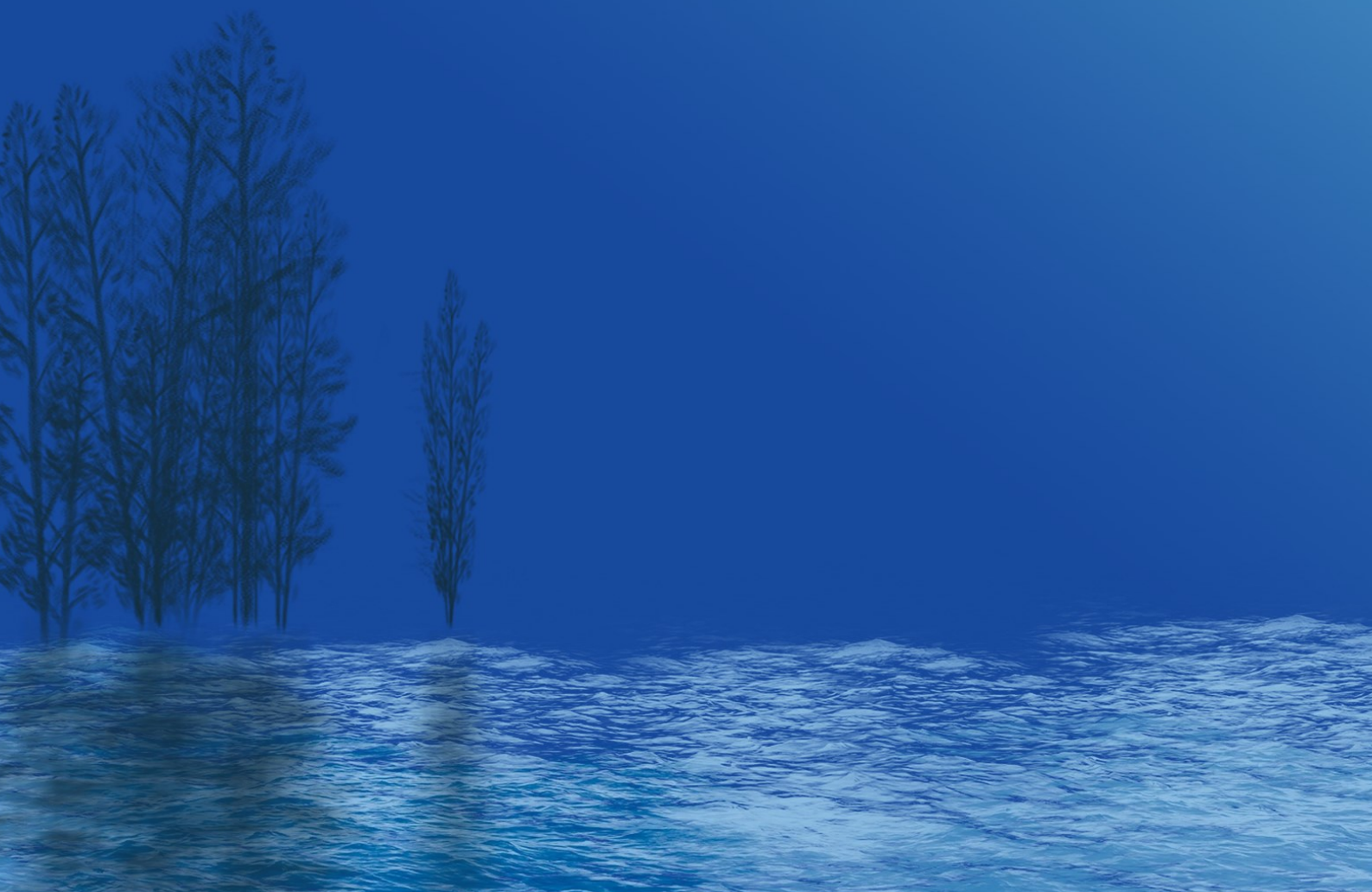
WASWAC

HOT NEWS

ISSUE 11, 2022



HOT NEWS

ISSUE 11 2022

WASWAC

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Editors: Dr.Pengfei DU & Dr. Donghao HUANG

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

June 19-23, 2023

Palacký University, Olomouc, Czech Republic

The 5th WASWAC World Conference, with the topic of "Adaptation strategies for soil and water conservation in a changing world" will be held during June 19-23, 2023 in 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.

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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!

China issues dataset of lake-catchment characteristics on Qinghai-Tibet Plateau

Aerial photo taken on July 9, 2019 shows the scenery at Mt Nyanpo Yutse in Tibetan autonomous prefecture of Golog of Northwest China's Qinghai province. Qinghai province, much of which lies on the Qinghai-Tibet Plateau, is the home to the headwaters of the Yangtze, Yellow and Lancang rivers. [Photo/Xinhua]

China's National Tibetan Plateau Data Center (TPDC) has recently issued and shared a dataset of lake-catchment characteristics on the Qinghai-Tibet Plateau, announced Lanzhou University.

A research team from the Center for the Pan-third Pole Environment of Lanzhou University conducted the dataset. It provides fundamental data for the study of lakes on the Qinghai-Tibet Plateau, said Liu Junzhi, professor at Lanzhou University and leader of the team.

Lakes collect runoff, sediment, and nutrients from upstream watersheds and are a vital destination for material migration at the watershed scale. Therefore, lake water and sediment attributes are significantly affected by catchment attributes, such as climate, terrain, and vegetation conditions, said Liu.

The dataset delineates the watershed boundaries of 1,525 lakes, with an area from 0.2 to 4503 square kilometers, on the Qinghai-Tibet Plateau. It calculates 721 catchment-scale attributes on the aspects of lake body, terrain, climate, vegetation, geology, and anthropogenic activities.

Under the Chinese Academy of Sciences, the TPDC is the only data center in China with complete scientific data for the Qinghai-Tibet Plateau and surrounding regions. Since its establishment in 2019, it has collected scientific datasets on the cryosphere, solid Earth, ancient environments, land surfaces, and other fields.

Details at: *https://www.chinadaily.com.cn/a/202211/25/WS63805f2fa31057c47eba1167.html*

First Conference on World Geography was held

The First Conference on World Geography, with the theme of "Geography and Our Common Future," is held on November 26, 2022, at East China Normal University, Shanghai.

A Chinese expert proposed a new solution of integrated development via strengthening border trade exchanges and cross-border coordination in the region of the Himalayas to tackle the multi-dimensional geopolitical security risks and further promote building a regional community of shared future, at a key conference in Shanghai.

The proposal was made at the First Conference on World Geography, with the theme of Geography and Our Common Future.

Since the 20th century, geography has been a key to geopolitics and international cooperation when viewed as a basic subject in studying man's relationship to land.

The First Conference on World Geography was jointly held by the Geographical Society of China, China Institute for Innovation & Development Strategy, East China Normal University (ECNU) and University of the Chinese Academy of Sciences.

Experts from China and abroad delivered over 500 keynote lectures and reports on a variety of topics ranging from geography and low-carbon energy security to research innovative tools and methodologies for the advancement of world geography during the two-day conference, which

is being held both online and on-site.

Du Debin, professor of human geography and dean of the School of Urban and Regional Science at the ECNU said：Geography is an interdisciplinary subject between the natural sciences and the humanities, when we talk about the construction of a community with a shared future for mankind, we have to understand the distribution of local natural geographic resources and the local humanities, and the social and economic conditions, since humans are not only about population, but also about the spatial distribution of activities, and the relationship between all human activities and the natural environment.

Details at: *https://english.ecnu.edu.cn/cd/c5/c1703a445893/page.htm*

Soil as a sustainable resource

The BonaRes Conference 2023 "Soil as a Sustainable Resource" will be held 15 – 17 May 2023 in Berlin, Germany.

TOPICS:

1. Impact of agriculture and cropping systems on soil functions
2. Carbon and nutrient cycling in soils: Processes and interactions in a changing world
3. Soil biomes and multifunctionality of soils
4. Soil degradation and sustainable soil management in agricultural landscapes
5. Model-based prediction of the dynamics of soil functions
6. Using soil sensing technologies for soil mapping, modelling and decision making in agriculture
7. Soils as a key to climate change mitigation: private and public governance instruments to unlock the potential
8. Data challenges and solutions

CALL FOR ABSTRACTS:

Submission Deadline: Tuesday, 10 January 2023 .

Submit your abstract here:

https://www.bonares2023.de/call-for-abstracts.html

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Introduction of College of Water Conservancy, Shenyang Agricultural University

1, Introduction of Shenyang Agricultural University

The history of Shenyang Agricultural University can be traced back to the provincial Fengtian Agricultural College in 1906. In 1952, the new Shenyang Agricultural College was established based on the College of Agriculture of Fudan University and some departments of the Northeast Agricultural College and was approved by the State Council as a national key institution of higher education in 1979. In 1981, it became one of the first units with the right to confer doctoral and master's degrees. In 1985, it was renamed Shenyang Agricultural University, and Deng Xiaoping inscribed its name.

The university has a relatively complete agricultural education and research system. There are 16 colleges, 4 teaching departments (centers), 8 post-doctoral research stations, 10 doctoral degree authorization points, 114 master's degree authorization points, and 58 undergraduate majors; 3 national key disciplines and 3 key disciplines of the Ministry of Agriculture. The university has been selected as one of the top universities in Liaoning Province, 2 disciplines have been selected as one of the 20 world-class disciplines in Liaoning Province, and 5 disciplines have been selected as one of the top disciplines in China.

Figure 1 Campus of Shenyang Agricultural University

There are 98 scientific research institutions above the provincial level, including the National Field Scientific Observation Research Station, National Engineering Research Center, National Local Joint Engineering Laboratory, New Rural Development Institute approved by the Ministry of Science and Technology and the Ministry of Education, and 19 undergraduate experimental teaching centers.

2, About the College of Water Conservancy

The College of Water Conservancy of Shenyang Agricultural University was established in 1995, and its predecessor was the Department of Water Resources of Shenyang Agricultural College, which was established in 1952.

The College has set up five undergraduate majors: agricultural water conservancy engineering, water conservancy and hydropower engineering, soil and water conservation and desertification control, civil engineering, and surveying and mapping engineering. There are three secondary doctoral programs (Agricultural Soil and Water Engineering, Water Conservation and Irrigation Engineering, Soil and Water Conservation and Desertification Control), one primary master's program in water conservancy engineering (including five secondary master's programs), and three secondary master's programs (Agricultural Soil and Water Engineering, Water Conservation and Irrigation Engineering, Soil and Water Conservation and Desertification Control). It has a postdoctoral station for agricultural soil and water engineering. The college has four provincial and ministerial research platforms in agricultural soil and water engineering, two provincial demonstration teaching centers and practice bases, one provincial demonstration major in agricultural soil and water engineering, and one pilot major in civil engineering with provincial characteristics and a teaching team.

3, About Soil and Water Conservation and Desertification Control Research

The undergraduate program of Soil and Water Conservation and Desertification Control was formerly known as Soil and Water Conservation established in 1990, and was upgraded to the undergraduate program in 1997, becoming the ninth institution in China to offer an undergraduate program of Soil and Water Conservation and Desertification Control. After nearly 30 years of efforts, the university has trained more than 800 undergraduates and graduates, and was awarded the master's degree in soil and water conservation and desertification control in 2002, and has trained more than 200 master's students so far.

Research Direction

After years of development, the department has conducted systematic research in the field

of soil and water conservation theory, desertification control technology, and urban soil and water conservation engineering in response to the characteristics of soil erosion in typical northern regions of China and the needs of ecological civilization construction, and has formed such research fields and advantages with obvious regional characteristics as "soil erosion law in northeastern black soil area" and "theory and technology of ecological restoration of typical degraded ecosystems in the north". The research fields with distinctive regional characteristics and advantages have been formed, such as "the soil erosion law in the Northeast black soil area" and "the theory and technology of ecological restoration of typical degraded ecosystems in the North". The following three main research directions have been formed.

- ***Soil erosion principle research***: This direction focuses on soil erosion law and erosion control in the northeastern black soil area, and explores slope and erosion gully development, watershed water-sand process and pollutant transport, freeze-thaw and snow-melt erosion, etc., which fills the gap in China's cold season soil erosion law research.
- ***Comprehensive management of watershed***: This direction mainly conducts systematic research in the field of regional typical ecosystem degradation and its ecological restoration mechanism, and forms a complete research system on typical ecosystem degradation and ecological restoration with Liaohe River as the main line, large reservoirs in Liaohe River basin as the focus, and Liaohe estuary wetlands as the center.
- ***Soil and water conservation and ecological environment evaluation***: This direction focuses on the wetlands of Liaohe estuary, carries out research on the degradation mechanism and ecological restoration of fragile ecosystems, and explores the mechanism of the formation of downstream estuarine wetlands and the evolution of upstream water ecology.

Scientific Research Platform

The research team of soil and water conservation has the following research platforms:

- ***National Positioning Observatory of Wetland Ecosystem***

It belongs to the National Forestry and Grassland Bureau and is located in Nanjingzi Village, Dongguo Town, Panshan County, Panjin City, Liaoning Province, with a laboratory area of 500m2. The station mainly researches the habitat restoration technology of the black--billed gull breeding base and the establishment of a wetland irrigation system. The la-

-boratory also conducts research on regional biodiversity conservation mechanisms, wetland ecosystem health and early warning under complex anthropogenic intervention conditions, regional landscape ecological security pattern construction, and other major scientific issues.

Figure 2 Panjin Wetland and its associated resources, Liaoning

◆ ***Compound Soil Erosion Laboratory***

Shenyang Agricultural University has built the first "compound soil erosion laboratory" in China. Unlike the previous single erosion force, this laboratory can simulate the superposition of multiple forces, which is an effective tool for deeper research in the field of soil and water conservation. At present, it is the only one in the national universities and very few in the world in the field of soil erosion research.

The laboratory covers an area of 300m2 and is a steel structure project with a 14-meter lifting frame. The interior of the laboratory mainly includes three parts, namely the freeze-thaw cycle system, rainfall system, and wind tunnel system, which can realize the simulation of main soil erosion types such as hydraulic erosion, wind erosion and freeze-thaw erosion, especially it can meet the instrumentation requirements for the simulation of soil compound erosion mainly by hydraulic erosion and mainly by wind erosion in the northeast black soil area affected by freeze-thaw action.

The freeze-thaw cycle system consists of three parts: an experimental box, a refrigeration unit, and an electric control box. Internal space of 20m2, 1.8m high, freeze-thaw temperature difference ± 20℃, can realize programmed control. It is mainly used to simulate the compound effect of freezing and thawing with hydraulic and wind forces, as well as the effect of freezing and thawing on the physical and chemical properties of soil.

The rainfall system is the most widely used down-jet rainfall simulation device in the international arena. It mainly includes water supply equipment (water supply tank set,

pressurization device), control equipment (electric control box, frequency converter), and rainfall device. The minimum rainfall intensity is 30mm/h and the maximum is 210mm/h, and the rainfall uniformity is more than 80%. It is mainly used to simulate the hydraulic erosion process such as raindrop splash erosion, slope erosion, and the influence of multiple factors on water erosion, etc.

The wind tunnel system consists of a power control system, soft connection, diffusion section, rectification section, contraction section, and test section. The total length of the wind tunnel is 18 m, and the wind speed range is 4~30 m/s. It is mainly used to observe the sand initiation mechanism, simulates the wind erosion process, nutrient loss during wind erosion of cultivated soil, and the influence of multiple factors on wind erosion, etc.

Figure 3 Compound Soil Erosion Laboratory

◆ ***Liaoning Provincial Key Laboratory of Soil Erosion Control and Ecological Restoration***

It is located in the College with a laboratory area of 300 m2. Six research directions have been set up according to the relevant research:

◇ Research on the theory and technology of sand control of agricultural land

◇ Research on the theory and technology of black land protection

◇ Theory and technology research on soil conservation and sand storage in farmland

◇ Theory and technology research on water conservation and water quality maintenance in mountainous areas

◇ Research on freezing and thawing erosion

and prevention and control in farmland

◇ Ecological restoration of degraded farmland systems

Main progress of soil and water conservation research

◆ ***The effects of seasonal freeze-thaw cycles on aggregates and associated soil available phosphorus, and soil organic matter in Northeast China***

This study tried to explore the responses of soil aggregate size distribution and associated available phosphorus (AP) and soil organic matter (SOM) to seasonal freeze-thaw cycles FTCs for different slope aspects in the Mollisol region of Northeast China. The main conclusions obtained from one FTCs season are as follows:

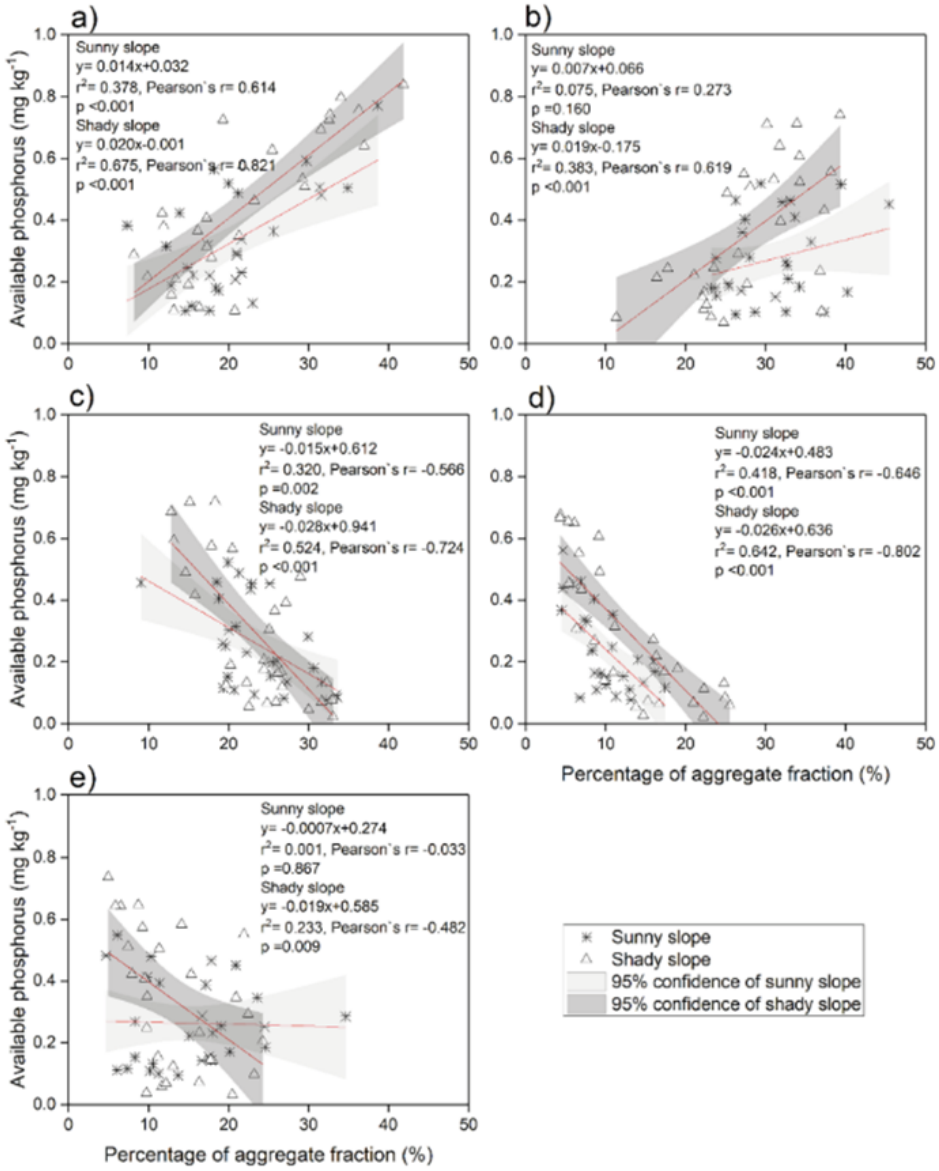

Figure 4 Relationships between the percentage of aggregates (a: < 0.25 mm, b: 0.25–1 mm, c: 1–2 mm, d: 2–5 mm, e: > 5 mm) and associated soil available phosphorus in the sunny and shady slopes during the study period.

(1) Although the FTCs had negative effects on soil aggregate size distribution in both SW and NE, the soil aggregate size distribution of NE was much more sensitive to seasonal FTCs than that of SW. Soil aggregates sized < 0.25 mm and 1–2 mm significantly ($p < 0.01$) increased as a result of seasonal FTCs in both SW and NE; these are the main soil aggregate size fractions that are lost in the study region, especially aggregates sized < 0.25 mm, which increased the most in NE. This phenomenon could promote soil erosion in the following rainy season. (2) Similar to the soil aggregate fractions, soil AP in NE showed lower stability with larger CV values than that of SW during seasonal FTCs. There were linear relationships between the proportions of aggregate fractions and associated AP content. (3) Changes in SOM were relatively stable and only the SOM content of aggregates sized > 1 mm significantly ($p < 0.05$) decreased in NE after seasonal FTCs. We did not find clear relationships between SOM and the proportion of aggregate fractions or AP during the seasonal freeze-thaw period under field conditions. Therefore, SW and NE should be treated differently when controlling land degradation associated with soil erosion using soil conservation measures.

◆ ***Sediment provenance in the black soil region***

Limited research is available on the sediment provenance of snowmelt erosion. In this study, a Bayesian mixing model-based fingerprint tracing technique was used to estimate the relative sediment source contributions for snowmelt erosion in the black soil region of Northeast China, which experiences severe snowmelt erosion. Relative sediment contributions were estimated under two source classification schemes (Scheme 1: cultivated land, forest, and gully; Scheme 2: Scheme 1 + unpaved road) using the geochemical tracers. Kruskal–Wallis test and discriminant function analysis revealed different optimum composite fingerprints for Scheme 1 and Scheme 2. Cultivated land, forest, and gully accounted for 52.1%, 1.4%, and 46.5%, respectively, of sediment contributions with a goodness of fit (GOF)= 0.89 and the mean absolute fit (MAF)= 0.62 in Scheme 1. However, gully-derived sediment from snowmelt erosion dominated the sediment contribution (66.1%) while cultivated land, forest, and unpaved track contributed 18.4% , 13.5% , and 2.0% (GOF=0.97, MAF=0.85), respectively, in Scheme 2. However, common tracer properties as composite fingerprints contributed 13.5%, 13.4%, and 73.1% (GOF = 0.97, MAF = 0.86) of sediment from cultivated land, forest, and gully, respec-

-tively, for Scheme 1 while cultivated land, forest, gully, and unpaved road contributed 15.9%, 12.0%, 69.8%, and 2.4%, respectively (GOF=0.98, MAF=0.89), for Scheme 2. Our results demonstrated that the gully, owing to snowmelt erosion, is the dominant sediment source and more attention should be paid to preventing and controlling gully erosion in the black soil region of Northeast China during the spring thawing period.

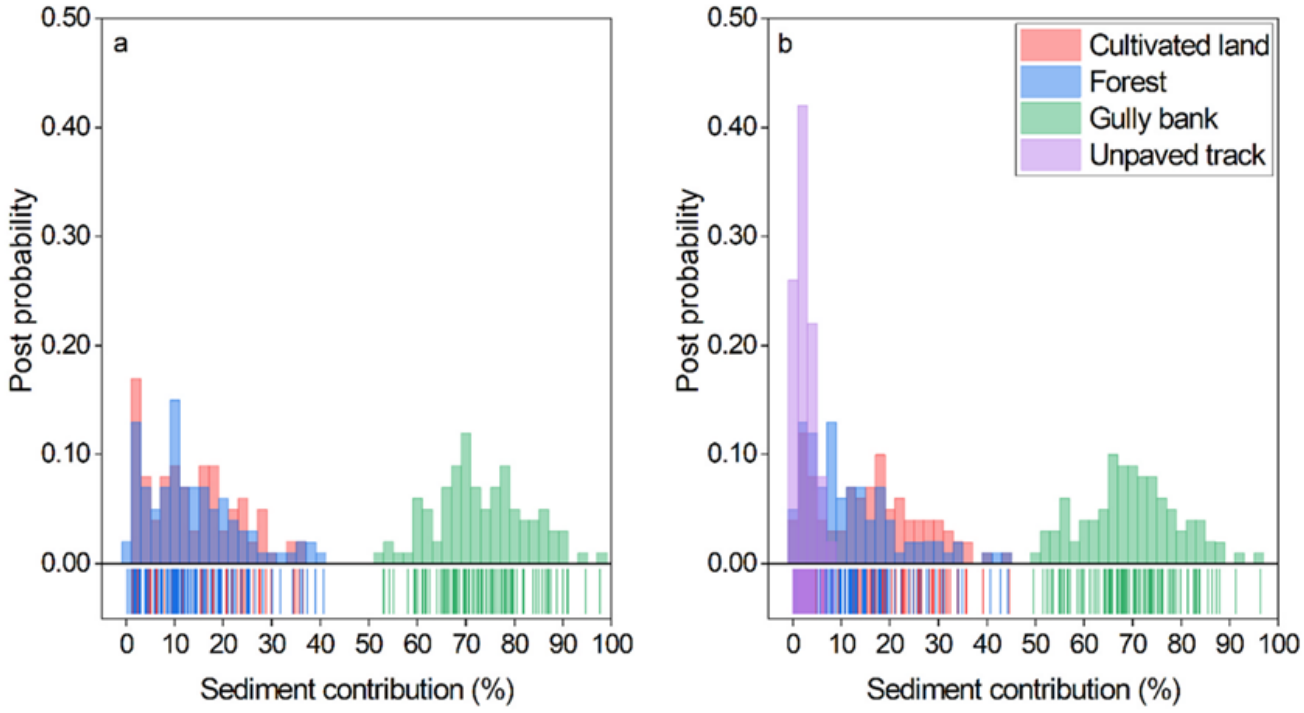

Figure 5 Post-probability estimation of relative sediment contribution for Scheme 1 (a) and Scheme 2 (b) with composite fingerprints in common

◆ ***Assessment of gully erosion susceptibility in the black soil region of Northeast China***

As a primary sediment source, gully erosion leads to severe land degradation and poses a threat to food and ecological security. Therefore, identification of susceptible areas is critical to the prevention and control of gully erosion. This study aimed to identify areas prone to gully erosion using four machine learning methods with derived topographic attributes. Eight topographic attributes (elevation, slope aspect, slope degree, catchment area, plan curvature, profile curvature, stream power index, and topographic wetness index) were derived as feature variables controlling gully occurrence from digital elevation models with four different pixel sizes (5.0 m, 12.5 m, 20.0 m, and 30.0 m). A gully inventory map of a small agricultural catchment in Heilongjiang, China, was prepared through a combination of field surveys and satellite imagery. Each topographic attribute dataset was randomly divid

-ed into two portions of 70% and 30% for calibrating and validating four machine learning methods, namely random forest (RF), support vector machines (SVM), artificial neural network (ANN), and generalized linear models (GLM). Accuracy (ACC), area under the receiver operating characteristic curve (AUC), root mean square error (RMSE), and mean absolute error (MAE) were calculated to assess the performance of the four machine learning methods in predicting spatial distribution of gully erosion susceptibility (GES).

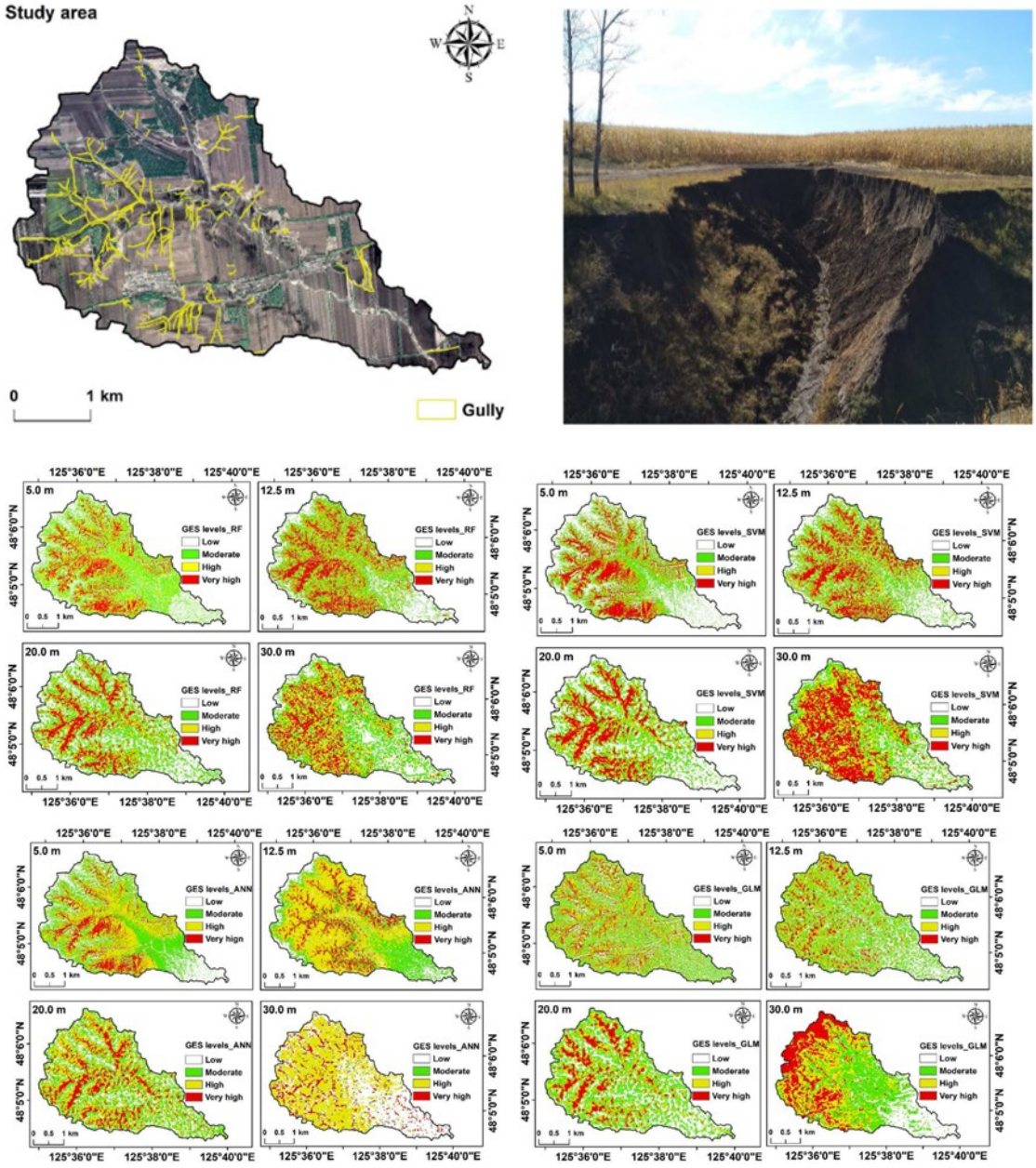

Figure 6. Study area, delineated gullies, a typical gully, and gully erosion susceptibility (GES) using different DEMderived topographic factors.

The results suggested that the selected topographic attributes were capable of predicting GES in the study catchment area. A pixel size of 20.0 mwas optimal for all four machine learning methods. The RF method described the spatial relationship between the feature variables and gully occurrence with the greatest accuracy, as it returned the highest values of ACC (0.917) and AUC (0.905) at a 20.0 m resolution. The RF was also the least sensitive to resolutions, followed by SVM (ACC =0.781-0.891, AUC = 0.724-0.861) and ANN (ACC = 0.744-0.808, AUC = 0.649-0.847). GLM performed poorly in this study (ACC = 0.693 - 0.757, AUC = 0.608-0.703). Based on the spatial distribution of GES determined using the optimal method (RF þ pixel size of 20.0 m), 16% of the study area has very high level susceptibility classes, whereas areas with high, moderate, and low levels of susceptibility make up approximately 24%, 30%, and 31% of the study area, respectively. Our results demonstrate that GES assessment with machine learning methods can successfully identify areas prone to gully erosion, providing reference information for future soil conservation plans and land management. In addition, pixel size (resolution) is the key consideration when preparing suitable datasets of feature variables for GES assessment.

- ***Analysis of driving forces on wetland ecosystem services value change: A case in Northeast China***

Social development and changes in natural conditions have seriously affected the ecosystem services value (ESV) of wetlands. It is important for social sustainable development and human welfare to identify and evaluate the driving factors that lead to changes in ESVs. Based on the land use data of Northeast China (NEC) from 1980 to 2015, the Emergy method and Logarithmic Mean Divisia Index decomposition analysis (LMDI) was applied to calculate the main ESVs of wetlands and clarify the contributions of different driving factors to ESVs changes. The results showed that the value of provision services (ESV p) and cultural services (ESV c) increased significantly, while the value of regulation services (ESV r) and supporting services (ESV s) decreased. Overall, the ESV of wetlands increased by 7.31 × 1022 solar emjoules (sej), with a growth rate of 127.73%. The most obvious factors driving ESV changes were the wetland supporting factor (ΔGA), per capita GDP factor (ΔPG), and protection investment factor (ΔT). The combined average contribution weight of the three factors was above 50%. From the perspective of driving force category, social-economic development effect had

the greatest impact on ESVs, with average contribution weights ranging from 45.18% to 54.59%, followed by human activity effect, average contribution weights ranging from 33.45% to 40.14%, and the influence of natural factor effect was relatively small. The research results would provide a reference for protecting and improving the ESV of the wetland ecosystem.

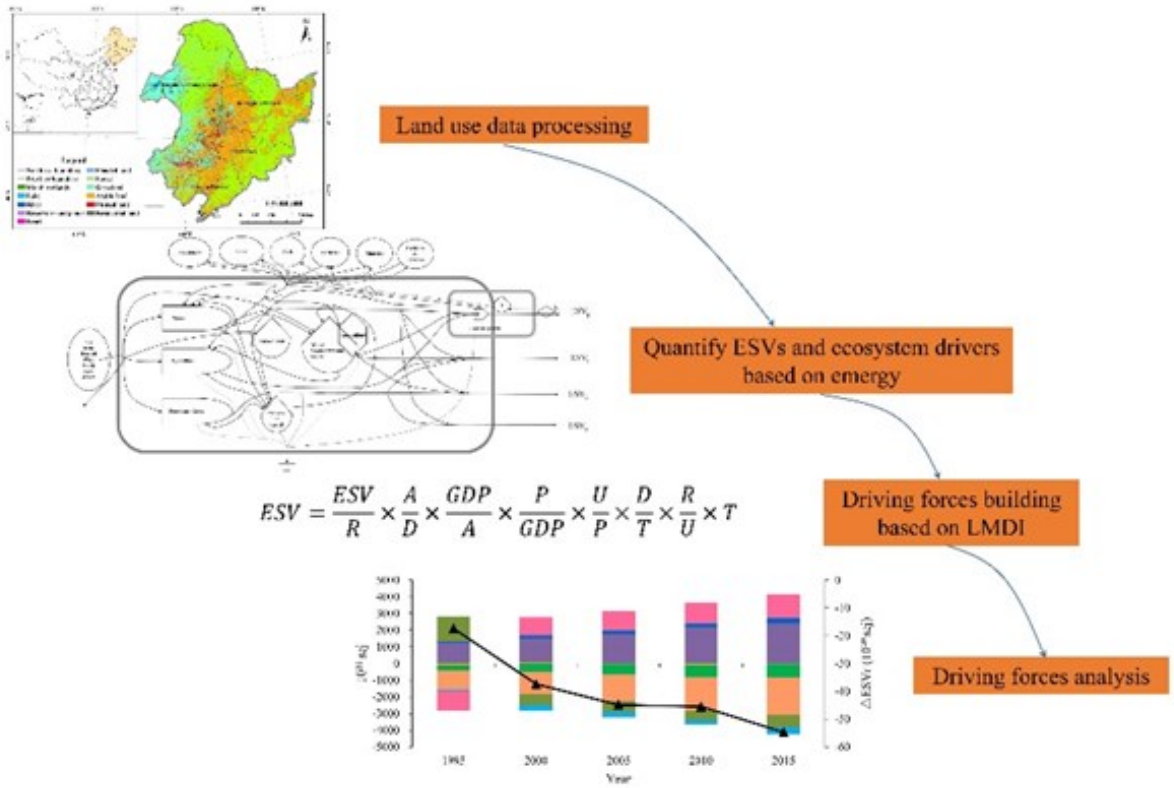

Figure 7. Analysis of driving forces on wetland ecosystem services value change

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