Newsletter
Soil Science Society of China

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In this Volume

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Biography of Prof. Bojie Fu

Professor Bojie Fu (©SSSC)

Prof. Bojie Fu, an Academician of the Chinese Academy of Sciences (CAS), a professor at the Research Center for Eco-Environmental Sciences, CAS and Beijing Normal University. He is the International Honorary Member of the American Academy of Arts and Sciences, a Fellow of the Academy of Sciences for Developing World (TWAS), and an Honorary Fellow of the Royal Geographical Society, Edinburgh, UK.

Prof. Fu has published over 500 academic papers and his main research focuses on landscape patterns and ecological processes, ecosystem services and management and sustainable development. He has received many merit awards including the Alexander von Humboldt Medal of European Geosciences Union, the TWAS-Lenovo Science Award, the Tan Kah Kee Science Award in Earth Science, the China National Natural Science Prize, the Outstanding Science and Technology Achievement Prize of CAS, the Ho Leung Ho Lee Science and Technology Prize in Geosciences, and the Distinguished Service Award of the International Association of Landscape Ecology. ■

Research Progress of Prof. Bojie Fu

Biophysical and economic constraints on China's natural climate solutions

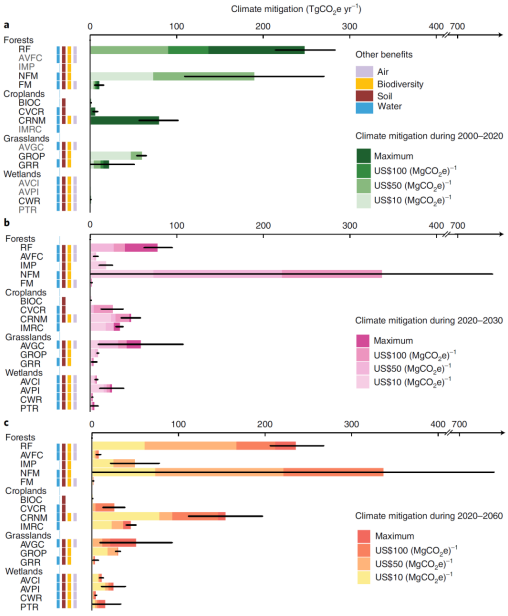

Figure1. Historical mitigation capacity and future NCS potential in China

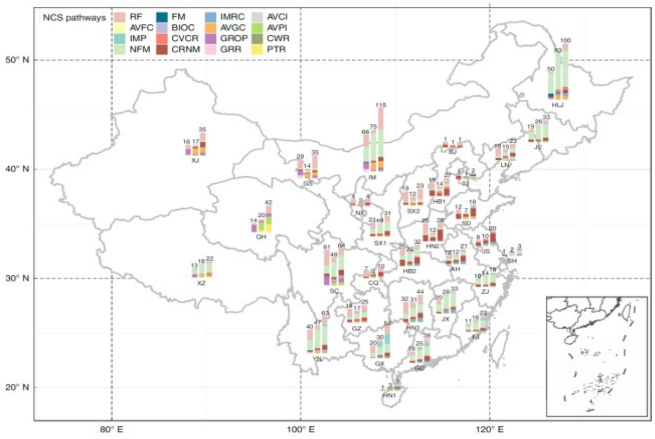

Figure2. Historical mitigation capacity and future NCS potential by each NCS pathway across the provinces of China

Natural climate solutions (NCS) are strategies for climate mitigation in the land sector that increase carbon storage or avoid GHG emissions. Here we estimate China's historic NCS mitigation at 0.6 (0.5–0.7) $PgCO_2e\ yr^{-1}$ (95% CI) during 2000–2020 (8% of fossil CO_2 emissions in the contemporary period). Through new NCS activities, the future maximum potential for NCS is projected at 0.6 (0.3–1.0) $PgCO_2e\ yr^{-1}$ (6% of fossil CO_2 emissions) during 2020–2030 and 1.0 (0.6–1.4) $PgCO_2e\ yr^{-1}$ during 2020–2060. Of the future NCS potentials, 26–31%, 62–65% and 90–91% can be achieved at mitigation costs of US$10, US$50 and US$100 $(MgCO_2e)^{-1}$, respectively. Thus, NCS can contribute substantially to China's Nationally Determined Contributions over the next 10 to 40 years but require a national strategy to reach climate goals and ensure co-benefits for people and nature. ■

Read More:
https://doi.org/10.1038/s41558-022-01432-3

Global assessment of nature's contribution to people

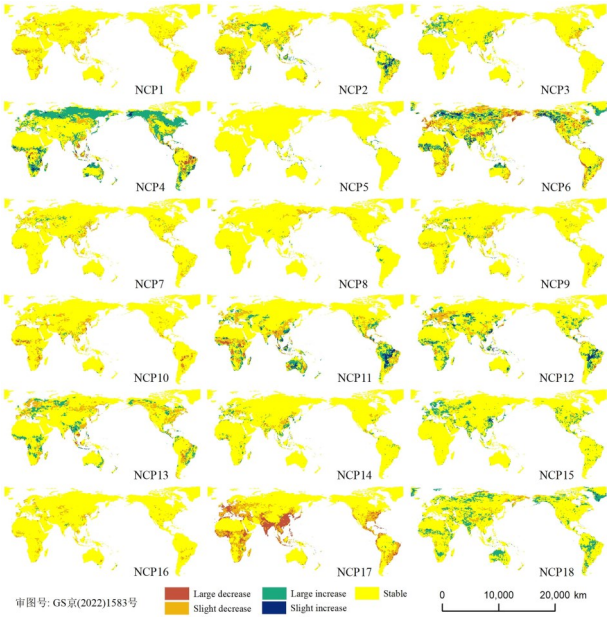

Figure. Spatiotemporal changes in NCPs from 1992 - 2018

Synergistically maintain or enhance the numerous beneficial contributions of nature to the quality of human life is an important but challenging question for achieving Sustainable Development Goals. However, the spatiotemporal distributions of global nature's contributions to people (NCPs) and their interactions remain unclear. We built a rapid assessment indicator framework and produced the first spatially explicit assessment of all 18 NCPs at a global scale. The 18 global NCPs in 1990 and 2018 were globally assessed in 15,204 subbasins based on two spatial indicator dimensions, including nature's potential contribution and the actual contribution to people. The results show that most of the high NCP values are highly localized. From 1992 to 2018, 6 regulating NCPs, 3 material NCPs, and 2 nonmaterial NCPs declined; 29 regulating-material NCP combinations (54 in total) dominated 76% of the terrestrial area, and the area with few NCPs accounted for 22%; and synergistic relationships were more common than tradeoff relationships, while the relationships among regulating and material NCPs generally traded-off with each other. Transitional climate areas contained few NCPs and have strong tradeoff relationships. However, the high synergistic relationship among NCPs in low latitudes could be threatened by future climate change. These findings provide a general spatiotemporal understanding of global NCP distributions and can be used to interpret the biogeographic information in a functional way to support regional coordination and achieve landscape multifunctionality for the enhancement of human well-being. ■

Read More:
https://doi.org/10.1016/j.scib.2023.01.027
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China Adopts Law on Yellow River Conservation

On 30 October 2022, the standing committee session of the National People's Congress (NPC) passed the law on the conservation of the Yellow River, as the country ramps up efforts to protect this important river. It will take effect on 1 April 2023.

After the Yangtze River Protection Law, this is the second piece of legislation directed towards a specific river basin and targets key problems of the Yellow River basin, including water shortages, ecological fragility and flooding.

To bolster ecological protection and restoration in the basin, the law stipulates that the country will prioritize the restoration of nature using the combination of natural and artificial restorative measures with the intensification of efforts for the comprehensive and systemic management of pollution sources in the Yellow River basin.

The law states that the country will make economical and intensive use of water resources in the Yellow River basin, with efforts made to promote water-efficient agricultural and industrial production, as well as water-saving urban activities.

According to the law, the country will construct flood-control systems in the mainstream and tributaries of the Yellow River that will achieve synergy between flood-control systems of interconnected basins.

It also stressed efforts to accelerate the green shift in development and to optimize regional economic structures and industrial activities for the protection of the river ecology, so as to boost the high-quality development of the Yellow River basin.

As a landmark piece of legislation in river-basin protection, the new law will provide solid support for promoting the ecological protection and high-quality development of the Yellow River basin in line with the rule of law.■

Read More:
https://english.news.cn/20221030/ccc5f681776e40cd9920b6b0d5a082d0/c.html

https://epaper.chinadaily.com.cn/a/202301/19/WS63c89ea8a310777689886169.html

China Releases Guideline on Water and Soil Conservation

On 3 January 2023, the general offices of the Communist Party of China Central Committee and the State Council released a guideline to strengthen the conservation of water and soil to promote the establishment of an ecologically aware and responsive society, geared for a balanced and sustainable development that features harmonious coexistence between humanity and nature. The guideline details targets for strengthening water and soil conservation by 2025 and 2035.

According to the Ministry of Water Resources, China has made consistent progress in reducing its land area affected by severe water and soil erosion in the past decade. The total area of eroded land across the country had decreased to about 2.7 million square kilometers by 2021, down by 274,900 sq km from 10 years ago.

By the end of 2021, 28 percent of China's land was affected by water and soil erosion to some extent. The country aims to see the proportion decrease to 27 percent by 2025 and to 25 percent by 2035, according to the guideline. ■

Read More:
https://www.chinadaily.com.cn/a/202301/13/WS63c0b33aa31057c47eba95b2.html

National Plan Aims to Push Back Desertification

On 3 January 2023, the State Council approved the National Desertification Prevention and Control Plan to do more to address the desertification. According to the plan, 6.7 million hectares of land affected by desertification will have been treated by 2025. By 2030, that figure is projected to reach 12.4 million hectares.

The plan has identified seven key areas where spreading deserts need to be pushed back, including the mountains of the Beijing-Tianjin-Hebei region, the areas around the Kubuqi Desert in the Inner Mongolia autonomous region and the Mu Us Desert in Shaanxi province.

In order to tackle desertification, the process through which once-fertile land turns into desert, the plan calls for recourse to science and technology to address the issue at its root, and for farmers and herdsmen to get involved in green means of utilizing light, heat, wind and remediating soil to improve their incomes. ■

Read More:
https://www.chinadaily.com.cn/a/202301/20/WS63c9eb15a31057c47ebaacc3.html

Professor Fang Wang Appointed Co-Editor-in-Chief of the Environmental Technology & Innovation Journal

On 23 December 2022, Elsevier announced that Prof. Fang Wang, a principal investigator (PI) at the Institute of Soil Science, CAS, has been appointed Co-Editor-in-Chief of the *Environmental Technology & Innovation* journal. According to the publisher's note, Prof. Wang's commitment to advancing scientific research will undoubtedly lead to significant contributions that will help solidify *Environmental Technology & Innovation*'s position as a highly reputable journal.

Prof. Wang also serves as Associate Editor of *Science of the Total Environment*, Academic Editor of *The Innovation*, and Editor of *Sustainable Horizons*. She is the Chair of the International Collaboration Working Committee of Soil Science Society of China (SSSC), Co-Chair of the working group of Collaboration between SSSC and Soil Science Society of America (SSSA), and a member of the International Panel on Chemical Pollution.

Environmental Technology & Innovation is now an open-access journal with an impact factor of 7.758 (2022). The journal focuses on a challenge-oriented approach to solutions that bring together excellent natural sciences, which underpins the development and application of technologies to understand and deliver a sustainable future. ■

Publisher's note on Prof. Fang Wang's appointment:
https://www.sciencedirect.com/science/article/pii/S2352186422004199?via%3Dihub

Journal homepage:
https://www.sciencedirect.com/journal/environmental-technology-and-innovation

Macro- and Microplastic Accumulation in Soil after 32 Years of Plastic Film Mulching

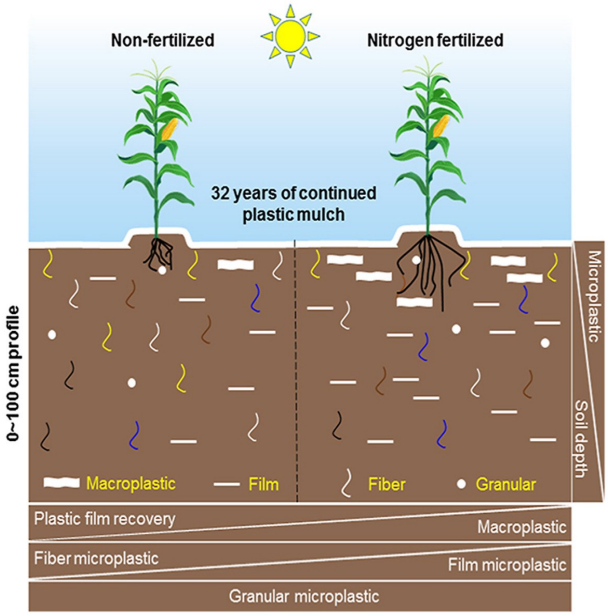

Figure. Schematic diagram of macro- and microplastic accumulation in soil after 32 years of plastic film mulching

Plastic film mulch (PFM) is a double-edged-sword agricultural technology, which greatly improves global agricultural production but can also causes severe plastic pollution of the environment.

Recently, Dr. Ding's research group from Shenyang Agriculture University systematically characterized and quantified the amount of macro- and micro-plastics accumulated after 32 years of continuous plastic mulch film use in an agricultural field. An interactive field trial was established in 1987, where the effect of plastic mulching and N fertilization on maize yield was investigated. The study showed that after the 32 years mulching, the amount of microplastics and film microplastics was about unexpectedly 10 and 2 times as abundant in the fertilized plots than in the non-fertilized plots, respectively. Macroplastics consisted mainly of films, while microplastics consisted of films, fibers and granules, with the films being from the plastic mulch films. Moreover, Plastic mulch films contributed 33%–56% to the total microplastics in 0–100 cm depth. The total number of microplastics in the topsoil (0–10 cm) ranged as 7183–10,586 particles/kg. In the deep subsoil (80–100 cm) the plastic concentration ranged as 2268–3529 particles/kg. These findings deepen our understanding that long-term use of plastic mulch films caused considerable pollution of not only surface, but also subsurface soil. ■

Read More:
https://doi.org/10.1016/j.envpol.2022.118945
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Characteristics of a Benchmark Loess-Paleosol Profile in Northeast China

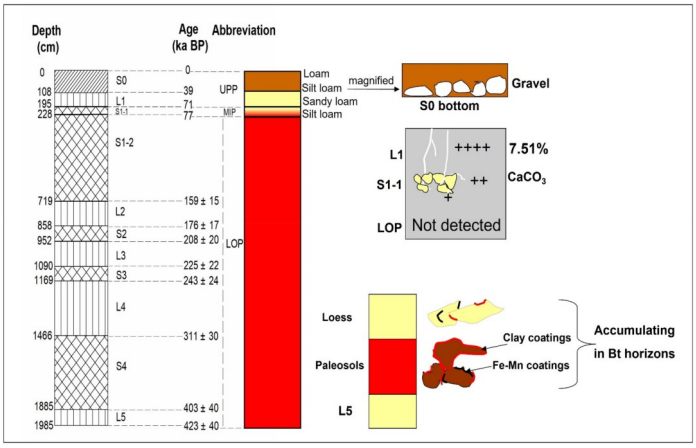

Figure. A schematic of the stratigraphy with corresponding time constraints and the schematic profile descriptions of the Chaoyang profile

The Chaoyang profile represents a rare multi-period, continuous and complete sequence of aeolian paleo-deposits with a stable sedimentary origin and multi-stage paleoclimatic cycles. Benchmark profiles including soil types at different pedogenic stages can be used for the recognition and classification of paleosols and paleoclimate reconstruction. The loess–paleosol sequence benchmark profile (LBP) is also helpful in comparing the results of paleoenvironment reconstruction from different ecological regions.

Recently, Dr. Sun's research group from Shenyang Agricultural University explored the characteristics of a Benchmark Loess-Paleosol Profile in Northeast China. A loess-paleosol profile derived from thick loess in Chaoyang city of Liaoning province, Northeast China, was investigated as a well-preserved LBP that included various paleosol types. To determine the nature and origin of the Chaoyang profile, the geographic, stratigraphic and morphological characteristics were described in the field. Bulk samples from 42 horizons were collected for chemical and physical analysis, and sub-sampling of 946 samples at 2 cm intervals from the surface to the bottom were taken to measure grain size distributions and magnetic susceptibility. Results showed that the 19.85 m thick loess–paleosol profile had been continuously deposited since 423 ka BP. The upper part (0–195 cm), or UPP, was predominantly of aeolian loess deposition origin but was mixed with water-reworked materials from a nearby secondary loess source. ►►

◄◄ The middle part (195–228 cm), or MIP, was also indirectly affected by the water-reworking process through the leaching of materials from the overlying UPP. The lower part (228–1985 cm), or LOP, was characterized by four reddish stratigraphic layers interbedded with five yellowish ones, indicating several types of paleosols developed under different ecological environments. The multi-stage paleoclimatic cycles as evidenced by morphological and physical characteristics as well as age dating and magnetic susceptibility correlated well with the Lingtai section and LR04 benthic $\delta^{18}O$. Because of these attributes, the Chaoyang profile can be deemed as a benchmark loess–paleosol profile for the recognition and classification of paleosols and paleoclimate reconstruction in Northeast China. The differences in morphological and physical properties between paleosols and loess suggest different soil fertility and agronomic properties and need further studies to assess their functionality with climate fluctuation. ■

Read More:
https://doi.org/10.3390/agronomy12061376
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The fungal feeding channel of soil micro - food web contributes to transformation of exogenous C into soil C - A ^{13}C labeling microcosm experiment

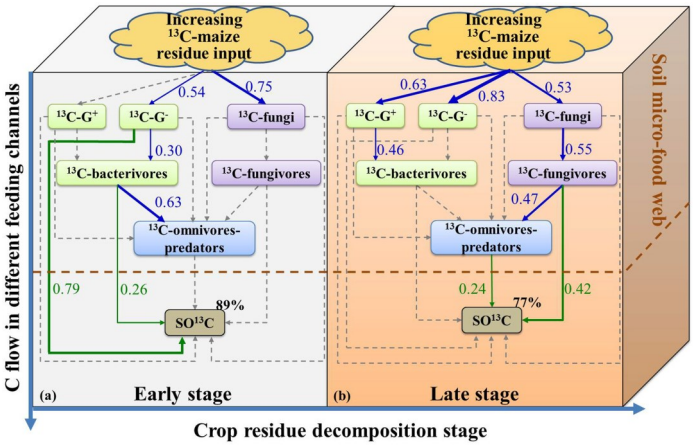


Figure. Structural equation models of ^{13}C flow through soil micro-food webs into soil organic carbon under increasing organic input at two incubation stages ((a) early stage and (b) late stage

Plant residue is an important carbon (C) source for soil communities that motivates underground C cycling. However, the effects of plant residue quantity on the structure of the soil micro-food web and the transformation of exogenous C within the micro-food web after increasing organic input are not known. Thus, a microcosm experiment was carried out to investigate the responses of soil micro-food web (including microorganisms and nematodes) to different amounts of ^{13}C-labelled maize residue addition treatments [without residue addition, 1/3 (1/3R), 2/3 (2/3R) and total residue addition (R)]. The abundances of residue ^{13}C in CO_2 ($^{13}CO_2$), soil organic C ($SO^{13}C$), microorganisms (^{13}C-microorganisms) and nematodes (^{13}C-nematodes) were determined after 1, 7, 35 and 84 days. Increasing organic input changed the micro-food web composition and increased the amount of ^{13}C-bacteria, ^{13}C-fungi and ^{13}C-fungivores but not ^{13}C-bacterivores. The result of the ^{13}C-based network showed that bacterivores were positively correlated with omnivores-predators at the early stage after increasing organic input, while fungivores were at the late stage. Greater $^{13}CO_2/SO^{13}C$ but lower $SO^{13}C$/total ^{13}C input ratios were found in the R than in the 1/3R treatment at the early stage. At the late stage, the R treatment decreased both $^{13}CO_2$/total ^{13}C input and $^{13}CO_2/SO^{13}C$ ratios. We concluded that increasing organic input strengthened the trophic interactions between microorganisms and nematodes. The transformation of exogenous C from bacteria to bacterivores might accelerate the turnover of soil C pool, however, the C flow from fungi to fungivores and then to omnivores-predators could contribute to the exogenous C sequestration in soil. ■

Read More:
https://doi.org/10.1002/ldr.4472

Hematite-mediated Mn(II) abiotic oxidation under oxic conditions: pH effect and mineralization

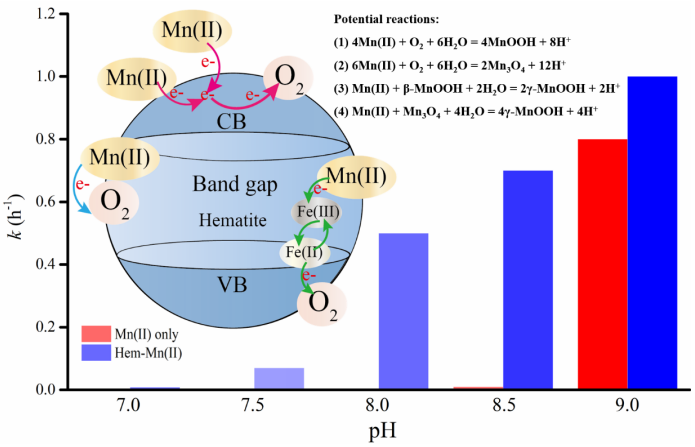


Figure: Schematic diagram of pH-dependent abiotic oxidation of Mn(II) on hematite surface under oxic conditions

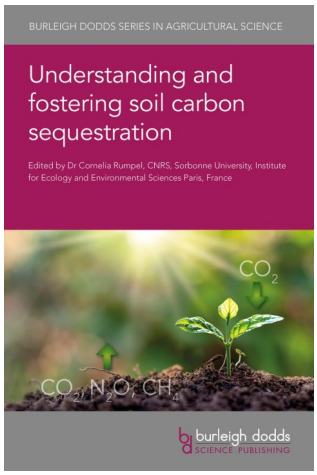
Interactions between manganese (Mn) and iron (Fe) are widespread processes in soils and sediments, however, heterogeneous Mn(II) oxidation on hematite surface under circumneutral and alkaline conditions is not fully understood.

Recently, Dr. Liu's research group from Institute of Eco-environmental and Soil Sciences, Guangdong Academy of Sciences systematically explored Mn(II) oxidation on hematite at various pH under oxic conditions. Mn(II) oxidation rates increased from 3×10^{-4} to 8×10^{-2} h^{-1} as pH increased from 7.0 to 9.0, whereas hematite enhanced Mn(II) oxidation rates to 1 h^{-1}. During oxidation process, high pH could promote the oxidation of Mn(II) into Mn minerals, resulting in the rapid consumption of the newly-formed H^+, and high pH could also facilitate Mn(II) adsorption and oxidation by altering Mn(II) reactivity and speciation. A co-shell structured nanowire composed of manganite and feitknechtite was observed owing to autocatalytic reactions. Specifically, the electron transfer between Mn (II) and O_2 occurred on the surface or through bulk phase of hematite, and the direct electron transfer in the O_2-Mn(II) complex and the indirect electron transfer in the O_2-Fe(II/III)-Mn (II) complex may both have contribution to the overall reactions. The findings provide a comprehensive interpretation of Fe-Mn interaction and have implications for interpreting the formation of soil Fe-Mn oxyhydroxides with unique properties for controlling element cycling. ■

Read More:
https://doi.org/10.1016/j.jcis.2023.01.034
©*Journal of Colloid and Interface Science*

Understanding and fostering soil carbon sequestration

Editor: Cornelia Rumpel



This book reviews the wealth of studies on soil carbon sequestration from the microscale to the profile and landscape scales. The authors summarize our current understanding of soil carbon sequestration concerning the regulating processes, measurement, reporting and verification (MRV), management practices and their potential applications in socio-economy, law and policy. This book provides valuable guidance to both soil researchers and policy makers, and is helpful for the better management of global soil carbon resources. The book has been published by Burleigh Dodds Science Publishing (the United Kingdom, ISBN-13 978-1786769695) in October 2022. ■

Upcoming Event

SSSA-SSSC Joint Webinar on Soils and Climate Change

Cross-cultural and international scientific cooperation is essential as we face global issues of climate change, food security and the need for environmental restoration. We have much to learn from scientists around the world, and our efforts will be strengthened and more effective when soil scientists are working together. To promote such collaboration and communication in soil science, the Joint Working Group of SSSA and SSSC is pleased to announce the first scientific meeting jointly sponsored by the two societies.

All are invited to attend the webinar!

Please click the below link to register and attend the conference for free.

Webinar link
(registration is required):
https://www.soils.org/education/SSSA-SSSC-Joint-Webinar/

Link for Live Broadcast
SSSA-SSSC Joint Webinar on Soils and Climate Change (koushare.com)

(Scan Code)

Date (U.S. Central Time): 22 February 2023, at 18:30-20:40 PM
Date (China Time): 23 February 2023, at 8:30-10:40 AM

Organizing Committee:
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Xiaoyuan Yan
Sabine Grunwald
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http://en.csss.org.cn/newsinfo/813080.html