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Editorial

Monitoring and Modeling Terrestrial Ecosystems' Response to Climate Change

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Global average land and sea surface temperatures have increased since 1850, which is likely due to the observed increase in anthropogenic greenhouse gas concentrations [1] and other possible influences include solar, volcanic, and greenhouse gas factors and natural variability that is internal to the climate system [1, 2]. There is ample evidence of the ecological impacts of recent climate change, from polar terrestrial to tropical marine environments [2]. These observed ecological changes are heavily biased in the directions predicted from global warming and have been linked to local or regional climate change through correlations between climate and biological variation, field and laboratory experiments, and physiological research [3]. Monitoring spatiotemporal dynamics of ecosystems response to climate change have drawn much attention in recent years [4].

This special issue consists of 18 articles and the topics include terrestrial water cycle, ecological changes in the phenology, ecosystem production, and ecosystem health monitoring.

Global change has led to the changes in the terrestrial hydrology. Four papers in this special issue focus on the spatial and temporal changes of the distribution and total amount of water resources. J. Wang et al. developed a water allocation and simulation (WAS) model for simulating the water cycle and output different evapotranspiration (ET) values for natural and artificial water use. The model was applied in Tianjin City of China, and the results demonstrate that ET of irrigation lands is a priority in ET control for water management. M. E. Kjelland et al. developed a Salton Sea Stochastic Simulation Model (S4M) with a higher degree of climate forecasting resolution. The model could be used to assist planners and residents of the Salton Sea (SS) transboundary watershed (USA and Mexico) in making sound policy decisions regarding complex water-related issues. X. Wang et al. evaluated the spatiotemporal characteristics of meteorological drought in Shandong Province of China from 1961 to 2008 by using the meteorological drought composite index (CI). D. Jiang et al. present a review of recent applications of the Gravity Recovery and Climate Experiment (GRACE) satellite data in terrestrial hydrology monitoring. It was found that GRACE data could be used for improving the monitoring result of the spatial and temporal changes of water cycle at large scale quickly.

Climate change has resulted in a significant effect on vegetation dynamics during the past decades. Lots of existing literatures have investigated seasonal variations in vegetation and their responses to climate changes, with both *in situ* and satellite observations. Q. Ge et al. presented a valid methodology for detecting the grassland tourist season. The beginning, the best, and the end of grassland tourist season of Inner Mongolia could be determined with remote sensing data. X. Yu et al. used time series of Moderate Resolution Imaging Spectroradiometer (MODIS) Enhanced Vegetation Index (EVI) data (2000–2009) to evaluate forest phenology dynamics and its responses to climate changes in the cool-temperate needle leaf forest region. J. Dai et al. provided the characteristics of spring phenological changes in China over the past 50 years based on observation data at 33 sites from the Chinese Phenological Observation Network (CPON). L. Guo et al. analyzed vegetation change of the six major biomes across Inner Mongolia at the growing season and the monthly timescales and estimated their responses to climate change between 1982 and 2006. H. Wang et al. compared satellite and ground-based phenology in China's temperate monsoon area. Five methods to estimate start of season (SOS) from the Advanced Very High Resolution Radiometer (AVHRR)/normalized difference vegetation index (NDVI) dataset were employed and evaluated. The results show that the variability of SOS time series is significantly different from ground phenology except for HANTS, Polyfit, and Midpoint methods.

Terrestrial net primary production (NPP) is a key component of energy and mass transformation in terrestrial ecosystems and also the key indicator of ecosystem functioning. In this special issue, four articles provided major approaches to monitoring and predicting terrestrial primary production in a changing global environment. S. Pan et al. provided a comprehensive review of three major approaches to monitoring and predicting terrestrial primary production, including ground-based field measurements, satellite-based observations, and process-based ecosystem modeling. The performance of the dynamic land ecosystem model (DLEM) at various scales from site to region to global was presented as case study. J. Fu et al. presented the evaluation of the marginal land resources suitable for developing bioenergy in Asia. A multiple factor analysis method was used to identify marginal land using multiple datasets including remote sensing derived land cover and meteorological data. Productions and biofuel potential were then estimated. Q. Lu et al. analyzed the combined effects of land use and climate change on grain production in northern China during 1988–2008, with the remote sensing derived farmland map, the moisture index (MI) from meteorological data, and unit grain production from statistical yearbooks. L. Liu et al. assessed the changes in production potential in China in response to climate change from 1960 to 2010, with the Global Agro-Ecological Zone (GAEZ) model. It was found that an increase of approximately 1.58 million tons/decade in production potential correlated with climate change.

Routine monitoring of regional ecosystem plays much important role in the research of global change. Q. Wang et al. proposed an integrated framework for monitoring ecosystem at regional scale. H. Yan et al. developed a conceptual model of the ecosystem resilience of forests. The result suggests that there is significant spatial heterogeneity of the ecosystem resilience of forests, indicating that it is feasible to generate large-scale ecosystem resilience maps with this assessment model. L. Huang et al. explored the dynamics of grassland degradation and restoration from 1990 to 2012 in the Northeastern Tibetan Plateau and its relationship with climate mitigation to provide a definite answer as to the forcing and response of grassland degradation and restoration to climate change. Y. Wang et al. presented a study on the impact of urbanization on the annual average temperature of the recent 60 years in Beijing. Meanwhile, Z. Qiao et al. focused on the influences of urban expansion on urban heat island in Beijing during 1989–2010. The results suggested that urban design based on urban form would be effective for regulating the thermal environment.

This special issue aims to summarize the most recent developments and ideas in monitoring and modeling terrestrial ecosystems response to climate change. Contributions presented here will promote the illustration of the relationship between terrestrial ecosystems and global climate change.

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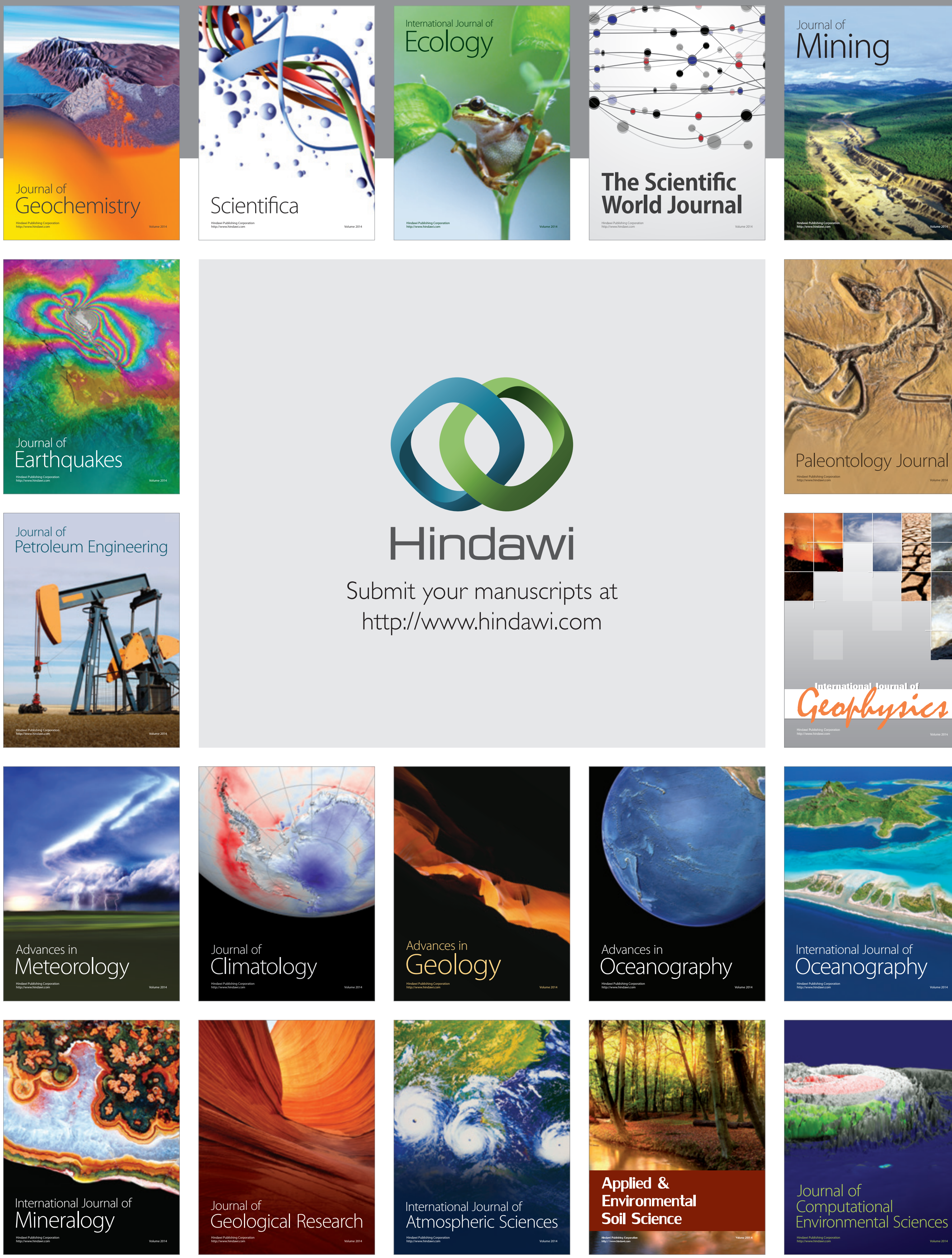
References

[1] IPCC, "Summary for policymakers," in *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, T. F. Stocker, D. Qin, G. K. Plattner et al., Eds., pp. 3–29, Cambridge University Press, Cambridge, UK, 2013.

[2] G. Walther, E. Post, P. Convey et al., "Ecological responses to recent climate change," *Nature*, vol. 416, no. 6879, pp. 389–395, 2002.

[3] C. Parmesan, "Ecological and evolutionary responses to recent climate change," *Annual Review of Ecology, Evolution, and Systematics*, vol. 37, pp. 637–669, 2006.

[4] Q. Ge, H. Wang, R. This, and J. Dai, "Phenological response to climate change in China: a meta-analysis," *Global Change Biology*, 2014.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