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Volume Page

Keyword: [TOP](#) > [Available Issues](#) > [Table of Contents](#) > [Abstract](#)

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[\[PDF \(469K\)\]](#) [\[References\]](#)**Mathematical model to explain a regime shift in Lake Takkobu**[Hisao NAKAJIMA](#)¹⁾ and [Noriko TAKAMURA](#)²⁾

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Abstract

Mathematical model analysis was used to explain a regime shift of Takkobu Lake in Hokkaido Japan. In this lake, a catastrophic change occurred several years ago from a clear to a turbid water state. Our mathematical model consists of three elements: cyanobacteria, DIN, and submerged plants. In this model, seasonal changes in parameters and states are also considered. This model exhibits a catastrophic change in cyanobacteria density when the level of DIN loading into the lake changes. That change occurs in both cases, with and without submerged plants. We assumed that if an algal bloom occurs then submerged plants go extinct because of light intensity insufficient for growth due to turbid water. Our model also shows 'Hysteresis' in the density of cyanobacteria from the change in the DIN loading level into the lake, since submerged plants inhibit the growth of cyanobacteria through nutrient competition, allelopathy, reduced resuspension, etc.

Key Words: [regime shift](#), [hysteresis](#), [cyanobacteria](#), [Anabaena](#), [algal bloom](#), [submerged plants](#), [nitrogen limitation](#)

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