

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