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IMPACTS OF FUTURE CLIMATE CHANGE ON ARCTIC TERRESTRIAL ECOSYSTEMS: AN ANALYSIS BASED ON ISI-MIP

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Terrestrial ecosystem modeling studies have implies that ongoing climatic change will exert considerable influences on the Arctic ecosystems, including carbon budget and biodiversity. However, there remain large uncertainties in our present predictions on the future change due to heterogeneity and complexity of terrestrial ecosystems. The uncertainty is difficult to fully measure using a single model, and so multiple models are used to capture a wider spectrum of estimation uncertainty. Such activity, called model intercomparison project (MIP), has been increasingly done in modeling communities. Since 2012, a project aiming at assessing impacts of future climate change across different sectors, the Inter-Sectoral Impacts Model Intercomparison Project (ISI-MIP), has been conducted by international modeling communities. The first phase was finished successfully and its output data are open to the public. We have participated in the ISI-MIP using a process-based terrestrial ecosystem model, the Vegetation Integrated SImulator for Trace gases (VISIT)[1]. The first analysis by seven models[2] showed that future climate change would affect terrestrial productivity and carbon budget to various degrees, depending on emission scenarios, climate projections, and ecosystem models. Also, the analysis indicated that the Arctic had several particularly uncertain (i.e., inconsistent among estimates) areas such as west Siberian lowlands and northern Alaska. Such a difficulty may be attributable to difference among models in responsiveness to temperature rise in conjunction with hydrological change. In this study, we present further analyses on the impacts of future climatic change on the Arctic terrestrial ecosystems on the basis of the ISI-MIP simulation results, considering their underlying mechanisms.

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[1] Ito, A., and M. Inatomi. 2012. Journal of Hydrometeorology 13:681–694.
[2] Friend, A.D., et al. 2014. Proceedings of the National Academy of Science U.S.A. 111:3280–3285.