**Understanding the transport feature of bloom-forming Microcystis in a large shallow lake: A coupled hydrodynamic and agent-based approach**

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*Microcystis* blooms, which interferes with recreation, water supply and aquatic life, has emerged as one of the most severe ecological problems affecting large and shallow freshwater lakes. This has focused research attention on the physiology and behavior of *Microcystis*, notably from the perspective of predicting blooms and developing effective engineering countermeasures. Understanding the complex transport feature of phytoplankton is important for predicting bloom-forming process. A coupled hydrodynamic and agent-based approach is developed to characterise the transport behaviour of colony-forming *Microcystis* in a large shallow lake. Two models are combined: a hydrodynamic model to offer a basic flow field, and an agent-based model to incorporate the physiological response (buoyancy-controlling strategies) and migratory behaviour (horizontal advection and random-walk vertical mixing) of Microcystis. Lake Taihu, which experiences high *Microcystis* blooms every year, was chosen as a case study to test the performance of this coupled approach. By comparing the coupled model with available field measurement, model results can reproduce changes in buoyancy status and three-dimensional distribution exposures to different wind intensities. We found that the transport pattern of *Microcystis* colonies is a dynamic balance between turbulence and wind drift, along with buoyancy which is related to colony size. Overall, the combined model here presents a promising tool for characterizing the detailed movement patterns of *Microcystis* colonies or patches in large shallow lakes.