WASWAC

HOT NEWS

ISSUE 12, 2022

HOT NEWS

ISSUE 12 2022

WASWAC

CONTENTS

Editors: Pengfei DU & Silian PAN

WASWAC President's New Year's Message of 2023

Dear WASWAC Councilors, Advisors, Regional Representatives, and all members,

We celebrate the end of 2022 and the beginning of 2023. This is always a hopeful time, although 2022 was difficult for many of us, under the influence of COVID-19. Fortunately, it is about time to go back to our normal life after numerous efforts in the last 3 years. We must look back on this period with the knowledge that brighter days are ahead of us, and remember that where you are now is not where you will always be. Each of us should have the courage and determination to face everything in life although the challenges is still great.

During 2022, we received the latest impact factor 7.481 for our official journal - the International Soil and Water Conservation Research (ISWCR), we drafted 12 issues Hot News to report the WASWAC news and the erosion related events over the world, we organized the International Workshop on Soil Erosion and Riverine Sediment in Mountainous Regions with other sister organizations, and also prepared the 5th WASWAC World Conference, which will be held in June 19-23, 2023 in Olomouc Czech Republic under the strong support of Czech Society of Soil Science.

As the first session international conference after the pandemic, our 5th WASWAC World Conference will provide all of you a good opportunity to have face to face exchange. We hope to have chance to meet you during the offline meeting. The updated announcement with more details will be released very soon, any queries please do not hesitate to let us know timely.

With the arriving of 2023, I would like to express my sincere thanks and to express my best wishes to all of you and all your families. Wishing you all a happy, healthy and prosperous New Year!

Duihu Ning
The President of WASWAC

The 5th WASWAC World Conference will be held in June 19-23, 2023

June 19-23, 2023

Palacký University, Olomouc, Czech Republic

The conference aims are:

◇ To analyse the present and future situation of soil and water conservation on a worldwide scale while taking local specifics into consideration.

◇ To analyse the effects of population growth, human activity and climate change on soil and water in the context of the demands of sustainable farming, water and food supply.

◇ To promote and increase collaboration between scientific organisations, policymakers, the general public and practitioners.

◇ To design goals, strategies and directions for conservation of soil and water as basic irretrievable natural resources for current exploitation and the needs of future generations.

Contact:

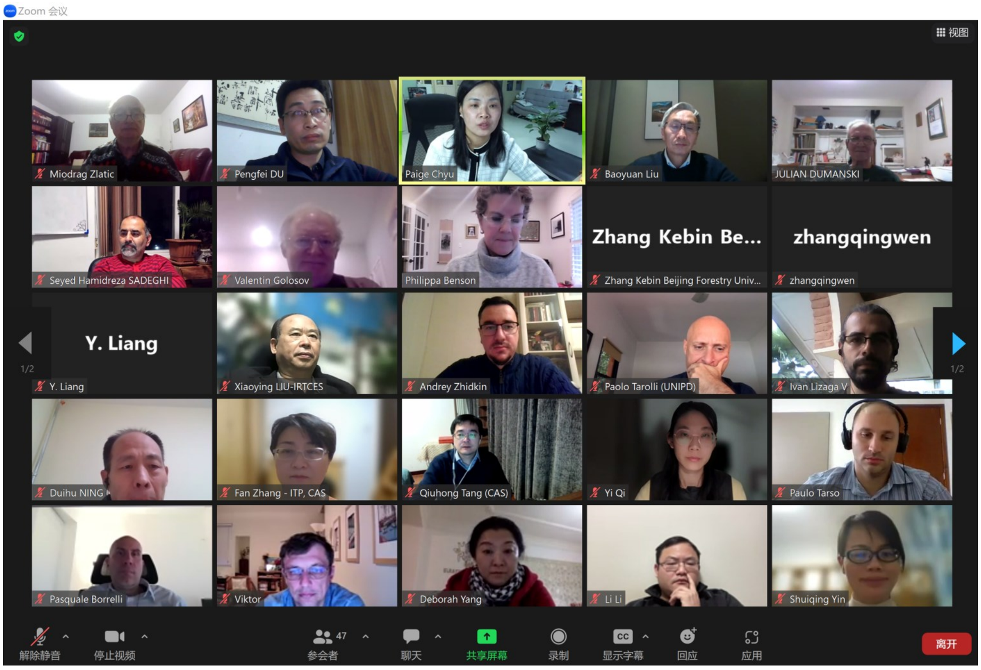
Prof. Bořivoj Šarapatka, Palacký University Olomouc,
e-mail: borivoj.sarapatka@upol.cz
Dr. Jana Konečná, Research Institute for Soil and Water Conservation, Prague,
e-mail: konecna.jana@vumop.cz
Dr. Pengfei DU, the Secretariat of WASWAC
E-mail: waswac@foxmail.com

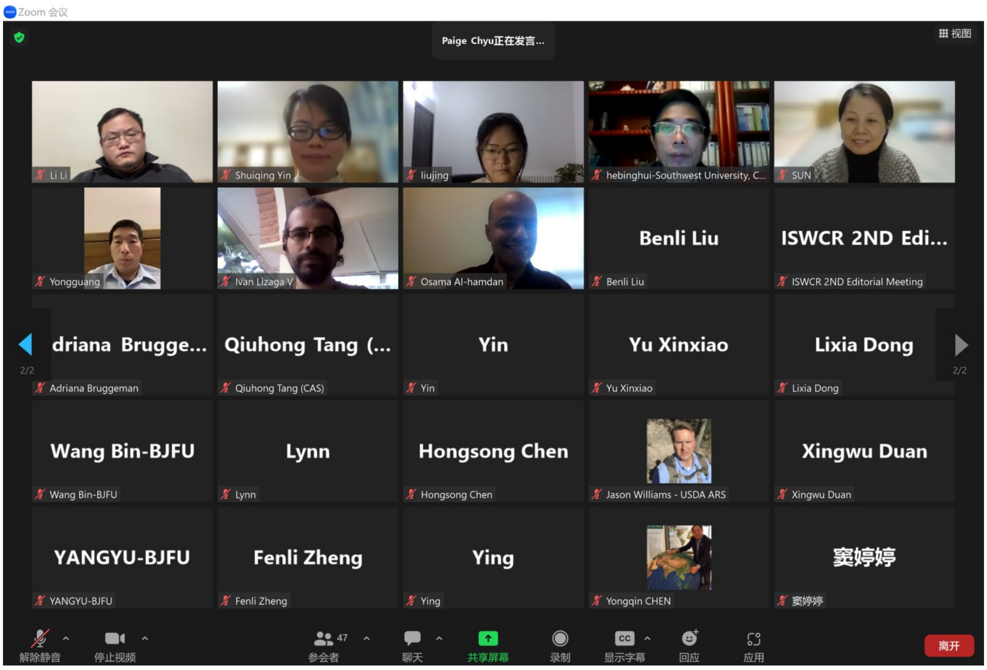
Please pay your attention to our detailed announcement that will be released in January, 2023.

Welcome to attend this conference onsite in beautiful Czech, see you there then!

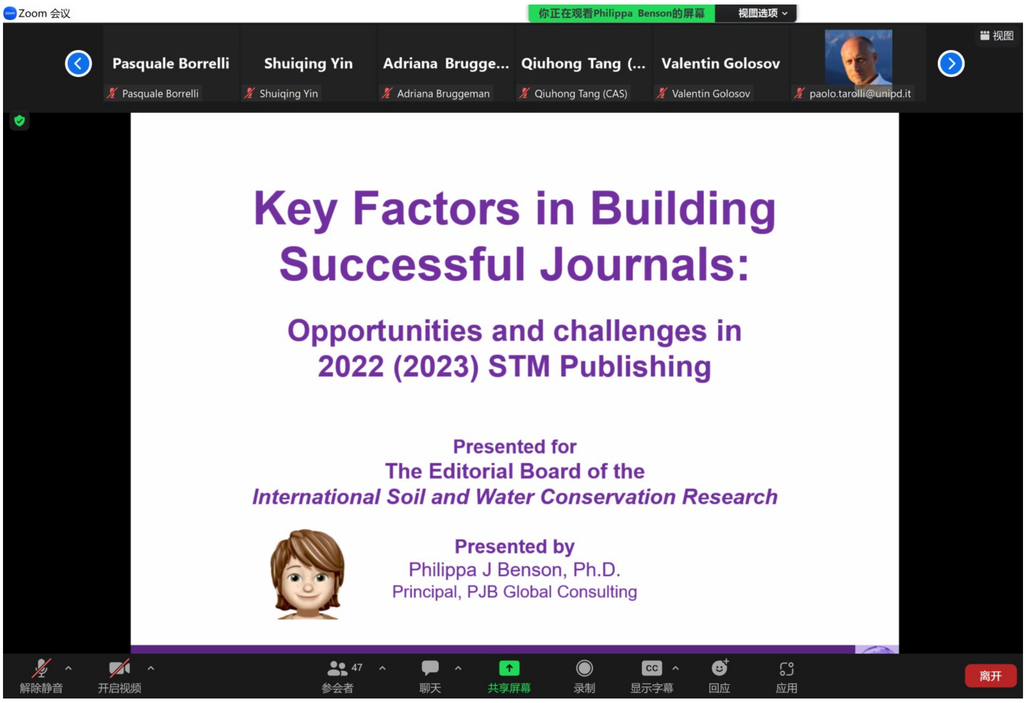
WASWAC Official Journal - ISWCR 2nd Editorial Meeting was Held

The second ISWCR Editorial Board meeting was successfully held on December 15, 2002. Totally 47 Participants attended this meeting, including Editors-in-Chief, President and representatives of WASWAC, Assistant Editors, Scientific Editors, Guest for an invited lecture, Invited representatives of the Publisher, the journal Advisors, Associate Editors, and Board Members.





In the beginning of the meeting, Prof. Duihu Ning, the President of WASWAC, and Prof. Baoyuan Liu, the Editors-in-Chief of ISWCR，both gave warm welcome speeches. Then Dr. Paige Chyu, the executive editor of the journal, reported journal performance summary and progress in 2022. In the invited lecture, Dr. Philippa Benson was invited to present with title of "Key Factors in Building Successful Journals: Opportunities and challenges in 2022 (2023) STM Publishing". Following some discussions on establishing database for high-impact articles, frequently asked questions to post on the website and plans for celebrating the tenth anniversary of ISWCR, were moderated by Prof. Miodrag Zlatic, Prof. Paolo Tarolli, and Dr. Li Li. Closing remarks was made by Prof. Julian Dumanski, the Advisor of ISWCR, and also the Vice President of WASWAC.



The invited speech presented by Dr. Philippa Benson

ISWCR is planning to organize regular Editorial Meetings to strengthen communications among board members. In 2022, two meetings in April and December were organized, respectively. Such meetings are going to be held twice a year in the future. We believe that such meeting must bring us more opportunities to face to face exchange useful ideas concerning the running and development of the Journal, so we hope that our board members can join us at the meeting once a year at least.

78th SWCS International Annual Conference

The Soil and Water Conservation Society (SWCS) is seeking oral presentations, posters, symposia, professional development sessions, and workshops for the 78th SWCS International Annual Conference, taking place in **Des Moines, Iowa, August 6-9, 2023.**

Submission deadline: *February 15, 2023*

The conference will assemble a diverse, multi-generational conservation community of researchers, practitioners, industry leaders, farmers, and students from around the world in Des Moines, Iowa, where the Soil and Water Conservation Society was founded 78 years ago and is still headquartered today. The agenda will feature the latest ideas, technologies, and practices, and foster a dialogue around their adoption. Through workshops, sessions, symposia, tours, exhibits, and demonstrations, cutting-edge research and practice developments in soil health, water quality, and resource management will be shared. Scientists and practitioners will present their work at the field, farm, and watershed scale across an array of private and public arenas. Applications of social theories and examples of successful outreach and education will enable attendees to identify ways to scale up localized successes. Participants will also hear about policy and economic developments that build a framework to increase conservation adoption and support future generations.

The 78th SWCS International Annual Conference is a one-of-a-kind opportunity to connect with a uniquely targeted group of conservation and environmental professionals. Becoming an exhibitor or sponsor gives you an affordable opportunity to market your products and services to a key audience and maximize your organization's exposure. Put your brand in front of those who are directly involved in the decision-making process of purchasing products and those who influence prospective buyers and conservationists.

For more information: *https://www.swcs.org/events/conferences/2023-annual-conference/*

Introduction of Soil and Water Conservation Research Team in Yunnan University

1, Research team profile

The Southwest Plateau Mountain , mainly in Yunnan Province, China, is the upstream or source area of Nu River, Lancang River, Red River, Yangtze River and Pearl River. Influenced by unique longitudinal range-gorge terrain, joint of East Asian summer monsoon and southwest monsoon, and mountain multi-ethnic activities, the soil erosion processes in the Southwest Plateau Mountain are extremely complex.

The mechanism of soil erosion under changing environment and its simulation, and the variations and its possible mechanisms of environment driven by soil erosion are the two scientific problems. Also, there are two challenges, namely investigation technology and early warning of land degradation, faced by soil erosion research. The agricultural planting pattern formed by multi-ethnic communities along the vertical mountains and the widely distributed sloping farmland in Yunnan Province have the most serious water and soil loss, where ecological management is the most difficult, but they have the greatest impact on the development of regional social and economy.

In order to reveal the rule of water and soil loss in Yunnan Province, and develop effective ecological restoration technology of water and soil conservation suitable for multi-ethnic areas, and help Yunnan Province's ecological civilization construction and rural revitalization strategy, Yunnan University has established a research team of "Plateau Mountain Water and Soil Process and Ecological Effects". The research team focuses on soil erosion mechanism, regional soil erosion prediction model and soil productivity assessment. Accordingly, a field observational station in the dry-hot valley has been established. This station has been successfully authorized officially as a provincial field observational station of Yunnan province in 2020.

Fig. 1 Yunnan University, where the research team established.

Since 2010, the team has published more than 100 academic papers in the field of soil erosion and soil and water conservation, including more than 60 SCI papers, more than 20 patents, 4 books (two of which is the first author affiliation), and 1 soil erosion atlas.

2, Soil erosion in Yunnan Province

Yunnan is the most typical plateau mountainous province in China. Due to the combined effects of strong monsoons, undulating topography, and vertical differentiation of human-land relationships, the soil erosion in this area is extremely serious, and has obvious regional characteristics. Our research results demonstrated that soil erosion in Yunnan Province was dominated by water erosion, and the total area of soil erosion in the province is 104,727.74 km^2, accounting for 27.33% of the total land area. The soil erosion areas of the Jinsha River, Pearl River, Red River, Lancang River, Nujiang River and Irrawaddy River accounted for 29.29%, 30.97%, 30.74%, 21.83%, 25.90% and 19.58% of the basin area, respectively.

3, Researches and technical services of soil and water conservation

3.1 Research team

The members of "Plateau Mountain Water and Soil Process and Ecological Effects" research team are composed of 20 teachers and 8 postdoctoral fellows. 12 members of them were selected as provincial level talents, such as "Yunan Revitalization Talent " , and "Young and Middle-aged Academic and Technical Leaders" in Yunnan Province. 3 members of them were selected as high-level talent of Yunnan University. And the research team was selected as Doctoral Supervisor Team in Yunnan Provincial. By December 2022, the team has a total of 159 graduate students, including 18 doctoral students, 141 master students, and 73 of them were outstanding graduates. They are all engaged in soil erosion and soil and water conservation all around China.

3.2 Research Projects

Since 2010, the research team has been granted more than 50 projects including NSFC-Yunnan Joint key project and the Second Comprehensive Scientific Investigation of the Qinghai-Tibet Plateau, funded by the National Natural Science Foundation of China (NSFC) and Ministry of Science and Technology of the People's Republic of China, etc.

Introduction of a Key Funds: Ecological restoration mechanism of degraded sloping land driven by soil erosion in the dry-hot valley

The dry-hot valleys mainly distribute in the upper reaches or source regions of important southwestern rivers (Yangtze River, Red River, etc.). It is not only the typical fragile ecological area, but also a key ecological security barrier in China. Because of the abundant solar energy in the dry-hot valley, steep slopes cultivation are common, which causes severe soil erosion. It is extremely difficult to take ecological restoration measures on these slope farmlands with serious land degradation in the region. In particular, the key limiting factors in ecological restoration of degraded slope farmland have not been fully understood, and the impacts of soil erosion on ecological restoration effects is largely ignored in the region. This research project is planned by comprehensively adopting artificial simulation, field monitoring, stable isotope experiments and so on to investigate changes of ecosystem service functions in cultivated land and abandoned farmland with different degrees of erosion degradation. We intend to clarify the ecological degradation process of slope farmland driven by soil erosion in the region and demonstrate the ecological restoration effects of slope farmland with different degradation degrees. On the basis of the above researching results, the quantitative relationships among "erosion-degradation-recovery" will be explored. And the threshold value for soil erosion catastrophe in slope farmland will be determined. Consequently, the key limiting factors for ecological restoration of slope farmland with different degradation degrees will be identified. All these researches are designed in order to reveal the ecological degradation and restoration mechanism of slope farmland in the dry-hot valley region and put forward restoration countermeasures for degraded slope farmland focusing on ecosystem service functions improvement. This research will be beneficial for providing theory basis and method reference for the restoration of fragile ecosystems.

3.3 Research Platform

"Yuanjiang Dry-hot Valley Soil Water and Conservation Observation and Research Station of Yunnan Province" (hereinafter referred to as Yuanjiang Station) was first built in October 2012 and officially listed in 2018 (Figure 2). It is the first field observation station in the Yuanjiang-Honghe River Basin focusing on soil erosion observation and soil and water conservation research. Yuanjiang Station has two parts. The main station is located in Laozhai as dry-hot valley. The auxiliary station is located in Xingping as a non dry-hot valley control area. The geographical location of the main station is 23°58′6 N, 101°38′56 E, 580m above sea level, 150 km from Kunming and 100 km from Yuxi City, Yunnan Province. Yuanjiang station is located in a typical dry-hot valley area of the Yuanjiang River. The basin has regionally representative slopechannel landforms, slope erosion, gully erosion and other erosion types, providing a favorable place for the systematic research of soil erosion and soil and water conservation. The basin where the station is located has typical land use types, such as natural forest, grassland, agricultural land, and economic fruit forest, which can provide typical cases. It strongly supports the construction of efficient utilization model of dry-hot valley land resources and the research on soil and water conservation technology system.

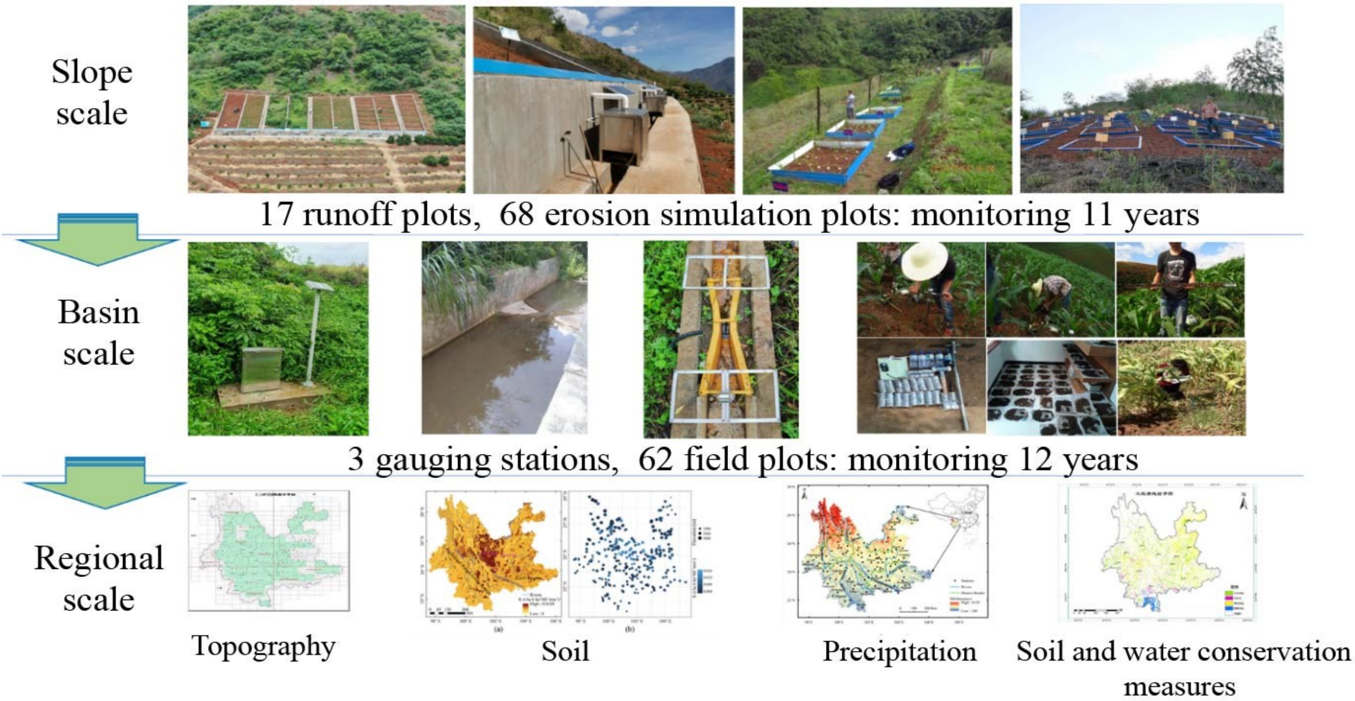


Figure 2 Yuanjiang Dry-hot Valley Soil Water and Conservation Observation and Research Station of Yunnan Province

Yuanjiang station focuses on the resources, environment and sustainable development of the dry-hot valleys in the southwest of China, as well as the response to global changes. Aiming at the characteristics of soil erosion and ecological degradation in Yuanjiang Dry-hot valley, the station emphasizes the combination of basic theory and applied technology research on the basis of previous scientific research, and integrates "monitoring, research, demonstration and talent training". According to the standard indexes and technical methods of soil and water conservation monitoring of the Ministry of Water Resources and ecological system study, the long-term positioning observation of regional soil, water, gas biological factors have been carried out. Eight observation and test platforms were established, including "slope runoff and sediment production observation" (Figure 3), "erosion and sediment production observation in small basin" (Figure 4), "soil erosion-productivity

Experiment" (Figure 5), "erosion-ecological restoration plot" (Figure 6), "soil-plant-atmosphere continuum (SPAC) water transport and conversion test" (Figure 7), "soil and water conservation effect plots of different tillage measures" (Figure 8), "pot experiment" (Figure 9) and "soil erosion-soil nitrogen cycle-ecological restoration interactive test platform" (Figure 10).

Figure 3 Slope runoff and sediment production observation

Figure 4 Erosion and sediment production observation in small basin

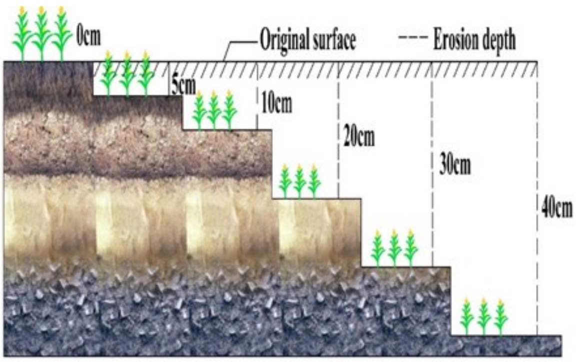


Figure 5 Soil erosion-productivity experiment

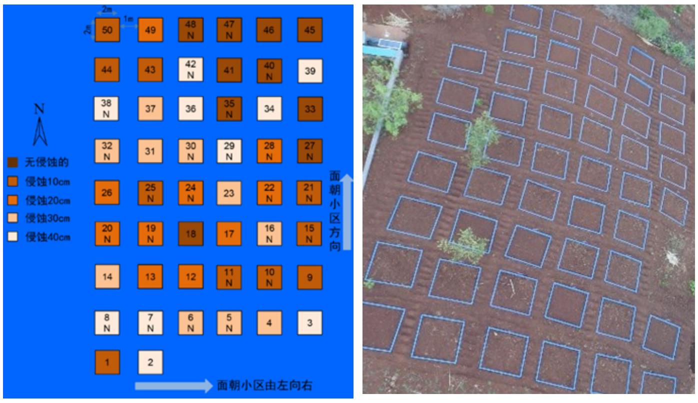


Figure 6 Erosion-ecological restoration plot

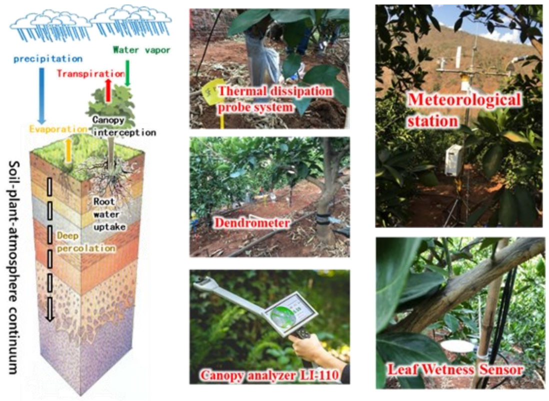


Figure 7 SPAC water transport and conversion test

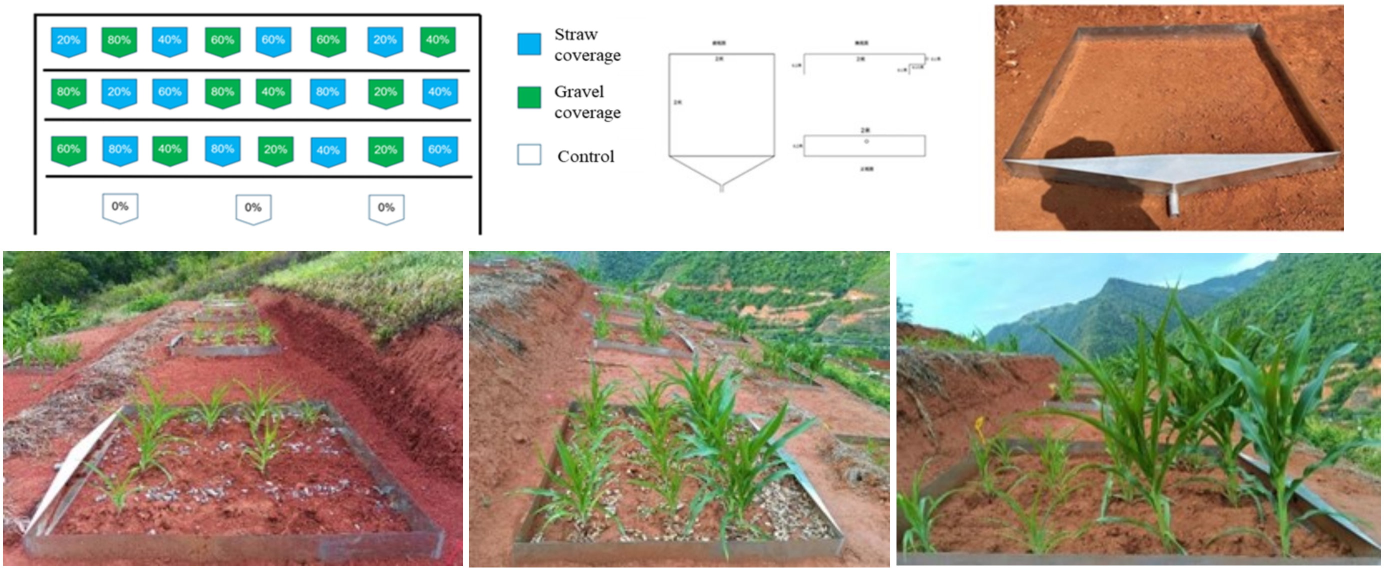


Figure 8 Soil and water conservation effect plots of different tillage measures

Figure 9 Pot experiment

Figure 10 Soil erosion-soil nitrogen cycle-ecological restoration interactive test platform

Yunnan University attaches great importance to the construction of Yuanjiang Station. The station now has 300 m^2 living area, 18 mu test and monitoring area, 5 professional field monitoring and management personnel and 22 -time scientific researchers.

Figure 11 Internship courses

4, Highlight of soil and water conservation research

Because of the special geographical environment in the southwest plateau, the process and mechanism of soil erosion are still unclear. The traditional investigation methods are difficult to accurately identify the intensity of regional soil erosion, the mechanism of erosion on soil productivity needs to be clarified, and the early warning of regional land degradation lacks quantitative methods. The team revealed the process and mechanism of soil erosion in the complex environment of Plateau Mountains through the mechanism of rainfall erosivity, topography and engineering measures on erosion intensity. On the basis of a clear mechanism, the automatic extraction technology of soil and water conservation engineering measure factors and the extraction technology of slope and slope length factors have been developed, forming a high-precision, full-coverage Plateau Mountains soil erosion investigation technology system. Based on the high-precision evaluation of soil erosion, the impact mechanism of erosion on plateau and mountain soil productivity was further revealed, the soil productivity index model under the influence of erosion was improved, and the calculation method of allowable soil loss based on maintaining sustainable soil productivity was developed. It provides theoretical and technical support for regional early warning of land degradation.

Result 1: Clarified the spatiotemporal pattern of soil erosion parameters and the mechanism of these parameters on soil erosion process in the Plateau Mountainous region

Result 1.1 Revealed the temporal and spatial characteristics of rainfall erosivity in the plateau mountainous region, and clarified the influence mechanism of rainfall erosivity on soil erosion

Based on the high-density rainfall station data, the spatial and temporal variation of rainfall erosivity over the Plateau Mountains was analyzed. Systematically analyzed the quantitative relationship between erosive rainfall erosivity and soil erosion and sediment yield in 115 soil and water conservation monitoring stations in Yunnan Province for three consecutive years, revised the calculation formula for daily rainfall erosivity, and clarified the relationship between extreme precipitation events and soil erosion. There is a nonlinear relationship (exponential relationship) rather than the traditionally perceived linear relationship. Based on the monitoring data of elevation change of rainfall and 63 years daily precipitation data from all meteorological stations in Yunnan Province, the annual average and seasonal rainfall erosivity factors were calculated, and the spatio-temporal variation of rainfall erosivity in Yunnan Province was studied by combining the empirical orthogonal function and Mann-Kendall nonparametric statistical test. The results show that the annual average rainfall erosivity in Yunnan Province is 3564.64 MJ mm/ (hm^2 h a), 80% of which is concentrated in summer and autumn. In the past 60 years, it has shown a downward trend, but there are significant seasonal and spatial differences.

Result 1.2 Defined the threshold of catchment area with value of 5000m^2 as the calculation of slope length

In view of the technical problem of variable calculation parameters of slope length factor under complex terrain conditions of Plateau Mountains, multi-scale DEM data system was used to analyze the influence of parameters on the calculation results of slope length and gradient. It was found that the calculation result of slope length is extremely sensitive to the threshold of catchment area. With the increase of catchment area threshold, the proportion of long-slope length significantly increased (Figure 12), leading to the overestimation of soil erosion survey results, which had not been found in previous surveys. The calculation results of gully density and slope length under different threshold values were compared with the field repeatedly, and the large scale topographic map and high-resolution remote sensing image data were used to assist the test. Finally, according to the terrain characteristics of the watershed, the catchment area threshold that best match the actual terrain were set.

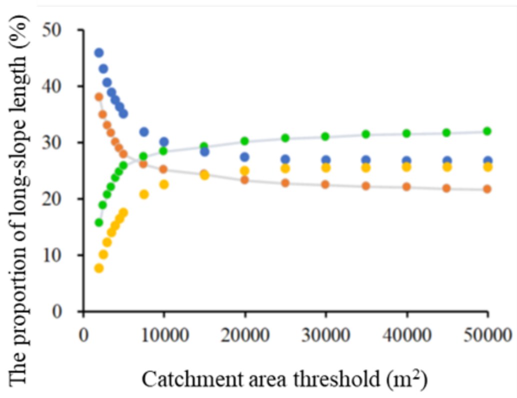


Figure 12 Influence of catchment area threshold on slope length

Result 1.3 Clarified the spatial pattern of soil and water conservation benefits of engineering measures in the Plateau Mountainous region

Based on the monitoring data of erosion plots, the quantitative evaluation of the soil and water conservation benefits of different engineering measures in Plateau Mountains was carried out. It was found that the soil and water conservation engineering measures have an important impact on soil erosion in Plateau Mountains. The quantitative effects of different soil and water conservation measures on the erosion and sediment yield were calculated based on the data of different soil and water conservation measures. Determined the parameters of each soil and water conservation measure in the China Soil Erosion Equation (CSLE). The engineering measure factor of slope terrace which was widely distributed in Plateau Mountains was 0.252. Further research on the soil conservation effect of soil and water conservation engineering measures in Plateau Mountains found that more than 80% of the soil erosion came from slope farmland without measures. Under the same slope condition, the soil erosion intensity of sloping land with engineering measures is significantly lower than that without measures. The soil erosion of slope farmland above 15° without measures is mainly severe or above, and the soil erosion of slope farmland above 15° with measures is still mild or moderate. With the increase of slope, the efficiency of soil and water conservation of engineering measures decreases (Figure 13). Taking Yunnan Province as an example, the annual soil conservation amount of various soil and water conservation engineering measures is about 5.08×108 t, which clarified the quantitative contribution of different measures to Plateau Mountains slope erosion.

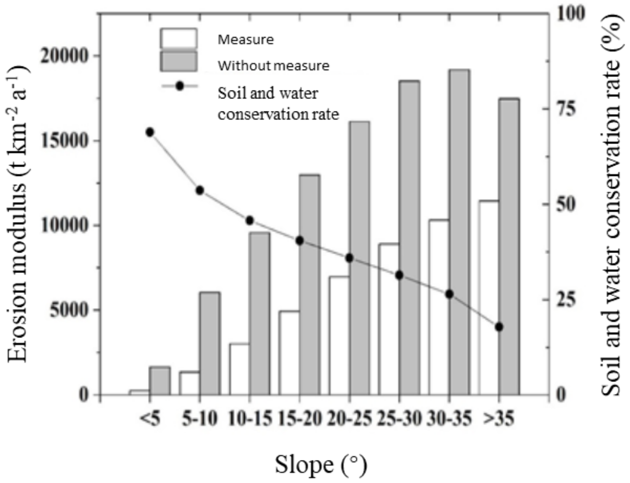


Figure 13 Slope differentiation of soil conservation benefits of engineering measures

Result 2: Take high precision soil water and conservation engineering measures data into regional soil erosion investigating

Result 2.1 Automatic extraction technology of regional scale soil and water conservation engineering measures based on deep learning

Based on the spatial differentiation of soil and water conservation engineering measures in Plateau Mountains and the characteristics of remote sensing images, a visual interpretation technology system for soil and water conservation engineering measures was established. The visual interpretation of engineering measures in Yunnan Province was completed, and the first provincial scale 1:5000 precision database of soil and water conservation engineering measures was established. The database includes 1,416,646 plots of soil and water conservation engineering measures, with a total area of 65,409.5 km². On this basis, combined with the big data deep learning platform, and using neural network image recognition technology, the automatic extraction technology of soil and water conservation engineering measures in Plateau Mountains has been developed. The extraction efficiency and precision of soil and water conservation engineering measures were greatly improved and the technical problems of extraction of soil and water conservation engineering measures at regional scale were solved.

Result 2.2 Set up soil erodibility database in Plateau Mountains based on GIS and soil genetic classification

Based on the data of the second national soil survey and field sampling, soil erodibility of typical soil species in Yunnan Province was calculated and its spatial variation was analyzed. The data of 347 typical soil types in Yunnan Province were collected in the second soil survey. Field investigation and laboratory test were carried out for 222 soil types with missing physical and chemical properties data. The calculation results of soil erodibility of each typical soil type was revised with the erosion and sediment yield data of 54 soil and water conservation monitoring plots (Figure 14). A database construction method based on GIS and soil genetic classification was proposed.

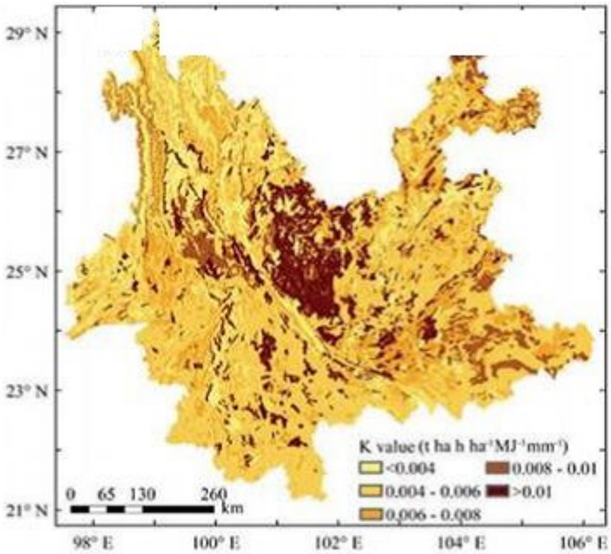


Figure 14 Spatial distribution of soil erodibility (K) in Yunnan Province based on GIS and soil genetic classification

Through the spatial link between the soil map and soil physical and chemical properties, the soil erodibility K value database in Yunnan Province was constructed. It was found that the K value in Yunnan Province varied between 0.0003-0.0169 t hm² h/ (hm² MJ mm), the average is 0.0062 t hm² h/ (hm² MJ mm), and has extremely significant spatial variability.

Result 2.3 Full-coverage, high-precision soil erosion survey technology in Plateau Mountains

Based on the mechanism of soil and water conservation engineering measures, topography, rainfall erosivity, soil erodibility and other key influencing factors on the soil erosion process in Plateau Mountains, combined with the research and development of key factor extraction technology and database creation, it solved the problem of incomplete traditional remote sensing survey factors and sampling survey with points substituted for surface. A soil erosion survey technique based on CSLE model was developed. It has achieved a technical breakthrough from qualitative evaluation to quantitative calculation and from sampling to full coverage survey in regional soil erosion investigation.

Result 3: Systematically revealed the response model of crop yield in the dryland to soil erosion, improved the quantitative evaluation method of soil productivity under the influence of erosion, developed a new method to calculate soil loss tolerance for sustainable soil productivity, and provided theoretical and technical support for regional early warning of land degradation

Result 3.1 Quantitative impact of erosion on soil productivity and its mechanism

It was found that the relationship between erosion degree and crop yield was not simple linear:

- When the erosion thickness is greater than 5 cm or the remaining soil thickness is less than 25 cm, soil available nutrients, effective soil moisture content and microbial diversity will be significantly reduced, resulting in a sharp decrease in crop yield and soil productivity (Figure 15).
- When the erosion thickness reached 20 cm, crop yield reduction is difficult to recover through fertilization and tillage measures. The impact of erosion on crop yield varies significantly among different crops. And the soybean yield reduction is most sensitive to soil erosion.
- Artificially simulated plots will exaggerate the impact of erosion on crop yield, thus clarifying the mechanism of soil erosion on crop yield.

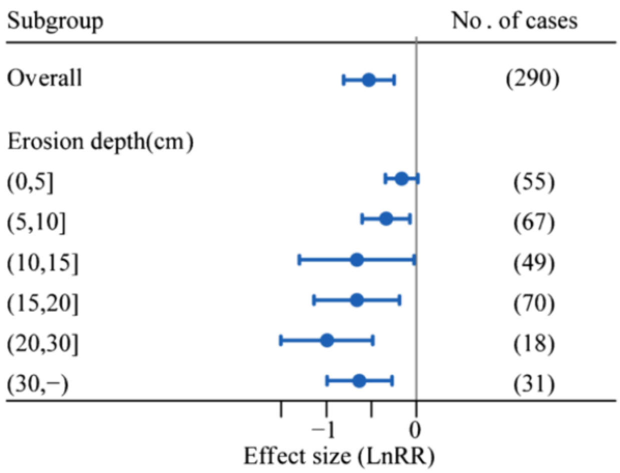


Figure 15 Relationship between crop yield and erosion thickness

Result 3.2 Clarified the relationship between erosion-soil physical and chemical properties-crop yield in the Plateau Mountainous region , and revised the soil productivity evaluation model

The quantitative relationship between soil organic matter content, available nutrient content, moisture content, bulk density and crop growth was elucidated through the experiment of crop yield control under the influence of the Plateau Mountains erosion. The improved soil productivity evaluation model under the influence of erosion (Modified Productivity Index, MPI) has been verified. The revised model can dynamically evaluate the impact process of erosion thickness on soil productivity, and the evaluation accuracy has increased by 22% compared with the original PI model.

Result 3.3 The innovative method of calculating soil loss tolerance for sustainable soil productivity, providing an effective means for early warning of land degradation in the Plateau Mountains

Soil loss tolerance (T) refers to the maximum allowable soil erosion rate in order to maintain a long-term high level of crop economic productivity. It is a quantitative target of soil erosion management and an important basis for early warning of land degradation. However, it is difficult to determine "what is the allowable reduction in productivity". At present, the T value is mostly determined by experience. Therefore, the MPI index is introduced into the ideal formula of allowable soil loss. Through the quantitative relationship between MPI index and crop yield, the productivity protection threshold was determined, and the calculation equation of allowable soil loss based on maintaining sustainable soil productivity was established. It solved the scientific problem that the protection threshold and time cannot be determined in the calculation of allowable soil loss, and provided a theoretical basis and quantitative standard for early warning of land degradation in Plateau Mountains.

5, Recruitment information

Relying on Yunnan University's various talent introduction programs and post-doctoral research stations, the team recruits domestic and foreign talents and post-doctoral researchers in geography, ecology, soil science and other disciplines all year round. For details, please refer to the relevant website (in Chinese).

◆ Yunnan University "Eastern Mainland Talent Plan"

http://www.rsc.ynu.edu.cn/info/1052/3648.htm

◆ Yunnan University "Youth Talent Training Program"

http://www.rsc.ynu.edu.cn/info/1052/4021.htm

◆ Postdoctoral Recruitment

http://www.ires.ynu.edu.cn/info/1082/3067.htm

Colorful Yunnan

The Secretariat of WASWAC
No. 20 Chegongzhuang Road West
Beijing 100048 P.R.China
www.waswac.org.cn
Tel: +86 10 6878 6579
Fax: +86 10 6841 1174
Email: waswac@foxmail.com