Environmental Monitoring

1-Cellulose-Based Electrochemical Sensors

By Sheraz, M (Sheraz, Muhammad) [1] ; Sun, XF (Sun, Xiao-Feng) [1] ; Siddiqui, A (Siddiqui, Adeena) [1] ; Wang, YK (Wang, Yongke) [1] ; Hu, SH (Hu, Sihai) [1] ; Sun, R (Sun, Ran) [1]
(provided by Clarivate) Source SENSORS Volume 25 Issue 3 DOI 10.3390/s25030645 Article Number 645 Published FEB 2025 Indexed 2025-02-17 Document Type Review

Abstract

Among the most promising areas of research, cellulose-based electrochemical sensors stand out for their intrinsic properties such as abundance, biocompatibility, and versatility. This review is concerned with the integration and application of cellulose-derived materials in electrochemical sensors, pointing out improvements in sensitivity, selectivity, stability, and functionality for a wide variety of applications. The most relevant developments on cellulose-based sensors have been concentrated on nanocellulose composite synthesis, advanced cellulose modification, and the successful embedding in wearable technologies, medical diagnostics, and environmental monitoring. Considering these, it is worth mentioning that significant challenges still need to be overcome regarding the scalability of production, selectivity improvement, and long-term stability under real operational conditions. Future research efforts will concern the union of cellulose-based sensors with the Internet of Things (IoT) and artificial intelligence (AI) toward wiser and more sustainable health and environmental solutions. Correspondingly, this work puts cellulose in the front line among the most perspective materials for enabling the development of eco-friendly and high-performance sensing technologies.

Keywords
Author Keywords
electrochemical sensorsbiocompatibilitycellulose-derived materialsenvironmental monitoringmedical diagnostics
Keywords Plus
BACTERIAL CELLULOSEGRAPHENE OXIDENANOCRYSTALLINE CELLULOSESURFACE MODIFICATIONWEARABLE SENSORSNANOCELLULOSEEXTRACTIONNANOCOMPOSITESCOMPOSITESNANOFIBERS

2-The Global Threat from the Irreversible Accumulation of Trifluoroacetic Acid (TFA)

By Arp, HPH (Arp, Hans Peter H.) [1] , [2] ; Gredelj, A (Gredelj, Andrea) [1] ; Glüge, J (Gluge, Juliane) [3] ; Scheringer, M (Scheringer, Martin) [3] , [4] ; Cousins, IT (Cousins, Ian T.) [5]
(provided by Clarivate) Source ENVIRONMENTAL SCIENCE & TECHNOLOGY Volume 58 Issue 45 Page 19925-19935 DOI 10.1021/acs.est.4c06189 Published OCT 30 2024 Early Access OCT 2024 Indexed 2024-11-15 Document Type Review

Abstract

Trifluoroacetic acid (TFA) is a persistent and mobile substance that has been increasing in concentration within diverse environmental media, including rain, soils, human serum, plants, plant-based foods, and drinking water. Currently, TFA concentrations are orders of magnitude higher than those of other per- and polyfluoroalkyl substances (PFAS). This accumulation is due to many PFAS having TFA as a transformation product, including several fluorinated gases (F-gases), pesticides, pharmaceuticals, and industrial chemicals, in addition to direct release of industrially produced TFA. Due to TFA's extreme persistence and ongoing emissions, concentrations are increasing irreversibly. What remains less clear are the thresholds where irreversible effects on local or global scales occur. There are indications from mammalian toxicity studies that TFA is toxic to reproduction and that it exhibits liver toxicity. Ecotoxicity data are scarce, with most data being for aquatic systems; fewer data are available for terrestrial plants, where TFA bioaccumulates most readily. Collectively, these trends imply that TFA meets the criteria of a planetary boundary threat for novel entities because of increasing planetary-scale exposure, where potential irreversible disruptive impacts on vital earth system processes could occur. The rational response to this is to instigate binding actions to reduce the emissions of TFA and its many precursors.

Keywords

Author Keywords

trifluoroacetic acidmultigenerational exposurePFASPMTvPvMenvironmental monitoring

Keywords Plus

PERFLUORINATED ALKYL ACIDSSAFE OPERATING SPACEPOLYFLUOROALKYL SUBSTANCESPLANETARY BOUNDARYHALOACETIC ACIDSSCIENTIFIC BASISMANAGING PFASWATERFATEPERFLUOROALKYL

Environmental Monitoring

3-3D Motion Manipulation for Micro- and Nanomachines: Progress and Future Directions

By Huang, H (Huang, Hai) [1] ; Yang, SH (Yang, Shihao) [2] ; Ying, YL (Ying, Yulong) [1] ; Chen, XZ (Chen, Xiangzhong) [3] ; Puigmartí-Luis, J (Puigmarti-Luis, Josep) [4] , [5] ; Zhang, L (Zhang, Li) [2] ; Pané, S (Pane, Salvador) [6] **(provided by Clarivate) Source ADVANCED MATERIALS Volume 36 Issue 1 DOI 10.1002/adma.202305925 Published JAN 2024 Early Access NOV 2023 Indexed 2023-12-23 Document Type Review**

Abstract

In the past decade, micro- and nanomachines (MNMs) have made outstanding achievements in the fields of targeted drug delivery, tumor therapy, microsurgery, biological detection, and environmental monitoring and remediation. Researchers have made significant efforts to accelerate the rapid development of MNMs capable of moving through fluids by means of different energy sources (chemical reactions, ultrasound, light, electricity, magnetism, heat, or their combinations). However, the motion of MNMs is primarily investigated in confined two-dimensional (2D) horizontal setups. Furthermore, three-dimensional (3D) motion control remains challenging, especially for vertical movement and control, significantly limiting its potential applications in cargo transportation, environmental remediation, and biotherapy. Hence, an urgent need is to develop MNMs that can overcome self-gravity and controllably move in 3D spaces. This review delves into the latest progress made in MNMs with 3D motion capabilities under different manipulation approaches, discusses the underlying motion mechanisms, explores potential design concepts inspired by nature for controllable 3D motion in MNMs, and presents the available 3D observation and tracking systems.

Keywords

Author Keywords

3D motionbuoyancyforce regulationmicro-/nanoswimmersz-axis motion

Keywords Plus

INDUCED-CHARGE ELECTROPHORESISLIGHTMICROMOTORSNANOMOTORSPROPULSIONMICROSWIMMERSFABRICATIONLOCOMOTIONPARTICLESDYNAMICS

Environmental Monitoring

4-An AUV-Enabled Dockable Platform for Long-Term Dynamic and Static Monitoring of Marine Pastures

By Zhang, ZY (Zhang, Zhuoyu) [1] ; Lin, MW (Lin, Mingwei) [1] ; Li, DJ (Li, Dejun) [1] ; Wu, RD (Wu, Rundong) [1] ; Lin, R (Lin, Ri) [1] ; Yang, CJ (Yang, Canjun) [1] (provided by Clarivate) **Source IEEE JOURNAL OF OCEANIC ENGINEERING Volume 50 Issue 1 Page 276-293 DOI 10.1109/JOE.2024.3455411 Published JAN 2025 Early Access NOV 2024 Indexed 2024-11-30 Document type Article**

Abstract

Environmental monitoring plays a crucial role in the development of marine ranches and the surveillance of underwater aquaculture organisms. To capitalize on the real-time, long-term, and static observation capabilities of seabed networks, as well as the dynamic and large-scale monitoring potential of underwater vehicles, a novel mobile platform for ocean ranches has been proposed. This platform comprises a floating platform, a docking station, and an autonomous underwater vehicle (AUV). The floating platform utilized is a versatile ocean testing platform that can be securely anchored in close proximity to the designated observation area. To enable static monitoring alongside the floating platform, a lightweight connection station, constructed using polyvinyl chloride pipes, is designed to accompany the platform. The AUV is employed for dynamic monitoring and is seamlessly linked to the aforementioned components using docking technology. Consequently, this integrated system achieves dynamic and static observations centered around a movable floating platform. Field experiments conducted in lakes and seas have validated the efficacy of this system in multiple scenarios, both on the surface and underwater. These experiments have demonstrated the system's ability to autonomously dock, transmit wireless signals and power, facilitate long-term static observations of fixed nodes, and conduct autonomous cruising for dynamic monitoring purposes.

Keywords

Author Keywords

Docking stationsMonitoringVehicle dynamicsSea surfaceSea measurementsReal-time systemsOptical sensorsOptical imagingIntegrated opticsCamerasAutonomous underwater vehicle (AUV)docking technologyunderwater guidance

Keywords Plus

AUTONOMOUS UNDERWATER VEHICLEDOCKING SYSTEMTRACKING

5-Transfer learning in environmental remote sensing

By Ma, YC (Ma, Yuchi) [1] , [2] ; Chen, S (Chen, Shuo) [3] ; Ermon, S (Ermon, Stefano) [4] ; Lobell, DB (Lobell, David B.) [1] , [2] (provided by Clarivate) **Source REMOTE SENSING OF ENVIRONMENT Volume 301 DOI 10.1016/j.rse.2023.113924 Article Number 113924 Published FEB 1 2024 Early Access NOV 2023 Indexed 2024-01-06 Document Type Review**

Abstract

Machine learning (ML) has proven to be a powerful tool for utilizing the rapidly increasing amounts of remote sensing data for environmental monitoring. Yet ML models often require a substantial amount of ground truth labels for training, and models trained using labeled data from one domain often demonstrate poor performance when directly applied to other domains. Transfer learning (TL) has emerged as a promising strategy to address domain shift and alleviate the need for labeled data. Here we provide the first systematic review of TL studies in environmental remote sensing. We start by defining the different forms of domain shift and then describe five commonly used TL techniques. We then present the results of a systematic search for peer-reviewed articles published between 2017 and 2022, which identified 1676 papers. Applications of TL in remote sensing have increased rapidly, with nearly 10 times more publications in 2022 than in 2017. Across seven categories of applications (land cover mapping, vegetation monitoring, soil property estimation, crop yield prediction, biodiversity monitoring, water resources management, and natural disaster management) we identify several recent successes of TL as well as some remaining research gaps. Finally, we highlight the need to organize benchmark datasets explicitly for TL in remote sensing for model evaluation. We also discuss potential research directions for TL studies in environmental remote sensing, such as realizing scale transfer, improving model interpretability, and leveraging foundation models for remote sensing tasks.

Keywords

Author Keywords

Remote sensingDomain shiftTransfer learningUnsupervised domain adaptationMulti-task learningFew-shot learningSelf-supervised learning

Keywords Plus

UNSUPERVISED DOMAIN ADAPTATIONNEURAL-NETWORKCLASSIFICATIONVARIABILITYFOREST

Environmental Monitoring

6-Lamellar Ti 3 C 2 MXene composite decorated with platinum-doped MoS 2 nanosheets as electrochemical sensing functional platform for highly sensitive analysis of organophosphorus pesticides

By Wang, F (Wang, Fei) [1] ; Zhu, Y (Zhu, Yao) [2] ; Qian, L (Qian, Long) [1] ; Yin, YH (Yin, Yuhao) [1] ; Yuan, ZY (Yuan, Ziyu) [1] ; Dai, YT (Dai, Yuting) [1] ; Zhang, T (Zhang, Tao) [1] ; Yang, DY (Yang, Dongya) [1] ; Qiu, FX (Qiu, Fengxian) [1] (provided by Clarivate) Source FOOD CHEMISTRY Volume 459 DOI 10.1016/j.foodchem.2024.140379 Article Number 140379 Published NOV 30 2024 Early Access JUL 2024 Indexed 2024-07-20 Document Type Article

Abstract

Precisely detecting organophosphorus pesticides (OPs) is paramount in upholding human safety and environmental preservation, especially in food safety. Herein, an electrochemical acetylcholinesterase (AChE) sensing platform entrapped in chitosan (Chit) on the glassy carbon electrodes (GCEs) decorated with Pt/MoS 2 /Ti 3 C 2 MXene (Pt/MoS 2 /TM) was constructed for the detection of chlorpyrifos. It is worth noting that Pt/MoS 2 /TM possesses good biocompatibility, remarkable electrical conductivity, environmental stability and large specific surface area. Besides, the heterostructure formed by the composite of TM and MoS 2 improves the conductivity and maintains the original structure, which is conducive to improving the electrochemical property. The coordination effect between the individual components enables the even distribution of functional components and enhances the electrochemical performance of the biosensor (AChE-Chit/Pt/MoS 2 /TM). Under optimal efficiency and sensitivity, the AChE-Chit/Pt/MoS 2 /TM/GCE sensing platform exerts comparable analytical performance and a wide concentration range of chlorpyrifos from 10-12 to 10-6 M as well as a low limit of detection (4.71 x 10-13 M). Furthermore, the biosensor is utilized to detect OPs concerning three kinds of fruits and vegetables with good feasibility and recoveries (94.81% to 104.0%). This work would provide a new scheme to develop high-sensitivity sensors based on the two-dimensional nanosheet/laminar hybrid structure for practical applications in environmental monitoring and agricultural product detection.

Keywords

Author Keywords

Two dimensional materialsMolybdenum disulfidePlatinumElectrochemical biosensorOPs

Keywords Plus

PERFORMANCE LIQUID-CHROMATOGRAPHYSENSORCHLORPYRIFOSBIOSENSORS

Environmental Monitoring

7-Twenty years of microplastic pollution research-what have we learned?

By Thompson, RC (Thompson, Richard C.) [1] ; Courtene-Jones, W (Courtene-Jones, Winnie) [1] ; Boucher, J (Boucher, Julien) [2] ; Pahl, S (Pahl, Sabine) [3] , [4] ; Raubenheimer, K (Raubenheimer, Karen) [5] ; Koelmans, AA (Koelmans, Albert A.) [6]
(provided by Clarivate) Source SCIENCE Volume 386 Issue 6720 DOI 10.1126/science.adl2746 Article Number eadl2746 Published OCT 25 2024 Indexed 2024-11-09 Document Type Review

Abstract

Twenty years after the first publication that used the term microplastic, we review current understanding, refine definitions, and consider future prospects. Microplastics arise from multiple sources, including tires, textiles, cosmetics, paint, and the fragmentation of larger items. They are widely distributed throughout the natural environment, with evidence of harm at multiple levels of biological organization. They are pervasive in food and drink and have been detected throughout the human body, with emerging evidence of negative effects. Environmental contamination could double by 2040, and wide-scale harm has been predicted. Public concern is increasing, and diverse measures to address microplastic pollution are being considered in international negotiations. Clear evidence on the efficacy of potential solutions is now needed to address the issue and to minimize the risks of unintended consequences.

Keywords

Keywords Plus

PLASTIC PARTICLESSURFACE
WATERSSEAINGESTIONRELEASEFIBERSENVIRONMENTTRANSPORTCHEMICALSSEDIMENTS

Environmental Monitoring

8-Biogenic synthesis of silver nanoparticles for colorimetric detection of Fe3+in environmental samples: DFT calculations and molecular docking studies

By Azizi-Khereshki, N (Azizi-Khereshki, Nasibeh) [1] , [2] , [3] ; Mousavi, HZ (Mousavi, Hassan Zavvar) [1] ; Farsadrooh, M (Farsadrooh, Majid) [4] ; Evazalipour, M (Evazalipour, Mehdi) [5] ; Feizi-Dehnayebi, M (Feizi-Dehnayebi, Mehran) [4] ; Ziarani, GM (Ziarani, Ghodsi Mohammadi) [4] ; Henary, M (Henary, Maged) [2] , [3] ; Rtimi, S (Rtimi, Sami) [6] ; Aminabhavi, TM (Aminabhavi, Tejraj M.) [7] , [8] , [9] (provided by Clarivate) Source JOURNAL OF ENVIRONMENTAL MANAGEMENT Volume 387 DOI 10.1016/j.jenvman.2025.125880 Article Number 125880 Published JUL 2025 Indexed 2025-06-12 Document Type Article

Abstract

Olive leaf (OL) extract, rich in phenolic compounds, was employed as a green reductant and capping agent for the biogenic synthesis of silver nanoparticles (Ag NPs), providing an eco-friendly alternative to conventional chemical methods. The OL-Ag NPs demonstrated dual functionality as a colorimetric Fe3+ sensor and broadspectrum antimicrobial agent, characterized by DLS, UV-vis spectroscopy, FT-IR, XRD, and FE-SEM. Optimization of the Fe3+ sensing parameters via CCD combined with RSM identified optimal conditions of pH 5.8, 211 mu L probe volume, and 3 min complexation time, resulting in rapid detection with a visible color change from pale yellow to dark green. The interference study demonstrated that OL-Ag NPs selectively detect Fe3+ in aqueous samples through Fe3+-specific chelation-induced agglomeration, exhibiting no cross-reactivity with coexisting ions. DFT calculations elucidated the stable interaction mechanism between OL-Ag NPs and Fe3+ ions, supported by molecular electrostatic potential maps and binding energy analyses. The colorimetric nanoprobe exhibited excellent selectivity for Fe3+ over competing metal ions, with a low detection limit (LOD) of 0.81 mu M and limit of quantification (LOQ) of 2.7 mu M. Field-deployable test strips enabled rapid on-site detection of Fe3+ ions, exhibiting concentration-dependent color shifts from pale yellow to dark green. The sensor achieved recoveries of 86-92.5 % in real water samples, consistent with ICP-OES results. Biological evaluations of OL-Ag NPs revealed strong antibacterial activity, with inhibition zones of 1.6 mm against B. subtilis (highest growth inhibition), 1.2 mm against S. aureus and E. coli, and 1.0 mm against P. aeruginosa (lowest growth inhibition), comparable to gentamicin. Molecular docking simulations supported these findings, showing binding free energies of-8.41 kcal/mol with S. aureus and-4.65 kcal/mol with E. coli proteins. Cytotoxicity assays on Hu02 cells indicated low toxicity and effective cellular uptake, with intracellular imaging confirming Fe3+ detection capability. Overall, this study presents a simple, cost-effective, and environmentally benign synthesis of OL-Ag NPs with dual functionality as a highly sensitive colorimetric sensor for Fe3+ and an effective antimicrobial agent, promising broad applications in environmental monitoring and biomedicine.

Keywords

Author Keywords

DFTGreen synthesisMolecular dockingOlive leaf extractSelective colorimetric detectionAg NPs

Keywords Plus

Environmental Monitoring

SELECTIVE DETECTIONPLASMONIC RESPONSEESCHERICHIA-COLIGREEN SYNTHESISIRON(III)ANTIBACTERIALIRONSENSORIONSEXTRACT

Environmental Monitoring

9-Maintaining robust terrestrial ecological monitoring amid technological advancements

By Buettel, JC (Buettel, Jessie C.) [1] , [2] ; Lindenmayer, DB (Lindenmayer, David B.) [1] , [2] ; Scheele, BC (Scheele, Ben C.) [1] , [2] ; Evans, MJ (Evans, Maldwyn J.) [1] , [2] (provided by Clarivate)
Source TRENDS IN ECOLOGY & EVOLUTION Volume 40 Issue 7 Page 651-662 DOI 10.1016/j.tree.2025.04.003 Published JUL 2025 Early Access JUL 2025 Indexed 2025-07-29
Document Type Review

Abstract

Long-term terrestrial biodiversity monitoring is crucial for understanding species and ecosystem responses to global change, yet it requires significant investment. Technological advancements offer opportunities for more efficient, scalable, and cost-effective monitoring, but transitioning to new methods pre-sents significant risks to data integrity. Guidance for researchers and practitioners to manage these transitions, therefore, is critical. We present a novel seven-step framework and decision-making tool to guide the integration of new methods into established monitoring programs. The framework includes compatibility assessment, concurrent method cross-validation, and ongoing review, balancing the benefits of new technologies with the need to maintain dataset integrity. Our framework can help to ensure that new methods enhance the value and robustness of long-term biodiversity datasets while maintaining monitoring continuity.

Keywords
Keywords Plus
LONG-TERMBIODIVERSITYCOST

Environmental Monitoring

10-Global and regional patterns of soil metal(loid) mobility and associated risks

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By Qi, CC (Qi, Chongchong) [1] , [2] ; Hu, T (Hu, Tao) [2] ; Zheng, Y (Zheng, Yi) [3] ; Wu, MT (Wu, Mengting) [2] ; Tang, FHM (Tang, Fiona H. M.) [4] ; Liu, M (Liu, Min) [5] ; Zhang, BT (Zhang, Bintian) [3] ; Derrible, S (Derrible, Sybil) [6] ; Chen, QS (Chen, Qiusong) [2] ; Hu, GR (Hu, Gongren) [7] ;
(provided by Clarivate) Source NATURE COMMUNICATIONS Volume 16 Issue 1 DOI 10.1038/s41467-025-58026-8 Article Number 2947 Published MAR 26 2025 Indexed 2025-04-04 Document Type Article

Abstract

Soil contamination by metals and metalloids (metal[loid]s) is a global issue with significant risks to human health, ecosystems, and food security. Accurate risk assessment depends on understanding metal(loid) mobility, which dictates bioavailability and environmental impact. Here we show a theory-guided machine learning model that predicts soil metal(loid) fractionation across the globe. Our model identifies total metal(loid) content and soil organic carbon as primary drivers of metal(loid) mobility. We find that 37% of the world's land is at medium-to-high mobilization risk, with hotspots in Russia, Chile, Canada, and Namibia. Our analysis indicates that global efforts to enhance soil carbon sequestration may inadvertently increase metal(loid) mobility. Furthermore, in Europe, the divergence between spatial distributions of total and mobile metal(loid)s is uncovered. These findings offer crucial insights into global distributions and drivers of soil metal(loid) mobility, providing a robust tool for prioritizing metal(loid) mobility testing, raising awareness, and informing sustainable soil management practices.

Keywords

Keywords Plus

HEAVY-METALSSEQUENTIAL EXTRACTIONTRACE-ELEMENTSCARBONBIOAVAILABILITYFRACTIONATIONCONTAMINATIONINFORMATIONRIVERZINC

Environmental Monitoring

11-Predicting Chlorophyll-*a* Concentrations in the World's Largest Lakes Using Kolmogorov-Arnold Networks

By Saravani, MJ (Saravani, Mohammad Javad) [1] ; Noori, R (Noori, Roohollah) [1] ; Jun, C (Jun, Changhyun) [2] ; Kim, D (Kim, Dongkyun) [3] ; Bateni, SM (Bateni, Sayed M.) [4] , [5] , [6] ; Kianmehr, P (Kianmehr, Peiman) [7] ; Woolway, RI (Woolway, Richard Iestyn) [8] (provided by Clarivate)
Source ENVIRONMENTAL SCIENCE & TECHNOLOGY Volume 59 Issue 3 Page 1801-1810 DOI 10.1021/acs.est.4c11113 Published JAN 16 2025 Early Access JAN 2025 Indexed 2025-01-24
Document Type Article

Abstract
Accurate prediction of chlorophyll-a (Chl-a) concentrations, a key indicator of eutrophication, is essential for the sustainable management of lake ecosystems. This study evaluated the performance of Kolmogorov-Arnold Networks (KANs) along with three neural network models (MLP-NN, LSTM, and GRU) and three traditional machine learning tools (RF, SVR, and GPR) for predicting time-series Chl-a concentrations in large lakes. Monthly remote-sensed Chl-a data derived from Aqua-MODIS spanning September 2002 to April 2024 were used. The models were evaluated based on their forecasting capabilities from March 2024 to August 2024. KAN consistently outperformed others in both test and forecast (unseen data) phases and demonstrated superior accuracy in capturing trends, dynamic fluctuations, and peak Chl-a concentrations. Statistical evaluation using ranking metrics and critical difference diagrams confirmed KAN's robust performance across diverse study sites, further emphasizing its predictive power. Our findings suggest that the KAN, which leverages the KA representation theorem, offers improved handling of nonlinearity and long-term dependencies in time-series Chl-a data, outperforming neural network models grounded in the universal approximation theorem and traditional machine learning algorithms.

Keywords
Author Keywords
Kolmogorov-Arnold networksEutrophicationChlorophyll-aPollution
Keywords Plus
WATER-QUALITY MODELFRESH-WATEREUTROPHICATIONREPRESENTATIONRESERVOIRSCLIMATEBLOOMS

Environmental Monitoring

12-M-quantile regression shrinkage and selection via the Lasso and Elastic Net to assess the effect of meteorology and traffic on air quality

By Ranalli, MG (Ranalli, M. Giovanna) [1] ; Salvati, N (Salvati, Nicola) [2] ; Petrella, L (Petrella, Lea) [3] ; Pantalone, F (Pantalone, Francesco) [4] (provided by Clarivate) Source BIOMETRICAL JOURNAL Volume 65 Issue 8 DOI 10.1002/bimj.202100355 Published DEC 2023 Early Access SEP 2023 Indexed 2023-10-12 Document Type Article

Abstract

In this work, we intersect data on size-selected particulate matter (PM) with vehicular traffic counts and a comprehensive set of meteorological covariates to study the effect of traffic on air quality. To this end, we develop an M-quantile regression model with Lasso and Elastic Net penalizations. This allows (i) to identify the best proxy for vehicular traffic via model selection, (ii) to investigate the relationship between fine PM concentration and the covariates at different M-quantiles of the conditional response distribution, and (iii) to be robust to the presence of outliers. Heterogeneity in the data is accounted by fitting a B-spline on the effect of the day of the year. Analytic and bootstrap-based variance estimates of the regression coefficients are provided, together with a numerical evaluation of the proposed estimation procedure. Empirical results show that atmospheric stability is responsible for the most significant effect on fine PM concentration: this effect changes at different levels of the conditional response distribution and is relatively weaker on the tails. On the other hand, model selection allows to identify the best proxy for vehicular traffic whose effect remains essentially the same at different levels of the conditional response distribution.

Keywords

Author Keywords

additive modelsB-splinescross-validationinfluence functionrobust regression

Keywords Plus

VARIABLE SELECTIONMODELSHETEROGENEITYSPLINES

Environmental Monitoring

13-Ecological impacts and management strategies of pesticide pollution on aquatic life and human beings

By Abuqamar, SF (Abuqamar, Synan F.) [1] ; El-Saadony, MT (El-Saadony, Mohamed T.) [2] ; Alkafaas, SS (Alkafaas, Samar S.) [3] ; Elsalahaty, MI (Elsalahaty, Mohamed I.) [3] ; Elkafas, SS (Elkafas, Sara S.) [4] , [5] ; Mathew, BT (Mathew, Betty T.) [1] ; Aljasmi, AN (Aljasmi, Amal N.) [1] ; Alhammadi, HS (Alhammadi, Hajar S.) [6] ; Salem, HM (Salem, Heba M.) [7] ; El-Mageed, TAA (El-Mageed, Taia A. Abd) [8] ; **(provided by Clarivate) Source MARINE POLLUTION BULLETIN Volume 206 DOI 10.1016/j.marpolbul.2024.116613 Article Number 116613 Published SEP 2024 Early Access JUL 2024 Indexed 2024-08-10 Document Type Review**

Abstract

Pesticide contamination has become a global concern. Pesticides can sorb onto suspended particles and deposit into the sedimentary layers of aquatic environments, resulting in ecosystem degradation, pollution, and diseases. Pesticides impact the behavior of aquatic environments by contaminating organic matter in water, which serves as the primary food source for aquatic food webs. Pesticide residues can increase ammonium, nitrite, nitrate, and sulfate in aquatic systems; thus, threatening ecological environment and human health. Several physical, chemical, and biological methodologies have been implemented to effectively remove pesticide traces from aquatic environments. The present review highlights the potential consequences of pesticide exposure on fish and humans, focusing on the (epi)genetic alterations affecting growth, behavior, and immune system. Mitigation strategies (e.g., bioremediation) to prevent/minimize the detrimental impacts of pesticides are also discussed. This review aims to shed light on the awareness in reducing the risk of water pollution for safe and sustainable pesticide management.

Keywords

Author Keywords

Aquatic lifeBioremediationEcotoxicityPersistent organic pollutantsSustainabilityWater contamination

Keywords Plus

FRESH-WATER FISHORGANOCHLORINE PESTICIDESPOLYCHLORINATED-BIPHENYLSAGRICULTURAL SOILSHUMAN HEALTHORGANOPHOSPHATE PESTICIDEHISTOPATHOLOGICAL CHANGESATRAZINE EXPOSUREACTIVATED CARBONTOXICITY

Environmental Monitoring

14-Comprehensive review on toxic heavy metals in the aquatic system: sources, identification, treatment strategies, and health risk assessment

By Saravanan, P (Saravanan, Panchamoorthy) [1] ; Saravanan, V (Saravanan, V.) [2] ; Rajeshkannan, R (Rajeshkannan, R.) [2] ; Arnica, G (Arnica, G.) [1] ; Rajasimman, M (Rajasimman, M.) [2] ; Baskar, G (Baskar, Gurunathan) [3] , [4] ; Pugazhendhi, A (Pugazhendhi, Arivalagan) [5] , [6] (provided by Clarivate) Source ENVIRONMENTAL RESEARCH Volume 258 DOI 10.1016/j.envres.2024.119440 Article Number 119440 Published OCT 1 2024 Early Access JUN 2024 Indexed 2024-11-11 Document Type Review

Abstract

Heavy metal pollution in water sources has become a major worldwide environmental issue, posing a threat to aquatic ecosystems and human health. The pollution of the aquatic environment is increasing as a result of industrialization, climate change, and urban development. The sources of heavy metal pollution in water include mining waste, leachates from landfills, municipal and industrial wastewater, urban runoff, and natural events such as volcanism, weathering, and rock abrasion. Heavy metal ions are toxic and potentially carcinogenic. They can also buildup in biological systems and cause bioaccumulation even at low levels of exposure, heavy metals can cause harm to organs such as the nervous system, liver and lungs, kidneys and stomach, skin, and reproductive systems. There were various approaches tried to purify water and maintain water quality. The main purpose of this article was to investigate the occurrence and fate of the dangerous contaminants (Heavy metal and metalloids) found in domestic and industrial effluents. This effluent mixes with other water streams and is used for agricultural activities and other domestic activities further complicating the issue. It also discussed conventional and non-conventional treatment methods for heavy metals from aquatic environments. Conclusively, a pollution assessment of heavy metals and a human health risk assessment of heavy metals in water resources have been explained. In addition, there have been efforts to focus on heavy metal sequestration from industrial waste streams and to create a scientific framework for reducing heavy metal discharges into the aquatic environment.

Keywords

Author Keywords

Heavy metalWater resource contaminationToxicityHealth effectsRisk assessmentBioindicators and bioaccumulation

Keywords Plus

DRINKING-WATERINDUSTRIAL WASTEWATERSAQUEOUS-SOLUTIONSORGANIC-COMPOUNDSOXIDATIVE STRESSACTIVATED CARBONHIP-REPLACEMENTREMOVALNICKELEXPOSURE

15-Assessing the effectiveness of long short-term memory and artificial neural network in predicting daily ozone concentrations in Liaocheng City

By Guo, QC (Guo, Qingchun) [1] , [2] , [3] , [4] ; He, ZF (He, Zhenfang) [1] , [2] ; Wang, ZS (Wang, Zhaosheng) [5] (provided by Clarivate) **Source SCIENTIFIC REPORTS Volume 15 Issue 1 DOI 10.1038/s41598-025-91329-w Article Number 6798 Published FEB 25 2025 Indexed 2025-03-08 Document Type Article**

Abstract

Ozone pollution affects food production, human health, and the lives of individuals. Due to rapid industrialization and urbanization, Liaocheng has experienced increasing of ozone concentration over several years. Therefore, ozone has become a major environmental problem in Liaocheng City. Long short-term memory (LSTM) and artificial neural network (ANN) models are established to predict ozone concentrations in Liaocheng City from 2014 to 2023. The results show a general improvement in the accuracy of the LSTM model compared to the ANN model. Compared to the ANN, the LSTM has an increase in determination coefficient (R2), value from 0.6779 to 0.6939, a decrease in root mean square error (RMSE) value from 27.9895 mu g/m3 to 27.2140 mu g/m3 and a decrease in mean absolute error (MAE) value from 21.6919 mu g/m3 to 20.8825 mu g/m3. The prediction accuracy of the LSTM is superior to the ANN in terms of R, RMSE, and MAE. In summary, LSTM is a promising technique for predicting ozone concentrations. Moreover, by leveraging historical data and LSTM enables accurate predictions of future ozone concentrations on a global scale. This model will open up new avenues for controlling and mitigating ozone pollution.

Keywords

Author Keywords

Artificial neural networkLong short-term memoryDeep LearningOzone

Keywords Plus

AIR-POLLUTIONMODELSEXPOSURE

16-Microplastics in the human body: A comprehensive review of exposure, distribution, migration mechanisms, and toxicity

By Li, Y (Li, Yue) [1] ; Chen, LP (Chen, Liping) [1] ; Zhou, NL (Zhou, Nonglin) [3] ; Chen, YY (Chen, Yuyuan) [1] ; Ling, ZC (Ling, Zhichen) [1] ; Xiang, P (Xiang, Ping) [2] (provided by Clarivate) **Source SCIENCE OF THE TOTAL ENVIRONMENT Volume 946 DOI 10.1016/j.scitotenv.2024.174215 Article number 174215 Published OCT 10 2024 Early Access JUN 2024 Indexed 2024-07-12 Document Type Review**

Abstract

Microplastics (MPs) are pervasive across ecosystems, presenting substantial risks to human health. Developing a comprehensive review of MPs is crucial due to the growing evidence of their widespread presence and potential harmful effects. Despite the growth in research, considerable uncertainties persist regarding their transport dynamics, prevalence, toxicological impacts, and the potential long-term health effects they may cause. This review thoroughly evaluates recent advancements in research on MPs and their implications for human health, including estimations of human exposure through ingestion, inhalation, and skin contact. It also quantifies the distribution and accumulation of MPs in various organs and tissues. The review discusses the mechanisms enabling MPs to cross biological barriers and the role of particle size in their translocation. To ensure methodological rigor, this review adheres to the PRISMA guidelines, explicitly detailing the literature search strategy, inclusion criteria, and the quality assessment of selected studies. The review concludes that MPs pose significant toxicological risks, identifies critical gaps in current knowledge, and recommends future research directions to elucidate the prolonged effects of MPs on human health. This work aims to offer a scientific framework for mitigating MP-related hazards and establishes a foundation for ongoing investigation.

Keywords

Author Keywords

MicroplasticsNanoplasticsExposure pathwaysOrgan distributionTranslocationHuman health risks

Keywords Plus

FIBERS

Environmental Monitoring

17-Comprehensive review of emerging contaminants: Detection technologies, environmental impact, and management strategies

By Li, XY (Li, Xingyu) [1] , [2] ; Shen, XJ (Shen, Xiaojing) [1] , [2] ; Jiang, WW (Jiang, Weiwei) [1] , [2] ; Xi, YK (Xi, Yongkai) [1] , [2] ; Li, S (Li, Song) [1] , [2] (provided by Clarivate) Source ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY Volume 278 DOI 10.1016/j.ecoenv.2024.116420 Article Number 116420 Published JUN 15 2024 Early Access MAY 2024 Indexed 2024-06-06 Document Type Article

Abstract

Emerging contaminants (ECs) are a diverse group of unregulated pollutants increasingly present in the environment. These contaminants, including pharmaceuticals, personal care products, endocrine disruptors, and industrial chemicals, can enter the environment through various pathways and persist, accumulating in the food chain and posing risks to ecosystems and human health. This comprehensive review examines the chemical characteristics, sources, and varieties of ECs. It critically evaluates the current understanding of their environmental and health impacts, highlighting recent advancements and challenges in detection and analysis. The review also assesses existing regulations and policies, identifying shortcomings and proposing potential enhancements. ECs pose significant risks to wildlife and ecosystems by disrupting animal hormones, causing genetic alterations that diminish diversity and resilience, and altering soil nutrient dynamics and the physical environment. Furthermore, ECs present increasing risks to human health, including hormonal disruptions, antibiotic resistance, endocrine disruption, neurological effects, carcinogenic effects, and other long-term impacts. To address these critical issues, the review offers recommendations for future research, emphasizing areas requiring further investigation to comprehend the full implications of these contaminants. It also suggests increased funding and support for research, development of advanced detection technologies, establishment of standardized methods, adoption of precautionary regulations, enhanced public awareness and education, crosssectoral collaboration, and integration of scientific research into policy-making. By implementing these solutions, we can improve our ability to detect, monitor, and manage ECs, reducing environmental and public health risks.

Keywords

Author Keywords

Emerging ContaminantsEnvironmental ImpactDetection MethodsPublic HealthPolicy DevelopmentInterdisciplinary Research

Keywords Plus

REMOVALRISKS

18-Monitoring phycocyanin in global inland waters by remote sensing: Progress and future developments

By Fang, C (Fang, Chong) [1] ; Song, KS (Song, Kaishan) [1] , [2] ; Yan, ZJ (Yan, Zhaojiang) [1] , [3] ; Liu, G (Liu, Ge) [1] (provided by Clarivate) **Source WATER RESEARCH Volume 275 DOI 10.1016/j.watres.2025.123176 Article Number 123176 Published MAY 1 2025 Early Access MAY 2025 Indexed 2025-02-10 Document Type Article**

Abstract

Cyanobacterial blooms are increasingly becoming major threats to global inland aquatic ecosystems. Phycocyanin (PC), a pigment unique to cyanobacteria, can provide important reference for the study of cyanobacterial blooms warning. New satellite technology and cloud computing platforms have greatly improved research on PC, with the average number of studies examining it having increased from 5 per year before 2018 to 17 per year thereafter. Many empirical, semi-empirical, semi-analytical, quasi-analytical algorithm (QAA) and machine learning (ML) algorithms have been developed based on unique absorption characteristics of PC at approximately 620 nm. However, most models have been developed for individual lakes or clusters of them in specific regions, and their applicability at greater spatial scales requires evaluation. A review of optical mechanisms, principles and advantages and disadvantages of different model types, performance advantages and disadvantages of mainstream sensors in PC remote sensing inversion, and an evaluation of global lacustrine PC datasets is needed. We examine 230 articles from the Web of Science citation database between 1900 and 2024, summarize 57 of them that deal with construction of PC inversion models, and compile a list of 6526 PC sampling sites worldwide. This review proposed the key to achieving global lacustrine PC remote sensing inversion and spatiotemporal evolution analysis is to fully use existing multi-source remote sensing big data platforms, and a deep combination of ML and optical mechanisms, to classify the object lakes in advance based on lake optical characteristics, eutrophication level, water depth, climate type, altitude, population density within the watershed. Additionally, integrating data from multi-source satellite sensors, ground-based observations, and unmanned aerial vehicles, will enable future development of global lacustrine PC remote estimation, and contribute to achieving United Nations Sustainable Development Goals inland water goals.

Keywords

Author Keywords

CyanobacteriaMachine learningSustainable development goalsPhycocyaninRemote sensing

Keywords Plus

MAPPING CYANOBACTERIAL BLOOMSINHERENT OPTICAL-PROPERTIESBIG DATA APPLICATIONSGOOGLE EARTH ENGINECHLOROPHYLL-AALGAL BLOOMSSUPPLY SOURCESHALLOW LAKEALGORITHMPHYTOPLANKTON

19-Monitoring phycocyanin in global inland waters by remote sensing: Progress and future developments

By Fang, C (Fang, Chong) [1] ; Song, KS (Song, Kaishan) [1] , [2] ; Yan, ZJ (Yan, Zhaojiang) [1] , [3] ; Liu, G (Liu, Ge) [1] (provided by Clarivate) Source WATER RESEARCH Volume 275 DOI 10.1016/j.watres.2025.123176 Article Number 123176 Published MAY 1 2025 Early Access MAY 2025 Indexed 2025-02-10 Document Type Article

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Keywords

Author Keywords

CyanobacteriaMachine learningSustainable development goalsPhycocyaninRemote sensing

Keywords Plus

MAPPING CYANOBACTERIAL BLOOMSINHERENT OPTICAL-PROPERTIESBIG DATA APPLICATIONSGOOGLE EARTH ENGINECHLOROPHYLL-AALGAL BLOOMSSUPPLY SOURCESHALLOW LAKEALGORITHMPHYTOPLANKTON

Environmental Monitoring

20-Monitoring phycocyanin in global inland waters by remote sensing: Progress and future developments

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By Fang, C (Fang, Chong) [1] ; Song, KS (Song, Kaishan) [1] , [2] ; Yan, ZJ (Yan, Zhaojiang) [1] , [3] ; Liu, G (Liu, Ge) [1] (provided by Clarivate) **Source WATER RESEARCH Volume 275 DOI 10.1016/j.watres.2025.123176 Article Number 123176 Published MAY 1 2025 Early Access MAY 2025 Indexed 2025-02-10 Document Type Article**

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Keywords

Author Keywords

CyanobacteriaMachine learningSustainable development goalsPhycocyaninRemote sensing

Keywords Plus

MAPPING CYANOBACTERIAL BLOOMSINHERENT OPTICAL-PROPERTIESBIG DATA APPLICATIONSGOOGLE EARTH ENGINECHLOROPHYLL-AALGAL BLOOMSSUPPLY SOURCESHALLOW LAKEALGORITHMPHYTOPLANKTON

21-First close insight into global daily gapless 1 km $PM_{2.5}$ pollution, variability, and health impact

By Wei, J (Wei, Jing) [1] ; Li, ZQ (Li, Zhanqing) [1] ; Lyapustin, A (Lyapustin, Alexei) [2] ; Wang, J (Wang, Jun) [3] ; Dubovik, O (Dubovik, Oleg) [4] ; Schwartz, J (Schwartz, Joel) [5] ; Sun, L (Sun, Lin) [6] ; Li, C (Li, Chi) [7] ; Liu, S (Liu, Song) [8] ; Zhu, T (Zhu, Tong) [9] **(provided by Clarivate) Source NATURE COMMUNICATIONS Volume 14 Issue 1 DOI 10.1038/s41467-023-43862-3 Article Number 8349 Published DEC 15 2023 Indexed 2024-01-08 Document Type Article**

Abstract

Here we retrieve global daily 1 km gapless PM2.5 concentrations via machine learning and big data, revealing its spatiotemporal variability at an exceptionally detailed level everywhere every day from 2017 to 2022, valuable for air quality monitoring, climate change, and public health studies. We find that 96%, 82%, and 53% of Earth's populated areas are exposed to unhealthy air for at least one day, one week, and one month in 2022, respectively. Strong disparities in exposure risks and duration are exhibited between developed and developing countries, urban and rural areas, and different parts of cities. Wave-like dramatic changes in air quality are clearly seen around the world before, during, and after the COVID-19 lockdowns, as is the mortality burden linked to fluctuating air pollution events. Encouragingly, only approximately one-third of all countries return to pre-pandemic pollution levels. Many nature-induced air pollution episodes are also revealed, such as biomass burning.

Keywords

Keywords Plus

AEROSOL OPTICAL DEPTHSHORT-TERM EXPOSUREPARTICULATE AIR-POLLUTIONSPATIAL-RESOLUTIONDAILY MORTALITYTIME-SERIESQUALITYCHINANO2DISEASE

Environmental Monitoring

22-Burden of Mental Disorders and Suicide Attributable to Childhood Maltreatment

By Grummitt, L (Grummitt, Lucinda) [1] ; Baldwin, JR (Baldwin, Jessie R.) [2] ; Lafoa'i, J (Lafoa'i, Johanna) [1] ; Keyes, KM (Keyes, Katherine M.) [3] ; Barrett, EL (Barrett, Emma L.) [1] (provided by Clarivate) Source JAMA PSYCHIATRY Volume 81 Issue 8 Page 782-788 DOI 10.1001/jamapsychiatry.2024.0804 Published AUG 2024 Early Access AUG 2024 Indexed 2024-05-18 Document Type Article

Abstract

Importance The proportion of mental disorders and burden causally attributable to childhood maltreatment is unknown. Objective To determine the contribution of child maltreatment to mental health conditions in Australia, accounting for genetic and environmental confounding. Design, Setting, and Participants This meta-analysis involved an epidemiological assessment accounting for genetic and environmental confounding between maltreatment and mental health and 3 cross-sectional national surveys: the Australian Child Maltreatment Study (ACMS) 2023, National Study of Mental Health and Well-being 2020-2022, and Australian Burden of Disease Study 2023. Causal estimates were derived on the association between childhood maltreatment and mental health conditions from a meta-analysis of quasi-experimental studies. This was combined with the prevalence of maltreatment from the ACMS to calculate the population attributable fraction (PAF). The PAF was applied to the number and burden of mental health conditions in Australia, sourced from 2 population-based, nationally representative surveys of Australians aged 16 to 85 years, to generate the number and associated burden of mental disorders attributable to child maltreatment. Exposure Physical abuse, sexual abuse, emotional abuse, or neglect prior to age 18 years. Main Outcomes and Measures Proportion and number of cases, years of life lost, years lived with disability, and disability-adjusted life-years of mental health conditions (anxiety, depression, harmful alcohol and drug use, self-harm, and suicide attempt) attributable to childhood maltreatment. Results Meta-analytic estimates were generated from 34 studies and 54 646 participants and applied to prevalence estimates of childhood maltreatment generated from 8503 Australians. Childhood maltreatment accounted for a substantial proportion of mental health conditions, ranging from 21% (95% CI, 13%-28%) for depression to 41% (95% CI, 27%-54%) of suicide attempts. More than 1.8 million cases of depressive, anxiety, and substance use disorders could be prevented if childhood maltreatment was eradicated. Maltreatment accounted for 66 143 years of life lost (95% CI, 43 313-87 314), primarily through suicide, and 184 636 disability-adjusted life-years (95% CI, 109 321-252 887). Conclusions and Relevance This study provides the first estimates of the causal contribution of child maltreatment to mental health in Australia. Results highlight the urgency of preventing child maltreatment to reduce the population prevalence and burden of mental disorders.

Keywords

Keywords Plus

RANDOMIZED-TRIALGLOBAL BURDENLIFE-COURSEABUSEPREVALENCENEGLECT

23-Microplastic pollution in terrestrial ecosystems: Global implications and sustainable solutions

By Zeb, A (Zeb, Aurang) [1] , [2] ; Liu, WT (Liu, Weitao) [1] , [2] , [3] ; Ali, N (Ali, Nouman) [1] , [2] ; Shi, RY (Shi, Ruiying) [1] , [2] ; Wang, Q (Wang, Qi) [1] , [2] ; Wang, JL (Wang, Jianling) [1] , [2] ; Li, JT (Li, Jiantao) [1] , [2] ; Yin, C (Yin, Chuan) [1] , [2] ; Liu, JZ (Liu, Jinzheng) [1] , [2] ; Yu, M (Yu, Miao) [1] , [2] ;
(provided by Clarivate) Source JOURNAL OF HAZARDOUS MATERIALS Volume 461 DOI 10.1016/j.jhazmat.2023.132636 Article Number 132636 Published JAN 5 2024 Early Access SEP 2023 Indexed 2023-11-05 Document Type Review

Abstract

Microplastic (MPs) pollution has become a global environmental concern with significant impacts on ecosystems and human health. Although MPs have been widely detected in aquatic environments, their presence in terrestrial ecosystems remains largely unexplored. This review examines the multifaceted issues of MPs pollution in terrestrial ecosystem, covering various aspects from additives in plastics to global legislation and sustainable solutions. The study explores the widespread distribution of MPs worldwide and their potential antagonistic interactions with co-occurring contaminants, emphasizing the need for a holistic understanding of their environmental implications. The influence of MPs on soil and plants is discussed, shedding light on the potential consequences for terrestrial ecosystems and agricultural productivity. The aging mechanisms of MPs, including photo and thermal aging, are elucidated, along with the factors influencing their aging process. Furthermore, the review provides an overview of global legislation addressing plastic waste, including bans on specific plastic items and levies on single-use plastics. Sustainable solutions for MPs pollution are proposed, encompassing

Keywords

Author Keywords

MicroplasticsSoilPlantsAgingAdditivesMitigation

Keywords Plus

MICROBIAL-DEGRADATIONEMERGING CONTAMINANTSORGANIC-MATTERRESIN PELLETSPLASTIC BAGSSOILBIODEGRADATIONNANOPLASTICSCONSUMPTIONENVIRONMENT

24-The distribution of subsurface microplastics in the ocean

By Zhao, SY (Zhao, Shiye) [1] ; Kvale, KF (Kvale, Karin F.) [2] ; Zhu, LX (Zhu, Lixin) [3] , [4] ; Zettler, ER (Zettler, Erik R.) [5] ; Egger, M (Egger, Matthias) [6] , [7] ; Mincer, TJ (Mincer, Tracy J.) [8] ; Amaral-Zettler, LA (Amaral-Zettler, Linda A.) [5] , [9] ; Lebreton, L (Lebreton, Laurent) [6] ; Niemann, H (Niemann, Helge) [5] , [10] ; Nakajima, R (Nakajima, Ryota) [1] ; **(provided by Clarivate) Source NATURE Volume 641 Issue 8061 DOI 10.1038/s41586-025-08818-1 Published MAY 1 2025 Indexed 2025-05-09 Document Type Article**

Abstract

Marine plastic pollution is a global issue, with microplastics (1 mu m-5 mm) dominating the measured plastic count(1,2). Although microplastics can be found throughout the oceanic water column(3,4), most studies collect microplastics from surface waters (less than about 50-cm depth) using net tows(5). Consequently, our understanding of the microplastics distribution across ocean depths is more limited. Here we synthesize depth-profile data from 1,885 stations collected between 2014 and 2024 to provide insights into the distribution and potential transport mechanisms of subsurface (below about 50-cm depth, which is not usually sampled by traditional practices(3,6)) microplastics throughout the oceanic water column. We find that the abundances of microplastics range from 10(-4) to 10(4) particles per cubic metre. Microplastic size affects their distribution; the abundance of small microplastics (1 mu m to 100 mu m) decreases gradually with depth, indicating a more even distribution and longer lifespan in the water column compared with larger microplastics (100 mu m to 5,000 mu m) that tend to concentrate at the stratified layers. Mid-gyre accumulation zones extend into the subsurface ocean but are concentrated in the top 100 m and predominantly consist of larger microplastics. Our analysis suggests that microplastics constitute a measurable fraction of the total particulate organic carbon, increasing from 0.1% at 30 m to 5% at 2,000 m. Although our study establishes a global benchmark, our findings underscore that the lack of standardization creates substantial uncertainties, making it challenging to advance our comprehension of the distribution of microplastics and its impact on the oceanic environment.

Keywords

Keywords Plus

PLASTIC DEBRISATLANTIC-OCEANMARINEWATERSEAACCUMULATIONPOLLUTIONPATHWAYSMATTERFLUX

25-Heavy metals pollution from smelting activities: A threat to soil and groundwater

By Adnan, M (Adnan, Muhammad) [1] , [2] ; Xiao, BH (Xiao, Baohua) [1] ; Ali, MU (Ali, Muhammad Ubaid) [3] ; Xiao, PW (Xiao, Peiwen) [1] , [2] ; Zhao, P (Zhao, Peng) [1] , [2] ; Wang, HY (Wang, Haiyan) [1] , [2] ; Bibi, S (Bibi, Shaheen) [4] , [5] (provided by Clarivate) **Source ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY Volume 274 DOI 10.1016/j.ecoenv.2024.116189 Article Number 116189 Published APR 1 2024 Early Access MAR 2024 Indexed 2024-05-03 Document Type Review**

Abstract

Throughout the literature, the word "heavy metal" (HM) has been utilized to describe soil contamination; in this context, we characterize it as those elements with a density greater than 5 g per cubic centimeter. Contamination is one of the major global health concerns, especially in China. China's rapid urbanization over the past decades has caused widespread urban water, air, and soil degradation. This study provides a complete assessment of the soil contamination caused by heavy metals in China's mining and smelting regions. The study of heavy metals (HMs) includes an examination of their potential adverse impacts, their origins, and strategies for the remediation of soil contaminated by heavy metals. The presence of heavy metals in soil can be linked to both natural and anthropogenic processes. Studies have demonstrated that soils contaminated with heavy metals present potential health risks to individuals. Children are more vulnerable to the effects of heavy metal pollution than adults. The results highlight the significance of heavy metal pollution caused by mining and smelting operations in China. Soil contaminated with heavy metals poses significant health concerns, both carcinogenic and noncarcinogenic, particularly to children and individuals living in heavily polluted mining and smelting areas. Implementing physical, chemical, and biological remediation techniques is the most productive approach for addressing heavy metal-contaminated soil. Among these methods, phytoremediation has emerged as a particularly advantageous option due to its cost-effectiveness and environmentally favorable characteristics. Monitoring heavy metals in soils is of utmost importance to facilitate the implementation of improved management and remediation techniques for contaminated soils.

Keywords

Author Keywords

Heavy metalsSmelting polluted soilSourcesRemediation

Keywords Plus

HEALTH-RISK ASSESSMENTAGRICULTURAL SOILSREMEDIATION TECHNOLOGIESMERCURY POLLUTIONECOLOGICAL RISKCHINACONTAMINATIONWASTEINDUSTRIALCADMIUM

26-Occurrence, fate, and ecological risk of antibiotics in wastewater treatment plants in China: A review

By Wang, BQ (Wang, Bingqing) [1] ; Xu, ZX (Xu, Zuxin) [1] ; Dong, B (Dong, Bin) [1] (provided by Clarivate) Source JOURNAL OF HAZARDOUS MATERIALS Volume 469 DOI 10.1016/j.jhazmat.2024.133925 Article Number 133925 Published MAY 5 2024 Early Access MAR 2024 Indexed 2024-04-28 Document Type Review

Abstract

This review offers a comprehensive overview of the occurrence, fate, and ecological risk associated with six major categories of antibiotics found in influent, effluent, and sludge from urban wastewater treatment plants (WWTPs) in China. Further exploration includes examining the correlation between antibiotic residual rates in the effluents and process parameters of urban WWTPs across the country. Lastly, a nationwide and urban clusterspecific evaluation of the ecological risk posed by antibiotics in WWTPs is conducted. The findings reveal that the average concentrations of antibiotics in influent, effluent, and sludge from urban WWTPs in China are 786.2 ng/ L, 311.2 ng/L, and 186.8 mu g/kg, respectively. Among the detected antibiotics, 42% exhibit moderate to high ecological risk in the effluent, with ciprofloxacin, sulfamethoxazole, erythromycin, azithromycin, and tetracycline posing moderate to high ecological risks in sludge. The current biological treatment processes in WWTPs demonstrate inefficacy in removing antibiotics. Hence, there is a pressing need to develop and integrate innovative technologies, such as advanced oxidation processes. This review aims to offer a more comprehensive understanding and identify priority antibiotics for control to effectively manage antibiotic pollution within WWTPs at both national and regional levels.

Keywords

Author Keywords

Wastewater treatment plantsAntibioticsWater treatment processSeasonal changeEcological risk

Keywords Plus

SEWAGE-TREATMENT PLANTSPERSONAL CARE PRODUCTSPHARMACEUTICALLY ACTIVE COMPOUNDSSLUDGE EXPERIMENTAL ASSESSMENTSOLID-PHASE EXTRACTIONLIQUID-CHROMATOGRAPHYRESISTANCE GENESFLUOROQUINOLONE ANTIBIOTICSSULFONAMIDE ANTIBIOTICSSEASONAL-VARIATION

27-Occurrence, fate, and ecological risk of antibiotics in wastewater treatment plants in China: A review

By Wang, BQ (Wang, Bingqing) [1] ; Xu, ZX (Xu, Zuxin) [1] ; Dong, B (Dong, Bin) [1] (provided by Clarivate) **Source JOURNAL OF HAZARDOUS MATERIALS Volume 469 DOI 10.1016/j.jhazmat.2024.133925 Article Number 133925 Published MAY 5 2024 Early Access MAR 2024 Indexed 2024-04-28 Document Type Review**

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Keywords

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Keywords Plus

SEWAGE-TREATMENT PLANTSPERSONAL CARE PRODUCTSPHARMACEUTICALLY ACTIVE COMPOUNDSSLUDGE EXPERIMENTAL ASSESSMENTSOLID-PHASE EXTRACTIONLIQUID-CHROMATOGRAPHYRESISTANCE GENESFLUOROQUINOLONE ANTIBIOTICSSULFONAMIDE ANTIBIOTICSSEASONAL-VARIATION

28-Integrated assessment of groundwater hydrogeochemistry and quality using multivariate statistical analysis, self-organizing maps, and water quality indices in District Bagh, AJK, Pakistan

By Basharat, U (Basharat, Usman) [1] , [2] ; Zhang, WJ (Zhang, Wenjing) [1] , [2] ; Abbasi, A (Abbasi, Arshad) [2] ; Mahroof, S (Mahroof, Sehrish) [4] ; Han, CH (Han, Cuihong) [1] , [2] ; Khan, SH (Khan, Shoukat Husain) [3] ; Li, SX (Li, Shuxin) [1] , [2] **(provided by Clarivate) Source ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY Volume 301 DOI 10.1016/j.ecoenv.2025.118515 Article Number 118515 Published AUG 2025 Early Access JUN 2025 Indexed 2025-06-23 Document Type Article**

Abstract

Groundwater is a critical resource in the District Bagh, Azad Jammu & Kashmir, Pakistan, but its quality is deteriorating due to anthropogenic and natural impacts. This study evaluates the hydrochemistry and quality of groundwater using an integrated approach that includes Multivariate Statistical Analysis, Self-Organizing Maps, Weighted Arithmetic Water Quality Index, Multiple Linear Regression and Irrigation Water Quality Indices. The study revealed significant differences in physicochemical characteristics, such as cations and anions in the groundwater samples, suggesting both natural and anthropogenic impacts. Pearson shows EC has a strong positive correlation with Na+ (r = 0.75) and Cl-(r = 0.73), along with a robust correlation between Na+ and Cl-(r = 0.98), highlighting their significant roles in groundwater's ionic content. Geochemical interactions, salinity, ion exchange, and anthropogenic activities are identified as essential factors influencing groundwater quality using factor analysis. Hydrogeochemistry is significantly influenced by lithology: halite dissolution Cl-input (Na+/Cl-= 1.039); rock formation promotes silicate weathering and Na+ release (Na+/Cl-> 1); gypsum dissolution (Ca2+/SO42-= 12.085); and carbonate weathering (Ca2+ + Mg2+/HCO3- = 1.232). Chloro-alkaline indices (CAI-I =-0.039, CAI-II = 0.007) suggest carbonate undersaturation. The SOM results showed that 64 neurons generated the hydrochemical properties of groundwater and were organized into four clusters, identifying areas with varied salinity, ionic content, and buffering capability. The computed WA-WQI scores vary from 8.45 to 122.03. MLR was applied to create a new WQI equation that includes four variables. The model shows that turbidity has the highest beta coefficient of 0.40 and is a major contributor to the classification of groundwater. The irrigation water quality investigation revealed that most of the irrigation indexes are suitable for agricultural use, with minor hazards of soil sodicity and permeability difficulties. These findings highlight the importance of ongoing monitoring and specific management measures for ensuring sustainable groundwater supplies.

Keywords

Author Keywords

HydrogeochemistryMultivariate statistical analysisSelf-organizing mapsGroundwater qualityWA-WQIMultiple linear regression

Keywords Plus

RIVERCHEMISTRY

29-Integrated assessment of groundwater hydrogeochemistry and quality using multivariate statistical analysis, self-organizing maps, and water quality indices in District Bagh, AJK, Pakistan

By Basharat, U (Basharat, Usman) [1] , [2] ; Zhang, WJ (Zhang, Wenjing) [1] , [2] ; Abbasi, A (Abbasi, Arshad) [2] ; Mahroof, S (Mahroof, Sehrish) [4] ; Han, CH (Han, Cuihong) [1] , [2] ; Khan, SH (Khan, Shoukat Husain) [3] ; Li, SX (Li, Shuxin) [1] , [2] **(provided by Clarivate) Source ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY Volume 301 DOI 10.1016/j.ecoenv.2025.118515 Article Number 118515 Published AUG 2025 Early Access JUN 2025 Indexed 2025-06-23 Document Type Article**

Abstract

Groundwater is a critical resource in the District Bagh, Azad Jammu & Kashmir, Pakistan, but its quality is deteriorating due to anthropogenic and natural impacts. This study evaluates the hydrochemistry and quality of groundwater using an integrated approach that includes Multivariate Statistical Analysis, Self-Organizing Maps, Weighted Arithmetic Water Quality Index, Multiple Linear Regression and Irrigation Water Quality Indices. The study revealed significant differences in physicochemical characteristics, such as cations and anions in the groundwater samples, suggesting both natural and anthropogenic impacts. Pearson shows EC has a strong positive correlation with Na+ (r = 0.75) and Cl-(r = 0.73), along with a robust correlation between Na+ and Cl-(r = 0.98), highlighting their significant roles in groundwater's ionic content. Geochemical interactions, salinity, ion exchange, and anthropogenic activities are identified as essential factors influencing groundwater quality using factor analysis. Hydrogeochemistry is significantly influenced by lithology: halite dissolution Cl-input (Na+/Cl-= 1.039); rock formation promotes silicate weathering and Na+ release (Na+/Cl-> 1); gypsum dissolution (Ca2+/SO42-= 12.085); and carbonate weathering (Ca2+ + Mg2+/HCO3- = 1.232). Chloro-alkaline indices (CAI-I =-0.039, CAI-II = 0.007) suggest carbonate undersaturation. The SOM results showed that 64 neurons generated the hydrochemical properties of groundwater and were organized into four clusters, identifying areas with varied salinity, ionic content, and buffering capability. The computed WA-WQI scores vary from 8.45 to 122.03. MLR was applied to create a new WQI equation that includes four variables. The model shows that turbidity has the highest beta coefficient of 0.40 and is a major contributor to the classification of groundwater. The irrigation water quality investigation revealed that most of the irrigation indexes are suitable for agricultural use, with minor hazards of soil sodicity and permeability difficulties. These findings highlight the importance of ongoing monitoring and specific management measures for ensuring sustainable groundwater supplies.

Keywords

Author Keywords

HydrogeochemistryMultivariate statistical analysisSelf-organizing mapsGroundwater qualityWA-WQIMultiple linear regression

Keywords Plus

RIVERCHEMISTRY

Environmental Monitoring

30-Micro-pressure promotes endogenous phosphorus release in a deep reservoir by favouring microbial phosphate mineralisation and solubilisation coupled with sulphate reduction

By Zhuo, TY (Zhuo, Tianyu) [1] ; He, LX (He, Lixin) [2] , [4] ; Chai, BB (Chai, Beibei) [2] , [4] ; Zhou, SL (Zhou, Shilei) [5] ; Wan, Q (Wan, Qiong) [3] ; Lei, XH (Lei, Xiaohui) [6] ; Zhou, ZM (Zhou, Zhenming) [7] ; Chen, B (Chen, Bin) [8] (provided by Clarivate) Source WATER RESEARCH
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Abstract

Deep reservoirs vary in their hydrostatic pressure owing to artificial water level control. The potential migration of phosphorus (P) in reservoir sediments raises the risk of harmful algal blooms. To ascertain the mechanisms of endogenous P release in reservoirs, we characterised aquatic microbial communities associated with coupled iron (Fe), P and sulphur (S) cycling at the sediment-water interface. The responses of microbial communities to hydrostatic pressures of 0.2-0.7 mega pascals (MPa; that is, micro-pressures) were investigated through a 30-day simulation experiment. Our findings unravelled a potential mechanism that micro-pressure enhanced the solubilisation of Fe/aluminium (Al)-bound P caused by microbially-driven sulphate reduction, leading to endogenous P release in the deep reservoir. Although the vertical distribution of labile Fe was not affected by pressure changes, we did observe Fe resupply at sediment depths of 2-5 cm. Metagenomic analysis revealed increased abundances of functional genes for P mineralisation (phoD, phoA), P solubilisation (pqqC, ppx-gppA) and sulphate reduction (cysD, cysC) in sediments subjected to micro-pressure, which contrasted with the pattern of S oxidation gene (soxB). There was a tight connection between P and S cycling-related microbial communities, based on significant positive correlations between labile element (P and S) concentrations and functional gene (phoD, cysD) abundances. This provided strong support that Fe-P-S coupling processes were governed by micro-pressure through modulation of P and S cycling-related microbial functions. Key taxa involved in P and S cycling (for example, Bradyrhizobium, Methyloceanibacter) positively responded to micro-pressure and as such, indirectly drove P release from sediments by facilitating P mineralisation and solubilisation coupled with sulphate reduction.

Keywords
Author Keywords
P releaseHydrostatic pressureMicrobial driversDiffusive gradients in thin filmsMetagenome
Keywords Plus
HYDROSTATIC-PRESSUREGENE-EXPRESSIONN2O EMISSIONSSULFIDEINTERFACEVIRULENCEOXIDATIONSEDIMENTSRESPONSESOCEAN

Environmental Monitoring

31-A local-to-global emissions inventory of macroplastic pollution

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Abstract

Negotiations for a global treaty on plastic pollution(1) will shape future policies on plastics production, use and waste management. Its parties will benefit from a high-resolution baseline of waste flows and plastic emission sources to enable identification of pollution hotspots and their causes(2). Nationally aggregated waste management data can be distributed to smaller scales to identify generalized points of plastic accumulation and source phenomena(3-11). However, it is challenging to use this type of spatial allocation to assess the conditions under which emissions take place(12,13). Here we develop a global macroplastic pollution emissions inventory by combining conceptual modelling of emission mechanisms with measurable activity data. We define emissions as materials that have moved from the managed or mismanaged system (controlled or contained state) to the unmanaged system (uncontrolled or uncontained state-the environment). Using machine learning and probabilistic material flow analysis, we identify emission hotspots across 50,702 municipalities worldwide from five land-based plastic waste emission sources. We estimate global plastic waste emissions at 52.1[48.3-56.3]million metric tonnes (Mt) per year, with approximately 57%wt. and 43%wt. open burned and unburned debris, respectively. Littering is the largest emission source in the Global North, whereas uncollected waste is the dominant emissions source across the Global South. We suggest that our findings can help inform treaty negotiations and develop national and sub-national waste management action plans and source inventories.

Environmental Monitoring

32-Chemometric investigation of river system contamination: Source identification and risk assessment using positive matrix factorization and Monte Carlo simulation

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Abstract
This study investigates the water quality of the Abdal River System in T & uuml;rkiye, an important water supply for the metropolitan area, using chemometric applications, including Positive Matrix Factorization (PMF) for source apportionment and Monte Carlo Simulation (MCS) for health risk assessment. Surface water samples were analyzed for 14 potentially toxic elements (PTEs), including nutrients and other elements. Their concentrations, in ascending order, were: Cd (0.13) G Cr (1.34) G Pb (1.50) G Mn (1.89) G Hg (1.98) G Cu (2.96) G Ni (5.32) G As (7.17) G Fe (31.16) G Zn (151.48) G Al (320.86) GK (3631) G Mg (15607) G Na (18870) G Ca (72842) mu g/L. The water quality was evaluated utilizing indices including Heavy Metal Pollution Index (HPI), Water Quality Index (WQI), and Contamination Degree (CD), with results indicating generally good water quality and minimal pollution levels. PMF analysis identified three primary sources of contamination: natural/geogenic processes, agricultural runoff, and urban activities including domestic runoff. Health risk assessments highlighted arsenic as the most significant contributor to non-carcinogenic and carcinogenic risks. For children, the hazard index (HI) for arsenic was 7.35E-01 (ingestion: 7.26E-01; dermal: 9.00E-03), remaining below the safety threshold of 1, indicating no significant non-carcinogenic risk. Similarly, the carcinogenic risk (CR) for arsenic was 2.92E-04, within the acceptable range (1E-06 to 1E-04). The Monte Carlo Simulation quantified variability and uncertainty in health risks, highlighting arsenic as the main contributor, with 16.15 % of scenarios for children exceeded the acceptable non-carcinogenic risk threshold. This study is the first to integrate PMF with MCS for a comprehensive evaluation of pollution sources and health risks in the Abdal River System, offering a novel approach to environmental management in semi-urban watersheds. The findings confirm the water quality is safe under current conditions but highlight the need for ongoing monitoring and targeted mitigation to ensure sustainable management of the Abdal River System.

Keywords
Author Keywords
Water qualityHealth risk assessmentPositive matrix factorizationMonte Carlo simulationPotentially toxic elements
Keywords Plus
MULTIVARIATE STATISTICAL EVALUATIONDISSOLVED TRACE-ELEMENTSWATER-QUALITY ASSESSMENTSURFACE-WATERHEAVY-METALSPOLLUTIONGIRESUNGROUNDWATERREACHESSTREAM