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IKCEST
International Knowledge Centre for Engineering Sciences and Technology under the Auspices of UNESCO
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Disaster Risk Reduction Knowledge Service
防灾减灾知识服务

Scientific and Technological Research Trend Report in the Field of Disaster Risk Reduction (2022)

IKCEST Disaster Risk Reduction Sub-platform Team

IKCEST Sci-Tech Trend Report

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Scientific and Technological Research Trend Report in the Field of Disaster Risk Reduction

——A bibliometric analysis of global disaster risk reduction literature and the influence of Chinese research in 2022

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Chinese Academy of Sciences

National Science Library, Chinese Academy of Sciences

IKCEST Disaster Risk Reduction Knowledge Service

February 2023

Abstract

Combined with expert interpretations, 100,267 Science Citation Index (SCI) journal papers published in Diaster Risk Reduction field in 2022 were retrieved as of December 31, 2022, with 165 countries/regions conducting relevant research.

The top 12 countries (>300 papers) in terms of the greatest number of papers published (in descending order) were China, the USA, India, the UK, Italy, Germany, Japan, Australia, Canada, France, Spain, and Iran. China had the highest number of publications worldwide.

Beijing Normal University (BNU) had the highest rate of papers cited, followed by the Helmholtz Association of German Research Centers (HGF) and the Swiss Federal Institute of Technology. The Chinese Academy of Sciences (CAS) and the HGF had the highest percentages of highly cited papers.

Research in this field was mainly distributed in the following 12 disciplines (>500 papers): Environmental Sciences, Multidisciplinary Earth Sciences, Water Sciences, Meteorology and Atmospheric Sciences, Public Environmental and Occupational Health, Environmental Studies, Green and Sustainable Technologies, Remote Sensing Sciences, Geochemistry and Geophysics, Imaging Sciences and Photographic Techniques, Environmental Engineering, and Geological Engineering. Research on disaster prevention and control in China was mainly distributed in the following 14 disciplines (>100 papers): Environmental Sciences, Integrated Earth Sciences, Water Resources, Meteorological and Atmospheric Sciences, Remote Sensing, Imaging Sciences and Photographic Technology, Environmental Engineering, Geological Engineering, Geochemistry and Geophysics, Green and Sustainable Science and Technology, Public Environmental and Occupational Health, Environmental Studies, and Geography and Civil Engineering.

The five research hotspots for 2022 were soil and water pollution caused by heavy metal pollution, earthquake disaster simulation and prediction, environmental vulnerability and health risks caused by air pollution, disasters related to climate change, and the spatial and temporal dynamics of land use based on geographic

information systems (GIS).

The Appendix presents 95 abstracts from papers similar to the research direction of the IKCEST Disaster Risk Reduction Knowledge Service with a high citation index.

Contents

Bibliometrics is a newly developed branch of library and information science that employs mathematical and statistical methods to describe, evaluate, and predict the status and development trends in science and technology using various statistical indicators.

The Web of Science (WoS) core collection database of the Institute for Scientific Information in the US includes the best scientific and technological journals from across the globe that are available in various disciplines. To a certain extent, the included papers can reflect the development trend of the scientific frontier, capture the status and publication position of countries and institutions over time, and further demonstrate the dominant position of each country and institution in a certain discipline. Based on data from the WoS core collection database InCites, which integrates the Analytical Integrated Indicator System[1] and key indicators from the Essential Science Indicators (ESI) and Journal Citation Reports (JCR), the academic competitiveness of countries and institutions in various subject areas can e accurately determined'.

Through a bibliometric analysis, we identified the publication output and influence of leading countries and research institutions in the field of disaster risk reduction (DRR) science, as well as the most salient research directions in various subject areas. We also analyzed the advantages and disadvantages of research in China to elucidate the development trends of scientific research on DRR at a macro scale.

1. Distribution of Research capability

1.1 Output and influence of papers from major countries

Combined with expert interpretations, 10,267 SCI journal papers published by 2022 were retrieved as of the retrieval date[2], with 165 countries conducting relevant research in this field. The top 12 countries (>300 papers) in terms of the number of papers published were China, the USA, India, the UK, Italy, Germany, Japan, Australia, Canada, France, Spain, and Iran. China leads the world in the number of papers published, with 3,630 papers featuring Chinese participation, accounting for

[1] http://help.incites.clarivate.com/inCites2Live/8980TRS/version/default/part/AttachmentData/data/InCites-Indicators-Handbook%20-%20June%202018.pdf
[2]February 13, 2021

approximately 27.9% of all papers and occupying a leading position in the DRR field. The US is second, (see the full list in Table 1), accounting for 17.7% of the total papers.

The WoS dataset was used as the basis for synchronizing the relevant retrieval results in the Incite database. As for the retrieval date (Feb 13, 2023), a total of 9,682 papers had been synchronized, and only 585 papers could not be synchronized owing to the update cycle of the Incite database, suggesting a small data deviation. Therefore, this section uses the Incite database to analyze intercountry competitiveness and cooperation. Among the top 12 countries (see Table 1), China and the USA had the highest citation frequency of papers[3], with the number of papers cited featuring Chinese participation being slightly higher. The UK, Germany, and Australia occupied a high percentage of cited papers, with over 45% of the papers having already being cited. Australia, Germany, and India had a high frequency of citations per paper. Both Australia and China had a high percentage of highly cited papers[4]: 2.03% and 1.59%, respectively, which is much higher than that of the top 12 countries, indicating a strong research strength. In addition, Australia had the highest percentage of hotspot papers[5], suggesting that the country will produce a significant number of high-caliber results in 2022 and gain the attention of scientists worldwide. Notably, Saudi Arabia, with fewer than 300 papers published per year, was involved in the publication of seven highly cited papers, Pakistan took part in the publication of six highly cited papers, and South Korea contributed to the publication of six highly cited papers, indicating a high level of research efficiency. Overall, although Australia does not have the highest number of papers published in the field, it has a high citation frequency per paper, high percentage of highly cited papers, high percentage of hotspot papers, and is more efficient in its research. In contrast, while the UK, Japan, Iran, and France have published a large number of papers, the percentages of papers cited and highly cited papers were relatively low, indicating that research efficiency needs to be improved (see Figure 1).

[3]Web of Science Core Collection cited frequency

[4] http://help.incites.clarivate.com/inCites2Live/8980TRS/version/default/part/AttachmentData/data/InCites-Indicators-Handbook%20-%20June%202018.pdf

[5] http://help.incites.clarivate.com/inCites2Live/8980TRS/version/default/part/AttachmentData/data/InCites-Indicators-Handbook%20-%20June%202018.pdf

Table 1: Top countries in disaster prevention and control research and their influence

Ranking	Country	WoS publication quantity	Cited frequency	Cited frequency per paper	Citation frequency (%)	Highly cited papers (%)	Hotspot cited papers (%)
1	China	3,630	5,804	1.60	41.46	1.59	0.24
2	USA	1,735	2,208	1.27	40.56	0.86	0.06
3	India	749	1,317	1.76	43.85	1.27	0.14
4	UK	674	1,046	1.55	48.26	0.79	0.16
5	Italy	643	914	1.42	45.92	0.5	0.17
6	Germany	495	826	1.67	46.9	1.28	0
7	Japan	430	429	1.00	33.01	0.73	0
8	Australia	411	775	1.89	46.95	2.03	0.51
9	Canada	389	510	1.31	43.28	0.54	0
10	France	343	420	1.22	37.65	0.9	0
11	Spain	323	490	1.52	45.54	0.66	0.33
12	Iran	317	459	1.45	41.12	0.99	0

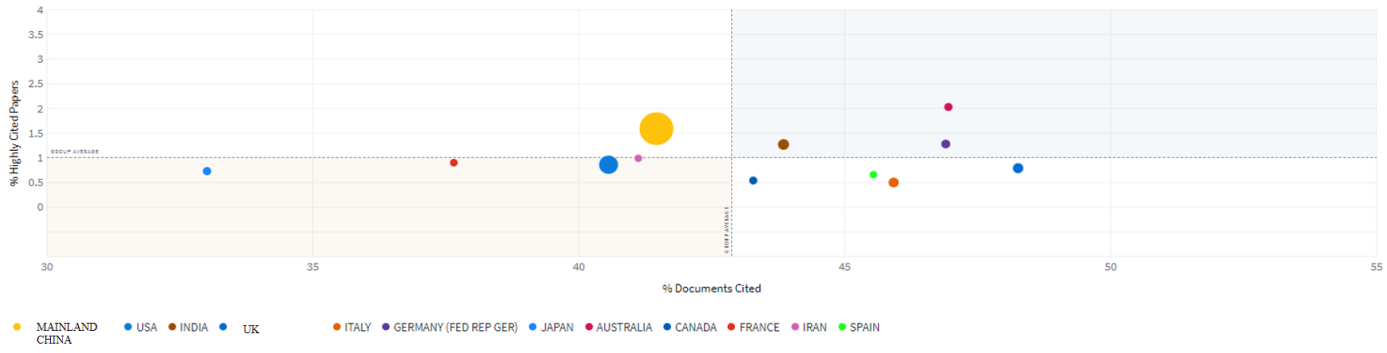

Figure 1: Total number of papers, cited frequency of papers, and proportion of cited papers in each country

1.2. Output and influence of papers from major research institutions

Among the top 12 institutions with more than 110 publications, Chinese institutions had the highest number of publications, indicating that it is more active than other countries in research in this field. With 56.86% of its papers cited, BNU had the highest percentage of cited papers, followed by HGF and the Swiss Federal Institute of Technology. Only two institutions, CAS and China University of Mining and Technology (CUMT), have published hotspot papers. In addition, the cited frequency per paper at BNU, the China University of Geosciences (CUG), and CAS was significantly higher than the average of the other institutions, indicating they have a higher quality of average output (see Table 2). It is noteworthy that despite the low number of papers published, the HGF and the University of California (UC) systems have a high percentage of highly cited papers, a high percentage of papers cited, and a high level of research efficiency (see Figure 2).

Table 2: Top 12 institutions in number of papers published on disaster prevention and control and their influence

Ranking	Institution	Country	WoS publication quantity	Cited frequency	Cited frequency per paper	Citation frequency (%)	Highly cited papers (%)	Hotspot cited papers (%)
1	CAS	China	573	813	46.95	1.42	2.27	0.17
2	CUMT	China	190	244	35.79	1.28	2.11	0.53
3	CNRS	France	182	182	36.81	1.00	1.1	0
4	UC system	USA	180	210	46.67	1.17	1.11	0
5	Indian Institute of Technology (IIT)	India	168	160	40.48	0.95	0.6	0
6	CUG	China	164	232	40.85	1.41	1.22	0
7	HGF	Germany	137	187	47.45	1.36	2.19	0
8	Swiss Federal Institute of Technology	Switzerland	108	119	47.22	1.10	0	0
9	BNU	China	102	158	56.86	1.55	0.98	0

10	INGV	Italy	102	97	43.14	0.95	0	0
11	China Earthquake Administration (CEA)	China	100	90	38	0.90	0	0
12	USGS	USA	100	107	46	1.07	1	0

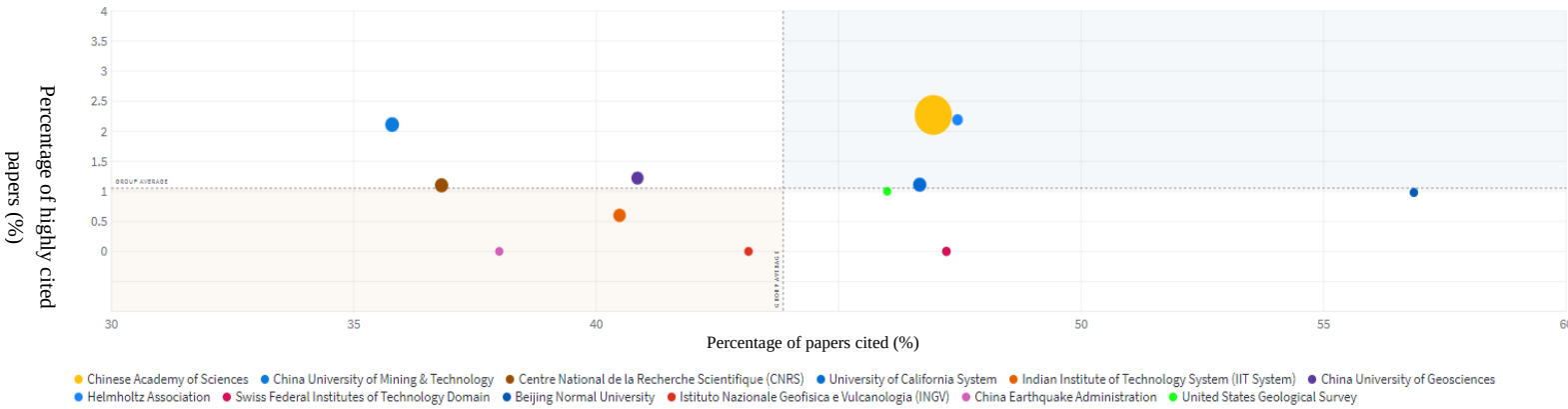

Figure 2: Graphical representation of total number of papers, percentage of highly cited papers, and percentage of cited papers by institution

2. Research trends

2.1 Major disciplinary areas

Based on the WoS platform, disaster prevention and control research covers 94 disciplinary areas[6] and is mainly distributed in the following 12 disciplinary directions (>500 papers): Environmental Sciences, Multidisciplinary Earth Sciences, Water Sciences, Meteorology and Atmospheric Sciences, Public Environmental and Occupational Health, Environmental Studies, Green and Sustainable Technologies, Remote Sensing Sciences, Geochemistry and Geophysics, Imaging Sciences and Photographic Techniques, Environmental Engineering, and Geological Engineering. China's research on disaster prevention and control covers 79 disciplinary areas and is mainly distributed in the following 14 disciplinary directions (>100 papers): Environmental Sciences, Integrated Earth Sciences, Water Resources, Meteorological and Atmospheric Sciences, Remote Sensing, Imaging Sciences and Photographic Technology, Environmental Engineering, Geological Engineering, Geochemistry and Geophysics, Green and Sustainable Sciences and Technology, Public Environmental and Occupational Health, Environmental Studies, Geography, and Civil Engineering. Figure 3 shows that research disciplines in China in the DRR field are consistent with global trends.

[6]The Web of Sciences disciplinary classification system is compound, meaning that a paper may belong to more than one discipline.

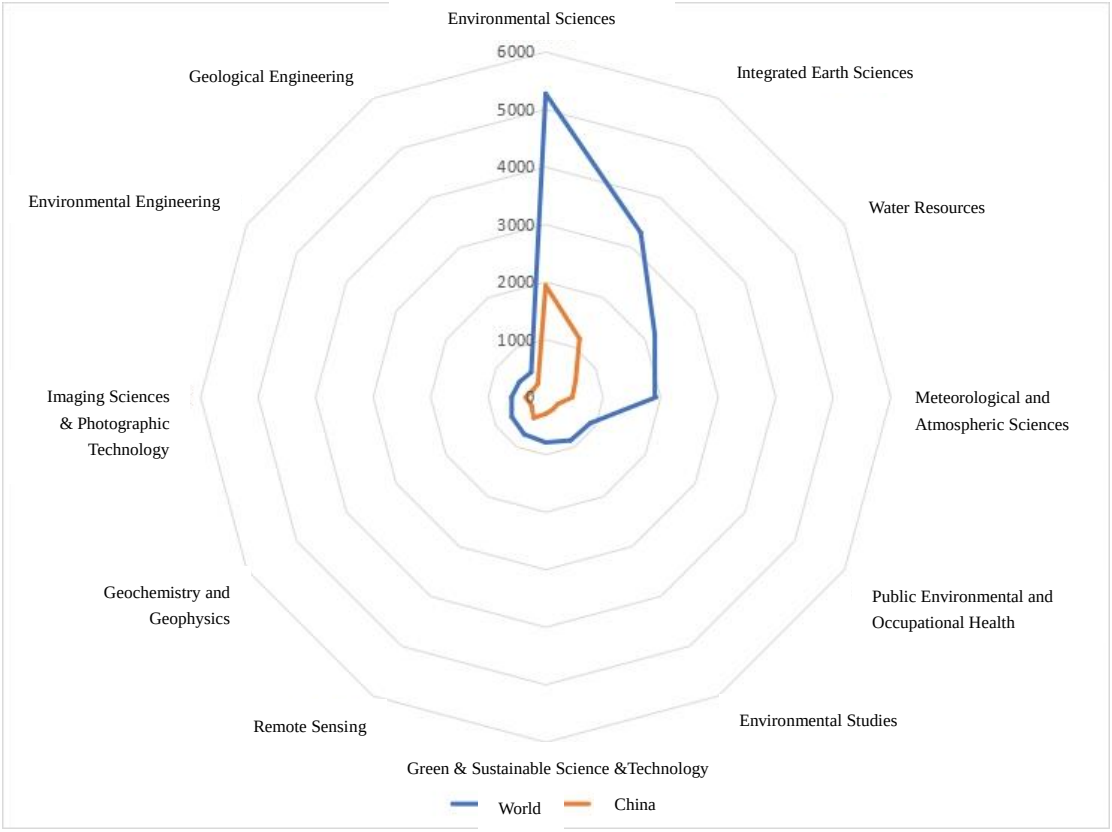

Figure 3: Number of papers on disaster prevention and control in major disciplinary areas at home and abroad

2.2 Major journals

Published journals reflect the direction of the research. According to the statistics from journals in the field of disaster prevention, Chinese authors have published papers in 361 journals, 14 journals have published more than 50 papers by Chinese authors, international authors have published papers in 720 journals, and 14 journals have published more than 100 papers by international authors.

Table 3: Major disaster prevention journals

No.	Journals	Number of papers	Impact factor	No.	Journals	Number of papers	Impact factor
1	SUSTAINABILITY	635	3.889	14	ENVIRONMENTAL RESEARCH	98	8.431
2	INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH	613	4.614	15	LANDSLIDES	97	6.153
3	INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION	504	4.842	16	JOURNAL OF CLEANER PRODUCTION	92	11.072
4	REMOTE SENSING	394	5.349	17	ENVIRONMENTAL MONITORING AND ASSESSMENT	83	3.307
5	NATURAL HAZARDS	359	3.158	18	BULLETIN OF ENGINEERING GEOLOGY AND THE ENVIRONMENT	81	4.13
6	WATER	310	3.53	19	ENVIRONMENTAL EARTH SCIENCES	79	3.119
7	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	296	5.19	20	GEOFLUIDS	79	2.006
8	SCIENCE OF THE TOTAL ENVIRONMENT	254	10.753	21	ENGINEERING GEOLOGY	75	6.902
9	FRONTIERS IN EARTH SCIENCE	251	3.661	22	ENVIRONMENTAL POLLUTION	74	9.988
10	FRONTIERS IN ENVIRONMENTAL SCIENCE	125	5.411	23	JOURNAL OF MARINE SCIENCE AND ENGINEERING	67	2.744
11	NATURAL HAZARDS AND EARTH SYSTEM SCIENCES	120	4.58	24	JOURNAL OF HYDROLOGY	66	6.708
12	ATMOSPHERE	105	3.11	25	ENVIRONMENT INTERNATIONAL	64	13.352
13	CHEMOSPHERE	103	8.943	26	TOXICS	63	4.472

3. Research Hotspots

In this section, based on the keyword co-occurrence method, Thomson Data Analyzer software was used to clean the Keywords Plus field of papers both by machine and manually. VOSviewer software was used to cluster the core topic words of papers representing the high-frequency topic words occurring in this topic; a certain co-occurrence frequency and intensity were set to cluster the keywords of papers according to the size of the dataset. In combination with expert interpretations, each cluster was named and separately interpreted to identify and analyze journal publication topics.

The average cited frequency of core topic words in the analysis results is based on the number of papers containing relevant topic words since their publication. The average strength of association represents the closeness between the core topic words contained in the topic concept, with a higher strength of association representing greater

co-occurrence and concentration of research, whereas the opposite represents a relatively low co-occurrence and research fragmentation.

Using Keywords Plus as the analysis field, after machine and manual cleaning, 983 keywords with more than ten occurrences were selected from 16,607 keywords for analysis and clustering. By clustering the core topic words with the greatest co-occurrence intensity in these papers, five clusters were obtained, with at least 20 topic words per cluster (see Figure 4). The five research hotspots were soil and water pollution caused by heavy metal pollution, earthquake disaster simulation and prediction, environmental vulnerability and health risks caused by air pollution, disasters related to climate change, and the spatial and temporal dynamics of land use based on GIS.

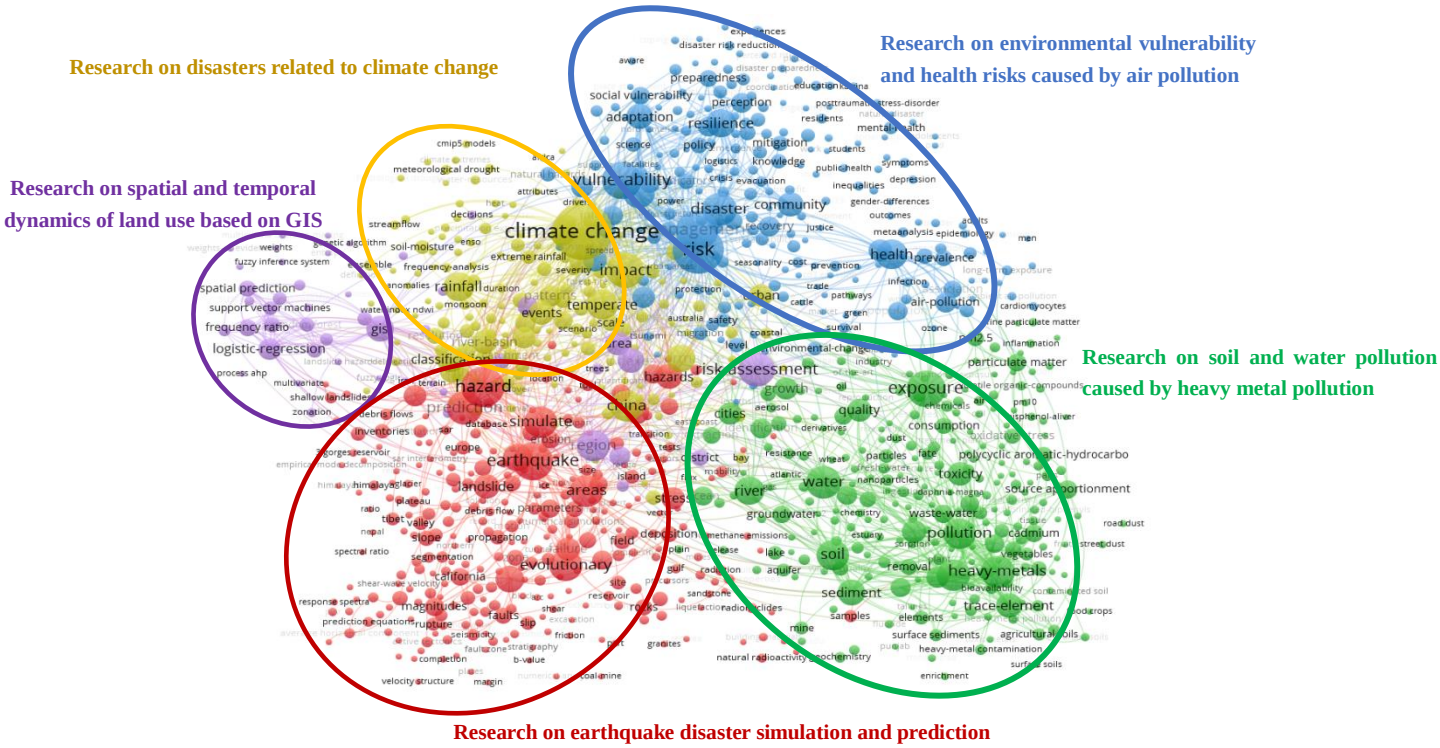

Figure 4: Analysis of research topics in the field of disaster prevention and control in 2022

Appendix: Abstracts of highly cited relevant literature

1.Wildfire Monitoring Based on Energy Efficient Clustering Approach for FANETS
Journal:DRONES

Abstract: Forest fires are a significant threat to the ecological system's stability. Several attempts have been made to detect forest fires using a variety of approaches, including optical fire sensors, and satellite-based technologies, all of which have been unsuccessful. In today's world, research on flying ad hoc networks (FANETs) is a thriving field and can be used successfully. This paper describes a unique clustering approach that identifies the presence of a fire zone in a forest and transfers all sensed data to a base station as soon as feasible via wireless communication. The fire department takes the required steps to prevent the spread of the fire. It is proposed in this study that an efficient clustering approach be used to deal with routing and energy challenges to extend the lifetime of an unmanned aerial vehicle (UAV) in case of forest fires. Due to the restricted energy and high mobility, this directly impacts the flying duration and routing of FANET nodes. As a result, it is vital to enhance the lifetime of wireless sensor networks (WSNs) to maintain high system availability. Our proposed algorithm EE-SS regulates the energy usage of nodes while taking into account the features of a disaster region and other factors. For firefighting, sensor nodes are placed throughout the forest zone to collect essential data points for identifying forest fires and dividing them into distinct clusters. All of the sensor nodes in the cluster communicate their packets to the base station continually through the cluster head. When FANET nodes communicate with one another, their transmission range is constantly adjusted to meet their operating requirements. This paper examines the existing clustering techniques for forest fire detection approaches restricted to wireless sensor networks and their limitations. Our newly designed algorithm chooses the most optimum cluster heads (CHs) based on their fitness, reducing the routing overhead and increasing the system's efficiency. Our proposed method results from simulations are compared with the existing approaches such as LEACH, LEACH-C, PSO-HAS, and SEED. The evaluation is carried out concerning overall energy usage, residual energy, the count of live nodes, the network lifetime, and the time it takes to build a cluster compared to other approaches. As a result, our proposed EE-SS algorithm outperforms all the considered state-of-art algorithms.

2.Assessing Factors Influencing Technology Adoption for Online Purchasing Amid COVID-19 in Qatar: Moderating Role of Word of Mouth
Journal: FRONTIERS IN ENVIRONMENTAL SCIENCE

Abstract: The COVID-19 pandemic developed new challenges for global consumers. In response to this disaster, digital technology users have faced the necessity to adopt and use specific technology apps for online shopping. This article examines how contingencies disrupt existing theoretical models and their implications for the post-COVID-19 era for online purchases. Customers prefer apps to use on the

websites for search and purchase amid the COVID-19 crisis. The websites offer competitive advantages to apps for branding and CRM prospects. This motive keeps customers happy and satisfied with the website offers. This study focuses on consumer electronics and observes the comparative influence of fundamental elements (i.e., hedonic motivation, habits, perceived risk, technological trust, and technological awareness) on purchasing customer satisfaction. The study further examines the impact of customer satisfaction with online purchases with website continuance intention (WCI). Notably, this study explores the moderating effect of word-of-mouth (WOM) on the relationship between customer satisfaction with online purchases and website continuance intention. This study designed a web-based survey and recruited frequent visitors including international and citizens of Qatar for data collection. The study employed a purposive sampling technique and used three standardized psychological tools to obtain the data set needed to measure customer satisfaction with online purchases. The survey used a web link, distributed 600 questionnaires via email and social media, and received only 468 responses. After screening, only 455 were valid responses. The study showed a response rate of 75.83%. The study results showed that hedonic motivation, habits, perceived risk, and technological awareness were positively related to customer satisfaction with online purchasing. Besides, customer satisfaction with subsequent online purchases is also positively associated with website continuance intention (WCI). The results revealed that this relationship remained stronger when word-of-mouth (WOM) was higher. Hence, this shows that online shopping is seen as a vital and interesting activity in the Qatari context. The findings provide useful insights for future studies to explore the effects of COVID-19 on online purchase intentions.

3.Geological evolution of offshore pollution and its long-term potential impacts on marine ecosystems

Journal:GEOSCIENCE FRONTIERS

Abstract: Populations and metropolitan centers are accumulated in coastal areas around the world. In view of the fact that they are geographically adjacent to coasts and intense anthropogenic activities, increasing global offshore pollution has been an important worldwide concern over the past several decades and has become a very serious problem that needs to be addressed urgently. Due to offshore pollution, various geological disasters occur in high frequency, including intensified erosion and salinization of coastal soils, frequent geological collapses and landslides and increasing seismic activities. Moreover, offshore pollu-tion shows increasingly serious impacts on the topography and geomorphology of offshore and coastal areas, including coastal degradation, retreating coastlines and estuary delta erosion. Offshore sedimenta-tion processes are strongly influenced by the pH changes of terrestrial discharges, and sedimentary dynamics have become extremely acute and complex due to offshore pollution. The seabed topography and hydrodynamic environment determine the fate and transport of pollutants entering offshore regions. Coastal

estuaries, port basins and lagoons that have relatively moderate ocean currents and winds are more likely to accumulate pollutants. Offshore regions and undersea canyons can be used as conduits for transporting pollutants from the continent to the seabed. It is particularly noteworthy that the spa-tial/temporal distribution of species, community structures, and ecological functions in offshore areas have undergone unprecedented changes in recent decades. Due to increasing offshore pollution, the stable succession and development trend of marine ecosystems has been broken. It is thus important to identify and regulate the quantity, composition and transportation of pollutants in offshore regions and their behavior in marine ecosystems. In particular, crucial actions for stabilizing marine ecosystems, including increasing species and biodiversity, should be implemented to enhance their anti-interference capabilities. This review provides an overview of the current situation of offshore pollution, as well as major trends of pollutant fate and transportation from continent to marine ecosystems, transformation of pollutants in sediments, and their bioaccumulation and diffusion. This study retrospectively reviews the long-term geological evolution of offshore pollution from the perspective of marine geology, and analyses their long-term potential impacts on marine ecosystems. Due to ecological risks associated with pollutants released from offshore sediments, more research on the influence of global offshore pollution based on marine geology is undoubtedly needed. (c) 2022 China University of Geosciences (Beijing) and Peking University. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/ licenses/by-nc-nd/4.0/).

4.A robust possibilistic flexible programming approach toward a resilient and cost-efficient biodiesel supply chain network

Journal:JOURNAL OF CLEANER PRODUCTION

Abstract: Increasing energy demand and the fast depletion of fossil fuels have prompted the quest for sustainable energy sources. Biodiesel is a potential fossil fuel replacement that can be used in engines without modification. However, the commercial feasibility of biodiesel production is a major challenge. A resilient and cost-efficient biodiesel supply chain network is essential for commercialization. In addition, disruption risks arising from operational downtime, labor strikes, natural disasters, and uncertainty embedded in the data compromise the effectiveness of tactical and strategic level supply chain planning. In line with these requirements, an animal fatbased biodiesel supply chain model that reduces the total system cost and accounts for both disruption and operational risks is proposed. The proposed model determines the optimal production-distribution quantities and supports facility location and capacity decisions against multiple supply and demand interruption scenarios. A novel interactive solution technique, robust possibilistic flexible programming, which enables decision-makers to incorporate flexibility into model constraints, has been introduced. Furthermore, a p-measure constraint that ensures the lowest cost under disruption scenarios is used to control network reliability. A

real-world case study is used to assess the suggested model and solution technique's applicability. The findings demonstrate a tradeoff between system reliability and nominal cost, showing that with a marginal increase in overall cost, the decisions can be secured against an uncertain environment. Biodiesel producers and distributors, as well as investors and regulators, may potentially benefit from the proposed model.

5.Numerical Simulation of Water-Silt Inrush Hazard of Fault Rock: A Three-Phase Flow Model

Journal:ROCK MECHANICS AND ROCK ENGINEERING

Abstract: Fault rock is a typical hazardous material of water-silt inrush during the excavation in underground mines. To investigate hydraulic characteristics of fault rock during the water-silt inrush, a one-dimensional radial three-phase flow model of water-rock-silt was established in this study. In the proposed model, the mass conservation and continuity equations of the three-phase flow were obtained; the rock particle migration and the momentum conservation of the three-phase fluid migration were described by erosion constitutive equations and non-Darcy flow equations, respectively. The laboratory tests of porosity and the evolution of volume discharge rate were compared, and the accuracy of the proposed three-phase model was verified by the comparison results. From the test and numerical results, a high standard deviation of repeated results is observed in the case with high silt concentrations, and the erosion effect is inhibited by the silt flow. Last but not least, the temporal-spatial distribution of hydraulic properties is obtained by the numerical simulation: With the progress of the three-phase flow, rock particles near the fluid outlet are first fluidized and constantly migrate outward, resulting in an increase of the porosity and permeability in fault rock. Subsequently, water-conducting pathways are gradually formed inside the fault rock, and then more fluidized rock particles flow out. Finally, the fluidized rock particles have completely migrated, and the porosity and permeability tend to be stable with the more significant non-uniform spatial distribution.

6.Towards the Unmanned Aerial Vehicles (UAVs): A Comprehensive Review

Journal:DRONES

Abstract: Recently, unmanned aerial vehicles (UAVs), also known as drones, have come in a great diversity of several applications such as military, construction, image and video mapping, medical, search and rescue, parcel delivery, hidden area exploration, oil rigs and power line monitoring, precision farming, wireless communication and aerial surveillance. The drone industry has been getting significant attention as a model of manufacturing, service and delivery convergence, introducing synergy with the coexistence of different emerging domains. UAVs offer implicit peculiarities such as increased airborne time and payload capabilities, swift mobility, and access to remote and disaster areas. Despite these potential features, including extensive variety of usage, high maneuverability, and cost-efficiency, drones are still limited in terms of battery endurance, flight autonomy and constrained

flight time to perform persistent missions. Other critical concerns are battery endurance and the weight of drones, which must be kept low. Intuitively it is not suggested to load them with heavy batteries. This study highlights the importance of drones, goals and functionality problems. In this review, a comprehensive study on UAVs, swarms, types, classification, charging, and standardization is presented. In particular, UAV applications, challenges, and security issues are explored in the light of recent research studies and development. Finally, this review identifies the research gap and presents future research directions regarding UAVs.

7. An interpretable model for the susceptibility of rainfall-induced shallow landslides based on SHAP and XGBoost

Journal:GEOCARTO INTERNATIONAL

Abstract: The machine-learning black box models, which lack interpretability, have limited application in landslide susceptibility mapping. To interpret the black-box models, some interpretable machine learning algorithms have been proposed recently. Among them is SHaply Additive ExPlanation (SHAP), which has attracted much attention because of its ease of operation and comprehensiveness. In this study, a novel interpretable model based on SHAP and XGBoost is proposed to interpret landslides susceptibility evaluation at global and local levels. The established evaluation model provided 0.75 accuracy and 0.83 AUC value for the test sets. The global interpretation shows that the peak rainfall intensity and elevation are the dominant factors that influence the occurrence of landslides in the study area. The combination of local interpretation and field investigations can provide a comprehensive framework for evaluating designated landslides, and it can also be used as a reference for preventing and managing the hazards of landslides.

8. A global meta-analysis of heavy metal(loid)s pollution in soils near copper mines: Evaluation of pollution level and probabilistic health risks

Journal: SCIENCE OF THE TOTAL ENVIRONMENT

Abstract: With the rapid development of the mining industry, the pollution of heavy metal(loid)s in soils near copper (Cu) mining sites is a significant concern worldwide. However, the pollution status and probabilistic health risks of heavy metal (loid)s of soils associated with Cu mines, have rarely been studied on a global scale. In this study, eight heavy metal (loid) concentrations in soil samples taken near 102 Cu mining sites worldwide were obtained through a literature review. Based on this database, the heavy metal(loid) pollution and ecological risk in soils near Cu mines were evaluated. Most of the study sites exceeded the moderately to heavily polluted levels of Cu and Cd; compared to other regions, higher pollution levels were observed at sites in Oman, China, Australia, and the United Kingdom. Soil pollution by Cd, Pb, and Zn at agricultural sites was higher than that in non-agricultural sites. In addition, these heavy metal (loid)s produced a high ecological risk to soils around Cu mining sites in which the contribution of Cd, Cu, and As reached up to 46.5%, 21.7%, and

18.4%, respectively. The mean hazard indices of the eight heavy metal(loid)s were 0.209 and 0.979 for adults and children, respectively. The Monte Carlo simulation further predicted that 1.40% and 29.9% of non-carcinogenic risk values for adults and children, respectively, exceeded the safe level of 1.0. Moreover, 84.5% and 91.0% of the total cancer risk values for adults and children, respectively, exceeded the threshold of 1E-04. Arsenic was the main contributor to non-carcinogenic risk, while Cu had the highest exceedance of carcinogenic risk. Our findings indicate that the control of Cu, Cd, and As should be prioritized because of their high incidence and significant risks in soils near Cu mines. These results provide valuable inputs for policymakers in design-ing effective strategies for reducing the exposure of heavy metal(loid)s in this area worldwide.

9. Evolution and modeling of mine water inflow and hazard characteristics in southern coalfields of China: A case of Meitanba mine

Journal: INTERNATIONAL JOURNAL OF MINING SCIENCE AND TECHNOLOGY

Abstract: In this paper, the hydrogeological characteristics in the southern coalfields of China are first briefly outlined. Then, taking the Meitanba mine as an example, the evolution and modeling of mine water inflow are studied. Finally, the hazard characteristics related to mine water and mud inrush are analyzed. The results show that the main mine water sources in the Meitanba mine area are groundwater, surface water and precipitation. The evolution of mine water inflow with time indicates that the water inflow is closely related to the development of karst structures, the amount of water from rainfall infiltration, and the scope of groundwater depression cone. The mine water inflow increases with time due to the increase in mining depth and the expansion of groundwater depression cone. Using the big well method and following the potential superposition principle, a hydrogeological model considering multi-well interactions has been developed to predict the mine water inflow. Based on the monitored data in the Meitanba mine area over a period of nearly 60 years, it is found that with increasing mining depth, the number of water and mud inrush points tended to decrease. However, the average water and mud flow rate per point tended to increase. (c) 2022 Published by Elsevier B.V. on behalf of China University of Mining & Technology. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

10. Dynamic mechanical characteristics and application of constant resistance energy-absorbing supporting material

Journal: INTERNATIONAL JOURNAL OF MINING SCIENCE AND TECHNOLOGY

Abstract: In deep underground engineering, rock burst and other dynamic disasters are prone to occur due to stress concentration and energy accumulation in surrounding rock. The control of dynamic disasters requires bolts and cables with high strength,

high elongation, and high energy-absorbing capacity. Therefore, a constant resistance energy-absorbing (CREA) material is developed. In this study, the dynamic characteristics of the new material are obtained via the drop hammer tests and the Split Hopkinson Pressure Bar (SHPB) tests of the new material and two common bolt (CB) materials widely used in the field. The test results of drop hammer test and SHPB test show that the percentage elongation of CREA material is more than 2.64 and 3.22 times those of the CB material, and the total impact energy acting on CREA material is more than 18.50 and 21.84 times, respectively, indicating that the new material has high elongation and high energy-absorbing capacity. Subsequently, the CREA bolts and cables using the new material are developed, which are applied in roadways with high stress and strong dynamic disturbance. The field monitoring results show that CREA bolts and cables can effectively control the surrounding rock deformation and ensure engineering safety.

11. Rapid Characterization of Large Volcanic Eruptions: Measuring the Impulse of the Hunga Tonga Ha'apai Explosion From Teleseismic Waves

Journal: GEOPHYSICAL RESEARCH LETTERS

Abstract: Most of the largest volcanic activity in the world occurs in remote places such as deep oceans or poorly monitored oceanic island arcs. Thus, our capacity of monitoring volcanoes is limited to remote sensing and global geophysical observations. However, the rapid estimation of volcanic eruption parameters is needed for scientific understanding of the eruptive process and rapid hazard estimation. We present a method to rapidly identify large volcanic explosions, based on analysis of seismic data. With this methodology, we promptly detect the 15 January 2022 Hunga Tonga Ha'apai eruption. We then analyze the seismic waves generated by the volcanic explosion and estimate its important first-order parameters. We further relate the parameters with the volcanic explosivity index (VEI). Our estimate of VEI similar to 6 indicates that how the Hunga Tonga eruption is among the largest volcanic activity ever recorded with modern geophysical instrumentation and can provide new insights into the physics of large eruptions.

12. Discovery and quantification of plastic particle pollution in human blood

Journal: ENVIRONMENT INTERNATIONAL

Abstract: Plastic particles are ubiquitous pollutants in the living environment and food chain but no study to date has reported on the internal exposure of plastic particles in human blood. This study's goal was to develop a robust and sensitive sampling and analytical method with double shot pyrolysis -gas chromatography/mass spectrometry and apply it to measure plastic particles >700 nm in human whole blood from 22 healthy volunteers. Four high production volume polymers applied in plastic were

identified and quantified for the first time in blood. Polyethylene terephthalate, polyethylene and polymers of styrene (a sum parameter of polystyrene, expanded polystyrene, acetonitrile butadiene styrene etc.) were the most widely encountered, followed by poly (methyl methacrylate). Polypropylene was analysed but values were under the limits of quantification. In this study of a small set of donors, the mean of the sum quantifiable concentration of plastic particles in blood was 1.6 mu g/ml, showing a first measurement of the mass concentration of the polymeric component of plastic in human blood. This pioneering human biomonitoring study demonstrated that plastic particles are bioavailable for uptake into the human bloodstream. An understanding of the exposure of these substances in humans and the associated hazard of such exposure is needed to determine whether or not plastic particle exposure is a public health risk.

13. The S2M meteorological and snow cover reanalysis over the French mountainous areas: description and evaluation (1958-2021)

Journal: EARTH SYSTEM SCIENCE DATA

Abstract: This work introduces the S2M (SAFRAN-SURFEX/ISBA-Crocus-MEPRA) meteorological and snow cover reanalysis in the French Alps, Pyrenees and Corsica, spanning the time period from 1958 to 2021. The simulations are made over elementary areas, referred to as massifs, designed to represent the main drivers of the spatial variability observed in mountain ranges (elevation, slope and aspect). The meteorological reanalysis is performed by the SAFRAN system, which combines information from numerical weather prediction models (ERA-40 reanalysis from 1958 to 2002, ARPEGE from 2002 to 2021) and the best possible set of available in situ meteorological observations. SAFRAN outputs are used to drive the Crocus detailed snow cover model, which is part of the land surface scheme SURFEX/ISBA. This model chain provides simulations of the evolution of the snow cover, underlying ground and the associated avalanche hazard using the MEPRA model. This contribution describes and discusses the main climatological characteristics (climatology, variability and trends) and the main limitations of this dataset. We provide a short overview of the scientific applications using this reanalysis in various scientific fields related to meteorological conditions and the snow cover in mountain areas. An evaluation of the skill of S2M is also displayed, in particular through comparison to 665 independent in situ snow depth observations. Further, we describe the technical handling of this open-access dataset, available at https://doi.org/10.25326/37#v2020.2. The S2M data are provided by Meteo-France - CNRS, CNRM, Centre d'etudes de la Neige, through AERIS.

14. Tsunami Effects on the Coast of Mexico by the Hunga Tonga-Hunga Ha'apai Volcano Eruption, Tonga

Journal:PURE AND APPLIED GEOPHYSICS

Abstract: The massive explosion by the January 15, 2022 Hunga Tonga-Hunga Ha'apai volcano in Tonga triggered a trans-oceanic tsunami generated by coupled

ocean and atmospheric shock waves during the explosion. The tsunami reached first the coast of Tonga, and later many coasts around the world. The shock wave went around the globe, causing sea perturbations as far as the Caribbean and the Mediterranean seas. We present the effects of the January 15, 2022 Tonga tsunami on the Mexican Pacific Coast, Gulf of Mexico, and Mexican Caribbean coast, and discuss the underrated hazard caused by great volcanic explosions, and the role of early tsunami warning systems, in particular in Mexico. The shock wave took about 7.5 h to reach the coast of Mexico, located about 9000 km away from the volcano, and the signal lasted several hours, about 133 h (5.13 days). The shock wave was the only cause for sea alterations on the Gulf of Mexico and Caribbean Sea, while at the Mexican Pacific coast both shock wave and the triggered tsunami by the volcano eruption and collapse affected this coast. The first tsunami waves recorded on the Mexican Pacific coast arrived around 12:35 on January 15, at the Lazaro Cardenas, Michoacan tide gauge station. The maximum tsunami height exceeded 2 m at the Ensenada, Baja California, and Manzanillo, Colima, tide gauge stations. Most tsunami warning advisories, with two exceptions, reached communities via social media (Twitter and Facebook), but did not clearly state that people must stay away from the shore. We suggest that, although no casualties were reported in Mexico, tsunami warning advisories of far-field tsunamis and those triggered non-seismic sources, such as landslides and volcanic eruptions, should be included and improved to reach coastal communities timely, explaining the associated hazards on the coast.

15. Investigations and new insights on earthquake mechanics from fault slip experiments

Journal: EARTH-SCIENCE REVIEWS

Abstract: Earthquakes occur mainly on active faults. Fault slip is closely related to seismicity and is thus widely discussed in Geosciences, Seismology, and Engineering. Slip experiment is a necessary and powerful tool to explore the physical processes and mechanisms of pre-earthquake, earthquake, and aftershock. This work reviews the experiment study of fault slip from field experiments, laboratory experiments, and numerical experiments, which helps to provide a clear understanding of earthquake mechanics. We show that there are five main influencing factors in the study of fault and earthquake: stress, velocity, material, fluid, and temperature. Around these factors, the process of shear failure and rupture nucleation, the weakening and strengthening of fault, the characteristics of slip behavior, and the signal characteristics of slip are discussed. These works do not only have the potential to advance the understanding of the earthquake mechanism, but also to guide the prediction and control of earthquakes disasters. Furthermore, there are still several issues that need to be better discussed, such as the influence of stress disturbance on fault stability, the scale effect between natural faults and laboratory faults, and the role of roughness in the friction and slip characteristics of faults. Moreover, it is also necessary to consider the earthquake precursors of multiple signals such as seismic velocity, electrical signal, and magnetic

signal, as well as effectively capture them in combination with artificial intelligence technology. It will be new breakthroughs in the prediction of earthquakes.

16. A Survey on Deep Learning-Based Change Detection from High-Resolution Remote Sensing Images

Journal: REMOTE SENSING

Abstract: Change detection based on remote sensing images plays an important role in the field of remote sensing analysis, and it has been widely used in many areas, such as resources monitoring, urban planning, disaster assessment, etc. In recent years, it has aroused widespread interest due to the explosive development of artificial intelligence (AI) technology, and change detection algorithms based on deep learning frameworks have made it possible to detect more delicate changes (such as the alteration of small buildings) with the help of huge amounts of remote sensing data, especially high-resolution (HR) data. Although there are many methods, we still lack a deep review of the recent progress concerning the latest deep learning methods in change detection. To this end, the main purpose of this paper is to provide a review of the available deep learning-based change detection algorithms using HR remote sensing images. The paper first describes the change detection framework and classifies the methods from the perspective of the deep network architectures adopted. Then, we review the latest progress in the application of deep learning in various granularity structures for change detection. Further, the paper provides a summary of HR datasets derived from different sensors, along with information related to change detection, for the potential use of researchers. Simultaneously, representative evaluation metrics for this task are investigated. Finally, a conclusion of the challenges for change detection using HR remote sensing images, which must be dealt with in order to improve the model's performance, is presented. In addition, we put forward promising directions for future research in this area.

17. The Content of Heavy Metals in Cigarettes and the Impact of Their Leachates on the Aquatic Ecosystem

Journal:SUSTAINABILITY

Abstract: Smoked cigarettes and butts are the most common kind of litter around the world. The buildup of these litters has badly polluted local water bodies and their compartments, and the cumulative effect of many cigarette butts scattered in a centralized location may pose a serious hazard to living species. To understand how heavy metals are leached out into the aquatic ecosystem, researchers must analyse the behavior of the materials that make up cigarettes. Using atomic absorption spectrometry, this study evaluated the content of several metals (such as Cd, Cu, Fe, Pb, Sn, Zn, and Hg) leached from various brands of unsmoked and smoked cigarettes and cigarette butts. The findings revealed that heavy metal is more prevalent in butte. These findings indicate that cigarette litter is a major source of metal contamination in the aquatic ecosystem and that apparent leaching may increase the risk of toxicity to aquatic organisms.

18. Trends of Rainfall Variability and Drought Monitoring Using Standardized Precipitation Index in a Scarcely Gauged Basin of Northern Pakistan
Journal: WATER

Abstract: This study focused on the trends of rainfall variability and drought monitoring in the northern region of Pakistan (Gilgit-Baltistan). Climate Hazards Group Infrared Precipitation with Stations (CHIRPS) model data were used for the period of 1981 to 2020. The Standardized Precipitation Index (SPI) was applied to assess the dry and wet conditions during the study period. The Mann-Kendall (MK) and Spearman's rho (SR) trend tests were applied to calculate the trend of drought. A coupled model intercomparison project-global circulation model (CMIP5-GCMs) was used to project the future precipitation in Gilgit-Baltistan (GB) for the 21st century using a multimodel ensemble (MME) technique for representative concentration pathway (RCP) 4.5 and RCP 8.5. From the results, the extreme drought situations were observed in the 12-month SPI series in 1982 in the Diamir, Ghizer, and Gilgit districts, while severe drought in 1982-1983 was observed in Astore, Ghizer, Gilgit, Hunza-Nagar, and Skardu. Similarly, in 2000-2001 severe drought prevailed in Diamir, Ghanche, and Skardu. The results of MK and SR indicate a significant increasing trend of rainfall in the study area, which is showing the conversion of snowfall to rainfall due to climate warming. The future precipitation projections depicted an increase of 4% for the 21st century as compared with the baseline period in the GB region. The results of the midcentury projections depicted an increase in precipitation of about 13%, while future projections for the latter half of the century recorded a decrease in precipitation (about 9%) for both RCPs, which can cause flooding in midcentury and drought in the latter half of the century. The study area is the host of the major glaciers in Pakistan from where the Indus River receives its major tributaries. The area and volume of these glaciers are decreasing due to warming impacts of climate change. Therefore, this study is useful for proper water resource management to cope up with water scarcity in the future.

19. A Quantitative Analysis of the Influence of Temperature Change on the Extreme Precipitation
Journal: ATMOSPHERE

Abstract: As an essential part of the hydrological cycle, precipitation is usually associated with floods and droughts and is increasingly being paid attention to in the context of global warming. Analyzing the change trends and correlation of temperature and extreme precipitation indicators can effectively identify natural disasters. This study aimed to detect the correlation and change trends of temperature and extreme precipitation indicators in Inner Mongolia from 1960 to 2019. Panel vector autoregression (PVAR) models based on Stata software were used to detect the correlation between temperature and extreme precipitation indicators at 35 climatological stations throughout Inner Mongolia. The temperature and extreme precipitation indicator trends were analyzed using the Mann-Kendall test and Sen's

slope method. The spatial distribution characteristics of the annual precipitation and rainfall intensity were more significant in the southeast and more minor in the northwest, while an increase in the annual wet days was noticeable to the northeast. The Granger cause tests of the temperature and the extreme precipitation indicators showed a correlation between each indicator and temperature at the significance level of 1%. The temperature positively correlated with only the rainfall intensity while negatively correlating with the remaining indicators. There is no doubt that trend analysis showed significant increasing trends in rainfall intensity at all stations, which means increased risk in extreme precipitation events. By contrast, the annual precipitation and annual wet days showed significant decreasing trends, which means that the precipitation is concentrated, and it is easier to form extreme precipitation events. The study can provide a basis for decision-making in water resources and drought/flood risk management in Inner Mongolia, China.

20. Flood risk index development at the municipal level in Costa Rica: A methodological framework

Journal: ENVIRONMENTAL SCIENCE & POLICY

Abstract: Floods constitute one of the most damaging natural hazards in the world. Seasonal and extraordinary rainfall recurrently trigger different types of floods in Costa Rica. An integrated and efficient flood risk management requires comprehensive understanding on the flood driving variables. This study analyzes and classifies the 82 Costa Rican municipalities in terms of hazard, exposure, and vulnerability to floods. Then, an index for flood risk is designed to comprehend the risk driver's role (hazard, exposure, and vulnerability) at a local level. The present method provides a flood risk index on a municipal scale done through a statistical validation of different sources of municipal-level data. Higher flood risk values mostly occur in municipalities located in extensive flatlands, medium to large areas in both the Pacific and Caribbean basins, as well as borderlands and coastal regions. The results can promote flood risk assessment plans in developing countries or regions where baseline information is limited. This approach has been absent in most of the national flood risk policies, specifically the plans analyzing the likelihood of short, mid, and long-term decline of risk conditions influencing flood disasters.

21. Imidacloprid toxicity in Clarias gariepinus: Protective role of dietary Hyphaene thebaica against biochemical and histopathological disruption, oxidative stress, immune and Aeromonas sobria infection

Journal: AQUACULTURE

Abstract: Recently, there has been a controversy about the hazards of toxic substances released to the aquatic biota. Therefore, the current context is the first attempt to assess the ability of a beneficial medicinal plant, Hyphaene thebaica fruit (HTF) to mitigate various toxic impacts in Clarias gariepinus induced by imidacloprid (IMI) including immune depression, protein impairment, oxidative stress, hepato-renal dysfunction, histopathological, and immune-histochemical alterations. The molecular

responses of IMI-induced toxicity at the molecular level and to recognize critical genes altered in response to toxicity are documented. Additionally, we investigated the fish resistance post-challenging with a pathogenic zoonotic bacterium, Aeromonas sobria. Fish (N = 240) were randomly allotted into four random groups in triplicate. The first (control) and second (HTF) groups were fed on basal diets that were enriched with 0.0 and 15 g kg(-1) of HTF without IMI exposure. The third and fourth groups were fed on the same diets and exposed to 1/5 of the 96-h of LC50 of IMI (2.03 mu g L-1) for 60 days. The findings clarified that the IMI exposure significantly augmented ($p < 0.05$) serum alanine (ALT), aspartate aminotransferases (AST), urea, and creatinine besides malondialdehyde (MDA) levels. While the activities of the protein profile (total protein, albumin, and globulin), immune parameters (lysozyme and immunoglobulin M), and hepatic antioxidant enzymes (superoxide dismutase and glutathione peroxidase) revealed marked depressions in comparison to the control. Histological and immune-histochemical alterations in liver and kidney tissues including vacuolation, severe necrosis, and degeneration, besides weak B-cell lymphoma 2 (BCL-2), potent caspase-3, and down-regulation of genes (IL-1 beta, IL-8, TNF-alpha, TGF-beta, TLR-5, LYSG, LYSC, NF-kappa beta, CC, and MYE) were noticed in the IMI-exposed group compared to the control. After 60 days of experimental trial, C. gariepinus challenged by A. sobria exhibited sluggish movement, fin rot accompanied with hemorrhages in different body parts, and severe skin ulcerations with the highest cumulative mortality (80%). Surprisingly, HTFdietary inclusion enhanced these variables by almost renovating to control values by maintaining histological architecture of the hepatic and renal tissues. Additionally, it increased the fish resistance against A. sobria indicated by reduced mortalities (40%) and enhanced clinical picture. The outputs of the recent study recommend the HTF-dietary supplement to protect against the IMI toxicity in C. gariepinus. And provide insights into the future application of the HTF as an anti-toxic, immune-stimulant, antioxidant, and antibacterial, for improving fish health and sustaining aquaculture. To avoid the deleterious toxic impacts of IMI, this pesticide must be applied carefully, especially near water bodies.

22. A multi-hazard framework for spatial-temporal impact analysis

Journal: INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION

Abstract: This paper aims to provide a five-step conceptual framework to analyze the impacts to the built environment from multi-hazard interactions. Our methodology includes a critical literature review and stakeholder workshops. This framework's five steps are the following: (I) identify hazards and their interactions, (II) multi-hazard modelling, (III) analysis of the hazards' spatio-temporal evolution of impacts, (IV) identification of impact interactions, (V) a multi-hazard risk or impact assessment. Our approach is based on the systematic analysis of the spatial and temporal evolution of hazards to determine potential impact interactions. In Step IV, we classify the spatial-temporal overlap of hazard impacts into four types: (i) spatial-temporal

overlapping, (ii) temporal (but not spatial) overlapping, (iii) spatial overlapping (with residual and subsequent damage), (iv) independent single hazards. Building on current multi-hazard approaches and guidelines, this framework is generally applicable to a broad range of hazards, includes both hazard and impact interactions, and considers residual damage and recovery processes. The framework is applied to a real-world case study in Po Valley, Italy, of a hypothetical damage scenario from an earthquake shock that weakens the levee system, and then combined with intense rain results in a levee collapse and flood. The framework application is supported by a visualization of each step, useful to identify key elements for multi-hazard impact modelling. Practical uses of the framework include the creation of checklists for decision-making, narrowing future research needs in multi-hazard risk, and integrating multi-hazard aspects into international disaster risk management guidelines.

23. Centrifugal model test on a riverine landslide in the Three Gorges Reservoir induced by rainfall and water level fluctuation

Journal: GEOSCIENCE FRONTIERS

Abstract: Frequent soil landslide events are recorded in the Three Gorges Reservoir area, China, making it necessary to investigate the failure mode of such riverside landslides. Geotechnical centrifugal test is considered to be the most realistic laboratory model, which can reconstruct the required geo-stress. In this study, the Liangshuijing landslide in the Three Gorgers Reservoir area is selected for a scaled centrifugal model experiment, and a water pump system is employed to retain the rainfall condition. Using the techniques of digital photography and pore water pressure transducers, water level fluctuation is controlled, and multi-physical data are thus obtained, including the pore water pressure, earth pressure, surface displacement and deep displacement. The analysis results indicate that: Three stages were set in the test (waterflooding stage, rainfall stage and drainage stage). Seven transverse cracks with wide of 1-5 mm appeared during the model test, of which 3 cracks at the toe landslide were caused by reservoir water fluctuation, and the cracks at the middle and rear part were caused by rainfall. During rainfall process, the maximum displacement of landslide model reaches 3 cm. And the maximum deformation of the model exceeds 12 cm at the drainage stage. The failure process of the slope model can be divided into four stages: microcracks appearance and propagation stage, thrust-type failure stage, retrogressive failure stage, and holistic failure stage. When the thrust-type zone caused by rainfall was connected or even overlapped with the retrogressive failure zone caused by the drainage, the landslide would start, which displayed a typical composite failure pattern. The failure mode and deformation mechanism under the coupling actions of water level fluctuation and rainfall are revealed in the model test, which could appropriately guide for the analysis and evaluation of riverside landslides. (c) 2022 China University of Geosciences (Beijing) and Peking University. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/

24. Combining rainfall-induced shallow landslides and subsequent debris flows for hazard chain prediction

Journal: CATENA

Abstract: Landslides, debris flows, and other destructive natural hazards induced by heavy rainfall in mountainous regions are sometimes not independent but combined to form a disaster chain. Based on the integral link between the triggering of the landslide and the subsequent debris flow, we propose an approach that combines the Transient Rainfall Infiltration and Grid-Based Regional Slope Stability (TRIGRS) model and the Rapid Mass Movements Simulation (RAMMS) model to achieve hourly hazard prediction. The results indicate that the TRIGRS model performed well in predicting the spatial distribution of the shallow landslides, with a success rate of 81.86%. Thus, it is reasonable to use it as the initial input for debris flow simulations. The relationship between the landslide area and the accumulated rainfall obtained using the TRIGRS model is a power-law relationship, which provides a reference for regions that lack rainfall data to predict the material source of a debris flow. The coupled model was found to have a good accuracy of 76.77% in simulating the debris flow. This was close to the debris flow simulation based on the interpreted landslides, and it still produced reasonable results and a more practical value. Furthermore, the proposed coupled model can dynamically predict disasters by the hour based on actual rainfall events. Therefore, the results of this study help provide a more complete hazard prediction picture for rainfall-induced landslide-debris flow hazards in mountainous regions.

25. Retrospecting on resource abundance in leading oil-producing African countries: how valid is the environmental Kuznets curve (EKC) hypothesis in a sectoral composition framework?

Journal: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH

Abstract: Policymakers and authorities in Africa are often concerned about economic growth and stability owing to the long history of socioeconomic problems that have bedeviled the continent for years. However, increasing environmental degradation challenges in recent times beckons for adequate attention considering Africa's vulnerability to climate change and environmental disasters. Thus, the current study examines the illustrious environmental Kuznets curve (EKC) hypothesis in a sectoral composition framework of fossil resources abundance among leading oil-producing African economies, including Algeria, Nigeria, Angola, and Egypt, using a combination of quantile regression (QR) approach and dynamic ordinary least square (DOLS) for data between 1995 and 2016. Based on the empirical results from the study, three main factors significantly increase environmental pollution through CO2 emissions among the countries, namely: fossil energy consumption, income levels, and the shares of the manufacturing sector in the total gross domestic product (GDP). While income growth exacerbates pollution, the negative impacts of the income

square were only significant at the lower and mid quantiles of the understudied periods in the QR estimates. Thus, the EKC hypothesis was not convincingly upheld for the countries as its validity demonstrates significant quantile effects. Furthermore, the tripartite causality nexus among real income, resource rent, and share of the service sector in GDP, which is unobserved in the share of the manufacturing sector, reflect the infamous Dutch disease argument among the resource-dependent countries. Hence, to promote environmental sustainability and address resource dependency toward the actualization of SDGs (1, 8, 12, and 13), the study recommends energy portfolios diversification alongside economic diversification.

26. Coseismic surface ruptures, slip distribution, and 3D seismogenic fault for the 2021 Mw 7.3 Maduo earthquake, central Tibetan Plateau, and its tectonic implications
Journal: TECTONOPHYSICS
Abstract: The 2021 Mw 7.3 Maduo earthquake, which hit the high mountain area of the internal Bayan Har Block in the central Tibetan Plateau, generated a similar to 154 km-long, nearly E-W-striking surface rupture zone. Field observations indicate prominent surface breaks characterized by discontinuous shear faults, en echelon tensional fissures, and mole track structures, revealing a dominantly left-lateral strike-slip motion with a maximum sinistral offset of similar to 2.7-2.8 m and general offset of similar to 1.0-1.5 m. The west part of the Maduo surface rupture zone occurred along the pre-existing Jiangcuo fault. Its east portion cut through some WNW-trending tectonics, indicating a previously unknown fault. The epicenter and slip distribution show a bilateral rupture for the Maduo quake. The complex 3D geometry of the Maduo seismogenic fault has controlled the occurrence of aftershocks and the multimodal distribution of coseismic displacements. The abnormally long Maduo surface rupture zone suggests that the rupture area-magnitude relationship might be more applicable than the rupture length-magnitude relationship for the magnitude estimation of a paleo-event. The occurrence of the Maduo earthquake challenges the active block model which used to predict little or no slip partitioning and large earthquakes in the block interior. A reappraisal of seismic hazard along intra-block faults with low strain rates is needed, especially across densely populated regions.

27. Study on the Overburden Failure Law of High-Intensity Mining in Gully Areas With Exposed Bedrock
Journal: FRONTIERS IN EARTH SCIENCE
Abstract: Most hilly areas are dotted with gullies, some of which contain plenty of water, especially in rainy seasons. Once surface water penetrates the underground working face, it will lead to an increased water inflow of the working face. Even worse, it may induce water and sand burst accidents. To prevent geological disasters such as water and sand burst and ensure the safe production in coal mines, it is necessary to reveal the development law of two zones in the overburden caused by shallow-seam fully mechanized top coal caving high-intensity mining in hilly areas

with exposed bedrock and timely grasp the communication between the water-flowing fractured zone (WFFZ) and the water in surface gullies. In this study, the working face P2 of the exposed bedrock surface in the Coal Mine DN is taken as the research object. First, the characteristics of overburden movement and the law of exposed bedrock surface movement in areas with exposed bedrock were investigated through similar simulation. Meanwhile, the temporal-spatial evolution of overburden movement caused by shallow-seam fully mechanized top coal caving high-intensity mining was clarified, and the mode of overburden movement was revealed. Moreover, the reason why the water inflow of the underground working face increases suddenly was theoretically explained. The following conclusions were drawn: Under shallow-seam fully mechanized top coal caving high-intensity mining, the WFFZ of the working face P2 is directly connected to the exposed bedrock surface, and the movement of the overburden is subject to the typical two-zone mode. The development height of the WFFZ is greater than the value in the traditional three-zone mode calculated according to the empirical formulas. The ratio of the WFFZ height to the mining thickness is 43.75. Under the two-zone mode, a water-flowing channel exists in the overburden near the open-off cut and the stopping line. When the surface water source is in the right position, the water inflow of the underground working face will increase suddenly.

28. Perception of Occupational and Environmental Risks and Hazards among Mineworkers: A Psychometric Paradigm Approach

Journal: INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH

Abstract: This study aims to assess workers' perception of occupational and environmental risks and hazards using the psychometric paradigm. For this purpose, data were collected using survey questionnaires from 360 mineworkers recruited from mineral and sand mines. Respondents were asked to evaluate eight occupational and environmental risks and hazards on nine commonly used risk characteristics. The principal component analysis revealed that two components, Dreaded and Unknown, explained 73% percent of the total variance in workers' risk perception. The results also showed that the risk of developing an occupational disease was perceived as the most dreaded and unknown type of risk, while landslide, occupational noise, and vibration exposure were the least familiar to the respondents. A practical implication of this research is that the results may offer an insight into the employees' perceptions of the hazards and risks associated with their working environment. This could help risk management develop and implement effective risk management and communications strategies.

29. Shape ratio effects on the mechanical characteristics of rectangular prism rocks and isolated pillars under uniaxial compression

Journal: INTERNATIONAL JOURNAL OF MINING SCIENCE AND TECHNOLOGY

Abstract: Isolated pillars in underground mines are subjected to uniaxial stress, and the load bearing cross-section of pillars is commonly rectangularly shaped. In addition, the uniaxial compression test (UCT) is widely used for determining the basic mechanical properties of rocks and revealing the mechanism of isolated pillar disasters under unidimensional stress. The shape effects of rock mechanical properties under uniaxial compression are mainly quantitatively reflected in the specific shape ratios of rocks. Therefore, it is necessary to study the detailed shape ratio effects on the mechanical properties of rectangular prism rock specimens and isolated pillars under uniaxial compressive stress. In this study, granite, marble and sandstone rectangular prism specimens with various height to width ratios (r) and width to thickness ratios (u) were prepared and tested. The study results show that r and u have a great influence on the bearing ability of rocks, and thin or high rocks have lower uniaxial compressive strength. Reducing the level of r can enhance the u effect on the strength of rocks, and increasing the level of u can enhance the r effect on the strength of rocks. The lateral strain on the thickness side of the rock specimen is larger than that on the width side, which implies that crack growth occurs easily on the thickness side. Considering r and u, a novel strength prediction model of isolated pillars was proposed based on the testing results, and the prediction model was used for the safety assessment of 179 isolated pillars in the Xianglu Mountain Tungsten Mine.

30. Graphene-based electrochemical sensors for antibiotic detection in water, food and soil: A scientometric analysis in CiteSpace (2011-2021)

Journal: CHEMOSPHERE

Abstract: The residues of antibiotics in the environment pose a potential health hazard, so highly sensitive detection of antibiotics has always appealed to analytical chemists. With the widespread use of new low-dimensional materials, graphene-modified electrochemical sensors have emerged as an excellent candidate for highly sensitive detection of antibiotics. Graphene, its derivatives and its composites have been used in this field of exploration in the last decade. In this review, we have not only described the field using traditional summaries, but also used bibliometrics to quantify the development of the field. The literature between 2011 and 2021 was included in the analysis. Also, the sensing performance and detection targets of different sensors were compared. We were able to trace not only the flow of research themes, but also the future areas of development. Graphene is a material that has a high potential to be used on a large scale in the preparation of electrochemical sensors. How to design a sensor with selectivity and low cost is the key to bring this material from the laboratory to practical applications.

31. Loess Landslide Detection Using Object Detection Algorithms in Northwest China

Journal: REMOTE SENSING

Abstract: Regional landslide identification is important for the risk management of landslide hazards. The traditional methods of regional landslide identification were mainly conducted by a human being. In previous studies, automatic landslide recognition mainly focused on new landslides distinct from the environment induced by rainfall or earthquake, using the image classification method and semantic segmentation method of deep learning. However, there is a lack of research on the automatic recognition of old loess landslides, which are difficult to distinguish from the environment. Therefore, this study uses the object detection method of deep learning to identify old loess landslides with Google Earth images. At first, a database of loess historical landslide samples was established for deep learning based on Google Earth images. A total of 6111 landslides were interpreted in three landslide areas in Gansu Province, China. Second, three object detection algorithms including the one-stage algorithm RetinaNet and YOLO v3 and the two-stage algorithm Mask R-CNN, were chosen for automatic landslide identification. Mask R-CNN achieved the greatest accuracy, with an AP of 18.9% and F1-score of 55.31%. Among the three landslide areas, the order of identification accuracy from high to low was Site 1, Site 2, and Site 3, with the F1-scores of 62.05%, 61.04% and 50.88%, respectively, which were positively related to their recognition difficulty. The research results proved that the object detection method can be employed for the automatic identification of loess landslides based on Google Earth images.

32. The conservation impacts of ecological disturbance: Time-bound estimates of population loss and recovery for fauna affected by the 2019-2020 Australian megafires

Journal: GLOBAL ECOLOGY AND BIOGEOGRAPHY

Abstract: Aim After environmental disasters, species with large population losses may need urgent protection to prevent extinction and support recovery. Following the 2019-2020 Australian megafires, we estimated population losses and recovery in fire-affected fauna, to inform conservation status assessments and management. Location Temperate and subtropical Australia. Time period 2019-2030 and beyond. Major taxa Australian terrestrial and freshwater vertebrates; one invertebrate group. Methods From > 1,050 fire-affected taxa, we selected 173 whose distributions substantially overlapped the fire extent. We estimated the proportion of each taxon's distribution affected by fires, using fire severity and aquatic impact mapping, and new distribution mapping. Using expert elicitation informed by evidence of responses to previous wildfires, we estimated local population responses to fires of varying severity. We combined the spatial and elicitation data to estimate overall population loss and recovery trajectories, and thus indicate potential eligibility for listing as threatened, or uplisting, under Australian legislation. Results We estimate that the 2019-2020 Australian megafires caused, or contributed to, population declines that make 70-82 taxa eligible for listing as threatened; and another 21-27 taxa eligible for

uplisting. If so-listed, this represents a 22-26% increase in Australian statutory lists of threatened terrestrial and freshwater vertebrates and spiny crayfish, and uplisting for 8-10% of threatened taxa. Such changes would cause an abrupt worsening of underlying trajectories in vertebrates, as measured by Red List Indices. We predict that 54-88% of 173 assessed taxa will not recover to pre-fire population size within 10 years/three generations. Main conclusions We suggest the 2019-2020 Australian megafires have worsened the conservation prospects for many species. Of the 91 taxa recommended for listing/uplisting consideration, 84 are now under formal review through national processes. Improving predictions about taxon vulnerability with empirical data on population responses, reducing the likelihood of future catastrophic events and mitigating their impacts on biodiversity, are critical.

33. Pathways to clean cooking fuel transition in low and middle income Sub-Saharan African countries: The relevance of improving energy use efficiency
Journal: SUSTAINABLE PRODUCTION AND CONSUMPTION
Abstract: Most of the Sub-Saharan African countries are heavily reliant on unclean cooking fuels due to facing multifaceted difficulties in overcoming such monotonic cooking fuel dependency. However, considering the environmental and human health hazards associated with the combustion of dirty cooking fuels, it has become imperative for these nations to identify the factors that can enable them to undergo a transition from the use of unclean to relatively cleaner cooking fuels. Against this backdrop, this current study aims to assess whether improving the level of energy efficiency can enhance access to clean cooking fuel and technology in selected developing nations across Sub-Saharan Africa. This is a seminal study that separately estimates the effects of energy efficiency gains on clean cooking fuel and technology access rates separately for low-, lower-middle-, and upper-middle-income Sub-Saharan African countries. The findings derived from this study are anticipated to help the Sub-Saharan African nations and other similar developing countries worldwide to partially attain the clean energy transition targets mentioned under the 2030 Sustainable Development Goals agenda of the United Nations. Overall, the results from the econometric analysis indicate that energy efficiency gains initially cannot enhance access to clean cooking fuel and technology but beyond certain energy efficiency threshold levels it can be effective in improving the access rates. Besides, the predicted energy efficiency thresholds are observed to vary across the Sub-Saharan African nations belonging to different income groups and levels of clean cooking fuel and technology access for the respective population. However, in all cases, the estimated energy efficiency threshold levels are witnessed to be greater than the mean level of energy use efficiency of these countries. Moreover, results also certify that economic growth, environmental pollution, financial globalization, financial development, and women empowerment are some of the other major drivers of clean cooking fuel transition across Sub-Saharan Africa. However, the impacts of these macroeconomic variables are observed to be relatively larger for the

comparatively richer and less unclean cooking fuel-dependent nations. Accordingly, this study recommends that the associated governments should implement policies that can expedite the rate of energy efficiency improvement, speed up the economic growth rate, restrict the influx of unclean foreign direct investments, develop the financial sector, and ensure greater empowerment of women for facilitating clean cooking fuel transition across this region.

34. Quantitative Threshold of Energy Fractal Dimension for Immediate Rock Burst Warning in Deep Tunnel: A Case Study

Journal: LITHOSPHERE

Abstract: Rock bursts are a serious geological disaster occurring in deep underground engineering operations, which will cause casualties and economic loss. The quantitative threshold of energy fractal dimension for immediate rock burst warning in a deep tunnel was studied. The study was conducted based on the immediate rock burst cases in the deep tunnels of Jinping Hydropower Station, China. Firstly, a fractal dimension calculation method was proposed for deep linear tunnels associated with microseismic monitoring to explore the energy fractal dimension during the 37 immediate rock bursts and their development to events of different intensities (intense and moderate events). On this basis, a mechanism analysis was undertaken to assess the distribution range and evolution of the energy fractal dimension in the development of the immediate rock bursts. Then, the energy fractal dimension, as a quantitative threshold, was taken as a criterion for judging the rock burst risk Furthermore, the corresponding warning index and dynamic control method were established. This index and method were applied in the subsequent construction process. The results can be used as a guide to establish a dynamic warning system based on the microseismicity monitored and provide a scientific basis for the prediction, warning, and risk-control standard of rock burst disasters during excavation of deep tunnels.

35. Urban Resilience for Urban Sustainability: Concepts, Dimensions, and Perspectives

Journal: SUSTAINABILITY

Abstract: Urbanization is a continuous process for a city's economic development. Though rapid urbanization provides a huge employment opportunity for people, urban threats also increase proportionately due to natural and man-made hazards. Understanding urban resilience and sustainability is an urgent matter to face hazards in the rapidly urbanized world. Therefore, this study aims to clarify the concept and develop key indications of urban resilience and sustainability from the existing literature. A systematic literature review guided by PRISMA has been conducted using literature from 1 January 2001 to 30 November 2021. It argues that sustainability and resilience are interrelated paradigms that emphasize a system's capacity to move toward desirable development paths. Resilience and sustainability

are fundamentally concerned with preserving societal health and well-being within the context of a broader framework of environmental change. There are significant differences in their emphasis and time scales, particularly in the context of urbanization. This study has identified key indicators of urban resilience under three major components like adaptive capacity (education, health, food, and water), absorptive capacity (community support, urban green space, protective infrastructure, access to transport), and transformative capacity (communication technology, collaboration of multi-stakeholders, emergency services of government, community-oriented urban planning). This study also identified several indicators under major dimensions (social, economic, and environmental) of urban sustainability. The findings will be fruitful in understanding the dynamics of urban vulnerability and resilience and its measurement and management strategy from developed indicators.

36. Identification of Coal and Gas Outburst-Hazardous Zones by Electric Potential Inversion During Mining Process in Deep Coal Seam

Journal: ROCK MECHANICS AND ROCK ENGINEERING

Abstract: Coal remains an important fuel and energy, especially in China. For coal mining in deep mines, the threat of coal and rock dynamic disasters (such as coal and gas outburst) to safe production is becoming more and more serious with the greatly increasing geo-stress and gas pressure. Hence, it is particularly important to real-timely monitor and finely identify outburst-hazardous zones and their hazard levels during coal mining. However, conventional methods fail to continuously and precisely monitor outburst-hazardous zones in spatial distribution. Previous studies have shown that under the coupling action of stress and gas, the electric potential (EP) signals can be generated and their response characteristics are closely related to the loading state and damage evolution process of coal. The inversion imaging method can be utilized to analyze the spatial distribution of the EP signals. On this basis, the field tests were conducted to study the EP response characteristics to the mining process of deep coal seams and analyze the relationship between the EP response and outburst hazard. Moreover, in view of the EP inversion imaging mechanism, the bilateral EP inversion n model was established on the mining-disturbed coal seam ahead of the mining face and the field application was also carried out. Furthermore, on account of the membership index of fuzzy mathematics, the critical EP inversion value was proposed. Then the outburst-hazardous zones in the coal seam ahead of the mining face were divided finely and identified quantitatively. In the end, the verification result showed that the yellow zones enable to identify most of outburst-hazardous zones, thus effectively avoiding the missing identification. Besides, the red zones can improve the identification efficiency, which is conducive to focusing on identifying zones with a high hazard level. The study results provide a valuable new application method for finely identifying coal and gas outburst hazards and preventing coal and rock dynamic disasters in deep coal mines.

37. Judging the sources of inferior groundwater quality and health risk problems

through intake of groundwater nitrate and fluoride from a rural part of Telangana, India

Journal: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH

Abstract: Evaluation of groundwater quality and related health hazards is a prerequisite for taking preventive measures. The rural region of Telangana, India, has been selected for the present study to assess the sources and origins of inferior groundwater quality and to understand the human health risk zones for adults and children due to the consumption of nitrate (NO3-)- and fluoride (F-)-contaminated groundwater for drinking purposes. Groundwater samples collected from the study region were determined for various chemical parameters. Groundwater quality was dominated by Na+ and HCO3- ions. Piper's diagram and bivariate plots indicated the carbonate water type and silicate weathering as a main factor and man-made contamination as a secondary factor controlling groundwater chemistry; hence, the groundwater quality in the study region is low. According to the Groundwater Quality Index (GQI) classification, 48.3% and 51.7% of the total study region are excellent (GQI: < 50) and good (GQI: 50 to 100) water quality types, respectively, for drinking purposes. However, NO3- ranged from 0.04 to 585 mg/L, exceeding the drinking water quality limit of 45 mg/L in 34% of the groundwater samples due to the effects of nitrogen fertilizers. This was supported by the relationship of NO3- with TDS, Na+, and Cl-. The -F- content was from 0.22 to 5.41 mg/L, which exceeds the standard drinking water quality limit of 1.5 mg/L in 25% of the groundwater samples. The relationship of F- with pH, Ca2+, Na+, and HCO3- supports the weathering and dissolution of fluoride-rich minerals for high F- content in groundwater. They were further supported by a principal component analysis. The Health Risk Index (HRI) values ranged from 0.20 to 20.10 and 0.36 to 30.90 with a mean of 2.82 and 4.34 for adults and children, respectively. The mean intensity of HRI (> 1.0) was 1.37 times higher in children (5.70) than in adults (4.16) due to the differences in weight size and exposure time. With an acceptable limit of more than 1.0, the study divided the region into Northern Safe Health Zone (33.3% for adults and 28.1% for children) and Southern Unsafe Health Zone (66.7% for adults and 71.9% for children) based on the intensity of agricultural activity. Therefore, effective strategic measures such as safe drinking water, denitrification, defluoridation, rainwater harvesting techniques, sanitary facilities, and chemical fertilizer restrictions are recommended to improve human health and protect groundwater resources.

38. Occurrence and environmental hazard of organic UV filters in seawater and wastewater from Gran Canaria Island (Canary Islands, Spain)

Journal: ENVIRONMENTAL POLLUTION

Abstract: Organic ultraviolet (UV) filters are used in personal care products, but they are also added to industrial products and are constantly released to the environment. This study analyses the occurrence of 8 widely used organic UV filters in seawater from three beaches on the Gran Canaria Island (Spain) and in three wastewater

treatment plants (WWTPs) by taking samples from influents and effluents. It also discusses the target compounds' post-treatment removal efficiencies. Sampling was carried out for 6 months and analytes were extracted by solid phase extraction with Sep-pak C18 cartridges. They were determined by ultra-high performance liquid chromatography coupled to mass spectrometry in tandem. The potential environmental hazard associated with the found concentrations was also assessed for marine organisms. Different target compounds were detected on the analysed beaches and in the wastewater. Benzophenone-3 (BP3) was the most recurrent compound in the seawater samples (frequency detection of 83%) and also in wastewater influents and effluents (measured in all the samples). However, the highest concentrations for seawater (172 mu g L-1) and influent wastewater (208 mu g L-1) corresponded to octocrylene, while methylene bis-benzotriazolyltetramethylbutylphenol was the compound most concentrated in secondary treatment effluent (34.0 mu g L-1) and BP3 in tertiary treatment effluent (8.07 mu g L-1). All the analysed samples showed that at least one target UV filter was present. Regarding the removal efficiencies of these compounds in the studied WWTPs, consistent differences between the target compounds were observed in influent concentration terms, where the average removal rates were higher than 50% for most of the compounds. Conventional treatment is unable to completely remove many studied compounds, while tertiary treatment acts as an additional elimination for some of them. An environmental hazard quotient above 1 was found for octocrylene, benzophenone-3 and 4-methylbenzylidene camphor, which indicates a potential high hazard for living species if these compounds are present.

39. Research on particle swarm optimization in LSTM neural networks for rainfall-runoff simulation

Journal: JOURNAL OF HYDROLOGY

Abstract: Flood forecasting is an essential non-engineering measure for flood prevention and disaster reduction. Many models have been developed to study the complex and highly random rainfall-runoff process. In recent years, artificial intelligence methods, such as the artificial neural network (ANN), have attempted to construct rainfall-runoff models. The more advanced deep learning methods of long short-term memory (LSTM) network have been proved to better predict hydrological time series. However, the selection of LSTM hyperparameters in the past mostly relied on the experience of the staff, which often led to failure to achieve the best performance. The aim of this study is to develop a method to improve flood forecast accuracy and lead time. A deep learning neural network model based on LSTM networks and particle swarm optimization (PSO) is proposed in this paper. The PSO algorithm was used to optimize the LSTM hyperparameter to improve the ability to learn data sequence features. The model focuses on the Jingle Watershed in the Fenhe River and the Lushi Watershed in the Luohe River and was used to predict flood processes using rainfall and runoff observation data from stations in the watersheds.

We evaluated the performance of the model with the Nash Sutcliffe efficiency coefficient, root mean square error, and bias. The results show that the PSO-LSTM model outperforms the M-EIES, ANN, PSO-ANN, and LSTM at all stations in the watersheds. The PSO-LSTM model improves the flood forecasting accuracy at different lead times, especially for those exceeding 6 h, and has higher prediction accuracy and stability. The PSO-LSTM model could be used to improve accuracy in short-term flood forecast applications.

40. Source analysis and source-oriented risk assessment of heavy metal pollution in agricultural soils of different cultivated land qualities

Journal: JOURNAL OF CLEANER PRODUCTION

Abstract: Heavy metal pollution in soil has received much attention in recent decades. Many studies have analyzed the contamination status, spatial distribution, and pollution sources of heavy metals. Little information is available on the interaction between cultivated land quality and soil heavy metal pollution. Combining soil quality information and intensive heavy metal sampling surveys, this study analyzed heavy metal contamination and the ecological and health risks of various soils with different quality levels. Additionally, through the PMF model and risk assessment techniques, the ecological and health risks of specific pollution sources and their interaction with soil quality were investigated. The results showed that the mean content of the studied elements followed the increasing order of Hg (0.12 mg/kg) < Cd (0.19 mg/kg) < As (6.98 mg/kg) < Pb (25.57 mg/kg) < Cr (72.02 mg/kg). In addition, with increasing soil quality, the concentrations of Pb, Cr and Hg as well as the overall ecological risk increased significantly. Regarding health risks, heavy metal pollution posed a higher risk to children than adults, and ingestion was the main exposure pathway. The total hazard index and carcinogenic risk also increased with increasing soil quality. The PMF analysis showed that Pb and Cr mainly came from industrial activities, As could be attributed to natural sources, Cd was mainly derived from agricultural activities, and Hg pollution was determined by coal combustion. Considering the risks of specific pollution sources, agricultural activities and coal combustion were the major reasons for high ecological risks, whereas industrial activities and coal combustion posed significantly higher risks in suburban high-quality soil. Industrial activities mainly determined the health risk, which contributed more than 50% to the total risk. There was an upward health risk trend with increasing soil quality. Industrial activities in high-quality suburban soil posed the highest health risk to both adults and children. Reasonable and effective policies should be formulated to control industrial pollution and improve the ecological environment in this area.

41. Environmental and health risk assessment of potentially toxic trace elements in soils near uranium (U) mines: A global meta-analysis

Journal: SCIENCE OF THE TOTAL ENVIRONMENT

Abstract: Soil pollution by potentially toxic trace elements (PTEs) near uranium (U)

mines arouses a growing interest worldwide. However, nearly all studies have focused on a single site or only a few sites, which may not fully represent the soil pollution status at the global scale. In this study, data of U, Cd, Cr, Pb, Cu, Zn, As, Mn, and Ni contents in U mine-associated soils were collected and screened from published articles (2006-2021). Assessments of pollution levels, distributions, ecological, and human health risks of the nine PTEs were analysed. The results revealed that the average contents of the U, Cd, Cr, Pb, Cu, Zn, As, Mn, and Ni were 39.88-, 55.33-, 0.88-, 3.81-, 3.12-, 3.07-, 9.26-, 1.83-, and 1.17-fold greater than those in the upper continental crust, respectively. The pollution assessment showed that most of the studied soils were heavily polluted by U and Cd. Among them, the U mine-associated soils in France, Portugal, and Bulgaria exhibited significantly higher pollution levels of U and Cd when compared to other regions. The average potential ecological risk value for all PTEs was 3358.83, which indicated the presence of remarkably high risks. Among the PTEs, Cd and U contributed more to the potential ecological risk than the other elements. The health risk assessment showed that oral ingestion was the main exposure route for soil PTEs; and the hazard index (HI) values for children were higher than those for adult males and females. For adult males and females, all hazard index values for the noncarcinogenic risks were below the safe level of 1.00. For children, none of the HI values exceeded the safe level, with the exception of U (HI = 3.56) and As (HI = 1.83), but Cu presented unacceptable carcinogenic risks. This study provides a comprehensive analysis that demonstrates the urgent necessity for treating PTE pollution in U mine-associated soils worldwide.

42. Recent climate and hydrological changes in a mountain-basin system in Xinjiang, China

Journal: EARTH-SCIENCE REVIEWS

Abstract: Xinjiang, China, is a representative arid region in Central Asia that is characterized by a unique mountain-basin structure and fragile mountain-oasis-desert ecosystems. Climate warming directly affects hydrological changes and may threaten water availability and ecological security in Xinjiang (XJ). In this study, we conducted a systematic review of recent climatic changes and their effects on hydrological system changes in XJ. The XJ climate has experienced significant warming and moistening during 1961-2018, and the most dramatic increase has occurred since the mid-1980s. Climate extremes have become increasingly notable in the warming climate, resulting in increases in precipitation and warm extremes and decreases in cold extremes. Moreover, accelerated local precipitation recycling has been triggered by an increasingly warm-wet climate and enhanced evaporation. The accelerated climate warming in XJ has caused significant glacier shrinkage, decreased snow cover and snowfall fraction, aggravated meteorological drought, increased river runoff, and lake expansion. The climate-related changes in the hydrological regimes may have adverse ecological effects, including increased soil moisture loss, reduced

growing season vegetation growth, and shrinkage of the desert-oasis ecotone. Despite many achievements in climate and hydrological change research in XJ, we suggest that there is an urgent need to improve the comprehensive ground observation network, reproduce climate variability findings using multiple datasets, reveal the underlying physical mechanisms, and assess the hydro-meteorological disaster risks of a warming climate in the future. In addition, a conceptual framework of the climate and hydrological changes in mountain-basin system proposed, which is expected to contribute to the understanding of arid region hydrology in the future.

43. A Prediction Method of Coal Burst Based on Analytic Hierarchy Process and Fuzzy Comprehensive Evaluation

Journal: FRONTIERS IN EARTH SCIENCE

Abstract: Coal burst has become a worldwide problem that needs to be solved urgently for the sake of coal mine safety production due to its complicated triggering mechanisms and numerous influencing factors. The risk assessment of coal burst disasters is particularly critical. In this work, 15 factors affecting coal burst occurrence are selected from the perspectives of geodynamic environment and geological and mining conditions, and the influence mechanism of each factor on coal bursts is analyzed. An evaluation index system of coal burst risk is put forward. A hierarchical model of coal burst prediction is established, and the weight of each influencing factor to coal burst risk is calculated. Based on the fuzzy comprehensive evaluation method, a coal burst prediction model is established, which can scientifically decompose and simplify the complicated problem and make coal burst prediction and prevention more pertinent and effective. The model is applied to assess the coal burst risk level of a coal mine in Shanxi Province, and the evaluation result is consistent with practical situations. This method considers the influencing factors comprehensively and determines the weight of each factor scientifically compared with other forecasting methods.

44. A comprehensive review on the recycling of spent lithium-ion batteries: Urgent status and technology advances

Journal: JOURNAL OF CLEANER PRODUCTION

Abstract: The burgeoning development of lithium-ion battery technology is imperative, not only realizing targets for reducing greenhouse gas emissions, but also changing the way of global communication and transportation. As the demand increases, the quantity of discarded lithium-ion batteries (LIBs) has been continuously rising, bringing a tough waste-management challenge for recycling service sectors at end-of-life. Nevertheless, spent LIBs also bring an opportunity because of their double-edged competitive advantages in ecology and economy. This comprehensive review is initiated on the background of the skyrocketing global lithium ion battery market, covering the possible environmental hazard and huge economic potential, with emphasis placed on state-of-the -art reclamation technologies. During the past decade, significant technological advances have been made in treatment processes of

spent LIBs, such as battery stabilization, electrolyte collection, electrode separation, active material leaching and purifying. Besides, effective reclamation strategies, based on pyrometallurgy, hydromet-allurgy or both, are in full swing to maximize resource recovery. Here, we provide a systematic overview of spent LIB recycling technologies from an all-sided perspective in current status. Perspectives for developing technol-ogies, establishing evaluation standards, and exploring correlative scientific issues are discussed. A closed-loop recycling chain entailing utilization, reclamation and resynthesis is recommended for the future outlook of spent LIB recycling.

45. Circular economy-driven two-stage supply chain management for nullifying waste
Journal:JOURNAL OF CLEANER PRODUCTION
Abstract: Global warming and environmental pollution are currently taking place at an alarming rate owing to excess waste generation. Food-waste is solely responsible for generating greenhouse gases that cause environmental hazards. Earlier studies are related to closed-loop supply chain and waste reduction in a single supply chain. The present research deals with the nullification of food-waste produced in the supply chain. The model consists of two-stage supply chain running parallelly. The primary chain relates to the linear model (produce, use, and discard), and the secondary chain collects those food-wastes generated in the primary chain, and recycles them into food products for livestock. The secondary chain consumer completely utilizes those recycled products, resulting in the nullification of waste. The demand for each player in the primary chain remains the same. The deterioration of finished items is lifetime dependent and only applicable to the primary chain finished product. Both the supplier and the manufacturer follow a single-setup-multiple-delivery policy for shipment. The deteriorated items are sent to the secondary chain manufacturer in lots for lot policy by the primary chain retailers. The circular economy concept is established as waste is circulated through a new supply chain and is consumed completely in the final stage. A global optimum solution for the model is obtained using an algebraic procedure. The cost reduction is performed to demonstrate the effectiveness of this model. A sensitivity analysis of the parameters establishes the validity of the model and effectiveness in reducing carbon emission and the total cost of two-stage supply chain. Suggestions for the application of this model are discussed in the form of managerial insights.

46. Upper-plate controls on subduction zone geometry, hydration and earthquake behaviour
Journal: NATURE GEOSCIENCE
Abstract: Structures in the upper, overriding plate impact the geometry, hydration state and seismogenic region of subduction zones, according to a 3D seismic structural model of the Nankai subduction zone. Many characteristics of the incoming oceanic lithosphere, such as its age, rigidity, fabric orientation or sediment thickness, are often cited as important properties controlling the geometry, state of stress,

dynamics and hazard potential of subduction zones, yet the links between upper-plate structures and subduction zone processes remain poorly understood. Here we report that high forearc wavespeeds (v(P) greater than 6.6 km s(-1)) beneath 8,000 km(2) of Kii Peninsula are associated with the Kumano pluton. We show that the dense, high-rigidity Kumano pluton generates a large vertical load, which forces the incoming Philippine Sea Plate to subduct with a trajectory that is a factor of two steeper than adjacent regions. Beneath the region of maximum curvature and faulting of the Philippine Sea Plate, reduced mantle velocities (6.5-7.5 km s(-1)) within a 25-km-thick, 100-km-wide region at 5-30-km sub-Moho depths may reflect serpentinization (more than 40% antigorite) of the subducting mantle and enhanced porosity from bending stresses. We further report that great (larger than M-w 8) earthquakes nucleated from the flanks of the Kumano pluton in 1944 and 1946. Our study demonstrates the profound impact of upper-plate structures on the geometry, hydration state and segmentation of large megathrust earthquakes at subduction zones.

47. Persistence, environmental hazards, and mitigation of pharmaceutically active residual contaminants from water matrices

Journal: SCIENCE OF THE TOTAL ENVIRONMENT

Abstract: Pharmaceutical compounds are designed to elicit a biological reaction in specific organisms. However, they may also elicit a biological response in non-specific organisms when exposed to ambient quantities. Therefore, the potential human health hazards and environmental effects associated with pharmaceutically active compounds presented in aquatic environments are being studied by researchers all over the world. Owing to their broad-spectrum occurrence in various environmental matrices, direct or indirect environmental hazardous impacts, and human-health related consequences, several pharmaceutically active compounds have been categorized as emerging contaminants (ECs) of top concern. ECs are often recalcitrant and resistant to abate from water matrices. In this review, we have examined the classification, occurrence, and environmental hazards of pharmaceutically active compounds. Moreover, because of their toxicity and the inefficiency of wastewater treatment plants to remove pharmaceutical pollutants, novel wastewater remediation technologies are urgently required. Thus, we have also analyzed the recent advances in microbes assisted bioremediation as a suitable, cost-effective, and eco-friendly alternative for the decontamination of pharmaceutical pollutants. Finally, the most important factors to reach optimal bioremediation are discussed.

48. Tropical cyclone climatology change greatly exacerbates US extreme rainfall-surge hazard

Journal:NATURE CLIMATE CHANGE

Abstract: Changes to tropical cyclones will increase the risk to US coastlines. Under a high-emissions scenario, the joint hazards of extreme rainfall and storm tides increase,

with the largest contribution being from increasing cyclone intensity and decreasing translation speed, rather than sea-level rise. Tropical cyclones (TCs) are drivers of extreme rainfall and surge, but the current and future TC rainfall-surge joint hazard has not been well quantified. Using a physics-based approach to simulate TC rainfall and storm tides, we show drastic increases in the joint hazard from historical to projected future (SSP5-8.5) conditions. The frequency of joint extreme events (exceeding both hazards' historical 100-year levels) may increase by 7-36-fold in the southern US and 30-195-fold in the Northeast by 2100. This increase in joint hazard is induced by sea-level rise and TC climatology change; the relative contribution of TC climatology change is higher than that of sea-level rise for 96% of the coast, largely due to rainfall increases. Increasing storm intensity and decreasing translation speed are the main TC change factors that cause higher rainfall and storm tides and up to 25% increase in their dependence.

49. Natural hazards and extreme events in the Baltic Sea region

Journal: EARTH SYSTEM DYNAMICS

Abstract: A natural hazard is a naturally occurring extreme event that has a negative effect on people and society or the environment. Natural hazards may have severe implications for human life and can potentially generate economic losses and damage ecosystems. A better understanding of their major causes, probability of occurrence, and consequences enables society to be better prepared to save human lives as well as to invest in adaptation options. Natural hazards related to climate change are identified as one of the Grand Challenges in the Baltic Sea region. Here, we summarize existing knowledge about extreme events in the Baltic Sea region with a focus on the past 200 years as well as on future climate scenarios. The events considered here are the major hydro-meteorological events in the region and include wind storms, extreme waves, high and low sea levels, ice ridging, heavy precipitation, sea-effect snowfall, river floods, heat waves, ice seasons, and drought. We also address some ecological extremes and the implications of extreme events for society (phytoplankton blooms, forest fires, coastal flooding, offshore infrastructure, and shipping). Significant knowledge gaps are identified, including the response of large-scale atmospheric circulation to climate change and also concerning specific events, for example, the occurrence of marine heat waves and small-scale variability in precipitation. Suggestions for future research include the further development of high-resolution Earth system models and the potential use of methodologies for data analysis (statistical methods and machine learning). With respect to the expected impacts of climate change, changes are expected for sea level, extreme precipitation, heat waves and phytoplankton blooms (increase), and cold spells and severe ice winters (decrease). For some extremes (drying, river flooding, and extreme waves), the change depends on the area and time period studied.

50. The Emergence of Different Local Resilience Arrangements Regarding Extreme Weather Events in Small Municipalities-A Case Study from the Wielkopolska Region,

Poland
Journal: SUSTAINABILITY
Abstract: Compared with other parts of the world, Poland is a relatively safe country in terms of natural disasters. Nevertheless, extreme weather events have become a significant threat in recent years, especially for local communities. These are exposed to intense rainfall, heavy wind, and heatwaves, as are larger towns. However, small municipalities have different economic, social, and human potential for undertaking preventive actions regarding meteorological extremes. In this paper, we are looking at what activities local communities from the Wielkopolska region in Poland undertake to cope with extreme weather events-specifically, heavy rainfall and heatwaves. We analyze the municipalities that are most and least exposed to extremes, based on meteorological data. These are further compared with local resilience measures in the event of extreme meteorological events through the risk management analysis of selected municipalities. The emergence of two approaches regarding extreme weather events has been observed. First, local arrangements consist of different resilience types. Both of the identified approaches are concentrated around rescue activities, representing recovery resilience. They differ in the second component of resilience: municipalities that have suffered more from weather extremes manifest more resistance resilience, whereas those communities where fewer meteorological events took place demonstrate more creativity-type resilience.

51. Landslide Susceptibility Mapping with Deep Learning Algorithms
Journal: SUSTAINABILITY
Abstract: Among natural hazards, landslides are devastating in China. However, little is known regarding potential landslide-prone areas in Maoxian County. The goal of this study was to apply four deep learning algorithms, the convolutional neural network (CNN), deep neural network (DNN), long short-term memory (LSTM) networks, and recurrent neural network (RNN) in evaluating the possibility of landslides throughout Maoxian County, Sichuan, China. A total of 1290 landslide records was developed using historical records, field observations, and remote sensing techniques. The landslide susceptibility maps showed that most susceptible areas were along the Minjiang River and in some parts of the southeastern portion of the study area. Slope, rainfall, and distance to faults were the most influential factors affecting landslide occurrence. Results revealed that proportion of landslide susceptible areas in Maoxian County was as follows: identified landslides (13.65-23.71%) and non-landslides (76.29-86.35%). The resultant maps were tested against known landslide locations using the area under the curve (AUC). This study indicated that the DNN algorithm performed better than LSTM, CNN, and RNN in identifying landslides in Maoxian County, with AUC values (for prediction accuracy) of 87.30%, 86.50%, 85.60%, and 82.90%, respectively. The results of this study are useful for future landslide risk reduction along with devising sustainable land use planning in the study area.

52. Assessment of heavy metal accumulation in freshwater fish of Dongting Lake, China: Effects of feeding habits, habitat preferences and body size

Journal: JOURNAL OF ENVIRONMENTAL SCIENCES

Abstract: We measured the concentrations of Cr, Fe, Ni, Cu, Zn, Cd, Pb and Hg, and the stable isotope ratios (delta C-13 and delta N-15) in 87 fish samples within 12 economic fish species collected from the Dongting Lake, the second largest freshwater lake in China. With few exceptions in concentration of Cr, most of fish species showed lower concentrations of the 8 metals than legislation thresholds. Piscivorous fishes had significantly higher values of delta N-15 (possessing higher trophic level) and metal concentrations than planktivorous and herbivorous fishes. Moreover, demersal fishes showed higher concentrations of Cu, Zn, Cd and Pb than pelagic and benthopelagic fishes. We found positive correlations between concentrations of Fe, Pb and Hg and delta N-15 ratio, confirming the biomagnification of the three metals through trophic transfer. In contrast, fishes showed clear growth dilution effect for Ni, Zn, Cu, Pb and Hg, indicated by the negative correlations between their concentrations and fish weight or length. Multiple regression analysis demonstrated that growth dilution and biomagnification effects simultaneously governed the metal concentrations in fish muscle, and the two effects' importance varied among different metals. The human health risk assessment indicated that all 8 metals gave target hazard quotient (THQ) values < 1.0, i.e., the estimated daily intake (EDI) of metals did not exceed the oral reference dose (RfD), indicating a safe consumption of these fish species for consumer. Our study provides comprehensive approaches to better understand the determining processes and potential risk of heavy metals in freshwater lake fishes. (C) 2021 The Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences. Published by Elsevier B.V.

53. Study on the Nonlinear Characteristics of EMR and AE during Coal Splitting Tests

Journal: MINERALS

Abstract: Coal and rock dynamic disasters have been the main concern in underground engineering because these seriously threaten the safety of miners and industrial production. Aiming to improve the EMR and AE monitoring technology, the refined nonlinear characteristics of EMR and AE during coal splitting failure are studied using Hilbert-H and multifractal theory, and valuable information pertaining to coal fracture law contained in EMR and AE waveform was revealed. The results show that the EMR and AE of coal splitting failure are related to the process of coal crack propagation. They possess the same initiation time and frequency band, however, the signal duration of EMR is comparatively longer than AE, and the main frequency of AE is higher than EMR. The EMR of coal splitting failure has the same excitation source as AE; nonetheless, the excited forms display different behavior. In terms of signal duration, the distribution of EMR signal is relatively uniform, the

proportion of large-signal is less, the amount of information is more than that of AE, and the multifractal characteristics are more complicated. During the coal splitting failure, AE is mainly generated in the process of wall vibration caused by crack propagation, while the generation of EMR includes piezoelectric effect, charge separation, free charge vibration, charge neutralization and other processes, making EMR more complicated than AE and has a relatively low frequency. The research provides an effective method for studying nonlinear refinement characteristics of coal EMR and AE, and can provide an important basis for the study of the mechanism of EMR generation.

54. Hydrogen cyanide production by soil bacteria: Biological control of pests and promotion of plant growth in sustainable agriculture
Journal: PEDOSPHERE
Abstract: Currently, plant diseases and insect infestations are mainly controlled by the extraneous application of pesticides. Unfortunately, the indiscriminate use of such agrochemicals can cause ecological and environmental problems, as well as human health hazards. To obviate the potential pollution arising from the application of agrochemicals, biological control of soilborne pathogens or insect pests using antagonistic microorganisms may be employed. Certain soil bacteria, algae, fungi, plants and insects possess the unique ability to produce hydrogen cyanide (HCN), which plays an important role in the biotic interactions of those organisms. In particular, cyanogenic bacteria have been found to inhibit the growth of various pathogenic fungi, weeds, insects, termites and nematodes. Thus, the use of HCN-producing bacteria as biopesticides offers an ecofriendly approach for sustainable agriculture. The enzyme, HCN synthase, involved in the synthesis of HCN, is encoded by the hcnABC gene cluster. The biosynthetic regulation of HCN, antibiotics and fluorescent insecticidal toxins through the conserved global regulatory GacS/GacA system is elaborated in this review, including approaches that may optimize cyanogenesis for enhanced pest control. In addition, the effects of bacterially synthesized HCN on the production of indole acetic acid, antibiotics and fluorescent insecticidal toxins, 1-aminocyclopropane-1-carboxylate deaminase utilization and phosphate solubilization may result in the stimulation of plant growth. A more detailed understanding of HCN biosynthesis and regulation may help to elaborate the precise role of this compound in biotic interactions and sustainable agriculture.

55. Deep Learning-Based Change Detection in Remote Sensing Images: A Review
Journal: REMOTE SENSING
Abstract: Images gathered from different satellites are vastly available these days due to the fast development of remote sensing (RS) technology. These images significantly enhance the data sources of change detection (CD). CD is a technique of recognizing the dissimilarities in the images acquired at distinct intervals and are used for numerous applications, such as urban area development, disaster management, land cover object identification, etc. In recent years, deep learning (DL) techniques

have been used tremendously in change detection processes, where it has achieved great success because of their practical applications. Some researchers have even claimed that DL approaches outperform traditional approaches and enhance change detection accuracy. Therefore, this review focuses on deep learning techniques, such as supervised, unsupervised, and semi-supervised for different change detection datasets, such as SAR, multispectral, hyperspectral, VHR, and heterogeneous images, and their advantages and disadvantages will be highlighted. In the end, some significant challenges are discussed to understand the context of improvements in change detection datasets and deep learning models. Overall, this review will be beneficial for the future development of CD methods.

56. Inclusion of groundwater and socio-economic factors for assessing comprehensive drought vulnerability over Narmada River Basin, India: A geospatial approach
Journal: APPLIED WATER SCIENCE
Abstract: Drought is amongst the most precarious natural hazards associated with severe repercussions. The characterization of droughts is usually carried out by the sector-specific (meteorological/agricultural/hydrological) indices that are mostly based on hydroclimatic variables. Groundwater is the major source of water supply during drought periods, and the socio-economic factors control the aftermaths of droughts; however, they are often ignored by the sector-specific indices, thereby failing to capture the overall impacts of droughts. This study aims to circumvent this issue by incorporating hydroclimatic, socio-economic and physiographic information to assess the overall drought vulnerability over Narmada River Basin, India, which is an agriculture-dominated basin highly dependent on groundwater resources. A Comprehensive Drought Vulnerability Indicator (CDVI) is proposed that assimilates the information on meteorological fluctuations, depth to groundwater level, slope, distance from river reach, population density, land use/land cover, soil type, and elevation through a geospatial approach. The CDVI showed a remarkable geospatial variation over the basin, with a majority (66.4%) of the area under highly to extremely vulnerable conditions. Out of 35 constituent districts of the basin, 9, 22, and 4 districts exhibited moderate, high, and extreme vulnerability to droughts, respectively. These results urge an immediate attention towards reducing drought vulnerability and enhancing resilience towards drought occurrences. The proposed multi-dimensional approach for drought vulnerability mapping would certainly help policy-makers to proactively plan and manage water resources over the basin, especially to ameliorate the pernicious impacts of droughts.

57. Accomplishments of NOAA's Airborne Hurricane Field Program and a Broader Future Approach to Forecast Improvement
Journal: BULLETIN OF THE AMERICAN METEOROLOGICAL SOCIETY
Abstract: Since 2005, NOAA has conducted the annual Intensity Forecasting Experiment (IFEX), led by scientists from the Hurricane Research Division at NOAA's Atlantic Oceanographic and Meteorological Laboratory. They partner with

NOAA's Aircraft Operations Center, who maintain and operate the WP-3D and Gulfstream IV-SP (G-IV) Hurricane Hunter aircraft, and NCEP's National Hurricane Center and Environmental Modeling Center, who task airborne missions to gather data used by forecasters for analysis and forecasting and for ingest into operational numerical weather prediction models. The goal of IFEX is to improve tropical cyclone (TC) forecasts using an integrated approach of analyzing observations from aircraft, initializing and evaluating forecast models with those observations, and developing new airborne instrumentation and observing strategies targeted at filling observing gaps and maximizing the data's impact in model forecasts. This summary article not only highlights recent IFEX contributions toward improved TC understanding and prediction, but also reflects more broadly on the accomplishments of the program during the 16 years of its existence. It describes how IFEX addresses high-priority forecast challenges, summarizes recent collaborations, describes advancements in observing systems monitoring structure and intensity, as well as in assimilation of aircraft data into operational models, and emphasizes key advances in understanding of TC processes, particularly those that lead to rapid intensification. The article concludes by laying the foundation for the next generation of IFEX as it broadens its scope to all TC hazards, particularly rainfall, storm-surge inundation, and tornadoes, that have gained notoriety during the last few years after several devastating landfalling TCs.

58. An integrated flood risk assessment approach based on coupled hydrological-hydraulic modeling and bottom-up hazard vulnerability analysis

Journal: ENVIRONMENTAL MODELLING & SOFTWARE

Abstract: Accurately quantifying and assessing the flood risks is critical for flood hazard mitigation and prevention. This study proposed a new integrated flood risk assessment framework to map flood risk, hazard and vulnerability by coupling the HEC-HMS hydrological model, the HEC-RAS 1D and 2D hydraulic models, and a bottom-up hazard vulnerability analysis. The Old Brahmaputra River floodplain of Bangladesh, a flood-prone region, was chosen as a case study. The coupled hydrological-hydraulic model shows a comparable robust performance in both calibration and validation periods with Nash-Sutcliffe efficiency coefficient = 0.93 (0.81), coefficient of determination = 0.95 (0.89), and percent bias = -1.17% (2.40%) for the calibration (validation) period. Our results indicate that the assessed risk levels are roughly consistent with the overall property distribution and flood hazard potential in the study area. The proposed framework and associated findings are valuable for developing adaptation strategies and early-warning systems to reduce flood impacts in the future.

59. A method for selection rationality evaluation of the first-mining seam in multi-seam mining

Journal: GEOMECHANICS AND GEOPHYSICS FOR GEO-ENERGY AND GEO-RESOURCES

Abstract: The reasonable selection of the first mining seam in coal seam group is of critical importance for the effective prevention and control of gas disasters during coal mining. At present, the selection of the first seam in a coal seam group is generally based on site conditions and professional experience, which results in a degree of blindness. Therefore, a rationality evaluation system for the selection of the first mining seam is needed to guide the operation of the site, which can guarantee the safety of coal mining. To address this issue, a method for evaluating the rationality of selecting the first mining seam was proposed in this paper. The method provides comprehensive, scientific and reliable theoretical guidance for the selection of the first mining seam when mining coal seam groups by combining the expert evaluation method with the entropy method. At the same time, the reliability of the method was verified through the case study at the Shihao Coal Mine in Chongqing, China. In summary, the method eliminates the blindness in selecting the first mining seam when mining coal seam group and provides theoretical guidance for coal seam group mining operations.

60. Inequitable patterns of US flood risk in the Anthropocene
Journal: NATURE CLIMATE CHANGE
Abstract: Current flood risk mapping, relying on historical observations, fails to account for increasing threat under climate change. Incorporating recent developments in inundation modelling, here we show a 26.4% (24.1-29.1%) increase in US flood risk by 2050 due to climate change alone under RCP4.5. Our national depiction of comprehensive and high-resolution flood risk estimates in the United States indicates current average annual losses of US$32.1 billion (US$30.5-33.8 billion) in 2020's climate, which are borne disproportionately by poorer communities with a proportionally larger White population. The future increase in risk will disproportionately impact Black communities, while remaining concentrated on the Atlantic and Gulf coasts. Furthermore, projected population change (SSP2) could cause flood risk increases that outweigh the impact of climate change fourfold. These results make clear the need for adaptation to flood and emergent climate risks in the United States, with mitigation required to prevent the acceleration of these risks. Climate change is increasing flood risk, yet models based on historical data alone cannot capture the impact. Granular mapping of national flood risk shows that losses caused by flooding in the United States will increase substantially by 2050 and disproportionately burden less advantaged communities.

61. Effects and contributions of meteorological drought on agricultural drought under different climatic zones and vegetation types in Northwest China
Journal: SCIENCE OF THE TOTAL ENVIRONMENT
Abstract: Meteorological drought is one of the driving forces behind agricultural drought. The response of agricultural drought to meteorological drought remains poorly understood under different climatic zones and vegetation types in Northwest China (NWC). Furthermore, the contribution of climate factors and human activities

to agricultural drought in NWC remains unclear. We combined the Standardized Precipitation Evapotranspiration Index (SPEI) and the satellite Vegetation Condition Index (VCI) to characterize meteorological and agricultural drought, respectively. Based on the trend analysis, Spearman's correlation coefficient and residual trend analysis, we studied the variation characteristics and response relationships of meteorological and agricultural drought under different climatic zones and vegetation types in NWC from 2000 to 2019 and evaluated the contributions of climate factors (SPEI and precipitation) and human activities on the agricultural drought. The results showed that under different climatic zones and vegetation types, the SPEI and VCI all showed an upward trend in NWC, indicating that meteorological and agricultural drought slowed down. It was further pointed out that the climate was humidified and the soil moisture increased in NWC. Meteorological drought has a definite effect on agricultural drought, and the effect varied non-linearly along the drought gradient with the strongest responses in the semiarid ecosystems. Drought resistance of different climatic zones and vegetation types was different, caused by the specific sensitivity and uniqueness of local arid environment. Among them, grasslands dominated the regional SPEI-VCI changes in NWC.. The combined effects of climatic factors (SPEI and precipitation) and human activities promoted the variation of agricultural drought in NWC. Climatic factors were the main drivers of agricultural drought change in grasslands, with the contribution rate reaching 76.71%. However, human activities all contributed significantly to agricultural drought than climatic factors, especially in the Loos Plateau, Junggar Basin and northern Tianshan Mountains, where the positive contribution of human activities exceeded 80%. Thus, the SKI and VCI can effectively reveal the change law of meteorological drought and agricultural drought in NWC. This study provides a theoretical basis for drought disaster relationship assessment.

62. Designing a resilient and sustainable closed-loop supply chain network in copper industry

Journal: CLEAN TECHNOLOGIES AND ENVIRONMENTAL POLICY

Abstract: Due to industrialization, copper demand has increased over the last decades. Recycling rate of copper is high and its scrap requires less energy than primary production, so sustainable closed-loop supply chain network design is considered a primary decision. Besides, the uneven distribution of copper has exaggerated the destructive effects of natural disasters such as earthquakes on mines. To the best of the authors' knowledge, there is no research about copper supply chain network design. In this paper, a copper network is designed and backup suppliers are used as a resilience strategy to reduce the effects of earthquakes on mining operations. Without backup model and with backup model are presented as multi-objective and are compared with each other. In each model, the economic objective is to maximize the supply chain profit; the environmental objective is to minimize water consumption and air pollutants; and the social objective is to maximize social desirability by

considering security and unemployment rates. The models are formulated using mixed-integer linear programming and they are solved by epsilon-constraint and weighted sum methods. Results show that, with backup model increases the supply chain responsiveness. Also, the model is able to improve the economic and social performances of the supply chain. But in environmental aspect, it performs worse than without backup model. This is because the backup suppliers are added to the supply chain and their exploitation will create negative environmental effects. In addition, using copper scraps saves costs, energy and the consumption of this non-renewable metal. [GRAPHICS] .

63. Development of novel fluorescence-based and label-free noncanonical G4-quadruplex-like DNA biosensor for facile, specific, and ultrasensitive detection of fipronil

Journal: JOURNAL OF HAZARDOUS MATERIALS

Abstract: Fipronil is a broad-spectrum insecticide widely used in agriculture and residential areas; its indiscriminate use leads to environmental pollution and poses health hazards. Early detection of fipronil is critical to prevent the deleterious effects. However, current insecticide analysis methods such as HPLC, LC/MS, and GC/MS are incompetent; they are costly, immobile, time-consuming, laborious, and need skilled technicians. Hence, a sensitive, specific, and cheap biosensor are essential to containing the contamination. Here, we designed two novel biosensors-the first design relied on fluorescent labeling/quenching, while the second sensor focused on label-free detection using Thioflavin T displacement. Altogether, we identified four candidate aptamers, predicted secondary structures, and performed 3D molecular modeling to predict the binding pocket of fipronil in FiPA6B aptamer. Furthermore, the aptameric sensors showed high sensitivity to fipronil of sub-ppb level LOD, attributed to stringent experimental design. The biosensors displayed high specificity against other phenylpyrazole insecticides and demonstrated robust sensitivity for fipronil in real samples like cabbage and cucumber. Notably, to the best of our knowledge, this is the first demonstration of noncanonical G4-quadruplex-like aptamer binding to fipronil, verified using CD spectroscopy. Such aptasensors possess considerable potential for real-time measurements of hazardous insecticides as point-of-care technology.

64. Improving the drought monitoring capability of VHI at the global scale via ensemble indices for various vegetation types from 2001 to 2018

Journal: WEATHER AND CLIMATE EXTREMES

Abstract: Drought is one of the most complex and harmful natural disasters. A study on the temporal and spatial patterns and the evolution of drought can provide a scientific basis for predicting drought occurrences. Based on a multi source dataset, we select a suitable control drought indicator for improving the vegetation health index (VHI), optimize its algorithm through Pearson correlation analysis, and compare the VHI performance before and after the improvement for various

vegetation types. Results show that (1) the self-calibrated Palmer drought severity index is more suitable than the standardized precipitation evapotranspiration index for improving the VHI; (2) the contribution of the thermal condition index to the VHI in most parts of the world is higher than that of the vegetation condition index; (3) the enhanced VHI significantly improves the detection of vegetation drought; and (4) vegetation drought events occurring in high latitudes tend to worsen, and the response of different vegetation types to drought is significantly different. Our research presents a step forward in improving the effectiveness of the VHI in detecting vegetation drought and thus its application prospects. Furthermore, the response characteristics of various vegetation types to drought are identified, deepening our understanding of vegetation drought, which may help decision-makers and authorities to develop better mitigation and adaptation strategies to reduce losses caused by these events.

65. Techno-economic analysis reveals the untapped potential of wood biochar
Journal: CHEMOSPHERE
Abstract: The United Nations estimates the rate of deforestation over 10 million hectares per year, with additional infested wood available due to drought, bark beetle calamity and other damage vectors. Processing the hard-to-reach infested wood into biochar via mobile pyrolysis units seems to be a good option for fire prevention. However, since most biochar is currently produced mainly from biological waste, there is not enough experience with wood biochar on a large scale. Review of current knowledge, followed by techno-economic assessment reveals that following the chemical composition of the feedstock, wood biochar outperforms other types of biochar in terms of high porosity. Therefore, wood biochar shows excellent results in increasing the amount of plant-available water content in soil and appears to be an excellent tool for recycling nutrients (especially into plant available forms of phosphorus and nitrogen). The overall positive effects of biochar application change from abiotic to biotic over time because as it decays, many of its physical properties disappear, but it can boost soil microbial communities on which soil fertility depends. As global climate change creates a wide range of factors that damage forest cover, wood biochar consequently represents untapped potential in the field of soil, nutrient, and energy management.

66. Groundwater contamination risk assessment using a modified DRATICL model and pollution loading: A case study in the Guanzhong Basin of China
Journal:CHEMOSPHERE
Abstract: Groundwater contamination risk assessment is not only the basis for groundwater management, but also an effective tool for groundwater pollution control and prevention. However, only groundwater vulnerability assessment is not enough to prove the risk of groundwater contamination. Therefore, this study describes an evaluation method combining aquifer intrinsic vulnerability and pollution source loading to evaluate groundwater contamination risk in Guanzhong Basin on a macro

scale. A modified DRATICL model was introduced to evaluate the intrinsic vulnerability, and the analytic hierarchy process (AHP) and the entropy weight method were combined to determine the weight of each evaluation factor. Pollution loading was evaluated by quantifying the characteristics of potential pollution sources, mainly including pollutant toxicity, pollutant release possibility and potential pollutant release amount. Finally, total iron, Cl-, SO42-, F-, COD (Chemical Oxygen Demand), NO3-, NO2- and TDS (Total Dissolved Solids) are used to calculate the water quality index and verify the model results. The results showed that industries were the most harmful potential pollution sources in the study area, followed by landfills. Very high vulnerability areas were mainly situated around Huazhou District, Huayin and Dali County, as well as the low terraces around Zhouzhi County and Hu County, which are mainly caused by shallow groundwater depth and high net recharge. The final groundwater contamination risk results showed the high groundwater contamination risks are detected around Xi'an City, Xianyang City, Hancheng City and Dali County. Both high vulnerability and high pollution loading were present at the Jingwei District in the north of Xi'an City, where a priority attention should be given.

67. Human health risk assessment of lead (Pb) through the environmental-food pathway

Journal: SCIENCE OF THE TOTAL ENVIRONMENT

Abstract: Drinking water and farm-to-fork pathways have been identified as the predominant environmental pathways associated with human exposure (HE) to Pb. This study integrates a GIS-based survey of metal concentrations in soil and a probabilistic quantitative risk assessment of Pb through the food chain. The case study area was selected in the east of Ireland. A step-wise exposure assessment collated the data for Pb concentration in soil and water media, bioaccumulation of Pb in unprocessed food products, such as potatoes, carrots, green vegetables, and salad vegetables. The daily mean HE to Pb through selected food products was found to be 0.073 mg day(-1), where a mean weekly exposure was estimated as 0.0065 mg kg body weight(-1) week(-1). Multiple risk estimates were used. Hazard Quotient (HQ), Daily Dietary Index (DDI), Daily Intake of Metal (DIM), Health Risk Index (HRI), Target Hazard Quotient (THQ) and Cancer Risk (CR) were found as 0.234 to 0.669, 0.002, 0.0002, 0.020 to 0.057, 0.234 to 0.669, and 0.00001, respectively which signify a low to moderate risk. A sensitivity analysis revealed that intake of potato is the most sensitive parameter of the model, which is positively correlated (coeff. + 0.66) followed by concentration of Pb in the arable soil (+0.49), bioaccumulation in tubers (+0.37), consumption of salad vegetables (+0.20), and consumption of green vegetables (+0.13) (top 5). A back-calculated limit of Pb in the soil (51 mg kg(-1)) justifies the lower threshold limit of Pb (50-300 mg kg(-1)) in agricultural soil set by the European Union to mitigate potential bio-transfer into food products. The study concludes there is a low to moderate risk posed by Pb, within the system boundary of

the probabilistic model, and highlights the significance of limiting Pb concentrations in the vegetable producing agricultural soil. (C) 2021 The Authors. Published by Elsevier B.V.

68. Approach for evaluating instantaneous impact forces during submarine slide-pipeline interaction considering the inertial action
Journal: OCEAN ENGINEERING
Abstract: With the rapid development of offshore oil and gas exploitation, submarine pipelines have become a common way to transport resources from the subsea wellhead to the production ship and the plant on shore. However, frequent submarine slide hazards pose a serious threat to the safe operation of the pipeline networks, in particular for the pipelines that have to pass through hazardous geological environments. Focusing on the instantaneous impact process of submarine slides on pipelines and the effects of the slide mass-related or pipeline-related parameters, this study includes a series of numerical simulations on the submarine slide-pipeline interaction at Reynolds numbers ranging from 0.36 to 287 via a computational fluid dynamics (CFD) method. The formation mechanism of the instantaneous impact forces is illuminated according to the characteristic analysis of the flow velocity and acceleration field around a pipeline during the slide-pipeline interaction. The conventional hybrid geotechnical-fluid dynamics framework describing the slide-pipeline forces is enhanced by considering the effect of inertial action, and force coefficients of different terms in the framework are quantified according to the CFD results data. Finally, an approach and detailed calculation table for evaluating the instantaneous impact forces are provided and verified by comparison with the previous experiments.

69. Occurrence, Controlling Factors and Health Hazards of Fluoride-Enriched Groundwater in the Lower Flood Plain of Yellow River, Northern China
Journal: EXPOSURE AND HEALTH
Abstract: High-fluoride groundwater is a major challenge to safe groundwater supply for global community. This study emphasized on the high-fluoride phreatic groundwater in the lower flood plain of Yellow River. A total of 86 phreatic groundwaters were sampled to elucidate the hydrochemistry, sources and driving forces of high-fluoride groundwater, and associated health hazards. Results indicate phreatic groundwaters in the study area are all slightly alkaline with TDS in a large variation of 559-4271 mg/L. High-fluoride groundwater is widespread in the study area with similar to 70% of groundwaters exceeding the Chinese drinking water permissible limit of 1 mg/L, and characterized by hydrochemical faces of HCO3- and Na+. Groundwater fluoride originates predominantly from the geogenic sources of fluorite dissolution and silicates weathering. Its release is retrained by the gypsum dissolution but stimulated by the precipitation of calcite, aragonite and dolomite. Groundwater fluoride enrichment is also facilitated by the alkaline condition, competitive adsorption of HCO3-, cation exchange process. The excessive fluoride in

groundwater can pose non-carcinogenic risk to all populations at more than 50% of sampling sites via drinking water pathway, but mostly the medium risk category. Infants were more susceptible with 15.12% of groundwaters demonstrated high health risk. The high health risk to other populations is limited. Differential water supply and defluorination are recommended to effectively utilize groundwater resource and safeguard residents' health.

70. A New Criterion of Strain Rockburst in Consideration of the Plastic Zone of Tunnel Surrounding Rock
Journal: ROCK MECHANICS AND ROCK ENGINEERING
Abstract: Highlights The radius of the plastic zone and the radial stress is introduces into the stress-intensity ratio. A new rockburst criterion is proposed to predict the rockburst classification. The certain relationship between the rockburst rating and the radius of the plastic zone and radial stress is studied.

71. Potential lead toxicity and leakage issues on lead halide perovskite photovoltaics
Journal: JOURNAL OF HAZARDOUS MATERIALS
Abstract: Recently, lead halide perovskite solar cells have become a promising next-generation photovoltaics candidate for large-scale application to realize low-cost renewable electricity generation. Although perovskite solar cells have tremendous advantages such as high photovoltaic performance, low cost and facile solution-based fabrication, the issues involving lead could be one of the main obstacles for its commercialization and large-scale applications. Lead has been widely used in photovoltaics industry, yielding its environmental and health issues of vital importance because of the widespread application of photovoltaics. When the solar cell panels especially perovskite solar cells are damaged, lead would possibly leak into the surrounding environment, causing air, soil and groundwater contamination. Therefore, lots of research efforts have been put into evaluating the lead toxicity and potential leakage issues, as well as studying the encapsulation of lead to deal with leakage issue during fire hazard and precipitation in photovoltaics. In this review, we summarize the latest progress on investigating the lead safety issue on photovoltaics, especially lead halide perovskite solar cells, and the corresponding solutions. We also outlook the future development towards solving the lead safety issues from different aspects.

72. Determination of factors affecting the response efficacy of Filipinos under Typhoon Conson 2021 (Jolina): An extended protection motivation theory approach
Journal: INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION
Abstract: The response efficacy measures can be utilized to assess a person's beliefs as to whether the recommended action step will actually minimize the impact of a natural disaster such as a typhoon. This study examines the response efficacy of Filipinos under Typhoon Conson 2021 (Jolina) using the Extended Protection Motivation Theory (PMT) approach. To accurately measure the factors and their relationships to response efficacy, an online questionnaire was developed and

distributed using a convenience sampling method to 388 Filipinos a few days before the typhoon hit the Philippines. Several latent variables in PMT such as understanding of typhoon, perceived severity, response cost, self-efficacy, and response efficacy together with some additional latent variables such as typhoon experience, geographical perspective, and perceived susceptibility were analyzed simultaneously. Structural Equation Modeling (SEM) showed that perceived severity of the typhoon and self-efficacy were the key factors affecting the response efficacy of Filipinos in preparing for typhoon Jolina. Moreover, it was also found that understanding typhoons, self-efficacy, perceived susceptibility, and past typhoon experience indirectly affected response efficacy. The results of this study could be utilized by future researchers and planners of natural disasters to find ways of enhancing the response efficacy in preparing for typhoons. Finally, the findings of this study can also be utilized as a theoretical framework for government worldwide in designing and implementing strategies and policies for natural disaster risk protection.

73. Coal Seam Gas Extraction by Integrated Drillings and Punchings from the Floor Roadway considering Hydraulic-Mechanical Coupling Effect

Journal: GEOFLUIDS

Abstract: Owing to the exhaustion of shallow coal resources, deep mining has been occupied in coal mines. Deep buried coal seams are featured by the great ground stress, high gas pressure, and low permeability, which boost the risk of gas disasters and thus dramatically threaten the security about coal mines. Coal seam gas pressure and gas content can be decreased by gas extraction, which is the primary measure to prevent and control mine gas disasters. The coal mass is simplified into a continuous medium with dual structure of pores and fractures and single permeability. In consideration of the combined effects of gas slippage and two-phase flow, a hydraulic-mechanical coupling model for gas migration in coals is proposed. This model involves the equations of gas sorption and diffusion, gas and water seepage, coal deformation, and evolution of porosity and permeability. Based on these, the procedure of gas extraction through the floor roadway combined with hydraulic punching and ordinary drainage holes was simulated, and the gas extraction results were used to evaluate the outburst danger of roadway excavation and to verify the engineering practice. Results show that gas extraction can reduce coal seam gas pressure and slow down the rate of gas release, and the established hydraulic-mechanical coupling model can accurately reveal the law of gas extraction by drilling and punching boreholes. After adopting the gas extraction technology of drilling and hydraulic punching from the floor roadway, the remaining gas pressure and gas content are reduced to lower than 0.5 MPa and 5.68 m(3)/t, respectively. The achievements set a theoretical foundation to the application of drilling and punching integrated technology to enhance gas extraction.

74. Spatial and seasonal variation of water quality indices in Gomal Zam Dam and its tributaries of south Waziristan District, Pakistan

Journal: ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH

Abstract: This study investigated the quality of water and its seasonal variation in the Gomal Zam Dam and tributaries, south Waziristan District, Pakistan. For this purpose, water samples were collected from the Gomal Zam Dam and its tributaries in the winter and summer seasons (n = 24 in each season). Water samples were analyzed and found within drinking water guidelines set by the World Health Organization (WHO), except turbidity. Water characteristics were evaluated for the water quality index (WQI) and sodium hazards. Based on WQI and sodium hazards, the water of Gomal Zam Dam and its tributaries were observed as good and in permissible levels for drinking and irrigation, respectively. The winter season has slightly poor water quality compared to the summer season due to higher contamination. Gibbs's and Piper's models showed that the water quality of Gomal Zam Dam and its tributaries was mainly characterized by the weathering of bedrocks. The studied water is classified as Na-Cl type and Mg-HCO3 types in the summer and winter seasons, respectively. Statistical analyses revealed that geogenic sources of rock weathering are the dominant factor for controlling the water quality of the area.

75. Ecological evaluation of heavy metal pollution in the soil of Pb-Zn mines

Journal: ECOTOXICOLOGY

Abstract: Soil heavy metal pollution evaluations are a necessary measure for mine ecological control projects. In this study, the heavy metals Pb, Zn and Cd were studied in mining areas, tailings areas, sewage plant areas, residential areas, reclamation areas, and farmland areas. Soil pollution assessments of lead-zinc ore mine soils in the countryside of China are performed based on the index of geoaccumulation (I-geo) and the improved analytic hierarchy process (AHP). Finally, the pollution sources were analyzed by positive matrix factorization (PMF). The I-geo for the heavy metals Pb, Zn and Cd in the mining area reached 5.20, 3.34, and 5.66, respectively. In addition, 80 and 65% of the mining area and tailings area reached extremely strong pollution, respectively. The numerical simulation predicts that the pollution hazard in the southeast of the mine is high and that the pollution is concentrated. The severity of soil pollution in mines derived by the index of improved analytic hierarchy process (P-AHP) was as follows: mining area (70.80) > sewage plant area (35.57) > tailings area (30.64) > farmland area (28.40) > residential area (21.11) > reclamation area (10.06). Among the three categories of pollution sources, one includes reclamation area, farmland area and tailings area; one includes sewage plant area and residential area; and one includes mining area. The source contribution of Pb by the phenomenon of indiscriminate discharge of wastewater after ore smelting was as high as 90.4%; The contribution of the blind mining and tailings piling phenomenon of mines to the source of heavy metals Zn and Cd was 81.4 and 90.2%, respectively. This study proposes a reliable scientific method and technical method for evaluating mine soil pollution and provides a guiding basis for mine development and protection.

76. Detection and segmentation of loess landslides via satellite images: a two-phase framework

Journal: LANDSLIDES

Abstract: Landslides are catastrophic natural hazards that often lead to loss of life, property damage, and economic disruption. Image-based landslide investigations are crucial for determining landslide susceptibility and risk. In practice, satellite images have been widely utilized for such investigations; however, they still require significant labor and time resources. In this study, we propose an image-based two-phase data-driven framework for detecting and segmenting landslide regions using satellite images. In phase I, an object detection algorithm, Faster-RCNN, is trained to detect the landslide location within the large-scale satellite images. The bounding boxes of each landslide location are proposed and visualized. In phase II, we crop the satellite images into small images using the location information of the bounding boxes. Next, we use a boundary detection algorithm to identify the boundary information of each detected loess landslide to strengthen the segmentation performance. Finally, we improve the architecture of the segmentation U-Net by integrating additional inception blocks with dilation to enhance the landslide segmentation performance. A total of 150 local loess landslide occurrences in northern China are selected as our case study to validate the effectiveness, efficiency, and universality of the proposed two-phase framework. Segmentation of loess landslides is considered a challenging task due to the intrinsic nature of vague boundary information. The proposed framework is compared with the conventional U-Net and other recent benchmarking landslide segmentation algorithms. Computational results indicate that the proposed framework produces more accurate segmentation of loess landslides compared with the other tested benchmarking algorithms.

77. An integrated approach to quantify ecological and human health risks of soil heavy metal contamination around coal mining area

Journal: SCIENCE OF THE TOTAL ENVIRONMENT

Abstract: Soil heavy metals harm ecological biodiversity and human health, and quantifying the risks more accurately is still obscure. In this study, a network environ analysis was applied to quantify risks between ecological communities based on control allocation and human health risk models to calculate human health exposure risks from soil heavy metals around Greenside coal mining in South Africa. Ecological and human health risks were apportioned using PMF model. Results showed assessed heavy metals (mean) exceeded local background content with a cumulative of moderately polluted using pollution load index (PLI). Total initial risk (R-i), the risk to biological organisms from direct soil exposure, was 0.656 to vegetation and 1.093 to soil microorganisms. Risk enters the food web via vegetation and harms the whole system. Integrated risks (initial, direct, and indirect) to vegetation, herbivores, soil microorganisms, and carnivores were 0.656, 0.125, 1.750,

and 0.081, respectively, revealing that soil microorganisms are the most risk receptors. Total Hazard Index (HIT) was <1 for adults (0.574) whereas >1 for children (4.690), signifying severe non-cancer effects to children. Total cancer risk (TCR) to children and adults surpassed the unacceptable limit (1.00E-04). Comparatively, Cr is a high-risk metal accounted for 63.24% (adults) and 65.88% (children) of the HIT and 92.98% (adults) and 91.31% (children) of the TCR. Four sources were apportioned. Contributions to Ri (soil microorganisms and vegetation) from F3 (industrial), F4 (atmospheric), F2 (coal mining), and F1 (natural) were 42.20%, 24.56%, 23.55%, and 9.68%, respectively. The non-cancer risk from F3 (37.67% to adults and 38.40% to children) was dominant, and TCR to children from the sources except F1 surpassed the unacceptable limit. An integrated approach of risk quantification is helpful in managing risks and reducing high-risk pollution sources to better protect the environment and human health.

78. Assessing the Radiological Risks Associated with High Natural Radioactivity of Microgranitic Rocks: A Case Study in a Northeastern Desert of Egypt

Journal: INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH

Abstract: This study aimed to evaluate the radiological hazards of uranium (U-238), thorium (Th-232), and potassium (K-40) in microgranitic rocks from the southeastern part of Wadi Baroud, a northeastern desert of Egypt. The activity concentrations of the measured radionuclides were determined by using a gamma-ray spectrometer (NaI-Tl-activated detector). The mean (U-238), (Th-232), and (K-40) concentrations in the studied rocks were found to be 3680.3, 3635.2, and 822.76 Bq/kg, respectively. The contents in these rocks were elevated, reaching up to 6.3 wt%. This indicated the alkaline nature of these rocks. The high ratios of Th/U in the mineralized rocks could be related to late magmatic mineralization, suggesting the ascent of late magmatic fluids through weak planes such as faults and the contact of these rocks with older granites. The present data were higher than those of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) guideline limits. All the radiological hazard results indicated high human health risks. This confirmed that this area is not radiologically safe, and care must be taken when working in this area. This study showed that the area under investigation had high U content suitable for uranium extraction that could be used in the nuclear fuel cycle.

79. Real-Time Processing of Spaceborne SAR Data With Nonlinear Trajectory Based on Variable PRF

Journal: IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING

Abstract: Spaceborne synthetic aperture radar (SAR) real-time imaging is especially important for disaster emergencies and real-time monitoring applications with highly desired real-time requirements. Therefore, the continuous improvement of real-time imaging efficiency is an important development trend. At present, traditional real-time imaging algorithms based on constant pulse repetition frequency (PRF) have low

accuracy when processing spaceborne SAR data with nonlinear trajectory. For this problem, the existing methods usually introduce some complex signal processing steps, such as scaling or interpolation processing, to improve the accuracy of the real-time imaging, but this will reduce its efficiency. Therefore, this article proposes a new real-time imaging algorithm based on variable PRF for nonlinear trajectory spaceborne SAR. By introducing the variable PRF, the proposed algorithm is equivalent to complete the complex signal processing steps in the radar signal transmission stage, which can greatly improve the efficiency of real-time imaging. Simulation experiments verify the effectiveness of the algorithm.

80. Potentially toxic metal concentration, spatial distribution, and health risk assessment in drinking groundwater resources of southeast Iran

Journal: GEOSCIENCE FRONTIERS

Abstract: In this study, the concentration and spatial distribution of potentially toxic metals (PTMs), including arsenic (As), cadmium (Cd), chromium (Cr), lead (Pb), copper (Cu), iron (Fe), manganese (Mn), and mag-nesium (Mg) in 23 wells and drinking groundwater distribution networks of Rafsanjan, located in south -east Iran were evaluated. Moreover, the assessment of carcinogenic and non-carcinogenic risks was estimated by Monte Carlo simulation (MCS). The results showed that the concentrations of As and Pb in more than 99% and 23.46% of the study area, respectively, were higher than the maximum concentra-tion level (10 mg/L). The mean concentration of other metals, including Cd, Cr, Cu, Fe, Mg, and Mn in all drinking water resources was within the WHO standard level. The mean hazard quotient (HQ) for As in the age group of children was 9.246 and adults 2.972, indicating high non-carcinogenic risk of As in the study area. The lifetime cancer risk (LTCR) of As was 1.36E-3 for adults and 1.52E-2 for children, indi-cating high non-carcinogenic risk of As. The level of HQ and LTCR for Pb in both age groups was in the acceptable range. The results of sensitivity analysis showed that the most effective variables were pollu-tant concentration and body weight (BW), respectively. Finally, it can be concluded that exposure to PTMs, especially As through drinking water in the study area can have significant effects on people's health living in the area; therefore, it is necessary to treat and remove As from groundwater resources before drinking or using for domestic purpose. (c) 2021 China University of Geosciences (Beijing) and Peking University. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/ licenses/by-nc-nd/4.0/).

81. Impacts of permafrost degradation on infrastructure

Journal: NATURE REVIEWS EARTH & ENVIRONMENT

Abstract: The warming and thawing of ice-rich permafrost pose considerable threat to the integrity of polar and high-altitude infrastructure, in turn jeopardizing sustainable development. In this Review, we explore the extent and costs of observed and predicted infrastructure damage associated with permafrost degradation, and the

methods available to mitigate such adverse consequences. Permafrost change imposes various threats to infrastructure, namely through warming, active layer thickening and thaw-related hazards such as thermokarst and mass wasting.These impacts, often linked to anthropogenic warming, are exacerbated through increased human activity. Observed infrastructure damage is substantial, with up to 80% of buildings in some Russian cities and -30% of some road surfaces in the Qinghai-Tibet Plateau reporting damage. Under anthropogenic warming, infrastructure damage is projected to continue, with 30-50% of critical circumpolar infrastructure thought to be at high risk by 2050. Accordingly, permafrost degradation-related infrastructure costs could rise to tens of billions of US dollars by the second half of the century. Several mitigation techniques exist to alleviate these impacts, including convection embankments, thermosyphons and piling foundations, with proven success at preserving and cooling permafrost and stabilizing infrastructure. To be effective, however, better understanding is needed on the regions at high risk.

82. Experimental investigation and prediction model for UCS loss of unsaturated sandstones under freeze-thaw action

Journal: INTERNATIONAL JOURNAL OF MINING SCIENCE AND TECHNOLOGY

Abstract: Sandstone is widely distributed in cold regions and the freeze-thaw deterioration of them has caused many geological engineering disasters. As an important and direct index of frost resistance, the strength loss of sandstones under freeze-thaw actions should be investigated to provide a guidance for the stability assessment of geological engineering. In this research, the UCS (Uniaxial compressive strength) loss of six typical sandstones with different water contents after 0, 20, 40 and 60 freeze-thaw cycles was measured in the laboratory. The experimental results indicated that the freeze-thaw damage was more serious in sandstones containing high water contents, and the critical saturations for causing a significant loss of UCS under freeze-thaw were 60%-80% for these sandstones. Below this critical saturation, the UCS loss of the sandstones was mainly caused by water weakening rather than freeze-thaw damage. Besides, a developed strength prediction model was proposed by combining the exponential decay function and multiple linear regression method. The initial porosity, elastic modulus and tensile strength of fresh sandstones were a good parameter combination to accurately determine the decay constant in this developed model. The main novelty of this model is that it can accurately and easily estimate the UCS loss of sandstones after any freeze-thaw cycle only using the initial parameters of fresh sandstones, but it does not need to perform freeze-thaw and mechanical strength experiments. This study not only provides an accurate prediction model of UCS under freeze-thaw, but also makes a contribution to better understanding the frost resistance mechanism of sandstones. (C) 2021 Published by Elsevier B.V. on behalf of China University of Mining & Technology.

83. Adaptive Local Structure Consistency-Based Heterogeneous Remote Sensing

Change Detection

Journal: IEEE GEOSCIENCE AND REMOTE SENSING LETTERS

Abstract: Change detection (CD) of heterogeneous remote sensing images is a challenging topic, which plays an important role in natural disaster emergency response. Due to the different imaging mechanisms of heterogeneous sensors, it is hard to directly compare the images. To address this challenge, we explore an unsupervised CD method based on adaptive local structure consistency (ALSC) between heterogeneous images in this letter, which constructs an adaptive graph representing the local structure for each patch in one image domain and then projects this graph to the other image domain to measure the change level. This local structure consistency exploits the fact that the heterogeneous images share the same structure information for the same ground object, which is imaging modality-invariant. To avoid heterogeneous data confusion, the pixelwise change image is calculated in the same image domain by graph projection. By comparing with some state-of-the-art methods, the experimental results show the effectiveness of the proposed ALSC-based CD method.

84. Algae-mediated antibiotic wastewater treatment: A critical review

Journal: ENVIRONMENTAL SCIENCE AND ECOTECHNOLOGY

Abstract: The existence of continually increasing concentrations of antibiotics in the environment is a serious potential hazard due to their toxicity and persistence. Unfortunately, conventional treatment techniques, such as those utilized in wastewater treatment plants, are not efficient for the treatment of wastewater containing antibiotic. Recently, algae-based technologies have been found to be a sustainable and promising technique for antibiotic removal. Therefore, this review aims to provide a critical summary of algae-based technologies and their important role in antibiotic wastewater treatment. Algal removal mechanisms including bioadsorption, bioaccumulation, and biodegradation are discussed in detail, with using algae-bacteria consortia for antibiotic treatment, integration of algae with other microorganisms (fungi and multiple algal species), hybrid algae-based treatment and constructed wetlands, and the factors affecting algal antibiotic degradation comprehensively described and assessed. In addition, the use of algae as a precursor for the production of biochar is highlighted, along with the modification of biochar with other materials to improve its antibiotic removal capacity and hybrid algae-based treatment with advanced oxidation processes. Furthermore, recent novel approaches for enhancing antibiotic removal, such as the use of genetic engineering to enhance the antibiotic degradation capacity of algae and the integration of algal antibiotic removal with bioelectrochemical systems are discussed. Finally, some based on the critical review, key future research perspectives are proposed. Overall, this review systematically presents the current progress in algae-mediated antibiotic removal technologies, providing some novel insights for improved alleviation of antibiotic pollution in aquatic environments. (c) 2022 Published by Elsevier B.V. on behalf of

85. Assessing the role of compound drought and heatwave events on unprecedented 2020 wildfires in the Pantanal

Journal: ENVIRONMENTAL RESEARCH LETTERS

Abstract: The year 2020 had the most catastrophic fire season over the last two decades in the Pantanal, which led to outstanding environmental impacts. Indeed, much of the Pantanal has been affected by severe dry conditions since 2019, with evidence of the 2020's drought being the most extreme and widespread ever recorded in the last 70 years. Although it is unquestionable that this mega-drought contributed significantly to the increase of fire risk, so far, the 2020's fire season has been analyzed at the univariate level of a single climate event, not considering the co-occurrence of extreme and persistent temperatures with soil dryness conditions. Here, we show that similarly to other areas of the globe, the influence of land-atmosphere feedbacks contributed decisively to the simultaneous occurrence of dry and hot spells (HPs), exacerbating fire risk. The ideal synoptic conditions for strong atmospheric heating and large evaporation rates were present, in particular during the HPs, when the maximum temperature was, on average, 6 degrees C above the normal. The short span of the period during those compound drought-heatwave (CDHW) events accounted for 55% of the burned area of 2020. The vulnerability in the northern forested areas was higher than in the other areas, revealing a synergistic effect between fuel availability and weather-hydrological conditions. Accordingly, where fuel is not a limiting factor, fire activity tends to be more modelled by CDHW events. Our work advances beyond an isolated event-level basis towards a compound and cascading natural hazards approach, simultaneously estimating the contribution of drought and heatwaves to fuelling extreme fire outbreaks in the Pantanal such as those in 2020. Thus, these findings are relevant within a broader context, as the driving mechanisms apply across other ecosystems, implying higher flammability conditions and further efforts for monitoring and predicting such extreme events.

86. Oil Spill Detection Based on Deep Convolutional Neural Networks Using Polarimetric Scattering Information From Sentinel-1 SAR Images

Journal:IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING

Abstract: Oil spill accidents can cause severe ecological disasters; hence, the timely and effective detection of oil spills on the marine surface is of great significance. Synthetic aperture radar (SAR) is very suitable for large-scale oil spill monitoring. As a more advanced form of SAR, polarimetric SAR (PolSAR) can provide more scattering information of land objects, which can help to improve the accuracy of oil spill detection. However, the current studies of oil spill detection by SAR data have mainly focused on using SAR intensity or amplitude information, and the phase information and other polarimetric information have not been fully utilized. To solve

this problem, using Sentinel-1 dual-polarimetric images as the data source, this article presents an intelligent oil spill detection architecture based on a deep convolutional neural network (DCNN), in which both the amplitude information and phase information are utilized. Furthermore, to improve the feature discrimination capability, the Cloude polarimetric decomposition parameters are also integrated into the proposed model. The results show that the improved DeepLabv3+ model, which takes ResNet-101 as the backbone network and group normalization (GN) as the normalization layer, can achieve superior performance than those traditional methods. Moreover, the model is better able to capture the fine details of oil spill instances and can achieve fine-scale segmentation.

87. Evidence-based guidelines for protective actions and earthquake early warning systems

Journal: GEOPHYSICS

Abstract: Earthquake early warning (EEW) systems are becoming in-creasingly available or are in development throughout the world. As these systems develop, it is important to provide evi-dence-based recommendations for protective action so people know how to protect themselves when they receive an alert. However, many factors need to be considered when developing contextually relevant and appropriate recommendations. We have reviewed earthquake injury reports, protective action and communication theories, and behavioral research to deter-mine what factors can guide inquiry and decision making when developing protective action guidelines. Factors that emerge from relevant literature include: (1) social, cultural, and envi-ronmental context, such as which people are present, what their social roles are, and in what type of building they are located when an earthquake happens, (2) demographic and ex-periential variables, such as gender and age as well as previous history with earthquakes; and (3) magnitude and intensity that influence the duration and impacts of the earthquake itself. Although we examine data from around the world, we focus largely on evidence-based recommendations for the U.S. sys-tem, ShakeAlert, because it provides a timely case study for understanding how people receive and respond to EEW mes-sages. In addition to synthesizing relevant literature, we recommend pathways forward for this interdisciplinary re-search community that explores EEW and its application around the world. Consistency in collecting and reporting in-jury data globally may assist in aligning this fragmented liter-ature to develop a richer understanding of how demographic, cultural, seismic, engineering, and technological issues can be addressed to reduce human suffering due to earthquakes.

88. Future precipitation changes in Egypt under the 1.5 and 2.0 degrees C global warming goals using CMIP6 multimodel ensemble

Journal: ATMOSPHERIC RESEARCH

Abstract: Rainfall projections for 1.5 and 2.0 degrees C warming can explain regional precipitation response to emission reductions under the Paris Agreements' goals.

Assessment of such changes is vital for Egypt, a global climate change hotspot. The performance of 29 CMIP6 GCMs' hindcasts was evaluated according to their capability to replicate the spatial patterns of annual, winter, and summer precipitation for 1971-2014 to select a suitable GCM subset to form a robust multimodel ensemble (MME). The MME median was used to project precipitation and precipitation extremes of Egypt at the end of the century (2081-2100) for two shared socioeconomic pathways (SSP) scenarios, SSP1-1.9 and SSP1-2.6, representing 1.5 and 2.0 degrees C warming at the end of the present century, respectively. The results showed an increase in precipitation in the northern high precipitation region by 37% and 54% for SSP1-1.9 and SSP1-2.6, respectively, and a decrease in the southwestern low precipitation region by -35% for both scenarios. The projected increase would be mostly in winter and almost no change in summer. The projection of precipitation extremes revealed an increase in extreme precipitation amount in the northern coast between 0% and 14% and the longest dry spell over most of the country by 160%. The results indicate more heterogeneity in the spatial distribution in Egypt's precipitation, increasing extreme precipitation amount in some regions and dry spell length over the whole country. The results indicate a large increase in hydrological hazard susceptibility in Egypt, even if the global warming can be limited to 2 degrees C at the end of the century following the Paris Agreement.

89. Flood Risk-Related Research Trends in Latin America and the Caribbean

Journal: WATER

Abstract: Latin America and the Caribbean (LAC), like many other regions in the world, are areas that are prone to hydrometeorological disasters, which threaten livelihoods and cause economic losses. To derive LAC's status in the field of flood risk-related research, we conducted a bibliometric analysis of the region's publication record using the Web of Science journal database (WoS). After analysing a total of 1887 references according to inclusion-exclusion criteria, 302 articles published in the last 20 years were selected. The research articles published in the period 2000-2020 revealed that Mexico, Brazil, and certain South American countries such as Chile, Peru, and Argentina are more productive in flood risk research. Scientific research is increasing, and most of the available studies focus on lowland areas. The frequently-used keywords are generic, and there is often verbatim copying from the title of the article, which shows the poor coherence between the title, abstract, and keywords. This limited diversification of keywords is of little use in bibliometric studies, reducing their visibility and negatively impacting the citation count level. LAC flood studies are mainly related to hydrometeorological assessments, flood risk analyses, geomorphological and ecosystem studies, flood vulnerability and resilience approaches, and statistical and geographic information science evaluations. This systematic review reveals that although flood risk research has been important in the last two decades, future research linked with future climatic scenarios is key to the development of realistic solutions to disaster risks.

90. Long-term exposure to low ambient air pollution concentrations and mortality among 28 million people: results from seven large European cohorts within the ELAPSE project

Journal: LANCET PLANETARY HEALTH

Abstract: Background Long-term exposure to ambient air pollution has been associated with premature mortality, but associations at concentrations lower than current annual limit values are uncertain. We analysed associations between low-level air pollution and mortality within the multicentre study Effects of Low-Level Air Pollution: A Study in Europe (ELAPSE). Methods In this multicentre longitudinal study, we analysed seven population-based cohorts of adults (age >= 30 years) within ELAPSE, from Belgium, Denmark, England, the Netherlands, Norway, Rome (Italy), and Switzerland (enrolled in 2000-11; follow-up until 2011-17). Mortality registries were used to extract the underlying cause of death for deceased individuals. Annual average concentrations of fine particulate matter (PM2.5), nitrogen dioxide (NO2), black carbon, and tropospheric warm-season ozone (O-3) from Europe-wide land use regression models at 100 m spatial resolution were assigned to baseline residential addresses. We applied cohort-specific Cox proportional hazard models with adjustment for area-level and individual-level covariates to evaluate associations with non-accidental mortality, as the main outcome, and with cardiovascular, non-malignant respiratory, and lung cancer mortality. Subset analyses of participants living at low pollutant concentrations (as per predefined values) and natural splines were used to investigate the concentration-response function. Cohort-specific effect estimates were pooled in a random-effects meta-analysis. Findings We analysed 28 153 138 participants contributing 257 859 621 person-years of observation, during which 3 593 741 deaths from non-accidental causes occurred. We found significant positive associations between non-accidental mortality and PM2.5, NO2, and black carbon, with a hazard ratio (HR) of 1.053 (95% CI 1.021-1.085) per 5 mu g/m(3) increment in PM2.5, 1.044 (1.019-1.069) per 10 mu g/m(3) NO2, and 1.039 (1.018-1.059) per 0.5 x 10(-5)/m black carbon. Associations with PM2.5, NO2, and black carbon were slightly weaker for cardiovascular mortality, similar for non-malignant respiratory mortality, and stronger for lung cancer mortality. Warm-season O-3 was negatively associated with both non-accidental and cause-specific mortality. Associations were stronger at low concentrations: HRs for non-accidental mortality at concentrations lower than the WHO 2005 air quality guideline values for PM2.5 (10 mu g/m(3)) and NO2 (40 mu g/m(3)) were 1.078 (1.046-1.111) per 5 mu g/m(3) PM2.5 and 1.049 (1.024-1.075) per 10 mu g/m(3) NO2. Similarly, the association between black carbon and non-accidental mortality was highest at low concentrations, with a HR of 1.061 (1.032-1.092) for exposure lower than 1.5x 10(-5)/m, and 1.081 (0.966-1.210) for exposure lower than 1.0x 10(-5)/m. Interpretation Long-term exposure to concentrations of PM2.5, and NO2 lower than current annual limit values was associated with non-accidental, cardiovascular, non-malignant respiratory, and lung cancer mortality in seven large

European cohorts. Continuing research on the effects of low concentrations of air pollutants is expected to further inform the process of setting air quality standards in Europe and other global regions. Copyright (C) 2022 The Author(s). Published by Elsevier Ltd.

91. Human genetic risk of treatment with antiviral nucleoside analog drugs that induce lethal mutagenesis: The special case of molnupiravir

Journal:ENVIRONMENTAL AND MOLECULAR MUTAGENESIS

Abstract: This review considers antiviral nucleoside analog drugs, including ribavirin, favipiravir, and molnupiravir, which induce genome error catastrophe in SARS-CoV or SARS-CoV-2 via lethal mutagenesis as a mode of action. In vitro data indicate that molnupiravir may be 100 times more potent as an antiviral agent than ribavirin or favipiravir. Molnupiravir has recently demonstrated efficacy in a phase 3 clinical trial. Because of its anticipated global use, its relative potency, and the reported in vitro host cell mutagenicity of its active principle, beta-d-N4-hydroxycytidine, we have reviewed the development of molnupiravir and its genotoxicity safety evaluation, as well as the genotoxicity profiles of three congeners, that is, ribavirin, favipiravir, and 5-(2-chloroethyl)-2'-deoxyuridine. We consider the potential genetic risks of molnupiravir on the basis of all available information and focus on the need for additional human genotoxicity data and follow-up in patients treated with molnupiravir and similar drugs. Such human data are especially relevant for antiviral NAs that have the potential of permanently modifying the genomes of treated patients and/or causing human teratogenicity or embryotoxicity. We conclude that the results of preclinical genotoxicity studies and phase 1 human clinical safety, tolerability, and pharmacokinetics are critical components of drug safety assessments and sentinels of unanticipated adverse health effects. We provide our rationale for performing more thorough genotoxicity testing prior to and within phase 1 clinical trials, including human PIG-A and error corrected next generation sequencing (duplex sequencing) studies in DNA and mitochondrial DNA of patients treated with antiviral NAs that induce genome error catastrophe via lethal mutagenesis.

92. Experimental investigation on the nonlinear characteristics of energy evolution and failure characteristics of coal under different gas pressures

Journal: BULLETIN OF ENGINEERING GEOLOGY AND THE ENVIRONMENT

Abstract: Studying the energy evolution characteristics of coal in a deep underground engineering environment will help people to understand the evolution process and induced mechanism of geological disaster and risk. To explore the influence mechanism of gas pressure on coal deformation, failure, and energy evolution, triaxial compression tests of coal under different gas pressure conditions were conducted in this study. Based on the test data, the mechanical properties, acoustic emission (AE) energy characteristics, and nonlinear characteristics of the energy evolution of coal containing gas were obtained. A theoretical formula for analyzing energy evolution is introduced. After this theoretical formula is verified by test data, the evolution characteristics of three energy rates (derivative of energy to stress) of coal are

obtained based on this formula. It is found that energy rate can be used as a new effective mechanical parameter to analyze and predict the damage and failure characteristics of coal. The energy dissipation characteristics before the peak can be divided into two types: high dissipative energy rate type (HDERT) and low dissipative energy rate type (LDERT), which indicates different failure modes (plastic failure and brittle failure). On this basis, the ratio of dissipative energy rate and input energy rate is further defined to effectively distinguish the two types of dissipative energy rates of coal mass. The research results are helpful to explore the fracturing evolution and energy driving mechanism of coal, and then play a guiding role in rock instability prediction and support and reinforcement measures selection.

93. Detecting Natural Hazard-Related Disaster Impacts with Social Media Analytics: The Case of Australian States and Territories

Journal: SUSTAINABILITY

Abstract: Natural hazard-related disasters are disruptive events with significant impact on people, communities, buildings, infrastructure, animals, agriculture, and environmental assets. The exponentially increasing anthropogenic activities on the planet have aggregated the climate change and consequently increased the frequency and severity of these natural hazard-related disasters, and consequential damages in cities. The digital technological advancements, such as monitoring systems based on fusion of sensors and machine learning, in early detection, warning and disaster response systems are being implemented as part of the disaster management practice in many countries and presented useful results. Along with these promising technologies, crowdsourced social media disaster big data analytics has also started to be utilized. This study aims to form an understanding of how social media analytics can be utilized to assist government authorities in estimating the damages linked to natural hazard-related disaster impacts on urban centers in the age of climate change. To this end, this study analyzes crowdsourced disaster big data from Twitter users in the testbed case study of Australian states and territories. The methodological approach of this study employs the social media analytics method and conducts sentiment and content analyses of location-based Twitter messages (n = 131,673) from Australia. The study informs authorities on an innovative way to analyze the geographic distribution, occurrence frequency of various disasters and their damages based on the geo-tweets analysis.

94. Breaking Limits of Remote Sensing by Deep Learning From Simulated Data for Flood and Debris-Flow Mapping

Journal: IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING

Abstract: We propose a framework that estimates the inundation depth (maximum water level) and debris-flow-induced topographic deformation from remote sensing imagery by integrating deep learning and numerical simulation. A water and debris-flow simulator generates training data for various artificial disaster scenarios. We show that regression models based on Attention U-Net and LinkNet architectures trained on such synthetic data can predict the maximum water level and topographic

deformation from a remote sensing-derived change detection map and a digital elevation model. The proposed framework has an inpainting capability, thus mitigating the false negatives that are inevitable in remote sensing image analysis. Our framework breaks limits of remote sensing and enables rapid estimation of inundation depth and topographic deformation, essential information for emergency response, including rescue and relief activities. We conduct experiments with both synthetic and real data for two disaster events that caused simultaneous flooding and debris flows and demonstrate the effectiveness of our approach quantitatively and qualitatively. Our code and data sets are available at https://github.com/nyokoya/dlsim.

95. A review of gold extraction using alternatives to cyanide: Focus on current status and future prospects of the novel eco-friendly synthetic gold lixiviants

Journal: MINERALS ENGINEERING

Abstract: We propose a framework that estimates the inundation depth (maximum water level) and debris-flow-induced topographic deformation from remote sensing imagery by integrating deep learning and numerical simulation. A water and debris-flow simulator generates training data for various artificial disaster scenarios. We show that regression models based on Attention U-Net and LinkNet architectures trained on such synthetic data can predict the maximum water level and topographic deformation from a remote sensing-derived change detection map and a digital elevation model. The proposed framework has an inpainting capability, thus mitigating the false negatives that are inevitable in remote sensing image analysis. Our framework breaks limits of remote sensing and enables rapid estimation of inundation depth and topographic deformation, essential information for emergency response, including rescue and relief activities. We conduct experiments with both synthetic and real data for two disaster events that caused simultaneous flooding and debris flows and demonstrate the effectiveness of our approach quantitatively and qualitatively. Our code and data sets are available at https://github.com/nyokoya/dlsim.