Impact assessment on temperature in Lake Biwa under the SRES climate change scenarios using Biwa-3D Integrated Assessment Model

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Impact assessment on lake temperature under the SRES climate change scenarios (A1B) has been evaluated by coupling MRI-GCM with 20km outputs and the Biwa-3D integrated assessment model, a three-dimensional non-hydrostatic lake dynamic and water quality model exclusively developed for Lake Biwa. A significant temperature increase in surface water, recording more than 34 degrees in the East Coast of the North Basin of the Lake has been predicted for the simulation for the period up to 2099, which may induce a catastrophic impact on lake water quality during the period. Weak stratification is predicted to start from March 2099 compared with observation of Stratification that doesn't commence until after April in 2002. The thickness of the eplimnion which is around 15-20m in 2002 increases to 25-30m in August 2099 due to temperature accumulation than 2002. It is very much concerned about lake water vertical mixing during winter whether it continue after lake water warming. According to the model outputs however, the vertical mixing may not always decrease due to the accumulated heat in the hyplimnion which may result a higher temperature than the atmospheric temperature during the winter. At



the same time, accumulated heat in the hyplimnion may induce catastrophic degradation in the lake ecosystem.

Figure 1. Vertical distribution along a cross-section (Ado River mouth-Maibara section) of averaged monthly temperature comparing 2002 and 2099, calculated using MRI-GCM output.

[1] Y. Yamashiki, M. Kato, K. Takara, E. Nakakita, M. Kumagai and C. Jiao. Impact assessment on Lake Biwa under the SRES climate change scenarios using Biwa-3D Integrated Assessment Model: part I – prediction of lake temperature. Hydrological Research Letters 4 (under review 2010)