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Editorial

Water and carbon dynamics in selected ecosystems in China

Global climate change and unprecedented socioeconomic development have resulted in tremendous environmental, ecological and resource stress on China's continued growth. Among the numerous challenges, nothing is more pressing than ecosystem degradation as evidenced by the regional-scale air and water pollution, groundwater depletion, soil erosion and rapid loss of biodiversity in some areas. In the past decade, large-scale vegetation-based ecosystem restoration activities including banning forest harvesting and promoting cropland conversion to forests have been initiated by the government with a goal to reduce further eco-environmental degradation and cope with 'ecological security'. Unfortunately, there is little guidance on the ecosystem restoration practices and the ecological effects of land management policies on ecosystem health and services are largely unknown. Research on water and carbon cycles and their interactions with climate and management has been given high priority by the Chinese government and various funding agencies in recent years. Clearly, China's success in ecological restoration will have great impact beyond its own geographic territory.

Study results on carbon and water fluxes from a large number of flux towers (i.e., ChinaFlux, www.chinaflux.org) have been published in China. However, previous studies focus on natural ecosystems and had limitations in quantifying anthropogenic effects on ecosystems. To fill the data and knowledge gaps on ecosystem responses to the changing climate and intensified human disturbances in China, the US-China Carbon Consortium (USCCC) (http://research.eeescience.utoledo.edu/lees/research/USCCC/) was established in November of 2003 to coordinate measurements of carbon, water and energy fluxes through collaboration among interested institutions. The USCCC was established based on a principle that standard flux measurement methods, calibration and QA/QC will be used throughout the network. A 'bottom up' approach, similar to the Global Lake Ecological Observatory Network (GLEON, www.gleon.org/), was adopted for this Consortium: each participating member funds its own research operation due to a lack of required large funding for supporting the multi-site activities but data are shared among the USCCC members and are made available to the international research communities for global syntheses. Over the past 6 years, the USCCC members have contributed significantly to several flux syntheses, including those of FLUXNET and Asian Flux. Currently, the USCCC consists of more than 10 research institutions from China and the US. The USCCC maintains a flux network that includes more than 15 permanent research sites with about 20 flux towers in ecosystems ranging from coastal wetlands to boreal forests.

The four papers in this volume reflect some of the progress made through the USCCC research activities. The first paper by Aronson and McNulty (2008) gives an extensive and thorough review on ecosystem warming experiments and provides practical recommendations in experimental design for various climatic conditions. Findings from this paper are valuable for developing countries, such as China, to initiate climate warming experiments with limited resources. This paper is followed by Chen et al. (2008) and Miao et al. (2008) who report energy and water balances in two paired eddy flux sites in the semi-arid grasslands. Their studies suggest that conversions from grasslands to crops significantly affect the energy and water balances through alteration of soil properties and vegetation phenology. The last paper by Guo et al. (2008) presents findings about the tidal effects on carbon flux in a marsh wetland near Shanghai in southeastern China. The research setting represents one of the few eddy flux sites that are on wetlands in the global flux network.

It has been challenging for Chinese scientists to publish in English due to language barriers, in addition to the high standards required by this journal. We hope the reader will find that these four papers are informative and of high scientific standard. We also hope that these papers will open up a window to the international research community to collaborate with scientists of the USCCC to contribute to our understanding of water and carbon processes in global terrestrial ecosystems that will change greatly in the future. Finally, we hope that the lessons learned from the operation of the USCCC may be useful for the flux research communities, especially in developing countries, where resources are limited in addressing large-scale carbon and water balance questions.

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