Special Section Guest Editorial: Earth Observation for Global Environmental Change

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Global change now poses a severe threat to the survival and development of humankind. It is increasingly drawing the attention of every country in the world. Global change refers to changes in the biophysical environment resulting from natural factors or human activities, as well as changes in society and human well-being. These changes are either at a global scale or at a local scale that has expanded to a global phenomenon. Meanwhile, global environmental problems are becoming more and more serious, threatening our lifestyle and survival.

Global change research requires advanced theories and methodologies for analyzing large-scale, long-term temporal and spatial evolution. Earth observation from space, which can be operated from visible to infrared to microwave wavelengths, has become an important technology used to observe global change phenomenon. The development and application of Earth observation have been considered priorities in global change research. Comprehensive observation by multiple remote sensing systems could provide an effective means for accurately observing global change.

But what about the interaction mechanisms between remote sensing's electromagnetic waves and their targets? How can we extract useful information on global change and other concerns? We are facing these challenges and should understand them deeply. For this reason, a project of the National Basic Research Program of China titled "Earth observation for sensitive variables of global change: mechanisms and methodologies" has been ongoing over the past several years. The research team has carried out spaceborne-airborne-ground remote sensing experiments and obtained a large amount of observational data. This special section of the *Journal of Applied Remote Sensing* would like to show some of the research results.

This special section contains nine selected papers in three groups. One group pertains mainly to Earth observation for ice and snow. "Glacier surface velocity estimation in the West Kunlun Mountain range from L-band ALOS/PALSAR images using modified synthetic aperture radar offset-tracking procedure" by Ruan et al. addresses SAR's role. The results indicate that winter glacier motion on the north slope is 1 cm/day faster than on the south slope—a result that corresponds well with the local topography. The SAR-based offset tracking is proven to be reliable and robust, making it possible to investigate comprehensive glacier movement and its response to environmental change. "Fluctuations and movements of the Kuksai Glacier, western China, derived from Landsat image sequences" by Yang et al. applies a normalized cross-correlation methodology, indicating that the velocity of the Kuksai glacier is higher in the upper portion and decreases downstream. The study demonstrates that glacial movements can be routinely monitored using Landsat images. "Methodology for geographical data evolution: three-dimensional particle-based real-time snow simulation with remote-sensing data" by Tan et al. addresses a methodology for geographical data evolution from a snow simulation. This computational simulation does not merely generate new data and spatial resolutions at a given time but offers multiscale environmental characteristics of the Earth and presents references for its future.

A second group of four papers is concerned with Earth observation for land and cities. "Target-driven extraction of built-up land changes from high-resolution imagery" by Zhang et al. employs the study of land information extraction strategies. The overall accuracy of built-up change mapping is about 91% and exceeds accuracies achievable by pixel or segment processing used in isolation. "Long-term effects of land use/land cover change on surface runoff in urban areas of Beijing, China" by Sun et al. presents rapid urbanization detection. A long-term hydrologic impact assessment model was applied to assess the impact of LULC change on

surface runoff. The results indicate that the selected study area experienced rapid urbanization from 1992 to 2009 and also indicate that the runoff increase was highly correlated with urban expansion. "Monitoring bidecadal development of urban agglomeration with remote sensing images in the Jing-Jin-Tang area, China" by Lu et al. investigates an enhanced built-up (BU) index method used to extract BU areas with an overall accuracy ranging from 75% to 91.35%. The results provide spatial information on the evolution of urban extent in the 1990s to 2010s in this region. "Spatiotemporal analysis of urban environment based on the vegetation-impervious surface-soil model" by Guo et al. presents a vegetation–impervious sur-face–soil (V–I–S) model used to quantify the ecological composition of urban/peri-urban envi-ronments. The support vector machine algorithm and several knowledge-based methods are applied to obtain the V–I–S component fractions at high accuracies.

Lastly, the two papers in the third group present two remote sensing methodologies. "Study of Radarsat-2 synthetic aperture radar data for observing sensitive factors of global environmen-tal change" by Guo et al. describes that Radarsat-2 is capable of polarimetric and interferometric observations, which can provide an effective way to document some sensitive variables of global environmental change. "Retrieval of aerosol optical depth over Bohai rim region by exploiting multifunctional transport satellite and MODIS data" by Bai et al. proposes that Earth-observing satellites can collect hourly information on the aerosol optical depth of a test area.