

Influence of the Ane River Basin on Dissolved Oxygen Concentration of Lake Biwa

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Due to its importance for the water resources of Japan, Lake Biwa characteristics have been studied by many scientists. Most studies focus in measuring several water quality parameters of the lake and also in modeling the lake circulation and water quality. Since the water inside the lake comes from the Lake Biwa watershed, we should try to understand lake-watershed dynamics as a whole. However, no study has yet been done that couples a hydrological model with the Lake Biwa circulation model. One of the most important basins that contribute to Lake Biwa water quantity and quality is the Ane River Basin, but its influence is not fully understood. Hence, the objective of the present work was to analyze the influence of the Ane River Basin on the dissolved oxygen concentration of the Lake Biwa through the development and use of a hydrological model coupled with a circulation model of the Ane River Basin.

Data

So far, Lake dissolved oxygen concentration has been monitored by Lake Biwa Environmental Research Institute in key point of the Lake. We also measured twice the Lake DO close to the Ane River mouth. The oxygen concentration at the winter time (January 2010) after the mixing season is well saturated according to those observations.

The basic meteorological parameters (temperature, humidity, wind velocity, solar radiation) and snow depth for upper stream of Ane river basin is being measured. By using those information we are developing semi-distributed model for the river basin taking into account of snow melting effect. However for the connection with Lake Biwa Model in this current study we have employed observed data for the

year 2002 to testify the effect of model integration.

Circulation Model

The circulation model used in this study is the Biwa-3D, which is a non-hydrostatic three dimensional model that uses a Mixed Scaling Formulation Model to solve the hydrodynamic component. The water quality component can simulate ecological parameters such as temperature, chlorophyll-A and dissolved oxygen.

Results

In this study we have performed numerical simulation of dissolved oxygen concentration in Lake Biwa for the year of 2002 under the condition of observed river discharge (Ane river) which includes other river streams. For the comparison, we have made calculation which reduces those discharge from Ane River to test whether we may observe the difference in oxygen concentration. At the modeling output not significant difference could not be observed, however using high-resolution simulation for Ane River Mouth shows the dispersion of the river water along the River Ane. We will proceed further observation and calculation for the basin.

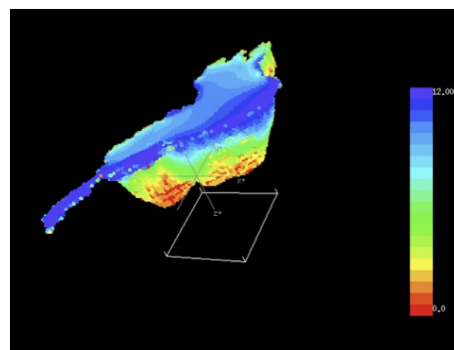


Figure 1 DO concentration calculated for December 2002 considering the all observed river inflow in the basin