BOĞAZİÇİ ÜNİVERSİTESİ 1863

INSTITUTE OF ENVIRONMENTAL SCIENCES

5th ANNUAL GRADUATE SYMPOSIUM

Institute of Environmental Sciences

ABSTRACT BOOK

Social and Scientific Committee

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Thanks to

Açelya Eren

Gökçin Gül

Başak Kılıç

Müge Özdemir

Ece Özön

F. Koray Sakarya

F. Öykü Sefiloğlu

Berivan Ülger

Annual Graduate Symposium
Tuesday, April 30th 2019

PROGRAM

09:00 - 09:30 Registration - Coffee Service

09:30 - 09:50 Welcome Speech by Prof: Dr: Orhan Yenigün: Director of the Institute of Environmental Sciences

10:00 – 10:45 Keynote Talk by Metin Albükrek- "Uluslararası Şirkette Çevre Yönetimi"

10:45 – 11:00 Coffee Break

11:00 – 12.00 Oral Session I

11:00 – 11:20 F. Öykü Sefiloğlu "Determination of Paddy Soil Contamination with Emerging Pollutants in Ergene Watershed"

11:20 – 11:40 Muhammad Mansour "Comparison of Waste-To-Energy Technologies of Gasification and Incineration"

11:40 – 12:00 F. Koray Sakarya "Industrial Wastewater Treatment by Algae-Bacteria Consortia"

12:00 – 12:20 Leyla Kabasakal Güzeloğlu "Social Multi-criteria Evaluation of Selected Dairy Farms in Turkey"

12:20 - 13:15 Lunch Break

13:15– 14:15 Oral Session II

13:15 – 13:35 Sultan Kılınç "Modeling Water Supply and Demand Balance of Istanbul Under Future Climate and Socio-Economic Change Scenarios"

13:35-13:55 Hatice Aygün Karaçay "Molecular and Morphological Identification of AMF in Kütahya Mine Tailings: Bio-Phytoremediating at Mine Site"

13:55 – 14:15 Burcu Calda "Contributions of Plant Microbe Interactions to Enhance Drought Resistance Against Forest Fires"

14:15 – 15:30 Coffee Break – Poster Evaluations

15:30 – 16:15 Keynote Talk by Ümit Şahin - "İklim Hareketinde Yeni Dalga Büyürken: Türkiye İklim Politikalarının Neresinde?"

16:15 – 16:45 Award Ceremony

Poster Presentations

ID 01 Zeynep Akdoğan - Multi-Criteria Decision Analysis Applications in Watershed Management: A Review

ID 02 Aslınur Çalışıyor - Anaerobic Biodegradation of Petroleum in Contaminated Soil Under Sulphate-Reducing and Methanogenic Conditions

ID 03 Ezelnur Çıtak - An Investigation on Airborne Particulate Matter Composition at the Saritepe Campus, Boğaziçi University

ID 04 Zeynep Demiray - Comparison of Different Reagents for the Enhanced DNALP Remediation in Heterogeneous Porous Media

ID 05 Alkor Ezer - An Assessment of Soil Erosion Using RUSLE Model: A Case Study from the Marmara Region

ID 06 Berivan Ülger - Evaluation of Biodegradation of Bioplastics Under Landfill Conditions

ID 07 Fatma Sibel Saygılı Aracı - Determination of Exposures of Mediterranean Touristic Resources by Using Regional Climate Modeling

ID 08 Fatma Ece Sayın - Effects of Arbuscular Mycorrhizal Fungi Interactions and Sewage Sludge Application on Heavy Metal Phytoremediation in Mine Tailings

ID 09 Tülay Şan - Modeling Heavy Metals Uptake by Plants: A Case Study of Phytoremediation from Southern Turkey

ID 10 Ömer Uzun - Anaerobic Co-Digestion of Cow Manure, Food Waste and Waste Activated Sludge with *Trametes Versicolor* Pre-Treatment Under Mesophilic Condition

ID 11 Korcan Yakşi - Impact of Cosolvents on the Interphase Mass Transfer of NAPLs in Porous Media

ID 12 Arca Yılmaz - Recreational Use of Commons: Carrying Capacity Assessment in Belgrad Versus Aladağlar Parks in Turkey

ID 13 Arca Yılmaz - Analyzing the Efficiency of Solvents on Chlorophyll Extraction in *Chlorella sorokiniana* and *Synechocystis sp.*

ORAL PRESENTATIONS

Session I: 11:00 - 12:20
Moderator: Arca Yılmaz

Determination of Paddy Soil Contamination with Emerging Pollutants in Ergene Watershed

Presenter: Feride Öykü Sefiloğlu

Agricultural pollution is one of the biggest environmental concerns regarding the contamination of both soil and water resources. Owing to the mobility of pollutants in soil-water system, contamination of soil can be considered as a risk factor for the human health as well as aquatic ecosystem. Therefore, monitoring of soil contamination has a prime importance not only for the evaluation of the risk for the environment but also for the development of treatment and remediation methods for contaminated sites. Hence, development of a multiresidue analytical method was targeted for a wide range of chemicals selected from 39 frequently used pesticides in rice cultivation and 28 industrial pollutants detected in water samples collected from Ergene River in 2017-2018. Simultaneous extraction of the target analytes from soil samples and their quantification were performed with acetate buffered QuEChERS (quick, easy, cheap, effective, rugged, and safe) method and liquid chromatography coupled with tandem mass spectroscopy (LC-MS/MS), respectively. The developed method gave satisfactory recoveries within 70-120% for 78% of the target compounds. The method was applied to 22 soil samples collected from mainly paddy fields located in southwestern Thrace region adjacent to Ergene River in two sampling campaigns (January and October 2018) in order to determine the agricultural pollution caused by the pesticide application and irrigational activities. The residues of the selected pesticides were found in all soil samples within the concentration range of 0.04-2430 µg/kg, whereas the industrial pollutants were dominantly detected in soil samples taken from paddy fields as 0.05-807 µg/kg.

Comparison of Waste-To-Energy Technologies of Gasification and Incineration

Presenter: Muhammad Mansour

Waste is an inevitable product of society, and one of the greatest challenges for future generations is to understand how to manage large quantities of waste in a sustainable way. One approach has been to minimize the amount of waste produced, and to recycle larger fractions of waste materials. However, there still is a considerable part of undesired end products that must be taken care of, and a more suitable solution than simple landfilling needs to be found. On the other hand, the threat of global climate change and resource depletion become a driving force for changes in municipal solid waste (MSW) management towards a more integrated one. The waste hierarchy has been regulated aiming at diverting MSW towards reduce, reuse and recycling. Landfill has the lowest priority because of the production of leachate and gaseous emissions. Waste-to-Energy (WtE) has gradually constituted one of the most important options to achieve energy recovery from municipal solid waste (MSW). Waste-to-Energy (WtE) technologies, consisting of mainly incineration, pyrolysis and gasification, take an inalienable role in integrated waste management attributed to significant waste mass and volume reduction and energy recovery from unrecyclable materials. This review will provide a framework for evaluating WTE technological options based on case studies of some countries using Incineration and Gasification technologies. It concluded WTE as a potential renewable source of energy, which will partly meet the energy demand and ensure effective MSWM.

Industrial Wastewater Treatment by Algae-Bacteria Consortia

Presenter: F. Koray Sakarya

Treatment of industrial wastewater in conventional biological treatment systems are achieved mainly by bacterial microorganisms. Meanwhile, conventional treatment systems fail to satisfy stringent wastewater discharge standards mainly on nutrients such as nitrogen and phosphorus, heavy metals and emerging contaminants such as micropollutants. In addition, conventional treatment systems become a source of major greenhouse gases such as carbon dioxide, nitrous oxide and methane, and are not economically feasible due to high energy consumption for oxygen supply for the treatment of organic carbon. As an alternative, sustainable hybrid treatment technologies that are more advanced in simultaneous removal of macro and micropollutants, nutrients and heavy metals while consuming less oxygen are desired. In this context, autotrophic algae will be utilized for heavy metal removal and provide oxygen for heterotrophic bacteria which perform removal of micropollutants. First phase of developing such a hybrid system requires choice of best performing algae with high tolerance to heavy metals. Secondly, algae culture media needs to be altered to examine the effects of key nutrients to heavy metal tolerance in algae. In this study, we present the results of heavy metal challenge tests with algae species Chlorella vulgaris (strain CCAP 211/11b) and Ettlia oleoabundans (strain UTEX 1185) against copper (Cu) and zinc (Zn). E. oleoabundans is found to be more tolerant to Zn and more prone to toxic effects of Cu compared to C. vulgaris. Addition of iron (Fe) micronutrient to algae culture media elevated Cu tolerance of C. vulgaris by 36.5%.

Social Multi-criteria Evaluation of Selected Dairy Farms in Turkey

Presenter: Leyla Kabasakal Güzeloğlu

Dairy farms were selected by purposive sampling method. Farms with dairy production as main economic activity were selected. Dairy farmers were categorized based on the processor of their choice. Farms selling milk to different types of processors were grouped under different categories. Qualitative and quantitative data was collected from 80 farms via questionnaire method. Based on the questionnaire; resource, energy, water and labor criteria were quantified using both numeric and verbal data. All data was statistically analyzed, and sustainability assessment was conducted using Social Multi Criteria Evaluation (SMCE) methodology. The aim is; to take a snapshot of the farms and compare their performances based on farm management (decisions) and milk production practices from a sustainability standpoint. NAIADE is used for final comparison of the farms. The results of the assessment are a starting point for discussing sustainability at farm level to enhance learning and awareness of sustainability at farm level.

Session II: 13:15 - 14:15
Moderator: Arca Yılmaz

Modeling Water Supply and Demand Balance of Istanbul Under Future Climate and Socio-Economic Change Scenarios

Presenter: Sultan Kılınç

Population growth creates an increased freshwater demand with the subsequent developments due to urbanization and industrialization in the metropolis Istanbul, Turkey. Climate change has additional serious impacts on water resources. Therefore, sustainable water management practices are required to cope with the dynamic socio-economic change and climate change on water demand and supply balance in Istanbul. In this study, Water Evaluation and Planning Systems (WEAP) modelling program, as an Integrated Water Resources Management (IWRM) tool, is used to understand the impacts of climate change and socio-economic changes such as population growth and water use on water demand and supply balance and to know what awaits Istanbul until 2100. The model is analyzed under different scenarios of socio-economic and climate change. The physical and spatial properties of the watershed basin and catchment hydrology data appropriate with Rainfall Runoff (Simplified Coefficient) Method of WEAP are used in the baseline scenario construction and scenario analysis. Regarding the results, the city is expected to experience the negative impacts of climate change much more after 2030 while the impacts will get more dispersed and unpredictable after 2040. The high dependency on the external water resources, especially on Melen River, is increasing the water insecurity of the city especially with the pressure created by increased total water demand of the city. To achieve a water-smart society under the increasing pressures of climate change and socio-economic changes; technological improvements, policy changes and educational activities to increase environmental awareness are needed with the joint contributions of all stakeholders.

Molecular and Morphological Identification of AMF in Kütahya Mine Tailings: Bio-Phytoremediating at Mine Site

Presenter: Hatice Aygün Karaçay

Tavşanlı is a coal mining site located in Kütahya, Turkey. The tailings of this mine site are contaminated with heavy metals. Heavy metal contamination possesses a threat to the biota, ecosystem function and structure. Thus, remediation of mine tailing is crucial for the removal and destruction of toxic elements. Bio-phytoremediation is the use of plants, microorganisms or both to remove, detoxify, sequester contaminants or convert them into non-toxic materials. Since Tavşanlı stands for a stressed environment due to its contamination, it is hypothesized that native plants have an interaction with Arbuscular Mycorrhizal Fungi (AMF) in order to support plants to thrive in harsh conditions. This study has been examined how bio-phytoremediation methods can be implemented for the Tavşanlı mine site tailings. Soil samples were obtained from the mine site and were examined using both molecular and morphological techniques to investigate the presence of AMF-specific strains of these microorganisms are known to bioremediate heavy metal contaminated sites. Specific primers that target the Internal Transcribed Spacer (ITS) region were used to identify the AMF in the soil samples, and the amplified region was sequenced and compared to the AMF database.

Contributions of Plant Microbe Interactions to Enhance Drought Resistance Against Forest Fires

Presenter: Burcu Calda

In recent years, there has been a significant increase in the number of wildfires in the Mediterranean basin along with climate change. Fires lead to more damage to forests than natural disasters. According to studies on the subject, wildfires are related to atmospheric instability and dryness, as well as changes in moisture content of different soil layers in the forest floor and change in fuel moisture content. On the other hand, Arbuscular mycorrhizal fungi (AMF) which are ubiquitous endophytic fungi have a crucial role in vegetation growth in ecosystems. Soil microbial contributions that form symbiotic associations with host plants improve ability of water uptake from soil, also reduce drought stress in their host plants. In this research, Canadian Fire Weather Index (FWI), which provide potential fire behaviour by using temperature, relative humidity, wind speed and precipitation, and the previous day's fuel moisture conditions will be used to estimate potential forest fire in the Mediterranean basin. Additionally, in the greenhouse experiment, plant-microbe (AMF) interaction to rise drought resistance against fires were highlighted. In this experiment, soil moisture rate was investigated by using soil taken from Muğla forest area and from a mine tailing area in Kütahya, Pinus nigra (Turkish pine) sapling, Quercus (oak) sapling and mycorrhiza (AMF). The greenhouse experiment has revealed that AMF used pots both in Muğla soil and mine soil are more successful in water uptake from soil as well as reducing drought stress in their host plants according to soil moisture measurements. Thus, soil microbial contributions might not only be used for reforestation in the mine area, but also be increased in forest area in order to decrease drought stress during dry summer. It might be used as precaution to prevent or to slow down forest fires in arid regions.

POSTER PRESENTATIONS

ID 01 Multi-Criteria Decision Analysis Applications in Watershed Management: A Review

Zeynep Akdoğan

Decision support tools have become a significant methodology in environmental sciences for many years. Multi-criteria decision analysis (MCDA) is a systematic methodology, which combines hierarchical structures of a problem and priorities for the alternatives in many fields. This study aims to review MCDA applications in watershed management. Over 200 papers published between 1981 and 2018, involve MCDA applications in watershed management are identified in the Web of Science database. The research articles of “Environmental Sciences”, “Environmental Studies” and “Water Resources” categories of Web of Science are taken into consideration to investigate MCDA approach in scientific research for evaluating long-term water security and planning watershed management strategies. The papers identified are subsequently classified according to watershed hydrology and/or water quality management issues. Here, watershed hydrology division focuses on quantity assessment and water supply and also includes the MCDA applications to assess the hydrological vulnerability of watersheds and alternatives for flood management, while water quality division involves MCDA studies in different environments including soil, groundwater and surface water of the watersheds. Risk assessment are also considered as a subtopic of both watershed hydrology and water quality management issues. The results reveal that application of MCDA tools in environmental sciences and watershed management has increased significantly over the last two decades. According to the results, the number of applications in water quality issue is more dominant than watershed hydrology.

ID 02 Anaerobic Biodegradation of Petroleum in Contaminated Soil Under Sulphate-Reducing and Methanogenic Conditions

Aslınur Çalışıyor

Petroleum is the most common raw energy source, resulting in soil and groundwater pollution during the exploration, refining, transport and storage. Recently, because of the high cost and secondary waste production during physical and chemical treatment, biological treatment methods have become essential in environmental studies. Instead of aerobic degradation, anaerobic degradation is carried out as an alternative method by virtue of less biomass production and biogas generation under different electron accepting conditions. The aim of this study was to assess the biodegradability of petroleum in contaminated soil under methanogenic and sulphate-reducing conditions at different temperatures by microcosms inoculated with sediment from a hydrocarbon-contaminated aquifer from Leuna, Germany. Microcosm tests were carried out for approximately 200 days and biodegradation efficiency, microbial community profile and biogas generation rates were monitored. Microbial community profiles were recorded by quantitative real time polymerase chain reaction (qRT-PCR), high resolution melting (HRM) and next generation sequencing (NGS) based amplicon sequencing of 16S rRNA genes. The performance of biodegradation was specified by total organic carbon (TOC) analysis as preliminary examination for total petroleum hydrocarbon (TPH) analysis. Based on the results, TOC degradation efficiency was as high as 70% under sulphate-reducing conditions while TOC removal was negligible under methanogenic conditions. According to molecular analyses, microbial community profiles were correlated with chemical process parameters such as TOC removal, biogas generation and electron acceptor utilization. Overall results of microcosm tests showed that the higher TOC removal efficiencies were related to the change in the microbial community profiles under sulphate-reducing conditions.

ID 03 An Investigation on Airborne Particulate Matter Composition at the Saritepe Campus, Boğaziçi University

Ezelnur Çıtak

Particulate matter (PM) are released into the atmosphere from both anthropogenic (e.g. transport and biomass burning) and natural sources (e.g. sea-salt, soil dust and vegetation). The purpose of this study is to evaluate chemical composition and possible sources of airborne particulate matter (PM) at the Sarıtepe campus of Boğaziçi University along the Black Sea coast. While a number of studies have focused on PM in coastal areas of the East Mediterranean Sea, the contributions of Black Sea to PM has been less studied. The campus is also close to the forests of north-western Istanbul and the newly opened highway connecting to the Yavuz Sultan Selim Bridge. PM Samples were collected from various locations within the campus and at different distances from the coast line. The study extended over a period of 10 months (21 March 2017 to 20 Jan. 2018) to study season variations (summer vs. winter) in PM as well as the sensitivity of PM levels to wind speed and direction. Sensitive laboratory techniques (ICP-MS, IC, AAS) were used for the analysis of the collected solid and aqueous phases. In total 360 samples were analysed for 26 parameters (F-, Cl-, NO2-, NO3-, SO42-, PO43-, Br-, Mg+, Ca2+, K+, Na+, Cr, Mn, Fe, Ni, Cu, Zn, Al, Cd, Pb, Si, Co, Mo, pH, TDS and electrical conductivity). Potential sources of the collected PM were investigated using a multivariate factor analysis technique (PMF 5.0). Results of the study shows that the metal compositions are highly correlated to each other. Levels of some metals were relatively high compared to reported data in the literature. The composition of the collected PM indicates that both anthropogenic and natural sources have contributed to the PM in the study area. Specifically, PMF analysis suggests that the PM most likely originated from 4 sources: Agricultural Activity, Burning Processes, Marine Aerosol, and Roadway Transportation.

ID 04 Comparison of Different Reagents for the Enhanced DNAPL Remediation in Heterogeneous Porous Media

Zeynep Demiray

The presence of chlorinated solvents in the subsurface in the form of dense non-aqueous phase liquids (DNAPL) often leads to long-term contamination of large portions of groundwater resources. In this study, reagent-enhanced remediation of DNAPL source zones is investigated. The laboratory-scale experiments focused on the recovery of pooled PCE entrapped in homogenous silica sand and natural calcareous soil using Tween 80, Sodium dodecyl sulfate (SDS), Methyl beta cyclodextrin (MCD) and water. Batch and 2-D flow-cell experiments were conducted to evaluate the performance of the different reagents within the two porous media. The batch tests revealed the behaviour of the multiphase system and identified potential limitations of the different flushing solutions. The flushing experiments were evaluated both in terms of the effluent time-dependent concentration and mass flux reduction. The results showed that the performance of reagents for PCE source zone remediation was in the following order: Tween 80> SDS> MCD>Water. Factors influencing the DNAPL recovery efficiency included the spatial distribution of the DNAPL, type and concentration of reagent, and the heterogeneity of the porous media. The implications of these findings on field remediation activities will be discussed. Overall, the experiments highlight the significance of site characteristics and the importance of selecting an appropriate flushing reagent for the development of effective DNAPL remediation strategies.

ID 05 An Assessment of Soil Erosion Using RUSLE Model: A Case Study from the Marmara Region

Alkor Ezer

Soil resource is essential for livelihood of human being. Soil erosion is one of the most serious natural problem affected by land degradation, agricultural and other human induced activities, such as climate change, particularly the changed precipitation trend. The aim of the study is applying the Revised Universal Soil Loss Equation (RUSLE) with the help of remote sensing and geographic information systems techniques to calculate soil loss and to map soil erosion of the Marmara Region of Turkey in changing climate conditions between 1989 and 2017, and also to make future projection of soil erosion for the years between 2020 and 2049. This model is composed of variety of factors associated with climate, vegetation, soil and topography

ID 06 Evaluation of Biodegradation of Bioplastics Under Landfill Conditions

Berivan Ülger

Plastics are utilized in numerous applications due to being applicable and cost-effective. Although their resistance leads to this extensive use, their environmental impacts cannot be ignored. Bioplastics generated mostly from renewable sources are seen as an alternative to conventional plastics. Polylactic Acid (PLA) is one of the mostly produced bioplastics because of its shelf life for various applications. Even though bioplastics have drawn a lot of attention recently, their ultimate situation in landfill sites is still unknown. In this study, standardized laboratory-scale lysimeter experiment was used for the simulation of landfill conditions to evaluate the biodegradability of PLA under real landfill conditions. The reactors were loaded with municipal solid waste taken from an operating landfill, PLA cups and seed sludge. The different phases of landfill stabilization were considered; hence, the reactors were operated under aerobic, semi-aerobic and anaerobic conditions, respectively. Throughout the operation, both the leachate and biogas of the reactors were regularly monitored with regard to their quality and quantity. Bioplastic cups were examined considering their mass change, tactile and visual aspects. The results indicate that bioplastics did not undergo significant biodegradation under the first two phases (aerobic and semi-aerobic) which lasted 106 days. The gravimetric and visual changes were negligible. On the other hand, it was seen that the cups were much softer and whiter when they were taken out of the last reactor. The surface of the cups was prominently damaged and there were around 13% decrease in weight of the cups.

ID 07 Determination of Exposures of Mediterranean Touristic Resources by Using Regional Climate Modeling

Fatma Sibel Saygılı Aracı

Summer tourism in the Mediterranean Basin is one of the most important contributors to the countries' GDPs, and is highly dependent on the climatic conditions. In this study, it is aimed to determine the exposures of the most visited touristic resources in the Mediterranean Basin via Tourism Climate Index which is an ideal indicator of tourism exposure to the hazard of changes to the mean climate. For this purpose, the outputs of the MPI-ESM-MR global climate model of the Max Planck Institute for Meteorology are downscaled to 50km by the use of Regional Climate Model (RegCM4.4) of the Abdus Salam International Centre for Theoretical Physics (ICTP). To make future projections for the period of 2021-2050 and 2070-2099 with respect to the reference period of 1971-2000, RCP 4.5 and RCP 8.5 scenarios are used. Tourism Climate Index (TCI) for projected periods are computed by using the 30-year monthly mean temperature, relative humidity, precipitation, wind and sunshine outputs of the RegCM4.4. Thereafter, the TCI values are plotted to see the changes throughout the months. This study is supported by YOK 100/2000 scholarship.

ID 08 Effects of Arbuscular Mycorrhizal Fungi Interactions and Sewage Sludge Application on Heavy Metal Phytoremediation in Mine Tailings

Fatma Ece Sayın

Phytoremediation can be enhanced by the substantial symbiotic relationship between Arbuscular Mycorrhizal Fungi (AMF) and the hyper accumulator plants. AMF enables fungal colonization in plants and their symbiotic relationship may promote stabilization of trace elements in rhizosphere of plants, favouring phytostabilization and phytoextraction. AMF sets up intimate hyphal network of fungi with the host plant root and enables nutrient, water and heavy metal uptakes. Additionally, application of sludge as a soil amending material improve the phytoremediation by promoting the growth of plants. This study aims to investigate the effects of AMF interactions and sewage sludge application on heavy metal phytoremediation in mine tailing soils. The chrome mine tailing soil samples having very high heavy metal (Cr, Al, and Fe) content were ameliorated by phytoremediation enhanced by inoculation of Glomalin Mosseae or Glomalin Intraradices and application three different doses of domestic sewage sludge. The greenhouse pot experiments were performed by planting sunflowers in 12 different pot series prepared in three parallels (total of 36 pots) and following their growth for three months. The pots were filled with the mine tailing soil and different sewage sludge doses of 10, 20 and 30 g/kg soil. One half of the pots were inoculated with Glomalin Mosseae and the rest with Glomalin Intraradices. AMF inoculation improved the efficiency of phytoremediation by increasing the metal uptake of plants. The sludge application improved the growth of plants. The combined Glomalin Mosseae and sludge (20 g/kg) amendments resulted with the highest plant heavy metal uptake and phytoremediation efficiency.

ID 09 Modeling Heavy Metals Uptake by Plants: A Case Study of Phytoremediation from Southern Turkey

Tülay San

Removal of heavy metals from the soil by phytoremediation has been a subject of interest in recent years due to the difficulties of removing heavy metals with conventional methods. Modelling is considered as a promising tool to understand the mechanisms of contaminant uptake by plants since it is the cheapest and the most time efficient way to predict the removal efficiency of the contaminant from the soil. The aim of this thesis is to model the uptake of heavy metals (Cu, Pb, Zn) by Sorghum and Sunflower. The model data were obtained from soil in Kilis, which was planted in 2011 and 2012. Modelling of heavy metal uptake was conducted using the GoldSim contaminant transport module. This mass transport model is a mathematical representation of an actual system, which can be used to simulate and hence predict the fate and transport of heavy metals within a coupled environmental system comprising both soil and plant. Model results are in good agreement with observed data. Kd, partition coefficient heavy metals between soil water and soil solid values for Cu, Zn, and Pb are found to be 3.47, 3.05, and 2.42 respectively. Results suggest that the uptake rate of Sunflower was higher than that of Sorghum. Partition coefficient is found to be the most effective parameter, followed by transpiration rate and plant mass in determining the residue heavy metal soil concentration.

ID 10 Anaerobic Co-Digestion of Cow Manure, Food Waste and Waste Activated Sludge with *Trametes versicolor* Pre-Treatment Under Mesophilic Condition

Ömer Uzun

Biological pre-treatment with fungal species such as *Trametes versicolor* using their extracellular enzymes leads to an improvement in biodegradation of lignocellulosic substrates and increases biogas production. In this study, cow manure (M), food waste (F) and waste activated sludge (W) were co-digested under mesophilic conditions with and without pre-treatment with T. versicolor captured in Ca-alginate beads. T. versicolor was incubated in the medium for 10 days and then it was encapsulated in Ca-alginate beads, and the pre-treatment process was conducted for the combination of MF, MW, FW and FMW. Following the biological pre-treatment, same amount of volatile solids-containing feedstock mixtures were inoculated with anaerobic seed sludge with an inoculum to substrate ratio of 2:1 (VS basis) and anaerobic digesters were set up. The results indicated that pre-treatment with T. versicolor led to an increase in methane yield for the combination of MF, MW, FW and FMW by 35%, 8%, 16% and 23%, respectively. Besides, our results showed that the food waste was the most significant substrate in this experiment for improving methane yield. Moreover, acetic acid concentration in the digesters were at their highest level on the 3rd day, and also significantly lower in the digesters that did not include food waste than the ones contained food waste, which was consistent with methane yield. The results also showed that the food waste led to the acceleration of the acidification process for anaerobic co-digestion, and consequently the concentrations of volatile fatty acids increased.

ID 11 Impact of Cosolvents on the Interphase Mass Transfer of NAPLs in Porous Media

Korcan Yakşi

Contamination of the subsurface with organic contaminants in the form of non-aqueous phase liquids (NAPLs) is a widespread and critical environmental threat. Due to their low aqueous solubilities, high adsorption rates and potentially high toxicities, these compounds act as long-term contamination sources and are among the most challenging to remediate. Among many remediation techniques introduced in recent years, cosolvent flushing for enhanced dissolution of NAPLs has been demonstrated as a cost-efficient and effective method for in-situ remediation of NAPLs. Interphase mass transfer of the NAPL mass into the flushing solution is a key process that controls the effectiveness of the enhanced dissolution remediation technology; yet very few direct studies have rigorously investigated the effect of cosolvents on it. This study investigates the effect of cosolvents on the mass transfer of NAPLs into flushing solutions. The cosolvent and NAPL selected for this purpose are ethanol and 1,2-dicholorobenzene (DCB), respectively. A series of experiments are conducted to test the effect of ethanol content and flushing velocity on mass transfer. The experimental results are interpreted using a one-dimensional analytical solution and a two-dimensional pore network model. The mass transfer coefficients estimated from the two models are used to develop Sherwood correlations. It is observed that cosolvent presence has a significant impact on mass transfer coefficient. The developed Sherwood correlations can potentially be used in further modelling studies and field applications involving the remediation of entrapped NAPLs.

ID 12 Recreational Use of Commons: Carrying Capacity Assessment in Belgrad Versus Aladağlar Parks in Turkey

Arca Yılmaz

In 1968, Hardin introduced the Tragedy of the Commons. Accordingly, a common pool resource will be over-exploited by its users in a projected time scale. A common pool resource is characterized by rivalry (one person's use diminishes others' use) and non-excludability (one cannot easily exclude others from using the resource). As such, national parks are widely considered as common pool resources and are usually overused. In Turkey, recreational parks are therefore subject to this tragedy. Excessive use of these spaces for touristic purposes create vulnerabilities. In the present study, two cases will be examined: Belgrad Forests in Istanbul and Aladağlar National Park in Niğde. The study aims to determine carrying capacity indicators and standards by using Limits of Acceptable Change (LAC) framework in two case studies. A short quantitative questionnaire collected data from 48 outdoor sports enthusiasts for Aladağlar National Park and 21 for Belgrad Forest. Questions related to litter amount, crowdedness and vegetation loss were asked. Results indicate that visitors generally cannot tolerate the litter amount that they see in the parks. Moreover, while the number of people visitors encounter was not seen as a major problem in Aladağlar, in Belgrad Forest it was found to be significant for visitors even though it was not the first priority. To satisfy high number of visitors, campgrounds should be kept clean and vegetation loss should be minimal. In sum, this study showed that visitor-induced problems are concern of visitors and park managements should regulate proposed indicators by setting standards.

ID 13 Analyzing the Efficiency of Solvents on Chlorophyll Extraction in *Chlorella sorokiniana* and *Synechocystis sp.*

Arca Yılmaz

Chlorophyll is the fundamental pigment that is involved in photosynthesis in green plants and algae. For the sake of definition, rate of some photosynthetic products, such as oxygen formation, carbohydrate production or hydrogen evolution, is given with respect to chlorophyll concentration. There are two ways to determine chlorophyll concentration; absorbance calculation by spectrophotometric method and measuring chlorophyll fluorescence. Regarding spectrophotometric method, there are no thoroughly accepted method for chlorophyll extraction and some solvents work better than the others on different algae strains. Also, various extinction coefficients are in use, which may lead a confusion. In this research, effects of different solvents on chlorophyll extraction in one alga and one cyanobacterium species were determined by spectrophotometric methods. Both Chlorella sorokiniana alga and cyanobacterium Synechocystis sp. were grown under 100 µmol photon/m^2s intensity of white fluorescent light under 12:12 hr light and dark cycles. As soon as the cultures reached mid-exponential stage, samples were collected in triplicates. Samples were centrifuged and washed twice with deionized water. Once pallets were obtained, samples were homogenized with a tissue grinder at 1200 rpm and extracted with solvents acetone (90% v/v), pure methanol and ethanol (95% v/v). Each solvent was tested separately. For acetone Jeffrey and Humphrey's Trichromatic equations, for methanol corrected Porra equations (Porra, 2002) and for ethanol Kaczmar (Kaczmar, 2004) equations were taken. Absorbance values were measured with UV-Vis spectrometer. The efficiency of solvents is shown with comparison.

Jury Members

Prof Dr. Ali Kerem Saysel	**Ece Özön**
Prof. Dr. Melek Türker Saçan	**Gökçin Gül**
Assoc. Prof. Başak Güven	**Duygu Özçelik**

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ENKA
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onur yılmaz design