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The relationship between nutrients and pH in lakes as an implication for biogeochemical cycles in continental rivers.

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In the perspective of global biogeochemical cycles, rivers are an important path transporting vast amounts of solids and solutes from land to ocean. Chemical reactions of nutrients via biological activities are likely to have a great impact on pH and carbon cycle in terrestrial water. However, previous researches focusing on this perspective were quite few. As rivers in Japan have relatively short residence time than world rivers, it is difficult to simply compare nutrient cycles in small rivers in Japan with those in large continental rivers. Thus, in this study we focused on biogeochemical cycles of lakes, which have longer and comparable residence time to large rivers in the world.

We measured carbonate chemistry of lake water from Lake Kasumigaura , Tega Marsh and Imba Marsh as typical alkaline lake systems in Japan. We also conducted a detailed survey on lake water and input rivers of Lake Inawashiro, as a representative of acidified lake.

Nutrients played an important role in the variation of pH in both alkaline and acidified lakes. In alkaline lakes, nutrients enhance the activity of photosynthesis and as a result elevate pH of surrounding water. In the acidified lake, precipitation of Fe(OH)3 during the mixing of acidified river water and lake water removes phosphorus and limits photosynthesis, remaining the low pH in the lake water. In continental rivers which have longer residence time, nutrients may also affect pH and carbon cycle in river water as found in this study.

Keywords: nutrient, pH, lake, river, limnology, biogeochemical cycle