

A Modeling Analysis of Carbon and Water Cycles in Northern Eurasia during the Past and This Century

Qianlai Zhuang^{1*}

¹Department of Earth, Atmospheric, and Planetary Sciences, Purdue University

The temperature increase and extreme climate change occurred in the past century are projected to continue during this century in northern Eurasia according to climate models. The changing climate may expedite permafrost thawing and intensify the hydrological cycle, in turn, accelerate the carbon greenhouse gas cycling in this region. Using a suite of hydrology, permafrost, biogeography, biogeochemistry and climate models, we explore how vegetation distribution, landscape (wet vs. dry), permafrost, hydrology, and carbon cycle have changed in the last century and will be affected during the 21st century. Our preliminary analyses indicate that the region was a consistent methane source in the past century and the source strength will increase by 60%. In contrast, the region was a carbon sink and the sink will double by the end of this century. As a result, the region will act as a strengthened greenhouse gas sink during this century. In the presentation, I will also present how regional water cycle is modeled considering the effects of climate, plant physiology, and snow and permafrost dynamics in various landscapes.

Keywords: Greenhouse gas cycling, biogeochemistry, permafrost, water, hydrology, earth system modeling