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Investigating the Feasibility of Mid-range Infrared Spectroscopic Analyzer (MIRA) for Quantification of Polysorbate 20

Dr. Wendy Todd

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Earth has a unique structure and consists of different layers and interacting subsystems reflective of the diversity of Earth's inhabitants.

Ecosystem diversity requires creative solutions, critical thinking, learning, and discovery all of which are fundamental elements of scientific endeavours, but those elements do not occur in a vacuum. People manifest these critical elements and the shared diversity of culture, experiences, and worldviews combines a broad range of perspectives, from a variety of knowledge sources to allow for the development of innovative solutions to the many unprecedented issues facing society. Thoroughly vetting diverse methodologies will yield stronger, more holistic solutions. The modern version of the scientific enterprise is heavily based on myopic perspectives, approaches, and interests, which in has created and sustained exclusive environments, destruction of fragile ecosystems, and loss of cultural diversity and thus innovative scientific solutions. As a result, only western science perspectives, ways of knowing, perspectives and approaches have been perpetuated while Traditional Knowledges have largely been overlooked. Historically excluded groups in STEM disciplines have lacked the opportunity to contribute vital perspectives that could enrich ideation and vetting of solutions, to today's climate and environmental crises.

Earth is facing an "all contributors needed" problems, however due to historical systemic structures, all contributors have not been invited to perform. Recent research shows that underrepresented science scholars produce higher rates of scientific novelty, yet they do not persist in systems where the innovation is created. The STEM workforce cannot operate at full capacity if all available and qualified minds are not engaged. The evolution of scientific productivity requires these new voices – new contributors. Here we will consider the important role and knowledge Indigenous peoples have to offer scientific innovation, environmental remediation, and in addressing the current global climate crisis.

Biography

Dr. Todd is a Dr. Howard Highholt Endowed Professor at UMD holding a joint appointment in the Departments of American Indian Studies and Earth & Environmental Sciences. AISES named her 2019 Professional of the Year. Dr. Todd has Ph.D.s in estuary - ocean systems and environmental science and engineering from OHSU. Her geoscience research focuses on examining microbial ecology, biogeochemistry, and biomineralization of metalliferous groundwaters. Her social science research focuses on DEI to provide understanding and respect for diverse students, faculty, and communities.She founded the Indigenous Geoscience Community, so that Traditional and Western knowledge systems can be expressed within culturally specific protocols. She co-founded the Indigenous Women's Water Sisterhood, providing knowledge about the Indigenous history of Lake Superior. Dr. Todd founded The Geoscience Education Program coupling STEM with Traditional Knowledge in K-12 education. She's a director for XKKF to preserve the highly endangered Northern Haida language.

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Extreme Precipitation in the Kulfo River Watershed, Ethiopia: Wavelet and Trajectory Analysis Assistant Professor at Ethiopian Defence University, College of Engineering

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Analysis of precipitation time series is a fundamental undertaking in meteorology and hydrology. The extreme precipitation scenario of the Kulfo River watershed is studied using wavelet analysis and atmospheric transport, a lagrangian trajectory model. Daily rainfall data for the 1991-2020 study periods are collected from the office of the Ethiopian Meteorology Institute. Meteorological fields on a three-dimensional grid at 0.5o x 0.5o spatial resolution and daily temporal resolution are also obtained from the Global Data Assimilation System (GDAS). Wavelet analysis of the daily precipitation processed with the lag-1 coefficient reveals some high power recurred once every 38 to 60 days with greater than 95% confidence for red noise. The analysis also identified inter-annual periodicity in the periods 2002 - 2005 and 2017 - 2019. Back trajectory analysis for 3-day periods up to May 19/2011 indicates the Indian Ocean source; trajectories crossed the eastern African escarpment to arrive at the Kulfo watershed. Atmospheric flows associated with the Western Indian monsoon redirected by the low-level Somali winds and Arabian ridge are responsible for the moisture supply. The time-localization of the wavelet power spectrum yields valuable hydrological information and the back trajectory approaches provide useful characterization of air mass source.

Biography

Dr Tesfay Mekonnen is a leading Assistant professor in the faculty of Meteorology and Hydrology. He has been actively participating in advising post graduate theses and writing researches. He has published extensively as author and co-author different articles in highly regarded, peer-reviewed journals. His research article entitled Analysis of Rainfall Trends and Its Relationship with SST Signals in the Lake Tana Basin, Ethiopia, which relates the effect of the large-scale dynamics on local climate for example had acquired a greater number of views, downloads, and citations. He frequently speaks at international conferences and was awarded many prestigious certificates.

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An Investigation on the Applications of Eucalyptus Bark Powder for the Removal Methylene Blue from Aqueous Solution

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Background: Textile, dyeing, and printing industries consume a large amount of water and different types of chemicals in their processes. Of the several dyes utilized in textile processing industries, methylene blue (MB) is widely used as the colouring agent. The removal of methylene blue (MB) from water bodies is necessary to meet regulated concentrations in order to protect human health and the environment and has been a subject of extensive academic and industrial research.

Objective: The main goal of this research was to evaluate the adsorption equilibrium isotherms, thermodynamic, kinetic, and mass transfer parameters for the removal of methylene blue from aqueous solution using Eucalyptus Bark Powder as an adsorbent.

Methods: In this work, eucalyptus bark powder was utilized as a low cost adsorbent for the removal methylene blue from aqueous solution. Batch adsorption studies were conducted and the effect of operating parameters such as adsorption dosage, pH, initial dye concentration, temperature, and contact time on the removal efficiency of Methylene blue (MB) were investigated. Adsorption equilibrium isotherm models were used to calculate the adsorption parameters and to evaluate the potential applicability of Eucalyptus Bark Powder for the removal of methylene blue from water. Thermodynamic parameters were calculated using thermodynamic equilibrium constants derived from various constants to reveal the feasibility and to understand the mechanism of the adsorption process. Kinetics aspects were studied to evaluate the rate of adsorption process. Mass transfer parameters were evaluated to predict the controlling step in the adsorption process.

Results: The maximum removal of MB was found at 2.5 g adsorbent dosage, 120 min contact time, pH of 8, Temperature of 303 K, and initial dye concentration of 200 mg/L. At optimum operating conditions, the experimental results of methylene blue removal efficiency was 92.5 %. The maximum theoretical adsorption capacity of methylene blue on the surface of chitosan/bentonite biocomposite was found to be 65.4 mg/g. Equilibrium studies were carried out in the temperature range of 283 to 313 K and found that the Freundlich isotherm fitted well to the experimental data with the highest correlation coefficient (R2) and least chi-square ($\chi 2$) values for all the adsorbents used.

Conclusion: The results revealed that eucalyptus bark powder was effective and a low cost adsorbent removal methylene blue from aqueous solution

Biography

Dr. Wondalem Misganaw has completed his PhD in Chemical Engineering from Indian Institute of Technology Delhi in 2017. Currently, he is Assistant Professor at Ethiopian Defence University, College of Engineering. He has published more than 7 papers in a peer reviewed journals and presented his research findings in more than 4 International conferences. His research interest is smart materials for environmental applications

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Modeling Land use Land Cover Dynamics using CA-Markov Chain Model and Geospatial Techniques: A Case of Belete Gera Regional forest Priority area, South Western Ethiopia

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Arrogant practices of land use including expansion of agricultural land and infrastructural development are resulting in deforestation that goes to climate change. Cellular Automata (CA)-Markov chain combines the advantages of cellular and Markov chain analysis to simulate and predict future land use/cover trends depending on the Land Use Land Cover (LULC) changes in the past. First, spatial distribution of LULC and area changed were calculated using IDRISI software and GIS technology, and then the forest land cover conversion to other LULC was evaluated to obtain rate of deforestation during a period of 1980-2018. Second, using transition potential matrices of 1999-2018, CA-Markov chain was executed to simulate spatial distribution of land use/cover in 2018. Based on the simulated LULC map for 2018 and the actual LULC map of 2018 CA-Markov model was validated with a kappa index of 1. Finally, future land use/cover transformed during the periods of 2018-2037 and 2037-2056 were predicted using CA-Markov chain model. The results revealed that decreasing of forest land and increasing of agricultural land in the study period. Forest land was decreased by 52,156.71 hectares from 1980 to 2018, while agricultural land increased by 78,021.35 hectares during 1980-2018. Rate of deforestation between 1980 and 2018 was 1,372.54 hectares per year. Therefore, the predicted results of 2037 year suggests that forest cover would decreases by 30,204.65 hectares within 19 years and also agricultural land would be increases by 30,693.91 hectares between 2018 and 2037. It approved helping concerned bodies that work on the forest better understand and address a tough land use system, and develop.

Biography

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Economic Dynamics of Adapting Climate Smart Agriculture on Sustainable Development Goals

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Climatic transformation, particularly through greater incidence and concentration of climate extremes, is anticipated to negatively influence agriculture and food security, especially in developing countries highly dependent on rain-fed agriculture. Although previous literature Argo-economic growth nexus rarely considered potential sectoral shifts causing increased disaster risks, socio-economic losses, and environmental problems. Therefore, this is an attempt to summarize the economic consequences of adopting Climate-Smart Agriculture (CSA) to attain food security and sustainable growth under climate change. For that purpose, Pakistan can be considered a developing country vulnerable to climate change-associated risks. Afterward, a qualitative approach was employed to determine the severity of the crisis faced by farmers and concerned communities. Furthermore, the optimization technique is suitable, where policymakers try to maximize welfare in current and future scenarios linked with the overall agricultural population. Moreover, this research can be included in analyses of several constraints and preferences of CSA design to apply it to several localities and conditions having numerous implications for innovation, research, and sustainable development

Biography

Sareer Ahmad is an aspiring economist currently pursuing Ph. D at Quaid-I-Azam University Islamabad, Pakistan, and research is in progress under the supervision of Prof. Dr. Amanat Ali. He holds an M.Phil. degree in economics also from Quaid-i-Azam University Islamabad, Pakistan. An undergraduate degree in economics from the University of Swabi. He participated in different national and international conferences. Now he is working as a Research Associate at the School of Economics, Quaid-I-Azam University Islamabad. His research expertise is in International Economics, Development economics, and Environmental economics. Most of his research work is published on Climate change, environmental degradation, exchange rate, and trade.

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Transient and stationary transport of adsorbing pollutants in model porous media

Mrs.Daniela Bauer

Departments of adsorption thermodynamics and kinetics and their influence on the different transport regimes

Understanding the transport of pollutants inside different porous structures remains a complex task as pollutants can adsorb to the solid surface following specific underlying adsorption kinetics. Transport is dominated by the pollutant specific adsorption behaviour coupled to the porous structure. We investigated the coupling between transport and adsorption in a two-dimensional regular porous medium by means of an extended Lattice Boltzmann approach [1-4]. We focused on the behaviour of molecules following: (1) the Henry model in which the adsorbed quantity is proportional to the adsorbate concentration and (2) the Langmuir model that describes monolayer adsorption and accounts for surface saturation.

The effect of the adsorption/desorption parameters on the transport behaviour in model porous media was investigated. For all adsorption conditions, we observed the three well-known transport regimes: diffusion-dominated regime (small times), transient regime (intermediate time range) and Gaussian or nearly Gaussian dispersion regime (large time range). However, there were important differences induced by the adsorption models. Particularly transient regimes, characterized by an asymmetric concentration profile, strongly depend on system parameters [5]. Concentration profiles become Gaussian (or nearly Gaussian) in the asymptotic long-time regime when the dynamical adsorption equilibrium is reached. We observed that the characteristic time to reach this equilibrium depends on the system's parameters and can be very long. In practice, such results may explain experimental observations where transport is found to be non-Gaussian even at a very large time scale. Consequently, for a better evaluation of pollutant transport in the subsoil or in water remediation processes it is crucial to consider the long-lasting transient regimes.

Biography

Daniela Bauer has her expertise in modelling flow and transport problems in porous media. She is particularly interested in the transport behaviour of adsorbing molecules. She focuses on the different adsorption thermodynamics and kinetics and their influence on the different transport regimes. Her flow and transport simulations are performed by means of an extended Lattice-Boltzmann code accounting for adsorption.

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Spatial and temporal evaluation of air quality index (aqi) from pre to post covid-19 lockdown in the megacity of pakistan

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Air pollution is the world's leading cause of deaths around the world. According to the World Health Organization (WHO), 7 million lives are lost due to exposure to hazardous atmospheric compounds. Pakistan, a third-world country of south Asia, is found to be occupied in severe economic and environmental crisis. Population in the country is exponentially growing, resulting in unplanned urbanization, fast industrialization, increased vehicular emissions, poor infrastructures and transport system. The performed study aims to highlight the variation in hazardous atmospheric compounds due to anthropogenic activities. Whereas, it also serves the purpose of providing air pollution status of the megacity of Pakistan. The selected study area was Karachi city and the parameter under observation was Air Quality Index (AQI). Live data retrieved from Plume Labs was sorted according to time and days and then was imported into ArcGIS software for formulation of choropleth maps. Results were classified into hazard as defined by United States Environment Protection Agency (USEPA) under various seasons in 4 divisions of Karachi. During autumn 2019, unhealthy AQI (181) was recorded in October. AQI in winter 2019-2020 increased further to 214 in December. In spring 2020, AQI became hazardous to 224 in February but prominently decreased after implementation of lockdown in April to 94. During summer 2020, noticeable drop was observed to 22 in June. While in July 2020, when lockdown was partially lifted, AQI reached to 88 and then slowly stabilized. After end of lockdown in October 2020, unhealthy AQI, 175, was observed. The fluctuations in AQI values is a strong evidence that anthropogenic activities majorly contribute in the degradation of air quality. In order to reduce the hazard, it is recommended to increase green infrastructure of the city to dilute hazardous compounds. Decrease in lawlessness with increase in heavy fines would effectively stimulate sustainability.

Biography

Falak Naeem has her expertise in environmental monitoring and Geographic Information Science (GIS) system. Her research based on air quality evaluation through cell phone and biomonitoring technique will provide cheap and convenient means of conquering the issue of air pollution for a developing country like Pakistan. She has also presented her various research work in International Conferences and is currently providing her services as a lecturer. The research presented above will assist decision-makers, environmentalists, government officials, law-enforcing bodies and researchers in determining point source of environmental pollution to reduce loss of human lives and maintain healthy environment as per the Sustainable Development Goals (SDGs). Dr. Lubna Ghazal has been linked with research and education sector since 12 years. She has raised various environmental issues and natural hazards on different forums. She is currently an Assistant Professor and is also working on a project of sustainable organic farming.

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