W A S W A C

HOT NEWS

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WASWAC

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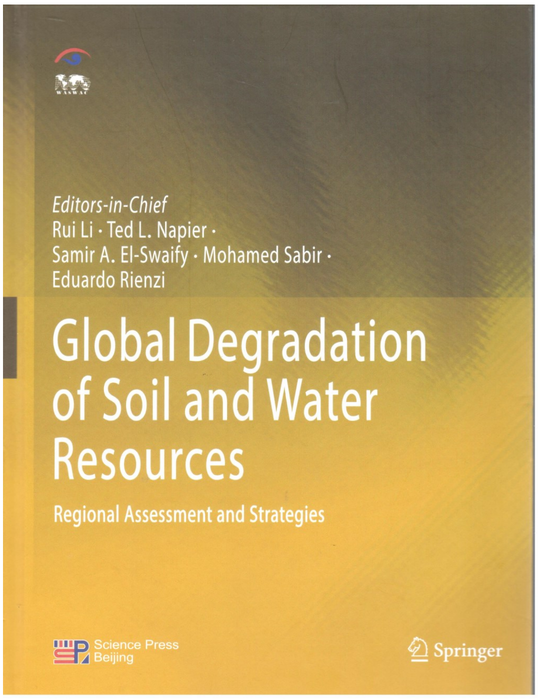
WASWAC Special Publication VIII: Global Degradation of Soil and Water Resources--Regional Assessment and Strategies

As the eighth special publication of WASWAC, following The USLE Story (I), Carbon Trading, Agricultural and Poverty (II), No-Till Farming Systems (III), Soil and Water Assessment Tool (SWAT) Global Applications (IV), Conservation Agriculture (V), Vegetable Agroforestry (VI), Our Gift to the Earth (VII), Global Degradation of Soil and Water Resources that organized by the association, jointly compiled by scientists of soil and Water conservation around the world, was officially published by Science Press and Springer, under the financial support of China Book International. Supports also from International Research and Training Center on Erosion and Sedimentation and Institute of Soil and Water Conservation, NWAFU & CAS/MWR. The purpose of the book is to address the lack of recent state-of-the art and state-of-the-science documentation of global degradation issues by focusing on soil and water conservation at global scale.



Degradation of soil and water resources is a serious environmental problem that will threaten the socio-economic wellbeing of the majority of global population in future. The book examines the current situation of land degradation in multiple regions of the world and offers alternative approaches to solve the problems through sharing advanced technologies and lessons learned. It provides comprehensive assessment on characteristics, level and effect of degradation in different regions.

WASWAC has been committed to the worldwide promotion and dissemination of soil and water conservation science and technology, and has published a series of relevant books, providing a platform for researchers and practitioners to share knowledge and experience. WASWAC will continue to publish more books in the future to promote the development of international soil and water conservation.

Introduction of Editors-in-Chief

Rui Li is a Professor at the Institute of Soil and Water Conservation (ISWC), Chinese Academy of Sciences and Ministry of Water Resources, and ISWC of Northwest A&F University. Address: Xinong Road 26, Yangling, Shaanxi Province, China. Email address: lirui@ms.iswc.ac.cn. He is the current president of the World Association of Soil and Water Conservation (WASWAC). He specializes in land resources evaluation, land use planning, monitoring soil and water degradation via remote sensing and GIS technologies. His principal research focuses on soil erosion and conservation at regional and global scales. He has coordinated and participated in more than 30 research projects relating to soil and water conservation. He has published over 120 articles in professional journals and published 12 books as principal editor or co-editor. He has received a number of awards because of his contributions to soil and water conservation research and management.

Ted L. Napier is an Emeritus Professor of Environmental Studies at The Ohio State University, Columbus, Ohio. Home address: 7326 St. Rte. 19, unit 2902, Mt. Gilead, OH 43338. E-mail address: napier.2@osu.edu. Telephone number: 614-284-2277. Dr. Napier has been a faculty member of The Ohio State University for 49 years. He has published articles extensively in domestic and international journals and is the author or co-author of several books focusing on the adoption of soil and water conservation production systems at the farm level. His research has been cited many times by peers in the field. Research Gate has identified approximately 1000 citations of the incomplete list of his publications listed with their organization. Ted has presented papers, consulted professionals/agencies, and conducted research in over 55 countries. He has been recognized numerous times by various professional groups for his contributions to the field of soil and water conservation.

Samir A. El-Swaify, Emeritus Professor and Founding Chair, Department of Natural Resources and Environmental Management, University of Hawaii, Honolulu Hawaii. Email address: elswaify@hawaii.edu. Telephone: 808-956-7530. Professor El-Swaify holds a B.S. in Agricultural Science from the University of Alexandria, Egypt and a Ph.D. in Soil Science from the University of California at Davis. He has been a faculty member at the University of Hawaii for over 51 years. During his career, Professor El Swaify has produced over 150 publications focusing on soil science and broader natural resource conservation issues. He has been recognized by several professional organizations for his many contributions to the field of soil and water conservation especially in tropical environments. He has contributed to the formation and functioning of many soil and water conservation groups in multiple regions of the planet.

Mohamed Sabir is a professor of Soil and Water Conservation in the National School of Forest Engineering, Ministry of Agriculture. Mailing address: ENFI,BP 511,11 015, Tabriquet, Sale, Morocco. Email address:miloudsaadia@hotmail.com. Professor Sabir holds a Ph.D. in Soil and Water Conservation. His research has been focused on watershed management and agroforestry. He has published articles extensively on the impacts of grazing on arid lands and the impact of land use on soils and erosion. He has examined the role of land husbandry on Mediterranean mountains of Morocco. Professor Sabir has contributed to several regional and global professional organizations focusing on soil and water conservation issues.

Eduardo Rienzi, Professor of Management and Conservation, University of Buenos Aires. Home address while in the USA: 1101 Beaumont Center, apartment number 15303, Lexington Kentucky 40513. Email address: Rienzi@agro.uba.ar. Eduardo Rienzi has been a faculty member of the University of Buenos Aires for 26 years. He is a soil scientist with extensive training in agronomic engineering. He is a former extension educator working as an agronomy agent among farmers located in Cordoba province in Argentina. He has published 52 papers in journals and in proceeding of professional meetings. Dr. Rienzi developed extensive skills in GIS modelling during a postdoctoral appointment within the Precision Agriculture Laboratory at the University of Kentucky. He is presently offering two graduate level courses in spatial analyses at the University of Buenos Aires.

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Measuring soil health easily and reliably

by Adityarup "Rup" Chakravorty

Healthy soils are a precious resource. They are vital for protecting ecosystems, maintaining water quality, producing crops, and mitigating climate change.

There are numerous indicators to measure soil health. However, these indicators don't always provide consistent results. In a new study, researchers report evaluating a rapid and inexpensive indicator of soil health, especially for dryland farming.

This study was recently published in the Soil Science Society of America Journal, a publication of the Soil Science Society of America.

The researchers measured bursts of carbon dioxide gas emitted when dried soil samples are rewetted. These bursts of carbon dioxide – called carbon dioxide flush – are an indicator of soil microbial activity.

"Measuring carbon dioxide flush is simple and inexpensive," says Upendra Sainju, lead author of the study. "We also found that carbon dioxide flush is related to several soil properties and long-term crop yields."

Sainju believes carbon dioxide flush can be

A view of the experimental site in dryland farming in eastern Montana where soil samples were collected to measure carbon dioxide flush. The research team determined that the easier and faster method of measuring carbon dioxide flush also resulted in a more reliable and useful indicator of soil health. Credit: Daniel Liptzin used to measure soil health and relate crop yields reliably. Currently, this method is evaluating to estimate dryland crop yields in arid and semiarid regions.

There are several advantages to using carbon dioxide flush as an indicator of soil health. For one, no chemicals are needed. Researchers can measure carbon dioxide flush from soil samples using devices called infrared analyzers.

"Not needing chemicals means carbon dioxide flush can easily be used to measure soil health directly from the field," says Sainju. "No chemicals being used also makes this process quick and economical."

That's important because several existing ways to measure soil health can be expensive and take a long time to analyze. Also, "they provide mixed results when measuring soil health," says Sainju. Having a single reliable measure of soil health will help farmers, ecologists, policy makers and various other stakeholders to evaluate the sustainability of agroecosystems for crop production, according to Sainju.

In addition to measuring soil health, measuring carbon dioxide flush can also help farmers reduce nitrogen fertilizer use. "We can use carbon dioxide flush to estimate how much nitrogen will be available from the soil to crops during a growing season," says Sainju. That means farmers can be strategic with fertilizer use. That can lead to lower costs of farming while enhancing environmental benefits.

Measurement of carbon dioxide flush in one-day incubation following rewetting of dry soil in a glass jar. The carbon dioxide flush is absorbed by an infrared analyzer attached to the cover of the jar (inset, upper left) and read in a laptop computer downloaded with the appropriate software. Credit: Upendra Sainju

Soil sample, water, container, glass jar, and cover with the infrared analyzer used to measure the carbon dioxide flush. After wetting the soil sample, it will be placed in the mason jar for one day. A carbon dioxide detector is under the lid, and information will be fed into a computer for data collection. Credit: Upendra Sainju

To test carbon dioxide flush as a soil health indicator, the researchers collected soil samples from two dryland study sites, both in northeastern Montana. For each soil sample, Sainju and colleagues measured carbon dioxide flush in two different ways.

One was the traditional way – add water to air-dried soil samples and let them sit for four days. Then the researchers used chemicals to measure carbon dioxide flush.

They also tested a faster method; one where the wetted soils sat for just one day. Then, the researchers used an infrared gas analyzer to detect the carbon dioxide flush from the samples.

These two methods yielded slightly different carbon dioxide flush results.

So, Sainju and colleagues tested a whole lot of soil properties – physical, chemical, and biological – and matched them with the two sets of carbon dioxide flush results. "Our results showed that the one-day results were better related to soil properties and crop yields than the four-day incubations," says Sainju. That meant the easier and faster method of measuring carbon dioxide flush also resulted in a more reliable, inexpensive, and useful indicator of soil health.

Sainju and colleagues plan to test this method in short-term experiments under dryland and irrigated cropping systems next. They will also expand testing the method in various soil and climatic conditions in different regions of the country.

Testing of carbon dioxide flush as a predictor of long-term mean crop yields is especially important, according to the study authors. That's because non-soil factors – such as droughts and floods, or pests – can affect crop production dramatically in some years. In the meantime, "measuring carbon dioxide flush provides soil health results that are accurate and reliable," says Sainju.

Source: https://www.soils.org/news/science-news/measuring-soil-health-easily-and-reliably/

Define and assess drought, the herculean challenge

by Joana Parente

The drying out of the soil in the wadis of the Dead Sea Valley. Credit: Stefan Schmitt (distributed via imaggeo.egu.eu)

The frequency and intensity of drought periods have increased since the 1950s over most land areas [1]. In fact, between 1998 and 2017, drought was the sixth natural hazard associated with disasters (4.8% of the total number of disasters) but the second in terms of the total number of affected people (33% of the total number of affected people), causing more than 21,000 deaths [2]. For example, in 1992, an intense and prolonged drought devastated a region of more than 800 million hectares in Africa and directly affected the lives of 20 million people [3]. Also, widespread drought in south-east Australia (1997–2009) has affected New Zealand direct and off-farm output of about NZ$3.6 billion [4]. In Europe, the joint impacts of drought and forest fires of 2003 exceed 13 billion € [5].

Over the 21st century, scientists have forecasted with high confidence that the total land area subject to increasing drought frequency, and severity will expand [4]. Future aridification in the Mediterranean, southwestern South America, and western North America will far exceed the magnitude of change seen in the last millennium [4]. Figure 1 shows the different impacts of different extreme weather events in Europe, which is becoming more vulnerable to the rise of sea level and the occurrence of more extreme weather events due to climate change [6]. Such impacts will be worse in some regions than in others. In particular, droughts are increasing in frequency and intensity in the Mediterranean area [6]. This increase might be due to weather conditions being strongly influenced by:

(i) position and magnitude of the Azores anticyclone,

(ii) the moderating effect of the Atlantic Ocean and,

(iii) the influence of the Mediterranean Sea and North Africa.

When developing drought risk prevention, mitigation, and preparation measures, it is thus important to address one or more components of risk, which is commonly defined as the product of hazard, exposure, and vulnerability [8]. In this regard, it is important to refer to an accurate definition of "drought". Contextually, it is essential to define the different types of drought impacts [8, 9]. With this in mind, I will guide you through an overview of the several definitions of drought types. We will look at the most common indices adopted to assess drought hazard, how to assess them, and a detailed list of the most important drought impacts.

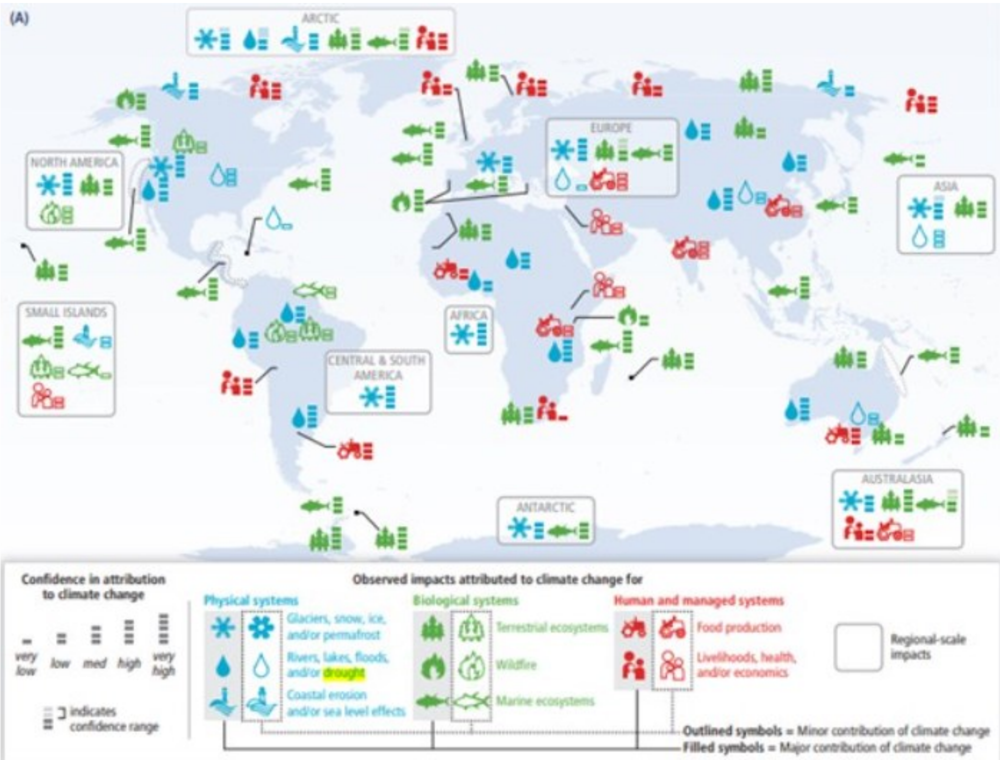
Drought risk assessment

Drought models have the main aim to predict/assess drought impacts. Usually, this is done by computing (i) drought hazard, which comprises the probability of a drought occurring in an area in a certain period [8] and causing loss of life or other health impacts, as well as damage and loss to property, infrastructure, ecosystems, and resources [4]. (ii) Drought vulnerability that highlights the expected lowest or highest drought sensitivity areas [4]. And (iii) drought risk, which is the potential drought consequences where something of value is at stake and the outcome is uncertain [4]. In other words, most of the existing models employ qualitative or semi-quantitative methods that allow us to estimate the number of people or livestock exposed to droughts and predict when and where drought will occur [11]. These methods use drought indicators and indices found in the Handbook of Drought Indicators and Indices [9] and also in an online catalogue of the existing drought hazard and risk tools: https://www.droughtcatalogue.com/.

Drought impact and adaptation

As a climate hazard, drought can impact multiple sectors of essential services to society, the environment, and the economy. In fact, drought impact can be seen as a consequence or a symptom of the vulnerability of drought occurrence on the human and economic activities and on the environment [9]. For example, when a drought occurs, water quantity and quality are likely to be affected and compromised, which might mean less water volume for human consumption and more costly and difficult water treatment [10]. Several other drought impacts are described in Table 1. With this in mind, you can understand how extremely crucial it is to model and know such impacts to support the decision of the adaptation strategies.

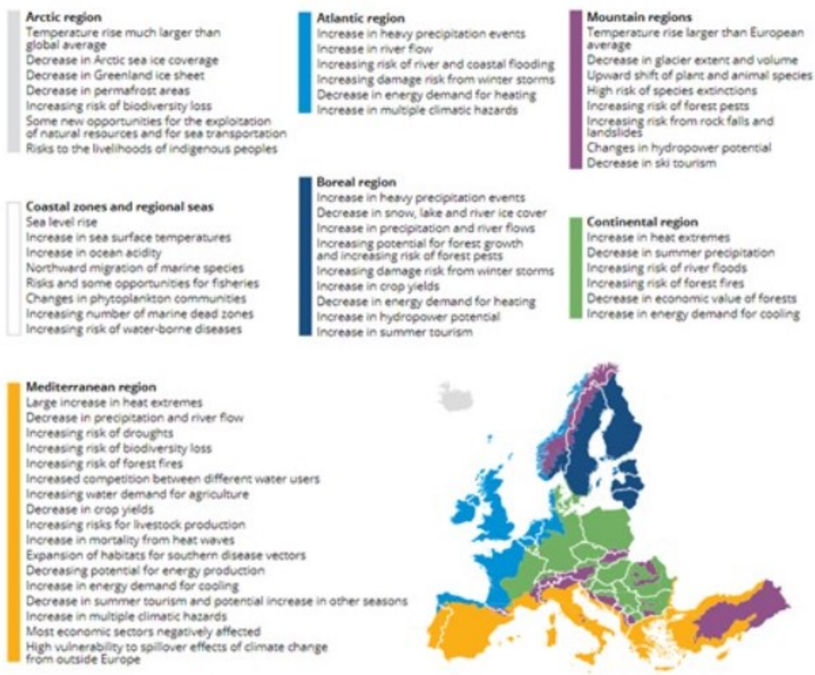
In recent decades, the impacts from recent climate-related extremes (Figure 2), such as droughts and wildfires, have revealed significant vulnerability and exposure of some ecosystems and many human systems to current climate variability [4]. Such impacts are consistent with a significant lack of preparedness for present climate variability in all countries [4].



Global patterns of impacts in recent decades attributed to climate change. Impacts are shown at a range of geographic scales. Symbols indicate categories of attributed impacts, the relative contribution of climate change (major or minor) to the observed impact, and confidence in attribution. Adapted from [4].

History shows that people and societies have adapted to climate, climate variability, and extremes, with varying degrees of success. Adaptation answers are becoming part of engineered and technological options, often integrated within existing planning processes, such as disaster risk management and water management [4]. For example, adjustments in technologies and infrastructure and ecosystem-based approaches are part of African national governments' adaptation plans and policies [4]. The agricultural sector is changing in Central and South America, and resilient crop varieties and climate forecasts have been adopted [4]. Policy instruments and binding technical guidance publications have been made at the European Union level. One example is the Water Framework Directive and the Drought Management Plan Report Including Agricultural, Drought Indicators and Climate Change Aspects [10]. Also, the European Climate Adaptation Platform Climate-ADAPT was created. Users can access information from the platform on the current and future vulnerability of regions and sectors or on tools that support adaptation planning. Finally, individual countries have been taking their measures. For example, in Portugal, several counties have been united with research institutions and other organizations, to develop Municipal Climate Change Adaptation Strategies. This useful information can be accessed and adapted from the individual person to a government institution. If you made till here, you might now understand better how drought works and the challenges they pose to our society. Research and policies are working in the right direction, but we still need to improve water management in water-scarce areas and develop drought early warning and prediction systems, which may help to reduce its impacts and harms on food production.

Post edited by Giulia Roder, Valeria Cigala and Gabriele Amato.

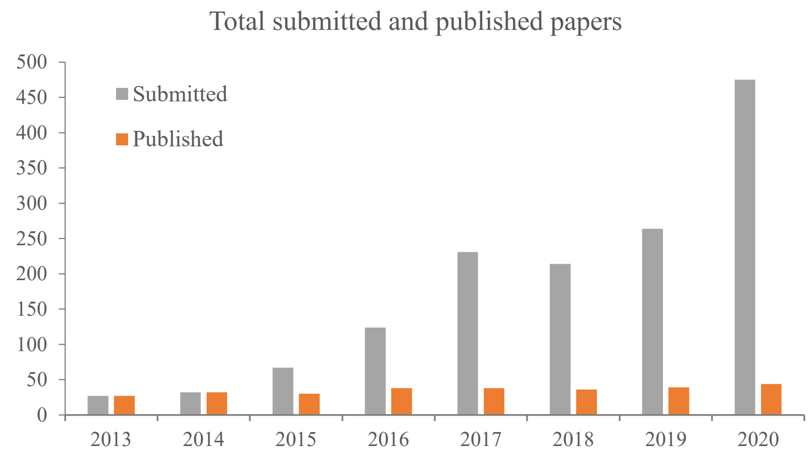


Find more about the reference and details: *https://blogs.egu.eu/divisions/nh/2021/11/29/define-and-assess-drought-the-herculean-challenge/*

Updated submission data of ISWCR in October 2021

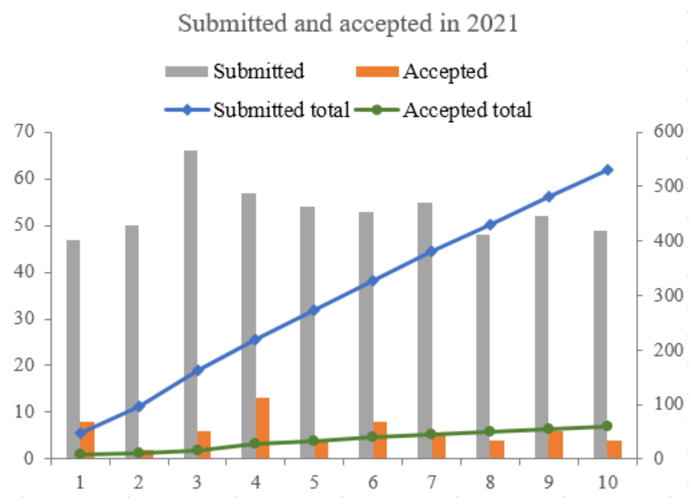
Annual Volume of Submissions and Publishing since 2013

Year	Published	Submitted
2013	27	27
2014	32	32
2015	30	67
2016	38	124
2017	38	231
2018	36	214
2019	39	264
2020	44	475



Monthly Submissions & Acceptance in the current year (2021)

Month	Submitted	Accepted
1	47	8
2	50	2
3	66	6
4	57	13
5	54	4
6	53	8
7	55	5
8	48	4
9	52	6
10	49	4



The International Soil and Water Conservation Research (ISWCR), initiated in June 2013, is a quarterly academic journal in English and publishes in Science Direct of Elsevier with open access globally. Since initiation, ISWCR has developed rapidly and established a good reputation in both international academia and publishing industry. It was indexed by Chinese Science Citation Database (CSCD) in April 2015, covered by SCOPUS in January 2017, and was indexed by Emerging Sources Citation Index (ESCI) of Clarivate Analytics in October 2017. In July 2019, ISWCR was officially indexed by SCIE. The Impact factor of ISWCR is 3.770 in 2019, and **6.027 in 2020.**

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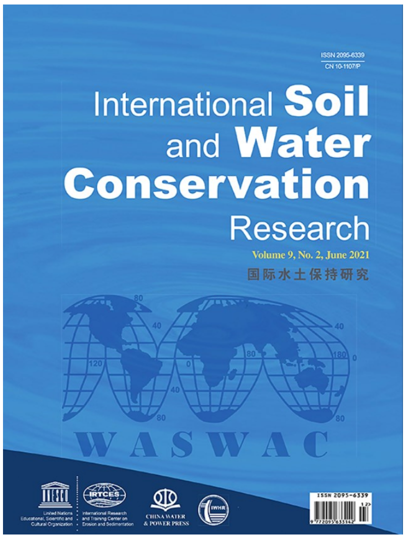

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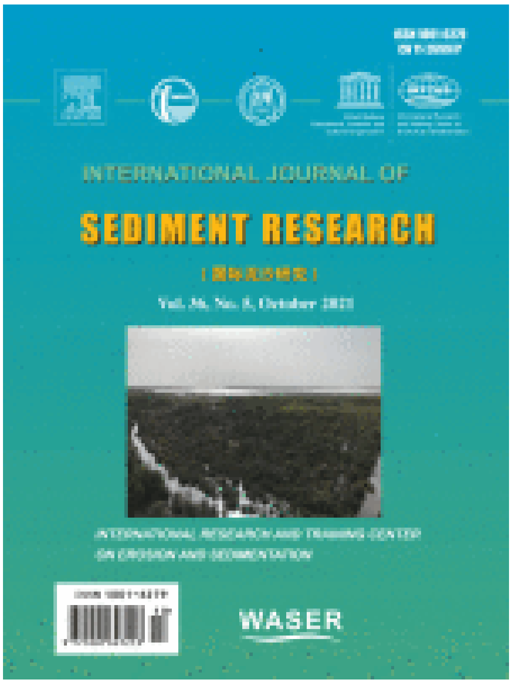

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