

Carbon patterns and processes in East Asian ecosystems: multi-scale approaches

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It has been argued that scale is the central problem in ecology (Levin, 1992). Studies on carbon cycles and global climate change, the current major themes in modern ecology, require the interfacing of phenomena that occur on different scales of space, time, and ecological organization. For several decades, tremendous efforts have been made to reveal the general patterns of, and the mechanisms for the global carbon cycles. However, many uncertainties remain, particularly on local to regional scales. To reduce these uncertainties, regional collaborations across the board of nations are required.

The A3 Foresight Program “Quantifying and predicting terrestrial carbon sinks in East Asia: toward a network of climate change research”, lasting from 2007 to 2012 and supported jointly by the National Natural Science Foundation of China (NSFC), the National Research Foundation of Korea (NRF), and the Japan Society for the Promotion of Science (JSPS), aimed to build a collaborative research and education platform focusing on the carbon processes in terrestrial ecosystems in East Asia. As the research platform, the main objectives of the A3 Foresight Program were to measure and to generalize the patterns and temporal dynamics of carbon cycling in East Asian ecosystems, and to reveal the temporal dynamics of carbon cycling, and to reveal the biotic and abiotic drivers that control the patterns and dynamics in this geographic region.

The program has been highly productive and achieved significant success in the study of carbon cycling in East Asia. To present these collective achievements, we have published three special issues so far (Fang *et al.* 2010; Muraoka *et al.* 2010; Son *et al.* 2012). As one of the special issue series, you will see that the current special issue comprises 10 papers concentrating on different scales of carbon processes. The first three papers by Zhou *et al.* (2013), Ma *et al.* (2013), and Du *et al.* (2013), respectively, present studies on soil respiration from tropical, subtropical and boreal forests in China. As a synthesis, Li *et al.* (2013) examines variation in root and heterotrophic respiration across China’s forest ecosystems.

Detailed studies about the growth of dominant species and ecosystem C and N storage and flux in low- and a high-density stands of *Pinus densiflora* are reported from Korea (Byun *et al.* 2013; Noh *et al.* 2013). Combining observations using approaches in plant physiological ecology and remote sensing, Muraoka *et al.* (2013) present the methodological advances in measuring and modeling canopy photosynthetic productivity in a deciduous broadleaf forest in Japan. Tang *et al.* (2013) extend such work by investigating resorption proficiency and efficiency of leaf nutrients in woody plants in eastern China against the background of nutrient limitation and productivity. The special issue also includes a paper investigating leaf photosynthesis and respiration under warming conditions on the Tibetan Plateau. The final contribution by Du *et al.* (2013) introduces a project of Nutrient Enrichment Experiments in China’s Forests (NEECF).

As an education platform, the A3 Foresight Program provides opportunities for students and mid-career scientists to work together, share ideas, and interact. As ecologists, we firmly believe that good science consisted of conducting and publishing first-rate research collaboration among colleagues from different regions and disciplines. In addition, it is necessary to train students who will be willing to pursue careers in the interdisciplinary fields of global change, biodiversity and ecosystem functioning. The picture of the participants of the workshop in Korea suggests that the A3 program just did so effectively.

We express our appreciation to the editorial team of the Journal of Plant Ecology, and particularly the editorial team with Bernhard Schmid, Shiquan Wan and Lijuan Liu, for giving us the opportunity to organize this special issue. Without their support the publication of this issue would not have been possible. We sincerely hope our papers will contribute to the understanding of carbon patterns and processes in East Asian ecosystems, and to the global terrestrial ecosystems as well.



The workshop held in Seoul in 2010. Pictured are A3 project leader from Korea, Japan and China, Yowhan Son (4th from the right in the second row), Hiroyuki Muraoka (5th from the right in the third row), Jingyun Fang (2nd from the right in the second row) and the other members of the A3 project.

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