

Editorial

Observations and Modeling of the Climatic Impact of Land-Use Changes

Xiangzheng Deng,¹ Burak Güneralp,² and Hongbo Su³

¹ *Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences (CAS), Beijing 100101, China*

² *Department of Geography, Texas A&M University, College Station, TX 77843, USA*

³ *Department of Environmental Engineering, Texas A&M University, Kingsville, TX 78363-8202, USA*

Correspondence should be addressed to Xiangzheng Deng; dengxz.ccap@gmail.com

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Land-use and land-cover change (LULCC) directly leads to changes in the surface conditions, such as altering surface albedo, roughness, and imperviousness. These changes in surface conditions can affect surface heat balance and water cycles. For example, urban LULCC can aggravate urban heat island effect. Therefore, it is important to understand climatic impacts of changes in biogeophysical processes induced by LULCC. These impacts, occurring at multiple spatial and temporal scales, can have serious consequences for food security, vulnerability to extreme events, biodiversity conservation, and a host of other issues of global importance.

Among the 48 papers collected in this special issue, several advances in this research field are to be found. Firstly, the observation data have been enhanced. The reclassified data (F. Wu et al. and Y. W. Yuan et al.) can meet the accuracy requirements for climate simulations and can be used in dynamical downscaling for regional climate simulations. Secondly, the state-of-the-art LULCC models have been implemented. The agent-based model used in modeling the LULCC impact on climate performed exceedingly well (T. Zhang et al.). Notably, X. Z. Deng et al. introduced a land use change dynamic (LUCD) model embedded in a regional climate model (RCM), which they show to be extraordinarily powerful in land surface system simulation. In addition, scenario analysis plays a key role in the study of impacts of LULCC on climate. Several scenarios (Q. Xu et al., J. Y. Zhan et al., and X. L. Ke et al.) were designed to predict the future

LULCC and the likely impacts on the regional climate in various case-study locations. Thirdly, different research applications from several other case studies were presented. In these case studies, most of which employ Weather Research and Forecasting Model (WRF), the climatic impacts of several types of LULCC, such as grassland degradation (Q. O. Jiang et al., R. Yu et al., F. Zhang et al., and Y. F. Li et al.), deforestation/afforestation (E. J. Ma et al., Z. H. Li et al., and T. Zhang et al.), urbanization (Y. Z. Lin et al., J. Y. Zhan et al., and C. H. Zhao et al.), and cultivated land reclamation (Q. L. Shi et al., Y. Qu et al., and H. M. Yan et al.), both in China and elsewhere are reported. Fourthly, effects of climate on evapotranspiration as well as water and energy exchanges we were also detected through observations and modeling (S. H. Chen et al., Y. Rong et al., J. J. Zhang et al., and Y. M. Yang et al.). Last but not least, several comprehensive review papers analyzed major challenges in the study of the impacts of LULCC on the regional climate (X. Z. Deng et al. and R. B. Singh et al.) and on human well-being via specifically altering the ecosystem provisioning services (X. Z. Deng et al. and Z. H. Li et al.).

This special issue is intended to advance our understanding of the mechanisms and impacts of LULCC on climate changes at local, national, and global levels. The editors hope the papers in this special issue will provide useful references for future study of observing and modeling the climatic impacts of LULCC.

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Xiangzheng Deng
Burak Güneralp
Hongbo Su

