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Preface to the special issue for the 8th International Symposium on Forest Soils: Linking Soil Processes to Forest Productivity and Water Protection under Global Change

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The 8th International Symposium on Forest Soils: Linking Soil Processes to Forest Productivity and Water Protection under Global Change was held during 24–28 October 2015 on the campus of Fujian Normal University in Fuzhou, China. The Symposium was organized for two principal reasons: first, to celebrate the 2015 International Year of Soils; and second, to address a crucial gap in the forest soils and forest management literature in a concerted effort. There is a pressing need for a "state-of-the-art" publication on the nature and research needs of integrating soil information and expertise into the management of Chinese forest resources. Especially in South China, most forests are located in the mountains and hills. Soils of the region are perceived to be fragile and easily damaged. Relatively few studies have been published in the international literature on forests and forest soils of southern China. Thus, our intention was to emphasize regionally available datasets, to incorporate the pertinent information from the world literature, and to place the issues facing forest scientists in southern China in an international context. The 8th International Symposium on Forest Soils continues the series of International Symposia sponsored by the International Union of Soil Science (IUSS) (previously International Society of Soil Science or ISSS) and other related agencies. The 3rd Symposium of this series was held in Balikpapan, Indonesia, 29 October–3 November 1995, with the 4th held in Vila Real, Portugal, 18–22 September 2000. The 5th, 6th, and 7th symposia were held in Bordeaux, France, 15–18 September 2004; in Noosa, Queensland, Australia, 19–23 August 2007; and in Shenyang, China, 17–20 September 2013, respectively. Next, the Forest Soils Working Group of IUSS will co-sponsor the joint North American Forest Soils Conference/the 9th International Symposium on Forest Soils, 10–16 June 2018, in Quebec City, Quebec, Canada. The Quebec symposium will be co-sponsored by the Soil Science Society of America (SSSA), the Canadian Society of Soil Science (CSSS), and the International Union of Forest Research Organizations (IUFRO). In addition, the Forest Soils Working Group, currently convened by Professor Zhihong Xu of Griffith University, Nathan, Brisbane, Australia, and Professor Chris Johnson of Syracuse University, USA, has also hosted both oral and poster sessions on forest soils during each IUSS (ISSS) World Congress of Soil Science since 2002.

This special issue (SI) of Journal of Soils and Sediments includes 16 papers selected from more than 50 submissions from the 8th Symposium. The papers in this SI discuss important fundamental and applied issues in forest soil science and forest ecology and provide a worthwhile contribution to the advancement of forest soil science. There has been increasing attention being paid to the benefits provided by soil organic matter for forest ecosystem functioning and health. Two of the papers in this SI deal

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with this topic. Using an acid hydrolysis method, Zhang et al. (2017a) quantified variations of soil organic matter quality under Chinese fir (*Cunninghamia lanceolata* (Lamb.) Hook) plantations at three different forest stand development stages in subtropical China. Their results suggest that a biochemical protection mechanism plays an important role in the accumulation of soil organic matter in the studied Chinese fir plantations. In the second study, the number of rotations and forest age were found to significantly affect the content of soil organic matter in Chinese fir plantations (Yu et al. 2017). Field observations suggest that the growth of Chinese fir in replanted forests was significantly reduced as compared with the previous rotation and this problem appears to be common in many regions (Huang et al. 2013). The reduction of plantation productivity in successive rotations appears to be related to losses in soil organic matter and nutrients (Zhang et al. 2004). Conversely, Yu et al. (2017) report in this SI that soil organic matter content increased after replanting Chinese fir forests, which suggests that replanting rotations may have a varied impact on soil organic matter in forest plantations.

Soil organic matter not only provides value for a number of ecosystem services (e.g., soil fertility) but is also a vital carbon (C) stock. Six papers discussed soil C dynamics under forests. Pang et al. (2017) quantified the above- and belowground C stocks across a chronosequence of spruce (*Picea asperata*) plantations in the eastern Tibetan Plateau, China. They found soil C stock remained unchanged for the first 12 years, but decreased from 12 to 46 years after the reforestation on cutovers. In the second C paper, Song et al. (2017) reported the impact of forest succession and forest type on soil organic C in subtropical China. They suggested that with increasing succession time, soil organic C and soil respiration generally increase and the conversion of natural forests to plantations decreases soil organic C content and soil respiration. In the third C paper, the variations of soil organic C stock and C fractions under different forest types in northeast China were compared (Wang et al. 2017). In the fourth C paper, the relationship between soil phenols and C accumulation in tea plantations was discussed (Fan et al. 2017). Tea plantations cover a land area of 3.7 million ha globally, with China having the largest planted area. Fan et al. (2017) found that nitrogen (N) fertilization increased soil organic C stocks because soil polyphenol metabolism was reduced by fertilization. Soil organic C stocks were found to be very sensitive to forest management practices (e.g., fertilization and changes in vegetation type) (Fan et al. 2017; Wang et al. 2017). Therefore, the terrestrial biological C sink may be offset by a slight shift in the fragile balance between C input and C mineralization caused by forest management practices (Huang et al. 2011). However, such small shifts are often difficult to detect in the short term due to the high spatial variation of SOC stocks (Dona et al. 2007). In the fifth C paper, the spatial variation of soil respiration in a coastal protection forest in southeastern China was studied (Chen et al. 2017). In the last C paper, the main drivers for the spatial variations of soil organic C in a subtropical mixed-species forest in central China were determined (Li et al. 2017). They found that the highest contribution to spatial variation of soil organic C came from soil variables including soil pH and available phosphorus, followed by vegetation and topographic variables. Compared with the surface soil, the explanatory power of soil and environmental variables for spatial variations was much lower for the subsurface soil.

Less is known, however, about the factors controlling the stability of organic C stocks in subsurface and deep soil layers than in surface soils (Fontaine et al. 2007). To better understand factors controlling soil organic C stocks in deep soil layers, the last C paper investigated the effect of land use on C stability to a depth of 80 cm (Lyu et al. 2017). This kind of research should be encouraged, especially studies on factors controlling the stability of soil organic C to depths of 3 m or deeper, as such data have rarely been reported. Currently, "deep" soil organic C in soils is typically considered to depths of 1–2 m at most (Rumpel and Kögel-Knabner 2011).

Soil microbial communities not only regulate key processes that control ecosystem C and nutrient cycling, but are also important sources of soil organic matter. In some soils, microbial biomass has been found to contribute >50% of the extractable soil organic matter (Simpson et al. 2007). A paper investigating the seasonal shifts in the abundance and structure of the microbial community in organic horizons under coniferous forests at different altitudes in Southwestern China is included in this SI (Zhang et al. 2017b). Their results suggest that the abundance and structure of the soil microbial community in Tibetan coniferous forests varied by season and bacterial and archaeal communities responded more quickly to seasonal freeze-thaw processes than the fungal community.

Nitrogen is an important factor limiting the growth of trees in many forest ecosystems. Two papers in this SI deal with this topic. In the first paper, the impact of vegetation restoration of degraded meadows on N transformations was studied (Jiang et al. 2017). They suggested that planting native species in the degraded meadows decreased N transformations. The second paper identified the key mechanisms on how input of N as NH_4^+ would stimulate nitrification in subtropical acid forest soils and found that input of NH_4^+ decreased soil pH and provided favorable microsites for the microbial nitrification of NH_4^+(Zhao et al. 2017).

In addition to soil organic matter, N cycling and soil microbial community structure and function, papers in this SI also deal with other interesting topics. For example, Wan et al. (2017) discussed the long-term fertilization effect on soil biological activities in navel orange orchards in subtropical China. Meng et al. (2017) quantified the relationships between forest type and soil macropore networks which would have important effects on the movement of soil water, air, and chemicals in forest ecosystems. Tu et al. (2017) discussed

indicators for soil quality assessment. Yang et al. (2017) investigated the changes in forest soil quality after planting with *Eucalyptus* species, which grow very fast. Eucalyptus plantations cover more than 4.5 million ha in southern China, and the environmental consequences of planting eucalyptus species at forest sites is now a subject of heated debate in the scientific community and forest industry in China.

Papers in this SI cover important fundamental and applied aspects of forest soil processes. Therefore, if these publications are successful in providing new research results and insights into existing theories of forest soil processes, our efforts in organizing this SI would be paid off. It is our sincere hope that the 8th International Symposium on Forest Soils and this SI of the Journal of Soils and Sediments have helped the development of international linkages, scientific exchanges, and awareness of emerging forest soil management issues, resulting in increased collaborative studies that address the effects of forest management and climate change on forest productivity and ecosystem services.

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