



# HOT NEWS

ISSUE 10, 2023



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 **ISSUE 10 2023**



## CONTENTS

<b>World Soil Day</b>	<b>01-02</b>
<b>IRTCES Delegation visited UNESCO Beijing Office</b>	<b>03-04</b>
<b>The First Webinar for ISWCR Special Issue was Held</b>	<b>05</b>
<b>The 9th International Symposium on Gully Erosion was Held</b>	<b>06-10</b>
<b>The 1st International Conference on Sustainable Mountain will be Held</b>	<b>11</b>
<b>A New Mass Balance Model Found to Improve <sup>137</sup>Cs Technology for Soil Erosion Estimation</b>	<b>12-13</b>
<b>Desert Areas Transformed into Lush Landscapes</b>	<b>14-16</b>

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## World Soil Day



### Key messages WSD 2023

(1) Soil and water are essential resources for sustaining life on Earth.

- ◇ Soil and water provide the foundation for food production, ecosystems, and human well-being. Recognizing their invaluable roles, we can take proactive measures to safeguard these resources for future generations.
- ◇ Soil erosion and compaction disrupt the capacity of soil to store, drain and filter water, and exacerbates the risk of flood, landslides and sand/dust storms.
- ◇ Soil and water are the medium in which plants grow and obtain essential nutrients.
- ◇ Healthy soil plays a crucial role as a natural filter, purifying and storing water as it infiltrates into the ground.
- ◇ Rainfed agriculture systems account for 80 percent of croplands, contributing to 60 percent of the global food production. These systems rely heavily on effective soil moisture management practices.
- ◇ Irrigated agriculture systems withdraw 70% of the world's freshwater and account for 20 percent of croplands.

(2) Soil and water are interconnected resources that need integrated management.

- ◇ The health of the soil and the quality and availability of water are interconnected.

- ◇ Implementing sustainable soil management practices enhances water availability for agriculture. Healthy soils, enriched with organic matter, play a crucial role in regulating water retention and availability.
  - ◇ Efficient use of quality water, promoting the sustainable use of fertilizers and pesticides, employing appropriate irrigation methods, improving drainage systems, controlling pumping, and monitoring soil and groundwater salinity levels are essential to maintaining sustainable agricultural practices.
  - ◇ Sustainable soil management is key to improve water productivity in irrigated systems.
- (3) Improper soil and water management practices affect soil erosion, soil biodiversity, soil fertility, and water quality and quantity.
- ◇ Water scarcity leads to the loss of soil biodiversity, while leaching and eutrophication from agriculture practices lead to the loss of biodiversity in water bodies.
  - ◇ The mismanagement of pesticides and fertilizers not only threatens soil and water quality but also poses significant risks to human health and ecosystems.
  - ◇ Poor irrigation and drainage practices are some of the main drivers of soil salinization.
  - ◇ Rising sea levels contribute to land loss, increasing the risk of soil salinization and sodification, which can negatively impact agricultural productivity.
- (4) Soil and water conservation contribute to climate change mitigation and adaptation.
- ◇ Improved soil and water management improves the land's capacity to withstand extreme climate events such as droughts, floods and sand/dust storms.
  - ◇ Integrated soil and water management practices provide essential ecosystem services, supporting life on earth and enhancing ecosystem resilience.
  - ◇ Healthy soils act as a carbon sink, by sequestering carbon from the atmosphere, thus contributing to both climate change adaptation and mitigation efforts.

From: <https://www.fao.org/world-soil-day/key-messages/en/>

## IRTCES Delegation visited UNESCO Beijing Office

On November 21st, the IRTCES Delegation visited the UNESCO Beijing Office for a discussion and exchange. Mr. Shahbaz Khan, Director of UNESCO Beijing Office and Director of Multisectoral Regional Office for East Asia, and Ms. Ai Suguira, Program Officer of Natural Sciences Division, attended the meeting. Prof. Zhang Jianjian, Deputy Director of the IRTCES, and relevant persons in charge of the Secretariat, the Research and Training Division, the Division of International Exchange and Information, and the Division of International Cooperation of the IWHR attended the meeting.

Prof. Zhang thanked UNESCO for its strong

support and assistance to both IWHR and IRTCES. He introduced the achievements of the IRTCES and the progress of the preparation of the 40th anniversary series of activities. In recent years, focusing on the development strategy of UNESCO, it has undertaken a large number of consulting and service projects in the fields of soil erosion and sediment management, hosted academic conferences and trainings, and promoted the distribution of academic journals, data collection and dissemination, popularization of science as well as capacity building, etc., so as to closely cooperate with UNESCO.



Director Shahbaz Khan congratulated the achievements of IWHR and IRTCES in water-related international cooperation, made suggestions on the positioning and development of IRTCES, expressed his full support for the preparatory work related to the 40th anniversary series of activities, and looked forward to IWHR and IRTCES to play a leading role in the development of UNESCO's International Hydrological Programme (IHP).

Ms. Ai Sugiura introduced the overall operation of UNESCO category II water-related centers, congratulated IRTCES on its fruitful achievements, and hoped that communication and cooperation would be further strengthened under the framework of UNESCO's medium- and long-term strategic priorities.

Prof. Liu Cheng introduced the case studies, education and capacity building carried out by the International Sediment Initiative (ISI), the flagship programme of the Intergovernmental Hydrological Programme (IHP), as well as the latest progress made under the framework and strategic update of the flag-

ship programme of the ninth phase of the IHP.

Prof. Du Pengfei introduced the progress and next step plan of the global soil erosion and river sediment data collection from the perspectives, data source, data processing and data display.

Dr. Meng Yuan introduced the cooperation of IWHR with UNESCO in the field of youth water science education. Taking the multilingual publication of Water Knowledge Reader as an opportunity, a series of activities have been carried out to bring high-quality water science popularization education resources to more than 50 teachers and 200 primary school students in Kenya, Cambodia and other countries.

Both sides had in-depth exchanges on the strategic position of IHP Phase IX, the role played by ISI, open science and open data, data collection and publication channels, water science education outreach and preparation for the series of activities for the IRTCES 40th anniversary.

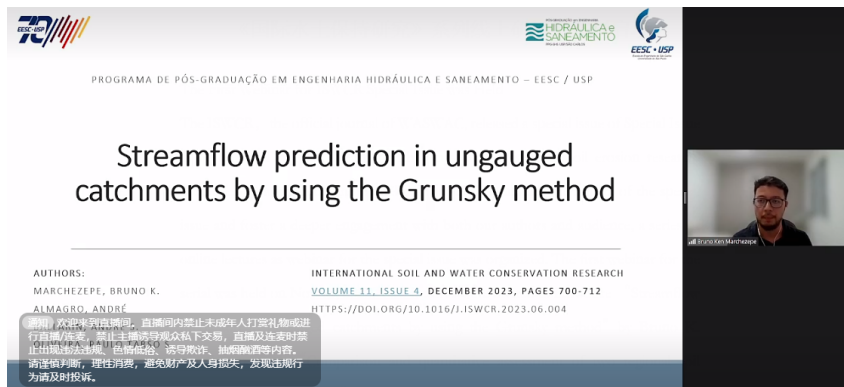


## The First Webinar for ISWCR Special Issue was Held

The ISWCR, the official journal of WASWAC, released a special issue of Special Issue in Honor of Dr. Mark Nearing with focus on Advances in soil erosion research: processes, measurement, and modeling. In order to enhance the impact of the special issue and foster a deeper engagement with both our authors and audience, a series of online lectures as webinar for the special issue was organized. The first webinar for the serial was held on Nov 15, 2023. Two lectures were invited to introduce “Streamflow prediction in ungauged catchments by using the Grunsky method” by Bruno K. Marchezepe and “Comparison and quantitative assessment of

two regional soil erosion survey approaches” by Prof. Baoyuan Liu.

The webinar was hosted by Dr. Viktor Polyakov, researcher at the Southwest Center for Watershed Research and associate editor of ISWCR, with technical support provided by KeAi, the journal's online publisher, and was broadcast live online through Zoom and synchronized with KeAi Academic Video, Keyan-Cloud and KouShare Live Platform. The webinar received a warm response from the global editorial team of ISWCR, authors, readers and soil and water conservation researchers, with 45 on-site interactions and 17,858 live broadcasts.



## The 9th International Symposium on Gully Erosion was Held

The 9th International Symposium on Gully Erosion was successfully held in Chengdu, China during November 3rd to 9th.



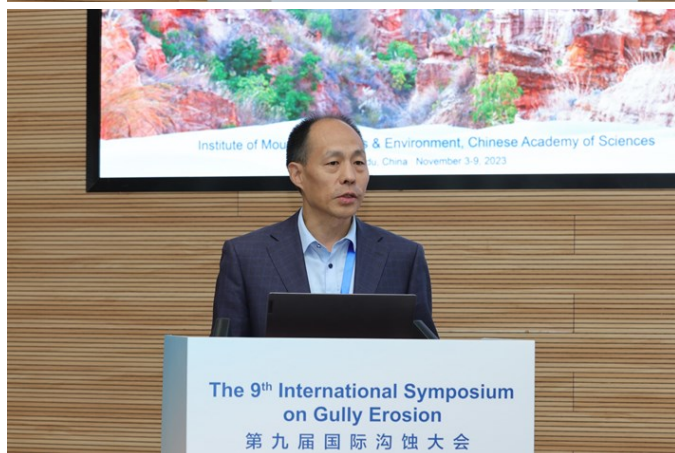
*Group Photo*

Professor Scott Wilkinson, Chairman of the 8th International Symposium on Gully Erosion, Professor Duihu Ning, President of the World Association of Soil and Water Conservation (WASWAC), Professor Hao Feng, Vice President of the Chinese Society of Soil and Water Conservation, and Professor Lijun Su, Vice Director of the Institute of Mountain Hazards and Environment, CAS, were invited and delivered speeches at the conference. The conference was graced by the presence of esteemed scientists such as Professor Rui Li, Honorary Chairman of the World Association of Soil and Water Conservation; Professor Xinbao Zhang, Former Vice Chairman of the International Commission on Continental Erosion; Professor Xiaobing Liu, Chairman of the ANSO-World Mollisols Association; Professor Yonggang Ge, Director of the Science and Technology Department in the Institute of Mountain Hazards and Environment; Professor Xiaodan Wang, Deputy Director of the Key Laboratory of Mountain Environment Evolution and Regula-



tion, CAS; and Professor Chaojun Ouyang, Director of the Key Laboratory of Mountain Hazards and Earth Surface Processes, CAS. The opening ceremony was presided over by Professor Donghong Xiong, Chairman of the conference from the Institute of Mountain

Hazards and Environment. Over 220 experts and scholars from China, Australia, Spain, Belgium, the United States, Germany, Japan, and other countries and regions, have been involved in this conference.



*Speech given by Professor Lijun Su, Vice Director of Institute of Mountain Hazards and Environment, Professor Scott Wilkinson, Chairman of the 8th International Symposium on Gully Erosion, Professor Duihu Ning, the President of the WASWAC, Professor Hao Feng, Vice President of the Chinese Society of Soil and Water Conservation, and Professor Donghong Xiong, from Institute of Mountain Hazards and Environment*

The conference focused on the theme of "Towards Deepening and Integration: Research on Gully Erosion under Global Environmental Change". Keynote speakers who were invited include Professor Scott Wilkinson from Australia's national science agency CSIRO, the Commonwealth Scientific Industrial Research Organization, Professor Fenli Zheng from Northwest A&F University of China, Professor Javier Casalí from Public University of Navarra, Professor Xingyi Zhang from the Northeast Institute of Geogra-

phy and Agroecology, CAS, China, and Professor Michael Maerker from the Leibniz Centre for Agricultural Landscape Research (ZALF), Germany, Professor Matthias Vanmaercke from the University of Leuven, Belgium, Professor Chongfa Cai from Huazhong Agricultural University of China, and Professor Robert Wells from the US Department of Agriculture, who shared the international frontiers and latest advancements in gully erosion research around the world.

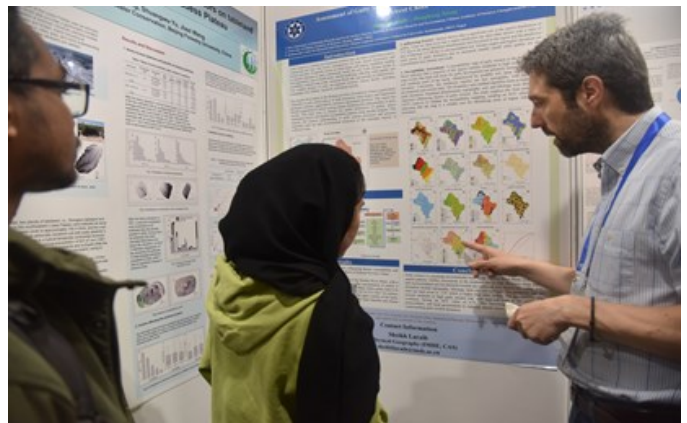


*Some keynote reports of the conference*



Simultaneously, the conference organized five specialized seminars focused on academic topics, two seminars only for graduate students, and a special poster exhibition. The topics encompassed "Innovative field and laboratory techniques and approaches to gully erosion research" "Gully development character-

istics, controlling factors, and erosion impacts" "Gully erosion processes and mechanisms" "Gully erosion modeling and prediction" and "Gully erosion control, land management, and their social-economic impacts", over 100 participants have been involved.



*Experts and scholars attending the meeting actively exchanged ideas.*

During the closing ceremony, the prestigious award was conducted to recognize graduate students who demonstrated excellence in their research presentations.

A post-conference tour has also been arranged for all participants. The gully control project in the Wenchuan earthquake-affected region

and the development of gully erosion in the Yuanmou dry-hot valley, have been investigated.

The International Symposium on Gully Erosion is a regular international conference sponsored by the International Association of Geomorphologists. Since its inception at



Leuven University in 2000, subsequent sessions have been held in the United States (2000), China (2002), Spain (2004), Poland (2007), Romania (2010), the United States (2016), and Australia (2019).

The conference was strongly supported by the

Bureau of International Cooperation of China Academy of Sciences, and was hosted by Institute of Mountain Hazards and Environment, CAS, and jointly organized by Forestry College of Sichuan Agricultural University and ANSO-World Mollisols Association.



*Award ceremony for outstanding graduate reports*



*Scientific investigation of Yuanmou dry-hot valley*

## The 1st International Conference on Sustainable Mountain will be Held




  
 دانشگاه محقق اردبیلی
   
 University of Mohaghegh Ardabili

اولین کنفرانس بین المللی  
**کوهستان پایدار**  
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وبسایت کنفرانس / Website  
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 December 11 & 12, 2023  
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 Paper Submission Deadline: December 6, 2023

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## A New Mass Balance Model Found to Improve $^{137}\text{Cs}$ Technology for Soil Erosion Estimation

Long-term monitoring of soil erosion is costly and labor-intensive. Radionuclide tracer technique has attracted extensive concern in soil erosion estimation, among which,  $^{137}\text{Cs}$  tracer has been widely used. Mathematical models are thus needed to convert measured  $^{137}\text{Cs}$  stock to soil loss or gain rates for a specific sampling site. However, because of the lack of rigorous validation of the model performance and assumptions, the applicability of the  $^{137}\text{Cs}$  erosion estimation technique is still seriously questioned.

For the sake of validating an assumption of the homogeneous  $^{137}\text{Cs}$  transfer and a key process which is overlooked in the theoretical models as well as improving the accuracy of the conversion models, Prof. Xunchang John Zhang, a researcher at the USDA-ARS Oklahoma and Central Plains Agricultural Research Center, evaluated the performance of the widely used empirical and theoretical conversion models using long-term measured soil loss data in two small watersheds (respectively referred to WS109 and WS118 in the study). On this basis, Prof. Zhang further developed an improved mass balance model that include the dynamic uptake of  $^{137}\text{Cs}$  by

suspended sediment in surface runoff and losses of  $^{137}\text{Cs}$  in both runoff solution and uptake by plants.

“All theoretical models overpredicted the net soil erosion rates by at least 400% for both watersheds. Whereas, the new model greatly improves soil erosion estimation with a mean relative error of 33%, which is comparable with those of the empirical models” explained Xunchang Zhang. “Large discrepancies between the measured and predicted  $^{137}\text{Cs}$  depletions clearly indicate that the mass of the  $^{137}\text{Cs}$  isotope is not conserved or balanced, demonstrating that a key process of  $^{137}\text{Cs}$  outflux was overlooked as a result of the invalid assumption” he added.

The data of the study also revealed that the finer monthly scale did not improve the  $^{137}\text{Cs}$  prediction over the annual scale, suggesting that the annual scale is sufficiently accurate for simulating soil redistribution with  $^{137}\text{Cs}$  given the inherent uncertainty in other aspects of the technique, such as parameter estimation.

This work, then, supports that the dynamic uptake of  $^{137}\text{Cs}$  by suspended sediment is a critical pathway controlling  $^{137}\text{Cs}$  loss and



redistribution during transfer. The failure to represent this key process in all existing theoretical models leads to a general overestimation of soil loss rates. The inclusion of this key process in the new mass balance model improves soil loss estimation considerably.

A notable finding of the study is the enhanced  $^{137}\text{Cs}$  loss by suspended sediment and solution loss during fallout as well as loss by plant uptake are, in theory, applicable to other fallout radionuclides such as  $^{210}\text{Pb}$  and  $^7\text{Be}$ , which have been widely used in soil erosion

estimation.

The research is published in the journal *Earth-Science Reviews*.

More information: Xunchang John Zhang, Evaluating and improving  $^{137}\text{Cs}$  technology for estimating soil erosion using soil loss data measured during 1954–2015, *Earth-Science Reviews* (2023).

DOI: [10.1016/j.earscirev.2023.104619](https://doi.org/10.1016/j.earscirev.2023.104619)

## Desert Areas Transformed into Lush Landscapes

URUMQI — Nestled deep in the heart of the Taklimakan Desert, often referred to as the "place you can enter but can't exit" in the Uyghur language, lies an extraordinary botanical garden.

The Taklimakan, China's largest desert, is also known as the "Sea of Death" and has remained an inhospitable land for a long time. Yet the Tazhong botanical garden, sprawling across more than 20 hectares, is home to over 230 plant species.

The architects of this botanical marvel are a

group of dedicated researchers. Thanks to their unwavering efforts, the ecological environment of the desert has undergone fundamental transformations.

In 1991, the researchers established a botanical testing base on the fringe of the desert to conduct pioneering experiments on cultivating plants through saline-alkali water irrigation, according to Chang Qing, the senior engineer at the Xinjiang Institute of Ecology and Geography under the Chinese Academy of Sciences who designed the Tazhong botanical garden.



*A Chinese technician (right) guides a group of visitors from Africa at the Tazhong botanical garden, Xinjiang Uygur autonomous region, on June 16. ZHOU SHENGBIN/XINHUA*

Three years later, as the desert road extended into the heart of the Taklimakan in Tazhong township, researchers from the institute relocated their research base to this remote location.

Decades have passed, and what was once barren land has transformed into lush forests. The plants cultivated here have not only contributed to ecological protection efforts across Xinjiang but have also ventured beyond borders, supporting desertification control projects in Africa, Central Asia and other regions. On the northern edge of the Taklimakan lies the Aiximan Lake area, located in Awat county, Aksu prefecture. Previously plagued by desertification, soil erosion and wetland degradation, the lake area in the western part of the Aksu River Basin was once inundated by windblown sand.

Today, it is a lush landscape, with expansive forests standing tall and lucid rivers meandering along the forest perimeter.

The transformation began in 2021 with Aksu's ecological restoration and desertification control project. Harnessing recycled water resources from the prefecture and Wensu county, the project utilized artificial irrigation as its central strategy to establish an ecological protection forest. This was complemented by the cultivation of economic and timber forests.

The region regenerates approximately 50 million cubic meters of water annually, supporting the irrigation needs of more than 33,000 hectares of ecological restoration forests.

"Sandstorms no longer plague Aksu like before. The number of dusty days has diminished in several of our towns, leading to a reduction in areas affected by sand and dust," said Jiang Lili, deputy director of Awat county's forestry and grassland bureau.

"Most importantly, we no longer experience sandstorms."

Moving farther south to the edge of the Taklimakan in Lop county, Hotan prefecture, one can witness the production of green energy. The Lop photovoltaic power station, with a total capacity of 200 megawatts, began operating in February.

Operated by the State Power Investment Corporation, the power station is estimated to produce an average output of 360 million kilowatt-hours annually, equivalent to saving 110,000 metric tons of standard coal and reducing carbon dioxide and nitrogen dioxide emissions by 330,000 tons and 1,300 tons, respectively.

"Located at a relatively low latitude, this area enjoys long hours of sunshine, with hardly any rainfall throughout the year," said Tian Juxiong, the station manager.



The vast expanse of golden sands in the Taklimakan is slowly evolving into a powerful catalyst for sustainable development in Xinjiang.

Desert tourism has become another testament to the shifting mindset of people in southern Xinjiang.

Makit county in Kashgar prefecture serves as the "gateway" to and from the Taklimakan, boasting one of the most abundant desert tourism resources in China. Thousands of adventure enthusiasts flock here from May to

the end of October each year.

According to data from the regional culture and tourism department, during this year's May Day holiday, Xinjiang received about 8 million tourists, a 141 percent increase compared to the previous year, and achieved tourism revenue of 6 billion yuan (\$840.62 million), up 192 percent year-on-year.

Details at:

<https://www.chinadaily.com.cn/a/202310/24/WS65372656a31090682a5ea57b.html>

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